UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 8770

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
90/014,419	12/16/2019 RULE	701	3992	CAAMP-001X

AIA (First Inventor to File): YES

INVENTORS

8032278, Residence Not Provided;
OMEGA PATENTS, LLC, DOUGLASVILLE, GA;
INNOVA ELECTRONICS CORPORATION (3RD PTY REQ.), ALISO VIEJO, CA;

APPLICANTS

STETINA BRUNDA GARRED & BRUCKER, ALISO VIEJO, CA

**** CONTINUING DATA **************************

This application is a REX of 11/773,272 07/03/2007 PAT 8032278
which is a CIP of 11/076,259 03/09/2005 PAT 7720597
which is a CON of 10/383,496 03/07/2003 PAT 7149623
which is a CON of 09/859,972 05/17/2001 PAT 6606561
which claims benefit of 60/264,811 01/29/2001
and claims benefit of 60/258,005 12/22/2000
and claims benefit of 60/251,552 12/06/2000
and claims benefit of 60/252,125 11/20/2000
and claims benefit of 60/236,890 09/29/2000
and claims benefit of 60/246,463 11/07/2000
and claims benefit of 60/222,777 08/03/2000
and claims benefit of 60/205,178 05/17/2000

**** FOREIGN APPLICATIONS *********************

** SMALL ENTITY **

Foreign Priority claimed	☐ yes ☐ no	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119 (a-d) conditions met	☐ yes ☐ no ☐ Met after Allowance			22	3
Verified and Acknowledged	Examiner's Signature Initials				

ADDRESS
27975

TITLE

Geotab Exhibit 1008
Geotab v. Omega

Vehicle Tracking Unit with Downloadable Codes and Associated Methods

FILING FEE RECEIVED 6000	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,419	12/16/2019	8032278	CAAMP-001X	8770

27975 7590 01/11/2021

ADD+G - 27975
1135 East State Road 434, Suite 3001
Winter Springs, FL 32708

EXAMINER
TARAE, CATHERINE MICHELLE

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
01/11/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patents and Trademark Office
P.O.Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS

STETINA BRUNDA GARRED & BRUCKER
75 ENTERPRISE
SUITE 250
ALISO VIEJO, CA 92656

Date: January 11, 2021

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. : 90014419
PATENT NO. : 8032278
ART UNIT : 3993

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified ex parte reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the ex parte reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Christopher F. Regan, Esquire
ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA
PO Box 3791
Orlando, FL 32802

(For Patent Owner)

STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, CA 92656

(For Third Party requester)

In re Flick
Ex Parte Reexamination Proceeding
Control No. 90/014,419
Request Deposited: 12/16/2019
For: U.S. Patent No. US 8,032,278 ('278 patent)

DECISION ON PETITION UNDER 37 C.F.R. § 1.59

This is a decision on the Patent Owner petition filed January 04, 2021 titled "PATENT OWNER'S PETITION TO EXPUNGE UNDER 37 C.F.R. §1.59(b)"

For the reasons set forth below, the decision on the petition is **Granted**.

STATUTES, REGULATIONS, AND PATENT EXAMINING PROCEDURES

37 CFR 1.59 Expungement of information or copy of papers in application file states in part that:

(b) An applicant may request that the Office expunge information, other than what is excluded by paragraph (a)(2) of this section, by filing a petition under this paragraph. Any petition to expunge information from an application must include the fee set forth in § 1.17(g) and establish to the satisfaction of the Director that the expungement of the information is appropriate in which case a notice granting the petition for expungement will be provided.

DECISION

In the January 4, 2021 petition, patent owner requests pursuant to 37 CFR 1.59(b), that the change of power of attorney filed December 7, 2020; the Notice of Acceptance of Power of Attorney and the Notice Regarding Change of Power of Attorney issued December 10, 2020 be expunged from the record.

In their petition, patent owner asserts and has established that the change of power of attorney filed by CalAmp on December 7, 2020 in 90/014,419 ('419 proceeding) was wrongly filed since CalAmp had no legal authority to act on behalf of this patent. Patent Owner notes that there was no statement under 37 CFR 3.73(c) filed with the change of power of attorney which noted that chain of title ended with CalAmp and further notes that reel 019515, and frame 0350, evidences that Omega Patent L.L.C, is the proper owner of the '278 patent. Thus, in view of the wrongly filed change of power of attorney, Patent Owner asserts that the Office improperly issued the Notice of Acceptance of Power of Attorney and Notice Regarding Change of Attorney on December 10, 2020.

Accordingly, since patent owner has established that the December 7, 2020 Change of Power of Attorney was wrongly filed and that the December 10, 2020 Notice of Acceptance of Power of Attorney and Notice Regarding Change of Attorney were improperly issued, the petition is granted and these documents are hereby expunged from the record.

CONCLUSION

1. Patent Owner's January 4, 2021 petition is **Granted**.

2. The December 7, 2020 Power of Attorney filed by CalAmp Corp. and the December 10, 2020 Notice of Acceptance of Power of Attorney and the Notice Regarding Change of

Power of Attorney issued by the Office have been expunged from the record by closing the papers in the Information File Wrapper (IFW) and marking them as non-public.

3. USPTO Office records for the '419 reexamination proceeding and for the '278 patent have been modified as appropriate based on this decision.

4. Inquiries regarding this decision may be directed to Stephen Stein, Managing Quality Assurance Specialist, Central Reexamination Unit, at (571) 272-1544.

/Stephen J. Stein/
Managing Quality Assurance Specialist
Central Reexamination Unit

cc: Barnes & Thornburg, LLP (IN)
11 S. Meridian Street
Indianapolis, IN 46204

Electronic Acknowledgement Receipt

EFS ID:	41544396
Application Number:	90014419
International Application Number:	
Confirmation Number:	8770
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Customer Number:	23643
Filer:	Jack G. Abid/Sheryl Scheibe
Filer Authorized By:	Jack G. Abid
Attorney Docket Number:	CAAMP-001X
Receipt Date:	04-JAN-2021
Filing Date:	16-DEC-2019
Time Stamp:	14:50:46
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the Office of Petitions	SS581063CIP1REX4PETITION.pdf	292160 fcd6463aef68cd8ca303a10f0990fafc082e3850	no	5

Warnings:

Information:	
Total Files Size (in bytes):	292160

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of **KENNETH FLICK**	)	
Serial No. **90/014,419**	)	Examiner: **C. TARAE**
Confirmation No. **8770**	)	Art Unit: **3992**
Filing Date: **12/16/2019**	)	Attorney Docket No. **CAAMP-001X** **(0058106CIP1_REX4)**
For: **VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS**	)	

PATENT OWNER'S PETITION TO EXPUNGE UNDER 37 C.F.R. §1.59

EFILE
Commissioner For Patents

Commissioner:

Pursuant to 37 C.F.R. §1.59, Omega Patents L.L.C. ("Patent Owner") hereby petitions the Director to expunge the filings noted below.

The present petition is being filed with the petition fee specified under 37 C.F.R. §1.17(g).

STATEMENT OF FACTS

1. On October 4, 2011, the patent at issue in this reexamination proceeding, U.S. Pat. No. 8,032,278 ('278 Patent), issued with 22 claims.

2. On December 28, 2016, the first *Ex Parte* Reexamination of the '278 Patent by CalAmp, an infringer of the '278 patent, was concluded with an *Ex Parte* Reexamination Certificate with all claims confirmed patentable.

3. On February 6, 2019, the second *Ex Parte* Reexamination of the '278 Patent by CalAmp was concluded with an *Ex Parte* Reexamination Certificate with all claims confirmed patentable.

4. On January 8, 2020, the third *Ex Parte* Reexamination of the '278 Patent by CalAmp was concluded with an *Ex Parte* Reexamination Certificate with all claims confirmed patentable.

5. On December 16, 2019, this fourth reexamination proceeding was initiated by the filing in the United States Patent and Trademark Office of a 60-page Request for *Ex Parte* Reexamination of the '278 Patent by Innova Electronics Corporation, a supplier to CalAmp.

6. On January 27, 2020, the Examiner mailed a decision finding that no substantial new question of patentability was raised by the Request, and rejecting the five

substantial new questions of patentability alleged in the request.

7. On February 25, 2020, the supplier to CalAmp filed a petition for review of the Examiner's decision refusing to institute the fourth *Ex Parte* Reexamination of the '278 patent.

8. On December 7, 2020, CalAmp wrongly filed for a change of power of attorney for the present application. No statement under 37 C.F.R. §3.73(c) noting the chain of title ending with CalAmp was filed. CalAmp has no legal authority or power to change the power of attorney.

9. On December 10, 2020, the USPTO wrongly issued a Notice of Acceptance of Power of Attorney and a Notice Regarding Change of Power of Attorney.

10. As evidenced at reel 019515, and frame 0350, Omega Patents L.L.C. is the proper owner of the '278 patent.

In re Patent of
Kenneth E. FLICK
Reexamination Control No. **90/014,419**
Filed: **12/16/2019**
_____/

REMARKS

Pursuant to 37 C.F.R. §1.59, the Patent Owner hereby requests expungement of: the change of power of attorney filed December 7, 2020; and the Notice of Acceptance of Power of Attorney and the Notice Regarding Change of Power of Attorney incorrectly issued on December 10, 2020.

The Commissioner is hereby authorized to charge or credit any discrepancies in fee amounts to Deposit Account No. 01-0484.

Respectfully submitted,

/JACK GEORGE ABID/

JACK GEORGE ABID
Reg. No. 58,237
Allen, Dyer, Doppelt,
+ Gilchrist, P.A.
255 S. Orange Avenue, Suite 1401
Post Office Box 3791
Orlando, Florida 32802
407-841-2330
407-841-2343 fax
Attorney for the Patent Owner

In re Patent of
Kenneth E. FLICK
Reexamination Control No. **90/014,419**
Filed: **12/16/2019**
_____/

CERTIFICATE OF SERVICE

Certificate of Service in compliance with 37 C.F.R. §1.530(c)

Pursuant to 37 C.F.R. §§1.530(c), 1.248, I hereby certify that on January 4, 2021, a complete copy of this Request is being served via First Class U.S. Mail upon Third Party Requester at the correspondence address as shown in PAIR:

Mark B. Garred
STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, California 92656

Respectfully submitted,

/JACK GEORGE ABID/

_____
Jack G. Abid

Electronic Acknowledgement Receipt	
EFS ID:	40275537
Application Number:	90014419
International Application Number:	
Confirmation Number:	8770
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Correspondence Address:	CHRISTOPHER F. REGAN, ESQUIRE ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA PO BOX 3791 - ORLANDO FL 32802-3791 US 407-841-2330 -
Filer:	Mark B. Garred/Andrea Levine
Filer Authorized By:	Mark B. Garred
Attorney Docket Number:	CAAMP-001X
Receipt Date:	13-AUG-2020
Filing Date:	16-DEC-2019
Time Stamp:	14:06:52
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Miscellaneous Incoming Letter	ResponseToPatentOwnersPetition_cert_service_attached.pdf	44024 b2d8085270d5ff4e59963770b5348ec853ad1d6f	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	44024		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reexamination Control No.:	90/014,419	Confirmation No.:	8770
Patent Under Reexamination:	8,032,278	Examiner:	TARAE, CATHERINE MICHELLE
For:	VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS		

RESPONSE TO PATENT OWNER'S PETITION TO EXPEDITE PRIOR FILED PETITION UNDER 37 C.F.R. § 1.182

Commissioner of Patents
Office of Petitions
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

Following a February 25, 2020 petition by Innova Electronics Corporation ("Requester") for review of the Examiner's decision refusing *ex parte* reexamination, Omega Patents L.L.C. ("Patent Owner") filed a petition on July 28, 2020 to expedite the decision on Requester's original petition. No time constraint, potential prejudice or other basis is cited as a basis for the petition. However, in points 5 and 7 of Patent Owner's July 28, 2020 petition (on pp. 2 and 3 thereof), Patent Owner refers to Requester as "a supplier to CalAmp" and "the supplier to CalAmp," who was the requester in three prior reexaminations of the patent currently under reexamination. The Patent Owner does not attempt to tie its supplier assertions to any reason for expediting consideration of Requestor's original petition.

In response to those assertions, Requester acknowledges that approximately five years ago Requester provided engineering and R&D services to CalAmp, but Requester has

not provided products and has not provided any further services to CalAmp since that time. Thus, any suggestion that Requester has no interest in this matter separate from CalAmp is incorrect, ignores the facts and record in this matter, and appears intended to prejudice the Examiner against Requestor's position in this proceeding.

Requester is a separate and distinct entity and has its own interest in the present reexamination proceeding, as set forth on p.1 of the reexamination request. Namely, Requester sells multivehicle compatible scan tools adapted to interface with vehicle diagnostic systems, as can be seen on Requester's website, www.innova.com. The use of positioning determining devices in combination with Innova scan tools, e.g., for fleet services applications, is an application that could be implemented by adaption of Requester products. As such, the patent under reexamination represents a possible obstacle to Requester, which appears to be unwarranted for the reasons set forth in the reexamination request.

Should the Petitions Office have any questions regarding this filing, you may contact Requester's representative at the number listed below. If any additional fees are required, please charge Deposit Account No. 19-4330.

Respectfully submitted,

By: _____

Date: August 13, 2020

Customer No.: 007663

Mark B. Garred
Registration No. 34,823
STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, California 92656
Telephone: (949) 855-1246
Fax: (949) 855-6371

CERTIFICATE OF SERVICE

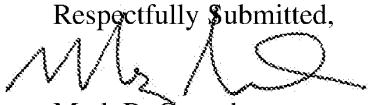
Certificate of Service in compliance with 37 C.F.R. § 1.510(b)(5)

Pursuant to 37 C.F.R. § 1.510(b)(5) and 37 C.F.R. § 1.33(c), I hereby certify that on August 13, 2020, a complete copy of this Response to Patent Owner's Petition to Expedite Prior Filed Petition Under 37 C.F.R. § 1.182 being served via First Class U.S. Mail upon Patent Owner at the correspondence address as shown in PAIR:

Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.
P.O. Box 3791
Orlando, FL 32802-3791

In accordance with 37 C.F.R. § 1.510(b)(5), on August 13, 2020.

Respectfully Submitted,



Mark B. Garred
STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, California 92656
Telephone: (949) 855-1246
Fax: (949) 855-6371

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reexamination Control No.:	90/014,419	Confirmation No.:	8770
Patent Under Reexamination:	8,032,278	Examiner:	TARAE, CATHERINE MICHELLE
For:	VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS		

RESPONSE TO PATENT OWNER'S PETITION TO EXPEDITE PRIOR FILED PETITION UNDER 37 C.F.R. § 1.182

Commissioner of Patents
Office of Petitions
P.O. Box 1450
Alexandria, VA 22313-1450

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Respectfully submitted,

Date: August 12, 2020

By: _____

Mark B. Garred
Registration No. 34,823
STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, California 92656
Telephone: (949) 855-1246
Fax: (949) 855-6371

Customer No.: 007663

Electronic Acknowledgement Receipt	
EFS ID:	40266779
Application Number:	90014419
International Application Number:	
Confirmation Number:	8770
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Correspondence Address:	CHRISTOPHER F. REGAN, ESQUIRE ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA PO BOX 3791 - ORLANDO FL 32802-3791 US 407-841-2330 -
Filer:	Mark B. Garred/Andrea Levine
Filer Authorized By:	Mark B. Garred
Attorney Docket Number:	CAAMP-001X
Receipt Date:	12-AUG-2020
Filing Date:	16-DEC-2019
Time Stamp:	16:45:42
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Miscellaneous Incoming Letter	ResponseToPatentOwnersPetition.pdf	39389 c1b77f68dcd510c01e244dc89c0cfc4c92de71e7	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	39389		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of **KENNETH FLICK**	)	
Serial No. **90/014,419**	)	Examiner: **C. TARAE**
Confirmation No. **8770**	)	Art Unit: **3992**
Filing Date: **12/16/2019**	)	Attorney Docket No. **CAAMP-001X** **(0058106CIP1_REX4)**
For: **VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS**	)	

PATENT OWNER'S TO PETITION TO EXPEDITE PRIOR FILED PETITION UNDER 37 C.F.R. §1.182

EFILE
Commissioner For Patents

Commissioner:

Pursuant to 37 C.F.R. §1.182, Omega Patents L.L.C. ("Patent Owner") hereby petitions the Director to expedite a decision on the third party, prior filed petition under 37 C.F.R. §1.181 to review the Examiner's correct decision to refuse to institute a fourth Reexamination of the present U.S. Pat. No. 8,032,278, filed February 25, 2020, in the above-captioned case.

The present petition is being filed with the petition fee specified under 37 C.F.R. §1.17(f).

STATEMENT OF FACTS

1. On October 4, 2011, the patent at issue in this reexamination proceeding, U.S. Pat. No. 8,032,278 ('278 Patent), issued with 22 claims.

2. On December 28, 2016, the first *Ex Parte* Reexamination of the '278 Patent by CalAmp, an infringer of the '278 patent, was concluded with an *Ex Parte* Reexamination Certificate with all claims confirmed patentable.

3. On February 6, 2019, the second *Ex Parte* Reexamination of the '278 Patent by CalAmp was concluded with an *Ex Parte* Reexamination Certificate with all claims confirmed patentable.

4. On January 8, 2020, the third *Ex Parte* Reexamination of the '278 Patent by CalAmp was concluded with an *Ex Parte* Reexamination Certificate with all claims confirmed patentable.

5. On December 16, 2019, this reexamination proceeding was initiated by the filing in the United States Patent and Trademark Office of a 60-page Request for *Ex Parte* Reexamination of the '278 Patent by a supplier to CalAmp.

6. On January 27, 2020, the Examiner mailed a decision finding that no substantial new question of patentability was raised by the Request, and rejecting the five substantial new questions of patentability alleged in the 60-

page request.

7. On February 25, 2020, the supplier to CalAmp filed a petition for review of the Examiner's decision refusing to institute a fourth *Ex Parte* Reexamination of the '278 patent.

In re Patent of
Kenneth E. FLICK
Reexamination Control No. **90/014,419**
Filed: **12/16/2019**
_____/

REMARKS

Pursuant to 37 C.F.R. §1.182, the Patent Owner hereby requests expedited processing for the petition for review of the Examiner's decision refusing to institute a fourth *Ex Parte* Reexamination of the '278 patent under 37 C.F.R. §1.181, filed on February 25, 2020.

The Commissioner is hereby authorized to charge or credit any discrepancies in fee amounts to Deposit Account No. 01-0484.

Respectfully submitted,

/JACK GEORGE ABID/

JACK GEORGE ABID
Reg. No. 58,237
Allen, Dyer, Doppelt,
+ Gilchrist, P.A.
255 S. Orange Avenue, Suite 1401
Post Office Box 3791
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Attorney for the Patent Owner

In re Patent of
Kenneth E. FLICK
Reexamination Control No. **90/014,419**
Filed: **12/16/2019**
_____/

CERTIFICATE OF SERVICE

Certificate of Service in compliance with 37 C.F.R. §1.530(c)

Pursuant to 37 C.F.R. §§1.530(c), 1.248, I hereby certify that on July 28, 2020, a complete copy of this Request is being served via First Class U.S. Mail upon Third Party Requester at the correspondence address as shown in PAIR:

Mark B. Garred
STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, California 92656

Respectfully submitted,

/JACK GEORGE ABID/

_____
Jack G. Abid

Electronic Patent Application Fee Transmittal

Application Number:	90014419
Filing Date:	16-Dec-2019
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Filer:	Jack G. Abid/Sheryl Scheibe
Attorney Docket Number:	CAAMP-001X

Filed as Large Entity

Filing Fees for ex parte reexam

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
PETITIONS TO THE CHIEF	1405	1	400	400
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**400**

Electronic Acknowledgement Receipt	
EFS ID:	40123308
Application Number:	90014419
International Application Number:	
Confirmation Number:	8770
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Correspondence Address:	CHRISTOPHER F. REGAN, ESQUIRE ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA PO BOX 3791 - ORLANDO FL 32802-3791 US 407-841-2330 -
Filer:	Jack G. Abid/Sheryl Scheibe
Filer Authorized By:	Jack G. Abid
Attorney Docket Number:	CAAMP-001X
Receipt Date:	28-JUL-2020
Filing Date:	16-DEC-2019
Time Stamp:	12:52:52
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$400

RAM confirmation Number	E20207RC53184355
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the Office of Petitions	ss58106cip1rex4petition.pdf	290724 a58818a4906691d43a8e8e5118b588dd5ec9ff59	no	5
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30238 8402d301b8674a3961c78394e7f2a1eade4b3ea6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	320962		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Patent Application Fee Transmittal

Application Number:	90014419
Filing Date:	16-Dec-2019
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Filer:	Mark B. Garred/Andrea Levine
Attorney Docket Number:	CAAMP-001X

Filed as Small Entity

Filing Fees for ex parte reexam

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
PETITION IN REEXAM PROCEEDING	2824	1	970	970
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**970**

Electronic Acknowledgement Receipt	
EFS ID:	38681587
Application Number:	90014419
International Application Number:	
Confirmation Number:	8770
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	8032278
Correspondence Address:	CHRISTOPHER F. REGAN, ESQUIRE ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA PO BOX 3791 - ORLANDO FL 32802-3791 US 407-841-2330 -
Filer:	Mark B. Garred/Andrea Levine
Filer Authorized By:	Mark B. Garred
Attorney Docket Number:	CAAMP-001X
Receipt Date:	25-FEB-2020
Filing Date:	16-DEC-2019
Time Stamp:	17:05:04
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$970

RAM confirmation Number	E20202OH05262183
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for Review of Reexam Denial	PetitionUnder37CFR1181_filed 25Feb2020.pdf	219958 2018b1bccea76ed2f4ca86b73f4cd8ddae3a131d	no	11
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30537 dff880f2c32ae7998d0f5d3d12ef85c310188107	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	250495		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Control No.: 90/014,419
Petition Under 37 C.F.R. §1.181
Attorney Docket: CAAMP-001X

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reexamination Control No.:	90/014,419	Confirmation No.:	8770
Patent Under Reexamination:	8,032,278	Examiner:	TARAE, CATHERINE MICHELLE
For:	VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS		

PETITION FOR REVIEW OF EXAMINER'S DECISION REFUSING *EX PARTE* REEXAMINATION UNDER 37 C.F.R. § 1.181

Commissioner of Patents
Office of Petitions
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

This petition under 37 C.F.R. § 1.181 and the corresponding fee under 37 C.F.R. § 1.20(c)(6) are being submitted. Petitioner respectfully requests that the Office review and reconsider the examiner's determination refusing *ex parte* reexamination of the above-referenced patent and decide, *de novo*, whether a substantial new question of patentability exists.

Authority for Petition

37 C.F.R. § 1.515(c) provides that "[t]he requester may seek review by a petition to the Director under § 1.181 within one month of the mailing date of the examiner's determination refusing ex parte reexamination" and that "[a]ny such petition must comply with § 1.181(b)." 37 C.F.R. § 1.550(i) provides that "[a] petition in an ex parte reexamination proceeding must be accompanied by the fee set forth in § 1.20(c)(6), except for petitions

under paragraph (c) of this section to extend the period for response by a patent owner, petitions under paragraph (e) of this section to accept a delayed response by a patent owner, petitions under § 1.78 to accept an unintentionally delayed benefit claim, and petitions under § 1.530(l) for correction of inventorship in a reexamination proceeding."

MPEP § 2248 provides, "If a petition seeking review of the examiner's determination refusing reexamination is filed, it is brought to the attention of the CRU Director or designee for decision. Where a petition is filed, the CRU Director will review the examiner's determination that a substantial new question of patentability has not been raised. The CRU Director's review will be *de novo*."

Statement of Facts

1. Innova Electronics Corporation (hereinafter, "Requester") requested *ex parte* reexamination of claims 1-22 of U.S. Patent No. 8,032,278 (hereinafter, "the subject patent") on December 11, 2019. The request for reexamination was given Reexamination Control No. 90/014,419 (hereinafter, "the present reexamination request").

2. The subject patent was previously reexamined in response to three prior *ex parte* reexamination requests, Reexamination Control No. 90/013,587 (hereinafter, "the first reexam"), Reexamination Control No. 90/013,851 (hereinafter, "the second reexam"), and Reexamination Control No. 90/014,309 (hereinafter, "the third reexam"). In all three reexaminations, the request was found to raise a substantial new question of patentability affecting claims 1-22 of the subject patent and reexamination was accordingly ordered.

3. In a Decision dated January 27, 2020 (hereinafter, "the Decision"), the present reexamination request was denied. According to the Decision, a substantial new question of patentability affecting claims 1-22 of the subject patent was not raised.

4. The present reexamination request sets out various grounds for finding a substantial new question of patentability on the basis of the prior art teachings of U.S. Patent No. 5,719,551 (hereinafter, "the Flick '551 reference"), as summarized by the following proposed rejections submitted by Requester (*see* p. 31 of the present reexamination request):

   i. "Claims 1-22 are rejected under 35 U.S.C. § 103(a) as unpatentable over Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the

Holusha article."

ii. "Claims 1-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the Flick '551 patent in view of any one of Brinkmeyer, Monroe, Drori, the Space Daily Trimble article, the Mateja article, and the Holusha article."

5. The Flick '551 reference is mentioned in the "Background of the Invention" section of the subject patent. In particular, at col. 2, lines 17-41, it is explained that "[a] number of patents disclose various security and control systems that address data bus interoperability" and that, "[f]or example, U.S. Pat. No. 5,719,551, assigned to Omega Patents, LLC, the assignee of the present invention, discloses a vehicle security system for a vehicle including a data bus connecting a plurality of vehicle devices," where "[a] signal enabling circuit enables the alarm controller to operate using a set of desired signals selected from a plurality of possible sets for different vehicles." According to the applicant of the subject patent, "[u]nfortunately, such advanced techniques for dealing with multiple device codes for a vehicle having a data communications bus have not yet been developed for vehicle tracking units."

6. The Flick '551 reference is also mentioned in one other part of the disclosure of the subject patent, col. 22, lines 1-7, where it is disclosed that, "[i]n all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus" and that "further aspects of interfacing with a vehicle data communications bus are described in U.S. Pat. Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention, the entire contents of which are incorporated herein by reference."

7. The Flick '551 reference was cited by the applicant of the subject patent in an Information Disclosure Statement and initialed by the examiner as having been considered on December 21, 2009. However, the Flick '551 reference was not cited by the examiner or referred to in any subsequent communications in the file history of the subject patent.

8. In the first reexam, the examiner considered whether U.S. Patent No. 6,346,876 ("the Flick '876 reference") raises a substantial new question of patentability in relation to double patenting. The Flick '876 reference incorporates U.S. Patent No. 6,011,460 ("the Flick '460 reference"). Both the Flick '876 reference and the Flick '460 reference are

related by domestic benefit claims to the Flick '551 reference of the present reexamination request. As set out on pp. 7-8 of the November 10, 2015 determination ordering the first reexam, it was found that there was no substantial new question of patentability as to double patenting "in that the claims of Flick '876 are directed to a different claimed invention than Flick '278." No consideration was given to the question of anticipation or obviousness.

9. The Flick '551 reference itself, while never asserted or considered as a basis for a substantial new question of patentability, was briefly mentioned during the previous reexaminations. For example, in the first reexam, on pp. 25-26 of the March 8, 2016 reply to the owner's statement, it was argued that the Flick '551 reference should be regarded as applicant-admitted prior art in accordance with MPEP § 2129. This argument was made in the context of evaluating whether the Flick '551 patent provides written description support and/or establishes evidence of construction reduction to practice of claims 1-22 of the subject patent. In the second reexam, during an Oral Hearing held on October 31, 2018, there was a discussion regarding the interpretation of "different vehicle" in light of the incorporation of the Flick '551 reference in the subject patent (*see*, e.g., pp. 4-7 of transcript dated November 16, 2018). The same issue is addressed in the Decision on Appeal dated November 13, 2018, at pp. 8-9. In the third reexam, on pp. 2-3 of the request, it was again argued that the Flick '551 reference should be regarded as applicant-admitted prior art, but not in the context of any proposed rejection under 35 U.S.C. § 102 or § 103. Nowhere in any of the prior reexams was there any consideration given to the teachings of the Flick '551 reference or its related family members on the question of anticipation or obviousness.

10. As set forth in the claim chart listed as Exhibit D of the present reexamination request, the following noncumulative teachings of the Flick '551 reference are relied upon by Requester in relation to the "multi-vehicle compatible controller" and "downloading interface" of claim 1 of the subject patent:

i. Abstract: "The security system preferably further includes a desired signal enabling circuit for enabling the alarm controller to operate using a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. Accordingly, the desired signal enabling circuit permits the alarm controller to communicate with the vehicle security sensor and the alarm indicator

via the data communications bus so that the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor."

ii. Col. 3, lines 50-60: "In yet another embodiment, the desired signal enabling means may comprise learning means for learning the desired set of signals. For example, the learning means may comprise downloading learning means for learning the desired set of signals from another device or central station. In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone."

iii. Col. 4, lines 18-30: "A vehicle function controller is provided along with an associated vehicle function controller bus interface means for interfacing the vehicle function controller to the data communications bus. The remote control system also includes desired signal enabling means for causing the vehicle function controller to operate using a desired set of signals for a desired vehicle from a plurality of possible sets of digital signals for different vehicles. Accordingly, the vehicle function controller can communicate with a vehicle device via the data communications bus so that the vehicle function controller is capable of operating the vehicle device responsive to the remote transmitter."

iv. Claim 1: "a vehicle security sensor and associated sensor bus interface means for interfacing said vehicle security sensor to the data communications bus" and "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate with said vehicle security sensor and said alarm indicator via the data communications bus so that said alarm controller is capable of operating said alarm indicator responsive to said vehicle security sensor."

v. Claim 8: "wherein said desired signal enabling means comprises download learning means for [learning][1] the desired set of signals from a downloading device."

vi. Claim 15: "memory means for storing a plurality of sets of signals for different vehicles; and selecting means for selecting a desired set of signals for a desired vehicle from the plurality of sets of signals for different vehicles, the desired set of signals for enabling said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator."

vii. Claim 21: "desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals."

viii. Claim 23: "download learning means for learning the desired set of signals from a downloading device."

ix. Claim 24: "cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device."

x. Claim 28: "enabling said alarm controller to operate using a set of desired signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of a vehicle security sensor and an alarm indicator."

xi. Claim 35: "wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the step of downloading the desired signals from a downloading device."

[1] Corrected in Certificate of Correction dated May 12, 1998.

xii. Claim 36: "a receiver within the vehicle for receiving a signal from said remote transmitter," "a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus," and "desired signal enabling means for enabling said function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter."

xiii. Claim 50: "enabling the vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting the vehicle function controller to communicate via the data communications bus with at least one of the vehicle devices" and "receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter."

Points to Be Reviewed

11. Whether the examiner's determination refusing *ex parte* reexamination, as set forth in the Decision dated January 27, 2020 ("the Decision"), should be reconsidered in light of the facts.

12. Whether a substantial new question of patentability affecting claims 1-22 of the subject patent is raised by the present reexamination request.

Arguments in Support of Reconsideration

13. As best understood from the Decision dated January 27, 2020 ("the Decision"), the examiner's determination that there is no substantial new question of patentability is premised on the examiner's assertion that the Flick '551 reference is

cumulative to previously considered prior art. However, the reasoning in the Decision does not support this conclusion with respect to any of the teachings of the Flick '551 reference that are relied upon by Requester as teaching the "multi-vehicle compatible controller" and "downloading interface" of claim 1 of the subject patent (*see, e.g.,* subparagraphs 10(i)-10(xiii) above).

14. As correctly noted by the examiner on pp. 7-8 of the Decision, it is Requester's position that the Flick '551 reference teaches the limitations relating to the "multi-vehicle compatible controller" and "downloading interface" of claim 1 of the subject patent. The examiner also correctly notes that "Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, and Holusha are not relied upon to teach the limitations relating to the multi-vehicle compatible controller and the downloading interface; rather, they are relied upon to teach a vehicle position determining device." On p. 9 of the Decision, the examiner concludes that there is no substantial new question of patentability for the stated reason that, "in all of the proceedings [of the subject patent], the teachings in the prior art that were deemed important by the Examiners in deciding patentability of the claims were directed to the limitations related to the multi-vehicle compatible controller and the downloading interface." According to the examiner, "[t]hus, the teachings of Flick '551 are cumulative to the teachings of the previous prior art considered by the Office and raise the same question of patentability previously considered by the Office."

15. Respectfully, the examiner's conclusion does not logically follow from its premise. While it is true that the teachings related to the multi-vehicle compatible controller and the downloading interface in various other prior art references were deemed "important" in the prosecution and reexaminations of the subject patent, the teachings were "important" in the sense that they were found to be *insufficient* teachings of these claim features. That is, the *lack* of these features in the already-considered prior art references is what led the examiner to conclude that the claims of the subject patent were patentable. In the present reexamination request, Requester now submits that a different reference, the Flick '551 reference, teaches these very features related to the multi-vehicle compatible controller and the downloading interface that were found to be lacking in the previously considered references. It of course does not follow that the teachings of the Flick '551 reference are necessarily cumulative, as appears to be the examiner's position on p. 9 of the Decision.

16. As best understood, the examiner's argument appears to be based on a flawed comparative analysis: rather than comparing the actual disclosures of the previous and new references to determine whether the new references are cumulative, the examiner instead compares the *claim limitations* previously at issue with the *claim limitations* at issue in the present reexamination. Such an analysis does not establish that the Flick '551 reference is cumulative to the teachings of the previous prior art that was considered, only that the same key features of the subject patent are again at issue. Put differently, the mere fact that a claim limitation was argued to be disclosed by a previously considered prior art reference (and found by the examiner to be lacking) does not mean that all new prior art references that are submitted as teaching that claim limitation are cumulative.

17. On p. 10 of the Decision, the Examiner goes on to characterize the teachings of the Flick '551 reference as being "similar" to the teachings of already-considered prior art without providing any articulation of why they are considered "similar": "The [proceedings of the subject patent] all considered and discussed on the record technical teachings by *similar* prior art references of the limitations related to the multi-vehicle compatible controller and the downloading interface" (emphasis added). However, Requester submits that the technical teachings of the Flick '551 reference (*see*, *e.g.*, subparagraphs 10(i)-10(xiii) above) are not similar to the teachings of any of the already-considered prior art references. The Decision does not even articulate which references are regarded as being similar to the Flick '551 reference, let alone why they are regarded as similar. Again, the fact that the claim limitations at issue were, then and now, the multi-vehicle compatible controller and the downloading interface, does not establish that the technical teachings of the newly submitted Flick '551 reference are similar to those previously considered.

18. Continuing on p. 10 of the Decision, the examiner argues that, "[a]dditionally, prior consideration of the technical teachings of Flick '551 is evidenced by its listing in Flick '278 under 'References Cited' and by its incorporation by reference in its entirety by Flick '278." However, as set forth in 35 U.S.C. § 303(a), such evidence is not enough to preclude the existence of a substantial new question of patentability: "The existence of a substantial new question of patentability is not precluded by the fact that a patent or printed publication was previously cited by or to the Office or considered by the Office." As noted above, the Flick '551 reference, while of record, was never considered in relation to anticipation or

obviousness in the file history of the subject patent or any of the prior reexaminations. At best, the claims of the Flick '876 reference, a family member having a related but different disclosure, were considered on the narrow grounds of double patenting.

Action Requested

19. Reconsideration of the examiner's determination refusing *ex parte* reexamination as set forth in the Decision dated January 27, 2020 ("the Decision").

20. *De novo* review of whether a substantial new question of patentability affecting claims 1-22 of the subject patent is raised by the present reexamination request.

For these reasons, Petitioner respectfully requests that the Office review and reconsider the examiner's determination refusing *ex parte* reexamination of the above-referenced patent and decide, *de novo*, whether a substantial new question of patentability exists. Should the Petitions Office have any questions regarding this Petition, you may contact Petitioner's representative at the number listed below. If any additional fees are required, please charge Deposit Account No. 19-4330.

Respectfully submitted,

Date: February 25, 2020

By: _____
Mark B. Garred
Registration No. 34,823

Customer No.: 007663

STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, California 92656
Telephone: (949) 855-1246
Fax: (949) 855-6371

CERTIFICATE OF SERVICE

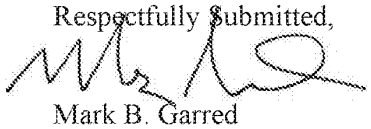
Certificate of Service in compliance with 37 C.F.R. § 1.510(b)(5)

Pursuant to 37 C.F.R. § 1.510(b)(5) and 37 C.F.R. § 1.33(c), I hereby certify that on February 25, 2020, a complete copy of this Petition for Review of Examiner's Decision Refusing Ex Parte Reexamination is are being served via First Class U.S. Mail upon Patent Owner at the correspondence address as shown in PAIR:

Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.
P.O. Box 3791
Orlando, FL 32802-3791

In accordance with 37 C.F.R. § 1.510(b)(5), on February 25, 2020.

Respectfully submitted,



Mark B. Garred
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Fax: (949) 855-6371

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,419	12/16/2019	8032278	CAAMP-001X	8770

7590 01/27/2020

CHRISTOPHER F. REGAN, ESQUIRE
ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA
PO BOX 3791
ORLANDO, FL 32802-3791

EXAMINER	
TARAE, CATHERINE MICHELLE	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
01/27/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,419* .

PATENT UNDER REEXAMINATION *8032278* .

ART UNIT *3992* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Order Denying Request For Ex Parte Reexamination	Control No. 90/014,419	Patent Under Reexamination 8032278	
	Examiner C. M TARAE	Art Unit 3992	AIA (FITF) Status No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

The request for *ex parte* reexamination filed 12/16/2019 has been considered and a determination has been made. An identification of the claims, the references relied upon, and the rationale supporting the determination are attached.

Attachments: a)☑ PTO-892, b)☐ PTO/SB/08, c)☐ Other: ____

The request for *ex parte* reexamination is DENIED.

This decision is not appealable (35 U.S.C. 303(c)). Requester may seek review by petition to the Commissioner under 37 CFR 1.181 within ONE MONTH from the mailing date of this communication (37 CFR 1.515(c)). **EXTENSION OF TIME TO FILE SUCH A PETITION UNDER 37 CFR 1.181 ARE AVAILABLE ONLY BY PETITION TO SUSPEND OR WAIVE THE REGULATIONS UNDER 37 CFR 1.183.**

In due course, a refund under 37 CFR 1.26 (c) will be made to requester:

a) ☐ by Treasury check or,

b) ☐ by credit to Deposit Account No. ____ , or

c) ☑ by credit to a credit card account, unless otherwise notified (35 U.S.C.303(c)).

/CATHERINE M TARAE/ Primary Examiner, Art Unit 3992	/Stephen Stein/ MQAS, CRU	/ALEXANDER J KOSOWSKI/ Supervisory Patent Examiner, Art Unit 3992

cc: Requester (if third party requester)

DECISION ON REQUEST FOR *EX PARTE* REEXAMINATION

The present application is being examined under the pre-AIA first to invent provisions.

A substantial new question ("SNQ") of patentability affecting claims 1-22 of U.S. Pat. No. 8,032,278 to Flick ("Flick '278") is not raised by the Request for *Ex Parte* reexamination filed December 11, 2019.

Reexamination is not granted for claims 1-22.

Prosecution History of U.S. Pat. No. 8,032,278

Application 11/773,272 ("'272") that matured into the '278 patent was originally filed July 3, 2007 with claims 1-30.

A Restriction Requirement issued by the Examiner on December 24, 2009 restricted the claims into two inventions: I) claims 1-22, drawn to a multi-vehicle tracking device and II) claims 23-30, drawn to a method for using the multi-vehicle tracking device.

Applicant elected group I, claims 1-22 in a response filed February 24, 2010.

In a Non-Final Office Action filed June 22, 2010, the Examiner rejected claims 1-22 under 35 USC 103 as being unpatentable over U.S. 5,940,007 to Brinkmeyer et al.

On October 22, 2010, Applicant argued that Brickmeyer et al. failed to disclose the multi-vehicle compatible controller being coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles.

In a Non-Final Office Action filed January 5, 2011, the Examiner rejected claims 1-22 under 35 USC 103 as being unpatentable over U.S. 6,253,064 to Monroe in view of U.S. 5,940,007 to Brickmeyer et al.

On April 5, 2011, Applicant argued that Monroe in view of Brickmeyer et al. failed to disclose the "multi-vehicle compatible controller being coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles. Applicant also argued that none of the applied prior art references discloses the multi-vehicle compatible tracking unit including a connector for temporary connection to a downloading device and a wireless receiver for temporary connection to a downloading device, as recited by the independent claims. Applicant notes that this claim feature enables a user to quickly download new vehicle codes into the multi-vehicle compatible tracking unit without removing and reinstalling the unit."

A Notice of Allowance was mailed on June 28, 2011 allowing claims 1-22 with the following reasons for allowance:

"Pending claims 1-22 are patentable over cited references of Monroe in view of Brinkmeyer et al., because these prior art do not make obvious a multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising: a vehicle position determining device; a wireless communications device; a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information; said multi-vehicle compatible controller to be coupled to the vehicle data bus for

communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device; and a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller;

said downloading interface comprising a connector for temporary connection to a downloading device."

Related Ex Parte Reexaminations of Flick '278

This *Ex Parte* reexamination request is the fourth reexamination request for Flick '278. The three prior *Ex Parte* reexaminations are summarized below:

90/013,587

In the Order granting *Ex Parte* Reexamination of claims 1-22 of Flick '278 mailed November 10, 2015, Examiner indicated "[k]ey to each of these claims is the [recitation] of a "vehicle data bus" and a "downloading interface for permitting downloading of enabling data."" p. 4. Examiner also indicated "key aspect of claims 1, 13 and 18 is the recitation of a "vehicle position determining device."" p. 6. Additionally, in the First Office Action mailed May 6, 2016, some of the references were initially considered by Examiner as disclosing the limitations related to the "multi-vehicle compatible controller." All of the claims were rejected under 35 USC 102 and 103. Claims 1-22 were ultimately confirmed in the Notice of Intent to Issue a

Reexamination Certificate ("NIRC") mailed December 1, 2016, where the Examiner indicated an agreement that "the declarations by Suman and McAlexander provide sufficient evidence that Sumar and Spaur failed to disclose the multi-vehicle compatible controller as recited in independent claims 1, 13 and 18." p. 2.

90/013,851

In the Order granting *Ex Parte* Reexamination of claims 1-22 of Flick '278 mailed December 15, 2016, Examiner indicated that an SNQ had been raised with regard to the "multi-vehicle compatible controller as recited in independent claims 1, 13 and 18, i.e. "said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles."" p. 30. In a Non-Final Office Action mailed March 29, 2017, claims 1-22 were rejected including the aforementioned limitations. After several rounds of prosecution, the rejections of claims 1-22 were appealed to the Patent Trial and Appeal Board ("PTAB") and the PTAB decision mailed November 13, 2018 reversed the Examiner's rejections of claims 1-22. In the decision, the PTAB noted that the reference "does not teach or suggest the recited multi-vehicle compatible controller and downloading interface… [and] we add that Appellant's evidence of secondary considerations of non-obviousness, including licensing, commercial success, copying by others, customer need, and the limited value for accused products without the invention… only further weighs in favor of Appellant." p. 14. Claims 1-22 were confirmed in a NIRC mailed January 10, 2019.

90/014,309

In the Order granting *Ex Parte* Reexamination of claims 1-22 of Flick '278 mailed July 10, 2019, Examiner indicated that the claim limitations related to the multi-vehicle compatible controller and the downloading interface were deemed important to patentability. pp. 54-55. In the same Order, Examiner indicated that SNQs were raised by the references in relation to the multi-vehicle compatible controller and the downloading interface. pp. 67-68. In a NIRC mailed November 27, 2019, claims 1-22 were confirmed; the Examiner indicating that the references lacked teaching of the limitations related to the multi-vehicle controller, the vehicle data bus, and the downloading interface. pp. 5-6.

References Asserted by Requester as Raising SNQs of Patentability

- U.S. Pat. No. 5,719,551 to Flick (issued February 17, 1998) ("Flick '551");
- U.S. Pat. No. 5,940,007 to Brinkmeyer et al. (issued August 17, 1999) ("Brinkmeyer");
- U.S. Pat. No. 6,253,064 to Monroe (issued June 26, 2001) ("Monroe");
- U.S. Pat. No. 5,081,667 to Drori et al. (issued January 14, 1992) ("Drori");
- *Trimble Microsoft Launch GPS System for Car PC*, available at http://www.spacedaily.com/news/gps-98a.html (published Jan. 8, 1998, last visited June 25, 2019) ("Space Daily Trimble");

- Jim Mateja, *Travetek Makes Mission Possible*, Chicago Tribune, available at https://www.chicagotribune.com/news/ct-xpm-1992-04-12-9202020707-story.html (published April 12, 1992, last visited June 25, 2019) ("Mateja");
- John Holusha, *DRIVING SMART; Lost in Yonkers? An Olds Option Could Be a Guide*, The New York Times, available at https://www.nytimes.com/1994/11/27/automobiles/driving-smart-lost-in-yonkers-an-olds-option-could-be-a-guide.html (published Nov. 27, 1994, last visited June 25, 2019) ("Holusha").

Proposed SNQs Raised in the Request

Issue 1: Whether Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holusha raise an SNQ with regard to claims 1, 13, or 18.

Issue 2: Whether Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holusha raise an SNQ with respect to double patenting of claims 1, 13, or 18.

Evaluation of SNQs Raised in Request for Reexamination

Issue 1: Whether Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holusha raise an SNQ with regard to claims 1, 13, or 18.

Requester asserts that Flick '551 teaches "a data bus connecting a plurality of vehicle devices. A signal enabling circuit enables the alarm controller to operate using

a set of desired signals selected from a plurality of possible sets for different vehicles" as well as "a desired signal enabling means [comprising] download learning means for learning the desired set of signals from a downloading device." Request at p. 22. Further, in Exhibit D Requester asserts that Flick '551 teaches the limitations relating to the multi-vehicle compatible controller and the downloading interface. pp. 2-4. Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, and Holusha are not relied upon to teach the limitations relating to the multi-vehicle compatible controller and the downloading interface; rather, they are relied upon to teach a vehicle position determining device. Exhibit D at p. 1.

Same Question of Patentability

MPEP 2242 I:

"If the prior art patents and printed publications raise a substantial question of patentability of at least one claim of the patent, then a substantial new question of patentability as to the claim is present, unless the same question of patentability has already been: (A) decided in a final holding of invalidity by a federal court in a decision on the merits involving the claim, after all appeals; (B) decided in an earlier concluded examination or review of the patent by the Office; or (C) raised to or by the Office in a pending reexamination or supplemental examination of the patent. If the request for reexamination includes issues involving 35 U.S.C. 325(d), the examiner must bring such issues to the attention of the appropriate SPRS or the Director of the CRU. Inquiries from the public regarding the treatment of issues involving 35 U.S.C. 325(d) in ex parte reexaminations should be referred to OPLA.

An earlier concluded examination or review of the patent is: (A) the original examination of the application which matured into the patent; (B) the examination of the patent in a reissue application that has resulted in a reissue

of the patent; (C) the examination of the patent in an earlier concluded reexamination or supplemental examination; (D) the review of the patent in an earlier concluded trial by the Patent Trial and Appeal Board, such as a post-grant review, inter partes review, or covered business method review of the patent; or (E) any other contested Office proceeding which has been concluded and which involved the patent."

As discussed above in the **Related *Ex Parte* Reexaminations of the Flick '278 Patent** and the **Prosecution History of U.S. Pat. No. 8,032,278**, in all of the proceedings: the prosecution of the application that became the Flick '278 Patent, the three previous *Ex Parte* reexaminations of the Flick '278 Patent and the PTAB review in its Decision in 90/013,851, the teachings in the prior art that were deemed important by the Examiners in deciding patentability of the claims were directed to the limitations related to the multi-vehicle compatible controller and the downloading interface. Thus, the teachings of Flick '551 are cumulative to the teachings of the previous prior art considered by the Office and raise the same question of patentability previously considered by the Office.

Cumulative Prior Art Teachings

MPEP 2242:

"[T]he same question of patentability may have already been decided by the Office where the examiner finds the additional (newly provided) prior art patents or printed publications are merely cumulative to similar prior art already fully considered by the Office in an earlier concluded examination or review of the claim." [emphasis added]

MPEP 2216:

"For requests filed under 35 U.S.C. 302, it is not sufficient that a request for reexamination merely proposes one or more rejections of a patent claim or

claims as a basis for reexamination. It must first be demonstrated that a patent or printed publication that is relied upon in a proposed rejection presents a new, non-cumulative technological teaching that was not previously considered and discussed on the record during the prosecution of the application that resulted in the patent for which reexamination is requested, and during the prosecution of any other prior proceeding involving the patent for which reexamination is requested. See also MPEP § 2242."

The prosecution of the application that became the Flick '278 Patent, the three previous *Ex Parte* reexaminations of the Flick '278 Patent and the PTAB review all considered and discussed on the record technical teachings by similar prior art references of the limitations related to the multi-vehicle compatible controller and the downloading interface. Additionally, prior consideration of the technical teachings of Flick '551 is evidenced by its listing in Flick '278 under "References Cited" and by its incorporation by reference in its entirety by Flick '278. See Flick '278 at col. 22, lines 5-7.

Accordingly, the proposed combinations using Flick '551 do not present a new, non-cumulative technological teaching that was not previously considered and discussed on the record by the Office.

Thus, the same question of patentability has already been decided by the Office since Flick '551 is merely cumulative to similar prior art already fully considered by the Office in an earlier concluded examination or review of the claims.

Therefore, Flick '551, in combination with Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holush, do not raise a substantial new question of patentability for any of claims 1-22 because the teachings related to the multi-vehicle compatible controller and the downloading interface 1) present the same question of

patentability that has already been decided by the Office during the prosecution of the application that resulted in the Flick '278 Patent for which reexamination is requested and the related *Ex Parte* Reexaminations, 2) do not present a new, non-cumulative technological teaching that was not previously considered and discussed on the record during the prosecution of the application that resulted in the Flick '278 Patent for which reexamination is requested, or the related *Ex Parte* Reexaminations, and 3) do not raise a substantial likelihood that a reasonable examiner would consider Flick '551 important in deciding whether or not the claim is patentable in this proceeding since, as shown above, the teachings of Flick '551 and similar prior art were already considered by the Office.

All of the proposed combinations solely rely on Flick '551 for the limitations relating to the multi-vehicle compatible controller and the downloading interface; therefore, none of the proposed combinations using Flick '551 in combination with Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holush raises an SNQ for claims 1-22.

Issue 2: Whether Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holusha raise a question of patentability with respect to double patenting.

Requester contends that the claims of Flick '278 are not patentably distinct from the claims of Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holusha, and says, "Though the claims of the Flick

'551 patent are not identical to the claims of the Flick '278 patent, it would have been obvious to a person of ordinary skill in the art at the time of the priority date of the Flick '278 patent to include a vehicle position determining device in view of the Flick '551 patent." Request at p. 24 and Exhibit E at pp 1-4.

The claims of Flick '278 are drawn to a multi-vehicle tracking unit including a vehicle data bus, a vehicle positioning determining device, a wireless communication device, a multi-vehicle compatible controller, and a downloading interface. A vehicle security system is not recited in the claims. Flick '278 says, "Referring to FIGS. 1-3, the vehicle tracking system 20 in accordance with the invention is now initially described. The vehicle system 20 illustratively includes a vehicle tracking unit 25 to be mounted in the vehicle 21 and a monitoring station 30 which is remote from the vehicle and which is typically in a fixed location. In the illustrated embodiment, the vehicle tracking unit 25 interfaces with various vehicle devices, such as may include security sensors, door locks, etc. as will be appreciated by those skilled in the art.... ***The vehicle tracking unit 25 is also illustratively connected to a separate vehicle security system 27 as may already be installed in the vehicle 21, from the factory or installed as an aftermarket product. Those of skill in the art will appreciate that in some embodiments of the vehicle tracking system 20 a separate vehicle security system 27 may not be needed, and/or various features thereof can be readily incorporated in the vehicle tracking unit 25***." [emphasis added] 4:32-48; Fig. 1. Accordingly, the multi-vehicle tracking unit does not necessarily include a vehicle security system and its features.

The claims of Flick '551 are drawn to a vehicle security system for a vehicle of a type including a data communications bus, a vehicle security sensor and associated sensor bus interface, an alarm indicator and associated alarm indicator bus interface, an alarm controller and associated alarm controller bus interface, and desired signal enabling means. The only controller claimed is an alarm controller. A vehicle tracking unit is not claimed. Flick '551 says, "Turning now additionally to FIG. 3 a first embodiment of the desired signal enabling means 17 is described. The vehicle security system 10 preferably comprises a vehicle security sensor and associated sensor bus interface means 60 for interfacing the vehicle security sensor to the data communications bus 62. The vehicle security system 10 also preferably includes an alarm indicator and associated alarm indicator bus interface means 64 for interfacing the alarm indicator to the data communications bus. Examples of vehicle security sensors and alarm indicators are described above in greater detail with reference to FIG. 1." 6:23-33; Fig. 3. Flick '551 is silent as to any discussion of a vehicle tracking unit.

Requester has not shown how the vehicle security system claims are an obvious variant of the multi-vehicle compatible tracking unit claims. Rather, the claims of Flick '278 do not require the particulars of the claims of Flick '551. Further, the claims of Flick '551 have separate utility such as for anti-theft measures in vehicles. Accordingly, the claims of Flick '278 are patentably distinct from the claims of Flick '551 because they are related as combination and subcombination. MPEP 806.05. "The prohibition against holdings of nonstatutory double patenting applies to requirements for restriction between independent or distinct inventions, such as the related subject

matter treated in MPEP § 806.04 through § 806.05(j), namely, between a combination and a subcombination thereof, between subcombinations disclosed as usable together, between a process and an apparatus for its practice, between a process and a product made by such process and between an apparatus and a product made by such apparatus, etc., so long as the claims in each application are filed as a result of such requirement." MPEP 804.01.

Accordingly, Flick '551 in combination with any one of Brinkmeyer, Monroe, Drori, Space Daily Trimble, Mateja, or Holusha, do not raise an SNQ with respect to double patenting of claims 1-22.

Conclusion

The Request for *Ex Parte* reexamination of claims 1-22 is not granted.

Extension of Time

Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexaminations proceeding. Additionally, 35 U.S.C. 305 requires that *ex parte* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extensions of time in *ex parte* reexamination proceedings are provided for in 37 CFR 1.550(c).

Amendment in Reexamination Proceedings

Patent owner is notified that any proposed amendment to the specification and/or claims in this reexamination proceeding must comply with 37 CFR 1.530(d)-(j), must be formally presented pursuant to 37 CFR §1.52(a) and (b), and must contain any fees required by 37 CFR § 1.20(c). See MPEP §2250(IV) for examples to assist in the preparation of proper proposed amendments in reexamination proceedings.

Service of Papers

After the filing of a request for reexamination by a third party requester, any document filed by either the patent owner or the third party requester must be served on the other party (or parities where two or more third party requester proceedings are merged) in the reexamination proceeding in the manner provided in 37 CFR 1.248. See 37 CFR 1.550.

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a) to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving '278 throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceedings throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282, and 2286.

Future Correspondence

If attempts to reach Examiner Michelle Tarae by telephone at 571-272-6727 are unsuccessful, the examiner's supervisor, Andrew Fischer, can be reached on 571-272-6779.

All correspondence relating to this ex parte reexamination proceeding should be directed: By Mail to:

Mail Stop Ex Parte Reexam
Central Reexamination Unit
Commissioner of Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to:

(571) 273-9900
Central Reexamination Unit

By Hand:

Customer Service Window
Randolph Building
401 Dulany Street
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Registered users of EFS-Web may alternatively submit such correspondence via the electronic filing system EFS-Web, at

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EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

Any inquiry concerning this communication should be directed to the Central Reexamination Unit at (571) 272-7705.

Signed:

/CATHERINE M TARAE/
Primary Examiner, Art Unit 3992

Conferees:

/Stephen Stein/
Managing Quality Assurance Specialist
Central Reexamination Unit

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Notice of References Cited	Application/Control No. 90/014,419	Applicant(s)/Patent Under Reexamination 8032278	
	Examiner C. M TARAE	Art Unit 3992	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-5719551-A	02-1998	Flick; Kenneth E.	B60R25/04	180/287
*	B	US-5940007-A	08-1999	Brinkmeyer; Horst	G07C9/00309	340/12.29
*	C	US-6253064-B1	06-2001	Monroe; David A.	G08G5/0082	455/430
*	D	US-5081667-A	01-1992	Drori; Ze'ev	B60R25/104	290/38C
	E					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
*	U	Trimble Microsoft Launch GPS System for Car PC, available at http://www.spacedaily.com/news/gps-98a.html (published Jan. 8, 1998, last visited June 25, 2019) (Year: 1998)
*	V	Jim Mateja, Travetek Makes Mission Possible, Chicago Tribune, available at https://www.chicagotribune.com/news/ct-xpm-1992-04-12-9202020707-story.html (published April 12, 1992, last visited June 25, 2019) (Year: 1992)
*	W	John Holusha, DRIVING SMART; Lost in Yonkers? An Olds Option Could Be a Guide, The New York Times, available at https://www.nytimes.com/1994/11/27/automobiles/driving-smart-lost-in-yonkers-an-olds-option-could-be-a-guide.html (published Nov. 27, 1994, last visited June 25, 2019) (Year: 1994)
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,419	8032278
	Examiner	Art Unit
	C. M TARAE	3992

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Reviewed prosecution history of US Pat No 8,032,278	01/07/2020	cmt
Reviewed related ex parte reexaminations: 90013587, 90013851, 90014309	01/08/2020	cmt

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

Warning
As of: January 8, 2020 2:23 PM Z

Omega Patents, LLC v. CalAmp Corp.

United States District Court for the Middle District of Florida, Orlando Division

April 6, 2017, Decided; April 6, 2017, Filed

Case No: 6:13-cv-1950-Orl-40DCI

Reporter
2017 U.S. Dist. LEXIS 55846 *

OMEGA PATENTS, LLC, Plaintiff, v. CALAMP CORP., Defendant.

Subsequent History: Affirmed in part and reversed in part by, Vacated by, in part, Remanded by *Omega Patents, LLC v. CalAmp Corp., 2019 U.S. App. LEXIS 10203 (11th Cir. Fla., Apr. 8, 2019)*

Prior History: *Omega Patents, LLC v. CalAmp Corp., 2016 U.S. Dist. LEXIS 174577 (M.D. Fla., Jan. 5, 2016)*

Core Terms

patent, infringement, speed, enhanced damage, invalidity, products, devices, attorney's fees, permanent injunction, Notice, prior art, Supplemental, damages, non-infringement, willful, programmed, invention, exceeded, licensing, combine, signals, cases, physical change, opinion letter, patents-in-suit, interrogatory, reexamination, notification, deposition, injunction

Counsel: **[*1]** For Omega Patents, LLC, a Georgia limited liability company, Plaintiff, Counter Defendant: Brian R. Gilchrist, Christopher F Regan, Ryan Thomas Santurri, LEAD ATTORNEYS, Allen, Dyer, Doppelt, Milbrath & Gilchrist, PA, Orlando, FL.

For Calamp Corp., a Delaware corporation, Defendant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Thomas D. Rein, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL; Christopher S. Carver, LEAD ATTORNEY, Akerman Senterfitt, LLP, Miami, FL; Peter A. Chiabotti, LEAD ATTORNEY, Akerman LLP, West Palm Beach, FL; Thomas R. Yaegers, LEAD ATTORNEY, Akerman LLP, Orlando, FL; Carrie Ann Wozniak, Akerman Senterfitt, LLP - Orlando, Orlando, FL; Joel A. Kauth, PRO HAC VICE, KPPB LLP, Anahein, CA.

For Calamp Corp., a Delaware corporation, Counter Claimant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Thomas D. Rein, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL; Carrie Ann Wozniak, LEAD ATTORNEY, Akerman LLP, Orlando, FL; Christopher S. Carver, LEAD ATTORNEY, Akerman Senterfitt, LLP, Miami, FL; Peter A. Chiabotti, LEAD ATTORNEY, Akerman LLP, West Palm Beach, FL; Joel A. Kauth, PRO HAC VICE, KPPB LLP, Anahein, CA. **[*2]**

Judges: PAUL G. BYRON, UNITED STATES DISTRICT JUDGE.

Opinion by: PAUL G. BYRON

Opinion

ORDER

This cause is before the Court on the following:

1. Plaintiff's Motion for Entry of Final Judgment, Including Entitlement to Attorneys' Fees, Enhanced Damages, and Entry of a Permanent Injunction (Doc. 148), filed March 9, 2016;

2. Plaintiff's Renewed Motion to Award Prejudgment Interest (Doc. 154) filed March 18, 2016;
3. Defendant's Response in Opposition to Plaintiff's Renewed Motion to Award Prejudgment Interest (Doc. 166), filed April 4, 2016;
4. Defendant's Opposition to Plaintiff's Motion for Entry of Final Judgment, Including Entitlement to Attorneys' Fees, Enhanced Damages, and Entry of a Permanent Injunction (Docs. 169, 170), filed April 11, 2016;
5. Plaintiff's Notice of Filing Declarations (Doc. 187), filed April 28, 2016;
6. Defendant's Notice of Filing Responsive Declarations (Doc. 188), filed April 29, 2016;
7. Defendant's Notice of Supplemental Authority regarding Response in Opposition to Plaintiff's Motion for Entry of Final Judgment (Doc. 192), filed May 17, 2016;
8. Defendant's Notice of Grant of Reexamination of '885 Patent (Doc. 193), filed June 6, 2016;

9. Plaintiff's Notice of Supplemental Authority (Doc. 194), filed **[*3]** June 13, 2016;
10. Defendant's Response to Plaintiff's Notice of Supplemental Authority (Doc. 195), filed June 14, 2016;
11. Plaintiff's Response to Defendant's Notice of Supplemental Authority at Docket Number 192 (Doc. 198), filed July 19, 2016;
12. Defendant's Reply to Plaintiff's Response to Notice of Supplemental Authority (Doc. 199), filed July 22, 2016;
13. Defendant's Notice of Grant of Supplemental Authority (Patent Office Action) (Docs. 200, 201), filed August 30, 2016; and
14. Defendant's Notice of Supplemental Authority (Patent Office Action) (Doc. 202), filed September 19, 2016.

Upon due consideration, and after reviewing the pleadings and the transcript of the trial (Doc. 178-184) and the transcript of the post-trial motion's hearing (Doc. 196), Plaintiff's Motions for Entry of Final Judgement, Enhanced Damages, and Reasonable Attorneys' Fees are granted, and Plaintiff's motions for Permanent Injunction is denied.

I. BACKGROUND

Omega Patents, LLC ("Omega") brought the instant action against CalAmp Corp. ("CalAmp") and contends that CalAmp infringed the claims of U.S. Patent No. 6,346,876 ("the '876 Patent")[1], U.S. Patent No. 6,756,885 ("the '885 Patent")[2], U.S. Patent No. 7,671,727 ("the '727 Patent")[3], and U.S. Patent No. ***8,032,278*** ("the '278 Patent")[4] (collectively, the "patents-in-suit").[5] (Doc. 1). The trial of this matter commenced on February 16, 2016, **[*4]** and concluding on February 24, 2016, (Doc. 178-184), with the jury returning a verdict in favor of Omega in which they found that all of Omega's asserted claims were valid and had been infringed upon by CalAmp's accused devices: the LMU 3000, LMU 3030, LMU 3050, the V-Pod and the V-Pod 2. (Doc. 144, p. 1-6). The jury rejected the Defendant's invalidity contentions and made three findings for Plaintiff on secondary considerations indicating nonobviousness. (*Id.* at pp. 7-9). Finally, the jury found Plaintiff had proven by clear and convincing evidence that CalAmp acted despite an objectively high likelihood that its actions infringed a valid patent and that this high likelihood of infringement was either known or so obvious that it should have been known to CalAmp. (*Id.* at pp. 9-10). The jury awarded damages in the amount of $2,975.200. (*Id.* at p. 10).

Omega contends the Court should award reasonable attorneys' fees pursuant to 35 U.S.C. § 285, enhanced damages pursuant to § 284, and a permanent injunction pursuant to § 283. (Doc. 148). CalAmp opposes the relief requested by Omega. (Doc. 169). The Court held oral argument on the post-trial motions on May 2, 2016. (Doc. 196). The parties subsequently submitted numerous pleadings consisting of supplemental **[*5]** authority and notices of *ex parte* reexamination by The Patent Office of the '278 patent, the '885 patent, and the '876 patent. (Docs. 198-202).

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[1] The jury found infringement of claims 1, 3, 4, 5, 12, 14, and 16. (Doc. 144, p. 2).

[2] The jury found infringement of claims 1, 2, 3, 12, and 14. (*Id.* at p. 3).

[3] The jury found infringement of claims 1, 10, and 11. (*Id.* at p. 4).

[4] The jury found infringement of claims 1-6, 8, 11-16, 18-19, and 21. (*Id.* at pp. 5-6).

[5] The patents-in-suite relate to control systems for vehicles with a "data communication bus." The term "data communication bus" has been previously construed by the Court to mean "wired connection for communication of digital messages among vehicle devises, with each message including one or more device addresses." (Doc. 50, p. 25).

II. STANDARD

A. Enhanced Damages

When this litigation proceeded to trial, the issue of enhanced damages was governed by the two-step inquiry announced by the Federal Circuit in *In re Seagate Tech., LLC, 497 F.3d 1360, 1371 (Fed. Cir. 2007)* (*en banc*). Following oral argument on Omega's motion for enhanced damages, the United States Supreme Court decided *Halo Elecs., Inc. v. Pulse Elecs., Inc., 136 S. Ct. 1923, 195 L. Ed. 2d 278 (2016)*. The Court in *Halo* rejects the *Seagate* two-part test for determining when a district court my increase damages pursuant to *35 U.S.C. § 284* as being inconsistent with the plain language of the statute. *Halo, 136 S. Ct. at 1928*. Following a historical exegesis of enhanced damages under the *Patent Act*, the Court concluded that "although there is 'no precise rule or formula' for awarding damages under *§ 284*, a district court's 'discretion should be exercised in light of the considerations' underlying the grant of that discretion." *Halo, 136 S. Ct. at 1932* (quoting *Octane Fitness, LLC v. ICON Health & Fitness, Inc., 134 S. Ct. 1749, 1756, 188 L. Ed. 2d 816 (2014)*).

The Court in *Halo* remarked that enhanced damages under patent law "should generally be reserved for egregious cases typified by willful misconduct." *Halo, 136 S. Ct. at 1934*. The Court observed that "[t]he sort of conduct warranting enhanced damages has been variously described in our cases as willful, wanton, malicious, bad-faith, **[*6]** deliberate, consciously wrongful, flagrant, or—indeed—characteristic of a pirate." *Halo, 136 S. Ct. at 1932*. The Court rejected the heightened standard of proof provided for by the Federal Circuit in *Seagate* in favor of a preponderance of the evidence standard. *Halo, 136 S. Ct. at 1934*. The type of culpability that supports an award of enhanced damages is "measured against the knowledge of the actor at the time of the challenged conduct." *Halo, 136 S. Ct. at 1933*.[6] Once a jury determines that an infringer "is guilty of conduct upon which increased damages may be based [,] ... the court then determines, exercising its sound discretion, whether, and to what extent, to increase the damages award given the totality of the circumstances." *Jurgens v. CBK, Ltd., 80 F.3d 1566, 1570 (Fed. Cir. 1996)*. While a finding of willful infringement does not mandate the imposition of enhanced damages, once the finding is made "the court must explain its reasons for declining to award enhanced damages." *Carnegie Mellon Univ. v. Marvell Tech. Group, Ltd., No. CIV.A. 09-290, 2014 U.S. Dist. LEXIS 43042, 2014 WL 1320154, at *9 (W.D. Pa. Mar. 31, 2014)*, *rev'd in part on other grounds*, *807 F.3d 1283 (Fed. Cir. 2015)*.

B. Attorney's Fees

The Supreme Court in *Octane Fitness* rejected the "more rigid and mechanical formulation" for determining when the district court may award reasonable attorney fees to the prevailing party in favor **[*7]** of the plain statutory text of *§ 285*, which provides "[t]he court in exceptional cases may award reasonable attorney fees to the prevailing party." *35 U.S.C. § 285*; *Octane Fitness, 134 S. Ct. at 1755*. An exceptional case is "simply one that stands out from others with respect to the substantive strength of a party's litigating position (considering both the governing law and the facts of the case) or the unreasonable manner in which the case was litigated." *Octane Fitness, 134 S. Ct. at 1756*. The district court applies the preponderance of the evidence standard and considers the totality of the circumstances. The district court may consider a number of factors in determining whether to award fees, including: (1) whether the infringer deliberately copied the invention; (2) whether the infringer had a good faith basis for believing it did not infringe or that the patent was invalid; (3) the closeness of the case; (4) conduct of the part in litigation; (5) defendant's relative size and financial condition; (6) the duration of the infringement; (7) remedial action by the defendant; (8) defendant's motivation for harm, and (9) whether defendant attempted to conceal its misconduct. *Read Corp. v. Portec, Inc., 970 F.2d 816, 827 (Fed. Cir. 1992)*.[7]

C. Permanent Injunction

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[6] The Court in *Halo* criticized, in pertinent part, the second prong of the *Seagate* test which allowed an infringer to escape enhanced damages by mustering a defense of invalidity or noninfringement at trial "even if [the infringer] did not act on the basis of the defense or was even aware of it." *Halo Elecs., Inc. v. Pulse Elecs., Inc., 136 S. Ct. 1923, 1933, 195 L. Ed. 2d 278 (2016)*.

[7] The *Read* factors are equally applicable to the assessment of enhanced damages.

The Supreme Court in *eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 126 S. Ct. 1837, 1839, 164 L. Ed. 2d 641 (2006)*, held that to obtain an injunction a party **[*8]** "must demonstrate: (1) that is has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest wound not be disserved by a permanent injunction." The Federal Circuit subsequently held that *eBay* eliminates a presumption of irreparable injury to the patent holder after a judgment of infringement and of no invalidity is returned. *Robert Bosch LLC v. Pylon Mfg. Corp., 659 F.3d 1142, 1149 (Fed. Cir. 2011)*. Moreover, there must be a causal nexus between the irreparable injury and the patent infringement. *Apple Inc. v. Samsung Elecs. Co., 735 F.3d 1352, 1360 (Fed. Cir. 2013)*.

III. DISCUSSION

Mr. Flick, the inventor of the four patents at issue, met with representatives of CalAmp, including Mr. Gallin Chen, in 2009 at a trade show to discuss Omega's belief that CalAmp was infringing certain patents. (Doc. 179, 76:10-18). During this initial meeting, Mr. Chen expressed his view that the Omega patents were invalid, but he nonetheless requested a draft license agreement. (*Id.* at 78:1-11). Omega complied and sent CalAmp a license agreement that CalAmp rejected shortly thereafter, resulting in Omega filing suit **[*9]** against CalAmp on December 15, 2009.[8] (*Id.*). Once litigation had commenced, Mr. Chen agreed to meet with Mr. Flick again at a trade show scheduled for January 2010. (*Id.* at 81:14-18). During the ensuing conversation, Mr. Chen represented to Omega that CalAmp did not program their products and any alleged infringement was caused by the end-user who programs the CalAmp devices. (*Id.* at 81:24-82:13). Based upon this representation Mr. Flick stayed the litigation against CalAmp and sued two end users: Numerex and Sky Patrol. (*Id.*). Numerex quickly settled with Omega and entered into a licensing agreement. (*Id.* at 82:14-23). Sky Patrol, however, revealed that, contrary to Mr. Chen's representation, CalAmp was responsible for programing their offending devices.[9] (*Id.* at 83:11-84:12). CalAmp subsequently settled with Omega and agreed to pay a royalty. (*Id.* at 84:13-21; Pl.'s Ex. 45).

Against this backdrop, CalAmp introduced the accused devices in late 2011 or early 2012. (Doc. 182, 53:2-5). Prior to introducing the accused products, CalAmp's counsel, Mr. David Bailey, reviewed a number of patents held by the Plaintiff, including the '885 and '727 patents at issue in this litigation. (Pl.'s Ex. 39). At the same **[*10]** time counsel for Omega and for CalAmp engaged in discussions concerning Omega's "extensive patent portfolio" in the area of databus applications.[10] (Pl.'s Ex. 34). It is, therefore, beyond dispute that CalAmp was fully aware of the Omega patents prior to introducing the accused products into the market.

Mr. Chen admitted on cross-examination that the LMUs and V-Pod and V-Pod2 were introduced as a direct result of consumer demand. (Doc. 182, 142:11-24). Mr. Chen explained that the LMUs connect to the vehicle data bus and read data from the bus. (*Id.* at 54:8-14). According to Mr. Chen, the LMU has a transmitter and a receiver, can read data from the vehicle data bus, can query a vehicle device for data, and can store the data received in response to the query. (*Id.* at 129:1-21). The '727 patent held by Omega, for example, claims a speed exceeded notification device for a vehicle comprising a "vehicle data communications bus" and "at least one vehicle device generating data related to vehicle speed on the" bus which determines when a vehicle's speed has exceeded a set threshold. (Joint Ex. 4, column 7, lines 4-17).

In an attempt to distinguish the LMU devices from the '727 patent, Mr. Chen testified that the LMU **[*11]** speed data is derived from the GPS module and not from the vehicle bus.[11] (Doc. 182, 133:13-21). He added that the LMU has the capacity to read speed from the bus, but CalAmp does not allow this because speed data generated from GPS is more accurate. (*Id.*).

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[8] The lawsuit filed by Omega in 2009 pertained to patents other than those at issue in the instant litigation.

[9] The deposition of CalAmp engineer, Peter Hergesheimer, was played at trial, and Mr. Hergesheimer acknowledged that CalAmp programs LMUs for approximately 75% of their customers, contradicting Mr. Chen's claim that CalAmp sold a black box. Mr. Hergesheimer also testified that software is loaded on the LMU online, because that is more cost effective than loading it at the time of manufacture.

[10] CalAmp engineer, Peter Hergesheimer, testified at trial via deposition that he did not design around the Omega patents.

[11] The '727 patent indicates that it is an object of the invention "to provide a speed exceeded notification device which may be readily used in a vehicle including a data communications bus and related methods." (Joint Ex. 4, column 2, lines 38-40).

However, Mr. Jerrery Eidberger, a CalAmp field application engineer, testified via deposition that a substantial percentage of customers do in fact have the LMU programmed by CalAmp to read the speed from the bus. Additionally, CalAmp responded to Omega's Frist Set of Interrogatories, wherein Omega asks CalAmp to "identify all customers for whom CalAmp has loaded scripts for geofencing or speed alerts into an Accused Product" by providing a long list of customers for whom CalAmp has loaded scripts related to speed alerts, noting that "some scripts do not cause a speed exceeded notification." (Pl.'s Ex. 16). CalAmp's acknowledgement that some scripts do not cause a speed exceeded notification means that other scripts do provide the speed exceeded notification from the vehicle bus as opposed to the GPS. Mr. Chen's testimony wherein he flatly denies the LMU reads vehicle speed from the bus is clearly contradicted by CalAmp's interrogatory **[*12]** answers.

Mr. Andrews, CalAmp's retained expert, echoed this misrepresentation when he testified that the CalAmp devices obtain speed data from the internal GPS sensor as opposed to obtaining speed from the bus. (Doc. 182, 248:3-5; 249:1-5). On cross-examination, Mr. Andrews admitted that if the LMU is programmed to read speed from the data bus and make the threshold determination that the speed has been exceeded, the accused device infringes the '727 patent. (Doc. 183, 172:19-22). Either Mr. Andrews ignored CalAmp's answers to Omega's interrogatories in reaching his opinion that the accused products do not infringe the '727 patent because speed is derived via GPS, or CalAmp withheld this information from its expert in order to obtain a non-infringement opinion. Either way, the testimony of Mr. Chen and Mr. Andrews provide substantial support for the jury's finding of willful infringement of the '727 patent, and this Court concurs in the jury's finding of willful infringement.

Further indicia of willful infringement by CalAmp is found in an e-mail sent by Mr. Chen to outside patent counsel, Mr. David Bailey[12], and senior vice president for corporate development, Mr. Garo Sarkissian. (Doc. 182, 112:13-19). On July 30, 2013, **[*13]** eight months after Omega instituted this lawsuit, Mr. Chen wrote to Messrs, Bailey, and Sarkissian and asked them to look at the '278 patent. (Pl.'s Ex. 48). Referring to claim 13 of the '278 patent, Mr. Chen wrote: "13 may relate to how we program a unit at the factory so it may be harder to avoid." (*Id.*). The '278 patent has as an object of the invention to "provide a multi-vehicle compatible tracking unit which may be used to control operable vehicle devices, and/or read information therefrom via the vehicle data communications bus." (Joint Ex. 5, column 2, lines 46-49). Clearly, Mr. Chen was concerned as late as July 30, 2013, that the accused devices infringe claim 13 of the '278 patent, as the jury ultimately found. His admission in this e-mail that the units are programed at the CalAmp factory is further evidence that his trial testimony describing the LMU as a black box, programmed by the end-user, was false.

In the same e-mail, Mr. Chen predicts what will ultimately become a defense theory advanced at trial, when he writes: the '727 patent "can be avoided by using GPS speed, not vehicle bus received speed, for speeding alerts." (Joint Ex. 5). It is difficult to ascribe a good faith basis for persisting at trial on the theory that **[*14]** the LMU determines speed from the GPS, as opposed to obtaining the data from the bus, when CalAmp's supplemental response to Omega's interrogatory, in which CalAmp admits to loading scripts for speed exceeded notification, was filed March 6, 2015—more two years after Mr. Chen suggested to his counsel and his colleague that using GPS speed will allow CalAmp to avoid the '727 patent. This email is consistent with an attempt to create a plausible defense at trial, perhaps in anticipation of the then-available *Seagate* enhanced damages analysis.[13] That Mr. Chen continued to advance the GPS theory at trial and in view of CalAmp's interrogatory answer demonstrates willful copying of Omega's invention.

In an attempt to satisfy the *Seagate* two-part test at trial, Mr. Chen testified that prior to launching the accused devices, CalAmp investigated the vehicle data bus market. (Doc. 182, 55:21-24). Mr. Sarkissian directed Mr. Chen to search for prior art, resulting in Mr. Chen reviewing over 300 patents. (*Id.* at 57:12-58:2). Mr. Chen also stated that in late 2010, Mr. Sarkissian, Mr. Steven Moran (CalAmp's general counsel), and he had received verbal opinions from Mr. Bailey that the **[*15]** accused products did not infringe existing patents. (*Id.* at 114:7-25; 117:7-12). Mr. Chen stated that he did not

[12] Mr. Bailey is an attorney practicing in the same firm as trial defense counsel. (Doc. 182, 144:20-25).

[13] The Supreme Court in *Halo* disapproved of the *Seagate* test in part because it allowed an infringer to "escape any comeuppance under § 284 solely on the strength of his attorney's ingenuity." *Halo*, 136 S. Ct. at 1933. Hence, opinion letters issued after-the-fact shed little light upon the infringer's culpability which must be "measured against the knowledge of the actor *at the time* of the challenged conduct." *Id.* [emphasis added].

request Mr. Bailey to memorialize these oral opinions in writing until after the lawsuit was commenced by Omega. (*Id.* at 145:1-3). The defense marked for identification exhibits 71-74, which are opinion letters written by Mr. Baily as to each patent-in-suit, and each opinion letter is dated June 27, 2014.[14] (Def.'s Exs. 71-74). However, it is curious—assuming Mr. Bailey had vetted the accused products against existing patents back in 2010—that in July 2013 Mr. Chen highlighted the difficulty of avoiding claim 13 of the '278 patent and suggested that the '727 patent can be avoided by focusing upon GPS speed determination. If, in fact, counsel had vetted the accused devices and the Omega patents three years earlier, there is no reason for Mr. Chen to suggest a noninfringement theory to his counsel, nor is there any reason for Mr. Chen to be concerned over claim 13 of the '278 patent. The Court does not find the testimony of Mr. Chen or of Mr. Bailey credible on the issue of whether counsel had rendered legal opinions prior to the launch of the accused products in which he opined the accused products do not **[*16]** offend any patent held by Omega. Mr. Chen's credibility is undermined by other evidence presented at trial[15], and it is incomprehensible that counsel would refrain from issuing a written opinion of noninfringement or invalidity to his client at or near the time that CalAmp launched the accused products. No reasonable explanation for this highly unusual practice was offered by CalAmp or Mr. Bailey.

The Court next considers whether this was a "close case" and whether CalAmp held a good faith belief the patents were not infringed or were invalid. CalAmp and their expert, Mr. Andrews, note that the Omega patents require the performance of a control function. (Doc. 182, p. 177:7-15; Doc. 195, p. 3). At trial Mr. Andrews defined "control function" as "a message on the bus that is going to control a device exhibiting a physical change in the device or the system." (Doc. 182, 177:7-15). The notion that control function envisions a physical change is critical to the Defendant's noninfringement arguments. Based upon the Court's review of Mr. Andrew's initial expert report, (Def.'s Ex. 38), this definition of control function does not appear in his original expert report. Mr. Andrews acknowledged **[*17]** on cross-examination that he did not apply the physical change qualifier to control function in his deposition. (Doc. 183, 103:10-14). Mr. Andrews explained that he had misspoken in his deposition when he failed to describe control function as requiring a physical change in the device or the system. (*Id.*). Mr. Andrews did, however, include in his rebuttal report the definition of control function as having the ability to enable a physical change in a device of the system; for example, locking a door, starting the engine, or turning on a light." (Def.'s Ex. 47, pp. 11-12). The crux of the non-infringement defense is that the LMU merely sends a "query for data" and does not control a vehicle device. (Doc. 182, p. 177:20-22). Because the LMU does not control a vehicle device, Mr. Andrews argues the accused products cannot satisfy the multi-vehicle compatible controller claim in the patents. (*Id.* at 238:9-12; 238:25-239:6; 239:14-240:6). Accordingly, Mr. Andrews' definition of control function as mandating a physical change precludes one from finding for Plaintiff Omega.

In order for Mr. Andrews' non-infringement argument to prevail, one must accept his opinion that the LMU is a passive **[*18]** device that uses the bus to request and receive data, but which does not "perform one or more control functions" with respect to the vehicle device. (Def.'s Ex. 47, p. 12; Doc. 182, 240:9-11). The difficulty lies in finding a basis for Mr. Andrews' interpretation of "control function." The Court construed the claim term "controller" to mean "electronic circuitry that performs one or more control functions." (Doc. 50, p. 24). The claim term "multi-vehicle compatible controller" was construed by the Court to mean "electronic circuitry that performs one or more control functions, and can operate with more than one vehicle." (*Id.*). The Court did not construe the term control function. CalAmp urged the Court to construe "function" as "[a]n operation of a vehicle device, such as remote starting the engine, remotely unlocking the vehicle doors, or changing the mode of a security system between armed and disarmed." (*Id.* at 18). But the Court observed: "The patent states the invention may be embodied in many

[14] The Court sustained Omega's objection to the admissibility of Mr. Bailey's opinion letters on the grounds that the letters—offered during Mr. Chen's testimony—constitute hearsay, and the letters confer expert testimony which was not properly disclosed by the Defense. However, the Court has considered the four opinion letters for purposes of the enhanced damages analysis. The Court is unaware of the substance of the verbal opinions allegedly offered by Mr. Bailey in 2010 prior to the launch of the accused products.

[15] Mr. Chen testified via deposition that he removed information from the CalAmp website regarding the LMU devices to make it more difficult for Omega to identify infringement. (Pl.'s Ex. 48) ("We don't want to make it easy for Omega to build their infringement case by just looking at the datasheets on our website. . . . the bigger hole is LMU 3000; it's launched, mature and broadly integrated by multiple partners. We can bury (i.e. omit) the LMU3030 for now on open website.").

different forms and should not be construed as limited to the illustrated embodiments set forth herein." (*Id.* at 18) (internal quotation marks and citations omitted). Accordingly, Mr. Andrews' interpretation **[*19]** of "control function" is not based upon the Court's claim construction. Similarly, nothing in any specification of the four patents-in-suit support Mr. Andrews' definition of "control function." (Joint Ex. 1-4; Doc. 183, 117:8-11; 118:1-6).

Mr. Andrews acknowledged that the microprocessor in the LMUs and the V-Pods sends a signal along the bus to the ECU and requests a response. (Doc. 183, 114:17-115:6). Omega's counsel engaged Mr. Andrews in the following colloquy:

> Q: Let's say the ECU responds with the device code signal—that would be controlling the ECU, wouldn't it?
> A: You're asking it for information. It's providing it back, yes.
> Q: So that's a yes?
> A: Okay.

(*Id.* at 118:9-24)

> Q: And would you also agree with me ... that sending a signal and getting a response could be a control function?
> A: Yes.

(*Id.* at 120:5-20)

Mr. Andrews admits that when the LMU seeks information from the ECU, the ECU must respond via the bus; however, he contends this is not a control function. (*Id.* at 143:1-6). Mr. Andrews argues that "one with ordinary skill in the art, in the automotive industry in telematics, would understand the difference between a command and a query." (*Id.* at 116:7-10). It is Mr. Andrews' contention **[*20]** that a command—or as he would call it a query—by the LMU that produces a mandatory response by the ECU does not meet the definition of controller and control function. The Defendant's attempt to cast a mandatory response to a query as a passive act that falls short of a control function is unsupported by the record and was conspicuously absent from Mr. Andrews' initial expert report. The emergence of this opinion late in the litigation is highly suspect, particularly when one considers that Mr. Andrews' also opined that the LMU cannot infringe the '727 patent because the LMU only generates speed data from the GPS—which is clearly contradicted by CalAmp's response to Omega's interrogatories.

Mr. Andrews and counsel for CalAmp presented other non-infringement arguments at trial. However, the Court finds that these additional grounds—all of which were rejected by the jury—do not, giving the totality of the circumstances, mitigate against an award of enhanced damages and reasonable attorneys' fees. For example, Mr. Andrews took issue with whether signals were stored on the accused devices as required by the '885 patent. (Doc. 183, 122:6-9). However, on cross-examination, Mr. Andrews agreed that the LMU sends **[*21]** out signals and the ECU sends a response, "[a]nd those signals are stored on the controller." (*Id.* at 123:7-124:9). Mr. Andrews admits the signals are stored on the LMU until the device is unplugged and re-plugged at which time it starts over. (*Id.* at 125:5-9). In fact, Mr. Andrews agrees the LMU is intended to be used in a manner that would store the CAN data and can be used in multiple vehicles. (*Id.* at 162:6-13).

CalAmp also presented invalidity defenses by identifying prior art that, when considered with SAE standards, rendered the patents obvious. In supplemental filings by the parties, the Court has been made aware that CalAmp sought *ex parte* reexamination of three of the patents-in-issue. The United States Patent and Trademark Office ("USPTO") has reexamined the '278 patent[16], (Doc. 192); the '885 patent[17], (Doc. 193), and the '876 patent[18], (Doc. 201). The USPTO rejected the pertinent claims of these three patents. While the USPTO issued Office Actions in *Ex Parte* Reexamination of the '278, '885, and '876 patents and rejected the relevant claims of these patents, the finding by the USPTO does not have preclusive effect as to the verdict rendered by the jury in the instant litigation unless the final USPTO decision is affirmed by the Federal **[*22]** Circuit before the jury's verdict become final. *Fresenius USA, Inc. v. Baxter Inter., Inc., 721 F.3d 1330, 1346 (Fed. Cir. 2017)*. Accordingly, the Court is not bound by the examiner's non-final conclusions when determining whether the jury's verdict is supported by substantial evidence.

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[16] Omega's response, including declarations from Mr. Suman, (Doc. 198-2), whose patent is being considered by the examiner as prior art, and Mr. McAlexander, (Doc. 198-3), demonstrates that the examination of '278 remains in a state of flux. (Doc. 198).

[17] The USPTO rejected every claim of the '885 patent on anticipation and obviousness grounds. (Doc. 202, p. 1).

[18] The USPTO rejected every claim of the '876 patent on anticipation and obviousness grounds. (Doc. 201, p. 2).

The Court recognizes that CalAmp does not suggest in their notices of supplemental authority that the non-final action of the PTO is outcome determinative. Rather, CalAmp cites to the examiner's findings to support the reasonableness of their reliance upon invalidity as a defense. The Court rejects CalAmp's position for a number of reasons. CalAmp's expert, Mr. Andrews, combined certain prior art, such as the Braitberg '497 patent, (Def. Ex. 10), with the Society of Automotive Engineers ("SAE") standard J1978, to predict the Omega '876 patent. (Doc. 182, 173:14-175:23; 178:8-15; 180:22-181:19). Mr. Andrews testified that "one of ordinary skill in the art [would] look to J1978 to determine how to connect the bus." (*Id.* at 184:13-18). However, Mr. Andrews, despite numerous questions posed on cross-examination, failed to articulate the motive for one of ordinary skill in the art to combine these references.[19] The best Mr. Andrews could do in suggesting a motive to combine J1978 with Braitberg is that scan **[*23]** tools were being used at the relevant time; hence, one would know to combine SAE J1978 with Braitberg to make a device multi-vehicle compatible.[20] (Doc. 183, 149:21-150:3). Mr. Andrews applied the Braitberg reference to the '876 and '885 patents, (Doc. 182, p. 198:1-20), and he applied J1978 to all four patents-in-suit. (*Id.* 250:1-270:19). The motive to combine prior art is critical to CalAmp's invalidity defense, because Mr. Andrews could not find prior art that had all of the claims that Mr. Flick has in his patents. (*Id.* at 132:17-133:7). Mr. Andrews failed to provide more than a conclusory opinion that one of ordinary skill in the art at the relevant time would have known to look to SAE J1978 in combination with the various prior art references. In this regard, Mr. Andrews' fails to assist the Defendant in carrying its burden of proof on invalidity.

In addition, the Court in *Halo* has eliminated the ability of an accused infringer to posit reasonable invalidity defenses which were not relied upon at the time the accused products were introduced into the market. *Halo*, 136 S. Ct. at 1933. Under *Seagate*, "the ability of the infringer to muster a reasonable (even though unsuccessful) defense at the infringement trial" was dispositive **[*24]** of the issue of enhanced damages. *Id.* Post-*Halo*, however, "culpability is generally measured against the knowledge of the actor at the time of the challenged conduct." *Id.* There is no indication in the record that Mr. Andrews provided CalAmp his opinion on invalidity before the accused products went into production in 2011. While the opinion letters issued by Mr. Bailey as to the '885 patent refer to SAE J1978, J1979, (Def.'s Ex. 73), this letter was written in June 2014 long after infringement had begun. Thus, there is no record evidence that CalAmp had knowledge of the invalidity defense derived from the combination of prior art and SAE standards at the time of the challenged conduct.[21] Since culpability is measured against the infringer's knowledge at the time of the challenged conduct, the after-the-fact invalidity defense is of little merit in assessing enhanced damages.[22]

The next *Read* factor directs the Court to consider the Defendant's size and financial condition. According to Omega's expert, Mr. Christian Tregillis, "CalAmp has sold over 245,000 units of the Accused Products, for over $21.5 million from April 2011 through November 2014," (Pl.'s Ex. 65, p. 37), "earning over $4.1 million **[*25]** in gross profits." (Pl.'s Ex. 65, p. 47). CalAmp is a publicly-traded corporation with over $75 million dollars in earnings last year. (Pl.'s Ex. 65). While CalAmp argues that the accused products are low-margin products sold in an extremely competitive market, this misses the point. The overall financial health of the infringer is evaluated—not the net profit generated by the offending conduct—to "ensure that enhanced damages would not prejudice defendant's non-infringing business." *Powell v. Home Depot U.S.A.,*

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[19] "A party seeking to invalidate a patent on the basis of obviousness must demonstrate by clear and convincing evidence that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so." *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012) (internal quotation marks omitted).

[20] Mr. Andrews admits that Braitberg does not provide multiple vehicle compatibility, a claim that is necessary to invalidate the Omega patents, so he adds SAE J1978. (Doc. 183, p. 130:6-10). Interestingly, Mr. Chen testified he was unware of J1978.

[21] In fact, Mr. Chen filed for patent US 2010/0158211on December 21, 2011, claiming "[s]ystems and methods in accordance with embodiments of the invention continuously collect information from vehicle devices via a vehicle data bus, store information in a database, and retrieve information from the database in response to requests from remote devices." (Pl.'s Ex. 14, Abstract). The patent issued June 21, 2012, and Mr. Chen did not disclose the prior art relied upon to invalidate Omega's similar patents.

[22] Assuming CalAmp had knowledge of the invalidity defense at the relevant time, the Court would not reach a different conclusion, since the motive to combine the prior art with the SAE standards is deficient.

Inc., 715 F. Supp. 2d 1285, 1298 (S.D. Fla. May 28, 2010). The Defendant has the financial wherewithal to endure the sanction of enhanced damages and an award of reasonable attorneys' fees.

A closely related factor for the Court to consider is the duration of CalAmp's conduct. As previously discussed, CalAmp was well aware of Omega's patents since at least 2010. Rather than take a license, and choosing not to design around Omega's patents, CalAmp elected to sell infringing products and continues to do so to this day. CalAmp's motivation to engage in this behavior is obvious: their customers wanted this technology, and CalAmp wanted to provide it. Moreover, as previously discussed, CalAmp attempted to conceal its infringement by misrepresenting to Omega that it **[*26]** only sold black boxes which were programmed by customers and by removing information from the CalAmp website to make discovery of infringement more difficult. These additional factors all weigh in favor of an award of enhanced damages and reasonable attorneys' fees.

Based upon the foregoing, the Court finds CalAmp willfully infringed the Omega patents-in-suit, further finding that the jury's finding of willful infringement is supported by substantial evidence. The Court independently reviewed the record evidence and finds an award of enhanced damages of threefold the actual damages and an award of reasonable attorneys' fees is supported by the evidence.[23]

The Court turns now to Omega's request for a permanent injunction. Omega quotes Chief Justice Robert's concurring opinion in *eBay* wherein he remarks that from "at least the early 19th century, courts have granted injunctive relief upon a finding of infringement in the vast majority of patent cases." *eBay, 126 S. Ct. at 1841*. However, Justice Thomas speaking for the majority clarified that "the decision whether to grant or deny injunctive relief rests within the equitable discretion of the district courts, and that such discretion must be exercised consistent **[*27]** with traditional principles of equity, in patent disputes no less than in other cases governed by such standards." *Id.* As Justice Kennedy elaborates in his concurrence, "trial courts should bear in mind that in many instances the nature of the patent being enforced and the economic function of the patent holder present considerations quite unlike earlier cases." *Id. at 1842*. Justice Kennedy cautions trial courts to use care in issuing permanent injunctions in the context of patent holders who primarily employ their patent to obtain licensing fees. *Id.* "When a patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed simply for undue leverage in negotiations, legal damages may well be sufficient to compensate for infringement and an injunction many not serve the public interest." *Id.*

Mr. Flick is a patent holder who presently generates revenue by licensing his patents; he no longer manufactures products. While Omega argues that it has maintained a restrictive licensing program of the patents-in-suit and has selectively licensed only a limited number of entities in the marketplace, (Doc. 148, p. 17), it is equally true that **[*28]** Omega was willing to license its patents to CalAmp. While Mr. Flick testified that Omega requires most licensees to transfer rights of improvements to Omega in order to strengthen its patents, it is clear that Omega does not require every licensee to agree to this term. In fact, the License Agreement entered into between Omega and CalAmp in relation to the products sold to SKYPATROL does not provide for assignment of improvements to Omega. (Pl.'s Ex. 88).

While cognizant of Omega's contention that a compulsory licensing agreement does not make Omega whole, and recognizing the Court need not balance the hardships in cases of willful infringement[24], the Court finds that monetary damages are adequate to compensate Omega for the injury sustained by CalAmp's infringement. Moreover, as indicated by the declaration of Mr. Michael Zachan, CalAmp's Senior Vice President, a number of public safety, local government, and utility providers would be placed at a considerable disadvantage in the execution of their important duties if a permanent injunction issues. The Court agrees with Omega that the logistic and financial turmoil that befalls CalAmp should an injunction be ordered is of their own design. **[*29]** However, the collateral impact upon important public safety functions weighs against a permanent injunction.

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[23] The Court notes that even if the PTO's non-final action rejecting the relevant claims of the '885 and '876 patents are affirmed by the Federal Circuit, enhanced damages and reasonable attorneys' fees are appropriate for the willful infringement of the '727 and '278 patents—assuming the '278 patent survives reexamination.

[24] *United States v. Marine Shale Processors, 81 F.3d 1329, 1358 (5th Cir. 1996)*; *see also Windsurfing Int'l v. AMF, Inc., 782 F.2d 995, 1003 (Fed. Cir. 1986)*.

For the foregoing reasons, the Court denies Omega's request for a permanent injunction, finding that the payment of customary licensing fees to Omega is adequate to protect the interests of Omega.

IV. CONCLUSION

For the aforementioned reasons, it is **ORDERED AND ADJUDGED** as follows:

1. Plaintiff Omega Patents, LLC's Motion for Entry of Final Judgement (Doc. 148) is **GRANTED**.

2. Plaintiff Omega Patents, LLC's Renewed Motion to Award Prejudgment Interest (Doc. 154) is **GRANTED**.

3. Plaintiff Omega Patents, LLC's Motion for Enhanced Damages (Doc. 148) is **GRANTED** and Plaintiff is awarded treble damages in the amount of eight million, nine hundred and twenty-five thousand and six hundred dollars ($8,925,600).

4. Plaintiff Omega Patents, LLC's Motion for Entitlement to Reasonable Attorneys' Fees (Doc. 148) is **GRANTED**.

5. Plaintiff Omega Patents, LLC's Motion for Entry of a Permanent Injunction

(Doc. 148) is **DENIED. DONE AND ORDERED** in Orlando, Florida, on April 6, 2017.

/s/ Paul G. Byron

PAUL G. BYRON

UNITED STATES DISTRICT JUDGE

End of Document

Granted

Bibliographic information

Publication number and date
US8032278B2 10/04/2011
Granted

Application number and date
US11773272 07/03/2007

Priority number and date
US11773272 07/03/2007

Original assignee
Omega Patents, L.L.C.

Current assignee
OMEGA PATENTS, L.L.C.

Inventor
Kenneth E. Flick

Legal representative
Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

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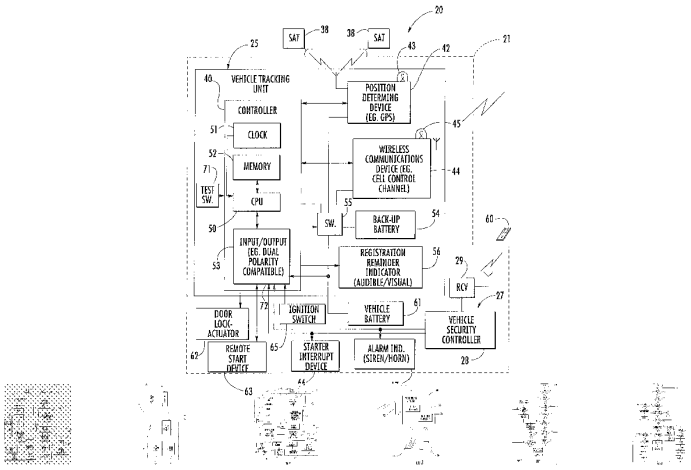

Abstract

A multi-vehicle compatible tracking unit is for a vehicle including a vehicle data bus extending throughout the vehicle. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a multi-vehicle compatible controller for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The multi-vehicle compatible controller may be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles. A downloading interface may be included for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller.

Description

RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of U.S. patent application Ser. No. 11/076,259 filed Mar. 9, 2005 now U.S. Pat. No. 7,720,597, which is a continuation of U.S. patent application Ser. No. 10/383,496 filed Mar. 7, 2003 now U.S. Pat. No. 7,149,623, which is a continuation of U.S. patent application Ser. No. 09/859,972 filed on May 17, 2001 now U.S. Pat. No. 6,606,561 which, in turn, was based upon provisional patent application Ser. Nos. 60/264,811 filed on Jan. 29, 2001; 60/258,005, filed Dec. 22, 2000; 60/251,552, filed Dec. 6, 2000; 60/252,125, filed Nov. 20, 2000; 60/236,890, filed Sep. 29, 2000; 60/246,463, filed Nov. 7, 2000; 60/222,777, filed Aug. 3, 2000; and 60/205,178, filed May 17, 2000, the entire contents of each of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of vehicle devices, and, more particularly, to a tracking system for vehicles, and related methods.

BACKGROUND OF THE INVENTION

[0003] Motor vehicles, such as passenger cars, trucks, busses, fleet vehicles, etc. are widely used and knowing the locations of such vehicles is often desired. For example, should a vehicle be stolen, it would be beneficial to know the vehicle's location so that authorities could be promptly and accurately directed to retrieve the vehicle. Indeed, the tracking system could plot the getaway path of the thief.

[0004] For a company with hired drivers, it may be desirable to know the driver's whereabouts during the course of the day. Similarly, a rental car agency or other fleet operator, for example, may wish to know the whereabouts of its fleet of vehicles.

[0005] It may also be desirable to track the location of a vehicle as it is used throughout the course of a normal day. For parents of younger or older drivers, for example, knowledge of the vehicle's location may provide some assurance that the driver is at designated locations and following a prescribed route.

[0006] A number of patents disclose various systems and approaches to tracking vehicles. For example, U.S. Pat. No. 5,223,844 discloses a tracking system including a control center and a mobile unit installed in the vehicle. The mobile unit may send security warnings to the command center via a wireless transceiver. Position information for the vehicle is determined using a GPS receiver at the vehicle.

[0007] U.S. Pat. No. 5,515,043 discloses a similar system which may send one or more preprogrammed telephone messages to a user when away from the vehicle. The user may remotely access location information or cause certain commands to be carried out by entering a personal identification number (PIN).

[0008] The widespread availability and use of the Internet has prompted a number of vehicle tracking systems to also make use of the Internet. For example, TelEvoke, Inc. proposed such a system in combination with Clifford Electronics. The system was to provide notification, control and tracking services via the telephone or the Internet. Users could be notified via phone, e-mail, or pager of events such as a car alarm being triggered. Users could control the vehicle remote devices via phone, web, or PDA such as unlocking car doors. Additionally, users could track TelEvoke-enabled vehicles on the Internet or via the telephone. An Internet map could be viewed by the user showing the actual and prior vehicle locations. TelEvoke offered its services via a centralized fully automated Network Operations Center. To reduce the communications costs, it was proposed to use the control channel of the cellular telephone network.

Citation	Authority	Normalized number	Application date	Publication number	Publication date
backward	US	5223844	04/17/1992	US5223844A	06/29/1993
backward	US	5515043	08/17/1994	US5515043A	05/07/1996
backward	US	5635693	02/02/1995	US5635693A	06/03/1997
backward	US	5654688	04/14/1995	US5654688A	08/05/1997
backward	US	5719551	08/22/1996	US5719551A	02/17/1998
backward	US	5940007	02/24/1997	US5940007A	08/17/1999

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Persons

Original Assignees

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Current Assignees

Original	Standardized	Normalized
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Original
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Legal representative(s)

Original	Standardized	Normalized
Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.		

Legal information

Status

Event	Date
Granted	10/04/2011
Filed	07/03/2007

Ownership

Date from	Date to	Name	Standardized	Normalized
07/02/2007		OMEGA PATENTS, L.L.C.	OMEGA PATENTS	

Payment status

Date	Payment status	Description
03/21/2019	Fee paid	PAYMENT OF MAINTENANCE FEE, 8TH YEAR, LARGE ENTITY.
03/18/2015	Fee paid	PAYMENT OF MAINTENANCE FEE, 4TH YEAR, LARGE ENTITY.

Litigation

Date	Docket number	Comments	Judgement
07/21/2017	1:17cv2769	Omega Patents, Llc V. Enfora, Inc., Filed July 21, 2017, D.C. N.D. Georgia, Doc. No. 1:17cv2769	
12/20/2013	6:13cv1950	Omega Patents, LLC v. Calamp Corp., Filed December 20, 2013, D.C. M.D. Florida, Doc. No. 6:13cv1950	ORDER granting 316 Motion for Entry of Final Judgment. See Order for details. Signed by Judge Paul G. Byron on 11/25/2019. (SCM)
02/28/2013	1:13cv646	Omega Patents, LLC v. Enfora, Inc., Filed February 28, 2013, D.C. N.D. Georgia, Doc. No. 1:13cv646	

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8032278 or 8,032,278

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1. Omega Patents, LLC v. CalAmp Corp.

United States District Court for the Middle District of Florida, Orlando Division | Jan 05, 2016 | 2016 U.S. Dist. LEXIS 174577

Opinions

Terms: Opinion

... U.S. Patent No. 7,671,727 ("the '727 Patent") , and U.S. Patent No. **8,032,278** ("the '278 Patent") (collectively, the "patents-in-suit"). (Doc. 1). The patents-in-suit relate to control systems for vehicles with a "data communications bus." (Doc. 54, pp. 1-2)....

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2. Omega Patents, LLC v. CalAmp Corp.

United States District Court for the Middle District of Florida, Orlando Division | Apr 06, 2017 | 2017 U.S. Dist. LEXIS 55846

Opinions

Terms: Opinion

... The jury found infringement of claims 1, 10, and 11. (id. at p. 4). , and U.S. Patent No. **8,032,278** ("the '278 Patent") 4 The jury found infringement of claims 1-6, 8, 11-16, 18-19, and 21. (...

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3. Omega Patents, LLC v. CalAmp Corp.

United States Court of Appeals for the Federal Circuit | Apr 08, 2019 | 920 F.3d 1337

Overview: In this patent infringement action, jury's verdict of infringement as to claim 12 of the '876 patent and all asserted claims of the '885 patent was set aside because the instant court could not discern if the jury found infringement of the claims at issue based upon a theory of infringement inconsistent with the proper construction.

Opinions

Terms: Opinion

... 6,756,885 ('885 patent) , 7,671,727 ('727 patent) , and **8,032,278** ('278 patent) were infringed and are not invalid. We affirm the judgment of no invalidity, affirm-in-part, reverse-in-part, vacate-in-part, and remand the judgment as to direct infringement. ...

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4. Omega Patents, LLC v. Calamp Corp.

United States District Court for the Middle District of Florida, Orlando Division | Sep 22, 2017 | 2017 U.S. Dist. LEXIS 186645

Opinions

Terms: Opinion

... U.S. Patent No. 7,671,727 ("the '727 Patent") , and U.S. Patent No. **8,032,278** ("the '278 Patent") (collectively, the "patents-in-suit"). (Doc. 1). Omega attached to its Complaint a Settlement Agreement entered into between ...

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5. Omega Patents, LLC v. CalAmp Corp.

United States District Court for the Middle District of Florida, Orlando Division | Jan 13, 2016 | 2016 U.S. Dist. LEXIS 174576

Opinions

Terms: Opinion

... U.S. Patent No. 7,671,727 ("the '727 Patent") , and U.S. Patent No. **8,032,278** ("the '278 Patent") (collectively, the "patents-in-suit"). (Doc. 1). The patents-in-suit relate to control systems for vehicles with a "data communications bus." (Doc. 54, pp. 1-2). ...

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6. Omega Patents, LLC v. Calamp Corp.

United States District Court for the Middle District of Florida, Orlando Division | Feb 20, 2015 | 2015 U.S. Dist. LEXIS 194173

Opinions

Terms: Opinion

... '885 Patent "); 7,671,727 (the " '727 Patent "); and **8,032,278** (the " '278 Patent "). (Doc. 38, p. 2). I. BACKGROUND Plaintiff, ...

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Mealey's Daily News Update - IP/Tech | Apr 08, 2019
... Omega Patents LLC 's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and **8,032,278** are not invalid. The '876 and '885 patents hare a common ...

2. Patent Defendant: Willful Infringement Jury Verdict Was Erroneous
Intellectual Property: Mealey's Litigation Report | Jul 16, 2018 | 1300 words
... dispute are Omega 's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and **8,032,278** . The '876 and '885 patents hare a common specification and ...

3. Patent Defendant: Willful Infringement Jury Verdict Was Erroneous
Intellectual Property Pleadings: Mealey's Litigation Report | Jul 16, 2018 | 1300 words
... dispute are Omega 's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and **8,032,278** . The '876 and '885 patents hare a common specification and ...

4. Patent Defendant: Willful Infringement Jury Verdict Was Erroneous
Patents: Mealey's Litigation Report | Jul 16, 2018 | 1300 words
... dispute are Omega 's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and **8,032,278** . The '876 and '885 patents hare a common specification and ...

5. Telematics Company Wins New Trial On Indirect Patent Infringement
Intellectual Property: Mealey's Litigation Report | Apr 15, 2019 | 1355 words
... Omega Patents LLC 's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and **8,032,278** are not invalid. The '876 and '885 patents hare a common ...

6. Telematics Company Wins New Trial On Indirect Patent Infringement
Patents: Mealey's Litigation Report | Apr 15, 2019 | 1355 words
... Omega Patents LLC 's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and **8,032,278** are not invalid. The '876 and '885 patents hare a common ...

7. United States Courts Opinions: United States District Court Western District of Appeals for the Federal Circuit : OMEGA PATENTS, LLC, Plaintiff-Appellee v. CALAMP CORP., Defendant-Appellan
Financial Law Reporter (Global) | Apr 09, 2019 | 1222 words
... Nos. 6,346,876 ('876 patent), 6,756,885 ('885 patent), 7,671,727 ('727 patent), and **8,032,278** ('278 patent) were infringed and are not invalid. We affirm the ...

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27. Briefing.com: Hourly In Play (R) - 23:00 ET
Briefing.com | Oct 03, 2019 | 19974 words
... assessed $1 in damages. On the second patent (U.S. Pat. No. **8,032,278**), the jury found direct infringement and awarded damages at a ...

28. District Court Rules Plaintiff Need Not Come Forward with Evidence of Priority Date Earlier than Patent Application Until Defendant Produces Clear and Convincing Evidence of Invalidating Prior Art and Summary Chart Is Not Sufficient
Newstex Blogs | Feb 03, 2016 | 185 words | Jeffer Mangels Butler Mitchell LLP
... U.S. Patent No. 7,671,727 ("the '727 Patent"), and U.S. Patent No. **8,032,278** ("the '278 Patent"). The patents relate to control systems for vehicles ...

29. PTO Litigation Center Report - September 15, 2015
Newstex Blogs | Sep 15, 2015 | 515 words | Sterne Kessler Goldstein Fox
... 3600<nl/>Newly-Posted Reexam Requests<nl/>Control # - 90/013,587<nl/>Date - 9/14/2015<nl/>Patent # - **8,032,278** <nl/>Inventor - FLICK, Kenneth E.<nl/>Assignee - OMEGA PATENTS, L.L.C. <nl/>Title - ...

30. Omega Patents Wraps up One Case and Launches Another
Newstex Blogs | Mar 11, 2013 | 476 words
... device products infringe U.S. Patent No. 6,346,876[6], U.S. Patent No. 7,671,727[7], U.S. Patent No. **8,032,278** [8], and U.S. Patent No. 8,362,886[9]. According to the complaint, Kenneth Flick ...

31. US Patent Issued to Omega Patents on Oct. 4 for "Vehicle Tracking Unit with Downloadable Codes and Associated Methods" (Georgia Inventor)
US Fed News | Oct 10, 2011 | 267 words
... 2007, under Application No. 11/773,272. For further information please visit: http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=**8032278**&OS=**8032278**&RS=**8032278** For any query with respect to this article or any other ...
... Va. , Oct. 10 -- United States Patent no. **8,032,278** , issued on Oct. 4, was assigned to Omega Patents LLC ...

32. U.S. Patents Awarded to Inventors in Georgia (Oct. 6)
Targeted News Service | Oct 06, 2011 | 2486 words | Targeted News Service Targeted News Service
... (11/773,272). The full-text of the patent can be found at http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=**8,032,278**&OS=**8,032,278**&RS=**8,032,278** Written by Satyaban Rath; edited by Hemanta Panigrahi. *** Emory University ...
... -- Omega Patents, Douglasville, Ga., has been assigned a patent (**8,032,278**) developed by Kenneth E. Flick, Douglasville, Ga., for "vehicle tracking ...

33. Omega Patents Assigned Patent
Targeted News Service | Oct 06, 2011 | 282 words | Targeted News Service

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8,032,278

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1. 6:13cv1950. Omega Patents, Llc V. Calamp Corp.
Florida Middle District Court | Dec 20, 2013 | 6:13cv1950 | Patent | Patent Infringement | Closed
... (excerpts) , # 4 Exhibit 4, JE5 - US Patent No **8,032,278** , # 5 Exhibit 5, JE4 - US Patent No 7,671,727 ...
... That U.S. Patent Nos. 6,346,876 B1, 6,756,885 B1, 7,671,727 B2, and **8,032,278** B2 are not entitled to any priority date earlier than their ...
... That U.S. Patent Nos. 6,346,876 B1, 6,756,885 B1, 7,671,727 B2, and **8,032,278** B2 are not entitled to any priority date earlier than their ...
... That U.S. Patent Nos. 6,346,876 B1, 6,756,885 B1, 7,671,727 B2, and **8,032,278** B2 are not entitled to any priority date earlier than their ...
... vehicle having a data bus and associated methods 2010-03-02 340 466 **8,032,278** Vehicle tracking unit with downloadable codes and associated methods 2011-10-04 701 ...

2. 1:17cv2769. Omega Patents, Llc V. Enfora, Inc.
Georgia Northern District Court | Jul 21, 2017 | 1:17cv2769 | Patent | Patent Infringement | Closed
... reading from a data bus and associated methods 2004-06-29 340 426.1 **8,032,278** Vehicle tracking unit with downloadable codes and associated methods 2011-10-04 701 ...
... -B -Patent No. 6,756,885 , # 3 Ex -C -Patent No. **8,032,278** Ex -C -Patent No. **8,032,278** , # 4 Civil Cover Sheet Civil Cover Sheet...

3. 1:13cv646. Omega Patents, Llc V. Enfora, Inc.
Georgia Northern District Court | Feb 28, 2013 | 1:13cv646 | Patent | Patent Infringement | Closed
... vehicle having a data bus and associated methods 2010-03-02 340 466 **8,032,278** Vehicle tracking unit with downloadable codes and associated methods 2011-10-04 701 ...

4. 1:17mi99999. Plaintiff V. Defendant
Georgia Northern District Court | Dec 27, 2016 | 1:17mi99999 | Other Contract | Diversity-Breach of Fiduciary Duty | Open
... No. 6,756,885 , # 4 Exhibit C - U.S. Patent No. **8,032,278** , # 5 Certificate of Interested Persons and Corporate Disclosure Statement ...

5. 18-1309. Omega Patents, LLC v. CalAmp Corp.
Federal Circuit Court of Appeals | Dec 19, 2017 | 18-1309 | 830: Patent Infringement (Fed. Question) | Terminated
... date by the Clerk of Court. [618058] [JAB] 6,756,885 6,737,989 7,671,727 **8,032,278** 6,346,876...

1

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1 Multi-vehicle compatible control system generating command signals on a data bus and associated methods Flick, Kenneth E (Inventor). Not assigned (Assignee). US 6346876. (Published 12 Feb 2002) Show KWIC

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2 Multi-vehicle compatible control system generating command signals on a data bus and associated methods Flick, Kenneth E (Inventor). Not assigned (Assignee). US 6346876. (Published 12 Feb 2002) Show KWIC

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Multi-vehicle compatible control system generating command signals on a data bus and associated methods

Flick, Kenneth E (Inventor). Not assigned (Assignee). **US 6346876**. (Published 12 Feb 2002).

Bibliographic information

Assignee	Not assigned
Inventor	Flick, Kenneth E
Publication number	US 6346876 (12 February 2002)
Related patent	US 6756885 US 8032278
US classification	B60R: VEHICLES, VEHICLE FITTINGS, OR VEHICLE PARTS, NOT OTHERWISE PROVIDED FOR
Plaintiff	Omega Patents, LLC
Defendant	Enfora, Inc.
Court and docket number	N.D.Ga. (Docket: 1:17CV02769)
Court filing date	21 July 2017
Action	CAUSE - 28 USC 1338 - COMPLAINT FOR PATENT INFRINGEMENT
Language	English
Document type	Patent
Source attribution	LitAlert, © Publisher specific
Accession number	P2017-30-36
Document URL	http://dialog.proquest.com/professional/docview/1925169890?accountid=131444
First available	2017-08-02
Database	LitAlert® (1973 - current)

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Multi-vehicle compatible control system generating command signals on a data bus and associated methods

Flick, Kenneth E (Inventor). Not assigned (Assignee). **US 6346876**. (Published 12 Feb 2002).

Bibliographic information

Assignee	Not assigned
Inventor	Flick, Kenneth E
Publication number	US 6346876 (12 February 2002)
Related patent	US 6737989 US 6756885 US 7671727 US 8032278
US classification	340/426.13: Communications: electrical
Plaintiff	OMEGA PATENTS, LLC
Defendant	CALAMP CORP
Court and docket number	Florida, Middle Dist (Docket: 6:13CV01950)
Court filing date	20 December 2013
Action	CAUSE - 35 USC 271 - COMPLAINT FOR PATENT INFRINGEMENT
Language	English
Document type	Patent
Source attribution	LitAlert, © Publisher specific
Accession number	P2013-52-29
Document URL	http://dialog.proquest.com/professional/docview/1471329429?accountid=131444
First available	2013-12-30
Database	LitAlert® (1973 - current)

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Neutral
As of: January 8, 2020 2:23 PM Z

Omega Patents, LLC v. CalAmp Corp.

United States District Court for the Middle District of Florida, Orlando Division

January 13, 2016, Decided; January 13, 2016, Filed

Case No: 6:13-cv-1950-Orl-40DAB

Reporter
2016 U.S. Dist. LEXIS 174576 *

OMEGA PATENTS, LLC, Plaintiff, v. CALAMP CORP., Defendant.

Prior History: Omega Patents, LLC v. CalAmp Corp., 2016 U.S. Dist. LEXIS 174577 (M.D. Fla., Jan. 5, 2016)

Core Terms

Patent, patents-in-suit, prior art, invalidates, infringe, references, Devices, summary judgment, burden of proof, shift a burden, persuasion, preceding, premature, contests, clear and convincing evidence, burden of persuasion, filing date, in limine, continuations-in-part, anticipate, contends, asserts, denies, chart, track

Counsel: **[*1]** For Omega Patents, LLC, a Georgia limited liability company, Plaintiff, Counter Defendant: Brian R. Gilchrist, Christopher F Regan, Ryan Thomas Santurri, LEAD ATTORNEYS, Allen, Dyer, Doppelt, Milbrath & Gilchrist, PA, Orlando, FL.

For Calamp Corp., a Delaware corporation, Defendant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Thomas D. Rein, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL; Christopher S. Carver, LEAD ATTORNEY, Akerman Senterfitt, LLP, Miami, FL; Peter A. Chiabotti, LEAD ATTORNEY, Akerman LLP, West Palm Beach, FL; Thomas R. Yaegers, LEAD ATTORNEY, Akerman LLP, Orlando, FL; Carrie Ann Wozniak, Akerman Senterfitt, LLP - Orlando, Orlando, FL; Eugene Chong, Joel A. Kauth, PRO HAC VICE, Charles R. Halloran, KPPB LLP, Anahein, CA.

For Calamp Corp., a Delaware corporation, Counter Claimant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Thomas D. Rein, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL; Carrie Ann Wozniak, LEAD ATTORNEY, Akerman LLP, Orlando, FL; Christopher S. Carver, LEAD ATTORNEY, Akerman Senterfitt, LLP, Miami, FL; Peter A. Chiabotti, LEAD ATTORNEY, Akerman LLP, West Palm Beach, FL; Eugene Chong, Joel **[*2]** A. Kauth, PRO HAC VICE, Charles R. Halloran, KPPB LLP, Anahein, CA.

Judges: PAUL G. BYRON, UNITED STATES DISTRICT JUDGE.

Opinion by: PAUL G. BYRON

Opinion

ORDER

This cause comes before the Court on the following:

1. Defendant CalAmp Corp.'s Motion That U.S. Patent Nos. '876, '885, '727, and '278 Are Not Entitled To Any Priority Date Earlier Than Their Actual Filing Dates (Doc. 95), filed September 29, 2015; and
2. Plaintiff Omega Patents, LLC's Opposition to CalAmp's Motion for a Priority Finding (Doc. 97), filed October 13, 2015.

Upon consideration and having reviewed the pertinent pleadings and the exhibits submitted by the parties, the

Court denies Defendant's motion to determine the priority dates for patents '876, '885, '727, and '278 as premature.

I. BACKGROUND

A. The Patents-in-Suit

Omega Patents, LLC ("Omega") contends that CalAmp Corp. ("CalAmp") infringes the claims of U.S. Patent No. 6,346,876 ("the '876 Patent"), U.S. Patent No. 6,737,989 ("the '989 Patent"), U.S. Patent No. 6,756,885 ("the '885 Patent"), U.S. Patent No. 7,671,727 ("the '727 Patent"), and U.S. Patent No. ***8,032,278*** ("the '278 Patent") (collectively, the "patents-in-suit"). (Doc. 1). The patents-in-suit relate to control systems for vehicles with a "data communications bus." (Doc. 54, pp. 1-2). Omega asserts that CalAmp's devices are used to monitor particular vehicle characteristics and conditions and report vehicle information to an end user, thus infringing on the patents-in-suit. (*Id.* at p. 2).

CalAmp advertises for sale the LMU-3000, **[*3]** LMU-3030, and LMU-3050 (the "Accused Devices") which are described as full-featured tracking systems which "access vehicle diagnostic interface data, track vehicle speed and location, plus detect hard braking, cornering, or acceleration." (Doc. 114-1, p. 2; 114-2, p. 2). CalAmp denies that the Accused Devices infringe upon any claim of the patents-in-suit and further asserts a number of defenses. (Doc. 10).

B. Procedural Setting

CalAmp moves the Court to determine the issue of whether the patents-in-suit, excluding the '989 Patent, are entitled to any priority date earlier than the date the patents-in-suit were actually filed. (Doc. 95, p. 1). CalAmp does not frame the motion as a motion *in limine*; that is, CalAmp does not move the Court to exclude or permit certain testimony or evidence at trial.[1] Nor does CalAmp seek summary judgment on any issue.[2] Omega correctly states that it is under no obligation to establish priority until CalAmp first sets forth a prima facie case of invalidity as to a specific claim or patent and carries its burden of persuasion that the relevant prior art reference is dated after the earlier priority date (the '551 Patent) but before the filing date of the patent(s) at issue. (Doc. **[*4]** 97, p. 3). *PowerOasis, Inc. v. T-Mobile USA, Inc., 522 F.3d 1299, 1305 (Fed. Cir. 2008)*.

II. STANDARD OF REVIEW

Omega has the burden of proving that the Accused Devices infringe upon the patents-in-suit by a preponderance of the evidence. *Tech. Licensing Corp. v. Videotek, Inc., 545 F.3d 1316, 1327 (Fed. Cir. 2008)*. CalAmp then has the burden of proving by clear and convincing evidence that the patents-in-suit, otherwise presumed valid, are invalid. *Id.* It is not until these burdens of persuasion have been met that Omega embraces the burden of proving that the patents-in-suit enjoy a priority date preceding the relevant prior art. *Id. at 1327-28*.

III. DISCUSSION

CalAmp identifies in a summary chart prior art references which it believes invalidates via anticipation and/or obviousness the '278, '727, '876, and '885 Patents. (Doc. 95, pp. 4-5). Thereafter, CalAmp discusses the proper standard for determining when a continuation-in-part is entitled to the filing date of an earlier patent, and CalAmp presents argument including citations to the parent patent (the '551 Patent) and to various alleged admissions made by Omega's expert witness and attorneys in prior litigation. (*See* Doc. 95).

Omega contends that the submission of a chart containing prior art references which allegedly establish invalidity is inadequate to shift the burden of persuasion back to Omega to demonstrate **[*5]** that the patents-in-suit are entitled to a priority date preceding the date the

---

[1] Because Omega contests whether the prior art references cited by CalAmp anticipate the patents-in-suit, and considering the contested material issue of fact on this point, a ruling *in limine* would be improvident.

[2] Assuming *arguendo* CalAmp had filed a motion for summary judgment on the issue of priority, Omega contests whether the prior art cited by CalAmp is sufficient to shift the burden of persuasion to Omega to demonstrate a priority date preceding the prior art, rendering summary judgment on the issue of determining priority dates improper. *See Tech. Licensing Corp. v. Videotek, Inc., 545 F.3d 1316, 1327 (Fed. Cir. 2008)*.

patent was filed.[3] (Doc. 97, pp. 4-5). That is, Omega submits that mere references to prior art is insufficient to establish that the prior art in fact invalidate the patents-in-suit, which is a precondition to shifting the burden of persuasion back to Omega. The Court agrees that CalAmp's request for a determination of the applicable priority date is premature. Assuming Omega establishes infringement of some or all of the patents-in-suit, and further assuming CalAmp proves by clear and convincing evidence that prior art invalidates some or all of the patents-in-suit, then and only then does Omega have a burden of establishing that the continuations-in-part relate back to the parent patent.

IV. CONCLUSION

Accordingly, it is **ORDERED AND ADJUDGED** that Defendant CalAmp Corp.'s Motion That U.S. Patent Nos. '876, '885, '727, and '278 Are Not Entitled To Any Priority Date Earlier Than Their Actual Filing Dates (Doc. 95) is **DENIED WITHOUT PREJUDICE** as premature.

DONE AND ORDERED in Orlando, Florida on January 13, 2016.

/s/ Paul G. Byron

PAUL G. BYRON

UNITED STATES DISTRICT JUDGE

End of Document

[3] Omega also presents argument on the methodology used to analyze continuations-in-part to determine entitlement to an earlier priority date. (*See* Doc. 97).

Neutral
As of: January 8, 2020 2:23 PM Z

Omega Patents, LLC v. CalAmp Corp.

United States Court of Appeals for the Federal Circuit

April 8, 2019, Decided

2018-1309

Reporter
920 F.3d 1337 *; 2019 U.S. App. LEXIS 10203 **; 103 Fed. R. Serv. 3d (Callaghan) 612; 2019 U.S.P.Q.2D (BNA) 123680

OMEGA PATENTS, LLC, Plaintiff-Appellee v. CALAMP CORP., Defendant-Appellant

Prior History: [1]** Appeal from the United States District Court for the Middle District of Florida in No. 6:13-cv-01950-PGB-DCI, Judge Paul G. Byron.

Omega Patents, LLC v. CalAmp Corp., 2017 U.S. Dist. LEXIS 55846 (M.D. Fla., Apr. 6, 2017)

Disposition: AFFIRMED-IN-PART, REVERSED-IN-PART, VACATED-IN-PART, AND REMANDED.

Core Terms

infringement, patent, inducement, speed, products, customers, district court, communications, new trial, argues, signals, willful, prior art, invalidity, notification, compatible, asserted claim, damages, original claim, comprising, exceeded, receiver, transmitter, written question, multi-vehicle, vacate, state of mind, remote, compensatory damages, jury's verdict

Case Summary

Overview
HOLDINGS: [1]-In this patent infringement action, appellant was entitled to JMOL of no direct infringement by appellant for all of the asserted claims of the '876 patent and '885 patent because there was insufficient evidence for the jury to have found the claim limitation "a transmitter and a receiver for receiving signals from said transmitter" in the claims of the '876 patent and the '885 patent was satisfied by appellant's selling its systems; [2]-The jury's verdict of infringement as to claim 12 of the '876 patent and all asserted claims of the '885 patent was set aside because the instant court could not discern if the jury found infringement of the claims at issue based upon a theory of infringement inconsistent with the proper construction.

Outcome
Judgment affirmed in part, reversed in part, vacated in part, and matter remanded.

LexisNexis® Headnotes

Civil Procedure > Appeals > Reviewability of Lower Court Decisions > Preservation for Review

HN1[] **Reviewability of Lower Court Decisions, Preservation for Review**

Fed. R. Civ. P. 46 requires that a party, at the time the ruling or order of the trial judge is sought, make known to the court the action that he desires the court to take and the grounds therefor, otherwise a claim of error is typically forfeited. This requirement is not a mere

technical formality and is essential to the orderly administration of civil justice. At the same time, courts have recognized that the requirement of securing a ruling is not to be applied in a ritualistic fashion. Context may well reveal an implicit ruling that will suffice to preserve the issue.

Civil Procedure > Appeals > Reviewability of Lower Court Decisions > Preservation for Review

HN2[] **Reviewability of Lower Court Decisions, Preservation for Review**

An issue not raised by an appellant in its opening brief is waived.

Civil Procedure > Judgments > Relief From Judgments > Motions for New Trials

Patent Law > Infringement Actions > Claim Interpretation

Patent Law > Jurisdiction & Review > Standards of Review > Substantial Evidence

Patent Law > Jurisdiction & Review > Standards of Review > De Novo Review

Civil Procedure > Judgments > Relief From Judgments > Vacation of Judgments

HN3[] **Relief From Judgments, Motions for New Trials**

Where the district court's patent claim construction relies only on intrinsic evidence, the construction is a legal determination reviewed de novo. When the district court errs in its jury instructions as to the construction of a term central to the infringement dispute, the error requires at least vacatur of the verdict and a remand for a new trial unless the appellate court can conclude that the error was not prejudicial, i.e., was harmless. The error in the instruction governing this central dispute at trial would be harmless only if a reasonable juror would have been required by the evidence to find infringement even without the error. The jury's determination of infringement is reviewed for substantial evidence.

Business & Corporate Compliance > ... > Infringement Actions > Infringing Acts > Indirect Infringement

HN4[] **Infringing Acts, Indirect Infringement**

Liability for inducement must be predicated on direct patent infringement.

Business & Corporate Compliance > ... > Patent Law > Infringement Actions > Infringing Acts

HN5[] **Infringement Actions, Infringing Acts**

To use a system for purposes of infringement, a party must put the invention into service, i.e., control the system as a whole and obtain benefit from it. A person must control (even if indirectly) and benefit from each claimed component.

Civil Procedure > ... > Jury Trials > Verdicts > General Verdicts

HN6[] **Verdicts, General Verdicts**

One cannot use the answers to special questions as weapons for destroying the general verdict. The general verdict must be read in light of the written questions submitted to the jury, jury instructions, and presentation at trial.

Business & Corporate Compliance > ... > Infringement Actions > Infringing Acts > Indirect Infringement

HN7[] **Infringing Acts, Indirect Infringement**

The patentee must show that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another's infringement. Liability for inducement can only attach if the defendant knew of the patent and knew as well that the induced acts constitute patent infringement.

Business & Corporate Compliance > ... > Infringement Actions > Infringing Acts > Indirect Infringement

HN8[] **Infringing Acts, Indirect Infringement**

A belief as to invalidity cannot negate the scienter required for induced infringement.

Civil Procedure > Appeals > Reviewability of Lower Court Decisions > Preservation for Review

HN9[] **Reviewability of Lower Court Decisions, Preservation for Review**

Failure to object to admission of the evidence does not act as waiver as to a challenge to the sufficiency of the evidence for the jury to award damages.

Business & Corporate Compliance > ... > Infringement Actions > Infringing Acts > Indirect Infringement

HN10[] **Infringing Acts, Indirect Infringement**

Advice of counsel is relevant to induced infringement and willfulness. "Opinion-of-counsel evidence" is relevant to the intent analysis for induced infringement because such evidence may reflect whether the accused infringer knew or should have known that its actions would cause another to directly infringe.

Counsel: BRIAN R. GILCHRIST, Allen, Dyer, Doppelt & Gilchrist, PA, Orlando, FL, argued for plaintiff-appellee. Also represented by RYAN SANTURRI.

CONSTANTINE L. TRELA, JR., Sidley Austin LLP, Chicago, IL, argued for defendant-appellant. Also represented by STEPHANIE P. KOH, BRYAN C. MULDER, THOMAS D. REIN.

Judges: Before PROST, Chief Judge, DYK and WALLACH, Circuit Judges.

Opinion by: DYK

Opinion

[*1341] DYK, *Circuit Judge*.

CalAmp Corp. appeals from a judgment that U.S. Patent Nos. 6,346,876 ('876 patent), 6,756,885 ('885 patent), 7,671,727 ('727 patent), and ***8,032,278*** ('278 patent) were infringed and are not invalid. We affirm the judgment of no invalidity, affirm-in-part, reverse-in-part, vacate-in-part, and remand the judgment as to direct infringement. We vacate and remand for a new trial on indirect infringement, compensatory damages, willful infringement, enhanced damages, and attorney's fees.

BACKGROUND

This case involves a patent infringement suit brought by Omega Patents, LLC ("Omega") against CalAmp for infringement of claims 1, 3, 4, 5, 12, 14, and 16 of the '876 patent, claims 1, 2, 3, 12, and 14 of the '885 patent, claims 1, 10, and 11 of the '727 patent, and claims 1, **[**2]** 2, 3, 4, 5, 6, 8, 11, 12, 13, 14, 16, 18, 19, and 21 of the '278 patent. Representative claims are set forth in the addendum.

The patents generally relate to multi-vehicle compatible systems that can remotely control various vehicle functions (for example, remote vehicle starting), *see, e.g.*, '876 patent, col. 3, ll. 34-36; '885 patent, col. 3, ll. 33-35, and read the status of various vehicle devices (for example, battery health), *see, e.g.*, '278 patent, col. 18, ll. 56-57. The systems can also be used to notify the driver, or the driver's employer, if certain conditions occur (for example, speeding). *See, e.g.*, '727 patent, col. 2, ll. 41-45; '278 patent, col. 9, ll. 26-33. In order to be compatible with different vehicles, the controller must determine the appropriate protocol to use in communicating with a particular vehicle data bus (an internal communications network), which is connected to various devices in the vehicle. This process involves the controller's first sending out a series of signals using different protocols to the vehicle's data bus, which relays them to the vehicle's devices. If the vehicle device recognizes one of the signals, it can then respond with its own signal, which travels to the data bus and then back to the controller. **[**3]** The controller relies on this response to determine the appropriate protocol to use for further communication with the vehicle devices. *See, e.g.*, '885 patent, col. 4, ll. 9-23; col. 9, ll. 21-55.

CalAmp operates in the telematics industry, assisting businesses and government entities monitor and collect data for their assets (for example, a fleet of vehicles). CalAmp sells its Location Messaging Unit ("LMU") products, which are multi-vehicle compatible devices that include a GPS receiver for vehicle tracking. The LMU connects to a vehicle's data communication bus via the onboard diagnostics **[*1342]** port and can retrieve information (for example, battery health or vehicle speed) from the vehicle's engine control unit ("ECU") via the vehicle's data bus. Further, the LMU can relay information to CalAmp's servers (for example, in the form of a speeding notification), which enables businesses to remotely monitor various aspects of their vehicles.

Omega filed suit against CalAmp in the Middle District of Florida on December 20, 2013, for patent infringement based on CalAmp's LMU systems and related products.[1] After a trial, a jury found all asserted claims to be not invalid and infringed, and the jury also found **[**4]** that CalAmp willfully "infringed a valid patent." J.A. 170. The jury awarded Omega approximately $2.98 million in compensatory damages. The district court trebled damages for willful infringement, awarded attorney's fees to Omega, awarded damages for sales made subsequent to the jury verdict, and added pre-judgment interest. The award totaled approximately $15 million with an on-going royalty rate of $12.76 per unit. The district court declined to award a permanent injunction, a determination that is not at issue in this appeal.

CalAmp appealed the final judgment and we have jurisdiction pursuant to *28 U.S.C. § 1295(a)(1)*.

DISCUSSION

I. Invalidity

CalAmp argues that the district court's claim construction of the terms "transmitter," "receiver," and "data communication bus / vehicle data communications bus / vehicle data bus" were erroneous. Some or all of the terminology appears in each of the various claims of the asserted patents. There is no argument that these constructions had any effect on the jury's findings of infringement. Rather, CalAmp contends that these constructions affected the jury's verdict of invalidity, though there is no claim that these constructions affected invalidity with respect to **[**5]** prior art introduced at trial. The contention is that had the district court adopted CalAmp's proposed constructions, "CalAmp's invalidity defenses would have included additional prior art references." CalAmp, Open. Br. at 17.

HN1[] "*Federal Rule [of Civil Procedure] 46* requires that a party, at the time the ruling or order of the trial judge is . . . sought, make known to the court the action that he desires the court to take . . . and the grounds therefor," otherwise a claim of error is typically forfeited. 9B Charles A. Wright & Arthur R. Miller, *Federal Practice and Procedure* § 2472 (3d ed. 2018) ("Wright & Miller"). "This requirement is not a mere technical formality and is essential to the orderly administration of civil justice." *Id.* At the same time, courts have recognized that the requirement of securing a ruling is "not to be applied in a ritualistic fashion." Wright & Miller § 2472. Context may well reveal an implicit ruling that will suffice to preserve the issue. CalAmp informed the district court during *Markman* that construction of the terms "transmitter," "receiver," and "data bus" were actually in dispute because additional prior art for CalAmp's invalidity defense may or may not be relevant **[**6]** depending on the court's construction.

Here CalAmp did nothing in the district court *Markman* proceeding to specifically identify the prior art that would be impacted by the claim construction ruling. At the **[*1343]** *Markman* hearing, there was no identification of any specific prior art references that would be excluded by the district court's claim construction ruling.[2] Instead, the court was presented with only vague claims that there was prior art before August 22, 1995, one year before the earliest priority date of the asserted patents, that would be relevant under CalAmp's proposed construction. To be sure, CalAmp was not required to identify the prior art at the *Markman* proceeding in order to preserve the argument, but here CalAmp fails to argue the prior art was identified at any

[1] The products at issue are the LMU-3000, LMU-3030, and LMU-3050. CalAmp also sells its VPOD products that allow other CalAmp devices to connect to a vehicle's data bus. VPOD and VPOD2 were also at issue before the jury. The parties do not differentiate between the various products on appeal, so neither do we.

[2] The closest CalAmp came is a statement during the *Markman* hearing relating "to a reference that was cited in Omega's brief," J.A. 18644, but there appears to be no specific prior art cited there either, Omega's Opposition to CalAmp's Motion for Claim Construction, ECF No. 40.

time thereafter.

In its opening brief on appeal, CalAmp argued its "invalidity defenses would have included additional prior art references showing such wired connections." But in its opening brief CalAmp failed to present a developed argument as to why any actions by the district court after the *Markman* hearing had the effect of excluding or limiting prior art that CalAmp offered to present or even what **[**7]** relevant prior art was excluded by the claim construction ruling. Under these circumstances, CalAmp has failed to properly preserve the issue. *See* Becton Dickinson & Co. v. C.R. Bard, Inc., 922 F.2d 792, 800 (Fed. Cir. 1990) HN2[] ("[A]n issue not raised by an appellant in its opening brief . . . is waived.").

We decline CalAmp's invitation to speculate as to how additional prior art may have been rendered irrelevant under the court's claim construction. Thus, although CalAmp's challenge to the district court's claim construction was preserved under Federal Rule of Civil Procedure 51 for purposes of challenging the jury instructions, Lighting Ballast Control LLC v. Philips Elecs. N. Am. Corp., 790 F.3d 1329, 1338 (Fed. Cir. 2015), we conclude that CalAmp failed to satisfy the requirements of Federal Rule of Civil Procedure 46 by not seeking admission into evidence of, or at least specifically identifying, the additional prior art. Such a request and specific ruling by the district court is particularly necessary where the prior art concerns a defense of obviousness because a prior art reference need not satisfy every claim element to still be relevant to obviousness.

For these reasons, we affirm the judgment as to the validity of the asserted patent claims.

II. Infringement

We next consider the district court's order denying CalAmp's motion for judgment as a matter of law ("JMOL") or a new trial based on various infringement issues. **[**8]** We review the denial of JMOL de novo, viewing the evidence in the light most favorable to the non-moving party.

HN3[] "Where the district court's claim construction relies only on intrinsic evidence, as is the case here, the construction is a legal determination reviewed de novo." In re: Copaxone Consol. Cases, 906 F.3d 1013, 1022 (Fed. Cir. 2018). When the district court errs in its jury instructions as to the construction of a term central to the infringement dispute, "[t]he error requires at least vacatur of the verdict and a remand for a new trial unless we can conclude that the error was not prejudicial, *i.e.*, was harmless." Avid Tech., Inc. v. Harmonic, Inc., 812 F.3d 1040, 1047 (Fed. Cir. 2016). "[T]he error in the instruction governing this central dispute at trial would be harmless only if a reasonable juror would have been required by the evidence to find []infringement even without **[*1344]** the error." *Id.* The jury's determination of infringement is reviewed for substantial evidence.

A. Infringement of '727 Patent Claim 11

CalAmp argues that there was insufficient evidence for the jury to find direct infringement by CalAmp of original claim 11, now amended claim 1, of the '727 patent.[3] Omega alleged this device claim was directly infringed by CalAmp's sale and programming of its products as well as indirectly infringed by CalAmp's sale, programming, **[**9]** and advertising that induced customers to infringe.

CalAmp's sole argument as to why it does not infringe is based on the claim limitation that the device "read[ ] the data related to vehicle speed from the vehicle data communications bus" and use that information to determine when "to send a remote vehicle speed exceeded notification."[4] J.A. 350, col. 7, ll. 13-18. Neither party sought construction of these terms, and the district court instructed the jury to give the terms their plain and ordinary meaning. The claim language above refers to the patented device's ability to send a speed exceedance notification based on vehicle speed information retrieved from the vehicle's data bus. This functionality can be useful for remotely monitoring driver behavior in real-time.

CalAmp contends that its products do not use vehicle speed from the data bus to send a speed exceedance notification but instead use the GPS receiver on the LMU to make such determinations, and therefore it does not infringe. But the testimony by CalAmp's witnesses could reasonably be interpreted by the jury as indicating that some small percentage, less than 5%, of its devices infringed by being programmed to use vehicle **[**10]**

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[3] After the jury rendered its verdict, original claim 1 of the '727 patent was amended during an ex parte reexamination to incorporate the limitation of dependent claim 11. Original claims 1 and 10 were thereby abandoned, and original claim 11 was cancelled.

[4] CalAmp admits that "[t]he speed notifications sent by CalAmp's products contain vehicle location information" as required by original claim 11. CalAmp, Opening Br. at 40.

speed data from the data bus to send a speed exceedance notification. *See* J.A. 14330; J.A. 14335 (CalAmp's witness testifying that "[w]e ran a count, and . . . based on the count that more than 95 percent of the speed thresholds are done by GPS, and this list here [of customer scripts using vehicle bus speed] was less than 5 percent."); 14371 (CalAmp's witness testifying "it would be a *subset*" of cases that did not infringe (emphasis added)). CalAmp further argues that if there was infringement, it was by CalAmp's customers and not by CalAmp. This argument is belied by CalAmp's response to Omega's interrogatory, where it stated it "has identified the customers for whom it [i.e., CalAmp] has loaded scripts [into devices it sold to customers] related to . . . speed alerts." J.A. 8780; *see also* J.A. 14271 ("Q. Does CalAmp develop scripts for customers? A. Yes.").

This is admittedly a close issue, but we conclude that there was sufficient evidence for a reasonable jury to find that CalAmp, at least under some circumstances, directly infringed original claim 11 of the '727 patent and therefore affirm the judgment of infringement. Our conclusion affirming the jury's judgment that CalAmp directly infringed **[**11]** claim 11 of the '727 by selling its products and programming a subset with infringing functionality moots the issue of whether the same acts constituted indirect infringement by CalAmp.

B. Infringement of '876 Patent Claims and '885 Patent Claims

CalAmp argues it was entitled to JMOL on (1) no direct infringement as to all of **[*1345]** the asserted claims of the '876 patent and '885 patent, and (2) no indirect infringement as to these same claims. If it is not entitled to JMOL for indirect infringement, CalAmp argues that a new trial is required. These systems claims were alleged to be directly infringed by CalAmp's making and selling of the patented systems and indirectly infringed by CalAmp's inducement of its customers to directly infringe the systems claims.

1. Direct Infringement by CalAmp

Omega's theory of direct infringement as to the systems claims is based on CalAmp's making and selling its systems to its customers. We assume that a systems claim is infringed by the sale of the system. The question then is whether "all of the elements of the claim . . . [are] present in the accused system[s]" allegedly sold by CalAmp. *Network, LLC v. Centraal Corp., 242 F.3d 1347, 1353 (Fed. Cir. 2001)*; *see Centillion Data Sys., LLC v. Qwest Commc'ns Int'l, 631 F.3d 1279, 1288 (Fed. Cir. 2011)* ("In order to 'make' the system under *§ 271(a)*, [defendant] would need to combine all of the claim elements . . . **[**12]** .").

We agree with CalAmp that there was insufficient evidence for the jury to have found the claim limitation "a transmitter and a receiver for receiving *signals from said transmitter*" in the claims of the '876 patent and the '885 patent was satisfied by CalAmp's selling its systems. '876 patent, col. 11, ll. 36-37 (emphasis added); '885 patent, col. 11, ll. 16-17. The evidence at trial only showed that the LMU "transmitter" transmits signals to a "receiver" on a cell tower, which can then relay that information to CalAmp's servers, and the LMU "receiver" receives signals from a "transmitter" on the cell tower. But CalAmp is not alleged to provide the cell tower. *See, e.g.*, J.A. 8589; J.A. 16019-20. CalAmp therefore does not provide all the required claim elements, and Omega does not argue that CalAmp directly infringes by "us[ing]" the system. *See* Omega Response Br. at 29. Thus, CalAmp was entitled to JMOL of no direct infringement by CalAmp for all of the asserted claims of the '876 patent and '885 patent.

2. Induced Infringement

We next consider Omega's claims that CalAmp induced direct infringement by CalAmp's customers.

a. Direct Infringement by CalAmp's Customers

HN4[] "[L]iability for inducement must be predicated on direct infringement." *Limelight Networks, Inc. v. Akamai Techs., Inc., 572 U.S. 915, 921, 134 S. Ct. 2111, 189 L. Ed. 2d 52 (2014)*; *see Enplas Display Device Corp. v. Seoul Semiconductor Co., 909 F.3d 398, 407 (Fed. Cir. 2018)*. Omega's **[**13]** theory here is that CalAmp's customers directly infringed the systems claims. CalAmp argues three separate theories as to why there were no predicate acts of direct infringement by CalAmp's customers.

First, CalAmp argues that "Omega failed to identify even one instance of direct infringement" by CalAmp's customers that could support liability for inducement. CalAmp, Open. Br. at 39. Omega's theory of infringement was that the customers directly infringed when they used CalAmp's products. *HN5*[] "[T]o use a system for purposes of infringement, a party must put the invention into service, i.e., control the system as a whole and obtain benefit from it." *Centillion, 631 F.3d at 1284*. "[A] person must control (even if indirectly) and benefit from each claimed component." *Intellectual Ventures I v. Motorola Mobility, 870 F.3d 1320, 1329 (Fed. Cir. 2017)*. Here, there was evidence from which

the jury could infer **[*1346]** that customers controlled and used the system and received the required benefits. *See, e.g.*, J.A. 8780-87 (identifying customers using CalAmp products); J.A. 15943-45 (Omega's technical expert testifying the asserted claims would be infringed by customer use of CalAmp's products). Based on the record, we conclude that this theory does not warrant setting aside the jury verdict.

Second, CalAmp argues **[**14]** that Claim 12 of the '876 patent and all asserted claims of the '885 patent require a "device code." Omega has recognized "[t]he claims . . . require 'communication' using a vehicle device code." Omega Response Br. at 18. The district court defined "device code" to mean a "signal from a vehicle device," but the court improperly declined to define the term "vehicle device." J.A. 148-50. CalAmp seeks reversal or, in the alternative, a new trial for the judgment of infringement as to these claims because the district court's failure to construe the term "vehicle device" in this context allowed Omega to argue infringement under an erroneous theory, namely that the LMU was a "vehicle device" that could send infringing "device codes."[5]

During the *Markman* proceeding, CalAmp argued that the term "vehicle device" should be construed consistent with its use in the specification as an "electrical or electronic component in a vehicle that can be controlled and/or the status thereof read." Omega argued that the term need not be construed because such a construction would not be helpful to the jury.[6] CalAmp argued the jury would "need to have a definition of what this term means" and that under "the O2 Micro case **[**15]** in [CalAmp's] responsive brief . . . you can't just leave the terms open for the jury to construe" because the term is "not very informative to the jury for them to understand what does this include and what does this exclude." *Markman* Tr. 68, 70. Omega, on the other hand, did not "see that the jury would need any sort of explanation" because the claim language was "perfectly understandable." *Markman* Tr. at 70, 71. The district court noted that "[i]t may be inherent for people with knowledge, but I don't know that people on a jury would understand that it can be controlled or the status of it read based on what claim 1 says." *Markman* Tr. at 72. Nonetheless, the district court refused to construe the term "vehicle device" "[s]ince CalAmp's proposed construction of 'vehicle device' is taken from the patents-in-suit," *Omega Patents, LLC v. CalAmp Corp., No. 6:13-cv-1950-Orl-40DAB, 2015 WL 10568791, at *6 (M.D. Fla. Feb. 20, 2015)*, and the court instructed the jury to give undefined terms their plain and ordinary meaning.

As we have held repeatedly, "[w]hen the parties raise an actual dispute regarding the proper scope of these claims, the court, not the jury, must resolve that dispute." *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co., 521 F.3d 1351, 1360 (Fed. Cir. 2008)*. The court is not absolved of this **[**16]** duty to construe the actually disputed terms just because the specification of the **[*1347]** patent defines the term. Even if the parties had agreed to the construction, the district court was still obligated to give that construction to the jury in its instructions.

Ultimately, Omega agreed that the construction CalAmp proposed was "fine" and was consistent with the '876 patent's and '885 patent's specification, which referred to "vehicle devices" as those "electrical/electronic devices that can be controlled and/or the status thereof read via the data communications bus.'"876 patent col. 6 l. 60-col. 7 l. 4; '885 patent col. 6 ll. 41-52. Based on this construction, CalAmp argues that no reasonable jury could conclude that the LMU was a "vehicle device" because the LMU is not "controlled by and/or the status thereof read via the data communications bus."[7]

Omega's primary theory at trial was that the LMU was a "vehicle device" and the signals it sent to the ECU were infringing "device codes." *See, e.g.*, J.A. 8631, 15897,

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[5] All asserted claims refer to a "vehicle device," but CalAmp does not challenge the jury's finding of infringement of claims not including the "device code" limitation under this theory. See CalAmp, Oral Arg. at 5:34-5:47; 5:49-6:01. At trial, Omega relied on the ECU as the claimed "vehicle device" in the various claims. *See, e.g.*, J.A. 16065. It is not contested on appeal that the ECU constitutes a "vehicle device."

[6] Although Omega contests CalAmp's construction on appeal, at the *Markman* hearing Omega conceded that "if the Court decides [the term 'vehicle device'] needs to be construed, you know, [CalAmp's] definition is fine." Mark-man Tr. at 71:9-11, ECF No. 236. "[I]s there anything that I can point to in CalAmp's definition that isn't right? I don't think so; otherwise, I would have articulated a different definition." *Id.* at 71:6-9.

[7] Omega argues that although CalAmp raised the issue of construing "vehicle device" during claim construction, it should have raised the issue again before the jury was instructed. We have held that in such circumstances a party is not required to continue to press forward with its claim construction when the district court has not clearly indicated that it was open to changing its mind on the is-sue. *O2 Micro, 521 F.3d at 1359*.

16013-14, 16063-64. This theory was inconsistent with the proper claim construction to which Omega agreed, however. In the absence of guidance in the form of proper claim construction, the jury lacked a yardstick by which **[**17]** to measure the arguments and evidence on this issue and assess whether Omega's infringement theory was a valid one. We cannot discern if the jury found infringement of the claims at issue based upon a theory of infringement inconsistent with the proper construction. Therefore, we must set aside the jury's verdict of infringement as to claim 12 of the '876 patent and all asserted claims of the '885 patent. *Avid, 812 F.3d at 1047*. Accordingly, a new trial on this issue is warranted.

The question remains whether we should order a new trial, or, as CalAmp contends, reverse the district court's denial of its motion for JMOL of noninfringement. We conclude that JMOL is not warranted on this issue. This is so because Omega also presented evidence that the signal sent from the ECU (an uncontested "vehicle device") to the LMU could satisfy the "device code" limitation. *See, e.g.*, J.A. 16012, 16014-15, 16021, 16065.

Third, CalAmp argues that there was no infringement of claim 12 of the '876 patent and all of the asserted '885 patent claims because its products do not satisfy the claim limitation "determining a match between a read device code and the stored device codes." *See* '876 patent, col. 12, ll. 30-31; '885 patent, col. 11, ll. 22-24. Neither party sought construction of this **[**18]** term, and the jury was instructed to give the term its plain and ordinary meaning. This claim language refers to the process by which the multi-compatible controller determines which protocol to use in communicating with any particular vehicle and its devices. The controller first sends out a series of signals using different protocols and only signals that correspond to a vehicle device will elicit a response signal, which the controller uses to determine a match (i.e., determine the appropriate protocol to use for further communication).

CalAmp argues that there was insufficient evidence to support the jury's verdict of infringement because "[n]o reading or matching is required" by CalAmp's products. CalAmp Reply Br. at 11. Instead, after the LMU sends out signals using different protocols, "merely receiving a response [back from a vehicle device] **[*1348]** is sufficient" to determine the appropriate protocol to use for further communication. *Id.* We conclude that, contrary to CalAmp's argument, the plain and ordinary meaning of the term "determining a match" does not require any particular order of steps. Omega's technical expert testified that the LMU operates by first sending out a series **[**19]** of signals based on stored device codes and then determines a match if it receives a response from a vehicle device based on one of those signals. *See, e.g.*, J.A. 16014-18. This capability is consistent with the above claim language, and thus in this respect there was no error in the jury verdict.

We affirm the jury's verdict as to predicate acts of direct infringement by CalAmp's customers for claims 1, 3, 4, 5, 14, and 16 of the '876 patent. We vacate and remand for a new trial the issue of whether there were predicate acts of direct infringement for claim 12 of the '876 patent and all of the asserted claims of the '885 patent.

b. Inducement by CalAmp

We next consider CalAmp's argument that it was entitled to JMOL of no inducement of all of the asserted claims of the '876 patent and '885 patent. CalAmp also argues, in the alternative, for a new trial on inducement for claims 1, 3, 4, 5, 14, and 16 of the '876 patent as to which we have sustained the jury's verdict of direct infringement by CalAmp's customers.

CalAmp argues that the jury's verdict cannot be sustained based on evidence of inducement by CalAmp because the jury was not provided with written questions on the issue of inducement. The verdict form given to the jury was proposed by CalAmp. **[**20]** CalAmp does not argue that the jury was inappropriately instructed on the only theory of inducement. Instead, CalAmp argues that because written questions regarding direct infringement were submitted to the jury, the absence of such questions on induced infringement precluded the jury from awarding damages on that basis. But *HN6*[↑] one cannot "use the answers to special questions as weapons for destroying the general verdict." *Julien J. Studley, Inc. v. Gulf Oil Corp., 407 F.2d 521, 526-27 (2d Cir. 1969)*. The general verdict must be read in light of the written questions submitted to the jury,[8] jury instructions, and presentation at trial. *See Popham v. City of Kennesaw, 820 F.2d 1570, 1575 (11th Cir. 1987)* ("[T]he court must consider all the

[8] The written questions on direct infringement were generally, "[h]as Omega proven by a preponderance of the evidence that any of the accused CalAmp devices infringed any of the following claims of the [asserted] patent?" J.A. 163. The written question to the jury on damages was "[w]hat amount of damages, if any, do you find is adequate to compensate Omega for CalAmp's infringement of any claim found to be valid and not licensed?" J.A. 171.

circumstances, especially the issues submitted to the jury, [and] the instructions to the jury" when interpreting the jury's responses to written questions). Here, we conclude that induced infringement was properly before the jury, and, thus, CalAmp was not entitled to JMOL of no induced infringement on this basis.[9]

The written questions to the jury asked whether "any of the accused CalAmp **[*1349]** devices infringed" the asserted claims of the '876 patent and '885 patent.[10] We conclude that these questions should be read as asking the jury whether it found that CalAmp's customers' "use" of these products **[**21]** constituted infringement. This interpretation is consistent with the jury instruction regarding inducement, which noted the jury must find that the customers infringed in order to find CalAmp liable for inducement, as well as with the general damages verdict. CalAmp was not entitled to JMOL of noninfringement.

CalAmp also argues that it is entitled to a new trial on inducement as to claims 1, 3, 4, 5, 14, and 16 of the '876 patent—claims as to which we have affirmed the judgment of direct infringement by CalAmp's customers. HN7[] "[T]he patentee must show . . . that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another's infringement." Enplas, 909 F.3d at 407. "Liability for inducement 'can only attach if the defendant knew of the patent and knew as well that the induced acts constitute patent infringement.'" *Id.* (quoting Commil USA, LLC v. Cisco Sys., Inc., 135 S. Ct. 1920, 1926, 191 L. Ed. 2d 883 (2015) (internal quotation marks omitted)); *see* Global-Tech Appliances, Inc. v. SEB S.A., 563 U.S. 754, 768, 131 S. Ct. 2060, 179 L. Ed. 2d 1167 (2011).

As for whether CalAmp "knowingly induced infringement and possessed specific intent to encourage another's infringement," Enplas, 909 F.3d at 407, the district court's erroneous exclusion of Gallin Chen's and David Bailey's testimony as to CalAmp's state of mind (described below) substantially prejudiced CalAmp's ability to present its **[**22]** defense for indirect infringement. Chen is the "senior director of business development in CalAmp's corporate development group," Trial Tr. at 38:25-39:1, ECF No. 182, and Bailey was CalAmp's outside counsel before CalAmp launched the accused products. This exclusion deprived CalAmp of the opportunity to support its defense that there was no inducement because it reasonably believed it did not infringe the patents at the time CalAmp launched the products at issue. Commil, 135 S. Ct. at 1928 ("[We] require[] proof the defendant knew the acts were infringing" for induced infringement. (citing Global-Tech Appliances, Inc. v. SEB S.A., 563 U.S. 754, 769-70, 131 S. Ct. 2060, 179 L. Ed. 2d 1167 (2011))). Of course, CalAmp's state of mind as to the validity of the asserted patents at the time of infringement is irrelevant to the issue of inducement. Commil, 135 S. Ct. at 1929 (HN8[] "[A] belief as to invalidity cannot negate the scienter required for induced infringement."). This issue is further discussed with the willful infringement issue in section IV. We therefore vacate the jury's findings as to indirect infringement and remand for a new trial as to claims 1, 3, 4, 5, 14, and 16 of the '876 patent.

C. Infringement of '278 Patent Claims

The '278 patent claims are device claims, and the sole theory of infringement as to these claims was direct infringement by CalAmp's sale of its products. **[**23]** These claims have a "device code" limitation, and, for the same reasons discussed in section II.B.1.a for claim 12 of the '876 patent and all asserted claims of the '885 patent, we conclude a new trial is required on direct infringement by CalAmp.

III. Compensatory Damages

For the reasons discussed above, the judgment of CalAmp's infringement **[*1350]** has only been affirmed as to original claim 11 of the '727 patent, and we have ordered a new trial as to the remaining claims.[11] The question is whether this is sufficient to sustain the award of compensatory damages despite that the "normal rule would require a new trial as to damages" when the jury

[9] Contrary to CalAmp's argument, Wordtech Sys. v. Integrated Networks Sols., 609 F.3d 1308 (Fed. Cir. 2010) does not control this case. In *Wordtech*, the court held that a written question submitted to the jury asking whether the "*devices* infringed by '(B) [c]ontributing to infringement in the U.S.'" was confusing because a device "cannot possess knowledge required under § 271(c)." *Id.* at 1317. Here, and unlike in *Wordtech*, there were no written questions on inducement. The finding of intent is not found in the answers to the written questions.

[10] The written questions appear to be erroneous as they ask the jury whether "CalAmp devices infringed" the claims where many of the claims are not device claims, but rather systems claims. But no objection was made at trial, and this is not presented on appeal.

[11] The damages award could also have been based on abandoned original claims 1 and 10 of the '727 patent. Those claims, of course, could not support an award of compensatory damages.

renders a single verdict on damages and liability as to a subset of asserted claims has been set aside on appeal. *Verizon Servs. Corp. v. Vonage Holdings Corp., 503 F.3d 1295, 1310 (Fed. Cir. 2007)*; *WesternGeco LLC v. ION Geophysical Corp., 913 F.3d 1067 (Fed. Cir. 2019)*.

The parties have addressed this issue in their briefs as well as in *Fed. R. App. P. 28(j)* letters submitted to the court after oral argument. Omega argues that the damages verdict of approximately $2.98 million can be sustained if liability as to any one of the thirty asserted patent claims survives. No such instruction as to damages was requested or given to the jury. However, Omega relies on the testimony of its damages expert, who testified that the inclusion of a most favored nations ("MFN") **[**24]** clause in previous Omega licenses would lead to the same royalty rate for infringement of any of the asserted patent claims. In a hypothetical negotiation Omega would not agree to a royalty rate for the asserted patent claims lower than prior licensing rates on a group of patents that included the asserted ones because any decrease would, by operation of the MFN clause, reduce the rates that earlier licensees were paying. *See, e.g.*, J.A. 16099-100. CalAmp argues this testimony was based on a mere assumption and that other licenses in evidence showed that different royalty rates applied to different patents. The parties also differ as to whether Omega's evidence of prior licenses was sufficient to establish damages.[12] We need not decide these issues. This is so because we conclude there was insufficient evidence to support the damages award of approximately $2.98 million based on the evidence presented based on infringement of claim 11 of the '727 patent, the sole claim as to which we have affirmed the verdict of CalAmp's infringement.

Omega's damages theory was premised on CalAmp's total actual sales of its accused products. *See* J.A. 8801, 16101. We have affirmed infringement of claim 11 of **[**25]** the '727 patent (a device claim) only as to a subset of CalAmp's products that were programmed to function in an infringing manner. In this respect, Omega's expert relied on testimony by CalAmp's engineer (Jeffrey Eiberger) in concluding there was infringement of claim 11. *See, e.g.*, Trial Tr. at 73, *Omega Patents, LLC v. CalAmp Corp.*, No. 6:13-cv-01950 (M.D. Fla. April 25, 2016), ECF No. 181. The engineer testified that "a script is what makes the CalAmp device do anything at all," and "[t]he CalAmp device out of the box as shipped from CalAmp doesn't do anything." Court Exhibit No. 7 at 10-11, ECF No. 147. The accused products are capable of retrieving vehicle speed from the data bus and of infringing only with additional "programming" (i.e., a script), Omega, Response Br. at 22. There is no evidence to support a finding of infringement of more than some unidentified subset of the accused **[*1351]** CalAmp devices where the necessary scripts were installed. *Nazomi Commchs., Inc. v. Nokia Corp., 739 F.3d 1339, 1346 (Fed. Cir. 2014)*. Such evidence cannot support an award of damages with respect to all of CalAmp's devices. We vacate the damages award and remand for a new trial.

At the new trial, Omega will have the opportunity to establish the damages attributable to the number **[**26]** of accused CalAmp products that infringe based on the installation of customer scripts, and any activity found to infringe or induce infringement of the other claims.

IV. Willful Infringement and Enhanced Damages

For willful infringement, the jury was asked whether it had found CalAmp willfully "infringed a valid patent," without specifying which patent or patents or which claim or claims were willfully infringed. Based on the record, we cannot determine which patent(s) or claim(s) the jury found to be willfully infringed, and such a finding may be based on an infringement finding that has been set aside.[13] Under these circumstances, neither party contests that the jury's verdict as to willfulness must be vacated and a new trial conducted.[14] *See Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc., 711 F.3d 1348, 1381 (Fed. Cir. 2013)*. Because the jury's willfulness finding must be vacated, so too must

[12] Omega argues that CalAmp waived its argument as to the sufficiency of the evidence for the compensatory damages award when it did not object to entry of the licenses that the damages expert relied on. We disagree. *NN*[1] Failure to object to admission of the evidence does not act as waiver as to a challenge to the sufficiency of the evidence for the jury to award damages. *See Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1325, 1335 (Fed. Cir. 2009)*.

[13] The verdict may also have been based on original claims 1 and 10 of the '727 patent that were abandoned during the ex parte reexamination proceeding. A verdict of willful infringement as to these claims would not have been sustainable.

[14] "Q. On the willfulness [issue], you agree that if we hold that there has to be a new trial on any of these claims or the JMOL should have been granted on any of these claims, the willfulness conclusion has to be set aside, right? A. I believe . . . that is accurate." Omega, Oral Arg. at 28:34-28:56; *see* CalAmp Reply Br. at 32.

the resulting enhanced damages and attorney's fees award by the district court, both of which were explicitly based on the willful infringement finding.[15] *See* Exmark Mfg. Co. v. Briggs & Stratton Power Prods. Grp., LLC, 879 F.3d 1332, 1352-53 (Fed. Cir. 2018).

Because willful infringement will be retried, we find it appropriate to address evidentiary issues as to intent that will likely arise again on remand. Moreover, the claimed error also directly relates to CalAmp's intent **[**27]** as to infringement (but not invalidity) and forms the basis for our earlier ruling concerning the need for a new trial on inducement.

CalAmp argues that the district court erred by excluding Chen's testimony as to CalAmp's state of mind regarding infringement and validity of the asserted patent claims. CalAmp also argues that testimony by its outside counsel at the time of the alleged infringement, David Bailey, was inappropriately limited to testifying only as to his conclusions, without being able to provide a reasonable explanation of his analysis. CalAmp argues that this error substantially prejudiced its defense, particularly where Omega relied on the lack of such testimony in its closing arguments in support of willfulness. *See, e.g.*, J.A. 16720 **[*1352]** ("We heard all about [Chen's] big stack and his little stack [of LMU-related patents]. Didn't hear any analysis of those patents.").

First, we conclude that the district court's exclusion of Chen's testimony relating to CalAmp's state of mind prior to the alleged acts of infringement was an abuse of discretion. Chen's testimony on this issue was clearly relevant, as the evidence shows he was the "main person" tasked with investigating the **[**28]** patent landscape "before CalAmp decided to release" the accused products and he was central to CalAmp's decision to launch the accused products. J.A. 16240, 16238; *see* J.A. 16238-39, 16243-45, 16297-300. He testified that during his investigation he would discuss his findings with his superior, Garo Sarkissian, who was part of CalAmp's executive team. J.A. 16295-97. "CalAmp rel[ied] on the searching that [Chen] did to . . . see the lay of the land." J.A. 16311. Despite being able to testify as to his investigation into whether the asserted patent claims would be infringed and were valid, he was prevented from stating his conclusions. *See, e.g.*, J.A. 16213. In particular, the district court excluded this proffered testimony as not appropriately disclosed expert testimony under Federal Rule of Civil Procedure 26. But Chen was not provided to offer expert testimony on non-infringement or invalidity.[16] Rather, he was provided to offer testimony as to the bases for CalAmp's state of mind, one of which was his investigation of the patent landscape. Therefore, he should have been allowed to present a limited summary of his conclusion from this investigation and the basis for it.

Based on a hearsay objection, Chen **[**29]** was also prevented from answering the question, "[b]ased on the oral opinion [from counsel], did you have an understanding whether counsel believed the [LMU] infringed the '885 patent?" J.A. 16299-300. The answer to that question would not implicate hearsay, as it was not being offered for the truth of the matter asserted (i.e., whether the patent was actually infringed). Fed. R. Evid. 801(c)(2). Instead, it was offered for the purpose of establishing the effect on the listener (i.e., that CalAmp reasonably believed it did not infringe the patent based, in part, on counsel's opinion). *See* Wright & Miller § 6719; 5 Jack B. Weinstein & Margaret A. Berger, Weinstein's Federal Evidence, § 801.11 (2019).

This erroneous limitation in Chen's testimony substantially prejudiced CalAmp by excluding testimony that was critical to the question of whether CalAmp had the required mental state.

Second, the district court erred by preventing CalAmp's outside counsel, Bailey, from testifying as to the analysis he allegedly provided to CalAmp (Chen and his superior, Sarkissian) prior to the launch of the products at issue in the litigation. *See* J.A. 16297-98 ("[W]e would conference call in on the speaker phone Mr. Sarkissian,

---

[15] We note that to the extent the district court's enhanced damages decision relied on the conclusion that it was highly unusual for an attorney to give an oral opinion without also providing a written opinion and that there would not be increased cost to receiving such a written opinion, there is no evidence in the record to support that conclusion. We are also skeptical that such a conclusion is consistent with industry practice. Whatever skepticism the district court had of Chen's and Bailey's testimony is irrelevant to the issues of inducement and willful infringement as it was the jury's prerogative as fact-finder whom to credit.

[16] Where district courts have excluded lay testimony on the issues of invalidity and infringement, we have typically sustained such exclusion when the case involves complex technology. *Compare* Air Turbine Tech., Inc. v. Atlas Copco AB, 410 F.3d 701, 713-14 (Fed. Cir. 2005), *with* Wyers v. Master Lock Co., 616 F.3d 1231, 1242 (Fed. Cir. 2010).

and so he would also hear the opinion of our counsel."). **[**30]** We have repeatedly recognized that HN10[] advice of counsel is relevant to induced infringement and willfulness. For example, we held in Broadcom Corp. v. Qualcomm Inc., 543 F.3d 683, 699 (Fed. Cir. 2008), that "opinion-of-counsel evidence" is relevant to the intent analysis for induced infringement because such evidence "may reflect whether the accused infringer 'knew or should have known' that its actions would cause **[*1353]** another to directly infringe." We further held in Bettcher Industries, Inc. v. Bunzl USA, Inc., 661 F.3d 629, 649 (Fed. Cir. 2011), that "[t]he fact and general content of" a noninfringement opinion from defendant's patent lawyer "was relevant and admissible . . . with respect to [defendant's] state of mind and its bearing on [induced] infringement."[17]

As to willfulness, an accused infringer's reliance on an opinion of counsel regarding noninfringement or invalidity of the asserted patent remains relevant to the infringer's state of mind post-*Halo*. We recently held in Exmark Manufacturing Co. v. Briggs & Stratton Power Products Group, LLC, 879 F.3d 1332, 1353 (Fed. Cir. 2018), that "[t]o the extent that [the district court] excluded evidence relevant to [defendant's] state of mind at the time of the accused infringement, [that decision] d[id] not comport with the standard articulated in *Halo*." *See also* Polara Eng'g Inc. v. Campbell Co., 894 F.3d 1339, 1353-54 (Fed. Cir. 2018) (recognizing the relevance of "reliance on competent opinion of counsel" to willfulness).

The district court only allowed **[**31]** Bailey to testify as to his bare conclusions regarding infringement and validity, "but not the substance of [his] opinion." J.A. 16338. Bailey should also have been allowed to present a reasonable explanation as to how he arrived at his conclusions. We agree that if not appropriately cabined Bailey's testimony (and Chen's testimony as well) could confuse the jury into concluding that the testimony was relevant to the issues of infringement and invalidity, rather than CalAmp's mental state as to these issues. *See* Fed. R. Evid. 403. We note that Bailey's written opinions to CalAmp after the current suit was filed were appropriately excluded since they were not contemporaneous with the infringing activity. We also note that Bailey was not relying on the written opinions to refresh his recollection of his prior oral statements.

On remand, the district court should allow Chen to testify as to the conclusions he reached from his own independent investigation and a summary of the basis for that conclusion and to present an appropriately limited summary as to the opinion of counsel he received. *See* Fed. R. Evid. 403. Of course, Chen's investigation is only pertinent in so far as it was communicated to the defendant's decisionmakers **[**32]** prior to the alleged infringement. Similarly, Bailey should be allowed to provide a limited summary of the basis for his conclusion. The bases for Bailey's oral conclusions or the methodology used to arrive at them is, of course, only relevant to the issue of defendant's state of mind for inducement and willful infringement to the extent that information was actually communicated to the defendant's decisionmakers prior to infringement.

CONCLUSION

We affirm the jury's verdict that the asserted patent claims were not invalid, except for original claims 1 and 10 of the '727 patent, which were abandoned during the ex parte reexamination. We set aside the judgment of infringement as to original claims 1 and 10 of the '727 patent. We affirm the judgment that CalAmp directly infringed original claim 11 (amended claim 1) of the '727 patent. We reverse the judgment as to CalAmp's direct infringement of all asserted claims of the '876 patent and '885 patent. We affirm the finding that CalAmp's customers directly infringed **[*1354]** claims 1, 3, 4, 5, 14, and 16 of the '876 patent, but we vacate and remand for determination as to whether CalAmp had the requisite mental state for induced infringement. Also, we vacate the judgment of indirect infringement of claim 12 of **[**33]** the '876 patent and the asserted claims of the '885 patent and remand for a new trial to determine whether (1) there were predicate acts of direct infringement for these claims and (2) whether CalAmp had the requisite mental state for induced infringement. We also vacate the judgment of infringement as to all of the asserted '278 patent claims and remand for a new trial to determine whether CalAmp directly infringed these claims.

We vacate and remand for a new trial the compensatory damages award, the jury's willfulness finding, and the

[17] *See also* DSU Med. Corp. v. JMS Co., 471 F.3d 1293, 1307 (Fed. Cir. 2006) (en banc) (holding that the record supported jury verdict of no induced infringement where it showed defendant contacted an Australian attorney and "obtained letters from U.S. patent counsel advising that [its product] did not infringe").

district court's enhanced damages and attorney's fees award.

On remand, the parties are urged to achieve clarity by clearly presenting evidence, objections, arguments, and jury instructions as to direct and indirect infringement, compensatory damages, and willful infringement, assuming the parties choose to continue pursuing such issues, so that this court may effectively fulfill its appellate function in in any further review arising from the retrial.

AFFIRMED-IN-PART, REVERSED-IN-PART, VACATED-IN-PART, AND REMANDED

COSTS

No costs.

ADDENDUM

Claims 1 and 12 of the '876 patent recite:

> Claim 1. A control system for a vehicle comprising a data communications bus and at least one vehicle device connected **[**34]** to the data communications bus, the control system comprising:
>
> a transmitter and a receiver for receiving signals from said transmitter; and
>
> a multi-vehicle compatible controller at the vehicle and cooperating with said transmitter and receiver, said multi-vehicle compatible controller generating at least one set of command signals on the data communications bus for the at least one vehicle device, the at least one set of command signals comprising at least one working command signal and at least one non-working command signal for a given vehicle to thereby provide command compatibility with a plurality of different vehicles.
>
> Claim 12. A control system according to claim 1 wherein said multi-vehicle compatible controller is further for storing a set of device codes for a given vehicle device for a plurality of different vehicles, for reading a device code from the data communications bus, and for determining a match between a read device code and the stored device codes to thereby provide reading compatibility with a plurality of different vehicles.

'876 patent, col. 11, ll. 32-48 (emphases added); col. 12, ll. 26-33 (emphases added).

Claim 1 of the '885 patent recites:

> A control system for a vehicle comprising **[**35]** a data communications bus and at least one vehicle device connected thereto, the control system comprising:
>
> a transmitter and a receiver for receiving signals from said transmitter; and
>
> a multi-vehicle compatible controller cooperating with said transmitter and said receiver and for storing a set of device codes for a given vehicle device for a plurality of different vehicles, for reading a device code from the data communications bus, and for determining a match between a read device code and the stored device codes to thereby provide compatibility with a plurality of different vehicles.

'885 patent, col. 11, ll. 13-25 (emphases added).

[*1355] Claim 1 of the '278 patent recites:

> A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible tracking unit comprising:
> a vehicle position determining device;
> a wireless communications device;
> a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information;
>
> said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one **[**36]** vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and
> a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller.

'278 patent, col. 25, l. 64-col. 26 l. 15 (emphases added).

At the time the jury rendered its verdict, claims 1 and 11 of the '727 patent recited:

> Claim 1. A speed exceeded notification device for a vehicle of a type comprising a vehicle data communications bus extending throughout the

> vehicle, and at least one vehicle device generating data related to vehicle speed on the vehicle data communications bus, the speed exceeded notification device comprising:
> a wireless communications device; and
> a controller to be coupled to the vehicle data communications bus for
>
> reading the data related to vehicle speed from the vehicle data communications bus, and
>
> determining when a vehicle speed exceeds a speed threshold for a first time period and based thereon cooperating with said wireless communications device to send a remote vehicle speed exceeded notification..
>
> Claim 11. The speed exceeded notification device according **[**37]** to claim 1 wherein the remote vehicle speed exceeded notification further comprises a vehicle position.

J.A. 350 (col. 7, ll. 4-17; 48-50) (emphases added).

Original claim 1 of the '727 patent was amended during an ex parte reexamination to incorporate the limitation of dependent claim 11 (italicized below), which was canceled, and now recites:

> Amended Claim 1. A speed exceeded notification device for a vehicle of a type comprising a vehicle data communications bus extending throughout the vehicle, and at least one vehicle device generating data related to vehicle speed on the vehicle data communications bus, the speed exceeded notification device comprising:
> a wireless communications device; and
> a controller to be coupled to the vehicle data communications bus for
>
> reading the data related to vehicle speed from the vehicle data communications bus, and
>
> determining when a vehicle speed exceeds a speed threshold for a first time period and based thereon cooperating with said wireless communications device to send a remote vehicle speed exceeded notification, *and wherein the remote vehicle speed exceeded notification comprises a vehicle position.*

[*1356] J.A. 353 (Col. 1, ll. 21-38) (emphases added).

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Patent Defendant: Willful Infringement Jury Verdict Was Erroneous

Mealey's(R) Litigation Report: Intellectual Property

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Body

In a July 2 reply brief, a telematics company accused of infringing four patents tells the Federal Circuit U.S. Court of Appeals that "at a minimum," it is entitled to a new trial with regard to willfulness, enhanced damages and attorney fees (Omega Patents LLC v. CalAmp Corp., No. 18-1309, Fed. Cir.).

(Reply brief available 78-180716-007B)

According to CalAmp Corp., U.S. Judge Paul G. Byron of the Middle District of Florida committed legal error when excluding the opinions of CalAmp's counsel because the judge allowed patent owner Omega Patents LLC to argue that CalAmp "recognized the need for opinions, likely received unfavorable ones, and forged ahead" with plans to launch an infringing product line regardless.

"The error was compounded by clearly erroneous factual findings," CalAmp maintains.

Control Systems

At issue in the dispute are Omega's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and ***8,032,278***. The '876 and '885 patents hare a common specification and claim "control systems" for communicating with and causing operations by, or responses from, vehicle devices, including remote starters, door locks and security systems. The '278 patent claims a "controller" for communicating with a vehicle device, while the '727 patent claims "speed exceeded notification devices."

"All of the asserted claims in all four patents call for the device of the invention to be connected to a vehicle data communications bus and to communicate with or monitor a vehicle device that is also connected to that bus," CalAmp asserts in an April 25 appellant brief.

(Appellant brief available 78-180716-005B)

CalAmp's accused "LMU" products connect to the on-board diagnostic (OBD) port of a vehicle.

"They include a GPS receiver to establish the vehicle's location, and they connect to the vehicle's data bus using the OBD port to obtain data regarding factors such as fuel use, speed, mileage, and running hours from the vehicle's engine control unit (ECU)," CalAmp notes.

The LMU products were specifically designed to be unable to control any vehicle devices, in order to avoid infringing the patents in suit, according to CalAmp. Additionally, the appellant asserts that its speed-exceeded notification function was designed to use speed data from a GPS receiver, instead of speed data from the vehicle bus, as recited by the '727 patent. In 2010 CalAmp notified Omega of its intent to launch the LMU products with OBD connectivity and asserted that it did not believe the LMU products would infringe.

Damages Awarded

Dissatisfied, Omega filed the instant lawsuit in 2013. CalAmp denied infringement, asserted that the patents in suit are invalid and commissioned its outside counsel, David Bailey, to "memorialize his prior oral opinions" regarding the same, which were provided to CalAmp during development of the LMU products. Bailey delivered his written opinions in June 2014, stating that the '876 patent is not infringed by the LMU products and that the '885, '278, and '727 patents are invalid. "Bailey determined that CalAmp's products would not infringe the '876 patent because, among other things, they did not include the 'multi-vehicle compatible controller' required by its claims," CalAmp maintains.

Jurors disagreed, finding that the accused CalAmp products willfully infringe each asserted claim of all four patents, and awarded $2,975,200 in damages. Post-trial, Judge Byron enhanced the award to $15 million, along with an ongoing royalty for Omega.

Series Of Errors

Urging review, CalAmp maintains on appeal that the judge committed a "series of errors," including adopting a claim construction that imported limitations from the patents' specifications into the claims, and declining to resolve a dispute over the proper construction of "vehicle device" despite voicing agreement that CalAmp's proposed construction of the term was correct. Judge Byron additionally denied CalAmp judgment as a matter of law "despite the absence of substantial evidence to support a finding of infringement," according to the appellant. Moreover, CalAmp continues, "the court allowed the jury to award damages based on licenses that bear no relationship to the hypothetical license the parties would have negotiated here."

With regard to willfulness, enhanced damages and attorney fees, CalAmp asserts that the findings and award "were fatally infected by the improper exclusion of highly relevant evidence regarding CalAmp's state of mind - namely, its good faith belief that its products would not infringe any valid Omega patent."

"Had CalAmp been permitted to present its evidence, the jury would have learned that CalAmp had reviewed hundreds of patents before it launched the accused products, including the Omega patents at issue here. CalAmp designed its products specifically to avoid those patents and informed Omega of its intentions and its reasons for believing it did not infringe. And when Omega nevertheless alleged infringement, CalAmp commissioned formal, written opinions to memorialize the oral opinions on which it had relied," the appellant argues.

"With this evidence largely excluded, the jury was left with a highly misleading picture that inexorably led to the willfulness finding. The awards of enhanced damages and attorneys' fees were the product of serious errors, and therefore cannot stand, even if the remainder of the judgment could," CalAmp adds.

Case 'Tried Fairly'

On May 30, Omega filed an appellee brief in which it argues that the case "was tried fairly and according to the law" and that "wishing for a different result is not a basis for a finding of error" by the lower court.

(Appellee brief available 78-180716-006B)

Moreover, Omega maintains not only that Judge Byron's claim constructions were proper but also that CalAmp failed to demonstrate that the outcome "would have been any different with alternative definitions." Omega "offered detailed testimony from its technical expert, who identified where each element of each asserted claim was found in the CalAmp LMU system," covering "both direct and indirect infringement," according to the appellee. "While CalAmp offered competing theories and opinions, it is not the role of this Court to re-weigh the evidence and determine, from the cold record, which opinions were more believable and worthy of acceptance," Omega argues.

With regard to willfulness, Omega notes that "the jury and the district court were the parties tasked with weighing evidence and determining the credibility of the testimony" and asserts that the findings are "clearly supported" by the evidence.

"At best, CalAmp offers alternative interpretations of the evidence, not a lack of evidence or error by the fact-finders. CalAmp's strategic decision not to offer testimony of the person who decided, on behalf of CalAmp, to move forward with the infringing activity proved to be significant. The testimony of a lawyer who admitted he did not memorialize his opinions was due to be discounted, if not entirely rejected. CalAmp's strategic maneuver of attempting to offer expert invalidity theories previously excluded by the court through a lay witness was properly rejected. CalAmp's tactical decisions did not produce the desired outcome. This is no error by the district court. CalAmp is not entitled to try again with hopes for a different outcome," Omega adds.

Counsel

CalAmp is represented by Constantine L. Trela, Jr., Thomas D. Rein, Stephanie P. Koh and Bryan C. Mulder of Sidley Austin in Chicago.

Brian R. Gilchrist and Ryan T. Santurri of Allen, Dyer, Doppelt + Gilchrist in Orlando, Fla., represent Omega.

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Omega Patents, LLC v. Calamp Corp.

United States District Court for the Middle District of Florida, Orlando Division

February 20, 2015, Decided; February 20, 2015, Filed

Case No: 6:13-cv-1950-Orl-40DAB

Reporter
2015 U.S. Dist. LEXIS 194173 *; 2015 WL 10568791

OMEGA PATENTS, LLC, a Georgia limited liability company, Plaintiff, v. CALAMP CORP., a Delaware corporation, Defendant.

Subsequent History: Motion granted by, in part, Motion denied by, in part, As moot *Omega Patents, LLC v. CalAmp Corp., 2016 U.S. Dist. LEXIS 174577 (M.D. Fla., Jan. 5, 2016)*

Core Terms

Patent, signal, communications, downloading, transmitter, compatible, codes, receiver, terms, multi-vehicle, specification, interface, remote, construe, message, invention, speed, skilled, enabling, notification, exceeded, wired, comprising, functions, parties, stored, proposed construction, radio frequency, embodiments, control system

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Judges: PAUL G. BYRON, UNITED STATES DISTRICT JUDGE.

Opinion by: PAUL G. BYRON

Opinion

ORDER

This cause comes before the Court on the following:

1. Plaintiff's Motion for Claim Construction (Doc. 38), filed September 5, 2014;
2. Defendant Calamp Corp.'s Opening Claim Construction Brief (Doc. 39), filed September 5, 2014;
3. Plaintiff's Opposition to Calamp's Motion for Claim Construction (Doc. 40), filed October 3, 2014; and
4. Calamp Corp.'s Responsive Claim Construction Brief (Doc. 41), filed October 3, 2014.

The Court heard oral argument from the parties on November 24, 2014 (Doc. 46). At the conclusion of the hearing, the Court requested the parties to submit briefs addressing the issue of when and under what circumstances a claim should **[*3]** be construed by the Court. The parties filed briefs on this issue on December 12, 2014. (Docs. 48, 49). In total, the parties request the Court to construe eleven terms across five patents.[1]

I. BACKGROUND

Plaintiff, Omega Patents, LLC ("Omega"), initiated this patent infringement lawsuit on December 20, 2013 (Doc. 1). Omega then filed a Motion for Claim Construction requesting the Court to construe two claims. (Doc. 38). Defendant Calamp Corp. ("Calamp") filed a claim construction brief requesting the Court to construe nine claims. (Doc. 39). The parties have reached agreement on the construction of the following claim terms: "Controller" and "Multi-vehicle compatible controller." (Doc. 38, p. 1). All of the patents-in-suit were invented by Mr. Kenneth E. Flick, and the technologies at issue involve control systems for vehicles with a data communications bus, which is a computer network within a vehicle, and various codes, signals, and data which monitor particular vehicle characteristics and conditions and which perform or command certain functions, including the operation of certain vehicle devices.

II. LEGAL STANDARDS FOR CLAIM CONSTRUCTION

The Court construes a patent claim as a matter **[*4]** of law. *Markman v. Westview Instruments, Inc., 517 U.S. 370, 372, 116 S. Ct. 1384, 134 L. Ed. 2d 577 (1996)*. To construe a claim, the Court begins with the words of the claim itself. *Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)*. Generally, the Court accords the words of a claim "their ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." *Phillips v. AWH Corp., 415 F.3d 1303, 1312-13 (Fed. Cir. 2005)* (internal quotation marks omitted). Persons of ordinary skill in the art do not read the claim term in isolation, but in the context of the entire patent. *Id. at 1313*. If the ordinary meaning of claim language is "readily apparent even to lay judges," then claim construction requires "little more than the application of the widely accepted meaning of commonly understood words." *Id. at 1314*. But because the meaning of a claim term as understood by a person skilled in the art is often not immediately apparent, the Court looks to both intrinsic evidence (the words of the claims themselves, the specification, and the prosecution history) and extrinsic evidence (sources such as dictionaries and expert testimony). *Id.*; *Finisar Corp. v. DirecTV Grp., Inc., 523 F.3d 1323, 1328 (Fed. Cir. 2008)*.

The patent's specification is "the single best guide to the meaning of a disputed term," as it may reveal that the patentee intended a special definition to apply to a claim term that differs **[*5]** from its ordinary meaning or that the patentee intentionally disclaimed or disavowed the claim's scope. *Phillips, 415 F.3d at 1315-16* (internal quotation marks omitted). The Court also considers the prosecution history, which is created by the patentee in an attempt to explain and obtain the patent. *Id. at 1317*. The prosecution history consists of the complete record of proceedings before the Patent and Trademark Office ("PTO") and the prior art cited during the examination of the patent. *Id.* Unlike the specification, which is a final product, the prosecution history is less useful in claim construction because it represents the ongoing negotiations between the PTO and applicant. *Id.*

The Court also looks at the prosecution history "to determine whether the applicant clearly and unambiguously 'disclaimed or disavowed'" an interpretation of claim scope in order to obtain the patent grant. *Middleton, Inc. v. Minn. Mining and Mfg. Co., 311 F.3d 1384, 1388 (Fed. Cir. 2002)* (quoting *Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448,*

[1] The patents-in-suit include U.S. Patent Nos. 6,346,876 (the "'876 Patent"); 6,737,989 (the "'989 Patent"); 6,756,885 (the "'885 Patent"); 7,671,727 (the "'727 Patent"); and ***8,032,278*** (the "'278 Patent"). (Doc. 38, p. 2).

452 (Fed. Cir. 1985)). A patentee disclaims an interpretation by "clearly characterizing the invention in a way to try to overcome rejections based on prior art," as opposed to simply describing features of the prior art without distinguishing the claimed invention based on those features. Computer Docking Station Corp. v. Dell, Inc., 519 F.3d 1366, 1374-75 (Fed. Cir. 2008). Thus, the Court protects the public's reliance on the definitive **[*6]** statements made during the prosecution by precluding the patentee from "recapturing" through claim construction an interpretation disclaimed during prosecution. Id. at 1374 (quoting Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1323 (Fed. Cir. 2003)). However,

> [I]f the specification expressly defines a claim term and remarks made to distinguish claims from the prior art are broader than necessary to distinguish the prior art, the full breadth of the remark is not a clear and unambiguous disavowal of claim scope as required to depart from the meaning of the term provided in the written description.

Id. at 1375 (internal quotation marks omitted) (quoting 3M Innovative Props. Co. v. Avery Dennison Corp., 350 F.3d 1365, 1373 (Fed. Cir. 2003)).

Extrinsic evidence, such as expert testimony and dictionary definitions, is helpful but "less significant than the intrinsic record." Phillips, 415 F.3d at 1317 (internal quotation marks omitted). However, expert testimony about claim terms that is conclusory, unsupported or "clearly at odds" with the intrinsic evidence is not useful. Id. at 1318 (internal quotation marks omitted). Moreover, while dictionaries and treatises are relevant, the Court must ensure that the dictionary definition does not contradict a definition "found in or ascertained by a reading of the patent documents." Id. at 1322-23 (quoting Vitronics, 90 F.3d at 1584 n.6). "In sum, extrinsic evidence may be useful to the court, but **[*7]** it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence." Phillips, 415 F.3d at 1319. In the instant case, the parties agree that the Court need not consider extrinsic evidence to construe the claim terms in dispute, and neither party has presented extrinsic for the Court's consideration.

Several other principles guide the Court's construction of claim terms. First, the Court presumes that the same terms appearing in different portions of the claims have the same meaning, unless the specification and prosecution history clearly demonstrate otherwise. Fin Control Sys. Pty, Ltd. v. OAM, Inc., 265 F.3d 1311, 1318 (Fed. Cir. 2001). While the "[i]nterpretation of a disputed claim term requires reference to the other claims," Georgia-Pacific Corp. v. U.S. Gypsum Co., 195 F.3d 1322, 1331 (Fed. Cir. 1999), "the presence of a dependent claim that adds a particular limitation raises a presumption that the limitation in question is not found in the independent claim." Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 910 (Fed. Cir. 2004). Courts are further cautioned that "a construction that renders the claimed invention inoperable should be viewed with extreme skepticism." Talbert Fuel Sys. Patents Co. v. Unocal Corp., 275 F.3d 1371, 1376 (Fed. Cir. 2002) (citation omitted), *vacated and remanded on other grounds*, *537 U.S. 802, 123 S. Ct. 70, 154 L. Ed. 2d 3 (2002)*.

Finally, district courts have an obligation to construe terms when it is necessary to resolve a genuine and material legal dispute **[*8]** between the parties. *See* O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co., Ltd., 521 F.3d 1351, 1361-62 (Fed. Cir. 2008); E-Pass Techs., Inc. v. 3Com Corp., 473 F.3d 1213, 1219 (Fed. Cir. 2007) ("[A]ny articulated definition of a claim term ultimately must relate to the infringement questions that it is intended to answer."). The party requesting the Court to construe a claim term must demonstrate that the construction is both necessary and correct; that is, construction of the claim term must be fundamental to issues of infringement or invalidity, and the Court may not issue an advisory opinion. IP Cleaning S.p.A. v. Annovi Reverberi S.p.A., No. 08-cv-147-bbc, 2008 U.S. Dist. LEXIS 102312, at *3 (W.D. Wisc. Dec. 17, 2008).

III. AGREED TERMS

As previously noted, the parties have reached an agreement as to the proper construction of the following two terms:

Go to table1

IV. DISPUTED TERMS

Omega filed the initial Motion for Claim Construction, requesting the Court to construe two terms: "transmitter" and "receiver." (Doc. 38). Accordingly, the Court will construe these two claims prior to addressing Calamp's request for construction of nine additional terms. **[*9]**

A. The '876 and '885 Patent Terms: "Transmitter" and "Receiver"

Go to table2

The terms "transmitter" and "receiver" are used in asserted claims of the '876 Patent (Doc. 39-1) and the '885 Patent (Doc. 39-2). Turning first to the construction of "transmitter," Calamp contends that the patents describe the transmitter as sending signals without restricting the specific type of signals being sent—that is, without limiting the construction to require "radio frequency." (Doc. 39, p. 21). Calamp submits that the '876 and '885 Patents do not specifically define transmitter to limit the meaning of that term as commonly understood by individuals skilled in the art.[2] (*Id.* at p. 22). Similarly, Calamp contends that "receiver" is described in the patents as receiving signals and is not restricted to radio frequency signals. (*Id.* at p. 23).[3]

Omega submits that Calamp's construction and citation to the specifications of the '876 and '885 patents fail to place the terms "transmitter" and "receiver" into the context of the invention which Omega argues envisions remote control systems for a vehicle. (Doc. 38, p. 6). Omega proposes that **[*10]** the Court need only consider the claims, read in light of the specification, to comprehend that the invention focuses upon a remote control system for cars. (*Id.*). Omega directs the Court to the '551 Patent, noting that both the '876 and '885 Patents claim priority back to the '551 Patent. The Court agrees with Omega that both the '876 and '885 Patents are continuations-in-part and claim priority back to the '551 Patent. (*Id.* at p. 7). The background to the '551 Patent provides:

> The concepts and features of the invention may also be desirably incorporated in a remote control system for a vehicle, such as a vehicle security system, a remote engine starter system, or a remote keyless entry system, for example. The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter.[4] (Doc. 38-3, 4:12-18).

As noted by counsel for Omega at the *Markman* hearing, Figure 1 of the '551 Patent depicts a remote transmitter/receiver, denoted as TX/RX (13), with an antenna (13a). (*Id.* at Fig. 1; 5:12-15). Similarly, Figure 2 of the '551 Patent also depicts a remote transmitter (57, 57a). (*Id.*, Fig. 2; 5:51-6:21). Figures 7, 8, and 9 of the '551 Patent also illustrate a radio frequency ("RF") transmitter and receiver and an antenna for communicating **[*11]** with various devices.[5] (*Id.*, Figs. 7-9, 8:1-35).

Omega next directs the Court to the abstract of the '876 Patent which describes "[a] control system [that] includes a transmitter and a receiver for receiving signals from the remote transmitter, and a multivehicle compatible controller cooperating with the transmitter and receiver." (Doc. 39-1). Similarly, the abstract of the '885 Patent describes the invention and states "[t]he approach is useful for a number of vehicle remote control functions including vehicle security, remote keyless entry and remote starting." (Doc. 39-2). While claim 1 of the '876 and '885 Patents do not describe the transmitter or receiver as remote, wireless, or receiving a RF signal, Omega correctly notes that no dependent claim in either patent limits the transmitter or receiver to a hardwired device. To the contrary, several dependent claims in the '876 and '885 Patents describe and discuss remote transmitters and receivers, including dependent claims 13-18 and 30-32 of the '876 Patent (Doc. 39-1) and claims 8, 12-15, 22-23, and 26-31 of the '885 Patent. (Doc. 39-2).

Based on the foregoing, the Court concludes that the dependent claims in the '876 and '885 Patents do not contain limitations or language requiring the Court to limit the scope of the **[*12]** independent claims. Accordingly, the independent claims may properly be construed in the context of the patent specifications and in view of the '551 Patent to provide for remote control functions. Therefore, the Court construes the terms "transmitter" as **radio frequency transmitter** and the term "receiver" as **radio frequency receiver**, adopting the construction proposed by Omega.

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[2] Calamp directs the Court to the '876 Patent at 3:5-12; 3:63-4:9; 4:14-28; 4:33-36; 5:35-54; 5:55-6:2; 6:3-16; 6:17-27, and cites the '885 Patent at 3:5-12; 3:49-62; 4:5-8 4:9-24; 5:16-24; 5:35-62; 5:64-6:8. (Doc. 39, p. 22).

[3] Calamp cites the same specification language as was relied upon for its proposed construction of "transmitter."

[4] References to the column and lines within a given specification shall be denoted by the column number and line numbers. For example, column 1, lines 2-10 are denoted as 1:2-10.

[5] Figures 1, 2, 7, 8, and 9 of the '551 Patent appear in Appendix A to this Order.

B. The '876, '885, '727, and '278 Patent Terms: "Data Communication Bus/ Vehicle Data Communications Bus/ Vehicle Data Bus"

Go to table3

The term "data communication bus" is used in the '876 (Doc. 39-1) and '885 Patents (Doc. 39-2). The term "vehicle data communications bus" is used in the '727 Patent. (Doc. 39-3). The term "vehicle data bus" is found in the '278 Patent. (Doc. 39-4). Calamp asks the Court to construe these three sets of terms appearing in patents '876, '885, '727, and '278, arguing that construction is necessary to assist the jury.

Calamp contends that **[*13]** in all of the patents-in-suit, the data communication bus is described as a wired connection for transferring data to and from vehicle devices. (Doc. 39, p. 11). Calamp cites the '876 Patent specification which states, "Digital messages are communicated to all modules over the data communications bus." (Doc. 39-1, 2:18-19). Calamp further refers the Court to the '885 Patent specification language which is identical to the '876 language. (Doc. 39-2, 2:18-19). Calamp also quotes the '278 Patent, which provides, "This and other objects, features, and advantages in accordance with the present invention are provided by a multi-vehicle compatible tracking unit for a vehicle comprising a *vehicle data bus extending throughout the vehicle*." (Doc. 39-4, 2:50-53) (emphasis added). Finally, Calamp cites to the '727 Patent which similarly provides for a "vehicle data bus extending throughout the vehicle."[6] (Doc. 39-3, 2:44-45).

Omega submits that Calamp incorrectly seeks a construction which requires data transfer both to and from vehicle devices, whereas the patents-in-suit do not require two-way commands transferred on the bus. (Doc. 40, p. 4). Omega directs the Court to the plain language of claim 1 of the '876 Patent which provides, in pertinent **[*14]** part:

> 1. A control system for a vehicle comprising a data communications bus and at least one vehicle device connected to the data communications bus, the control system comprising:
>
> . . . .
>
> a multi-vehicle compatible controller at the vehicle and cooperating with said transmitter and receiver, said multi-vehicle compatible controller *generating at least one set of command signals on the data communications bus* for at least one vehicle device
>
> . . . .

(Doc. 39-1, 11:30-42) (emphasis added). Omega reasons that the plain language of claim 1 of the '876 Patent instructs the reader that at least one signal is generated, or sent, to at least one vehicle device. (Doc. 40, p. 5). The use of the term "generating" indicates sending a signal and does not require a signal to be both sent to a device and received from a device.

When one considers the background to the invention, as stated in the '876 Patent, it is clear that a signal may be generated or sent along the bus to a vehicle device without a return signal being sent from the device to the bus. For example, the background to the '876 Patent states that an "alarm indication may typically be a flashing of the lights and/or the sounding of the vehicle horn or a siren." (Doc. 39-1, **[*15]** 1:35-37). Such an alarm may consist of a signal being generated and sent to the device without the device sending a return signal along the bus. One skilled in the art need only read the description of preferred embodiments for the '885 Patent to understand that the data communications bus controls complex and simple functions within the vehicle. "In other words, the vehicle devices connected to the data bus may be considered to be relatively simple devices, such as sensors, or more complicated devices with some internal processing, such as may generally be considered as controllers." (Doc. 39-2, 6:48-52). The simple devices, such as sensors, receive a signal generated and sent to the device without sending a reply to the controller. Accordingly, giving the words of the claim(s) their ordinary and customary meaning that the term would have to those skilled in the art, and taking the term within the context of the entire patent, the terms "data communications bus," "vehicle data communications bus," and "vehicle data bus" do not envision or require the transference of data "to and from" vehicle devices.

Calamp next proposes that Omega's insertion of device "addresses" in their proposed definition **[*16]** of the above terms is not supported by the patents-in-suit. (Doc. 39, p. 12). Calamp argues that the term "address" is an optional feature in the systems described in the '876 and '885 Patents. (*Id.*). Calamp cites the '885 Patent specification to support this interpretation, which reads, "Each message *may* have one or more addresses associated with it so that the devices can recognize which messages to ignore and which messages to respond to or read." (Doc. 39-2, 2:20-22)

[6] The Court notes that none of the language cited by Calamp contained within the various patents-in-suit requires two-way communication of messages along the bus.

(emphasis added). However, the Court finds that this quote is taken out of context. The context is found in the following excerpt:

> With multiplexing technology, the various electronic modules or devices may be linked by a single signal wire in a bus also containing a power wire, and one or more ground wires. Digital messages are communicated to all modules over the data communications bus. Each message may have one or more addresses associated with it so that the devices can recognize which message to ignore and which message to respond to or read.

(*Id.* at 2:16-22). Therefore, the word "may" cannot reasonably be interpreted to suggest that associating an address with a message is optional. Rather, each message will have at least one and perhaps **[*17]** multiple addresses associated with it, depending on the number of electronic modules or devices linked by the command bus. The Court finds that the presence of at least one address is fundamental to the functioning of the invention.[7]

Based on the foregoing, the Court construes the term "data communications bus" as used in the '876 (Doc. 39-1) and '885 Patents (Doc. 39-2), "vehicle data communications bus" as used in the '727 Patent (Doc. 39-3), and "vehicle data bus" as found in the '278 Patent, collectively "data communication bus" as follows: **"wired connection for communication of digital messages among vehicle devices, with each message including one or more device addresses."**

C. The '876, '885, '727, '278 Patent Term: "Vehicle Device"

Go to table4

Calamp contends the term "vehicle device" should be construed by the Court because the term is broad and susceptible to many meanings. (Doc. 39, p. 13). The parties agree that claim terms should be construed by the Court when it is necessary to resolve a genuine and material legal dispute between the parties or when necessary **[*18]** to aid the jury in understanding claim terms. Calamp's proposed construction of the term "vehicle device" is taken verbatim from the '876 and '885 Patents, with closely analogous language found in the '727 and '278 Patents. (*Id.*). Since Calamp's proposed construction of "vehicle device" is taken from the patents-in-suit, the Court need not construe the claim term. The definition is not in dispute, nor is additional construction necessary to aid the jury in understanding the claim term. Calamp's request to construe the term "vehicle device" is denied.

D. The '876 Patent Term: "Command Signal"

Go to table5

The term "command signal" appears in claims of the '876 Patent. Calamp contends the '876 Patent, when read in its entirety, supports construction of the term "command signal" as requiring that the signal causes a desired function to be performed. (Doc. 39, p. 14). Calamp notes that the specifications include the following **[*19]** language: "will cause an operation or response from the vehicle device." (Doc. 39-1, 3:16-20). Defendant quotes portions of the specifications which state command signals may be "for operating" a specific vehicle device. (*Id.* at 3:39, 41-45; 5:45-49).

Omega submits that claim 1 of the '876 Patent clearly states that not every command signal will cause an operation or response from a vehicle device:

> 1. A control system for a vehicle comprising a data communications bus and at least one vehicle device connected to the data communications bus, the control system comprising:
>
> . . . .
>
> a multi-vehicle compatible controller at the vehicle and cooperating with said transmitter and receiver, said multi-vehicle compatible controller generating at least one set of command signals on the data communications bus for at least one vehicle device, the at least one set of command signals comprising at least *one working and at least one non-working command signal* for a given vehicle to thereby provide command compatibility with a plurality of different vehicles.

(*Id.* at 11:30-48) (emphasis added).

The claim makes it clear that the control system uses a working and non-working command signal because "multiple signals **[*20]** or codes can be generated on the data communications bus, and only that code for the

[7] While the '727 and '278 Patents do not specifically reference an address, one skilled in the art at the time of the invention would understand a vehicle data communications bus to require one or more addresses in order to control or read a device.

given vehicle and device will cause an operation or response from the vehicle device." (*Id.* at 3:17-20) (emphasis added). Further, "an object of the invention [is] to provide a control system and related method for a vehicle comprising a data communications bus and at least one vehicle device connected to the data communications bus, and wherein the system is *adapted to operate with different vehicles*." (*Id.* at 2:66-3:4) (emphasis added). Since the system is designed to operate with a variety of vehicle platforms, not every signal generated on the data communications bus will cause a function to be performed. In order for a signal to cause a function to be performed, the signal must be received by a device contained within a compatible vehicle platform.[8] Accordingly, Calamp's proposed construction incorrectly includes within the definition of the "command signal" the requirement that a signal generated on the data communication bus must always cause a desired function to be performed.

Based on the foregoing, the Court construes "command signal" as follows: **"signal generated on the data communications [*21] bus for operating a vehicle device."**

E. The '876 and '885 Patent Term: "Device Code"

Go to table6

Calamp asserts that the '876 and '885 Patents describe "device code" as a signal from a vehicle device that is read on the vehicle bus. (Doc. 39, p. 15). Calamp's proposed construction is based on select language from the '876 and '885 Patents. For example, both the '876 and '885 Patents discuss "reading a device code *from* the data communications bus." (Doc. 39-1, 9:22-23; Doc. 39-2, 3:12-13) (emphasis added). The complete text of the specification is, as always, helpful in construing the claim terms:

> More particularly, the multi-vehicle compatible controller is for storing a set of device codes for a given vehicle device for a plurality of different vehicles, for reading a device code from the data communications bus, and for determining a match between a read device code and the stored device codes to thereby provide compatibility **[*22]** with a plurality of different vehicles.

(Doc. 39-1, 9:19-25).

The '885 Patent further elaborates upon the manner in which the multi-vehicle compatible controller functions:

> Moreover, the multi-vehicle compatible controller is also for storing a set of device codes for a given vehicle device for a plurality of different vehicles, for reading a device code from the data communications bus, and for determining a match between a read device code and the stored device codes to thereby provide compatibility with a plurality of different vehicles.

(Doc. 39-2, 3:10-16). Both of these patents clearly state that when a device code is read, it is read "from" the data communications bus and not "on" the vehicle bus. To the extent Calamp's proposed construction describes the signal from the vehicle device as being read "on" the vehicle bus, the claims and specifications of the pertinent patents contradict this interpretation.

The next issue is whether the device codes travel "from" a vehicle device, as Calamp contends, or travels "to and from" a vehicle device, as Omega suggests. As previously discussed, the relevant specifications state: "[T]he multi-vehicle compatible controller is also for storing a set of **[*23]** device codes for a given vehicle device for a plurality of different vehicles, for reading a device code from the data communications bus [and determining whether a match exists] . . . ." (*Id.*). The specifications, therefore, certainly state that device codes, or signals, are stored on the multi-vehicle compatible controller, and codes received from the data communications bus can be read to determine if the stored code matches the code received from the data communications bus. The claims and specifications do not describe any scenario wherein the device code is a signal sent "to" a vehicle device, which appears to be accomplished by command signals. Omega does not direct the Court to any intrinsic evidence to support its contention that a device code, or signal, travels both to and from a vehicle device.

Based on the foregoing, the Court agrees with Calamp that the claims and specifications of the pertinent patents-in-suit describe "device codes" as **signal from a vehicle device**. The Court, however, declines to adopt Calamp's construction to the extent it describes device codes as being "read on the vehicle bus." The description proffered by Calamp is contradicted by the clear wording **[*24]** of the claims and specifications, which state the signal or code is read "from" the bus and not "on" the bus. Additionally, Calamps's construction

[8] "In other words, multiple signals or codes can be generated on the data communications bus, and only that code for the given vehicle will cause an operation or response from the vehicle device." (Doc. 39-2, 7:31-34).

focuses on the signal being "read" and fails to address the storage of device codes and the comparison of stored codes to codes received from the communications bus. The Court finds it is not necessary to include a partial description of how device codes are utilized by the multi-vehicle compatible controller, because the ordinary meaning of the claim language relative to the uses made of the device codes is readily apparent to those skilled in the art.

Thus, the term "device codes" is construed by the Court to mean: **"signal from a vehicle device."**

F. The '885 Patent Term: "Function"

Go to table7

Calamp contends that the definition of the term "function" found in claim 24 of the '885 patent should be limited to the three embodiments identified in Calamp's **[*25]** proposed claim construction. (Doc. 39, p. 17). Omega asserts the term "function" does not require construction because the ordinary meaning of the claim language is readily apparent to persons of ordinary skill in the art and even to lay judges. (Doc. 40, pp. 9-10). The Court agrees that the claim language is sufficiently clear and unambiguous to enable an individual of ordinary skill in the art, as well as lay judges, to apply the language in the context of this litigation.

The patent states the invention may be embodied in "many different forms and should not be construed as limited to the illustrated embodiments set forth herein." (Doc. 39-2, 4:63-65). The term "function" is self-evident from the context of the list of embodiments:

> The second transmitter/receiver pair may be used to cause a *desired function* to be performed at the vehicle, such as remote starting the engine, remotely unlocking the vehicle doors, or changing the mode of a security system between armed and disarmed modes, for example. Many other similar applications are contemplated by the present invention as will be appreciated by those skilled in the art.

(*Id.* at 5:24-31) (emphasis added). Clearly, a function is the **[*26]** operation of one of the vehicle devices. Accordingly, the Court declines to construe this term.

G. The '727 Patent Term: "Remote Vehicle Speed Exceeded Notification"

Go to table8

The term "remote vehicle speed exceeded notification" is found in the '727 Patent. Calamp proposes a construction of the term which emphasizes that the message indicating that a preset speed has been exceeded is sent "from" the vehicle. (Doc. 39, p. 18). Calamp asserts that the patent, and Omega's proposed construction, fail to state that the message originates from within the vehicle. (*Id.*). Omega argues that no construction is required because the ordinary meaning of the claim language is readily apparent. (Do. 40, p. 11). The Court agrees with Omega and finds that the term "remote vehicle speed exceeded notification" does not require construction or clarification.

Claim 1 of the '727 Patent clearly identifies that the speed **[*27]** exceeded notification device includes "at least one vehicle device *generating* data related to vehicle speed." (Doc. 39-3, 7:6-7) (emphasis added). Therefore, the message is clearly sent from the vehicle, where the vehicle devices reside. The claim language further states that the device determines "when a vehicle speed exceeds a speed threshold *for the first time period*" and sends a remote vehicle speed exceeded notification. (*Id.*) (emphasis added). That is, a device internal to the vehicle sends the notification outside of the vehicle. To the extent the patent provides for multiple speed exceeded notifications being sent from the vehicle, the claim language clearly addresses the manner in which this is accomplished. (*Id.* at 7:18-22, 27-29).

Based on the foregoing, the Court declines Calamp's request for construction of the term "remote vehicle speed exceeded notification."

H. The '278 Patent Term: "Downloading Interface"

Go to table9

Calamp asserts that the term "downloading interface" is unclear and may result in jurors concluding the term involves a software interface for downloading **[*28]** or some other type of interface. (Doc. 39, p. 19). Calamp contends that the patent describes the downloading interface as "hardware" or a connection to the tracking unit. (*Id.*). However, the plain language of the patent describes downloading interface more broadly. The patent provides the following variety of methods for data

to be received from the downloading interface:

> The downloading interface may comprise either a wired or wireless signal downloading interface. The wired signal downloading interface may comprise a connector for temporary connection to a downloading device, for example. The wireless signal downloading interface may include a wireless receiver for temporary connection to a downloading device . . . . The downloading interface may also be for permitting downloading of at least one programming instruction for the multi-vehicle compatible controller, in some embodiments.

(Doc. 39-4, 3:4-16). The summary of the invention, cited above, tracks the language found in claims 1, 2, 4, and 8. (*Id.* at 25:63-26:39).

The ordinary meaning of "download interface" is readily apparent to persons of ordinary skill in the art. To the extent one may desire additional context for the term **[*29]** "downloading interface," that context is found in the background and summary of the invention. The background statement provides, "For a company with hired drivers, it may be desirable to know the driver's whereabouts during the course of the day. Similarly, a rental car agency or other fleet operator, for example, may wish to know the whereabouts of its fleet of vehicles." (*Id.* at 1:37-41). To facilitate these objectives, the summary of the invention informs the reader that, "[t]he tracking unit may also include a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code . . . ." (*Id.* at 2:63-66). The embodiment section of the patent further educates the reader that data received via the downloading interface may provide a number of pieces of information regarding the vehicle, including whether the vehicle is being moved by an unauthorized driver, whether the vehicle is being broken into, whether the vehicle is being driven in excess of an authorized speed, and the like. (*Id.* at 11:36-12:10).

Accordingly, the ordinary meaning of the language of the patent, including the term downloading interface, instructs the reader, **[*30]** including lay judges and jurors, of the type of data transmitted from the vehicle device and the manner of its transmission: wired, wireless, and for permitting downloading of at least one programming instruction, for example. A downloading interface is, therefore, not limited to a hardwired connection.

Based on the foregoing, the Court declines to construe the term "downloading interface."

I. The '278 Patent Term: "Enabling Data"

Go to table10

The term "enabling data" appears in the '278 Patent. (Doc. 39-4). Calamp avers that the term lacks any common meaning or specific structure to one of ordinary skill in the art and should be construed. (Doc. 39, p. 20). Calamp acknowledges the term enabling data is referenced in several places, but submits the term is not defined other than at column 24, lines 8-12 of the '278 Patent. (*Id.*) The **[*31]** specification provides, in pertinent part:

> The multi-vehicle compatible tracking unit also illustratively includes a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller. The enabling data may be the vehicle device code or codes, an instruction to select a code or codes from among those already stored, or the data or sequence to allow the controller to generate the vehicle device code or codes, for example.

(Doc. 39-4, 24:4-12). Other references to "enabling data" include references to figures within the patent, stating, "Enabling data related to at least one corresponding vehicle device code for use by the multi-vehicle compatible controller is downloaded via a downloading interface." (*Id.* at 25:14-16).

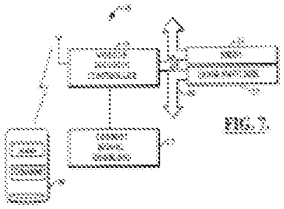
Calamp suggests that any construction of enabling data should be limited to claim 1 of the '278 Patent (Doc. 39-4, 26:13-15), which provides, in part, "[E]nabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller." (Doc. 40, p. 13). Omega objects to Calamp's inclusion of some of the preferred embodiments **[*32]** into their proposed definition, citing *Northern Telecom Ltd. v. Samsung Elecs. Co., 215 F.3d 1281, 1293 (Fed. Cir. 2000)* ("This court consistently declines to construe claim terms according to the preferred embodiment."). The Court agrees that Calamp's proffered construction improperly restricts or narrows the scope of this term.

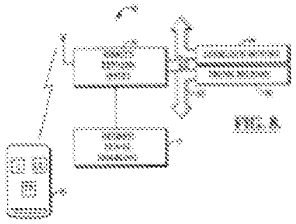
Based on the foregoing, the Court construes the term "enabling data" as follows: **data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller**.

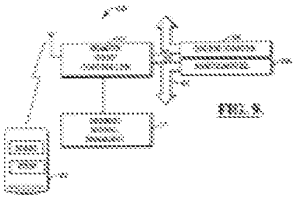
J. The '278 Patent Term: "Programming Instruction"

Go to table11

The term "programming instructions" is found in the '278 Patent. (Doc. 39-4). Calamp submits that this term should be construed by the Court because the term is susceptible to multiple meanings. (Doc. 39, p. 21). Omega advised the Court during the *Markman* hearing that it does not object to Calamp's proposed construction. The Court therefore adopts Calamp's proposed construction.







V. CONCLUSION

The Court adopts the following constructions:

Go to table12

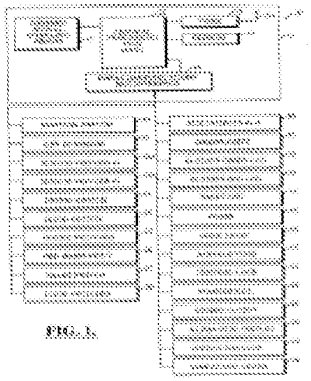
DONE AND ORDERED in Orlando, Florida on February 20, 2015.

/s/ Paul G. Byron

PAUL G. BYRON

UNITED STATES DISTRICT JUDGE

APPENDIX A



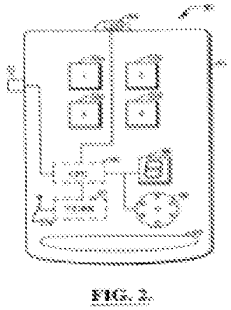


Table1 (*Return to related document text*)

Claim Term	Agreed Construction
Controller	Electronic circuitry that performs one or more control functions.
Multi-vehicle compatible controller	Electronic circuitry that performs one or more control functions, and can operate with more than one vehicle.

Table1 (*Return to related document text*)

Table2 (*Return to related document text*)

Claim Term	Omega's Construction	Calamp's Construction
Transmitter	Radio frequency transmitter.	Device that sends signals.
Receiver	Radio frequency receiver.	Device that receives signals.

Table2 (*Return to related document text*)

Table3 (*Return to related document text*)

Claim Term	OMEGA's Construction	CALAMP's Construction
Data communication bus	*No construction needed; alternatively, it should be defined as follows*: Wired connection for communication of digital messages among vehicle devices, with each message including one or more device addresses	Wired connection for transferring data to and from vehicle devices

Table3 (*Return to related document text*)

Table4 (*Return to related document text*)

Claim Term	OMEGA's Construction	CALAMP's Construction
Vehicle device	No construction needed	Electrical or electronic component in a vehicle that can be controlled and/or the status thereof read

Table4 (*Return to related document text*)

Table5 (*Return to related document text*)

Claim Term	OMEGA's Construction	CALAMP's Construction

Claim Term	OMEGA's Construction	CALAMP's Construction
Command signal	*No construction needed; alternatively, it should be defined as follows*: Signal generated on the data communications bus for operating a vehicle device	Signal generated on the data communications bus for operating a vehicle device to cause a desired function to be performed at the vehicle

Table5 (*Return to related document text***)**

Table6 (*Return to related document text***)**

Claim Term	OMEGA's Construction	CALAMP's Construction
Device codes	*No construction needed; alternatively, it should be defined as follows*: Signal to or from a vehicle device	Signal from a vehicle device read on the vehicle bus. Amended at the Markman hearing as follows: Signal from a vehicle device read on the vehicle bus and/or stored in the controller

Table6 (*Return to related document text***)**

Table7 (*Return to related document text***)**

Claim Term	OMEGA's Construction	CALAMP's Construction
Function	*No construction needed; alternatively, it should be defined as follows*: An operation of a vehicle device	An operation of a vehicle device, such as remote starting the engine, remotely unlocking the vehicle doors, or changing the mode of a security system between armed and disarmed

Table7 (*Return to related document text***)**

Table8 (*Return to related document text***)**

Claim Term	OMEGA's Construction	CALAMP's Construction
Remote vehicle speed exceeded notification	*No construction needed; alternatively, it should be defined as follows*: Notification sent when a	A message sent from a vehicle indicating that the vehicle speed has exceeded a particular speed

Claim Term	OMEGA's Construction	CALAMP's Construction
	vehicle speed exceeds a speed threshold for a first time period	

Table8 (*Return to related document text*)

Table9 (*Return to related document text*)

Claim Term	OMEGA's Construction	CALAMP's Construction
Downloading interface	No construction needed	Connection that can receive data

Table9 (*Return to related document text*)

Table10 (*Return to related document text*)

Claim Term	OMEGA's Construction	CALAMP's Construction
Enabling data	*No construction needed; alternatively, it should be defined as follows*: Data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller	A vehicle device code or codes, and instruction to select a code or codes, or the data or sequence to allow the controller to generate a vehicle device code or codes

Table10 (*Return to related document text*)

Table11 (*Return to related document text*)

Claim Term	OMEGA's Construction	CALAMP's Construction
Programming instructions	No construction needed	Code which instructs the controller to perform an operation

Table11 (*Return to related document text*)

Table12 (*Return to related document text*)

CLAIM TERM	AGREED CONSTRUCTION
Controller	Electronic circuitry that performs one or more control functions.
Multi-vehicle compatible controller	Electronic circuitry that performs **[*33]** one or more control functions, and can operate with more than one vehicle.

CLAIM TERM	AGREED CONSTRUCTION
Transmitter	Radio frequency transmitter.
Receiver	Radio frequency receiver.
Data communication bus/ vehicle data communications bus/ vehicle data bus	Wired connection for communication of digital messages among vehicle devices, with each message including one or more device addresses.
Vehicle device	Plain meaning
Command signal	Signal generated on the data communications bus for operating a vehicle device.
Device codes	Signal from a vehicle device.
Function	Plain meaning
Remote vehicle speed exceeded notification	Plain meaning
Downloading interface	Plain meaning
Enabling data	Data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller.
Programming instructions	Code which instructs the controller to perform an operation.

Table12 (*Return to related document text*)

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Mealey's IP/Tech - Telematics Company Wins New Trial On Indirect Patent Infringement

Mealey's Daily News Update

April 8, 2019

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Cite: 2019-4956 Mealey's Daily News Update 7

Section: 2019, 4956

Dateline: WASHINGTON, D.C.

Body

A panel of the Federal Circuit U.S. Court of Appeals on April 8 awarded a defendant a new trial on the questions of indirect patent infringement, damages, willfulness, enhanced damages for willfulness and a patent owner's entitlement to attorney fees (Omega Patents LLC v. CalAmp Corp., No. 18-1309, Fed. Cir.).

(Decision available 16-190415-043Z)

Circuit Judge Timothy B. Dyk, joined by Judges Sharon Prost and Evan J. Wallach, affirmed only the finding by U.S. Judge Paul G. Byron of the Middle District of Florida that Omega Patents LLC's U.S. patent Nos. 6,346,876, 6,756,885, 7,671,727 and ***8,032,278*** are not invalid.

The '876 and '885 patents hare a common specification and claim "control systems" for communicating with and causing operations by, or responses from, vehicle devices, including remote starters, door locks and security systems. The '278 patent claims a "controller" for communicating with a vehicle device, while the '727 patent claims "speed exceeded notification devices." The asserted claims of all four patents in suit call for a device to be connected to a vehicle data communications bus and to communicate with or monitor a vehicle device that is also connected to the same bus.

Opinions Memorialized

Appellant telematics firm CalAmp Corp.'s accused "LMU" products connect to the on-board diagnostic (OBD) port of a vehicle. They include a GPS receiver to establish the vehicle's location and connect to a data bus using the OBD port to obtain data from the vehicle's engine control unit (ECU) on various factors including fuel use, speed, mileage and running hours. CalAmp maintained that its LMU products were specifically designed to be unable to control vehicle devices, in order to remain noninfringing. Additionally, the appellant asserted that its speed-exceeded notification function was designed to use speed data from a GPS receiver, instead of speed data from the vehicle bus, as recited by the '727 patent.

In 2010, CalAmp notified Omega of its intent to launch the LMU products with OBD connectivity and asserted that it did not believe the LMU products would infringe. Dissatisfied, Omega filed the instant lawsuit in 2013. CalAmp denied infringement, asserted that the patents in suit are invalid and commissioned its outside counsel, David

Bailey, to "memorialize his prior oral opinions" regarding the same, which were provided to CalAmp during development of the LMU products.

Bailey delivered his written opinions in June 2014, stating that the '876 patent is not infringed by the LMU products and that the '885, '278 and '727 patents are invalid. Jurors disagreed, finding that the accused CalAmp products willfully infringe each asserted claim of all four patents and awarded $ 2,975,200 in damages. Post-trial, Judge Byron enhanced the award to $ 15 million, along with an ongoing royalty for Omega.

Vague Claims

Affirming with regard to patent validity, the Federal Circuit rejected CalAmp's challenge to Judge Byron's construction of "transmitter," "receiver" and "data communication bus / vehicle data communications bus / vehicle data bus." According to CalAmp, had the judge adopted CalAmp's proposed constructions, "CalAmp's invalidity defenses would have included additional prior art references."

"Here CalAmp did nothing in the district court [claim construction] proceeding to specifically identify the prior art that would be impacted by the claim construction ruling. At the [claim construction] hearing, there was no identification of any specific prior art references that would be excluded by the district court's claim construction ruling," the panel noted.

"Instead, the court was presented with only vague claims that there was prior art before August 22, 1995, one year before the earliest priority date of the asserted patents, that would be relevant under CalAmp's proposed construction. To be sure, CalAmp was not required to identify the prior art at the [claim construction] proceeding in order to preserve the argument, but here CalAmp fails to argue the prior art was identified at any time thereafter," the panel ruled.

Erroneous Exclusion

Also upheld by the Federal Circuit was the verdict of direct infringement of claim 11 of the '727 patent, an issue the panel deemed "close." However, the panel sided with CalAmp with regard to the '876 and '885 patents. "We agree with CalAmp that there was insufficient evidence for the jury to have found the claim limitation 'a transmitter and a receiver for receiving signals from said transmitter' in the claims of the '876 patent and the '885 patent was satisfied by CalAmp's selling its systems," the Federal Circuit wrote, deeming CalAmp entitled to judgment as a matter of law (JMOL) of no infringement.

The panel next partly set aside the verdict of induced infringement but found that a new trial, and not JMOL, is warranted because "Omega also presented evidence that the signal sent from the ECU . . . to the LMU could satisfy the 'device code' limitation" in some of the asserted patent claims.

"We affirm the jury's verdict as to predicate acts of direct infringement by CalAmp's customers for claims 1, 3, 4, 5, 14, and 16 of the '876 patent. We vacate and remand for a new trial the issue of whether there were predicate acts of direct infringement for claim 12 of the '876 patent and all of the asserted claims of the '885 patent," the Federal Circuit ruled.

However, the panel found that a new trial is required for claims 1, 3, 4, 5, 14 and 16 of the '876 patent because the judge erred in excluding testimony regarding CalAmp's state of mind, thereby "substantially" prejudicing CalAmp's ability to present a defense for indirect infringement. "This exclusion deprived CalAmp of the opportunity to support its defense that there was no inducement because it reasonably believed it did not infringe the patents at the time CalAmp launched the products at issue," the Federal Circuit ruled.

Subset Of Products

In view of the decision to order a new trial on all claims with the exception of claim 11 of the '727 patent, the panel concluded that the compensatory damage award cannot stand. The theory of damages presented by Omega was based on total, actual sales by CalAmp of various accused products, but the Federal Circuit affirmed infringement "only as to a subset" of products that were programmed to function in an infringing manner.

"The accused products are capable of retrieving vehicle speed from the data bus and of infringing only with additional 'programming' (i.e., a script). There is no evidence to support a finding of infringement of more than some unidentified subset of the accused CalAmp devices where the necessary scripts were installed. Such evidence cannot support an award of damages with respect to all of CalAmp's devices. We vacate the damages award and remand for a new trial," the panel held.

Similarly, the Federal Circuit said that no enhancement for willfulness is warranted. At the new trial, Judge Byron was directed to permit Bailey to testify as to "a reasonable explanation as to how he arrived at his conclusions," the panel ruled. Finally, the Federal Circuit urged the parties "to achieve clarity by clearly presenting evidence, objections, arguments, and jury instructions as to direct and indirect infringement, compensatory damages, and willful infringement, assuming the parties choose to continue pursuing such issues, so that this court may effectively fulfill its appellate function in in any further review arising from the retrial."

Counsel

CalAmp is represented by Constantine L. Trela Jr., Thomas D. Rein, Stephanie P. Koh and Bryan C. Mulder of Sidley Austin in Chicago.

Brian R. Gilchrist and Ryan T. Santurri of Allen, Dyer, Doppelt + Gilchrist in Orlando, Fla., represent Omega.

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Neutral
As of: January 8, 2020 2:23 PM Z

Omega Patents, LLC v. CalAmp Corp.

United States District Court for the Middle District of Florida, Orlando Division

January 5, 2016, Decided; January 5, 2016, Filed

Case No: 6:13-cv-1950-Orl-40DAB

Reporter
2016 U.S. Dist. LEXIS 174577 *

OMEGA PATENTS, LLC, Plaintiff, v. CALAMP CORP., Defendant.

Subsequent History: Motion denied by, Without prejudice *Omega Patents, LLC v. CalAmp Corp., 2016 U.S. Dist. LEXIS 174576 (M.D. Fla., Jan. 13, 2016)*

Motion granted by, Costs and fees proceeding at, Motion granted by, Injunction denied by *Omega Patents, LLC v. CalAmp Corp., 2017 U.S. Dist. LEXIS 55846 (M.D. Fla., Apr. 6, 2017)*

Motion denied by *Omega Patents, LLC v. Calamp Corp., 2017 U.S. Dist. LEXIS 186645 (M.D. Fla., Sept. 22, 2017)*

Prior History: *Omega Patents, LLC v. Calamp Corp., 2015 U.S. Dist. LEXIS 194173 (M.D. Fla., Feb. 20, 2015)*

Core Terms

Patent, laches, inequitable conduct, counterclaim, unfair competition, patents-in-suit, issues, motion to bifurcate, summary judgment, unenforceability, equitable

Counsel: **[*1]** For Omega Patents, LLC, a Georgia limited liability company, Plaintiff: Brian R. Gilchrist, Christopher F Regan, Ryan Thomas Santurri, LEAD ATTORNEYS, Allen, Dyer, Doppelt, Milbrath & Gilchrist, PA, Orlando, FL.

For Calamp Corp., a Delaware corporation, Defendant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Thomas D. Rein, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL; Christopher S. Carver, LEAD ATTORNEY, Akerman Senterfitt, LLP, Miami, FL; Peter A. Chiabotti, Thomas R. Yaegers, LEAD ATTORNEY, Akerman LLP, West Palm Beach, FL; Carrie Ann Wozniak, Akerman Senterfitt, LLP - Orlando, Orlando, FL; Eugene Chong, Joel A. Kauth, PRO HAC VICE, Charles R. Halloran, KPPB LLP, Anahein, CA.

For Calamp Corp., a Delaware corporation, Counter Claimant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Thomas D. Rein, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL; Carrie Ann Wozniak, LEAD ATTORNEY, Akerman LLP, Orlando, FL; Christopher S. Carver, LEAD ATTORNEY, Akerman Senterfitt, LLP, Miami, FL; Peter A. Chiabotti, LEAD ATTORNEY, Akerman LLP, West Palm Beach, FL; Eugene Chong, Joel A. Kauth, PRO HAC VICE, Charles R. Halloran, KPPB LLP, Anahein, **[*2]** CA.

Omega Patents, LLC, a Georgia limited liability company, Counter Defendant: Brian R. Gilchrist, Christopher F Regan, Ryan Thomas Santurri, LEAD ATTORNEYS, Allen, Dyer, Doppelt, Milbrath & Gilchrist, PA, Orlando, FL.

Judges: PAUL G. BYRON, UNITED STATES DISTRICT JUDGE.

Opinion by: PAUL G. BYRON

Opinion

ORDER

This cause comes before the Court on the following:

1. Plaintiff's Motion to Bifurcate Issues of Inequitable Conduct and Prosecution Laches (Doc. 93), filed September 29, 2015; and
2. Defendant CalAmp Corp.'s Response in Opposition to Plaintiff's Motion to Bifurcate Issues of Inequitable Conduct and Prosecution Laches (Doc. 100), filed October 16, 2015.

Upon consideration and having reviewed the pertinent pleadings and the exhibits submitted by the parties, the Court grants Plaintiff's Motion to Bifurcate the Issue of Prosecution Laches and denies Plaintiff's Motion to Bifurcate the Issue of Inequitable Conduct as moot.

I. BACKGROUND

A. The Patents-in-Suit

Omega Patents, LLC ("Omega") contends that CalAmp Corp. ("CalAmp") infringes the claims of U.S. Patent No. 6,346,876 ("the '876 Patent"), U.S. Patent No. 6,737,989 ("the '989 Patent"), U.S. Patent No. 6,756,885 ("the '885 Patent"), U.S. Patent No. 7,671,727 ("the '727 Patent"), and U.S. Patent No. ***8,032,278*** ("the '278 Patent") (collectively, the "patents-in-suit"). (Doc. 1). The patents-in-suit relate to control systems for vehicles with a "data communications bus." (Doc. 54, pp. 1-2). **[*3]** [1] Omega asserts that CalAmp's devices are used to monitor particular vehicle characteristics and conditions and report vehicle information to an end user, thus infringing on the patents-in-suit. (*Id.* at p. 2).

CalAmp advertises for sale the LMU-3000, LMU-3030, and LMU-3050 (the "Accused Devices") which are described as full-featured tracking systems which "access vehicle diagnostic interface data, track vehicle speed and location, plus detect hard braking, cornering, or acceleration." (Doc. 114-1, p. 2; 114-2, p. 2). CalAmp denies that the Accused Devices infringe upon any claim of the patents-in-suit and further asserts a number of defenses. (Doc. 10).[2] CalAmp also counterclaimed, seeking a declaratory judgment of noninfringement, invalidity, and unenforceability due to inequitable conduct for the patents-in-suit. (Doc. 20).

B. Procedural Setting

Omega moved for summary judgment on CalAmp's claim of unenforceability as a result of Omega's alleged inequitable conduct. (Doc. 54). CalAmp responded in opposition to Omega's summary judgment motion (Doc. 76), and thereafter, Omega filed a reply brief. (Doc. 79). After reviewing the briefs submitted by the parties and after considering the exhibits in support, **[*4]** the Court granted Omega's motion for summary judgment on CalAmp's claim of unenforceability. (Doc. 118, pp. 17-20). The Court concluded that CalAmp failed to establish its counterclaim of inequitable conduct by clear and convincing evidence. (*Id.*).

Additionally, Omega moved for summary judgement on CalAmp's counterclaim for unfair competition. (Doc. 54). The Court noted in its Order on summary judgment that CalAmp dropped the unfair competition counterclaim when it filed its Amended Counterclaim. (Doc. 20; Doc. 118, p. 3 n.2). Accordingly, the Court denied Omega's motion for summary judgment on the unfair competition claim as moot. The defense of laches, now refined to address prosecution laches, is still pending.

II. STANDARD

Federal Rule of Civil Procedure Rule 42 permits the district court to order separate trials of "one or more separate issues, claims, crossclaims, counterclaims, or third-party claims" in order to "avoid prejudice" or even for convenience. Fed. R. Civ. P. 42(b). The Court must preserve the parties' federal right to a jury trial at all times. *Id.* CalAmp's claim of prosecution laches permits the Court to render a patent unenforceable "when [a patent] has issued only after an unreasonable and unexplained delay in prosecution **[*5]** that constitutes an egregious misuse of the statutory patent system

[1] The Court has previously construed "data communications bus" to mean "wired connection for communication of digital messages among vehicle devices, with each message including one or more device addresses." (Doc. 50, p. 25).

[2] CalAmp alleges laches in their seventh affirmative defense. (Doc. 10, p. 5).

under the totality of the circumstances." *Cancer Research Tech. Ltd. v. Barr Labs., Inc., 625 F.3d 724, 728 (Fed. Cir. 2010)* (internal quotation marks omitted). "[P]rosecution laches' requirement of an unreasonable and unexplained delay includes a finding of prejudice, as does any laches defense." *Id. at 729*.

III. DISCUSSION

In opposing Omega's motion to bifurcate, CalAmp focuses extensively on the fact that the unfair competition claim concerns legal issues, while the inequitable conduct claim involves equitable issues. (Doc. 100, p. 1). CalAmp argues that the facts are comingled between these actions, concluding that bifurcation would impair their right to a jury trial. (*Id.* at pp. 2-3). The majority of CalAmp's opposition concerns a detailed discussion of the acts and omissions that purportedly constitutes inequitable conduct and which support the unfair competition claim. (*Id.* at pp. 4-9).

Having concluded that CalAmp cannot, as a matter of law, present sufficient evidence to carry the day on their inequitable conduct counterclaim,[3] the Court granted summary judgement in favor of Omega. Since the Amended Counterclaim disposed of the unfair competition claim as well, CalAmp is precluded from presenting the alleged inequitable or unfair behavior of **[*6]** Omega to the jury as evidence of unfair competition.

Turning to the issue of prosecution laches, it is clear that this is an equitable defense whereby the patent(s) may be deemed unenforceable. *Symbol Techs., Inc. v. Lemelson Med., Educ. & Research Found., LP, 422 F.3d 1378, 1384 (Fed. Cir. 2005)*. The delay in the prosecution of any one application is insufficient to merit the dramatic relief of declaring the patent unenforceable. *Id. at 1386*. To prevail on this defense, one must prove that a patent has issued "only after an unreasonable and unexplained delay in prosecution that constitutes an egregious misuse of the statutory patent system under the totality of circumstances." *Cancer Research, 625 F.3d at 728* (internal quotation marks omitted).

The Court is presently unaware of any evidence in the record demonstrating that Omega engaged in the type of delay of prosecution of the patents-in-suit which warrants this remedy, and CalAmp has not cited any supporting evidence in their opposition papers. Omega submits that allowing evidence of prosecution laches will result in prejudice to their case and will prolong an already complex trial. (Doc. 93, p. 9). The Court agrees with Omega's assessment of the potential for confusion and prejudice from the injection of this issue into the trial, particularly absent evidence of a causal **[*7]** link between the alleged delay in prosecution and the issues before the Court—and before the jury.

To the extent that CalAmp seeks to pursue the equitable defense of prosecution laches, this matter will be heard by the Court either before or after the trial on the merits. Should CalAmp desire to present this equitable defense prior to the trial on the merits, the Court will require a detailed proffer of the anticipated evidence to determine the propriety of delaying the date-certain trial.

IV. CONCLUSION

Accordingly, it is **ORDERED AND ADJUDGED** that Plaintiff's Motion to Bifurcate Issues of Inequitable Conduct and Prosecution Laches (Doc. 93) is **GRANTED IN PART and DENIED IN PART** as follows:

1. The motion is **GRANTED** as it relates to the equitable defense of prosecution laches.

2. The motion is **DENIED AS MOOT** as it relates to the issue of inequitable conduct.

DONE AND ORDERED in Orlando, Florida on January 5, 2016.

/s/ Paul G. Byron

PAUL G. BYRON

UNITED STATES DISTRICT JUDGE

End of Document

[3] *See* Count III of the Amended Counterclaim. (Doc. 20).

Neutral
As of: January 8, 2020 2:23 PM Z

Omega Patents, LLC v. Calamp Corp.

United States District Court for the Middle District of Florida, Orlando Division

September 22, 2017, Decided; September 22, 2017, Filed

Case No: 6:13-cv-1950-Orl-40DCI

Reporter
2017 U.S. Dist. LEXIS 186645 *

OMEGA PATENTS, LLC, Plaintiff, v. CALAMP CORP., Defendant.

Prior History: Omega Patents, LLC v. CalAmp Corp., 2016 U.S. Dist. LEXIS 174577 (M.D. Fla., Jan. 5, 2016)

Core Terms

venue, patent, patents-in-suit, pendent, infringement, time of filing, intervening, nucleus, parties, issues, elected, sever

Counsel: **[*1]** For Omega Patents, Llc, a Georgia limited liability company, Plaintiff, Counter Defendant: Brian R. Gilchrist, Ryan Thomas Santurri, LEAD ATTORNEYS, Allen, Dyer, Doppelt, & Gilchrist, PA, Orlando, FL USA; Christopher F Regan, Allen, Dyer, Doppelt, Milbrath & Gilchrist, PA, Orlando, FL USA.

For Calamp Corp., a Delaware corporation, Defendant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Sidley Austin LLP, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL USA; Christopher S. Carver, Peter A. Chiabotti, Thomas R. Yaegers, LEAD ATTORNEYS, Akerman LLP, Fort Lauderdale, FL USA; Carrie Ann Wozniak, Akerman Senterfitt, LLP - Orlando, Orlando, FL USA; Joel A. Kauth, PRO HAC VICE, KPPB LLP, Anahein, CA USA.

For Calamp Corp., a Delaware corporation, Counter Claimant: Bryan C. Mulder, Constantine L. Trela, Jr., Stephanie P. Koh, Sidley Austin LLP, LEAD ATTORNEYS, PRO HAC VICE, Sidley Austin, LLP, Chicago, IL USA; Carrie Ann Wozniak, LEAD ATTORNEY, Akerman LLP, Orlando, FL USA; Christopher S. Carver, Peter A. Chiabotti, LEAD ATTORNEYS, Akerman LLP, Fort Lauderdale, FL USA; Joel A. Kauth, PRO HAC VICE, KPPB LLP, Anahein, CA USA.

Judges: PAUL G. BYRON, UNITED STATES DISTRICT JUDGE. **[*2]**

Opinion by: PAUL G. BYRON

Opinion

ORDER

This cause is before the Court on Defendant CalAmp's Motion to Vacate the Judgment and Dismiss for Lack of Venue, (Doc. 222), and Plaintiff Omega's Response in Opposition. (Doc. 225). The issues before this Court are as follows: (1) what is the operative time in the litigation for assessing venue, (2) whether pendent venue existed over the patents-in-suit, (3) whether Defendant has waived their objection to venue being proper in the Middle District of Florida, Orlando Division, and (4) whether the holding of the United States Supreme Court in TC Heartland LLC v. Kraft Foods Group Brands LLC, 137 S. Ct. 1514, 197 L. Ed. 2d 816 (2017), constitutes an intervening change in the law such that it is an extraordinary circumstance that justifies relief under Fed. R. Civ. P. 60(b)(6). Upon due consideration, the Court finds the Defendant has consented to venue

being proper in this district as relates to the '989 patent and that pendent venue existed for the remaining patents-in-suit. The Court further finds the Defendant waived any objection to the exercise of pendent venue, and that the holding in *TC Heartland* does not express an intervening change in the law. Accordingly, the Defendant's Motion to Vacate Judgement and Dismiss for Lack of Venue is denied.

I. BACKGROUND

Omega brought the instant action **[*3]** against CalAmp on December 20, 2013, claiming that CalAmp infringed the claims of U.S. Patent No. 6,346,876 ("the '876 Patent"), U.S. Patent No. 6,737,989, U.S. Patent No. 6,756,885 ("the '885 Patent"), U.S. Patent No. 7,671,727 ("the '727 Patent"), and U.S. Patent No. ***8,032,278*** ("the '278 Patent") (collectively, the "patents-in-suit"). (Doc. 1). Omega attached to its Complaint a Settlement Agreement entered into between Omega and CalAmp on June 9, 2010, which contains the following agreement:

> Defendant agrees that if Plaintiff files suit against it in the future for infringement of one or more of the U.S. Letters Patent No . . .'868, . . . '561, . . . '989, . . . '187, . . . '355, . . . '623 . . . . Or '244 in the U.S. District Court for the Middle District of Florida, Orlando Division, that Defendant will not move to dismiss such suit based on lack of personal jurisdiction, improper venue or forum non conveniens; Defendants expressly consent to jurisdiction and venue in this District..."

(Doc. 1-2).

CalAmp did not file a motion to dismiss the Complaint on the basis of venue being improper in this district and instead answered the lawsuit. In their Answer, CalAmp "[admitted] that venue is proper in this forum with respect to the claims relating to . . .'989. Except as expressly admitted, CalAmp denies all other allegations contained in Paragraph 5."[1] (Doc. 10, ¶ 5). Moreover, CalAmp filed **[*4]** a counter-claim wherein they seek declaratory judgment "of non-infringement, invalidity and unenforceability of a patent arising under the Declaratory Judgment Act . . . ."[2] (*Id.* at p. 6). On the issue of venue, CalAmp conceded that "[v]enue is proper in this forum pursuant to 28 U.S.C. §§ 1391(b) and the applicable law of this Court." (*Id.* at p. 7, ¶ 5).

The case proceeded to trial on February 16, 2016, and prior to opening statements counsel for Omega announced the following: "Judge, before we get the jury in—and, Joel (counsel for CalAmp), jump in, if you want—**between the parties**, we've agreed to try and streamline the case. So for the Court's edification, we are no longer pursuing the '989 patent." (Doc. 178, p. 3:5-9) (emphasis added). At no time following this announcement did CalAmp argue that venue was no longer proper as relates to the remaining patents-in-suit. The trial went forward and the parties litigated the validity of the patents-in-suit for seven (7) days. (Doc. 178-184). The jury returned a verdict in favor of Plaintiff and against Defendant on each of the patents-in-suit. (Doc. 144). Final Judgment was entered by the Court on April 24, 2017, (Doc. 211), and an Amended Final Judgment was entered on July 19, 2017. (Doc. 227). **[*5]**

CalAmp now argues that, notwithstanding its concession that venue was proper in this Court over Plaintiff's infringement claim relative to the '989 Patent and despite its failure to object to pendent venue, the judgment should be vacated and the case should be transferred for new trial in the U.S. District Court for the Central District of California.

II. STANDARD

"Venue must be determined based on the facts at the time of filing." Lewis v. Pension Ben. Guar. Corp., No. 14-Cv-03838, 2015 U.S. Dist. LEXIS 135130, 2015 WL 5577377 (N.D. Ga. Aug. 11, 2015) (quoting Flowers Indus., Inc. v. F.T.C., 835 F.2d 775, 778 n.1 (11th Cir. 1987) (holding that plaintiff was in the process of changing its incorporation to Georgia while the case was pending is not relevant, because "venue must be determined based on the facts at the time of filing"). Where a complaint sets forth multiple claims, venue must be established for each claim and each defendant. Vivani Pharms., LLC v. Clinical Formula, LLC, No. 10-21537-Civ., 2011 U.S. Dist. LEXIS 37343, 2011 WL 1303218 (S.D. Fla. Mar. 31, 2011) (citing Hoover Group, Inc. v. Custom Metalcraft, Inc., 84 F.3d 1408, 1410 (Fed. Cir. 1996). However, where all claims arise out of

[1] In their Answer CalAmp admits they consented to venue in this district as to the '989 patent and avers that they have not consented to venue regarding any of the other patents-in-suit. (Doc. 10, ¶4). However, CalAmp did not move to sever the other patents-in-suit from the '989 patent, nor did they object to pendent venue being exercised by this Court.

[2] CalAmp sought declaratory judgement as to all of the patents-in-suit and not just the '989 patent.

a common nucleus of operative facts, venue may be proper for the entire proceeding under pendent venue. *Id.* (citing Rodriguez v. Chandler, 641 F. Supp. 1292, 1302 (S.D.N.Y. 1986), *aff'd 841 F.2d 1117 (2d Cir. 1988)*.[3]

As to the impact of *TC Heartland*, a defense is unavailable "if its legal basis did not exist at the time of the answer or pre-answer **[*6]** motion" such that it was "for all practical purposes impossible for the defendant to interpose their . . . defense." Reebok Int'l LTD. v. TRB Acquisitions LLC, 2017 U.S. Dist. LEXIS 109576, 2017 WL 3016034 (D. Or. July 14, 2017) (citing Gilmore v. Palestinian Interim Self-Gov't Auth., 8 F. Supp. 3d 9, 13 (D.D.C. 2014), *aff'd*, 843 F.3d 958 (D.C. Cir. 2016)). An "intervening change in the law can constitute an 'extraordinary circumstance' that justifies relief under Rule 60(b)(6). Ritter v. Smith, 811 F.2d 1398, 1401 (11th Cir. 1987)."

III. DISCUSSION

A. Venue is Determined at the time of Filing

CalAmp ignores in their analysis of the venue issue the principle that "venue must be determined based on the facts at the time of filing." Flowers Indus., Inc., 835 F.2d at 778. Instead, CalAmp skips ahead to the United States Supreme Court's holding in *TC Heartland*, and advocates that venue was improper once Omega elected not to move forward on the '989 patent. This logic is flawed for the simple reason that venue must be determined at the time the action is filed and not at some future date in the proceedings.

Here venue was clearly proper based upon the facts at the time of filing. Omega commenced suit against CalAmp for their infringement of a number of patents-in-suit, including the '989 patent. (Doc. 1). CalAmp previously entered into a settlement agreement with Omega in which CalAmp "expressly consent[ed] to jurisdiction and venue in this District" as to the '989 patent. (Doc. 10, ¶ 4). Hence, venue was proper as to the '989 patent based upon the facts at the time **[*7]** the Complaint was filed. CalAmp cites no authority for the proposition that venue became improper once Omega elected not to proceed on the '989 patent, because to do so would be contrary to the law of this Circuit.[4] This leaves only one question: did the Court properly exercise pendent venue over the other patents-in-suit?

The Court notes that CalAmp never moved to sever the '989 patent—which is the patent supporting stipulated venue in this district—from the other patents-in-suit. That is, if the infringement of the '989 patent would not be determined by common issues of proof, common issues of fact, and witnesses common to all of the patents-in-suit, CalAmp should have moved to sever the remaining patents-in-issue from the '989 patent in order to preserve their objection to venue. Having stipulated to venue being proper in this district as relates to the infringement of the '989 patent, and knowing that venue is determined by the facts at the time the litigation is commenced, CalAmp should have known that pendent venue would render venue proper as to the remaining patents-in-suit if the infringement claim relating to the patents-in-suit arose from a common nucleus of fact. The Court concludes that CalAmp did not move to sever the other **[*8]** patents-in-suit from the '989 patent, because they recognized the common issues of fact and law, and the commonality of witnesses and exhibits, applicable to all of the patents-in-suit. That is, CalAmp appreciated, notwithstanding their objection, that pendent venue existed in this case, as will be demonstrated below.

B. Pendent Venue was Proper

---

[3] *See also,* Beattie v. United States, 756 F.2d 91, 244 U.S. App. D.C. 70 (D.C.Cir.1984) (court exercised pendent venue over improperly venued counts because of common identity of parties and proof); Reuber v. U.S., 750 F.2d 1039, 242 U.S. App. D.C. 370 (D.C.Cir.1984) (court applied pendent venue theory because of existence of common facts, common issues of proof and common witnesses demonstrating nexus between various counts); Jackson v. MCI Telecomms Corp., No. 92-2503-GTV, 1993 U.S. Dist. LEXIS 14280, 1993 WL 408332 (D.Kan.1993) (court heard plaintiff's claims under pendent venue theory after considering relatedness of claims, effect on judicial economy, convenience of the parties, and identity of damages); Dooley v. United Techs Corp., 786 F. Supp. 65 (D.D.C.1992) (court exercised pendent venue over all of plaintiff's claims after finding they arose out of same common nucleus of facts); Christian Dalloz, S.A. v. Holden, No. 90-0835, 1990 U.S. Dist. LEXIS 10888, 1990 WL 121342 (E.D.Pa.1990) (pendent venue applied when parties and proof are identical, which factors were evidence of common nucleus of operative fact).

[4] It is troubling, however, that CalAmp failed to cite controlling Eleventh Circuit law which was their duty to this Court.

The Complaint sets forth a single count of infringement of "the patents-in-suit" by the sale of a product identified as the LMU-3000.[5] (Doc. 1, ¶¶ 11-16). The patents-in-suit all pertain to various components of the infringing devices. For example, the '876 and '885 patents pertain to the data communications bus. (Doc. 39, p. 11). The '727 patent applies to the vehicle data communications bus, and the '278 patent describe the vehicle data bus. (*Id.*). CalAmp in their claim construction brief—filed before Omega elected not to pursue the '989 patent—observed that "[t]he patents-in-suit use several similar terms to describe a vehicle's data communications bus. All are intended to have the same meaning, and thus should be given the same construction." (*Id.*). CalAmp's claim construction brief identifies the patents-in-suit, including the '989 patent, as all being "based on continuations-in-part ("CIPs") of earlier applications. **[*9]** (*Id.* at p. 1). Omega claimed the infringing product(s) infringed claims 1, 3-5, 12, 14, 16, 28, 34-36 and 41 of the '876 patent, claims 23, 31, 32, 34 and 35 of the '989 patent, claims 1-3, 12, 14, and 24 of the '885 patent, claims 1, 10, 11, 19 and 25 of the '727 patent, and claims 1-6, 8, 11-14, 16, 18, 19 and 21 of the '278 patent. (*Id.* at p. 8). It is beyond dispute that all of the patents-in-suit involve a common nucleus of fact such that pendent venue was proper over the patents-in-suit. Since venue is determined at the time of filing, it is irrelevant that Omega elected on the first day of trial not to pursue the '989 infringement claims. CalAmp cites no authority supporting a contrary conclusion.

To put a finer point on this issue: even assuming the holding in *TC Heartland* constitutes an intervening change in the law, it is of no benefit to the Defendant. Clearly, the Supreme Court held in *TC Heartland* that is prior decision in *Fourco Glass Co. v. Transmirra Products Corp., 353 U.S. 222, 226, 77 S. Ct. 787, 1 L. Ed. 2d 786 (1957)*, correctly defined venue for purposes of *§ 1400(b)*, overturning the contrary holding in *VE Holding Corp. v. Johnson Gas Appliance Co., 917 F.2d 1574, 1578 (1990)*. *TC Heartland, 137 S. Ct. at 1521*. However, the holding in *TC Heartland* has no effect in the instant case, because venue was proper as to the '989 patent and as to the remaining patents-in-suit under the doctrine of pendent venue. The Supreme Court in *TC Heartland* established how venue is **[*10]** to be determined in these actions in the absence of a stipulation to venue accompanied by pendent venue.

[5] The offending products are the LMU-3000, LMU-3030, LMU-3050, VPOD and VPOD2. (Doc. 144).

While this Court need not address whether *TC Heartland* meets the intervening law exception to waiver to resolve the Defendant's motion, the Court will express its thoughts on the subject to allow for a more comprehensive review of the Court's analysis on appeal. In rejecting the conclusion reached in *VE Holdings*, the Supreme Court noted that in amending *§ 1391(c)* in 1988 and 2011, Congress did not indicate an intention to "alter the meaning of *§ 1400(b)* as interpreted in *Fourco*." *TC Heartland, 137 S. Ct. at 1519*. The Supreme Court decided *Fourco* in 1957, and respectfully this Court observes, as other Courts have, that the Federal Circuit cannot overturn Supreme Court precedent. *See Reebok Int'l LTD. v. TRB Acquisitions LLC, No. 3:16-cv-1618-SI, 2017 U.S. Dist. LEXIS 109576, 2017 WL 3016034 (D. Or. July 14, 2017)* (quoting *Elbit Sys. Land & C41 Ltd. v. Hughes Network Sys., LLC, No. 2:15-CV-00037-RWS-RSP, 2017 U.S. Dist. LEXIS 94495, 2017 WL 2651618, at * 20 (E.D. Tex. June 20, 2017)*; *see also Cobalt Boats, LLC v. Sea Ray Boats, Inc., 254 F. Supp. 3d 836, 2017 WL 2556679, at * 3 (E.D. Va., 2017)* (noting that "*Fourco* has continued to be binding law since it was decided in 1957, and thus, it has been available to every defendant since 1957"). Accordingly, CalAmp cannot take advantage of the intervening law exception to waiver of venue.

[*11] IV. CONCLUSION

The parties stipulated to venue in this judicial district for any litigation brought by Omega to enforce the '989 patent. At the time Omega instituted this litigation, venue was proper—pursuant to the Settlement Agreement—as to the infringement of the '989 patent. Contemporaneous with their action to enforce the '989 patent, Omega sought to enforce additional patents which "were based on continuations-in-part ("CIPs") of earlier applications." The patents-in-suit were infringed by CalAmp products and the issues, facts and evidence involved a common nucleus, which is no doubt why CalAmp did not seek to sever the other patents-in-suit from the '989 patent. Accordingly, pendent venue existed over the other patents-in-suit, and the pendent venue was not lost when Omega elected not to pursue infringement claims as to the '989 patent. To find otherwise would run contrary to the express holding of this Circuit announced in *Flowers Industries, Inc. v. F.T.C.*. Moreover, allowing a party to defeat venue after the litigation is commenced by, for example, moving their corporation out of the state invites gamesmanship. Which is precisely why venue is determined by facts at

the time of filing and not some other point in the litigation.

[*12] Accordingly it is hereby **ORDERED AND ADJUDGED** that CalAmp's Motion to Vacate the Judgment and Dismiss for Lack of Venue (Doc. 222) is **DENIED**.

DONE AND ORDERED in Orlando, Florida, on September 22, 2017.

/s/ Paul G. Byron

PAUL G. BYRON

UNITED STATES DISTRICT JUDGE

End of Document

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,419	8032278
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
STETINA BRUNDA GARRED & BRUCKER 75 ENTERPRISE, SUITE 250 ALISO VIEJO, CA 92656

LITIGATION REVIEW ☑	cmt (examiner initials)	08 January 2020 (date)
Case Name		Director Initials
Omega Patents, LLC v. Enfora, Inc., N.D. Ga, No. 1:13-cv-00646		
Omega Patents, LLC v. Enfora, Inc., N.D. Ga, No. 1:17-cv-02769		
Omega Patents, LLC v. CalAmp Corp., M.D. Fla., Orlando Division, No. 6: 13-cv-1950		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,419	12/16/2019	8032278

CONFIRMATION NO. 8770

REEXAM ASSIGNMENT NOTICE

CHRISTOPHER F. REGAN, ESQUIRE
ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA
PO BOX 3791
ORLANDO, FL 32802-3791

Date Mailed: 12/23/2019

NOTICE OF ASSIGNMENT OF REEXAMINATION REQUEST

The above-identified request for reexamination has been assigned to Art Unit 3993. All future correspondence to the proceeding should be identified by the control number listed above and directed to the assigned Art Unit.

A copy of this Notice is being sent to the latest attorney or agent of record in the patent file or to all owners of record. (See 37 CFR 1.33(c)). If the addressee is not, or does not represent, the current owner, he or she is required to forward all communications regarding this proceeding to the current owner(s). An attorney or agent receiving this communication who does not represent the current owner(s) may wish to seek to withdraw pursuant to 37 CFR 1.36 in order to avoid receiving future communications. If the address of the current owner(s) is unknown, this communication should be returned within the request to withdraw pursuant to Section 1.36.

NOTICE OF USPTO EX PARTE REEXAMINATION PATENT OWNER STATEMENT WAIVER PROGRAM

The USPTO has implemented a pilot program where, after a reexamination proceeding has been granted a filing date and before the examiner begins his or her review, the patent owner may orally waive the right to file a patent owner's statement. See *"Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings,"* 75 FR 47269 (August 5, 2010). One goal of the pilot program is to reduce the pendency of reexamination proceedings and improve the efficiency of the reexamination process.

Ordinarily when ex parte reexamination is ordered, the USPTO must wait until after the receipt of the patent owner's statement and the third party requester's reply, or after the expiration of the time period for filing the statement and reply (a period that can be as long as 5 to 6 months), before mailing a first determination of patentability. The USPTO's first determination of patentability is usually a first Office action on the merits or a Notice of Intent to Issue Reexamination Certificate (NIRC).

Under the pilot program, the patent owner's oral waiver allows the USPTO to act on the first determination of patentability immediately after determining that reexamination will be ordered, and in a suitable case issue the reexamination order and the first determination of patentability (which could be a NIRC if the claims under reexamination are confirmed) at the same time.

Benefits to the Patent Owner for participating in this pilot program include reduction in pendency.

To participate in this pilot program, Patent Owners may contact the USPTO's Central Reexamination Unit (CRU) at 571-272-7705. The USPTO will make the oral waiver of record in the reexamination file in an interview summary and a copy will be mailed to the patent owner and any third party requester.

cc: Third Party Requester(if any)
STETINA BRUNDA GARRED & BRUCKER
75 ENTERPRISE
SUITE 250
ALISO VIEJO, CA 92656

/rbell/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,419	12/16/2019	8032278

CONFIRMATION NO. 8770

STETINA BRUNDA GARRED & BRUCKER
75 ENTERPRISE
SUITE 250
ALISO VIEJO, CA 92656

REEXAMINATION REQUEST NOTICE

OC000000113505872

Date Mailed: 12/23/2019

NOTICE OF REEXAMINATION REQUEST FILING DATE

(Third Party Requester)

Requester is hereby notified that the filing date of the request for reexamination is 12/16/2019, the date that the filing requirements of 37 CFR § 1.510 were received.

A decision on the request for reexamination will be mailed within three months from the filing date of the request for reexamination. (See 37 CFR 1.515(a)).

A copy of the Notice is being sent to the person identified by the requester as the patent owner. Further patent owner correspondence will be the latest attorney or agent of record in the patent file. (See 37 CFR 1.33). Any paper filed should include a reference to the present request for reexamination (by Reexamination Control Number).

cc: Patent Owner
CHRISTOPHER F. REGAN, ESQUIRE
ALLEN, DYER, DOPPELT, MILBRATH & GILCHRIST, PA
PO BOX 3791
ORLANDO, FL 32802-3791

/rbell/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

Patent Assignment Abstract of Title

Total Assignments: 1

Application #: 11773272 **Filing Dt:** 07/03/2007 **Patent #:** 8032278 **Issue Dt:** 10/04/2011
PCT #: NONE **Intl Reg #:** **Publication #:** US20070279283 **Pub Dt:** 12/06/2007
Inventor: Kenneth E. Flick
Title: VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS

Assignment: 1

Reel/Frame: 019515 / 0350 **Received:** 07/03/2007 **Recorded:** 07/03/2007 **Mailed:** 07/03/2007 **Pages:** 3
Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).
Assignor: FLICK, KENNETH E., MR. **Exec Dt:** 07/02/2007
Assignee: OMEGA PATENTS, L.L.C.
5326 PRESLEY PLACE
DOUGLASVILLE, GEORGIA 30135
Correspondent: CHRISTOPHER F. REGAN
255 S. ORANGE AVENUE
SUITE 1401
ORLANDO, FL 32801

Search Results as of: 12/16/2019 10:15 AM

If you have any comments or questions concerning the data displayed, contact PRD / Assignments at 571-272-3350. v.2.6
Web interface last modified: Jun 26, 2017 v.2.6

11-08-00

A/pro

Please type a plus sign (+) inside this box → ⊞

(MODIFIED) PTO/SB/16 (12-97)
Approved for use through 1/31/98. OMB 0651-0037
Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Kurt	WITHAM	North Muskegon, Michigan
Scott	MEYERS	Grand Haven, Michigan
Dale	KENNEDY	New Era, Michigan

☐ *Additional inventors are being named on the ___ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (280 characters max)

SLIDE APPARATUS FOR MACHINE TOOLS

CORRESPONDENCE ADDRESS

Direct all Correspondence to:

☐ Customer Number [ ]

OR *Type Customer Number here*

Place Customer Number Bar Code Label here

X	Firm or Individual Name	Douglas H. Pauley				
	Address	Pauley Petersen Kinne & Fejer				
	Address	2800 West Higgins Road, Suite 365				
	City	Hoffman Estates	State	Illinois	ZIP	60195
	Country	USA	Telephone	847-490 1400	Fax	847-490 1403

ENCLOSED APPLICATION PARTS (check all that apply)

X Specification *Number of Pages* 26 — X Small Entity Statement

☐ Drawing(s) Number of Sheets [ ] — ☐ Other (specify) [ ]

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)

X A check or money order is enclosed to cover the filing fees — FILING FEE AMOUNT ($) $75.00

X The Commissioner is hereby authorized to charge *any deficiency in* filing fees or credit any overpayment to Deposit Acount Number: 19-3550

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

SIGNATURE Douglas H. Pauley — Date 11/07/00

TYPED or PRINTED NAME Douglas H. Pauley — REGISTRATION NO. 33,295

TELEPHONE 847-490 1400 — (If appropriate) Docket Number: AIM-101-P

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

SEND TO: Box Provisional Application, Assistant Comissioner for Patents, Washington, DC 20231

AIM-101-P

jc914 U.S. PTO
60/246463
11/07/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Kurt WITHAM
Scott MEYERS
Dale KENNEDY

Title: SLIDE APPARATUS FOR MACHINE TOOLS

Express Mail No.: EL686797339US

Date of Deposit: 07 November 2000

CERTIFICATE OF MAILING BY EXPRESS MAIL

EL686797339US

Box PROVISIONAL APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

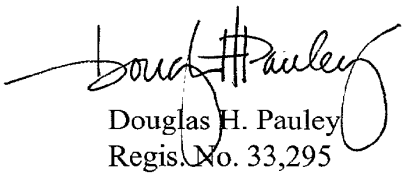
I hereby certify that the subject provisional patent application is being deposited with the United States Postal Service as Express Mail Post Office to Addressee No. EL686797339US, on 07 November 2000, and is addressed to Box PROVISIONAL APPLICATION, Assistant Commissioner for Patents, Washington, D.C. 20231, together with the items listed below.

- Provisional Application for Patent Cover Sheet, one (1) page, in duplicate
- Twenty-six (26) pages of specification
- Executed Claim for Small Entity Status document
- A check in the amount of $75.00 to cover the filing fee

Express Mail No.: EL686797339US

- Return Receipt Postcard

Respectfully submitted,



Douglas H. Pauley
Regis. No. 33,295

Pauley Petersen Kinne & Fejer
2800 West Higgins Road
Suite 365
Hoffman Estates, Illinois 60195
(847) 490-1400
FAX (847) 490-1403

DOCKET ALARM

PTO/SB/10 (10-92)

VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(d))-SMALL BUSINESS CONCERN	Docket Number AIM-101-P

Applicant or Patentee: Kurt WITHAM et al.
Serial or Patent No.:
Filed or Issued:
Title: SLIDE APPARATUS FOR MACHINE TOOLS

I hereby declare that I am

- ☐ the owner of the small business concern identified below:
- ■ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN: Automated Industrial Motion, Inc.
ADDRESS OF SMALL BUSINESS CONCERN: 1818 East Sherman Boulevard
Muskegon, Michigan 49444

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ■ the specification filed herewith with title as listed above.
- ☐ the application identified above.
- ☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention must file separate verified statements averring to their status as small entities and that no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization having any rights in the invention is listed below:

- ■ no such person, concern or organization exists.
- ☐ each such person, concern or organization is listed below:

Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: Kurt Witham
TITLE OF PERSON IF OTHER THAN OWNER: PRESIDENT / OWNER
ADDRESS OF PERSON SIGNING: 1818 East Sherman Boulevard, Muskegon, Michigan 49444
SIGNATURE: [signature] DATE: 11/7/00

PTO/SB/10 (10-92) P702.1

AIM-101-P

AIM AUTOMATED INDUSTRIAL MOTION

History of AIM Coated Square Gib Slides

Slides first employed on AIM CNC Spring Coilers in 1991. Today the slides are used on six different models of AIM Coilers.
Replacement slides for mechanical spring coilers introduced to the public in October 1994.
Coated square gib slides used on a variety of custom wire forming equipment since 1991.
DuraBond Slides introduced to public on July 9, 1999.

Product Description

AIM square gib slides are an alternative to the original bronze dovetail slides on Torin mechanical spring coilers. Our square gib design incorporates a Rulon coated surface, which provides high load capacity, is resistant to contaminants and can be run without lubrication. Mating surfaces are fabricated from hardened and ground A2 tool steel. The maintenance free slides are extremely durable and provide high accuracy.

Changes in 2000

Using Thompson Rod material for tool post rather than drill rod or tool steel
Hardening A2 slide to 58-62 Rc rather than 48-52 Rc.
Revised CNC machining process to minimize setups.
Converted to HRS material from gauge stock on gibs and bottom plates
Engraving DuraBond Logo on face of slide

Future changes

Considering a change from 0.040" Rulon to 0.031" which will provide higher rigidity.

1818 E. Sherman Blvd. • Muskegon, Michigan 49444 • Telephone (231) 739-5525 • Fax (231) 733-4981 • www.aimcoil.com

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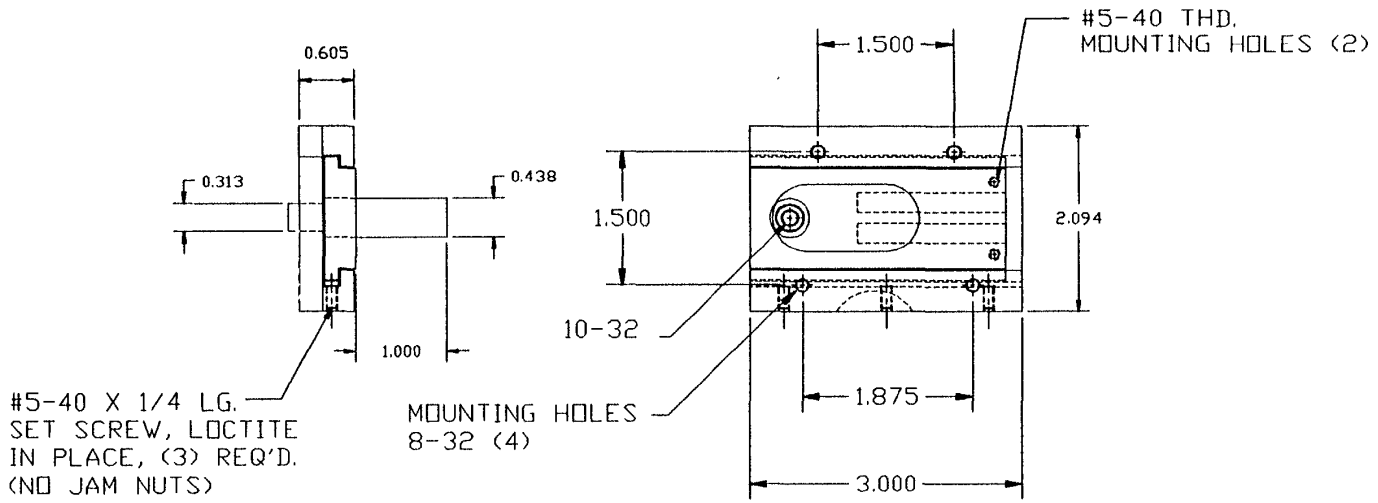

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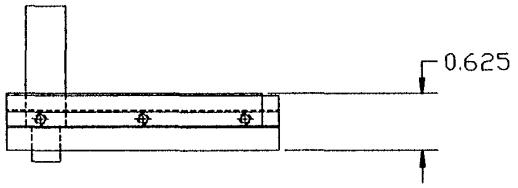
(4) REQ'D. ~ 8-32 X 1/2 LG. S.H.C.S.



W100A CUSTOMER APPROVAL

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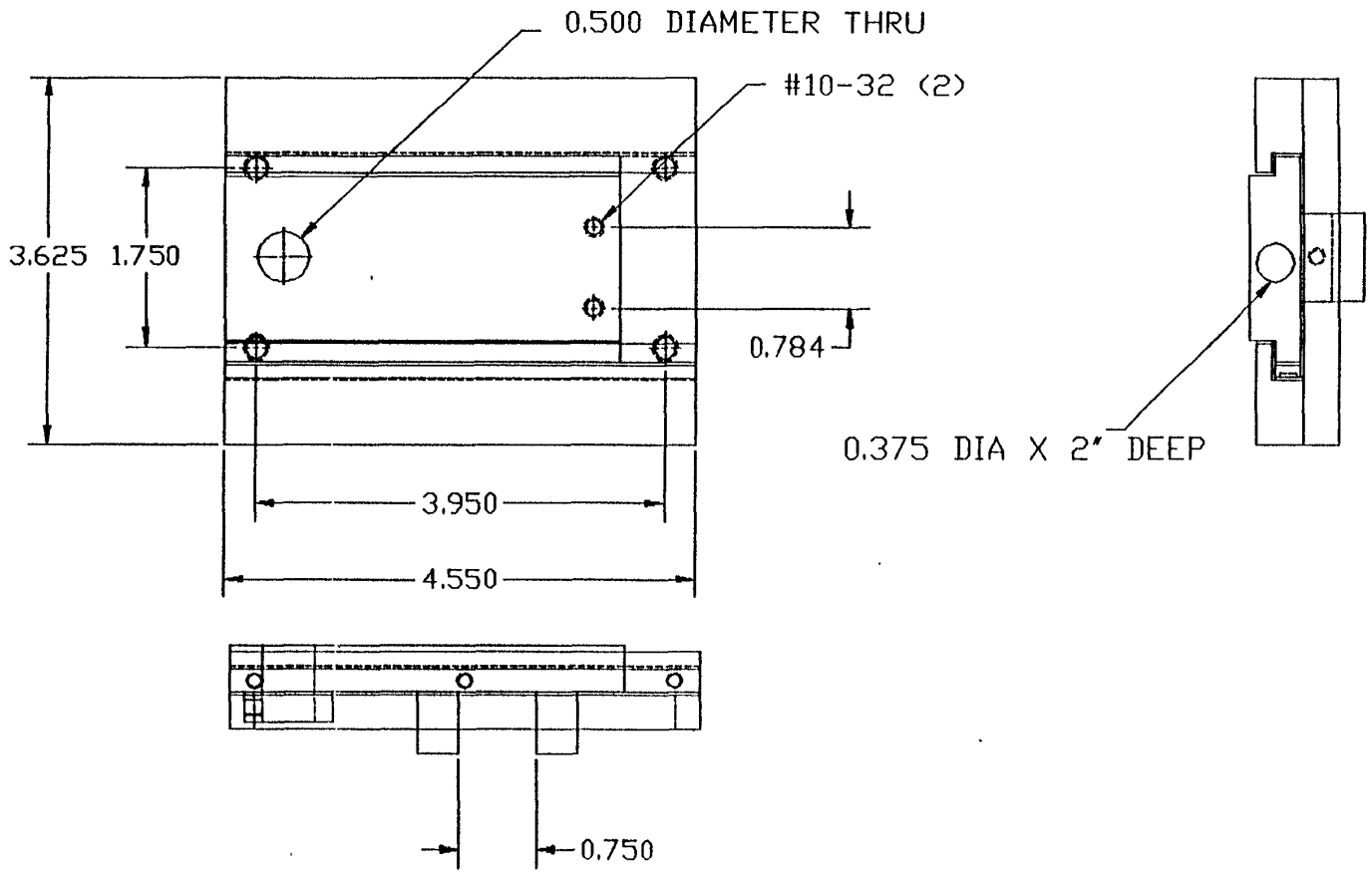

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10-32 X 3/8 (2)

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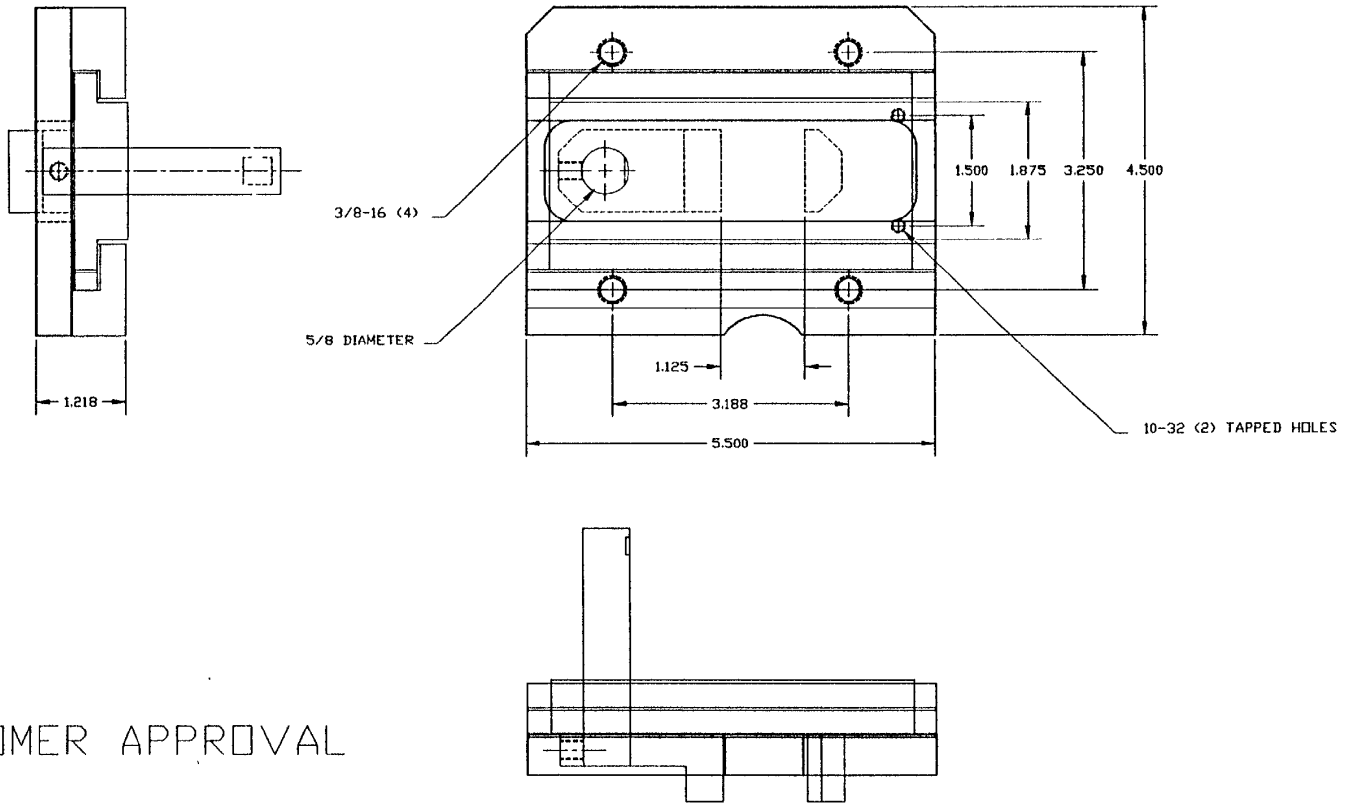
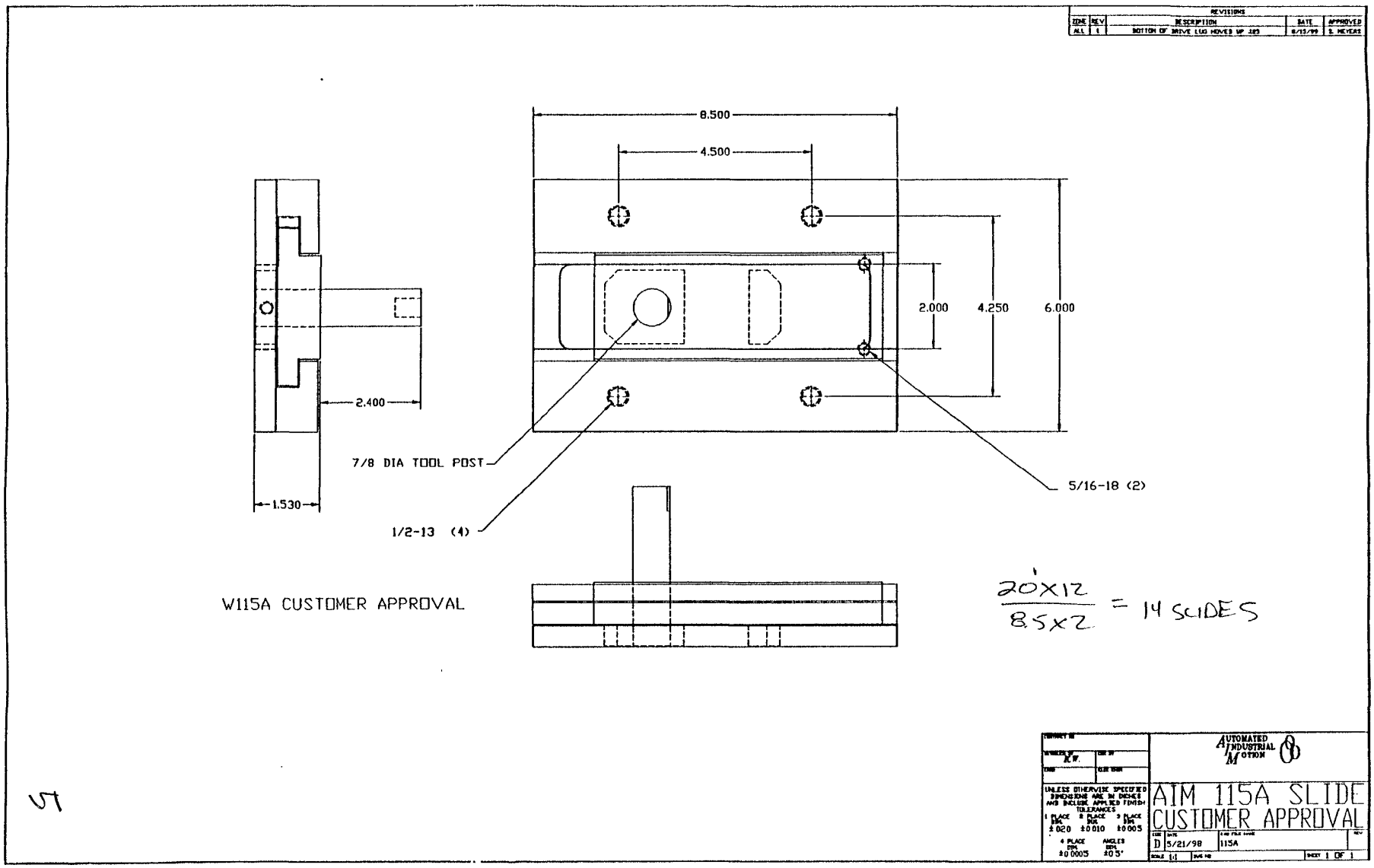
3



W11A CUSTOMER APPROVAL

4


REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
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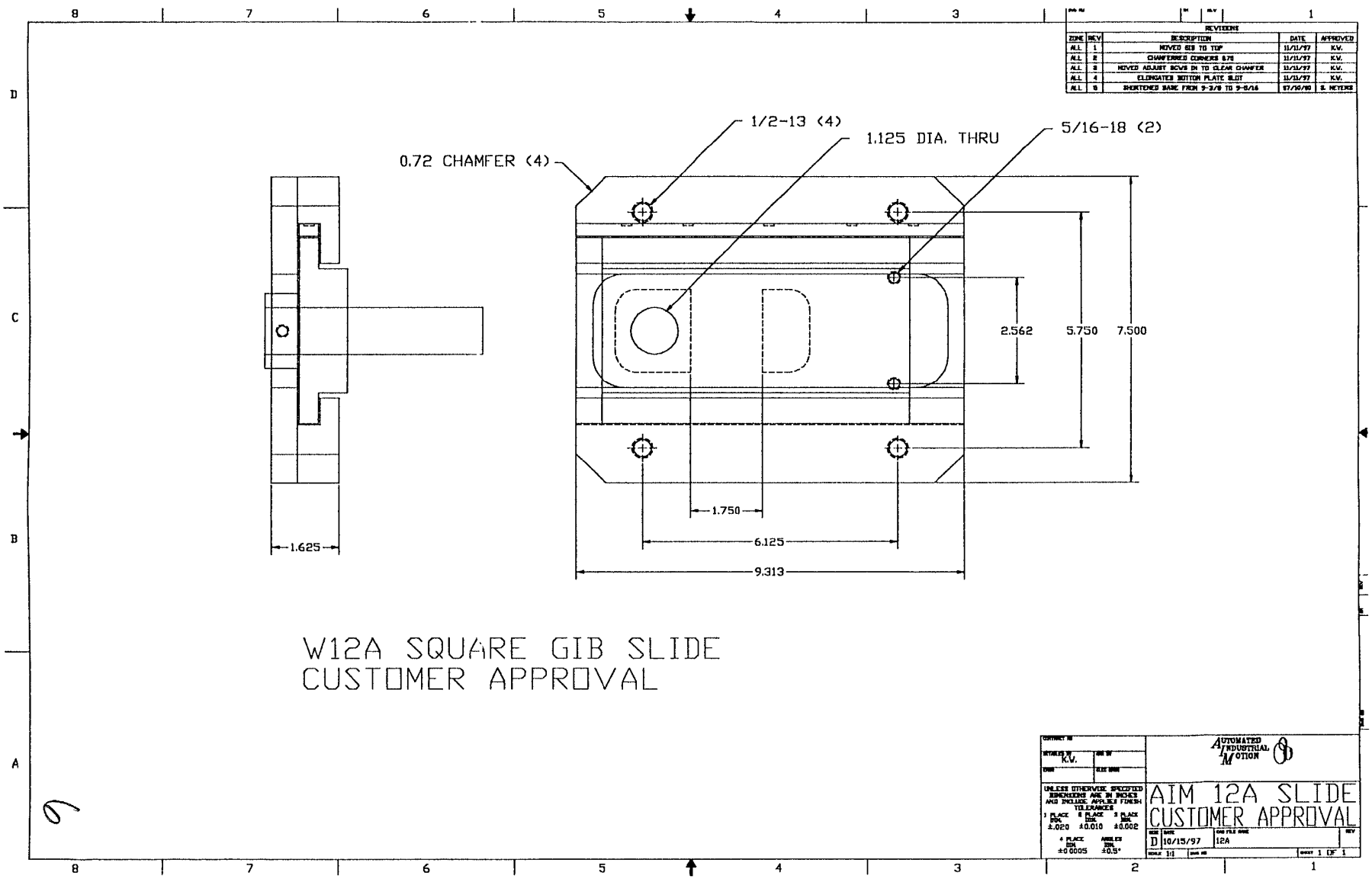
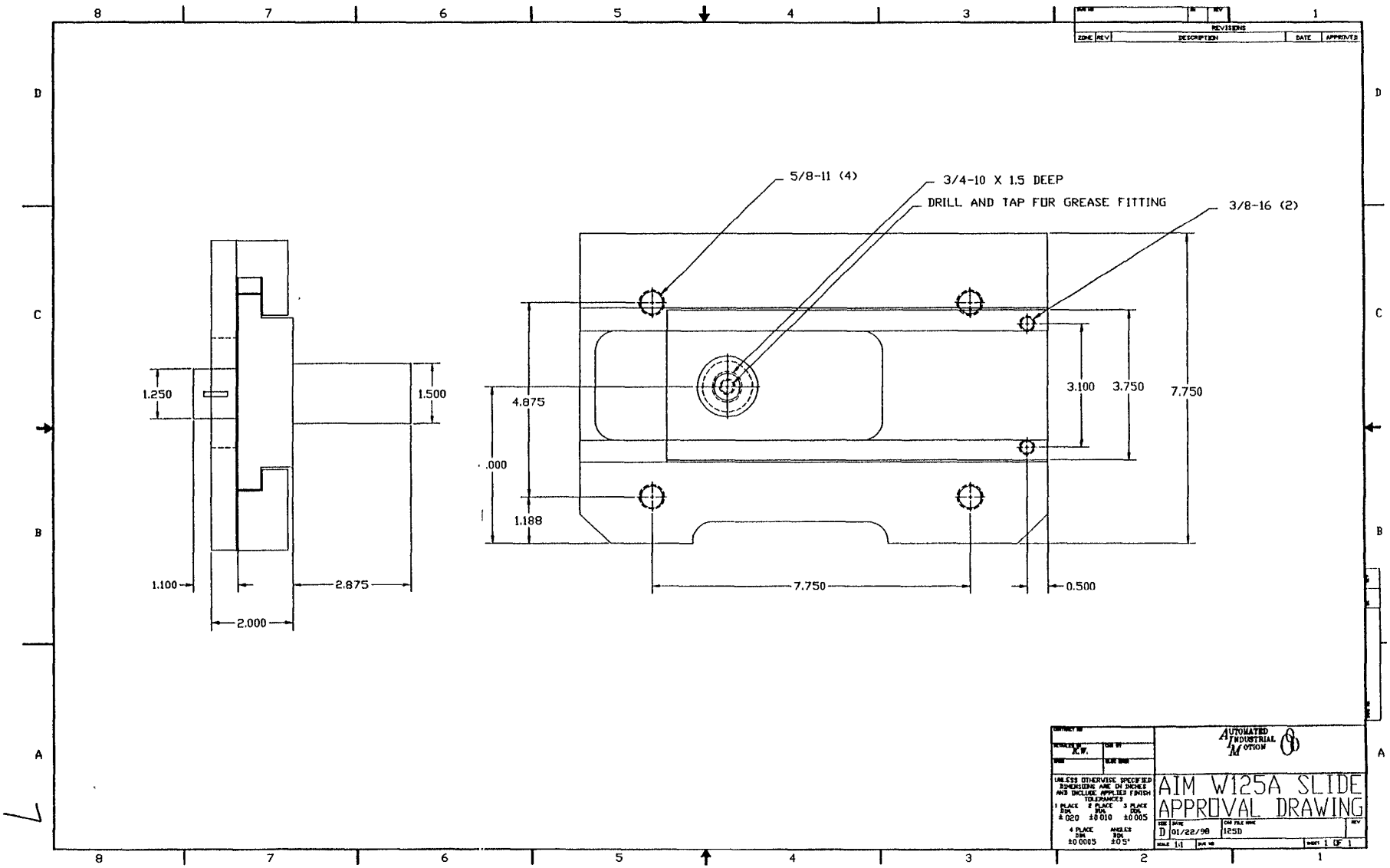
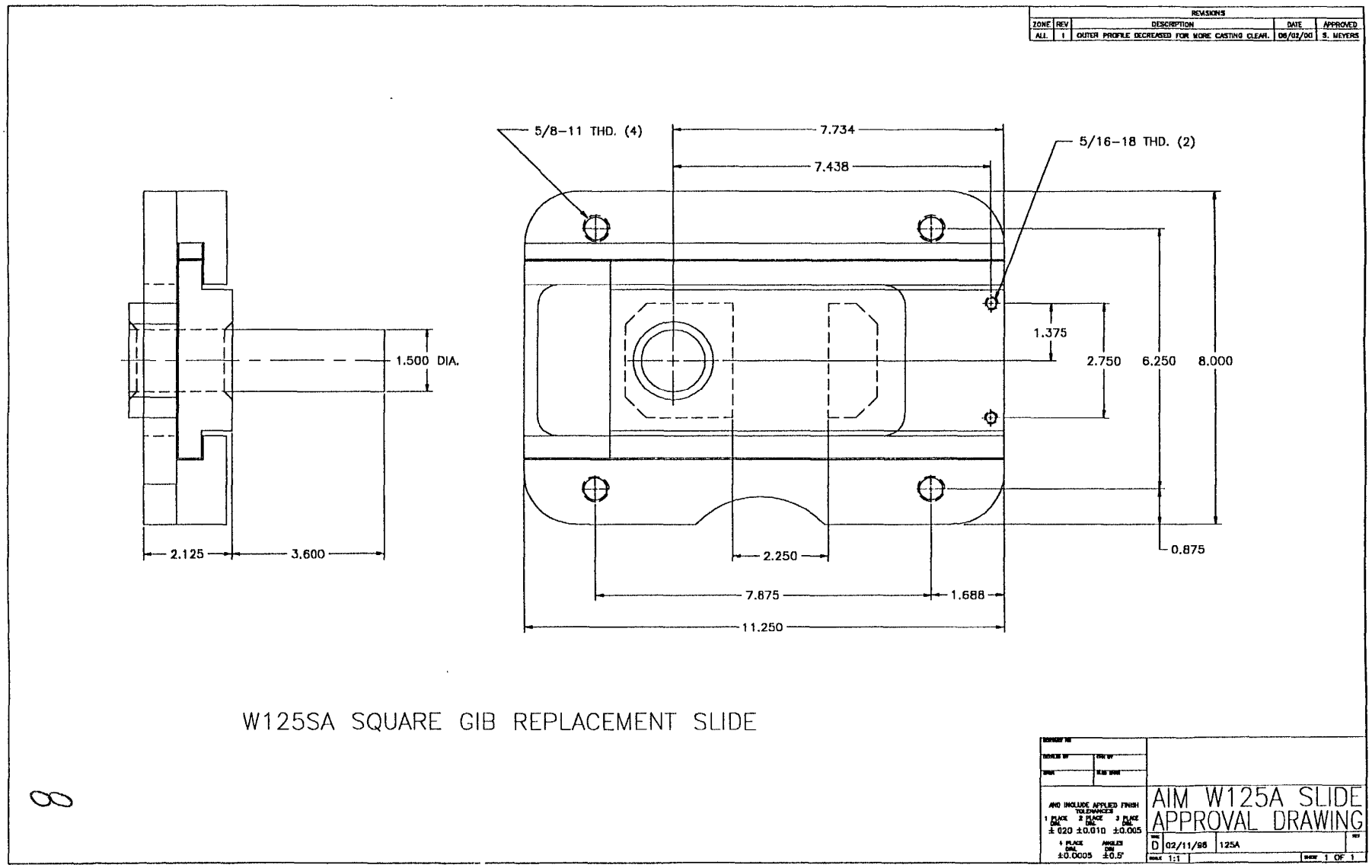
8.500
4.500
2.000
4.250
6.000
2.400
1.530
7/8 DIA TOOL POST
1/2-13 (4)
5/16-18 (2)
W115A CUSTOMER APPROVAL
20'x12 / 8.5x2 = 14 SLIDES
AUTOMATED INDUSTRIAL MOTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES
1 PLACE DIM. ±.020
2 PLACE DIM. ±0.010
3 PLACE DIM. ±0.005
4 PLACE DIM. ±0.0005
ANGLES DIM. ±0.5°
AIM 115A SLIDE
CUSTOMER APPROVAL
D 5/21/98 115A
SCALE 1:1
SHEET 1 OF 1
5



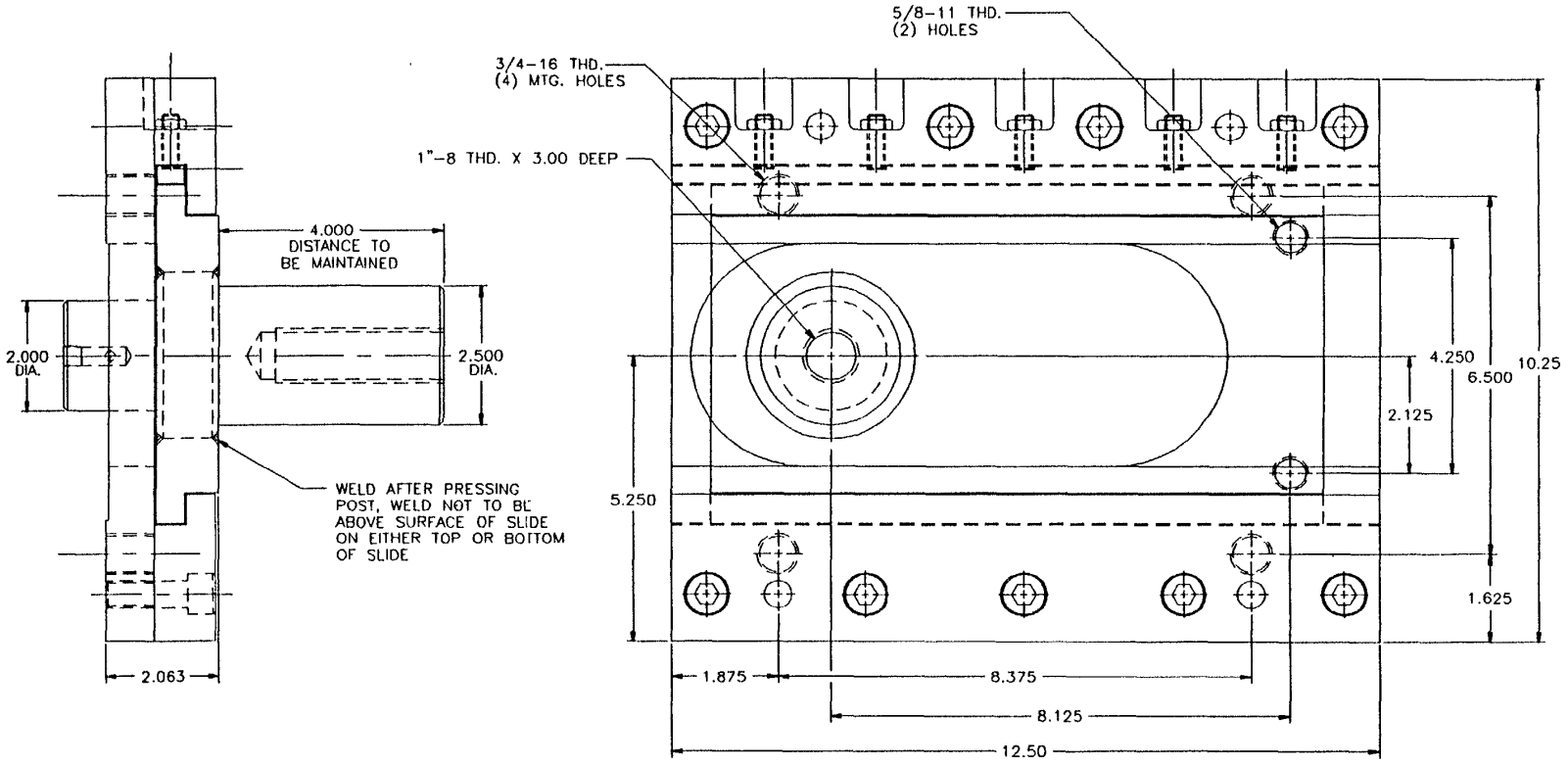
REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
ALL 1 MOVED GIB TO TOP 11/11/97 K.V.
ALL 2 CHAMFERED CORNERS 0.75 11/11/97 K.V.
ALL 3 MOVED ADJUST SCWS IN TO CLEAR CHAMFER 11/11/97 K.V.
ALL 4 ELONGATED BOTTOM PLATE SLOT 11/11/97 K.V.
ALL 5 SHORTENED BASE FROM 9-3/8 TO 9-5/16 97/10/80 S. MEYERS
1/2-13 (4)
1.125 DIA. THRU
5/16-18 (2)
0.72 CHAMFER (4)
2.562
5.750
7.500
1.750
6.125
9.313
1.625
W12A SQUARE GIB SLIDE
CUSTOMER APPROVAL
AUTOMATED INDUSTRIAL MOTION
K.V.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES
1 PLACE DIM. ±.020
2 PLACE DIM. ±0.010
3 PLACE DIM. ±0.002
4 PLACE DIM. ±0.0005
ANGLES DIM. ±0.5°
AIM 12A SLIDE
CUSTOMER APPROVAL
D 10/15/97 12A
SCALE 1:1
SHEET 1 OF 1

DOCKET ESKSA209




REVISIONS
ZONE REV DESCRIPTION DATE APPROVED
ALL 1 OUTER PROFILE DECREASED FOR MORE CASTING CLEAR. 06/02/00 S. MEYERS
5/8-11 THD. (4)
7.734
7.438
5/16-18 THD. (2)
1.500 DIA.
1.375
2.750
6.250
8.000
2.125
3.600
2.250
0.875
7.875
1.688
11.250
W125SA SQUARE GIB REPLACEMENT SLIDE
AND INCLUDE APPLIED FINISH TOLERANCES
1 PLACE DIM. ±.020
2 PLACE DIM. ±0.010
3 PLACE DIM. ±0.005
4 PLACE DIM. ±0.0005
ANGLES DIM ±0.5°
AIM W125A SLIDE APPROVAL DRAWING
D 02/11/98 125A
SCALE 1:1
SHEET 1 OF 1

8



DRAWN BY: S. MEYERS	CHK BY:	AIM AUTOMATED INDUSTRIAL MOTION	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH TOLERANCES: 1 PLACE DIM ± .020; 2 PLACE DIA ±0.010; 3 PLACE DIM ±0.005; 4 PLACE DIM ±0.0005; ANGLES DIM ±0.5°		AIM 13A SLIDE CUSTOMER APPROVAL	
		SIZE C; DATE 1-18-99; 13AASSY; REV	
		SCALE NONE; SHEET	

AIM for every production advantage you need!

Replacement Slide Assemblies

10

Designed to improve the production quality of your mechanical coilers and offer you a low cost advantage.

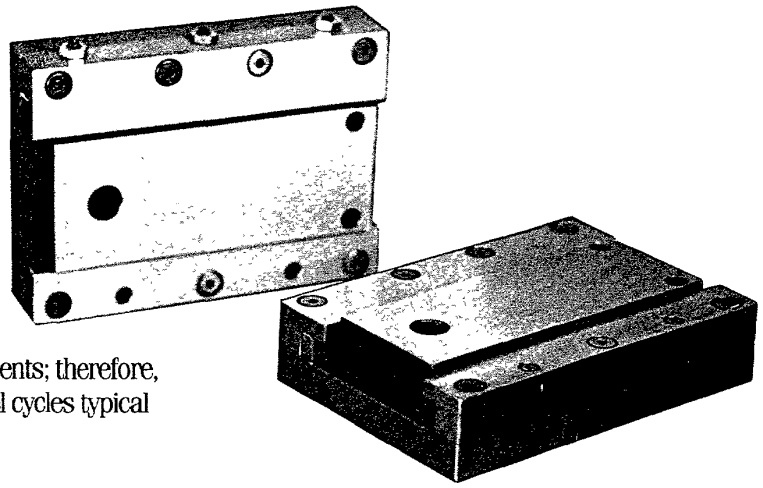
AIM

Automated Industrial Motion

The Leader In Production Advantages

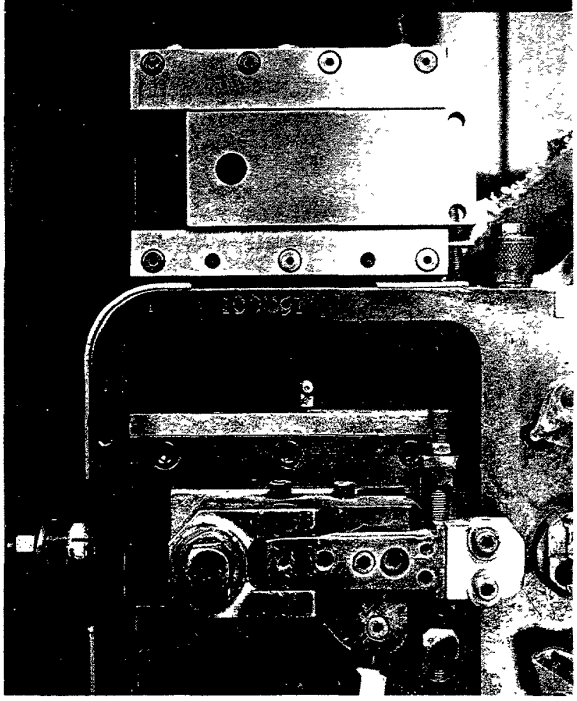
The Maintenance-Free Advantage

from Automated Industrial Motion AIM



AIM square gib replacement slides for mechanical coilers eliminate the need for constant lubrication that ball slides and bronze gibs require. The square gib features an innovative surface providing both strength and resistance to foreign particles. AIM square gib replacement slides contain no rolling elements; therefore, they are ideally suited for the short travel cycles typical in most coiling applications.

AIM slides offer a directly interchangeable low cost quality production advantage



- ❑ Designed for easy replacement
- ❑ Permanent "built-in" lubrication
- ❑ Grinding dust and metal particals do not adversely affect performance
- ❑ Can operate dry or wet
- ❑ Available for most sizes and configurations
- ❑ High load capacity
- ❑ Square gib slides perform well in difficult environments
- ❑ Self-lubricating surface reduces maintenance
- ❑ Long lasting accuracy and repeatability
- ❑ Noise and vibration dampening
- ❑ Quick delivery on standard sizes
- ❑ Custom design available

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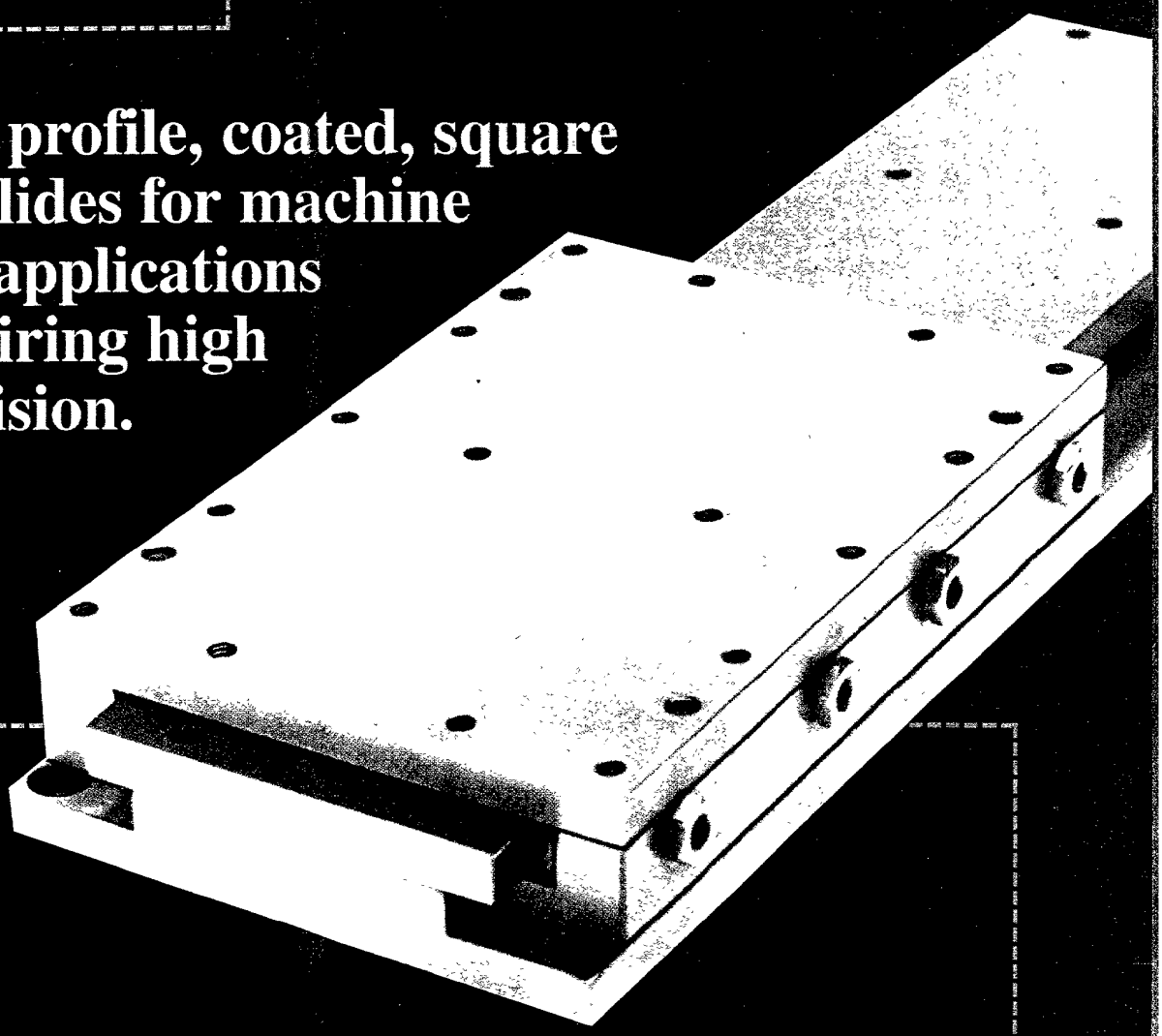
Phone (616) 739-5525 FAX (616) 733-4981

Ex. 1008 - Page 154

AIM AUTOMATED INDUSTRIAL MOTION

Low profile, coated, square gib slides for machine tool applications requiring high precision.



DURABOND™ SLIDE

12

BASIC COMPONENTS

1. Base
Stationary member of the slide system. Manufactured from high quality tool steel, hardened to 58-62 Rc and finish ground.

2. Saddle
Moving member of the slide system. Manufactured from high quality steel, bonded with Rulon® bearing material and finish ground.

3. Way
Saddle tracking member. Manufactured from high quality steel, bonded with Rulon® bearing material and finish ground.

4. Adjustment Way
Saddle retaining member. Manufactured from high quality steel, bonded with Rulon® bearing material and finish ground.

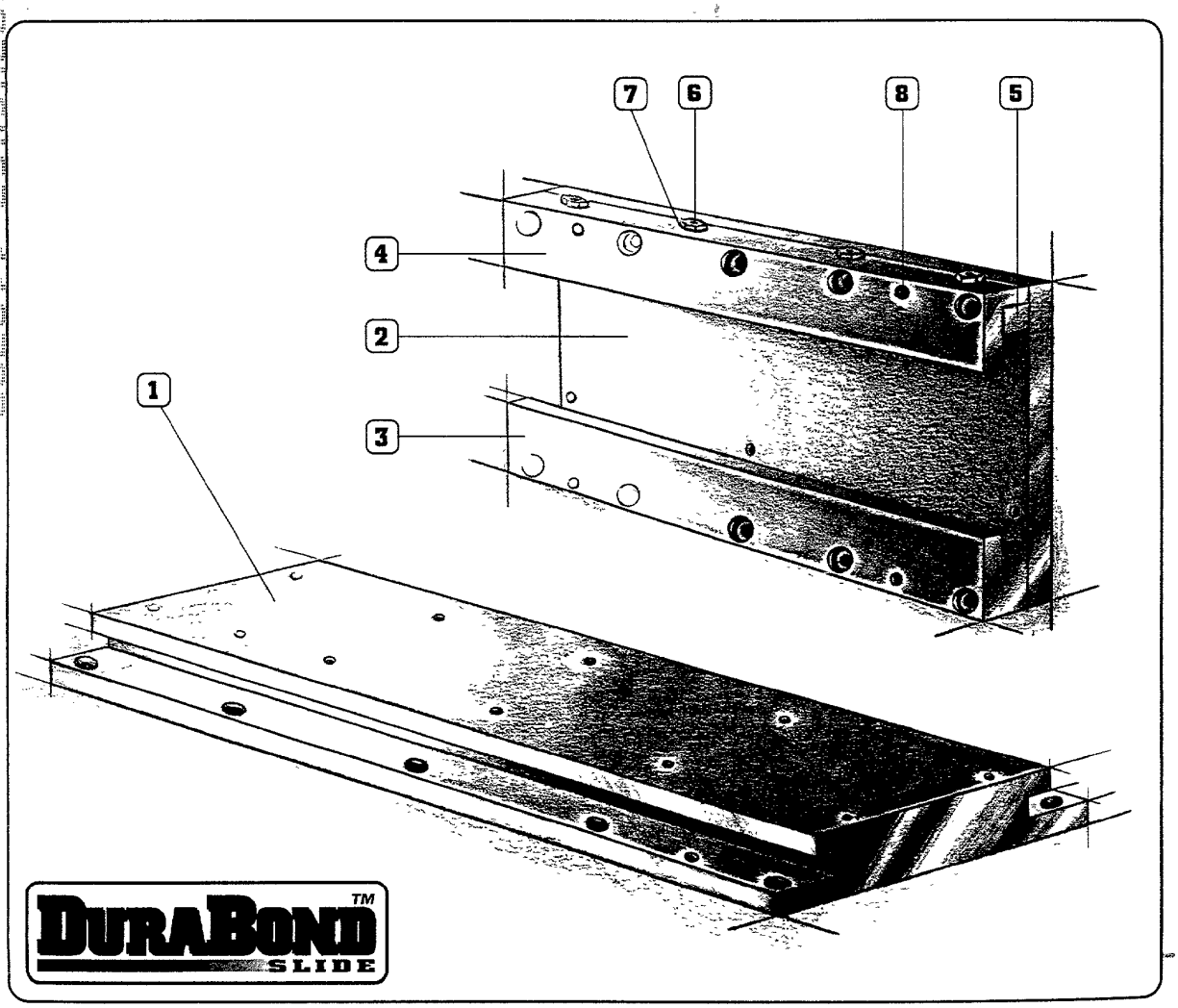
5. Adjustment Gib
Adjustable member of the slide system for setting clearance between the saddle and base. This member is bonded with Rulon® bearing material and finish ground.

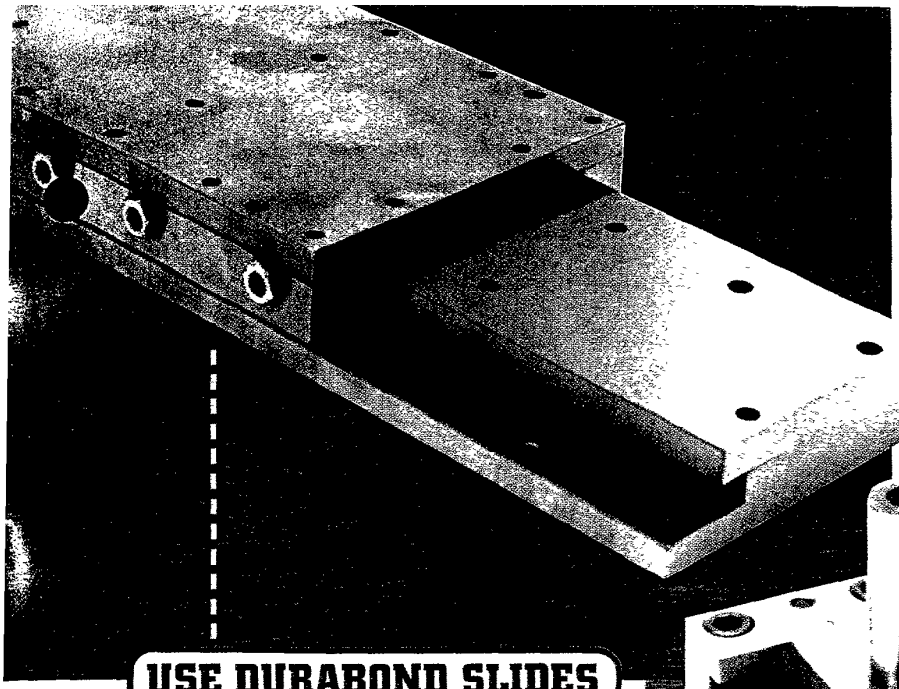
6. Gib Screw
High quality, fine thread Allen head set screws strategically oriented along one side of the saddle for positioning the adjustment gib.

7. Gib Screw Nut
Locks the gib screw in place to maintain gib adjustment.

8. Dowel Pins
Dowel pins are incorporated for definitive alignment of the ways and saddle plate.

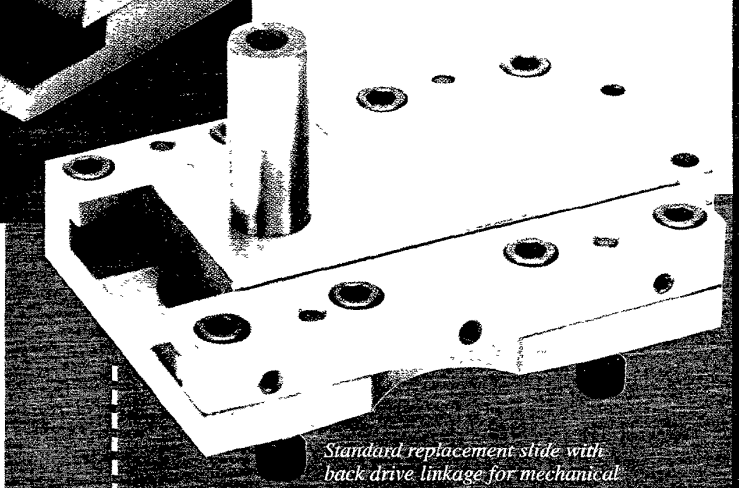
Each slide is assembled and individually fitted by qualified toolmakers prior to shipment.



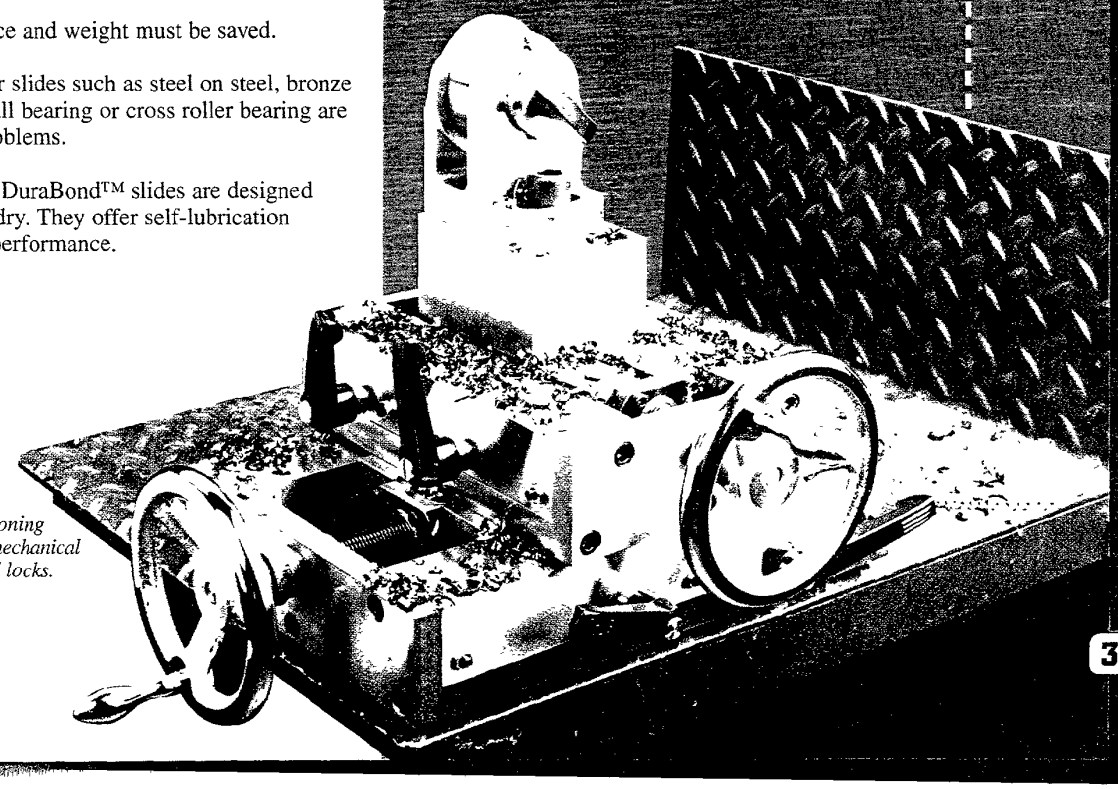


USE DURABOND SLIDES

- Wherever high quality, high precision slides are required.
- Where lubrication is undesirable or impossible.
- In corrosive environments, with non-lubricating liquids, or under conditions of high or low humidity, where high vacuums are present.
- In lubricated applications where friction and wear rates are unacceptable during starting and stopping, or where stick/slip is a problem.
- Where the electrical and insulative properties are important.
- Where space and weight must be saved.
- When other slides such as steel on steel, bronze on steel, ball bearing or cross roller bearing are causing problems.
- In general, DuraBond™ slides are designed to operate dry. They offer self-lubrication with high performance.



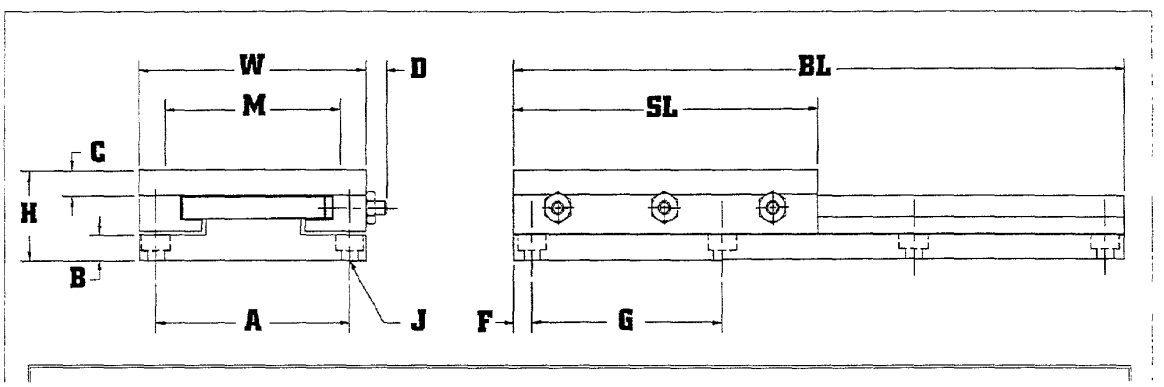
Standard replacement slide with back drive linkage for mechanical spring coilers.



Two-Axis positioning slide featuring mechanical screw drive and locks.

STANDARD LOW PROFILE SLIDE ASSEMBLIES IN WIDTHS FROM 2" TO 12"

DURABOND™ SLIDE



SADDLE DIMENSIONS

Series	W *Saddle Width*	H *Overall Height*	SL *Saddle Lengths*	M *Mounting Area*	A *Hole Width*	B *Flange Thick*	C *Plate Thick*	D *Gib Adj.*	E *Screw Size*
AS02	2.00	.938	3.00, 6.00, 8.00	1.38	1.625	.25	.25	.21	#8 SHCS
AS03	3.00	1.125	4.00, 6.00, 8.00	2.31	2.563	.31	.31	.27	#10 SHCS
AS04	4.00	1.375	6.00, 8.00, 10.00	3.19	3.500	.38	.38	.27	¼ SHCS
AS06	6.00	1.875	9.00, 12.00, 14.00	5.00	5.344	.47	.47	.30	5/16 SHCS
AS08	8.00	2.250	12.00, 14.00, 16.00	6.81	7.250	.56	.56	.44	⅜ SHCS
AS010	10.00	2.500	15.00, 18.00, 24.00	8.81	9.250	.62	.62	.44	⅜ SHCS
AS012	12.00	2.625	18.00, 24.00, 26.00	10.81	11.250	.62	.62	.44	⅜ SHCS

STATIC LOAD CAPACITY PER INCH OF ENGAGEMENT

Series	*Vertical Plane*	*Horizontal Plane*	*Inverted Plane*
AS02	1030	250	380
AS03	1870	260	500
AS04	2660	315	625
AS06	4220	470	940
AS08	5900	625	1250
AS010	7900	625	1250
AS012	9900	750	1500

DESIGN NOTES

1. Load capacity chart to be used as a guideline only.
2. Capacities shown based on static load limits of Rulon® LR at 1000 P.S.I.
3. Minimum saddle engagement not to exceed half of saddle length.
4. Lever arms not to exceed (2) times width of saddle from any direction.
5. Load capacities shown are for weights evenly distributed over saddle length.
6. All loads shown are in pounds per square inch of base/saddle contact length.
7. All dimensions are in inches.

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ORDER NUMBER INFORMATION — MOUNTING NOTES

Saddle Width (2" Wide)	Saddle Length (6" Long)	Base Length (12" Long)

AS02-SL06-BL12

1. (2) Location dowels are provided in each base.
2. Metric mounting holes available on request.
3. Tooling hole patterns in saddle, machined to customer specs. Available on request.

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AS02 BASE CONFIGURATIONS

BL *Base Lengths*	4.00	6.00	8.00	10.00	12.00
F *From Edge*	.25	.38	.50	.62	.75
G *Hole Spacing*	1.750	1.750	1.750	1.750	1.750
No. of Mounting Holes	6	8	10	12	14

AS03 BASE CONFIGURATIONS

BL *Base Lengths*	6.00	8.00	12.00	16.00	18.00
F *From Edge*	.50	.25	1.00	.50	.25
G *Hole Spacing*	2.500	2.500	2.500	2.500	2.500
No. of Mounting Holes	6	8	10	14	16

AS04 BASE CONFIGURATIONS

BL *Base Lengths*	12.00	14.00	16.00	18.00	20.00
F *From Edge*	.50	1.50	1.12	.75	.38
G *Hole Spacing*	2.750	2.750	2.750	2.750	2.750
No. of Mounting Holes	10	10	12	14	16

AS06 BASE CONFIGURATIONS

BL *Base Lengths*	12.00	14.00	16.00	18.00	20.00
F *From Edge*	1.12	.50	1.50	.88	1.88
G *Hole Spacing*	3.250	3.250	3.250	3.250	3.250
No. of Mounting Holes	8	10	10	12	12

AS08 BASE CONFIGURATIONS

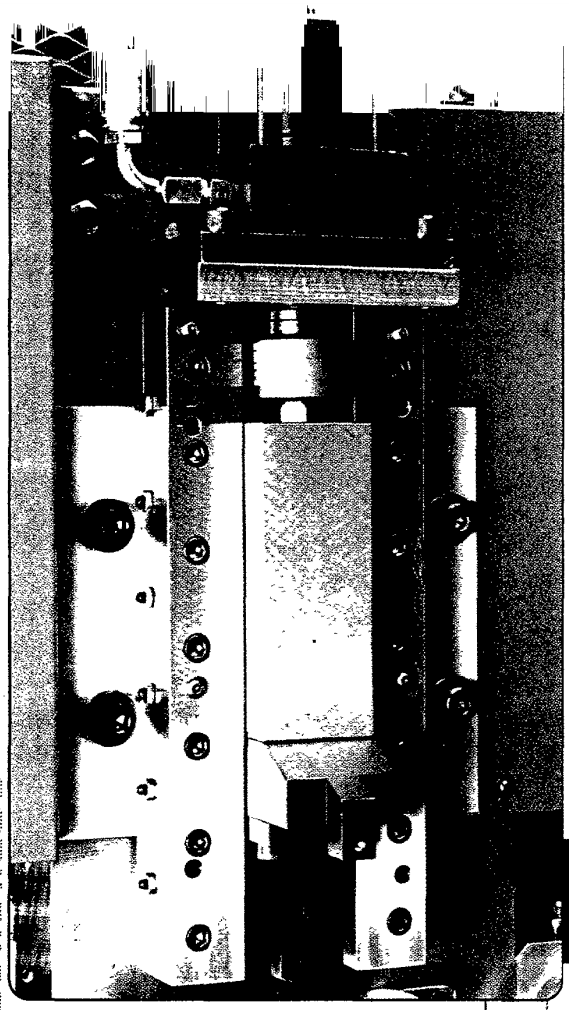
BL *Base Lengths*	14.00	16.00	18.00	20.00	24.00
F *From Edge*	1.38	.50	1.50	.62	.75
G *Hole Spacing*	3.750	3.750	3.750	3.750	3.750
No. of Mounting Holes	8	10	10	12	14

AS010 BASE CONFIGURATIONS

BL *Base Lengths*	18.00	22.00	26.00	28.00	32.00
F *From Edge*	.75	.69	.62	1.62	1.56
G *Hole Spacing*	4.125	4.125	4.125	4.125	4.125
No. of Mounting Holes	10	12	14	14	16

AS012 BASE CONFIGURATIONS

BL *Base Lengths*	22.00	24.00	28.00	30.00	32.00
F *From Edge*	.69	1.69	1.62	.56	1.56
G *Hole Spacing*	4.125	4.125	4.125	4.125	4.125
No. of Mounting Holes	12	12	14	16	16



Hydraulically actuated DuraBond™ slide with adjustable stroke.

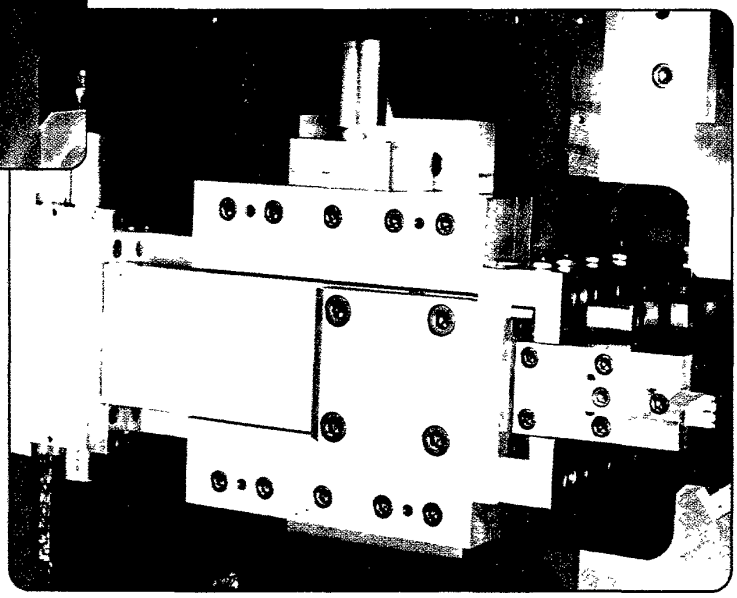
DURABOND™ CUSTOM SLIDES

DuraBond™ custom slides are designed for specific applications where standard slides are not commercially available.

DuraBond™ slides are ideal for upgrading original slide systems on worn out manufacturing equipment. The slides are engineered to duplicates exact dimensional characteristics including cross section, stroke, mounting holes and tooling bolt patterns.

DuraBond™ slides can be built from prints, electronic file data, or existing slides can be sent to us directly for duplication. In most cases, slides are documented and returned on the day of receipt.

Contact our sales engineering staff to discuss the method best suited for you.



Servo actuated, three axes DuraBond™ slide system.

SPECIFICATIONS

Saddle Width	2" to 12"
Base Length	4" to 32"
Stroke	0" to 18"
Load	Up to 260,000 pounds

•Single and multi axis slides are available.

•Actuation systems include mechanical screw, pneumatic, hydraulic, stepper and servo.

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DURABOND SLIDES

PERFORMANCE CONSIDERATIONS

LOAD

DuraBond™ slides are generally limited to 1000 psi, however: load limits can be increased by using thinner Rulon® cross sections.

SPEED

DuraBond™ slides are generally limited to 400 feet per minute under dry, low load operation. Higher speeds are possible with lubricants or liquid coolants.

FRICTION

Friction decreases rapidly with increases in load. Figure 1 shows the effect of surface velocity on friction. Because friction at start up and very low speeds is extremely low. stick/slip is virtually non-existent, making DuraBond™ slides ideal for start/stop applications.

MATING SURFACES

Performance is optimized when the hardest possible mating member is used. DuraBond™ bases are fabricated from A2 tool steel and hardened to 58-62 Rc.

CORROSION RESISTANCE

Rulon® material is practically inert to all acids, bases and solvents.

CONTAMINATION

Although Rulon® material embeds foreign particles to prevent wear; shielding or covering is suggested in areas of heavy contamination. Where practical, the saddle should maintain complete engagement with the base to produce a self-wiping action.

FIGURE 1
COEFFICIENT OF FRICTION VS. LOAD

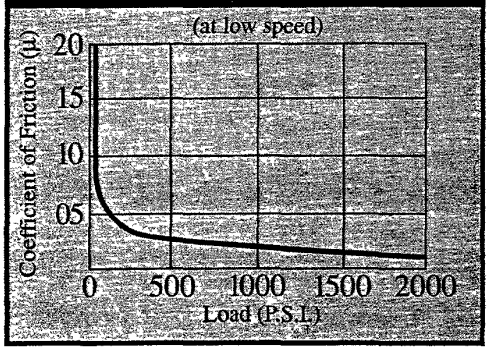
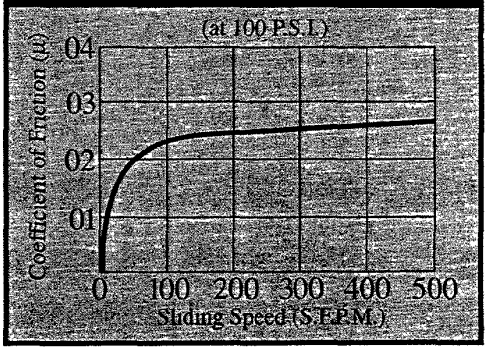


FIGURE 2
COEFFICIENT OF FRICTION VS. SPEED



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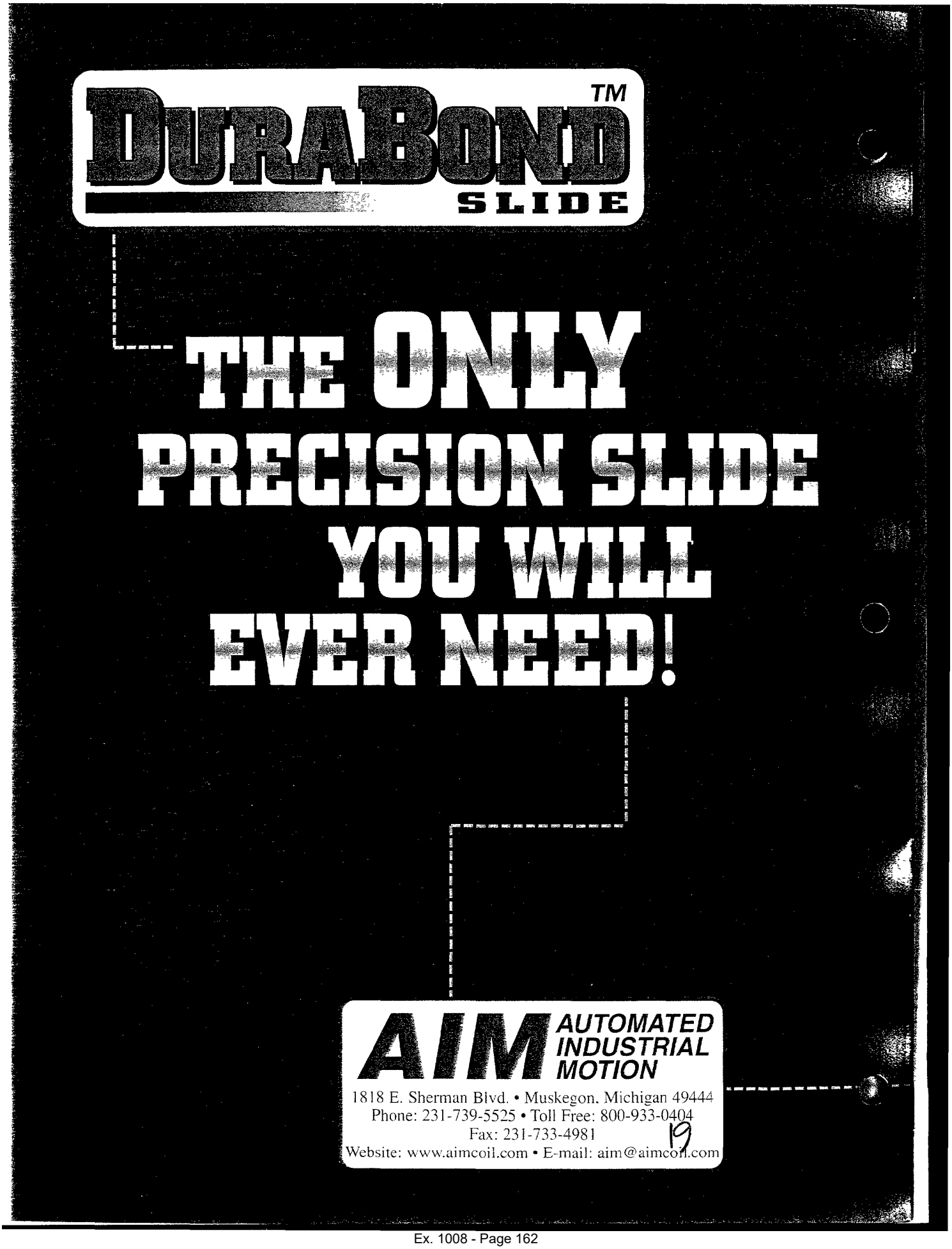
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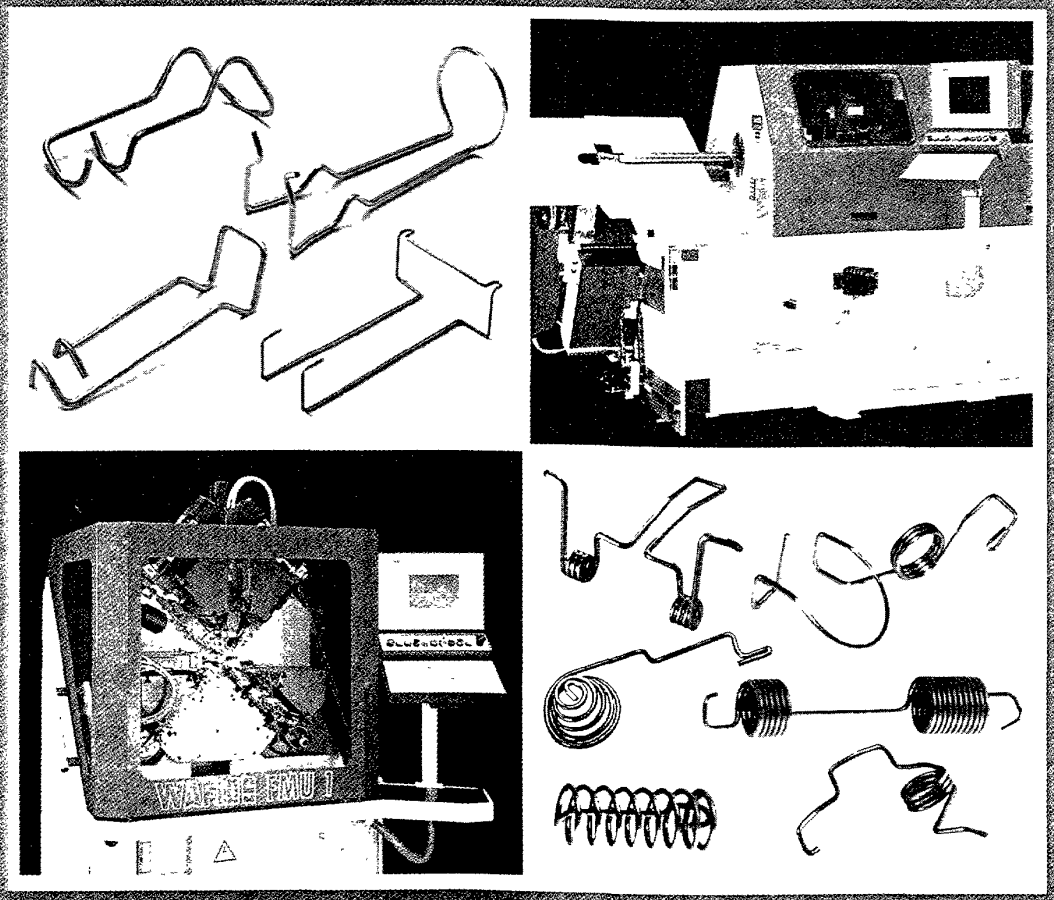

Inside ... Spring Making, Wire Forming, Welded Assembly of Wires, CASMI All Springs 98 Preview

20

Which Slide is Best?

by:
Kelly Dausey
AIM Automated Industrial Motion
1818 E. Sherman Blvd.
Muskegon, MI 49444 USA

Slides used in forming and springmaking machines require precision, stability, reliability, high load capacity, good wear characteristics and reduced maintenance. Only one type of slide meets all of these requirements.

No matter what type of wire bending or springmaking equipment you use, the repeatability and long term effectiveness of your equipment is highly dependent on the linear motion system that guides the tooling axes. This system, which serves as an integral part of the forming process, generally consists of a driving mechanism (either servo or cam actuated) and a slide.

Because of the rigorous requirements of wire forming and springmaking applications, the slide must be rigid and durable, and it must operate with as little maintenance as possible. Advances in linear motion technology have brought about many different slide configurations that offer improved features over what was once the standard on most wire forming and springmaking machines. With so many choices available, it can be difficult to determine which type of slide is best for each application.

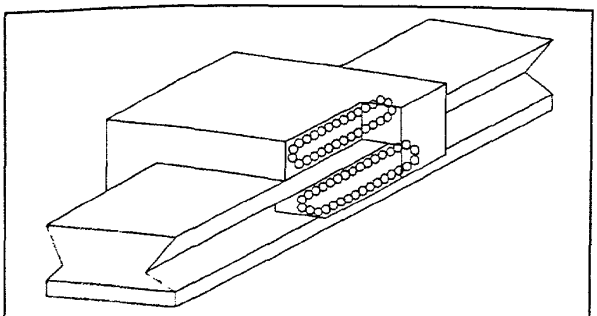

Fig. 1 — Recirculating ball slide has spherical rollers.

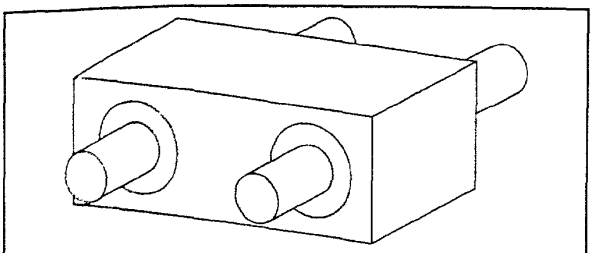

Fig. 2 — Linear ball bearing slide also has spherical rollers.

Rolling Element Slides

Many slides on the market today operate through the circulation of rolling bearing elements which may be either spherical or cylindrical in shape. Three commonly used slide types in this category are the recirculating ball slide (**Figure 1**), linear ball bearing slide (**Figure 2**) and roller bearing slide (**Figure 3**). Recirculating ball and linear ball bearing slides contain spherical rollers and roller bearing slides use cylindrical rollers.

As the moving part of the slide translates over the stationary part of the slide, these elements in turn circulate through a channel or track whose profile complements that of the rolling element, being either radiused or linear. The geometry of the track thus distributes the load on each element over as much surface as possible.

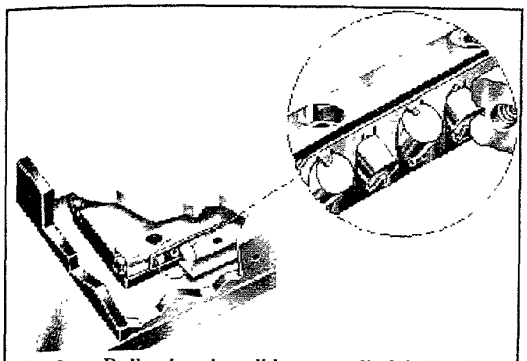

Fig. 3 — Roller bearing slide uses cylindrical rollers.

Because there is minimal surface contact, the frictional force is quite low and thus the efficiency is higher for rolling element slides when compared to nonrolling element slides. These slides work optimally where the application offers long strokes or travel distances which allow the bearing elements to completely recirculate and distribute both load and lubricant over as many elements as possible. Applications characterized by short repetitive cycles, however, can be somewhat problematic for rolling element slides. Localized wear can result because there is no opportunity for complete circulation and contact is repeatedly made over just a fraction of the total bearing element surface available.

Because forces are distributed over a limited surface area, these slides are not well suited for impact or shock loading such as would occur in wire cutting or even in repetitive, short stroke high accel/decel applications. *Brinelling*, or the permanent indentation of the slide surface by the rolling element due to dynamic loading, can result under these conditions.

Because there is steel-on-steel contact in rolling element slides, lubrication is critical in minimizing wear and optimizing performance. Care should be taken to avoid contamination of the recirculating tracks with wire shavings or grinding dust common in spring manufacturing environments. Contaminants can aggravate conditions known as counterrotation and stick-slip (see **Figure 4**).

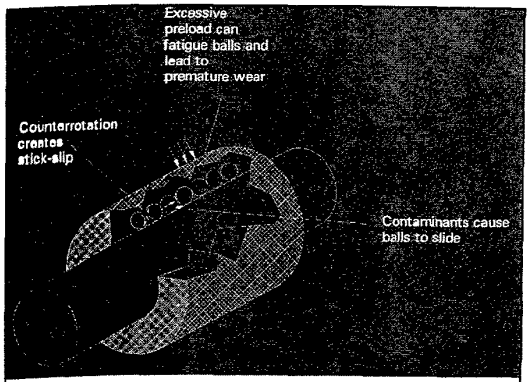

Fig. 4 — Effects of contaminants on rolling slides.

Shields, wipers and periodic cleaning can help to minimize the effects of adhesion of any airborne metallic or dust particles which could otherwise lead to premature failure.

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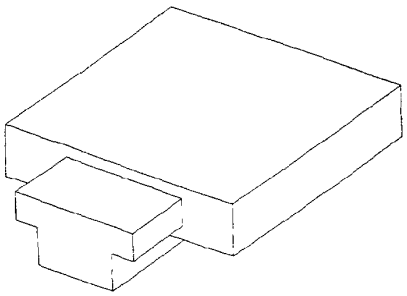


Fig. 5 — Square gib slide offers good rigidity, high load capacity and resistance to impact and shock, but needs high lubrication.

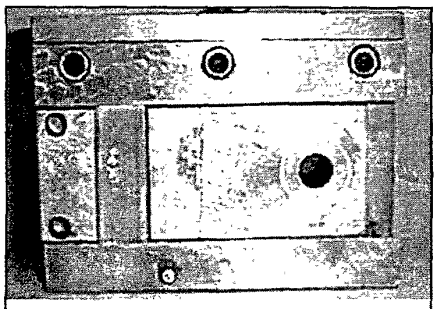


Fig. 6 — Dovetail slide also requires significant lubrication.

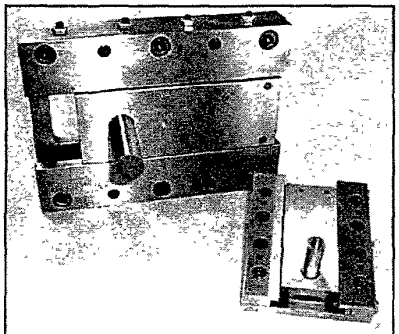


Fig. 7 — Square gib slide with bonded surface provides best combination of characteristics for forming and springmaking equipment.

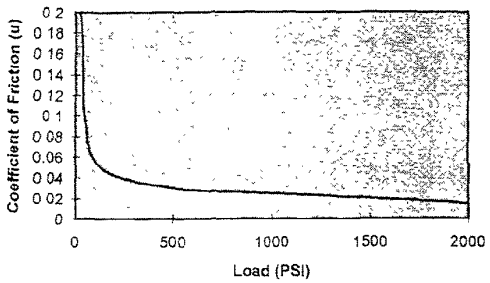


Fig. 8 — For bonded surface slides, coefficient of friction actually decreases as the load increases.

Square Gib & Dovetail Slides

In contrast to the rolling element slides, many machines use square gib, sometimes called box gib (see **Figure 5**), or dovetail slide configurations (see **Figure 6**), which do not contain rolling bearing elements. Although these slides have a higher coefficient of friction as previously discussed, the large amount of surface contact also means that these slides offer excellent rigidity, high load capacity and are better suited to withstand impact and shock loads.

Traditionally these slides also require significant lubrication due to the metal-to-metal contact.

The Bonded Square Gib Slide

A significant improvement to the original design however is in the application of a bonded surface to the traditional square gib style slide (see **Figure 7**). This new technology results in a slide that offers high load capacity and excellent rigidity in addition to many other interesting features. The bonded surface provides excellent wear characteristics and eliminates the need for re-lubrication. Although an initial coating of oil is recommended to facilitate break-in, no further lubrication is required throughout the life of the slide.

It is also interesting to note that the coefficient of friction, and therefore losses due to friction, actually decreases as load increases (see **Figure 8**). The bonded surface is also ideal for operation in tough manufacturing environments characterized by airborne debris or grinding dust. The coating allows contaminants to embed into the surface eliminating the need for seals and maintenance normally required for cleaning slide surfaces.

Although bonded square gib slides do provide gib adjustment, because there is no metal-to-metal contact, wear is minimal and the need for adjustment is greatly reduced. These slides are particularly well suited for start/stop or reversing applications such as those common in spring production because of the excellent properties offered relative to stick-slip and start-up.

Best Slide for Forming & Springmaking Machines

Certainly the rolling bearing element type slides can offer excellent precision and good reliability, particularly in longer stroke, high-speed applications. However, their sensitivity to shock loads and contamination as well as their need for constant lubrication make them less desirable for some forming and spring manufacturing applications.

The steel-on-steel square gib or steel-on-bronze dovetail slide configurations offer increased load capacity and good rigidity, but do not possess the excellent wear characteristics, vibration dampening capability and high tolerance to contamination of the bonded square gib slide.

Bonded slide technology, the optimum slide technology for forming and springmaking applications, has been applied in both new equipment and in replacement slides with great success. Bonded square gib slides offer long term operation with reduced maintenance and improved process control due to less wear and fewer adjustments.

To receive additional information on bonded square gib slide technology, and to obtain technical specifications on AIM's wire forming and springmaking equipment, contact the author

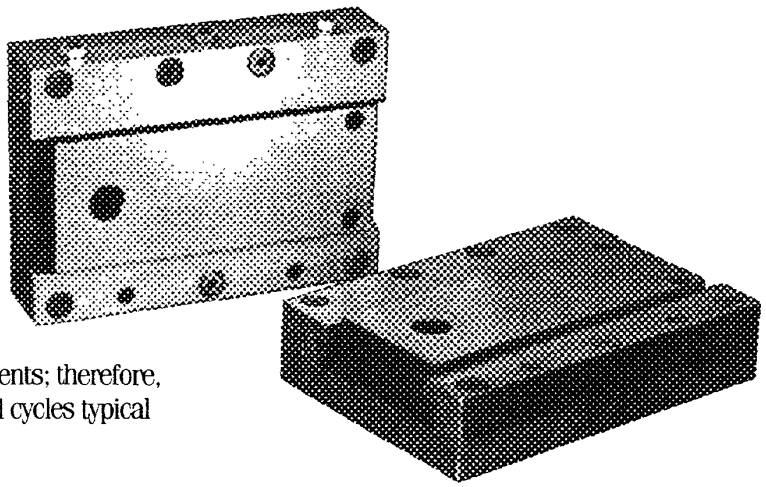
WFTI

Company Profile...

AIM Automated Industrial Motion, *manufactures spring and wire forming equipment and components. The company also offers services such as process development and spring prototyping.*

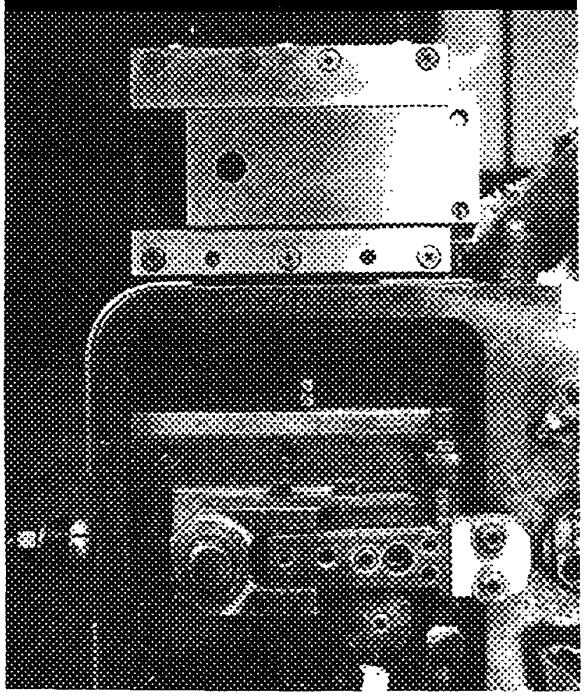
The Maintenance -Free Advantage

from Automated Industrial Motion AIM



AIM square gib replacement slides for mechanical coilers eliminate the need for constant lubrication that ball slides and bronze gibs require. The square gib features an innovative surface providing both strength and resistance to foreign particles. AIM square gib replacement slides contain no rolling elements; therefore, they are ideally suited for the short travel cycles typical in most coiling applications.

AIM slides offer a directly interchangeable low cost quality production advantage



- ❑ Designed for easy replacement
- ❑ Permanent "built -in" lubrication
- ❑ Grinding dust and metal particals do not adversely affect performance
- ❑ Can operate dry or wet
- ❑ Available for most sizes and configurations
- ❑ High load capacity
- ❑ Square gib slides perform well in difficult environments
- ❑ Self-lubricating surface reduces maintenance
- ❑ Long lasting accuracy and repeatability
- ❑ Noise and vibration dampening
- ❑ Quick delivery on standard sizes
- ❑ Custom design available

AIM The Leader In Production Advantages

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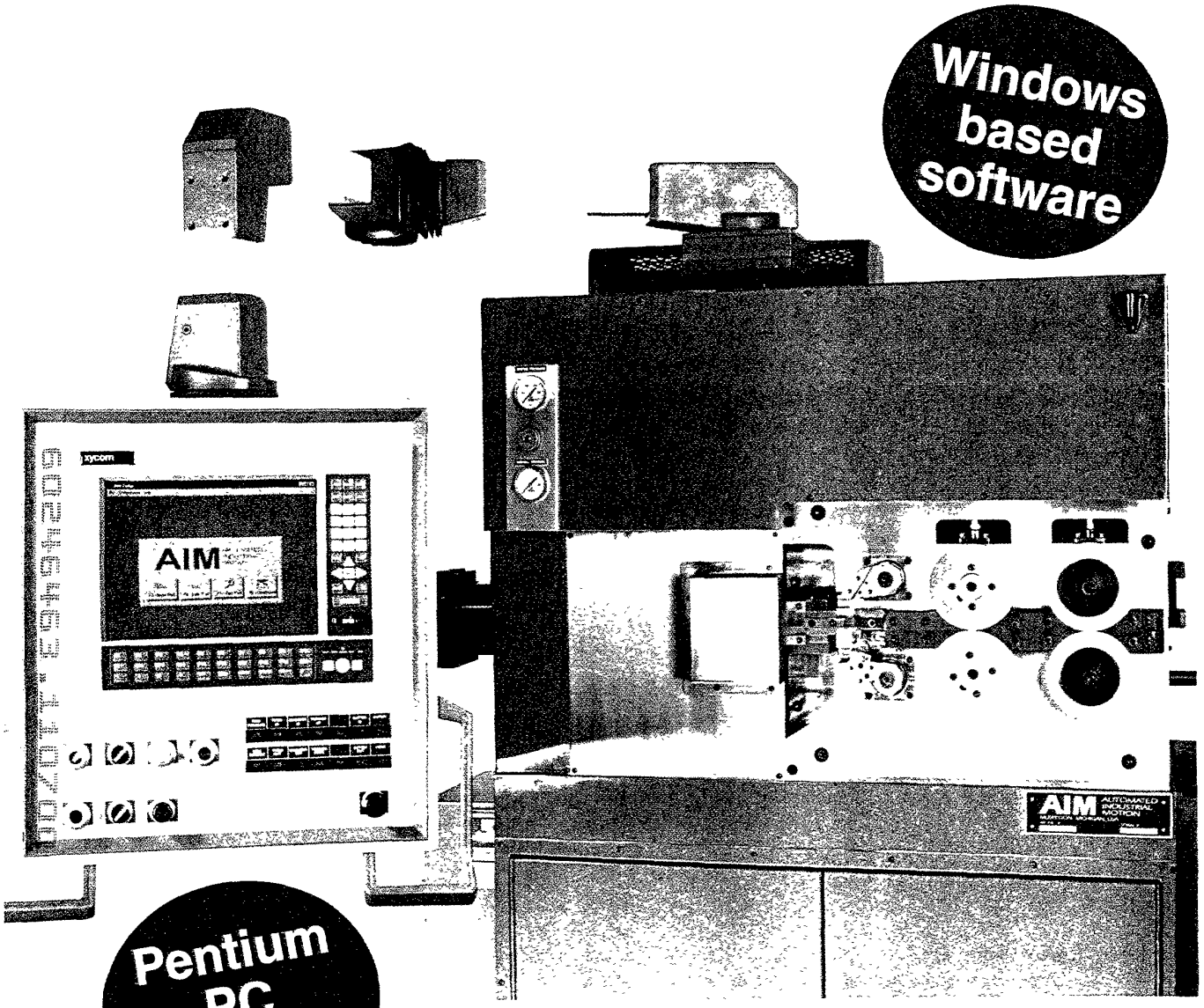
AIM AUTOMATED INDUSTRIAL MOTION

Computerized Spring Coiling Systems



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Specializing in custom equipment and turnkey automation systems.

Designed and engineered from concept to completion by springmakers to provide you with every computer controlled production advantage.

AIM AUTOMATED INDUSTRIAL MOTION

Computerized Spring Coiling Systems

The Leader In Production Advantages

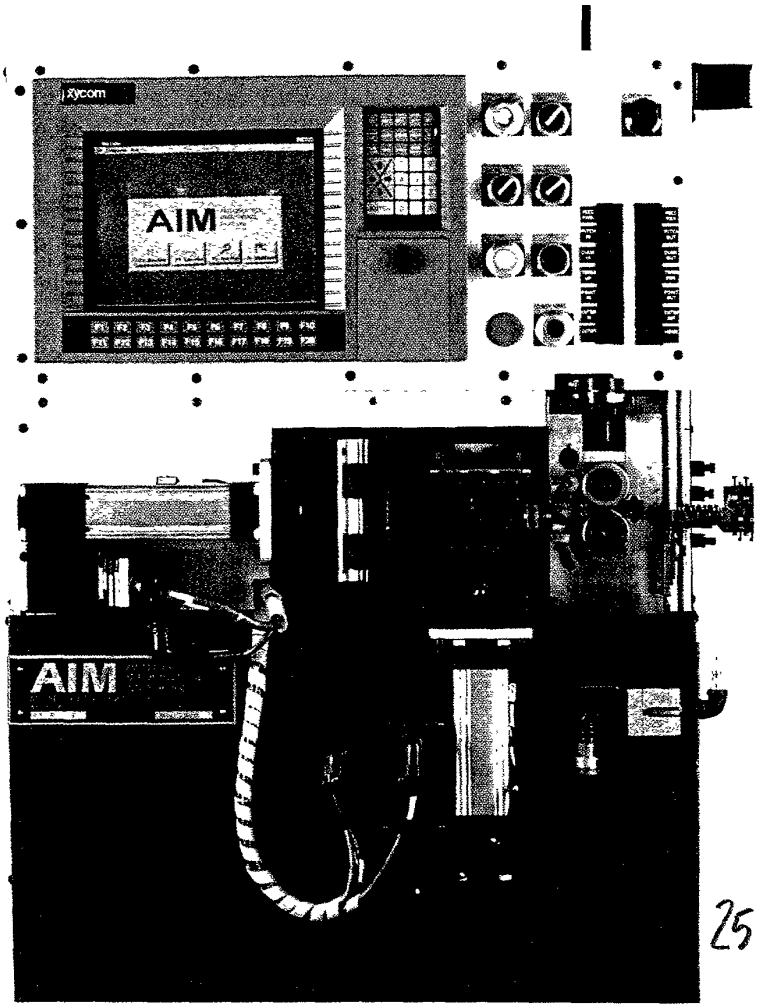
Control Features

- Pentium PC based
- Windows based software
- 8-axis capability
- Unlimited steps
- Maximum memory
- On-the-fly tool adjustments
- Controls housed in air conditioned base
- Pendant mounted operator interface
- On screen machine diagnostics
- Auxiliary inputs and outputs
- RS 232 port & modem communications
- Stores detailed part information
- Total parts counter and countdown production counter
- Diameter and free length gauging
- External equipment fault input for machine shutdown

Proven Service and support

Mechanical Features

- Coated Square Gib Slides
- AC Brushless servo motors
- High precision linear actuators
- True x-y linear motion eliminates pivot points
- Flush mount tooling
- Square chuck design for cassette tooling capability
- Separate locking of chuck and arbor
- Industry standard tooling
- Remote pitch clamp and feedroll pressure switch
- Adaptable to commercially available spring gauges



The advantages you demand as a leading springmaker

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AIM AUTOMATED INDUSTRIAL MOTION — Computerized Spring Coiling Systems

Computerized Coiler Specifications:

	Micro Coiler	AIM 100	AIM 1000
Wire Feed Speed	75"/sec	75"/sec	75"/sec
Maximum Wire Size	0.010"	0.040"	0.080"
Minimum Wire Size	0.0015"	0.008"	0.026"
Feed Length	Unlimited	Unlimited	Unlimited
Coil Diameter Range	3x wire DIA to 0.325"	3x wire DIA to 1"	3x wire DIA to 1.75"
Power	240 volt, 3 phase	240 volt, 3 phase	240 volt, 3 phase
Wire Line	48"	48"	48"
Machine Dimensions			
Length	20"	28"	48"
Width	18"	34"	29"
Height	Tabletop	70"	80"
Gross Weight	600 lbs.	2,800 lbs.	3,600 lbs.

	AIM 2000	AIM 3000	AIM 4000
Wire Feed Speed	40"/sec	50"/sec	40"/sec
Maximum Wire Size	0.180"	0.313"	0.625"
Minimum Wire Size	0.047"	0.080"	0.250
Feed Length	Unlimited	Unlimited	Unlimited
Coil Diameter Range	3x wire DIA to 3"	5x wire DIA to 5"	5x wire DIA to 8"
Power	240 volt, 3 phase	240 volt, 3 phase	240 volt, 3 phase
Wire Line	48"	48"	48"
Machine Dimensions			
Length	67"	86"	140"
Width	40"	71"	108"
Height	80"	96"	96"
Gross Weight	6,700 lbs.	16,000 lbs.	45,000 lbs.

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08-04-00

Approv

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)

Docket No.	58068	Type (+) --> [+]

INVENTOR(s)/APPLICANT(s)			
LAST NAME	FIRST NAME	MID. INIT.	RESIDENCE (CITY/STATE OR COUNTRY)
FLICK	Kenneth	E.	Douglasville, GA

TITLE OF THE INVENTION (280 Characters Max)

VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

CORRESPONDENCE ADDRESS

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STATE	Florida	ZIP CODE	32802-3791	COUNTRY	U.S.

ENCLOSED APPLICATION PARTS *(check all that apply)*

✓	Specification	*Number of Pages*	24		Small Entity Statement
✓	Drawing(s)	*Number of Sheets*	5		Other (specify) _____

METHOD OF PAYMENT

✓	A check or money order is enclosed to cover the Provisional Filing Fees		PROVISIONAL FILING FEE AMOUNT ($)	**$150.00**
✓	The Commissioner is hereby authorized to charge or credit any discrepancies in fee amounts to Deposit Account No.:	**01-0484**		

[ ] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[✓] No. [ ] Yes

Respectfully Submitted,

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Date: August 3, 2000

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VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3

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predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple

locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle

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doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal. Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.

2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D".

3. If the DIP switch 1 is in the Off position then:
   a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.
   b. if the yellow wire sees grounded or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

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2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.

4. The Gray wire bypass operates as follows:
   a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.
   b. After Alert warning "C" bypass all future Alert "C" until system is armed.
   c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.

5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or

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honk car horn or flashing light relay.

a. Non-stop activation from (Command "4")

b. 30-second activation from (Command "5")

6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to

Declaration

Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6").

Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7")

Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)
After first stops: Activates Green wire for 1 second to lock the doors.
After second stops: Activate Blue wire for 1 second to unlock the doors.
After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated please confirm". This is with system disarmed and

detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and
2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds

pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond

to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in

turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

The device or unit may be initially manufactured and shipped without all of the features being fully functional. One advantage of this is to prevent the unit at will from sending messages when being initially installed and tested in the vehicle, thereby reducing potential false alarms and burdens on the communications system, as well as potential charges to the user. After the unit is fully installed, a communication or transmission from the monitoring center may be sent to the unit enabling one or more selected features, such as during registration during which information is conveyed to the monitoring center and payment is made or authorized by the user.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert A".

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission

to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition. A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart labeled "Alert B".

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and determined whether it is greater than zero (eg. greater than six volts)and less than a high value (eg. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user

when away from the vehicle. If vehicle is being serviced and battery is disconnected this will cause the battery voltage to be equal to zero, then the low battery voltage transmission will not be communicated to the monitoring station. Also to prevent additional alerts, this message is prevented from being transmitting again until user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13.volts indicating the vehicle has started using the owner's ignition key. Again false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart labeled "Alert E".

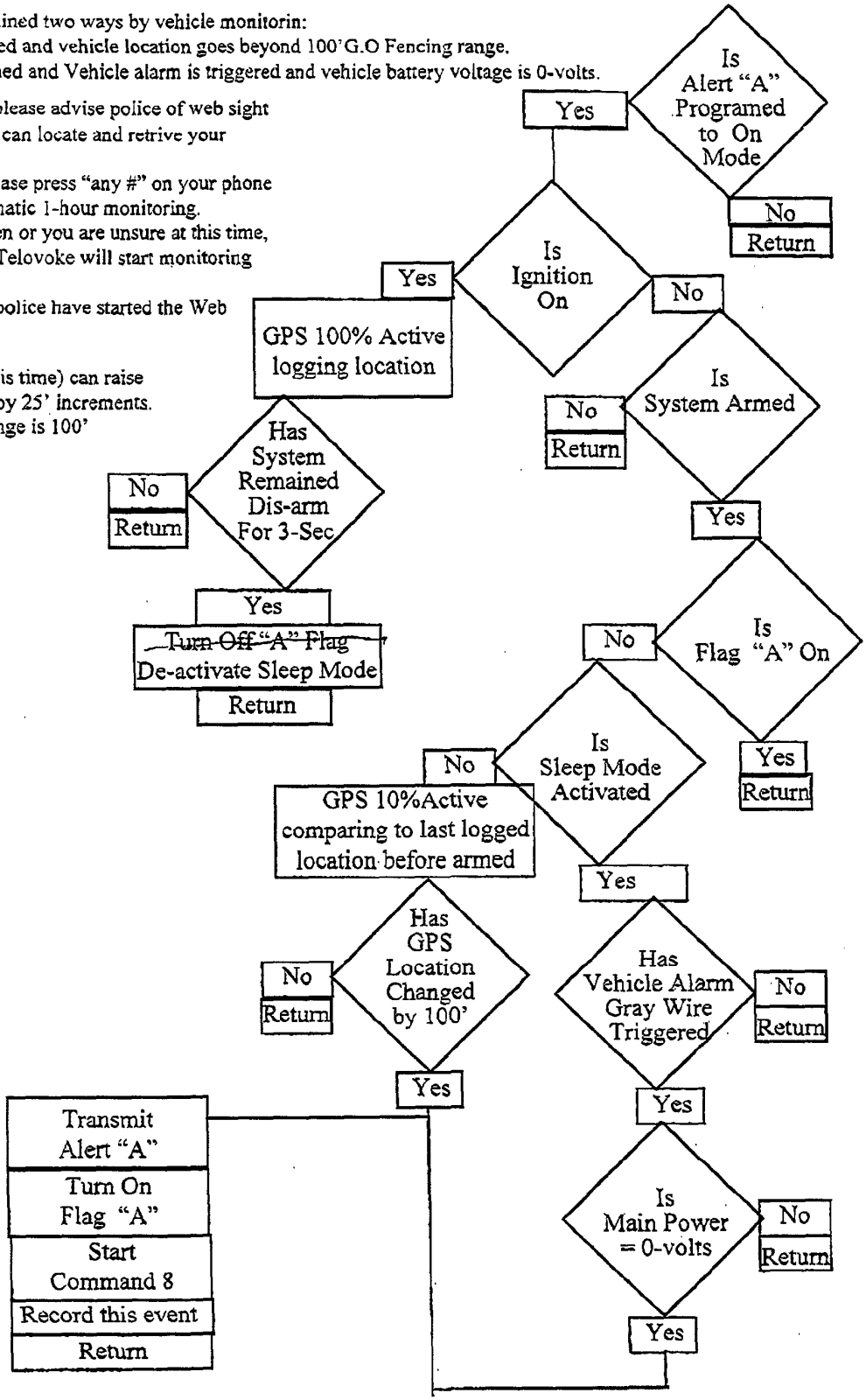
Ex. 1008 - Page 193

Alert "A" = Vehicle Stolen Alert

Vehicle stolen is determined two ways by vehicle monitorin:
1. Tracking system armed and vehicle location goes beyond 100'G.O Fencing range.
2. Tracking system Armed and Vehicle alarm is triggered and vehicle battery voltage is 0-volts.

Your vehicle is stolen, please advise police of web sight and your pin# so police can locate and retrive your vehicle.
If this is a false alert please press "any #" on your phone now to deactivate automatic 1-hour monitoring.
If vehicle has been stolen or you are unsure at this time, hang up an call police. Telovoke will start monitoring for upto
1-hour vehicle or until police have started the Web monitoring.

Televoke (not user at this time) can raise or lower G.O.Fencing by 25' increments.
G.O Fencing default range is 100'

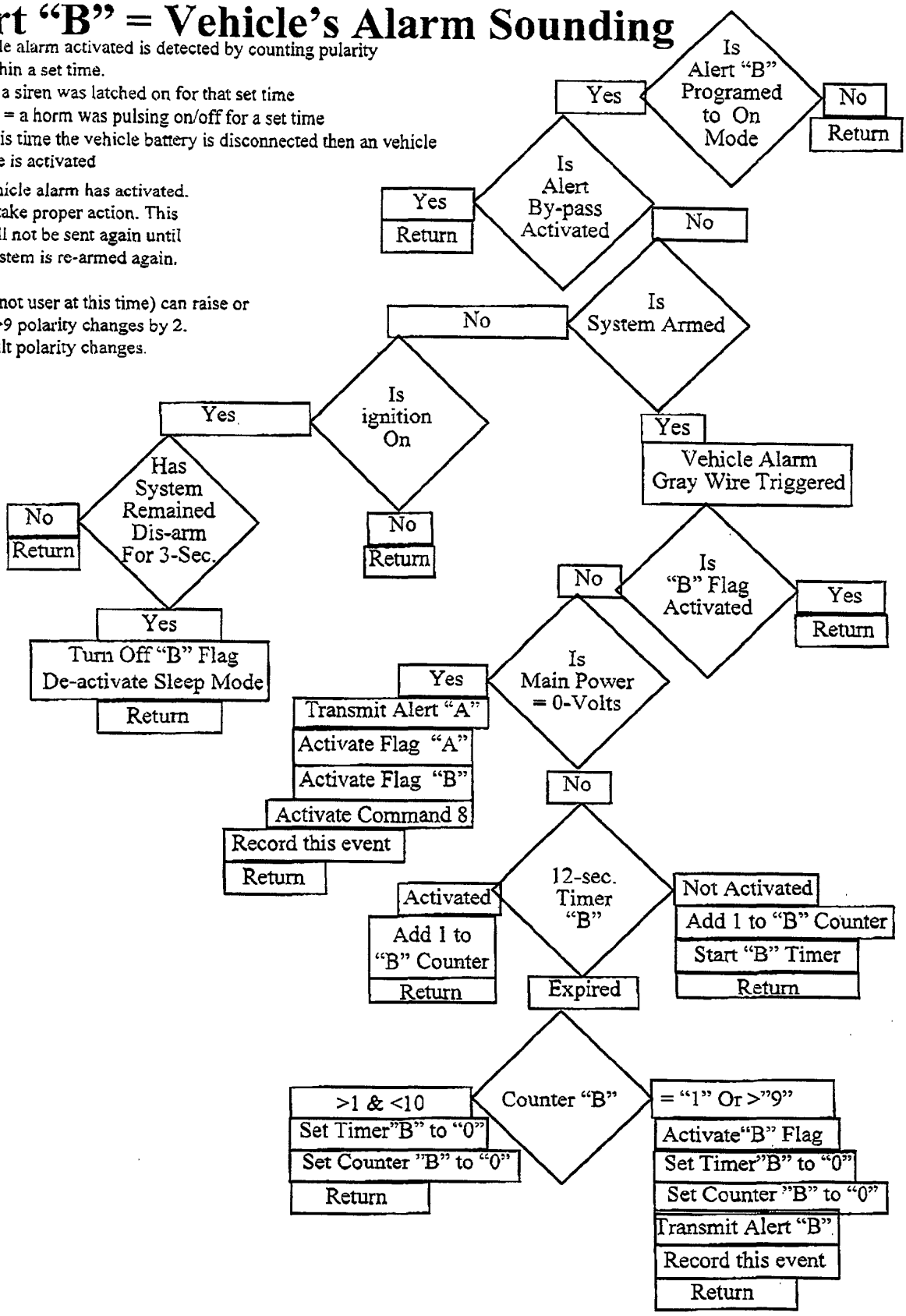


Alert "B" = Vehicle's Alarm Sounding

Your vehicle alarm activated is detected by counting pularity changeswithin a set time.
1 change = a siren was latched on for that set time
>9 changes = a horm was pulsing on/off for a set time
If during this time the vehicle battery is disconnected then an vehicle stolen mode is activated

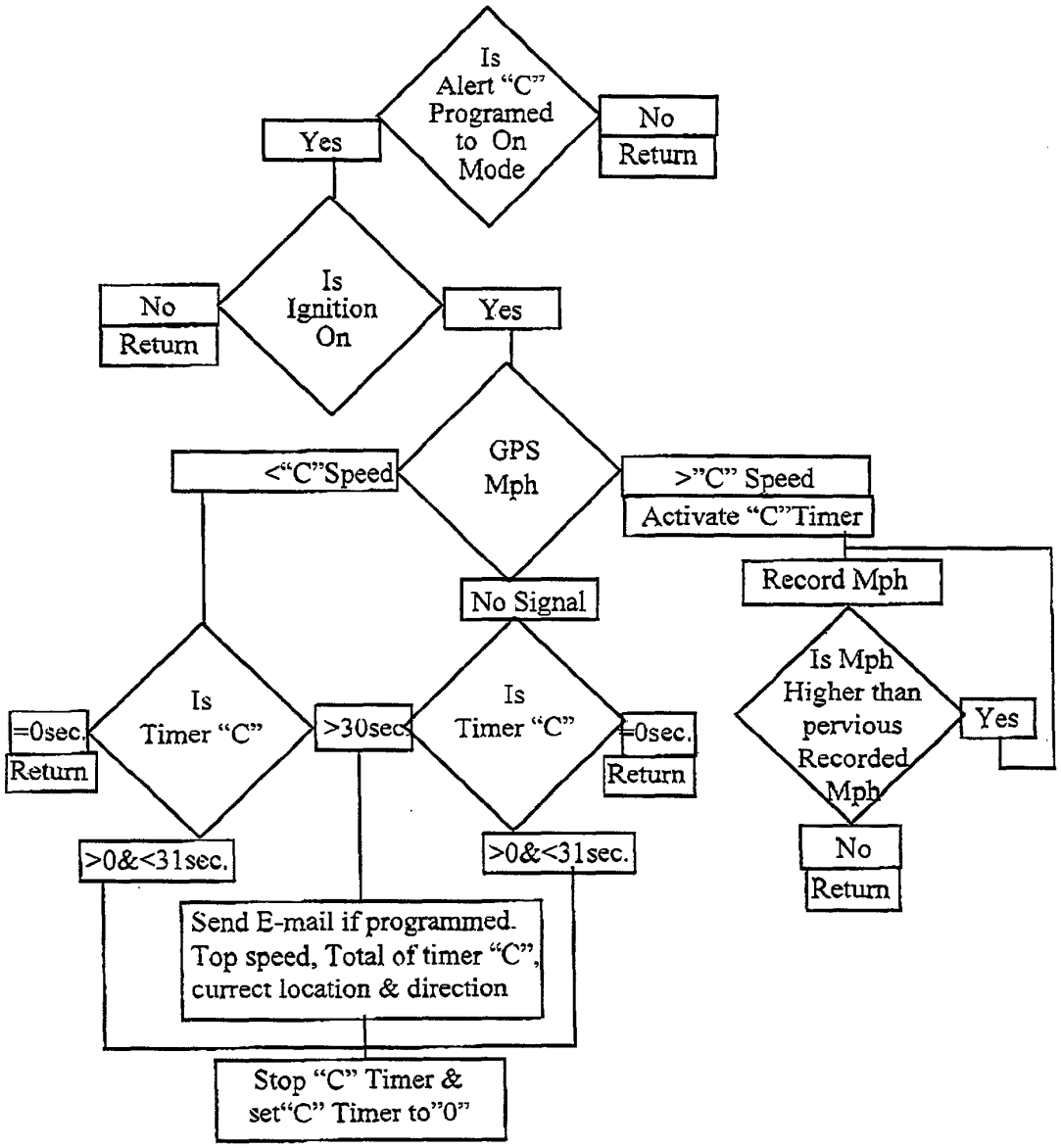
Your vehicle alarm has activated. Please take proper action. This alert will not be sent again until your system is re-armed again.

Televoke (not user at this time) can raise or lower the >9 polarity changes by 2.
>9 is default polarity changes.



Alert "C" = Speeding Too Long Of Time

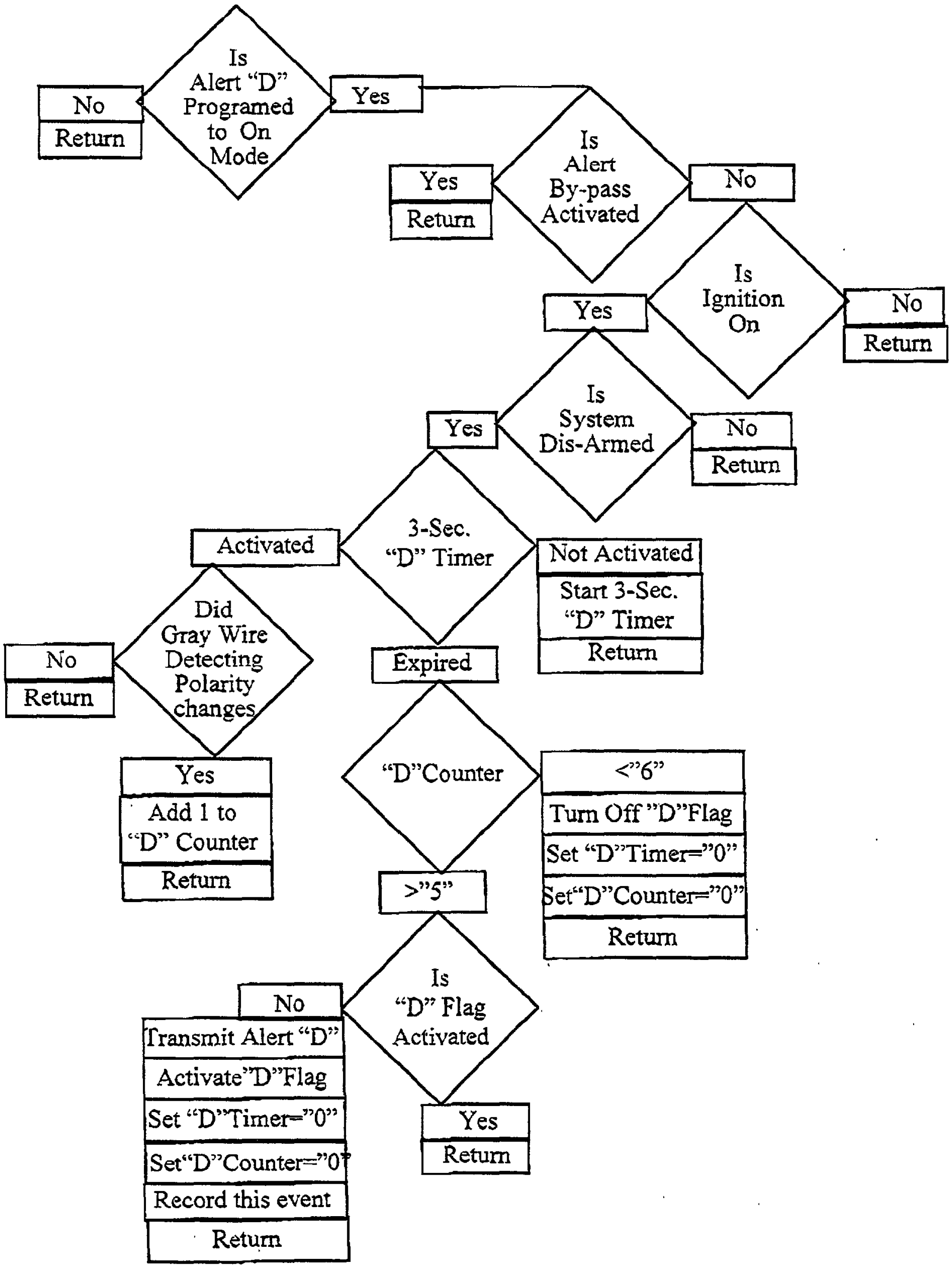
Vehicle was traveling faster than 80 m.p.h. for a longer time than 30 seconds. GPS indicates the speed.
If pre-programed to do so, records this as an event and will send e-mail instantly of Top speed, total time,direction and location speeding had stopped.
Alert "C" operation an be turned on or off by user
80 M.p.h. is default speed. Televoke (not user at this time) can raise or lower the speed by 5 m.p.h. increments.
30-seconds time is default. Televoke (not user at this time) can raise or lower the time by 5 minutes increments.



Alert "D" = Unauthorized Transmitter Alert

Your vehicle was programmed to operate from a new ignition key or remote transmitter. Please take proper action. This alert will not be sent again till the vehicles alert signal stops.

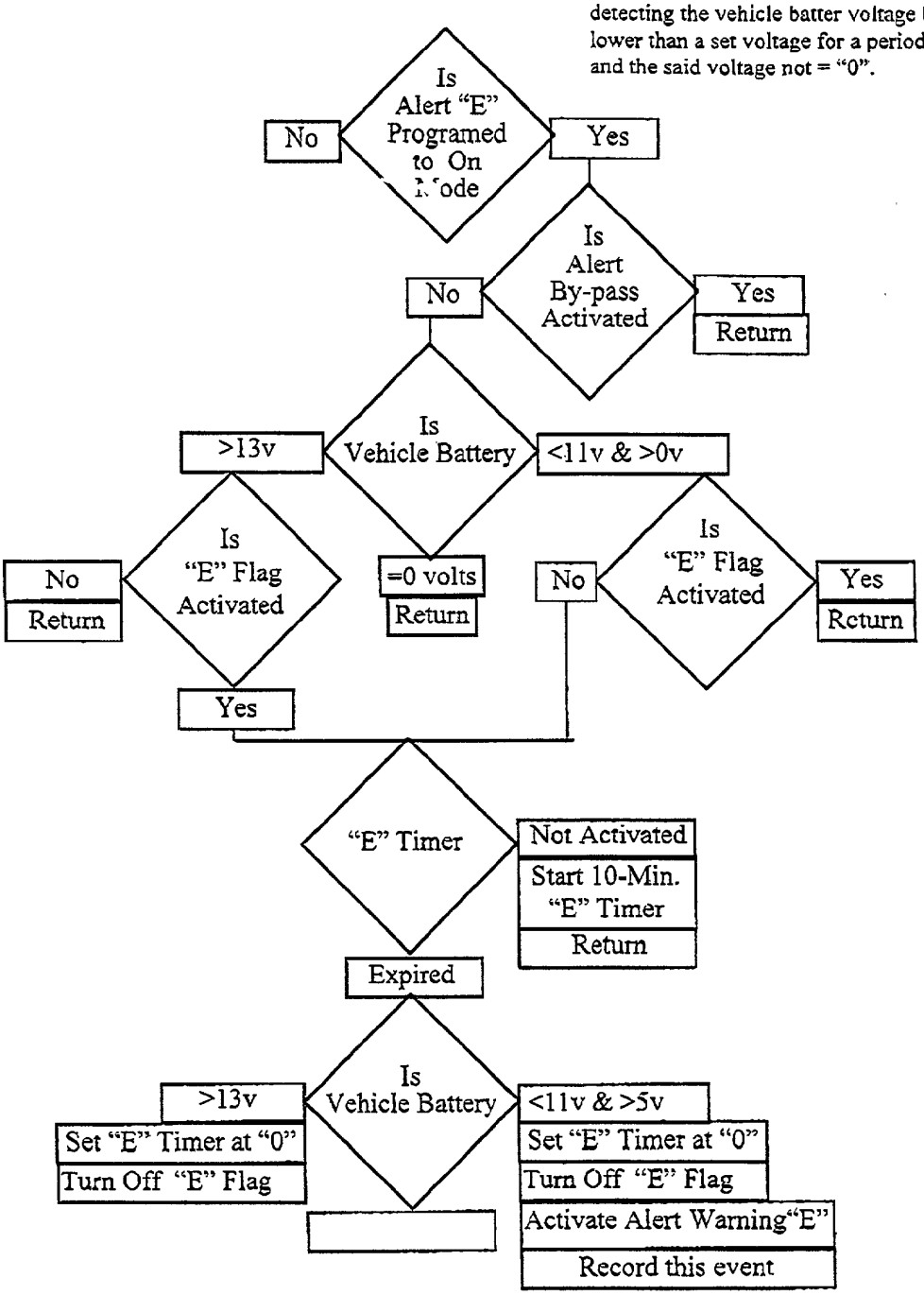
Unauthorized Transmitter Alert is activated when ignition key is turned on and detects a plurality of polarity changes on Gray wire within a set time. This Alert is prevented from activated again until said circuit returns to normal.



Alert "E" = Low Car Battery Power

Your vehicle has a low battery voltage indication. Please take proper action. This alert will not be sent again until your vehicles battery has retained the proper voltage.

Low battery power Alert is activated by detecting the vehicle batter voltage being lower than a set voltage for a period of time and the said voltage not = "0".



05_18-00

APPROV

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)

Docket No.	58066	Type (+) → [+]

INVENTOR(s)/APPLICANT(s)			
LAST NAME	FIRST NAME	MID. INIT.	RESIDENCE (CITY/STATE OR COUNTRY)
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TITLE OF THE INVENTION (280 Characters Max)

VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

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ENCLOSED APPLICATION PARTS *(check all that apply)*

✓	Specification	*Number of Pages*	20		✓	Small Entity Statement
	Drawing(s)	*Number of Sheets*				Other (specify)

METHOD OF PAYMENT

	A check or money order is enclosed to cover the Provisional Filing Fees		PROVISIONAL FILING FEE AMOUNT ($)	$75.00
✓	The Commissioner is hereby authorized to charge the Provisional Filing Fees and/or credit any discrepancies in fee amounts to Deposit Account No.:	01-0484		

[ ] Additional inventors are being named on separately numbered sheets attached hereto.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

[✓] No.

[ ] Yes, The name of the U.S. Government agency and the Government contract number are _____

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Date: May 17, 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kenneth E. KLICK

Serial: Not Yet Assigned

Attorney's Docket No.: 88066

Filed: Herewith

For: VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 25, United States Code, to the Patent and Trademark Office with regard to the invention entitled: VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION described in:

(x) the specification filed herewith
( ) application serial no. _____ filed _____
( ) patent no. _____ issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

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*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Kenneth E. Flick
NAME OF INVENTOR

SIGNATURE OF INVENTOR

5-17-00
DATE

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VEHICLE TRACKING SYSTEM WITH THEFT NOTIFICATION

Field of the Invention

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking and alerting system for a vehicle.

Description of the Invention

The invention includes a unit to be mounted in the vehicle and a monitoring station. The unit in the vehicle includes a GPS receiver, and a transmitter which may transmit on the control band of the cellular telephone network, or, via a voice or other data channel of the cellular network, or other wireless communications network. For example, the transmitter could also be a satellite transmitter.

The GPS receiver determines the vehicle location. In addition, the GPS receiver may be connected to a controller which controls and/or performs a number of vehicle tracking and/or security functions. Wireless vehicle location determining devices and approaches other than GPS may also be used in some embodiments of the invention. For example, vehicle location systems based upon multiple receptions from adjacent cellular receivers can also be used.

The monitoring station is interfaced to the cellular telephone network, or other communications

network, to thereby communicate with the vehicle unit. In addition, the monitoring station is also connected to the Internet to provide a number of advantageous features including updating the user or other authority when away from the vehicle of the vehicle's position. These features and advantages are described in further detail below. The monitoring station may also be connected to the telephone network in order to provide various preprogrammed communications, such as to the user or other authority.

The system preferably implements one or more of the following features:

1. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

2. Detects an optional vehicle alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

3. Detects an optional vehicle alarm systems remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

4. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the WEB site. The vehicle would be equipped with a security system as disclosed in U.S. Patent No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

5. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined max speed limit and duration thereof can be selected by the user.

6. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3

predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens). The time setting is selectable by the user.

7. Detects vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

8. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user also preferably has access to a WEB or Internet site that will display a map and silently contact the vehicle to acquire it's current location, speed, direction of travel, and previous multiple

locations with speeds, for example, the user's personal identification number (PIN) can be instantly activated by just a phone call. No additional installation is required.

Certain annual pre-pay package arrangement may be available. For example, up to 10 access entries per month can be provided on a low monthly billing of $4.90. Up to 30 access entries could be provided for $8.25 per month.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the WEB site. The user may control various vehicle functions remotely via the telephone or WEB site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment & installation is relatively inexpensive, and is on the order of about $190.00. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4). For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5). For the Lock/Unlock vehicle doors feature: from any phone or computer user a predetermined command (Command 7) activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle

doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low.

Some further details of an embodiment of the vehicle unit are provided below as relating to use of red and green LED indicators operated by the system controller.

Red LED verification of GPS receiving signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = when searching GPS location.

Constant = found location.

Off = no GPS signal found.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

Green LED verification of receiving the cell tower signal, using the LED built into the system controller:

With yellow wire having positive 12 volts:

Blinking = Cell control channel signal is detected.

Constant = sending micro burst signal. Stays on 5-seconds after each time system is transmitting.

Off = no cell tower signal received.

With yellow wire not having positive 12 volts:

Off = LED not functioning.

An example of representative DIP switch feature selection is as follows. Switch 1 may be used for adding orange wire for controlling arm/disarming of system. When On, the orange wire controls arm/disarm as follows: to arm, Orange wire is grounded and Yellow wire does not have 12 volts positive. To disarm, the Orange wire is not grounded. When switch 1 is Off, then only the Yellow wire controls arm /disarm as follows: to arm, the Yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed. To disarm the Yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

The Red Wire is connected to 12 vdc Power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11-volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.

The Black Wire is connected to Ground.

The Yellow Wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further:

1. If the system is in an armed mode and Lat/Long changes, then Alert "A" is given.

2. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D".

3. If the DIP switch 1 is in the Off position then:
a. if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues the 500 ma ground.
b. if the yellow wire sees grounded or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until system is disarmed

The Gray Wire is for Input and Output, and can be connected to an alarm siren or horn positive terminal. In addition:

1. With system armed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "B" alarm activation is given.

2. With system disarmed and if the Gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.

3. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving 12 v+ and the gray wire by-pass not being activated, then alert warning "D" is given.

4. The Gray wire bypass operates as follows:
   a. After Alert warning "B" bypass all future Alert "B" until system is disarmed.
   b. After Alert warning "C" bypass all future Alert "C" until system is armed.
   c. After Alert warning "D" bypass all future Alert "D" until no 12 volt pulses are detected on the gray wire within 3 seconds of yellow wire having 12 volts.

5. With system armed or disarmed. The Output: Internal + 12v, 1 amp transistor with pulses 1 second on & 1 sec off to activate siren or

honk car horn or flashing light relay.

a. Non-stop activation from (Command "4")

b. 30-second activation from (Command "5")

6. Turn off the above Alert "A" from (Command "1")

The Orange Wire is for the starter interrupt and arm/disarm system, and operates as follows:

1. If dip switch 1 is in the:

a. On position and:

i. the Orange wire has 12 volts or neutral, the system switches to the disarmed mode

ii. the Orange wire is grounded, then the system is switched to the armed mode

iii. and the starter interrupt output will not automatically operate. Can only be activated from "Command #4"

b. Off position and:

i. the Orange wire does not effect the arming or disarming of the system.

ii. 30 seconds after system arms the Orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to

Starter interrupt relay output.

2. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.

3. After Alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example:

Green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6").

Red Wire provides a constant 12v output from the Red power wire.

Blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7")

Pink wire provides a 250ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation Test Button may also be provided to work as follows. Pressing the button activates Orange wire for 10-seconds (starter interrupt), with these circuits in sequence:

First: Activates Gray wire for 1-second. (siren/horn)
After first stops: Activates Green wire for 1 second to lock the doors.
After second stops: Activate Blue wire for 1 second to unlock the doors.
After third stops: Activate Pink wire for 1 second to activate optional item.

Representative warning alerts are as follows:

Alert Warning "A": Automatic activation of "Command 8" and the vehicle unit contacts monitor station to instantly call 3 phone numbers with the message "Your Vehicle is stolen please confirm then call 911 to advise police of web site and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" until the system is re-armed.

Alert Warning "B": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting Gray wire having 12 volts pulsing or on constant for longer than 10-seconds). After Alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

Alert Warning "C": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle PANIC activated please confirm". This is with system disarmed and

detecting the Gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After the first activation then this is bypassed until the ignition turns on again.

Alert Warning "D": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the this message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of yellow wire having seen 12 volts positive. All future alert "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts.

Alert Warning "E": the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the Red wire with lower than 11 volts for ## minutes. All future alert "E" are bypassed until:

1. First: More than 13.5 volts are detected on the red wire and
2. Second: After yellow wire stops having positive voltage the red wire then must detects more than 12 volts.

Alert Warning "F": the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###"and time limit of "##"seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS)

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) Web site to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

a. Gray wire to pulse 1sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

b. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds

pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma. negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250ma. negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

a) With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:

i) Once instantly.

ii) Once in 1 hour if at the same location.

iii) Once in 6 hours if at the same location.

iv) Once in 12 hours if at the same location.

v) Once every 24 hours if at the same location.

b) Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a) At a user selected predetermined time ## (01-24) of each day, or

b) At a predetermined memory fill level, such as full or near full.

In addition, each system event may contains one or more of the following:

a) Vehicle Location

b) Vehicle total time at location

c) Time of day

d) Mph traveling

e) Total time traveling above MPH

f) Direction traveling

g) Delta

h) Special Alert messages, if any, including:

i) GPS signal not received for longer than 5 minutes.

ii) Traveling above ###MPH for ## minutes.

iii) Vehicle is stolen.

iv) Alarm activated.

v) Unauthorized remote transmitter alert.

vi) Battery saver mode activated

vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.

viii) Command 2: (Accessory activation)

ix) Command 3: (Vehicle Location was retrieved)

x) Command 4: (Hijack or Stolen mode activated)

xi) Command 5: (Car Find mode activated)

xii) Command 6: (Locked Doors)

xiii) Command 7: (Unlocked Doors)

xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include:

a) While the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is same then only update stationary total time.

b) If the GPS antenna is not receiving any signal:

i) Then enter last known GPS location and with indication this was the last known GPS location before GPS signal stopped and how long no GPS signal was received. And enter GPS location in the on-hold file.

c) When vehicle is traveling above ###MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These include

a) The user's vehicle has issued a stolen alert:

i) If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the Web site address and an identification number, such as the user's PIN, to allows the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

ii) If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

b) The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

c) The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond

to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmission are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature begins immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in

turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

Ex. 1008 - Page 221

US005719551A

United States Patent [19]

Flick

[11] Patent Number: 5,719,551

[45] Date of Patent: Feb. 17, 1998

[54] **VEHICLE SECURITY SYSTEM FOR A VEHICLE HAVING A DATA COMMUNICATIONS BUS AND RELATED METHODS**

[76] Inventor: **Kenneth E. Flick**, 5236 Presley Pl., Douglasville, Ga. 30135

[21] Appl. No.: **701,356**

[22] Filed: **Aug. 22, 1996**

[51] **Int. Cl.**[6] **B60R 25/10**

[52] **U.S. Cl.** **340/426**; 340/531; 340/533; 340/825.31; 340/825.32; 340/825.69; 180/287; 307/10.2

[58] **Field of Search** 340/426, 427, 340/428, 429, 531, 532, 533, 534, 825.31, 825.32, 825.69, 825.72; 180/173, 287; 307/10.2, 10.3; 395/200.12, 200.05, 309, 310, 830–33

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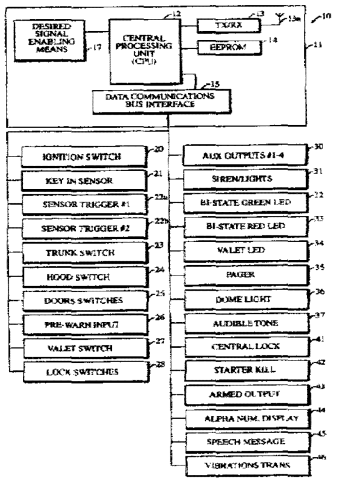
Mark Thompson, "The Thick and Thin of Car Cabling", *IEEE Spectrum*, pp. 42–45 (Feb. 1996).

Primary Examiner—Thomas Mullen
Assistant Examiner—Ashok Mannava
Attorney, Agent, or Firm—Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

[57] **ABSTRACT**

A vehicle security system includes a vehicle security sensor and associated sensor bus interface, an alarm indicator and associated alarm indicator bus interface, and an alarm controller and associated alarm controller bus interface for interfacing the alarm controller. The vehicle security system is for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices. The security system preferably further includes a desired signal enabling circuit for enabling the alarm controller to operate using a set of desired signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. Accordingly, the desired signal enabling circuit permits the alarm controller to communicate with the vehicle security sensor and the alarm indicator via the data communications bus so that the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor. The desired signal enabling circuit may preferably include a memory for storing a plurality of respective sets of signals for different vehicles, and a selecting circuit for selecting the desired set of signals from the plurality of different sets of signals for different vehicles. The desired signal enabling circuit may also be included in other vehicle remote control systems. Method aspects of the invention are also disclosed.

59 Claims, 8 Drawing Sheets



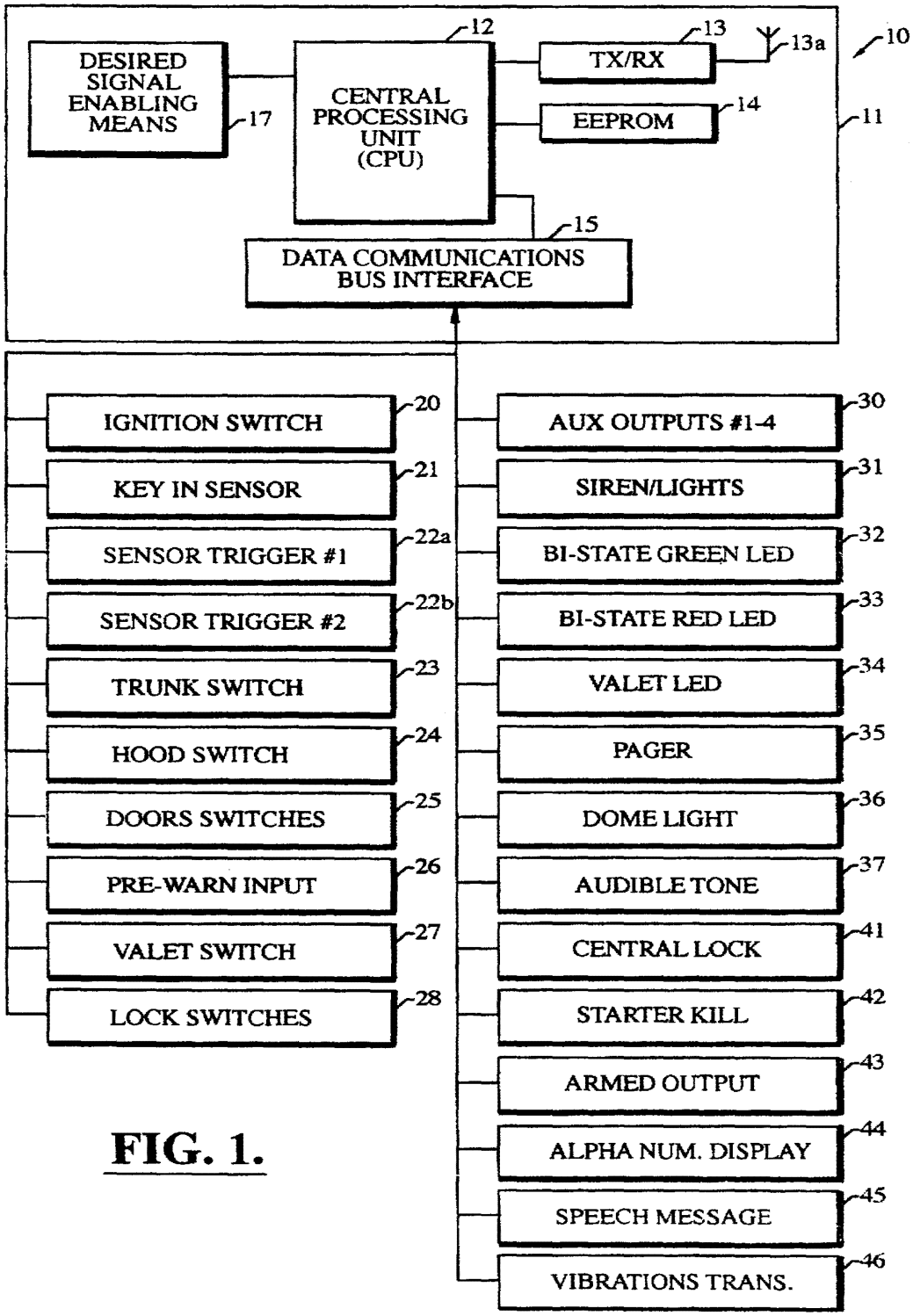

DESIRED SIGNAL ENABLING MEANS
17
CENTRAL PROCESSING UNIT (CPU)
12
TX/RX
13
13a
EEPROM
14
10
11
DATA COMMUNICATIONS BUS INTERFACE
15
IGNITION SWITCH
20
KEY IN SENSOR
21
SENSOR TRIGGER #1
22a
SENSOR TRIGGER #2
22b
TRUNK SWITCH
23
HOOD SWITCH
24
DOORS SWITCHES
25
PRE-WARN INPUT
26
VALET SWITCH
27
LOCK SWITCHES
28
AUX OUTPUTS #1-4
30
SIREN/LIGHTS
31
BI-STATE GREEN LED
32
BI-STATE RED LED
33
VALET LED
34
PAGER
35
DOME LIGHT
36
AUDIBLE TONE
37
CENTRAL LOCK
41
STARTER KILL
42
ARMED OUTPUT
43
ALPHA NUM. DISPLAY
44
SPEECH MESSAGE
45
VIBRATIONS TRANS.
46

FIG. 1.

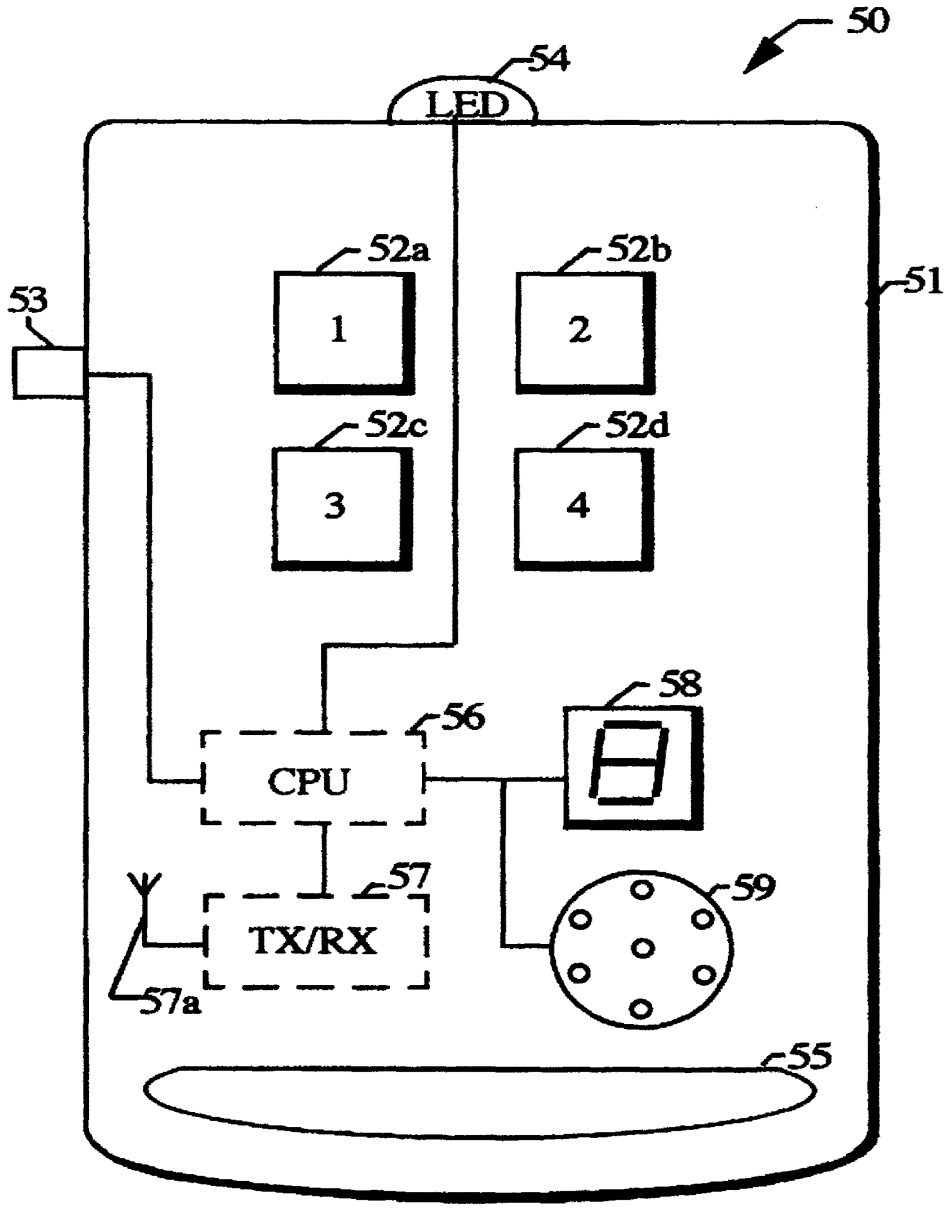


FIG. 2.

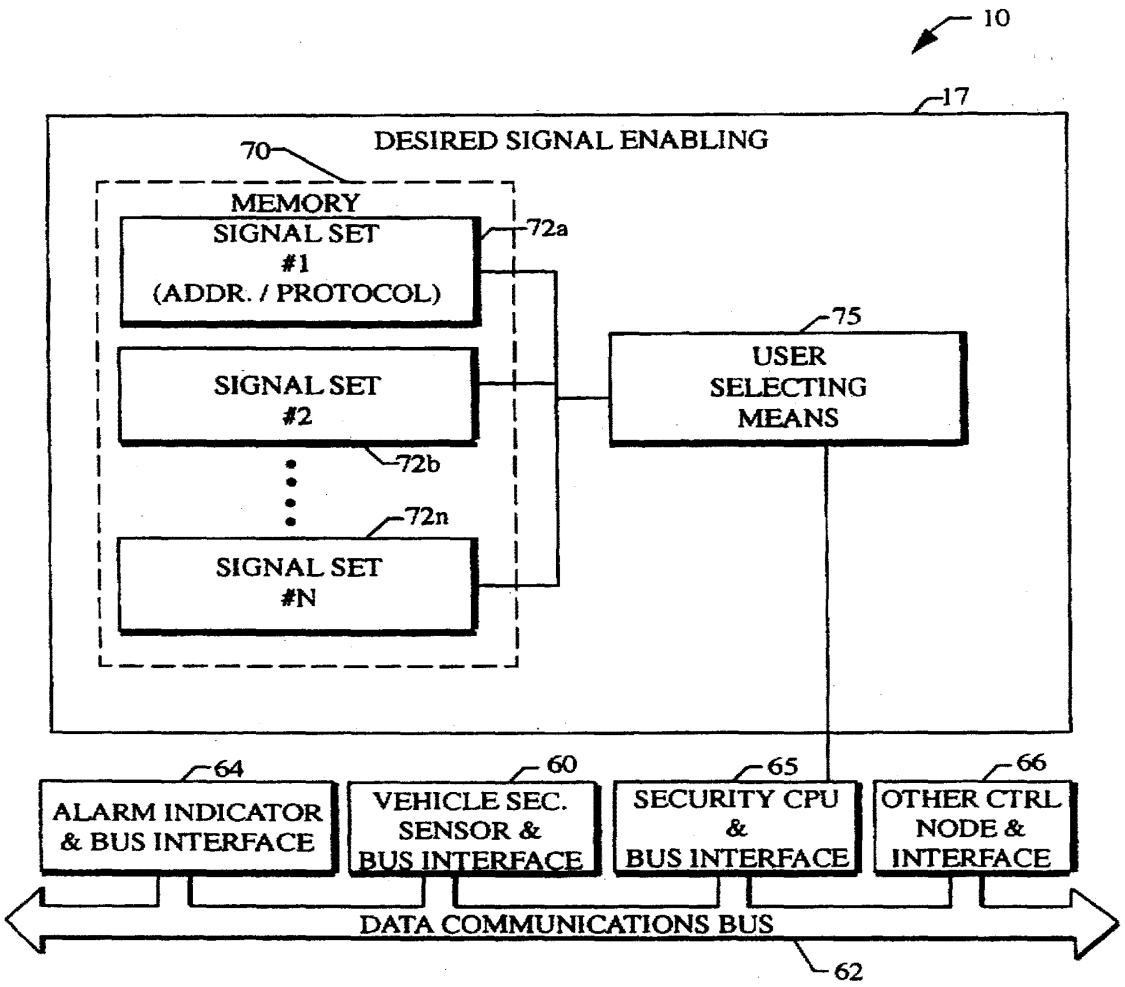

10
17
DESIRED SIGNAL ENABLING
70
MEMORY
SIGNAL SET #1 (ADDR. / PROTOCOL)
72a
SIGNAL SET #2
72b
72n
SIGNAL SET #N
75
USER SELECTING MEANS
64
ALARM INDICATOR & BUS INTERFACE
60
VEHICLE SEC. SENSOR & BUS INTERFACE
65
SECURITY CPU & BUS INTERFACE
66
OTHER CTRL NODE & INTERFACE
DATA COMMUNICATIONS BUS
62

FIG. 3.

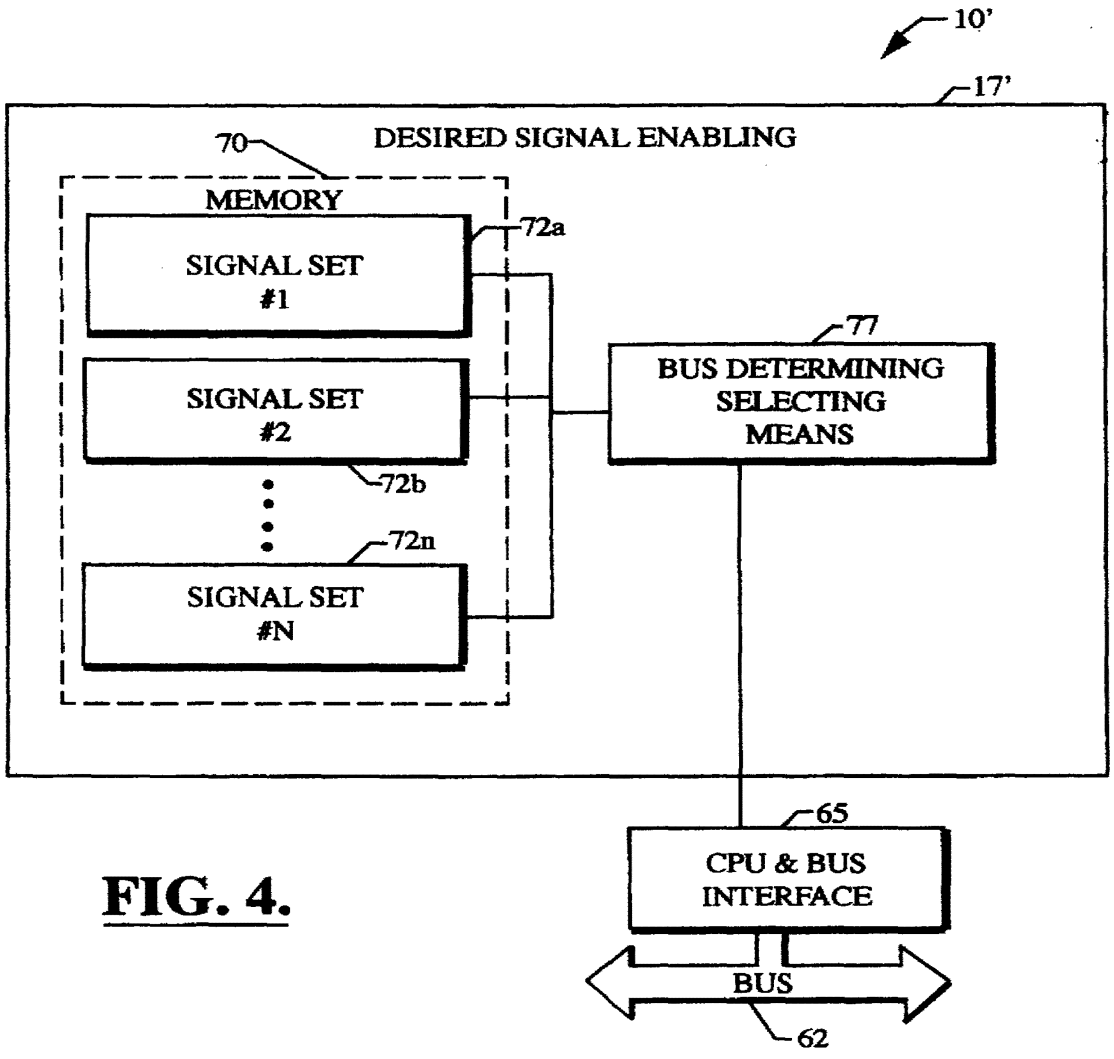

10'
17'
70
DESIRED SIGNAL ENABLING
MEMORY
SIGNAL SET #1
72a
SIGNAL SET #2
72b
72n
SIGNAL SET #N
77
BUS DETERMINING SELECTING MEANS
65
CPU & BUS INTERFACE
BUS
62

FIG. 4.

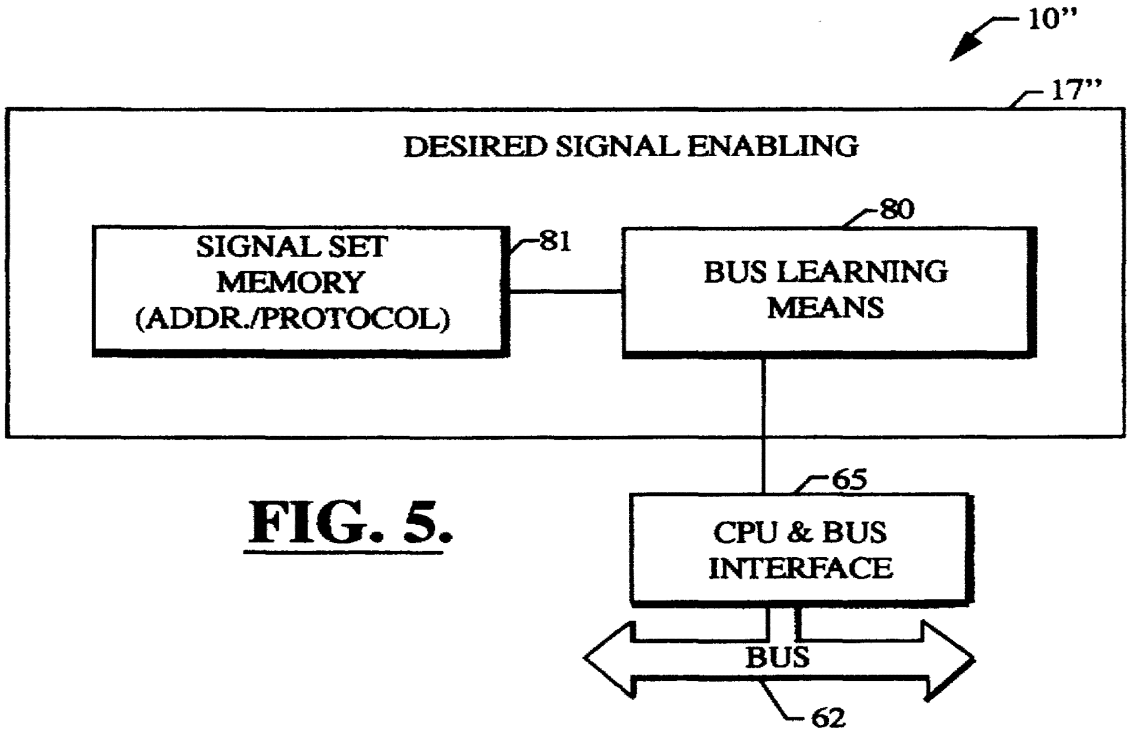

10"
17"
DESIRED SIGNAL ENABLING
SIGNAL SET MEMORY (ADDR./PROTOCOL)
81
80
BUS LEARNING MEANS
65
CPU & BUS INTERFACE
BUS
62

FIG. 5.

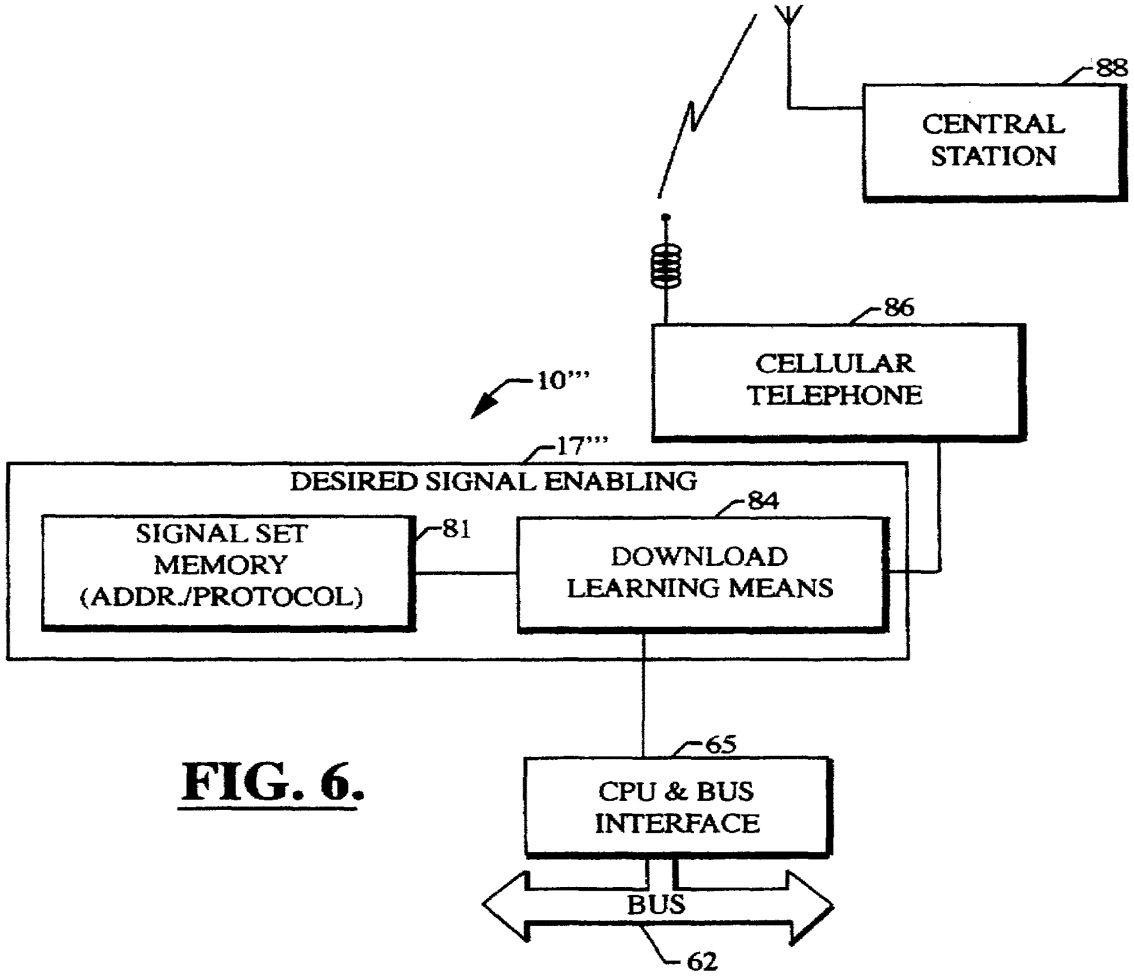

88
CENTRAL STATION
86
CELLULAR TELEPHONE
10'''
17'''
DESIRED SIGNAL ENABLING
84
SIGNAL SET MEMORY (ADDR./PROTOCOL)
81
DOWNLOAD LEARNING MEANS
65
CPU & BUS INTERFACE
BUS
62

FIG. 6.

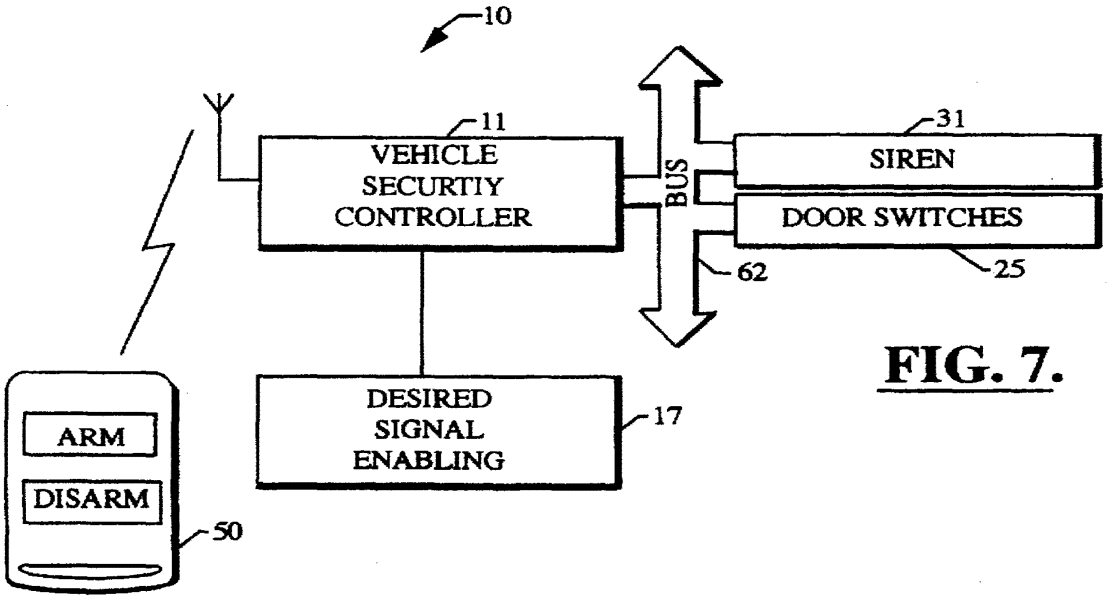

10
11
VEHICLE SECURTIY CONTROLLER
BUS
31
SIREN
DOOR SWITCHES
62
25
DESIRED SIGNAL ENABLING
17
ARM
DISARM
50

FIG. 7.

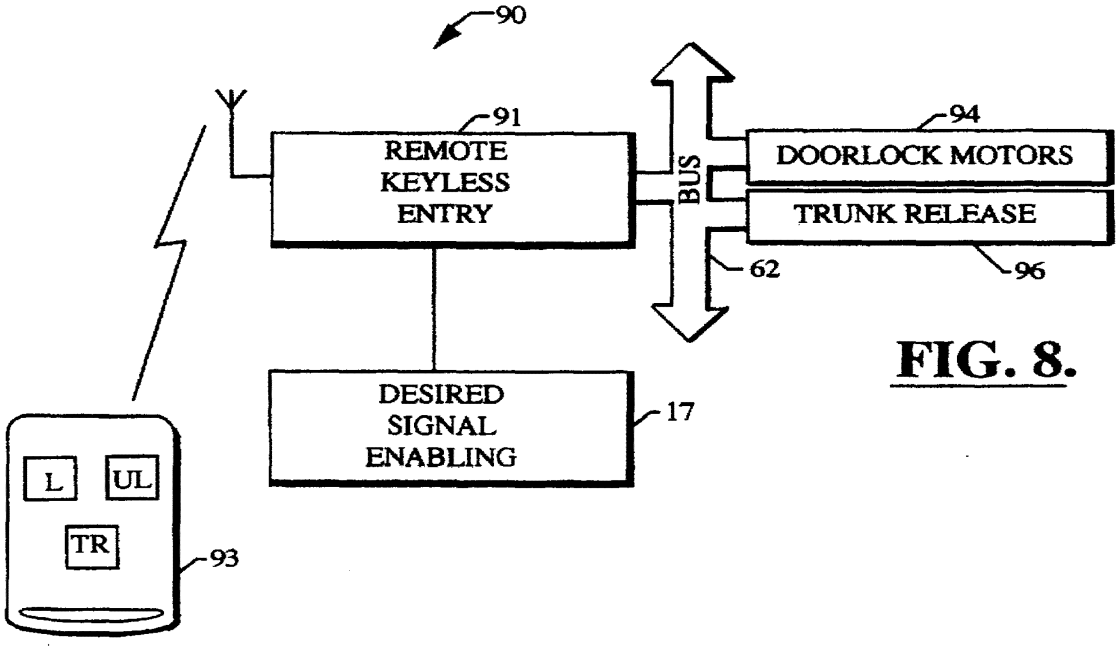

90
91
REMOTE KEYLESS ENTRY
BUS
94
DOORLOCK MOTORS
TRUNK RELEASE
62
96
DESIRED SIGNAL ENABLING
17
L
UL
TR
93

FIG. 8.

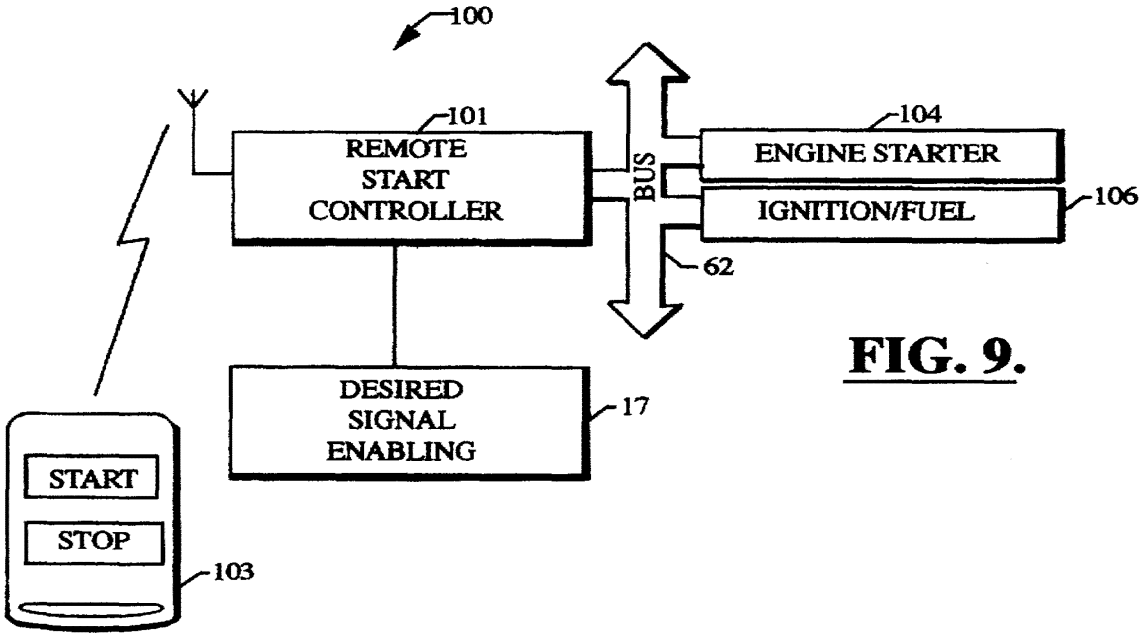

100
101
REMOTE START CONTROLLER
BUS
104
ENGINE STARTER
IGNITION/FUEL
106
62
DESIRED SIGNAL ENABLING
17
START
STOP
103

FIG. 9.

VEHICLE SECURITY SYSTEM FOR A VEHICLE HAVING A DATA COMMUNICATIONS BUS AND RELATED METHODS

FIELD OF THE INVENTION

This application is related to the field of security systems and, more particularly, to a security system and related methods for vehicles.

BACKGROUND OF THE INVENTION

Vehicle security systems are widely used to deter vehicle theft, prevent theft of valuables from a vehicle, deter vandalism, and to protect vehicle owners and occupants. A typical automobile security system, for example, includes a central processor or controller connected to a plurality of vehicle sensors. The sensors, for example, may detect opening of the trunk, hood, doors, windows, and also movement of the vehicle or within the vehicle. Ultrasonic and microwave motion detectors, vibration sensors, sound discriminators, differential pressure sensors, and switches may be used as sensors. In addition, radar sensors may be used to monitor the area proximate the vehicle.

The controller typically operates to give an alarm indication in the event of triggering of a vehicle sensor. The alarm indication may typically be a flashing of the lights and/or the sounding of the vehicle horn or a siren. In addition, the vehicle fuel supply and/or ignition power may be selectively disabled based upon an alarm condition.

A typical security system also includes a receiver associated with the controller that cooperates with one or more remote transmitters typically carried by the user as disclosed, for example, in U.S. Pat. No. 4,383,242 to Sassover et al. and U.S. Pat. No. 5,146,215 to Drori. The remote transmitter may be used to arm and disarm the vehicle security system or provide other remote control features from a predetermined range away from the vehicle. Also related to remote control of a vehicle function U.S. Pat. No. 5,252,966 to Lambropoulous et al. discloses a remote keyless entry system for a vehicle. The keyless entry system permits the user to remotely open the vehicle doors or open the vehicle trunk using a small handheld transmitter.

Unfortunately, the majority of vehicle security systems need to be directly connected by wires to individual vehicle devices, such as the vehicle horn or door switches of the vehicle. In other words, a conventional vehicle security system is hardwired to various vehicle components, typically by splicing into vehicle wiring harnesses or via interposing T-harnesses and connectors. The number of electrical devices in a vehicle has increased so that the size and complexity of wiring harnesses has also increased. For example, the steering wheel may include horn switches, an airbag, turn-signal and headlight switches, wiper controls, cruise control switches, ignition wiring, an emergency flasher switch, and/or radio controls. Likewise, a door of a vehicle, for example, may include window controls, locks, outside mirror switches, and/or door-panel light switches.

In response to the increased wiring complexity and costs, vehicle manufacturers have begun attempts to reduce the amount of wiring within vehicles to reduce weight, reduce wire routing problems, decrease costs, and reduce complications which may arise when troubleshooting the electrical system. For example, some manufacturers have adopted multiplexing schemes to reduce cables to three or four wires and to simplify the exchange of data among the various onboard electronic systems as disclosed, for example, in

"The Thick and Thin of Car Cabling" by Thompson appearing in the IEEE Spectrum, Feb. 1996, pp. 42–45.

Implementing multiplexing concepts in vehicles in a cost-effective and reliable manner may not be easy. Successful implementation, for example, may require the development of low or error-free communications in what can be harsh vehicle environments. With multiplexing technology, the various electronic modules or devices may be linked by a single signal wire in a bus also containing a power wire, and one or more ground wires. Digital messages are communicated to all modules over the data communications bus. Each message may have one or more addresses associated with it so that the devices can recognize which messages to ignore and which messages to respond to or read.

The Thompson article describes a number of multiplexed networks for vehicles. In particular, the Grand Cherokee made by Chrysler is described as having five multiplex nodes or controllers: the engine controller, the temperature controller, the airbag controller, the theft alarm, and the overhead console. Other nodes for different vehicles may include a transmission controller, a trip computer, an instrument cluster controller, an antilock braking controller, an active suspension controller, and a body controller for devices in the passenger compartment.

A number of patent references are also directed to digital or multiplex communications networks or circuits, such as may be used in a vehicle. For example, U.S. Pat. No. 4,538,262 Sinniger et al. discloses a multiplex bus system including a master control unit and a plurality of receiver-transmitter units connected thereto. Similarly, U.S. Pat. No. 4,055,772 to Leung discloses a power bus in a vehicle controlled by a low current digitally coded communications system. Other references disclosing various vehicle multiplex control systems include, for example, U.S. Pat. No. 4,760,275 to Sato et al.; U.S. Pat. No. 4,697,092 to Roggendorf et al.; and U.S. Pat. No. 4,792,783 to Burgess et al.

Several standards have been proposed for vehicle multiplex networks including, for example, the Society of Automotive Engineers "Surface Vehicle Standard, Class B Data Communications Network Interface", SAE J1850, July 1995. Another report by the SAE is the "Surface Vehicle Information Report, Chrysler Sensor and Control (CSC) Bus Multiplexing Network for Class 'A' Applications", SAE J2058, July 1990. Many other networks are also being implemented or proposed for communications between vehicle devices and nodes or controllers.

Unfortunately, conventional vehicle security systems for hardwired connection to vehicle devices, such as aftermarket vehicle security systems, are not readily adaptable to a vehicle including a data communications bus. Moreover, a vehicle security system if adapted for a communications bus and devices for one particular model, model year, and manufacturer, may not be compatible with any other models, model years, or manufacturers. Other systems for remote control of vehicle functions may also suffer from such shortcomings.

SUMMARY OF THE INVENTION

In view of the foregoing background, it is therefore an object of the present invention to provide a vehicle security system and associated method which is readily adapted or adaptable for installation in a vehicle having a data communications bus.

It is another object of the present invention to provide a security system or other remote control function systems and associated methods for installation in a vehicle having a data

communications bus, and wherein the vehicle is one from among a plurality of different vehicles with different device addresses and/or signal protocols for communicating with the vehicle devices.

These and other objects, advantages and features of the present invention are provided by a vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices. In particular, the vehicle security system preferably comprises a vehicle security sensor and associated sensor bus interface means for interfacing the vehicle security sensor to the data communications bus. The vehicle security system also preferably includes an alarm indicator and associated alarm indicator bus interface means for interfacing the alarm indicator to the data communications bus. An alarm controller and associated alarm controller bus interface means are also preferably included. The security system further preferably comprises desired signal enabling means for enabling the alarm controller to operate using a desired set of signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. Accordingly, the desired signal enabling means permits the alarm controller to communicate with the vehicle security sensor and the alarm indicator via the data communications bus so that the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor. The security system is thus advantageously compatible with many different types of vehicle data communications formats or protocols.

The data communications bus may preferably be a multiplexed data bus. Accordingly, the sensor bus interface means, the alarm bus interface means, and the alarm controller bus interface means may each comprise multiplexing means for interfacing with the multiplexed data bus of the vehicle.

The desired signal enabling means may preferably include memory means for storing a plurality of sets of signals for different vehicles, and selecting means for selecting the desired set of signals from the plurality of different sets of signals. In one embodiment, the selecting means may comprise user selecting means for permitting a user to select the desired set of signals. In another embodiment, the selecting means may comprise determining means for determining the desired set of signals based upon signals on the data communications bus.

The memory means may include device address memory means for storing a plurality of different sets of signals representative of different device addresses for different vehicles. Alternatively, or in addition thereto, the memory means may comprise protocol memory means for storing a plurality of different protocols for different vehicles.

In yet another embodiment, the desired signal enabling means may comprise learning means for learning the desired set of signals. For example, the learning means may comprise downloading learning means for learning the desired set of signals from another device or central station. In particular, the security system may interface to a cellular telephone and the desired set of signals may be downloaded or received and stored via the cellular telephone. In another variation, the learning means may comprise bus learning means for learning the desired set of signals based upon signals on the data communications bus. The security system, according to another aspect of the invention, may also interface with an existing vehicle controller or a communications bus node which is operatively connected to the data communications bus.

A method aspect of the invention is for operating a vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices. The method preferably comprises the steps of interfacing an alarm controller to the data communications bus, and enabling the alarm controller to operate using a desired set of digital signals for a desired vehicle from a plurality of sets of signals for different vehicles to thereby permit the alarm controller to communicate with at least one of a vehicle security sensor and an alarm indicator via the data communications bus. Accordingly, the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor and via the data communication bus.

The concepts and features of the invention may also be desirably incorporated in a remote control system for a vehicle, such as a vehicle security system, a remote engine starter system, or a remote keyless entry system, for example. The remote control system preferably comprises a remote transmitter and a receiver within the vehicle for receiving a signal from the remote transmitter. A vehicle function controller is provided along with an associated vehicle function controller bus interface means for interfacing the vehicle function controller to the data communications bus. The remote control system also includes desired signal enabling means for causing the vehicle function controller to operate using a desired set of signals for a desired vehicle from a plurality of possible sets of digital signals for different vehicles. Accordingly, the vehicle function controller can communicate with a vehicle device via the data communications bus so that the vehicle function controller is capable of operating the vehicle device responsive to the remote transmitter. Method aspects of this embodiment of the invention are also disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of the vehicle security system in accordance with the invention.

FIG. **2** is a schematic diagram of a remote transmitter of the vehicle security system in accordance with the invention.

FIG. **3** is a schematic block diagram of a portion of a first embodiment of the vehicle security system in accordance with the present invention.

FIG. **4** is a schematic block diagram of a portion of a second embodiment of the vehicle security system in accordance with the present invention.

FIG. **5** is a schematic block diagram of a portion of a third embodiment of the vehicle security system in accordance with the present invention.

FIG. **6** is a schematic block diagram of a portion of a fourth embodiment of the vehicle security system in accordance with the present invention.

FIG. **7** is a schematic block diagram of the vehicle security system in accordance with the present invention.

FIG. **8** is a schematic block diagram of a remote keyless entry system in accordance with the present invention.

FIG. **9** is a schematic block diagram of a remote engine starting system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough

and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout. Prime and multiple prime notation are used in alternate embodiments to indicate similar elements.

Referring now to the schematic block diagram of FIG. **1**, a vehicle security system **10** according to one aspect of the invention is first described. The security system includes a controller **11** which, in turn, in the illustrated embodiment includes a central processing unit (CPU) or microprocessor **12** operating under stored program control.

In the illustrated embodiment, a transmitter and receiver **13** are connected to the CPU **12** for receiving signals from a remote transmitter and for transmitting signals to a remote unit, as will be described in greater detail below. As would be readily understood by those skilled in the art, the transmitter portion of the controller **11** may not be needed in some embodiments of the invention. An antenna **13***a* is illustratively connected to the transmitter and receiver **13**.

In the illustrated embodiment, the CPU **12** is also operatively connected to a memory (EEPROM) **14** and a data communications bus interface **15** which provides both input and output interfaces to various vehicle devices. As would be readily understood by those skilled in the art, the CPU **12** may alternately or additionally have its own on-board memory.

The data communications bus interface **15** is illustratively connected to various vehicle input devices including: an ignition switch **20**; a key in the ignition sensor **21**; two zone sensors **22***a*, **22***b*; conventional trunk hood and door pin sensors or switches **23**, **24**, and **25**, respectively; and door lock switches **28**. In addition, a pre-warn sensor **26** and valet switch **27** also provide inputs to the controller **11** in the illustrated embodiment. As would be readily understood by those skilled in the art, other inputs are also contemplated by the present invention and are generally described herein by the term sensor. In addition, an input signal may also be received from a remote transmitter **50** (FIG. **2**).

The data communications bus interface **15** of the controller **11** may also preferably be connected to a plurality of output devices. The outputs may include auxiliary relay outputs **30**, such as for window control, remote starting, or a remote alarm indication, as would be readily understood by those skilled in the art. A siren and/or lights **31**, and green and red light emitting diodes (LEDs) **32**, **33** for dashboard mounting are also illustratively connected to the controller **11**. Other outputs may be directed to a valet LED **34**, a dome light **36**, a central lock relay or lock control unit **41**, a starter kill circuit **42**, and an armed relay output **43**. In addition, other outputs may be directed to one or more of an audible tone generator **37**, an alphanumeric display **44**, a speech message annunciator **45**, and a vibration transducer **46**, as will be readily appreciated by those skilled in the art. Other similar indicating devices are also contemplated by the present invention, as would be readily understood by those skilled in the art. Some of the illustrated devices may be hardwired to various control nodes as would be readily understood by those skilled in the art. The control nodes may be connected by the data communications bus as would also be known to those skilled in the art.

Referring now more particularly to FIG. **2**, a remote transmitter **50** in accordance with the invention is described. The remote transmitter **50** illustratively includes a housing **51** and a plurality of first momentary contact switches **52***a*–**52***d* carried by the housing. A second momentary contact switch **53** and an indicating light, such as the illustrated LED **54** are also carried by or mounted on the housing **51**. As would be readily understood by those skilled in the art, the remote transmitter **50** is typically relatively small and includes an opening **55** for facilitating connection to a vehicle key ring, for example. In addition, the remote transmitter **50** includes a central processing unit or microprocessor **56** operatively connected to the plurality of first switches **52***a*–**52***d*, the second switch **53**, and the LED **54**. The microprocessor is also connected to a transmitter and/or receiver circuit **57** and its associated antenna **57***a* for transmitting and/or receiving signals to and from the controller **11** of the vehicle security system **10**. Accordingly, the term "remote transmitter" is used broadly herein to describe the embodiment also including receiver means.

The remote transmitter **50** may also include a numeric or alphanumeric display **58**, and a speaker **59** coupled to an audible tone generator or a speech message generator, as may be provided by the microprocessor **56**. A vibration transducer, not shown, may also be incorporated into the remote transmitter **50** for communicating to the user as would be readily understood by those skilled in the art.

Turning now additionally to FIG. **3** a first embodiment of the desired signal enabling means **17** is described. The vehicle security system **10** preferably comprises a vehicle security sensor and associated sensor bus interface means **60** for interfacing the vehicle security sensor to the data communications bus **62**. The vehicle security system **10** also preferably includes an alarm indicator and associated alarm indicator bus interface means **64** for interfacing the alarm indicator to the data communications bus. Examples of vehicle security sensors and alarm indicators are described above in greater detail with reference to FIG. **1**.

The security system **10** further preferably comprises desired signal enabling means **17** for enabling the alarm controller **10** to operate using a desired set of signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. As would be readily understood by those skilled in the art, the term different vehicles may include vehicles from different manufacturers, different models, or even different trim levels of the same make and model. Accordingly, the desired signal enabling means **17** permits the alarm controller, that is, the security CPU and bus interface **65**, to communicate with the vehicle security sensor and the alarm indicator via the data communications bus **62** so that the CPU is capable of operating the alarm indicator responsive to the vehicle security sensor.

The data communications bus **62** may preferably be a multiplexed data bus as would be readily understood by those skilled in the art. Accordingly, the sensor bus interface means, the alarm bus interface means, and the alarm controller bus interface means may each comprise multiplexing means for interfacing with the multiplexed data bus of the vehicle. For example, any of the various multiplexing schemes as disclosed in "The Thick and Thin of Car Cabling" by Thompson appearing in the IEEE Spectrum, February 1996, pp. 42–45 may be used. Other data bus connection schemes are also contemplated by the present invention.

As illustrated in FIG. **3**, one embodiment of the desired signal enabling means **17** may preferably include a memory **70** for storing a plurality of sets **72***a*, **72***b* and **72***n* of signals for different vehicles, and selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles. By storing sets of signals is meant storing information or data necessary to generate the desired signals on the data bus **62** as would be readily

understood by those skilled in the art. The memory **70** may include device address memory means for storing a plurality of different sets of signals representative of different device addresses for different vehicles. Alternatively, or in addition thereto, the memory means may comprise protocol memory means for storing a plurality of different protocols for different vehicles. One or more other control nodes and associated bus interfaces **66** may also be connected to the data communications bus **62** as would also be readily understood by those skilled in the art. For example, other control nodes may include an engine controller thereby permitting the alarm controller to disable the engine, or the body controller thereby permitting the alarm controller to control the vehicle door locks as would be readily understood by those skilled in the art.

In the illustrated embodiment of FIG. **3**, the selecting means may comprise user selecting means **75** for permitting a user to select the desired set of signals. A keypad or other input means may be used to permit the user to select the desired signal set for his vehicle. The valet switch **27** (FIG. 1), for example, may also be operated by the user to select the desired signal set. The user may select the desired set of signals by entering a unique digital code similar to the selection of signals for a home electronics universal remote control. Other techniques for permitting the user to select the desired signal set from a plurality of stored sets are also contemplated by the invention as would be readily appreciated by those skilled in the art.

Referring now additionally to FIG. **4** another embodiment of the desired signal enabling means **17'** is described in accordance with the security system **10'** of the present invention. In this embodiment, the selecting means may comprise bus determining means **77** for determining the desired set of signals based upon signals on the data communications bus. For example, the bus determining means could determine the desired set of signals based upon sensed voltage levels or based upon the timing of signal pulses on the data communications bus **62**. The other components of this embodiment of the desired signal enabling means **17'** are similar to those described above with reference to FIG. **3** and need no further description.

Yet another embodiment of the security system **10"** according to the invention is explained with reference to FIG. **5**. In this illustrated embodiment, the desired signal enabling means **17"** includes a desired signal set memory **81** operatively connected to the illustrated bus learning means **80**. The bus learning means **80** may determine and store in the signal set memory **81** the protocol and/or device addresses for the vehicle devices. For example, the bus learning means **80** may permit the user to operate various vehicle devices and store a desired signal set based thereon as would be readily understood by those skilled in the art. The other components of the desired signal enabling means **17"** are similar to those described above with reference to FIG. **3** and need no further description.

Still another embodiment of the desired signal enabling means **17'"** is explained with reference to FIG. **6**. The desired signal enabling means **17'"** includes a signal set memory **81** operatively connected to the schematically illustrated download learning means **84**. The download learning means **84** may include an interface connected to the illustrated vehicle cellular telephone **86** to permit learning or downloading of the desired signal set from a remote or central monitoring and control station **88**, for example. As would be readily understood by those skilled in the art, the download learning means as well as the other desired signal enabling means may be implemented by software in the CPU **12** of the controller **11** or in a separate microprocessor or circuits.

One implementation of the security system **10** is shown in FIG. **7** and includes the vehicle security controller **11**. The remote transmitter **50** can switch the controller **11** between the armed and disarmed modes. The controller **11** in the armed mode is capable of generating an alarm indication via the siren **31** (FIG. 1) and based upon the door switches **25** (FIG. 1), for example. The communications are via the data communications bus **62** and, are based upon the desired signal set from the desired signal enabling means **17**.

The features and aspects described above may also be readily implemented into other vehicle related systems, such as for performing remote control functions. As shown in FIG. **8**, the invention may be embodied in a remote keyless entry system **90** including a remote keyless entry controller **91** operated by a remote handheld transmitter **93**. The controller **91** communicates with the door lock motors **94** and illustrated trunk release **96** via the data communications bus **62**. The remote keyless entry system **90** also includes the desired signal enabling means **17** which permits the controller **91** to perform the desired door locking and trunk release remote control functions or operations as would also be readily understood by those skilled in the art. As would be readily appreciated by those skilled in the art, any of the desired signal enabling means described herein and equivalent thereto may be used for the remote keyless entry system **90** in accordance with the present invention.

Turning now to FIG. **9**, yet another vehicle associated remote control function is illustrated and now explained. The remote engine starting system **100** includes a remote start controller **101** operable by a remote transmitter **103**. The remote controller **101** may communicate via the data communications bus **62** to enable the ignition and fuel systems **106** and crank the engine starter **104**. Various sensors may also be monitored as would be readily understood by those skilled in the art.

A method aspect of the invention is for operating a vehicle security system **10** for a vehicle of a type including a data communications bus **62** connecting a plurality of vehicle devices. The method preferably comprises the steps of interfacing an alarm controller **11** to the data communications bus **62**, and enabling the alarm controller to operate using a desired set of digital signals for a desired vehicle from a plurality of possible sets of signals for different vehicles to thereby permit the alarm controller to communicate with at least one of a vehicle security sensor **60** and an alarm indicator **64** via the data communications bus **62** (FIG. **3**). Accordingly, the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor and via the data communication bus.

Another method of the invention is for remotely controlling a vehicle function for a vehicle of a type including a data communications bus **62** connecting a plurality of vehicle devices, and a vehicle function controller and associated bus interface means for interfacing the vehicle function controller to the data communications bus. The method comprising the steps of: enabling the vehicle function controller to operate using a desired set of signals for a desired vehicle from a plurality of sets of signals for different vehicles for permitting the vehicle function controller to communicate via the data communications bus with at least one of the vehicle devices; and receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter.

Those of skill in the art will readily recognize the benefits and advantages of the present invention for aftermarket

security systems and other aftermarket systems for implementing remote control functions wherein compatibility with a potentially large number of different protocols and/or device addresses is desired. Of course, many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Accordingly, it is understood that the invention is not to be limited to the illustrated embodiments disclosed, and that the modifications and embodiments are intended to be included within the spirit and scope of the appended claims.

That which is claimed is:

1. A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices, said vehicle security system comprising:

a vehicle security sensor and associated sensor bus interface means for interfacing said vehicle security sensor to the data communications bus;

an alarm indicator and associated alarm indicator bus interface means for interfacing said alarm indicator to the data communications bus;

an alarm controller and associated alarm controller bus interface means for interfacing said alarm controller to the data communications bus; and

desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate with said vehicle security sensor and said alarm indicator via the data communications bus so that said alarm controller is capable of operating said alarm indicator responsive to said vehicle security sensor.

2. A vehicle security system according to claim 1 wherein said desired signal enabling means comprises:

memory means for storing a plurality of sets of signals for different vehicles; and

selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

3. A vehicle security system according to claim 2 wherein said selecting means comprises user selecting means for permitting a user to select the desired set of signals.

4. A vehicle security system according to claim 2 wherein said selecting means comprises bus determining means for determining the desired set of signals based upon signals on the data communications bus.

5. A vehicle security system according to claim 2 wherein said memory means comprises device address memory means for storing a plurality of different sets of signals for different device addresses.

6. A vehicle security system according to claim 2 wherein said memory means comprises protocol memory means for storing a plurality of different sets of signals for different protocols.

7. A vehicle security system according to claim 1 wherein said desired signal enabling means comprises bus learning means for learning the desired set of signals based upon signals on the data communications bus.

8. A vehicle security system according to claim 1 wherein said desired signal enabling means comprises download learning means for leaving the desired set of signals from a downloading device.

9. A vehicle security system according to claim 1 wherein said desired signal enabling means comprises protocol providing means for providing a protocol for the desired vehicle.

10. A vehicle security system according to claim 1 wherein said desired signal enabling means comprises device address providing means for providing device addresses for the desired vehicle.

11. A vehicle security system according to claim 1 further comprising a vehicle controller and associated vehicle controller bus interface means for connecting the vehicle controller to the data communications bus; and wherein said alarm controller is operatively connected to said vehicle controller.

12. A vehicle security system according to claim 1 wherein the data communications bus is a multiplexed data bus; and wherein the sensor bus interface means, the alarm bus interface means, and the alarm controller bus interface means each comprises multiplex interface means for interfacing with the multiplexed data bus.

13. A vehicle security system according to claim 1 wherein said vehicle security sensor comprises one of a door switch, a trunk switch, a proximity sensor, and a motion sensor.

14. A vehicle security system according to claim 1 wherein said alarm indicator comprises one of a vehicle light, a vehicle horn, a siren, a speech message generator, and a remote pager.

15. A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices, the vehicle devices comprising at least one of a vehicle security sensor and an alarm indicator, said vehicle security system comprising:

an alarm controller and associated alarm controller bus interface means for interfacing said alarm controller to the data communications bus;

memory means for storing a plurality of sets of signals for different vehicles; and

selecting means for selecting a desired set of signals for a desired vehicle from the plurality of sets of signals for different vehicles, the desired set of signals for enabling said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator.

16. A vehicle security system according to claim 15 wherein said selecting means comprises user selecting means for permitting a user to select the desired set of signals.

17. A vehicle security system according to claim 15 wherein said selecting means comprises bus determining means for determining the desired set of signals based upon signals on the data communications bus.

18. A vehicle security system according to claim 15 wherein said memory means comprises device address memory means for storing a plurality of different sets of signals for different device addresses.

19. A vehicle security system according to claim 15 wherein said memory means comprises protocol memory means for storing a plurality of different sets of signals for different protocols.

20. A vehicle security system according to claim 15 wherein the data communications bus is a multiplexed data bus; and wherein the alarm controller bus interface means comprises multiplex interface means for interfacing with the multiplexed data bus.

21. A vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices, the vehicle devices comprising at least one of a vehicle security sensor and an alarm indicator, said vehicle security system comprising:

an alarm controller and associated alarm controller bus interface means for interfacing said alarm controller to the data communications bus; and

desired signal enabling means for enabling said alarm controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of the vehicle security sensor and the alarm indicator, said desired signal enabling means comprising learning means for learning the desired set of signals.

22. A vehicle security system according to claim **21** wherein said learning means comprises bus learning means for learning the desired set of signals based upon signals on the data communications bus.

23. A vehicle security system according to claim **21** wherein said learning means comprises download learning means for learning the desired set of signals from a downloading device.

24. A vehicle security system according to claim **23** further comprising cellular telephone means cooperating with said download learning means for receiving signals from a remote downloading device.

25. A vehicle security system according to claim **21** wherein said signal desired enabling means comprises protocol providing means for providing a protocol for the desired vehicle.

26. A vehicle security system according to claim **21** wherein said desired signal enabling means comprises device address providing means for providing desired addresses for the desired vehicle.

27. A vehicle security system according to claim **21** wherein the data communications bus is a multiplexed data bus; and wherein the alarm controller bus interface means comprises multiplex interface means for interfacing with the multiplexed data bus.

28. A method for operating a vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices, the method comprising the steps of:

interfacing an alarm controller to the data communications bus; and

enabling said alarm controller to operate using a set of desired signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said alarm controller to communicate via the data communications bus with at least one of a vehicle security sensor and an alarm indicator.

29. A method according to claim **28** wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the steps of:

storing in a memory a plurality of sets of signals for different vehicles; and

selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

30. A method according to claim **29** wherein the step of selecting comprises permitting user selection of the desired set of signals.

31. A method according to claim **28** wherein the step of selecting comprises determining the desired set of signals based upon signals on the data communications bus.

32. A method according to claim **29** wherein the step of storing in memory comprises storing a plurality of different sets of signals representative of different device addresses.

33. A method according to claim **29** wherein the step of storing in memory comprises storing a plurality of different sets of signals representative of different protocols.

34. A method according to claim **28** wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the step of learning the desired set of signals based upon signals on the data communications bus.

35. A method according to claim **28** wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the step of downloading the desired signals from a downloading device.

36. A remote control system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices, said remote control system comprising:

a remote transmitter;

a receiver within the vehicle for receiving a signal from said remote transmitter;

a vehicle function controller, operatively connected to said receiver, and associated vehicle function controller bus interface means for interfacing said vehicle function controller to the data communications bus; and

desired signal enabling means for enabling said vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said vehicle function controller to communicate via the data communications bus with a vehicle device so that said vehicle function controller is capable of operating the vehicle device responsive to said remote transmitter.

37. A remote control system for a vehicle according to claim **36** wherein the plurality of vehicle devices comprises a vehicle security sensor and associated sensor bus interface means for interfacing said vehicle security sensor to the data communications bus; and wherein said vehicle function controller comprises an alarm controller being capable of generating an alarm responsive to the vehicle security sensor.

38. A remote control system for a vehicle according to claim **36** wherein the plurality of vehicle devices comprises a plurality of vehicle door locks movable between locked and unlocked positions and associated bus interface means for interfacing said door locks to the data communications bus; and wherein said vehicle function controller comprises a door lock controller for moving the vehicle door locks between locked and unlocked positions responsive to said remote transmitter.

39. A remote control system for a vehicle according to claim **36** wherein said plurality of vehicle devices comprises vehicle engine starting means and associated bus interface means for interfacing said vehicle engine starting means to the data communications bus; and wherein said vehicle function controller comprises a remote start controller for operating the vehicle engine starting means responsive to said remote transmitter.

40. A remote control system for a vehicle according to claim **36** wherein said desired signal enabling means comprises:

memory means for storing a plurality of sets of signals for different vehicles; and

selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

41. A remote control system for a vehicle according to claim **40** wherein said selecting means comprises user selecting means for permitting a user to select the desired set of signals.

42. A remote control system for a vehicle according to claim **40** wherein said selecting means comprises determining means for determining the desired set of signals based upon signals on the data communications bus.

43. A remote control system for a vehicle according to claim 40 wherein said memory means comprises address memory means for storing a plurality of different sets of digital signals for different device addresses.

44. A remote control system for a vehicle according to claim 40 wherein said memory means comprises protocol memory means for storing a plurality of different sets of signals for different protocols.

45. A remote control system for a vehicle according to claim 36 wherein said desired signal enabling means comprises learning means for learning the desired set of signals.

46. A remote control system for a vehicle according to claim 36 wherein said desired signal enabling means comprises protocol providing means for providing a protocol for the desired vehicle.

47. A remote control system for a vehicle according to claim 36 wherein said desired signal enabling means comprises device address providing means for providing device addresses for the desired vehicle.

48. A remote control system for a vehicle according to claim 36 further comprising a second vehicle controller and associated vehicle controller bus interface means for connecting to the data communications bus; and wherein said vehicle function controller is operatively connected to said second vehicle controller.

49. A remote control system for a vehicle according to claim 36 wherein the data communications bus is a multiplexed data bus; and wherein the vehicle function controller bus interface means comprises multiplexing means for interfacing with the multiplexed data bus.

50. A method for remotely controlling a vehicle function for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices, and a vehicle function controller and associated bus interface means for interfacing the vehicle function controller to the data communications bus; the method comprising the steps of:

enabling the vehicle function controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting the vehicle function controller to communicate via the data communications bus with at least one of the vehicle devices; and

receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter.

51. A method according to claim 50 wherein the plurality of vehicle devices comprises a vehicle security sensor and associated sensor bus interface means for interfacing the vehicle security sensor to the data communications bus; wherein the vehicle function controller comprises an alarm controller movable between armed and disarmed modes, the alarm controller when in the armed mode being capable of generating an alarm indication responsive to the vehicle security sensor; and wherein the step of receiving comprises receiving a signal so that the vehicle function controller is moved to one of the armed and disarmed modes.

52. A method according to claim 50 wherein the plurality of vehicle devices comprises a plurality of vehicle door locks movable between locked and unlocked positions and associated bus interface means for interfacing the door locks to the data communications bus; and wherein the step of receiving comprises moving the vehicle door locks to one of locked and unlocked positions responsive to the remote transmitter.

53. A method according to claim 50 wherein the plurality of vehicle devices comprises vehicle engine starting means and associated bus interface means for interfacing the vehicle engine starting means to the data communications bus; and wherein the step of receiving comprises operating the vehicle engine starting means responsive to the remote transmitter.

54. A method according to claim 50 wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the steps of:

storing in a memory a plurality of sets of signals for different vehicles; and

selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

55. A method according to claim 54 wherein the step of selecting comprises permitting user selection of the desired set of signals.

56. A method according to claim 54 wherein the step of selecting comprises determining the desired set of signals based upon signals on the data communications bus.

57. A method according to claim 54 wherein the step of storing in memory comprises storing a plurality of different sets of signals representative of different device addresses.

58. A method according to claim 54 wherein the step of storing in memory comprises storing a plurality of different sets of signals representative of different protocols.

59. A method according to claim 50 wherein the step of enabling the alarm controller to operate using a set of desired signals comprises the step of learning the desired set of signals.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,719,551
DATED : February 17, 1998
INVENTOR(S) : Kenneth E. Flick

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 9, Line 62 Strike::

"leaving"

Insert::

- - learning - -

Signed and Sealed this

Twelfth Day of May, 1998

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

US005940007A

United States Patent [19]

Brinkmeyer et al.

[11] **Patent Number: 5,940,007**

[45] **Date of Patent: Aug. 17, 1999**

[54] **REMOTE CONTROL SYSTEM FOR MOTOR VEHICLE RELATED DEVICES**

[75] Inventors: **Horst Brinkmeyer**, Waiblingen; **Arthur Hipp**, Kirchheim; **Daniel Hoffmann**, Esslingen; **Günter Schwegler**, Weinstadt; **Dirk Weigand**, Leipzig, all of Germany

[73] Assignee: **Mercedes-Benz AG**, Germany

[21] Appl. No.: **08/804,884**

[22] Filed: **Feb. 24, 1997**

[30] **Foreign Application Priority Data**

Feb. 24, 1996 [DE] Germany 196 07 017

[51] **Int. Cl.**[6] **G06F 7/04**; G08C 19/00; H02H 7/18

[52] **U.S. Cl.** **340/825.69**; 340/825.72; 340/825.31; 307/10.7

[58] **Field of Search** 340/825.3, 825.22, 340/825.69, 825.72, 825.31, 825.34; 380/21, 22, 23; 370/93, 96, 13; 307/10.7, 10.2, 10.3, 10.4, 10.5, 10.6

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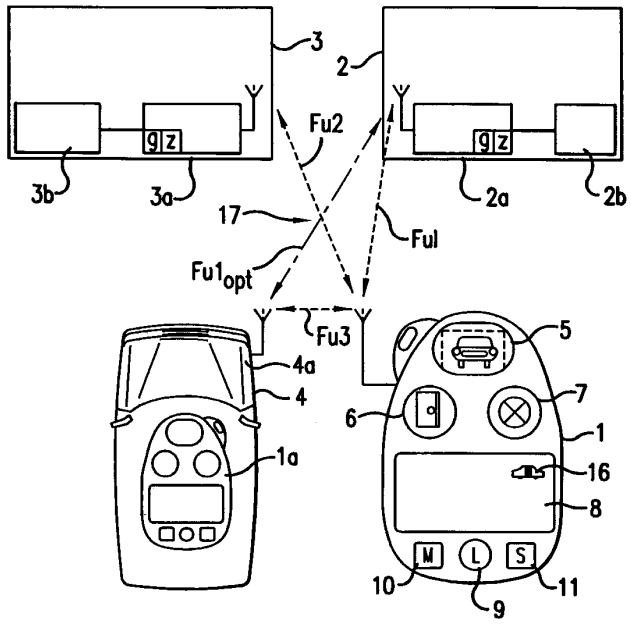
9015211	12/1990	WIPO .

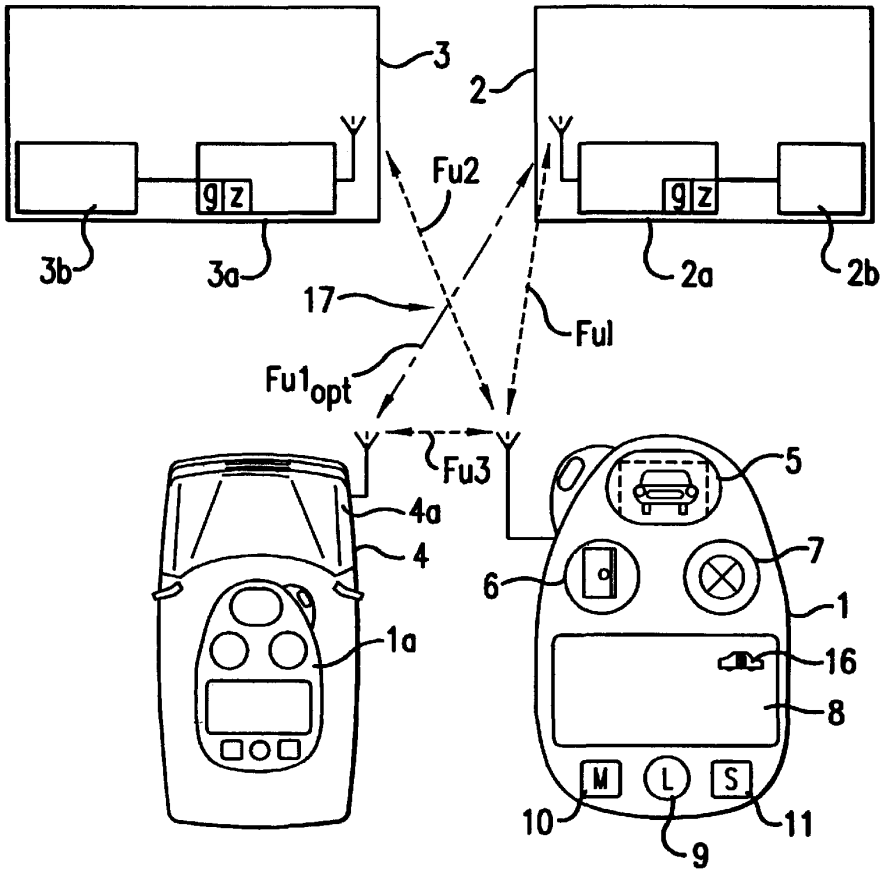
Primary Examiner—Michael Horabik
Assistant Examiner—Jean B. Jeanglaude
Attorney, Agent, or Firm—Evenson, McKeown, Edwards & Lenahan, P.L.L.C.

[57] **ABSTRACT**

A system and method for operating a remote control having a portable remote control unit which can control at least one function unit. The remote control unit and the function unit are connected with one another by way of a bidirectional data communication link, by which data can be transmitted by means of a symmetrical coding method. The remote control unit sends a learn mode reporting signal in a secret coding information learn mode to the controllable function unit which, in the learn mode, in turn, sends back an acknowledgment signal. Upon receipt of the acknowledgment signal, the remote control unit generates new secret coding information by means of the coding algorithm, as a function of basis secret coding information and of the previous secret coding information, and sends the new secret coding information to the function unit. The function unit then replaces the previous secret coding information with the new secret coding information and emits an acknowledgment signal, upon the receipt of which the remote control unit, in turn, replaces the previous secret coding information with the new secret coding information.

6 Claims, 4 Drawing Sheets




3
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g z
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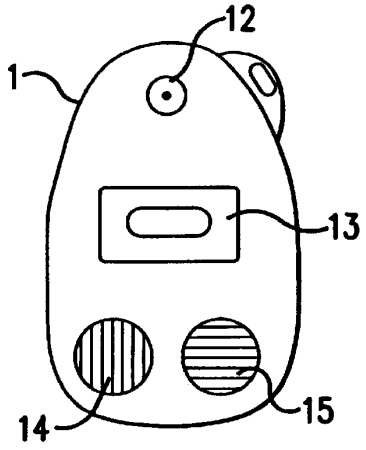
FIG.1


12
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15

FIG.2

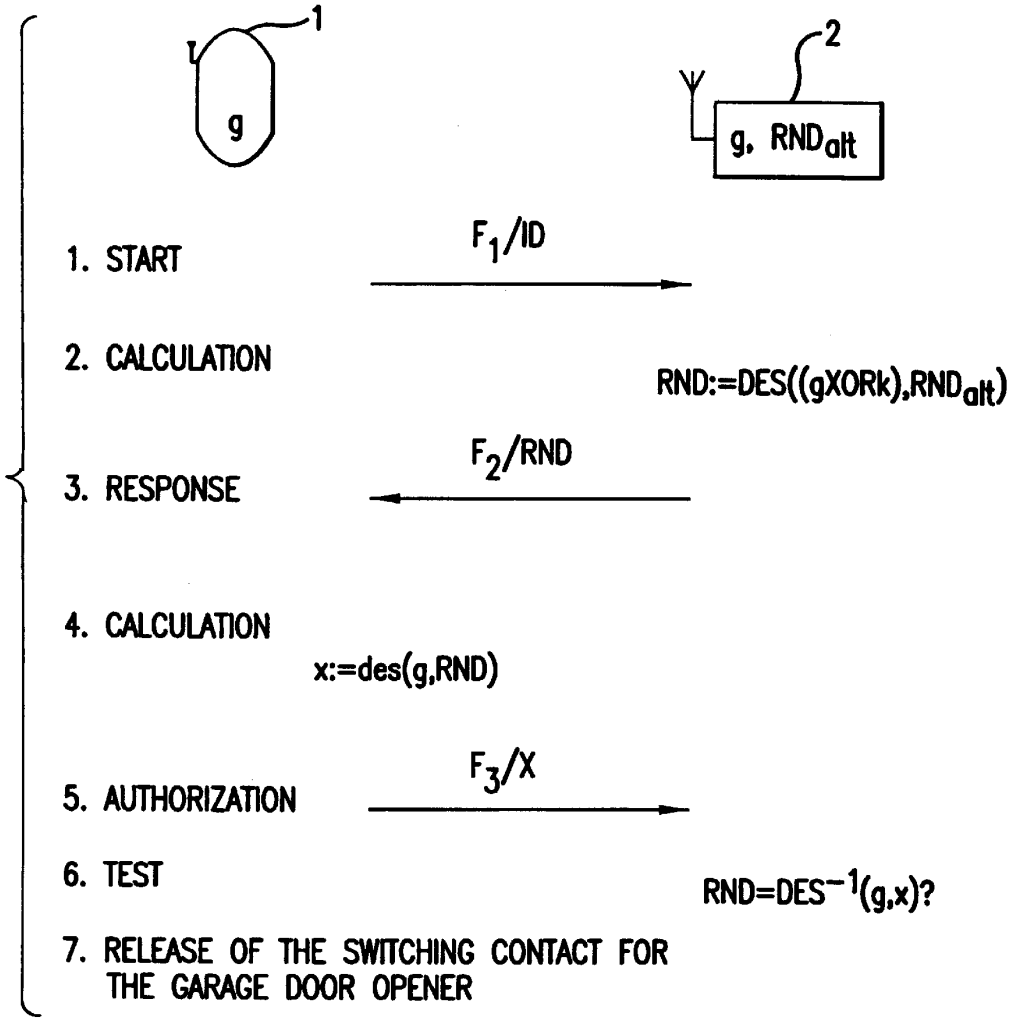
1
g
2
g, RND$_{alt}$
1. START
F_1/ID
2. CALCULATION
RND:=DES((gXORk),RND$_{alt}$)
F_2/RND
3. RESPONSE
4. CALCULATION
x:=des(g,RND)
F_3/X
5. AUTHORIZATION
6. TEST
RND=DES^{-1}(g,x)?
7. RELEASE OF THE SWITCHING CONTACT FOR THE GARAGE DOOR OPENER

FIG.3

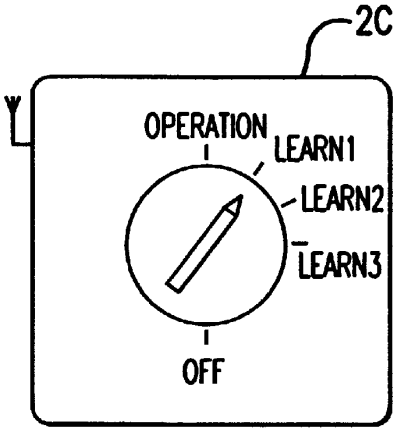

FIG.4A

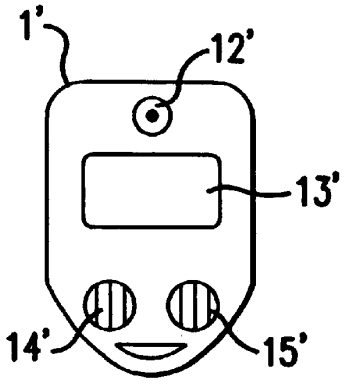

FIG.4B

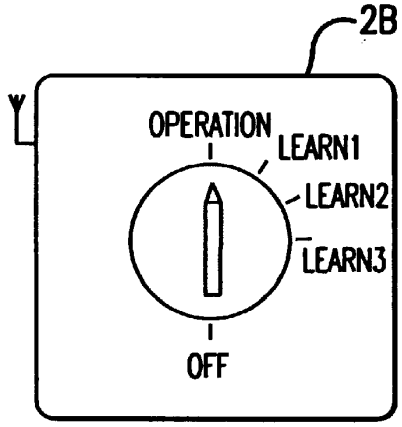

FIG.4C

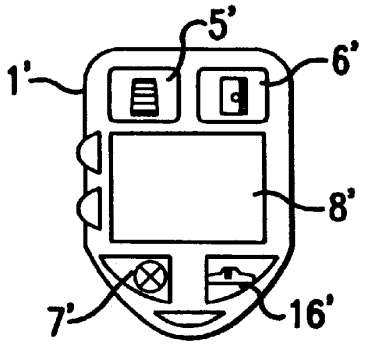

FIG.4D

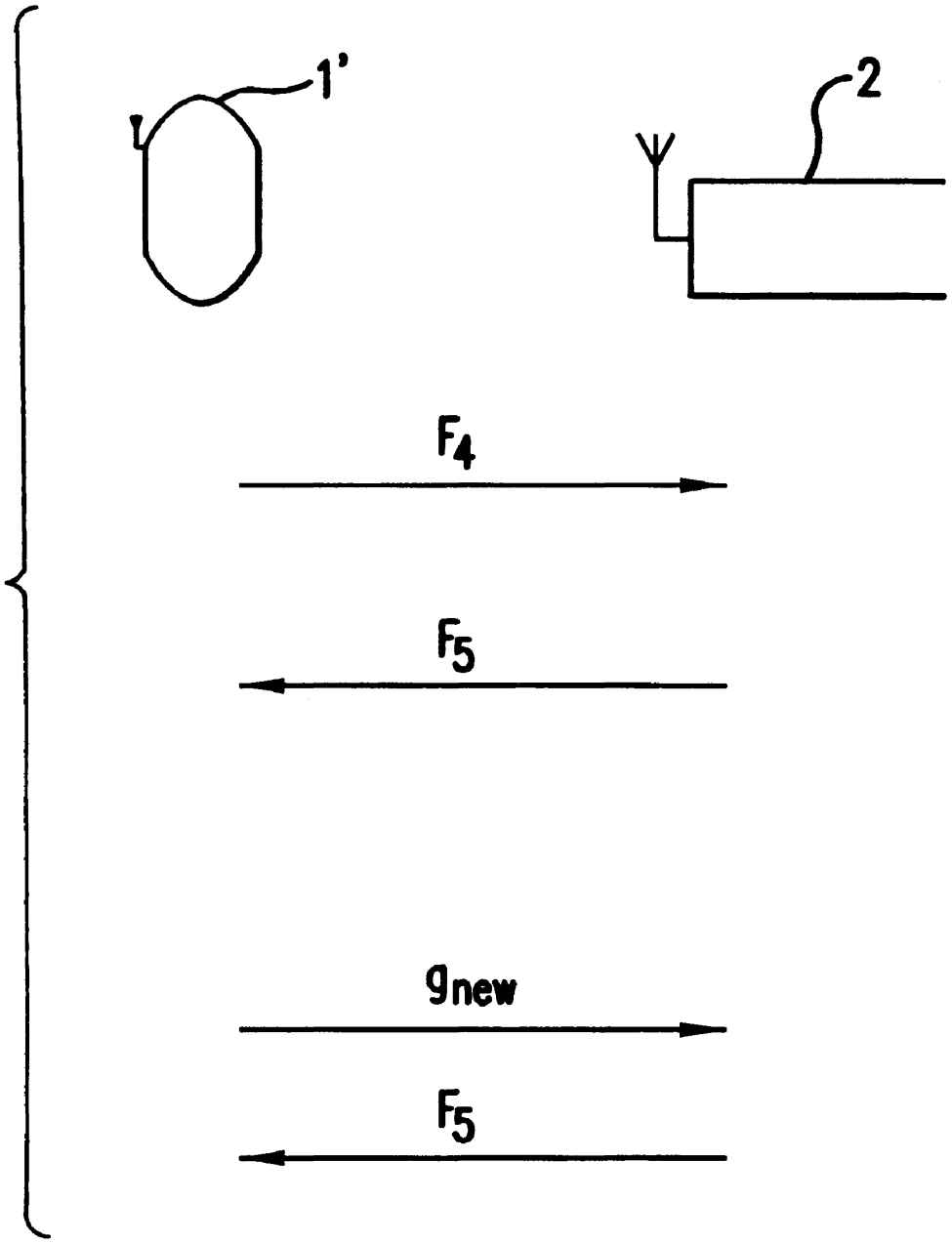

FIG.5

REMOTE CONTROL SYSTEM FOR MOTOR VEHICLE RELATED DEVICES

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a remote control system having a portable remote control unit for controlling at least one function unit, and a bidirectional data communication path for transmitting symmetrically encoded data between the remote control unit and the function unit, and to an operating process for such a system.

Code protected remote control systems of this type are used, for example, for motor vehicles and external motor-vehicle-related devices, such as garage door openers, to limit access to a selected group of authorized users. Authorized users establish their usage authorization to the respective controllable function unit by the fact that they are in the possession of an authorizing remote control unit. The remote control unit triggers a bidirectional code data exchange in which the pertaining authorization code is transmitted between the two units in a coded manner, and is subsequently examined for its conformity and therefore usage authorization. The use of a symmetrical coding method, which presupposes the presence of identical secret coding information in both units, offers a high degree of protection against attempts by unauthorized persons to control the function unit themselves, after having listened to such a code data exchange.

German published patent application DE 32 25 754 A1 discloses a remote control method and apparatus of this type, in which the secret coding information of the symmetrical coding method is a mathematical function, which is stored in an identical and unchangeable manner, on the one hand, in a key part and, on the other hand, in a lock part.

In cryptography, the so-called DES (Data Encryption Standard) algorithm is known, among others, as a very safe algorithm for symmetrical coding methods. German patent document DE 44 11 450 C1, for example, discloses a vehicle safety device with an electronic usage authorization coding for implementing a replacement key, instead of an asymmetrical coding method for a protected code data exchange in which only one of the two mutually communicating units must contain secret coding information.

In various cases, it is known to use a portable remote control unit in the form of an electronic vehicle key. The key not only authorizes access and/or usage of a motor vehicle, but also controls other vehicle function units or other function units, such as a garage door opening. For this purpose, in a representative manner, reference is made to German patent documents DE 30 43, 627 C2, DE 40 18 261 C1 and DE 42 15 221 C2 as well as to German published patent application DE 40 03 280 A1.

German published patent application DE 41 02 020 A1, discloses a remote control system having a vehicle key which is configured for bidirectional information exchange with the vehicle to control locking and unlocking elements of the vehicle. In addition, it also has a visual display unit for displaying information concerning driving condition parameters transmitted from the vehicle, such as the condition of the vehicle doors, driven mileage and level in the fuel tank, as well as additional non-vehicle parameters, such as the time of day and the condition of the key battery.

European published patent application EP 0 617 183 A2, discloses a vehicle remote control system with a key that has a voice memory, a microphone and a voice playback unit. Information, such as the number of a parking space where the vehicle is situated, can be fed in voice form into the key and stored there, after which this information can be retrieved from the key in voice form by the user.

Published patent application WO 90/15211 describes a remote control system of the initially mentioned type, for transmitting data which contain a random number, coded for example by means of the DES coding method, between the remote control unit and the function unit. The pertaining secret coding information can be changed in the remote control unit by bringing the latter together with an additional coding unit into which the user must first input the previous secret coding information to prove his authorization. If the code conformity test is successful, the user can feed new secret coding information into the remote control unit by way of the coding unit. The transmission of the new secret coding information into the function unit takes place after a normal authentication operation in which a negative result has occurred because of the secret coding information, which so far has been changed only in the remote control unit. The function unit will then change to a learn mode and, by way of the DES coding method, will retrieve the new secret coding information from the remote control unit.

In the remote control system described in U.S. Pat. No. 4,988,992, authorization codes of at least one. remote control unit can be transmitted to at least one function unit. In order to change the respective authorization code as required, the corresponding remote control unit is first brought into a programming mode which activates a random code generator provided there. The random code is stored in the remote control unit as a new authorization code. Additional remote control units can be synchronized by activating a learn mode, in which they can receive the new authorization code from the newly programmed remote control unit by way of a special antenna, if the remote control unit is brought into the direct vicinity and is caused to send the new authorization code. For entering the new authorization code into the respective function unit, a programming mode is activated on it, after which the function unit will, for a given time period, be enabled to receive a new authorization code which does not correspond to its previously stored code. A code received within this time period will then be stored by the function unit as a new authorization code.

One object of the invention is to provide a remote control system and process of the initially mentioned type which requires relatively low expenditures, and in which the secret coding information used for the applied symmetrical coding method can be changed in a simple manner that is protected from manipulation.

This problem is solved by means of a remote control system according to the invention, in which the learning operation for replacing previous secret coding information with new secret coding information is both simple and secure. When the learn mode is activated, the remote control unit automatically calculates new secret coding information, preferably by means of a pseudorandom operation. Since the secret coding information remains hidden even to the rightful owner of the remote control unit, he is not burdened with inputting it. Because new secret coding information can be generated upon request, the learn mode can be repeated as often as desired for the purpose of selecting new secret coding information. Because of the learning activation, and because the secret coding information can be replaced only in the function unit, after acknowledgment of secret coding information by the function unit to the remote control unit, it is ensured that the generation of new secret coding information triggered by an unauthorized person, on the one

hand, remains useless to him (since the function unit continues to require control by means of the old secret coding information) and, on the other hand, the authorized user will be able to continue to control the function unit by means of the remote control unit on the basis of the old secret coding information, which remains valid. Alternatively, it is also possible to preclude the generation of new secret coding information in the remote control unit when the function unit is not activated. The function unit should be guarded against access by unauthorized persons, and activation of the learn mode at the function unit should be protected by suitable locking; for example, by means of a key switch.

In one embodiment of the invention, at least one vehicle-side function unit (such as an auxiliary heater) and at least one function unit outside the vehicle (such as a garage door opener) can be controlled by the remote control unit. Furthermore, in a reversed data transmission direction, condition information, particularly with respect to the respective function unit, can be transmitted to the remote control unit and can be indicated there visually and/or acoustically.

In another embodiment, separate secret coding information for the coding algorithm in the remote control unit is assigned to each of the function units which can be controlled by the remote control unit. Thus, the secret coding information for various controllable function units can be changed independently of one another.

In still another embodiment, the controllable function unit can be switched between several learn mode channels, each of which is used to establish secret coding information for data communication with a specific remote control unit. In this manner, the function unit can be controlled by several authorizing remote control units, each with respective specific secret coding information.

Finally, in yet another embodiment of the invention, the so-called DES (Data Encryption Standard) algorithm for the symmetrical coding method is used. This arrangement permits particularly secure data communication between the remote control unit and the controllable function unit, at expenditures which are acceptably low.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a remote control system for controlling devices situated both inside and outside of a motor vehicle, by way of a portable remote control unit in the form of a key tag;

FIG. **2** is a schematic rear view of the key tag of FIG. **1**;

FIG. **3** depicts an authentication communication with the system of FIG. **1**, between the key tag and a garage door opener;

FIG. **4** depicts the operating steps in a key secret learning operation between a modified key tag as a portable remote control unit and the garage door opener of the system of FIG. **1**; and

FIG. **5** shows the communication sequence during the learning operation according to FIG. **4**.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram which shows an overview of a remote control system according to the invention, in which a portable remote control unit is provided in the form of a key tag **1**. A bidirectional radio data communication path **17**, having three radio channels (Fu1, Fu2, Fu3), provides a data exchange connection between the key tag **1** and a transmitting/receiving device **2***a* of a garage door opener **2** assigned to a vehicle garage, a transmitter/receiver **3***a* of a house **3** or a transmitter/receiver **4***a* of a vehicle **4**, in each case via an assigned one of the three radio channels (Fu1, Fu2, Fu3), according to the operating of pertaining function keys.

The key tag **1** can control the devices outside the vehicle via the pertaining radio channels (Fu1, Fu2) even when it is situated in the vehicle interior, as indicated by the illustrated position **1***a*. In the latter case, data communication takes place completely independently of the vehicle **4** and its transmitter/receiver **4***a*. It is also possible to improve the transmission characteristics, however, by converting the signals of the key tag **1***a* to the transmitter/receiver unit **4***a* of the vehicle, which then communicates with the transmitter/receiver device of the garage door opener by way of an optional radio channel ($fu1_{opt}$) indicated by a dash-dotted line in FIG. **1**. Of course, a different type of wireless data communication, for example, by infrared waves, can also be used.

The transmitter/receiver **2***a* of the garage door opener **2** has a switching output arranged in parallel to an operating element in the interior of the garage (not shown), which also controls a garage door actuator **2***b*. Thus, the motorized garage door opener can be actuated to open and close the garage door by either the key tag **1** or the operating element in the garage interior. By means of a switching output, the transmitter/receiver device **3***a* in the house **3** controls an electro-mechanical door opener **3***b* for the door of the house **3**, so that opening of the door can be released or blocked via the key tag **1**. It should be understood of course that, as required, the two transmitters/receivers **2***a*, **3***a* (of the garage door opener **2** and of the house **3** respectively) can also be combined to form a single, multi-channel transmitter/receiver. The transmitter/receiver **4***a* in the vehicle **4** is connected with the other components of the electric system of the vehicle, via a data bus system (not shown).

The key tag **1**, which operates as a portable remote control unit, as illustrated in the front view of FIG. **1** and in the rear view of FIG. **2**, has several functions. A function key **5** on the front side triggers data communication to control the garage door opener **2**, while another function key **6** controls the house door opener **3***b*. A third function key **7** may have a freely selectable radio remote control function, for which a suitable data protocol has previously been entered, such as switching on a yard light. Alternatively, such a yard light can also be switched on by means of another assigned communication channel in the transmitter/receiver **2***a* of the garage door opener **2**. In this variant, no separate radio data protocol need be fed.

The key tag **1** also has a display **8** which can be illuminated by an illumination key **9**. When a menu key **10** is operated, the display **8** presents a menu (which has previously filed functions inside the vehicle), from which a desired function can be selected by operating a setting key **11**. In the illustrated embodiment of FIG. **1**, the control of an auxiliary heater is shown as such a function, by a corresponding signal **16** which appears on the display **8**. The selected functions inside the vehicle are controlled via the radio channel (Fu3) between the key tag **3** and the vehicle **4**. For this purpose, the vehicle-side transmitter/receiver **4***a* transmits the corresponding control commands via the data bus system to the respective vehicle target component.

As illustrated in FIG. **2**, the key tag **1** has a function key **12** on its rear side, which is used to select a learn mode, and

will be explained further below. Another function key **13** used is a so-called panic key. Both of these function keys **12**, **13** are protected from unintentional operation by arranging them in a recess, or by providing them with a comparatively hard pressure point.

Operation of the panic key **13** triggers an alarm system situated in the vehicle. Also, if the vehicle is equipped with an antitheft system having a car telephone and a locating system, such as the GPS (Global Positioning System), the panic button can be used to make an emergency call. Further, a speaker **14** and a microphone **15** arranged on the rear side of the key tag **1** provide a voice recording and replay. Specifically, for example, information concerning the vehicle location can be entered in voice form and retrieved later. This function is particularly useful in the case of multiple users of the vehicle **5** in a motor vehicle fleet.

In addition, the display **8** may also provide information concerning the condition of the function elements controlled by the key tag **1** (such as of the garage door opener **2**, the house door opener **3***b* and the auxiliary vehicle heater), or other information which is transmitted to the key tag **1** via the transmitter/receiver devices **2***a*, **3***a*, **4***a* and the bidirectional data communication path **17**. For example, vehicle data, such as the mileage and the fuel tank content can also be shown on the display **8**, which is a special advantage where the vehicle is used by several drivers, as in the case of car rental agencies and so-called car sharing pools. Likewise, in this manner, as required, the locking state of the vehicle doors can be transmitted by the vehicle-side transmitter/receiver **4***a* and the pertaining radio channel (Fu3) to the key tag **1**, and be shown there on the display **8**.

As a further advantageous function of the remote control device, it can be provided that, when the vehicle antitheft system is triggered because of a theft attempt, a corresponding information signal is transmitted by the transmitter/receiver unit **4***a* of the vehicle **4** via the pertaining function channel (Fu3) to the key tag **1**. The key tag **1** will then emit a corresponding report concerning the attempted theft visually on the display **8** and/or acoustically by way of its speaker **14**.

In order to prevent a misuse of the remote control system by unauthorized persons, data communication between the key tag **1** and the transmitters/receivers **2***a*, **3***a*, **4***a* is protected by a usage authorization which must be satisfied as a prerequisite for properly receiving or processing data signals, such as a control signal for the garage door opener **2**, the house door opener **3***b* or the auxiliary vehicle heater. In order to verify the authorization of the operated key tag **1** to control the desired function unit, the remote control unit of FIG. **1** uses a symmetrical coding method based on the so-called DES (Data Encryption Standard) algorithm. The safety of the DES algorithm does not depend on keeping the algorithm per se secret, rather secret coding information (g) used in the coding algorithm is protected from disclosure. Such secret coding information is stored in both the key tag **1** and the transmitter/receiver devices **2***a*, **3***a*, **4***a* of the controlled function units. The coding algorithm generates a random number (z) as a function of this secret coding information (g) and further (optional) nonsecret parameters.

For example, FIG. **3** illustrates the steps followed in a typical authentication operation between the key tag **1** and the garage door opener **2**. As the starting step, the pertaining function key **5** (FIG. **1**) of the key tag **1** is operated, causing the key tag to emit a function code (F_1), together with a key identity code (ID). Upon the receipt of this information, the transmitter/receiver **2***a* of the garage door opener **2** is activated, **2***a* calculates a random number (RND) using the DES algorithm, as a function of the previously stored secret coding information (g), XOR-linked with an 8-byte constant (k), and a previously valid random number (RND_{old}). Because of its random characteristics, the DES algorithm is particularly suitable for use as a pseudorandom generator. The XOR-linking of the secret coding information (g) with the constant (k) provides an additional increase in safety so that, by means of the selected algorithm the system achieves optimum safety, simple logistics and ease of handling.

After the calculation, the transmitter/receiver of the garage door opener **2** transmits the random number (RND) (optionally preceded by a pertaining function code (F_2)) as a response signal, back to the key tag **1**. The key tag **1** then codes the random number (RND) using the DES algorithm and the secret coding information (g). The coding text (x) determined in this manner (optionally preceded by a function code (F_3)) is sent back to the garage door opener **2**. The transmitter/receiver of the garage door opener **2** uses the coding text (x) and the secret coding information (g), applying the inverse DES algorithm to determine the contained plain text information. It then examines the result to determine whether it corresponds to the previously generated and emitted random number (RND). If a match is determined to exist, it is concluded that the signal has been sent by an authorized control of the garage door opener **2**, so that the transmitter/receiver **2***a* releases a pertaining switching contact to control the garage door actuator **2***b*.

A special advantage of the remote control system according to the invention is that the secret coding information (g) used for the symmetrical coding method can easily be reset as often as desired, in order to assign usage authorization for one of the controllable function units to a particular key tag. For this purpose, a secret coding information learning operation is carried out, which will be explained in detail in the following by means of FIGS. **4** and **5**.

As an example, FIGS. **4** and **5** illustrate a learning operation between a key tag **1'** (slightly modified in comparison to that of FIGS. **1** and **2**), and a garage door opener corresponding to that in FIG. **1**, of which only a pertaining selection switch **2***c* is shown in FIG. **4**. The selection switch **2***c* has an "off" position in which the garage door opener is switched off, an "operating" position in which the garage door opener operates normally for controlled opening and closing of the garage door, and three learn mode positions ("learn 1", "learn 2" and "learn 3"). The latter corresponds respectively to three parallel learning channels by way of which three different variants of the secret coding information can be assigned to the garage door opener from three different key tags, so that the garage door opener can be controlled by any of these three key tags.

The modified key tags **1'**, in turn, contain a learn mode function key **12'**, a panic key **13'**, a loudspeaker **14'** and a microphone **15'**, on the back side, and a display **8'**, a function key **5'** (for controlling the garage door opener), a function key **6'** (for controlling the house door opener) and a freely allocatable function key **7'** (which can be programmed, for example, for the switching-on and switching-off of a yard light) on the front side. In the modified key tags **1** shown in FIG. **4**, another function key **16'** is arranged for direct control of the auxiliary vehicle heater (instead of selection by way of a menu as provided in the key tags **1** according to FIGS. **1** and **2**).

The operating steps of the secret coding information learning process are illustrated in FIG. **4**, while FIG. **5** shows the communication sequence. By means of this process the

garage door opener **2** learns new secret coding information (g_{new}) from a key tag **1'**, as follows. First, the learn mode is activated for the corresponding key tag **1'** by moving the selection switch **2***c* on the transmitter/receiver of the garage door opener **2** into the pertaining learning channel (for example, the "learn 1" position). Similarly, the learn mode is activated in the corresponding key tag **1'** by pressing the learn mode function key **12'**. Subsequently, the function key **5'** associated with the function unit which is to learn the new secret coding information (here the garage door opener **2**), is operated, causing the key tag **1'** to emit a corresponding function code (F_4) as the learn mode reporting signal. If at this time the remote station (that is, the garage door opener **2**) is properly in the learn mode, it will acknowledge reception of the function code (F_4) by emitting a learn mode acknowledgment signal in the form of a response function code (F_5). Only if such an operating signal (F_5) is properly received will the key tag **1'** use the DES algorithm to generate new secret coding information (g_{new})as a pseudo-random number with good random characteristics, based on a basis secret coding information (g_{basis}) (initially entered therein during the production) and the previously valid secret coding information (g).

During the first-time assignment of secret coding information, the initially entered secret coding information (g_{basis}) is used as previous secret coding information. Because the receipt of an acknowledgment message by the key tag **1'** is necessary to implement the learning process, an eliciting of the secret coding information from the key tag **1'** without the remote station is impossible. Thus, the secret coding information would be useless for an unauthorized person because the garage door opener **2** would continue to be openable only by means of the previous secret coding information (g). In the case of such a change of the secret coding information only in the key tag **1'**, however, the authorized user would also no longer be able to control the garage door opener **2** by means of the key tag **1'**.

In order to deal with this possibility, the newly generated secret coding information (g_{new}) is subsequently transmitted to the garage door opener **2**. After the reception and storage of the new secret coding information (g_{new}), optionally while replacing previously assigned secret coding information (g), the transmitter/receiver of the garage door opener **2** acknowledges such proper implementation by emitting a corresponding acknowledgment function code (F_6). The key tag **1'** erases the previously valid secret coding information (g) and replaces it with the new secret coding information (g_{new}) only upon the reception of this acknowledgment signal (F_6). In addition, the key tag **1'** also provides the user with a visual and/or acoustic acknowledgment by means of the display **8'** or the loudspeaker **14'**. It is understood that, as required, all other above-mentioned operating actions and acknowledgments can also be displayed on the display **8'** of the key tag **1'**. The selection switch **2***b* of the garage door opener **2** is then changed over.to normal operation, so that the learn mode is deactivated and the garage door opener **2** can be controlled by the key tag **1'** by means of data communication operations which contain a coding based on the new secret coding information (g_{new}). The learning operation is automatically deactivated in the key tag **1'** after reception of the acknowledgment signal (F_6) of the garage door opener **2**.

As demonstrated, the described secret coding information learning method makes is possible to assign a portable remote control unit, on the one hand, and a function unit which can be controlled by it, on the other hand, to one another in a usage authorizing manner, with a change of the secret coding information which can be repeated as often as desired. Control of the function unit by the remote control unit includes an extremely safe authentication process by means of a symmetrical coding method which uses this secret coding information. In this manner, several usage authorizing remote control units can be assigned to a particular function unit, and inversely several function units can be controlled by a particular remote control unit.

Although the invention has been described and illustrated in detail, it is to be clearly understood that the same is by way of illustration and example, and is not to be taken by way of limitation. The spirit and scope of the present invention are to be limited only by the terms of the appended claims.

What is claimed is:

1. Remote control system having a portable remote control unit, at least one function unit which is controlled by way of the remote control unit, and a bidirectional data communication link which transmits coded data between the remote control unit and the function unit, said coded data being generated by a symmetrical coding method using secret coding information stored in said portable remote control unit and said at least one function unit, wherein:

when a secret coding information learn mode is activated, the remote control unit emits a learn mode reporting signal;

upon the receipt of the learn mode reporting signal, the function unit emits a learn mode acknowledgment signal;

upon the receipt of the learn mode acknowledgment signal, the remote control unit, by means of the coding algorithm of the symmetrical coding method, as a function of secret coding information previously stored in said remote control unit, determines new secret coding information and sends said new secret coding information to the function unit;

after the receipt of the new secret coding information, the function unit replaces the previously stored secret coding information with the new one and sends an acknowledgment signal to the remote control unit; and

upon the receipt of the acknowledgment signal, the remote control unit replaces the previously stored secret coding information with the new secret coding information.

2. Remote control system according to claim **1** wherein the remote control unit controls at least one vehicle-side function unit and at least one function unit outside the vehicle has a device for indicating information to be transmitted by way of the bidirectional data communication path.

3. Remote control system according to claim **2** wherein for each function unit controlled by the remote control unit, the remote control unit uses separate secret coding information for data coding by means of the coding algorithm.

4. Remote control system according to claim **1** wherein the at least one function unit has a plurality of learn mode channels for learning respective different secret coding information specifically assigned to respective ones of a plurality of transmittable remote control units.

5. Remote control system according to claim **1** wherein the DES algorithm is used as the coding algorithm.

6. Process for operating a remote control device having a portable remote control unit, at least one function unit controlled by way of the remote control unit, and a bidirectional data communication link which transmits coded data between the remote control unit and the function unit, said coded data being generated by a symmetrical coding

method, said process comprising steps for usage-authorizing, outside-usage-protected, assignment of a particular portable remote control unit to a particular function unit to be controlled by the particular portable remote control unit, by means of the assignment of a common secret coding information of a symmetrical coding method used for the authentication, comprising:

activating a learn mode in the function unit and in the remote control unit, and transmitting a learn-mode reporting signal from the remote control unit to the function unit;

sending a learn mode acknowledgment signal from the function unit to the remote control unit upon receipt of the learn mode reporting signal;

calculating new secret coding information by means of a coding algorithm of the symmetrical coding method as a function of a basis secret coding information and of derived secret coding information previously stored in the remote control unit, and transmitting said new secret coding information to the function unit upon receipt of the learn mode acknowledgment signal by the remote control unit;

replacing the previous secret coding information with the received, new secret coding information in the function unit, said function unit sending an acknowledgment signal; and

replacing the derived secret coding information previously stored in the remote control unit with the new secret coding information in the remote control unit upon receipt of the acknowledgment signal.

* * * * *

US006253064B1

(12) **United States Patent**
Monroe

(10) **Patent No.: US 6,253,064 B1**
(45) **Date of Patent: Jun. 26, 2001**

(54) **TERMINAL BASED TRAFFIC MANAGEMENT AND SECURITY SURVEILLANCE SYSTEM FOR AIRCRAFT AND OTHER COMMERCIAL VEHICLES**

(76) Inventor: **David A. Monroe**, 740 Lincoln Center, 7800 IH 10 West, San Antonio, TX (US) 78230

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: **Feb. 25, 1999**

(51) **Int. Cl.**[7] **H04B 7/00**
(52) **U.S. Cl.** **455/66**; 455/430; 455/431
(58) **Field of Search** 455/66, 414, 430, 455/431, 456, 457

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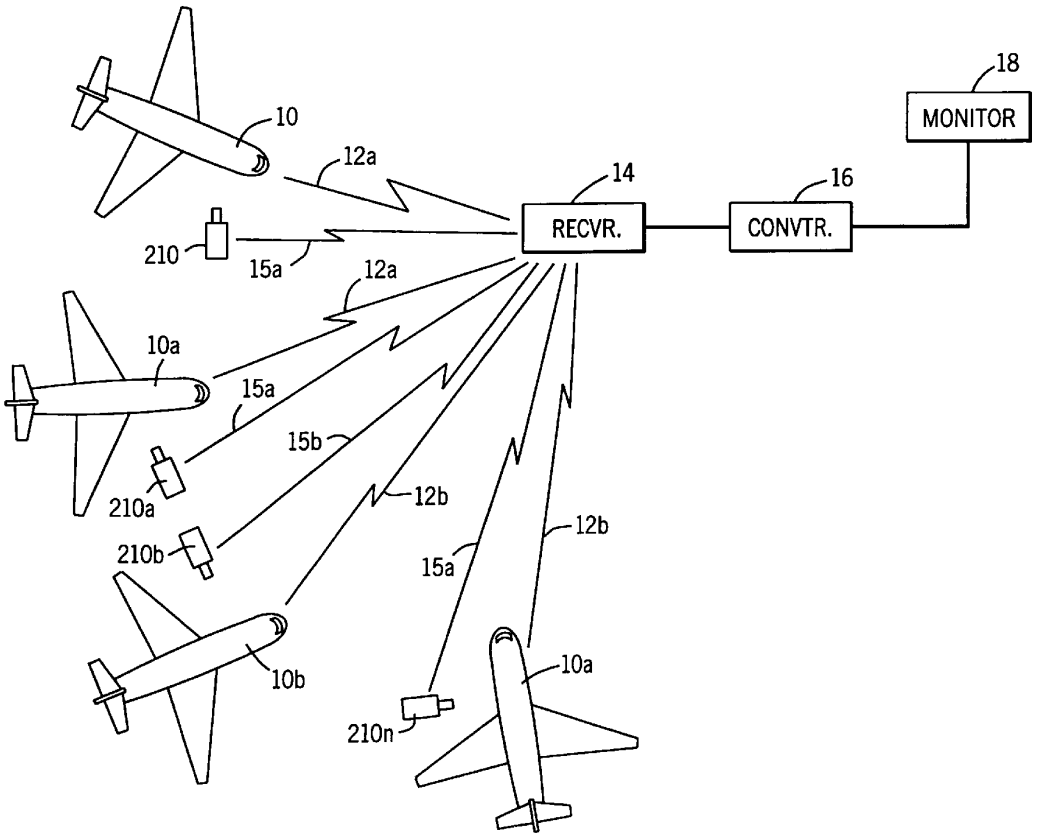
Primary Examiner—Daniel Hunter
Assistant Examiner—Thuan T. Nguyen
(74) *Attorney, Agent, or Firm*—Bracewell & Patterson LLP

(57) **ABSTRACT**

A traffic management, security and surveillance system for commercial vehicles while in port incorporates a plurality of strategically located sensors for identifying the location of both commercial vehicles and support assets, as well as personnel, for monitoring traffic flow and supporting traffic management of the commercial vehicles, assets and personnel while in the area. The location signals are transmitted to a ground based monitoring and control center and may be archived for later playback. The system also is adapted for utilizing on board location signal generators such as GPS sensors to provide traffic flow information and traffic management of all commercial vehicles, assets and personnel on the system.

29 Claims, 16 Drawing Sheets



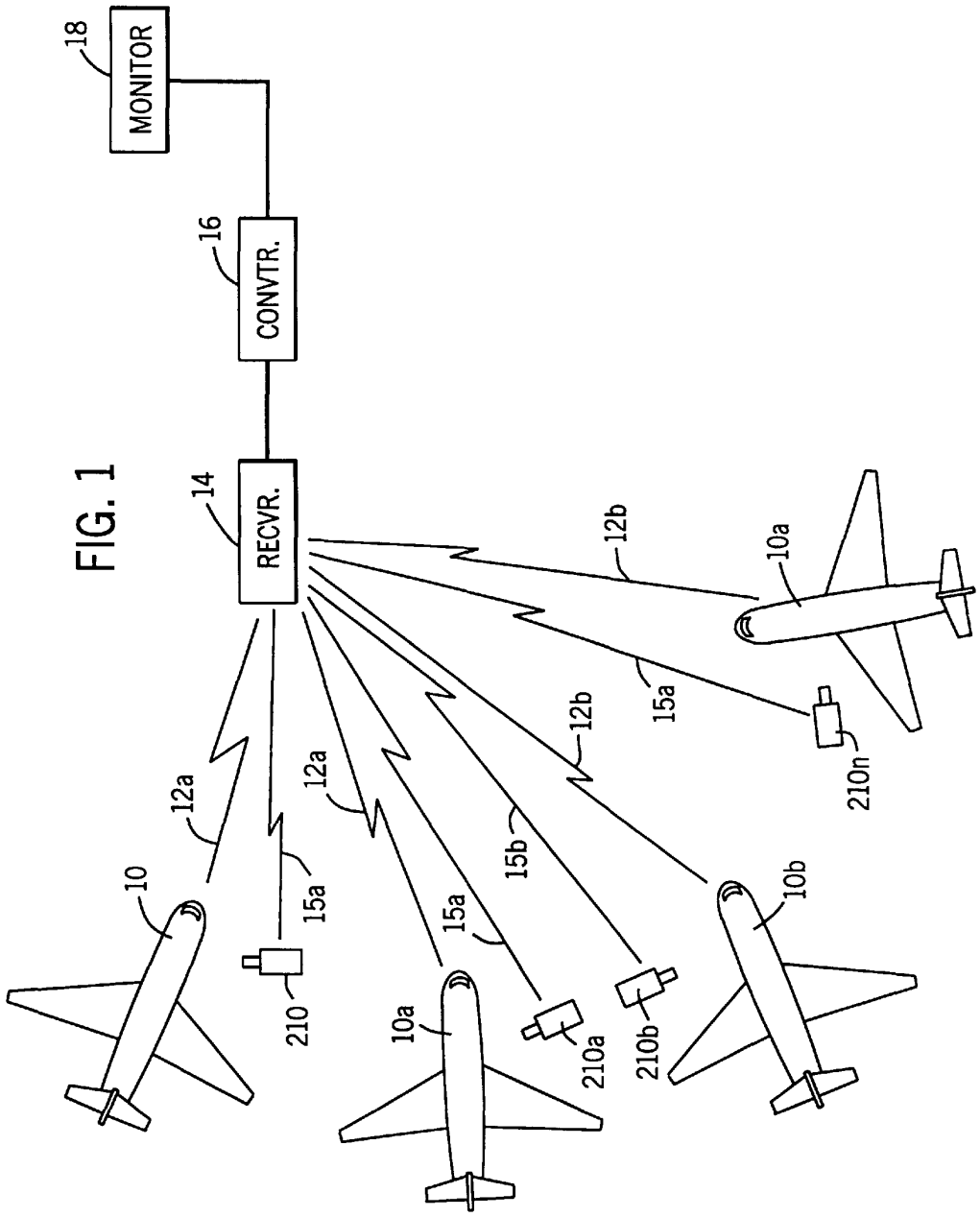

MONITOR
18
CONVTR.
16
RECVR.
14
12a
12a
12b
12b
15a
15a
15a
15b
10
10a
10a
10b
210
210a
210b
210n

FIG. 1

FIG. 2a

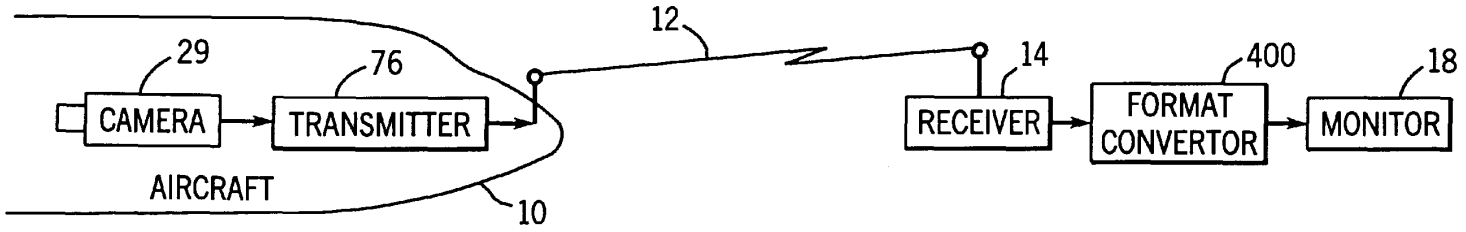

29
76
12
14
400
18
CAMERA
TRANSMITTER
RECEIVER
FORMAT CONVERTOR
MONITOR
AIRCRAFT
10

FIG. 2b

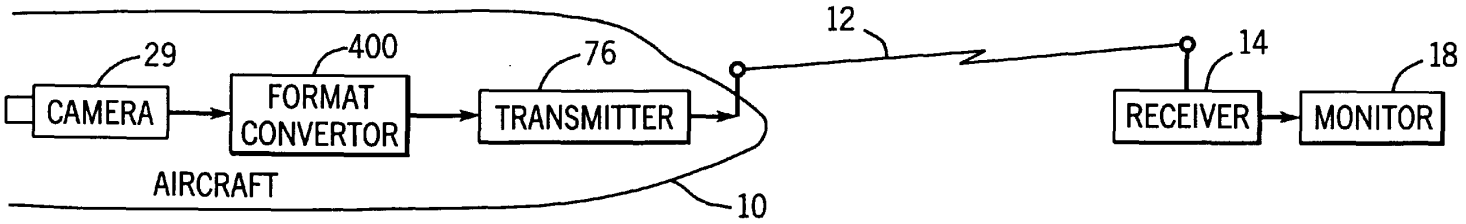

29
400
76
12
14
18
CAMERA
FORMAT CONVERTOR
TRANSMITTER
RECEIVER
MONITOR
AIRCRAFT
10

FIG. 3a

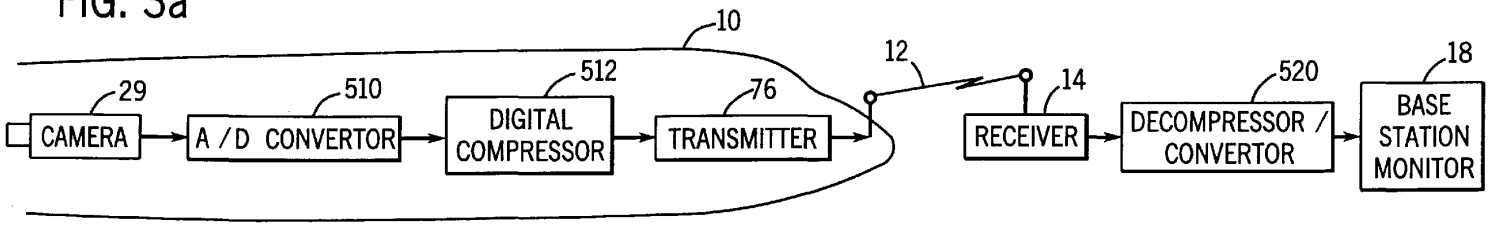

10
12
14
18
29
510
512
76
520
CAMERA
A /D CONVERTOR
DIGITAL COMPRESSOR
TRANSMITTER
RECEIVER
DECOMPRESSOR / CONVERTOR
BASE STATION MONITOR

FIG. 3b

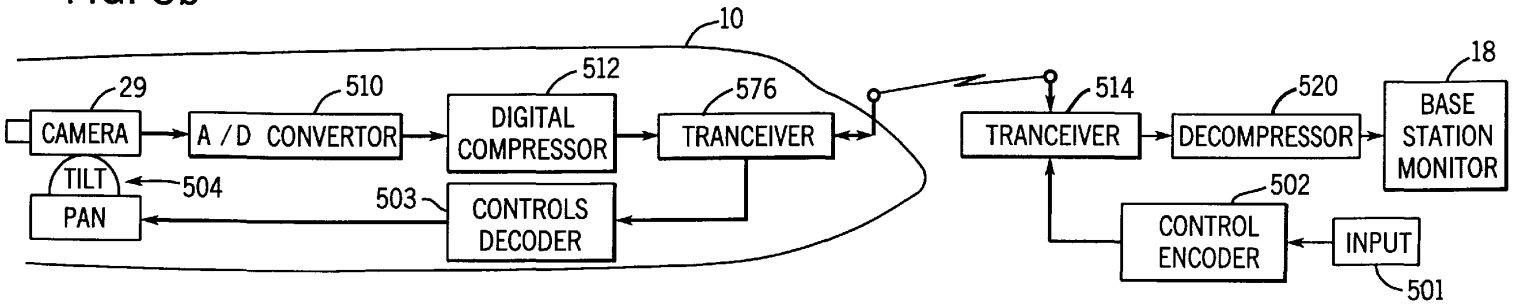

10
18
29
510
512
576
514
520
CAMERA
A /D CONVERTOR
DIGITAL COMPRESSOR
TRANCEIVER
TRANCEIVER
DECOMPRESSOR
BASE STATION MONITOR
TILT
504
PAN
503
CONTROLS DECODER
502
CONTROL ENCODER
INPUT
501

FIG. 4a

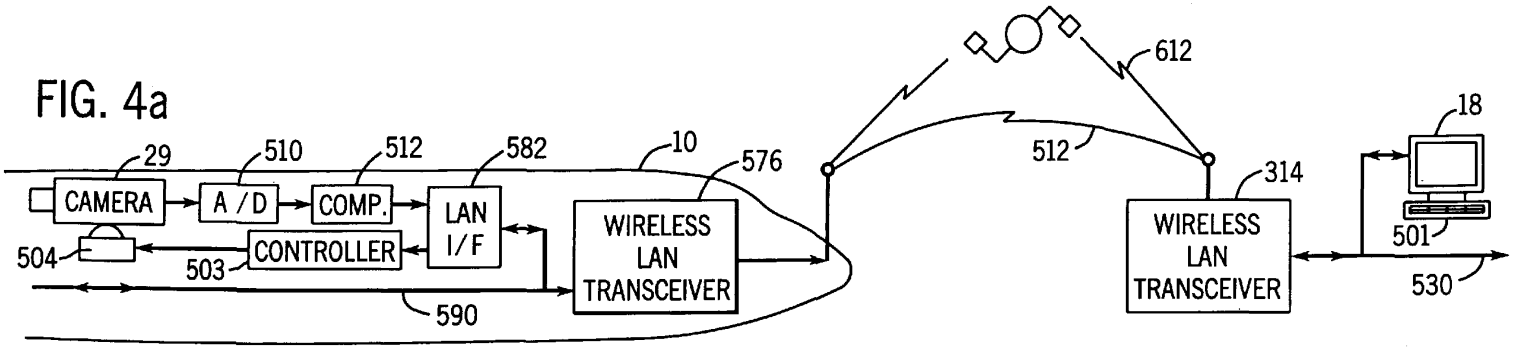
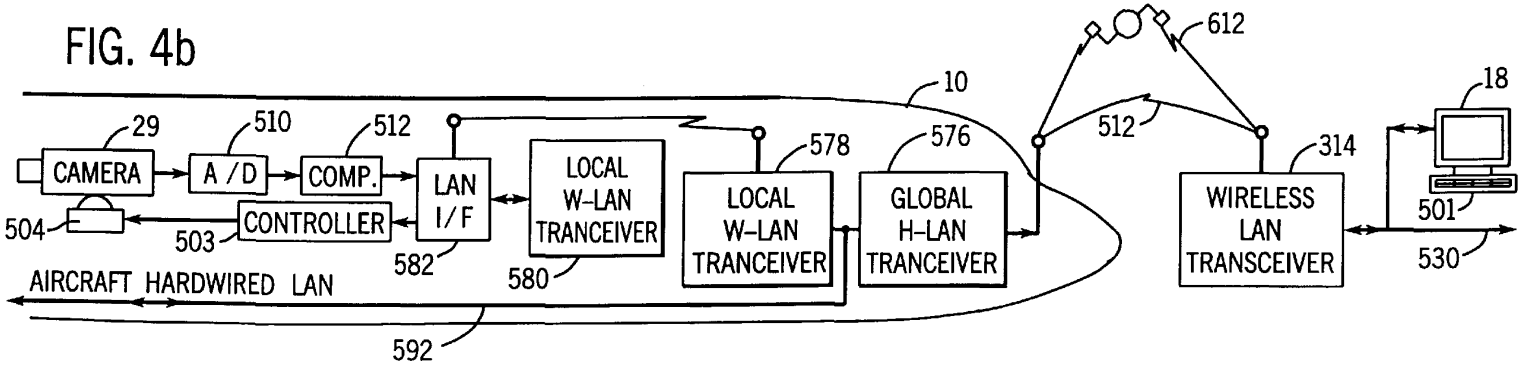

29
510
512
582
10
576
612
18
CAMERA
A / D
COMP.
LAN I/F
WIRELESS LAN TRANSCEIVER
512
314
504
CONTROLLER
503
501
WIRELESS LAN TRANSCEIVER
530
590

FIG. 4b


612
10
18
29
510
512
578
576
314
CAMERA
A / D
COMP.
LAN I/F
LOCAL W-LAN TRANCEIVER
LOCAL W-LAN TRANCEIVER
GLOBAL H-LAN TRANCEIVER
512
WIRELESS LAN TRANSCEIVER
504
CONTROLLER
503
501
582
580
530
AIRCRAFT HARDWIRED LAN
592

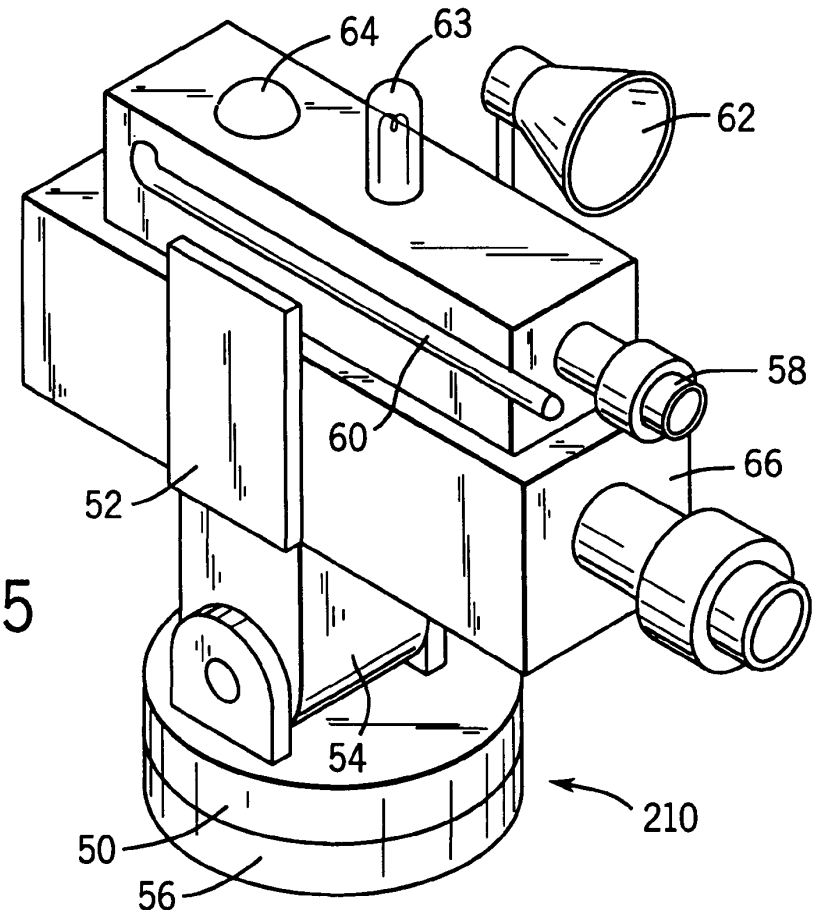


FIG. 5

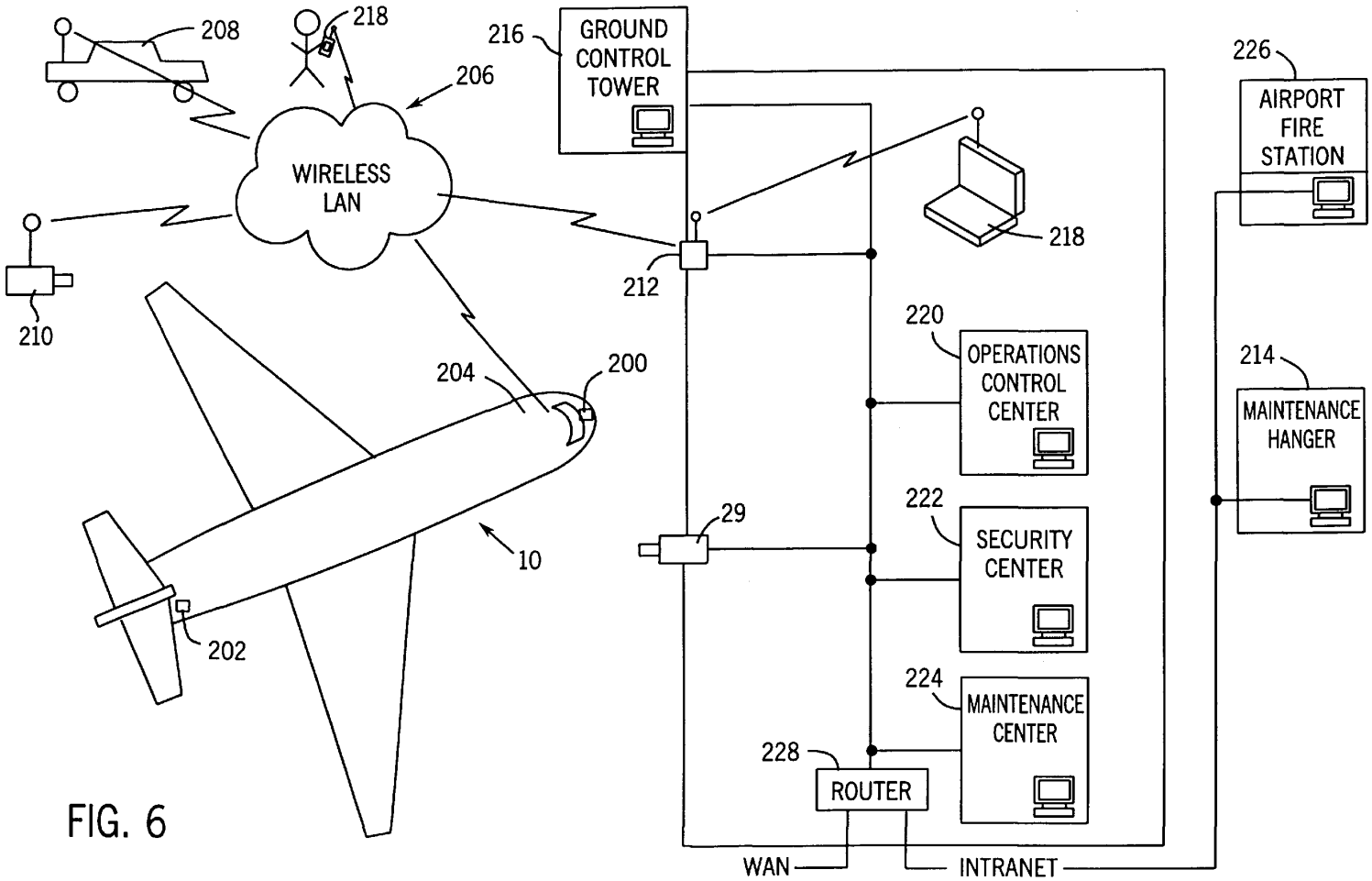

208
218
216
GROUND CONTROL TOWER
206
226
AIRPORT FIRE STATION
WIRELESS LAN
218
210
212
220
OPERATIONS CONTROL CENTER
214
MAINTENANCE HANGER
204
200
29
222
SECURITY CENTER
10
202
224
MAINTENANCE CENTER
228
ROUTER
WAN
INTRANET

FIG. 6

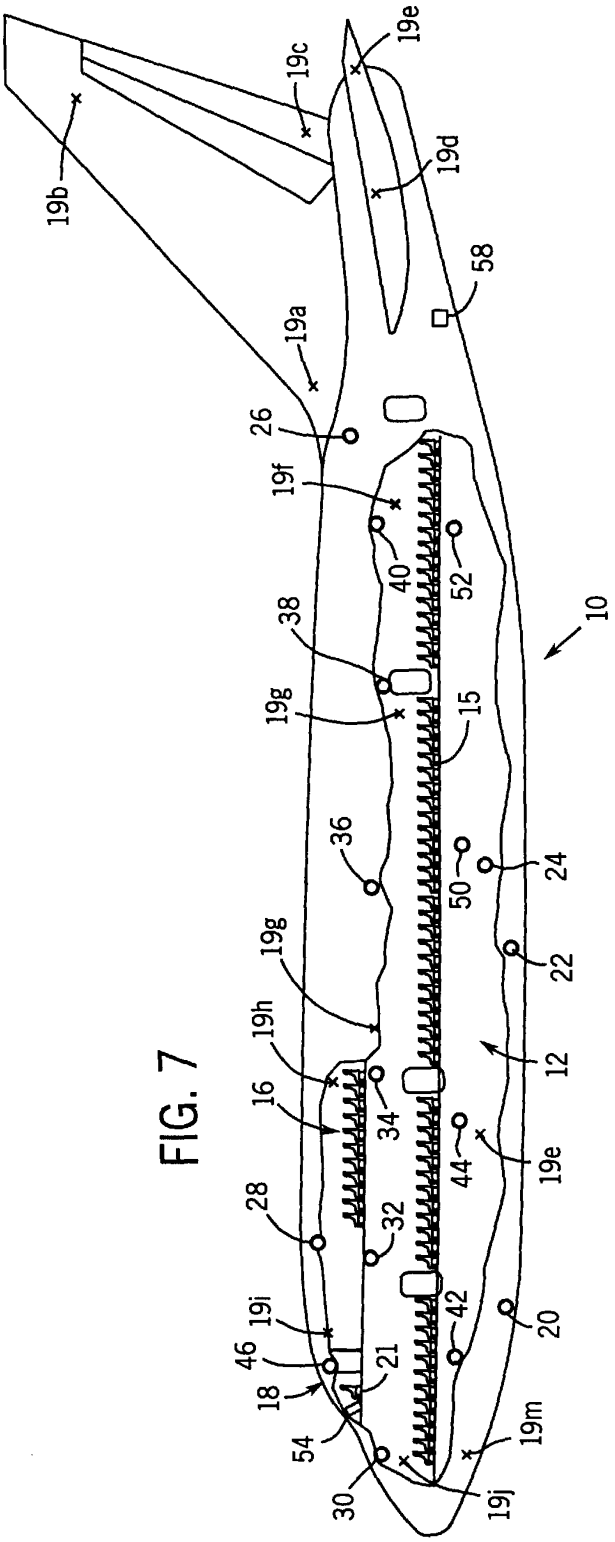

19e
19c
19d
19b
58
19a
26
19f
40
52
38
10
19g
15
36
50
24
19g
22
19h
12
16
34
44
19e
28
32
19i
42
20
46
21
18
54
19m
30
19j

FIG. 7

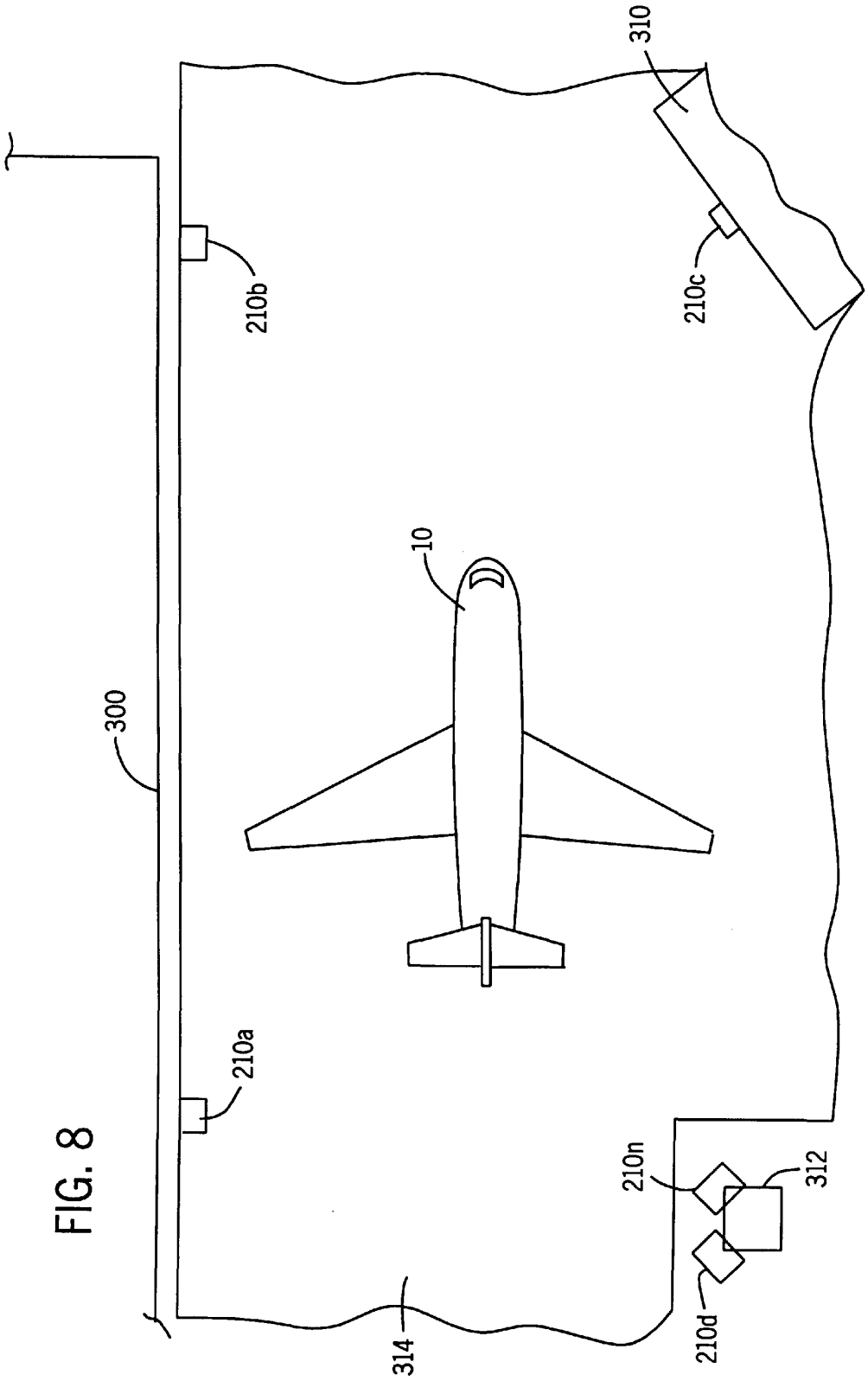


FIG. 8

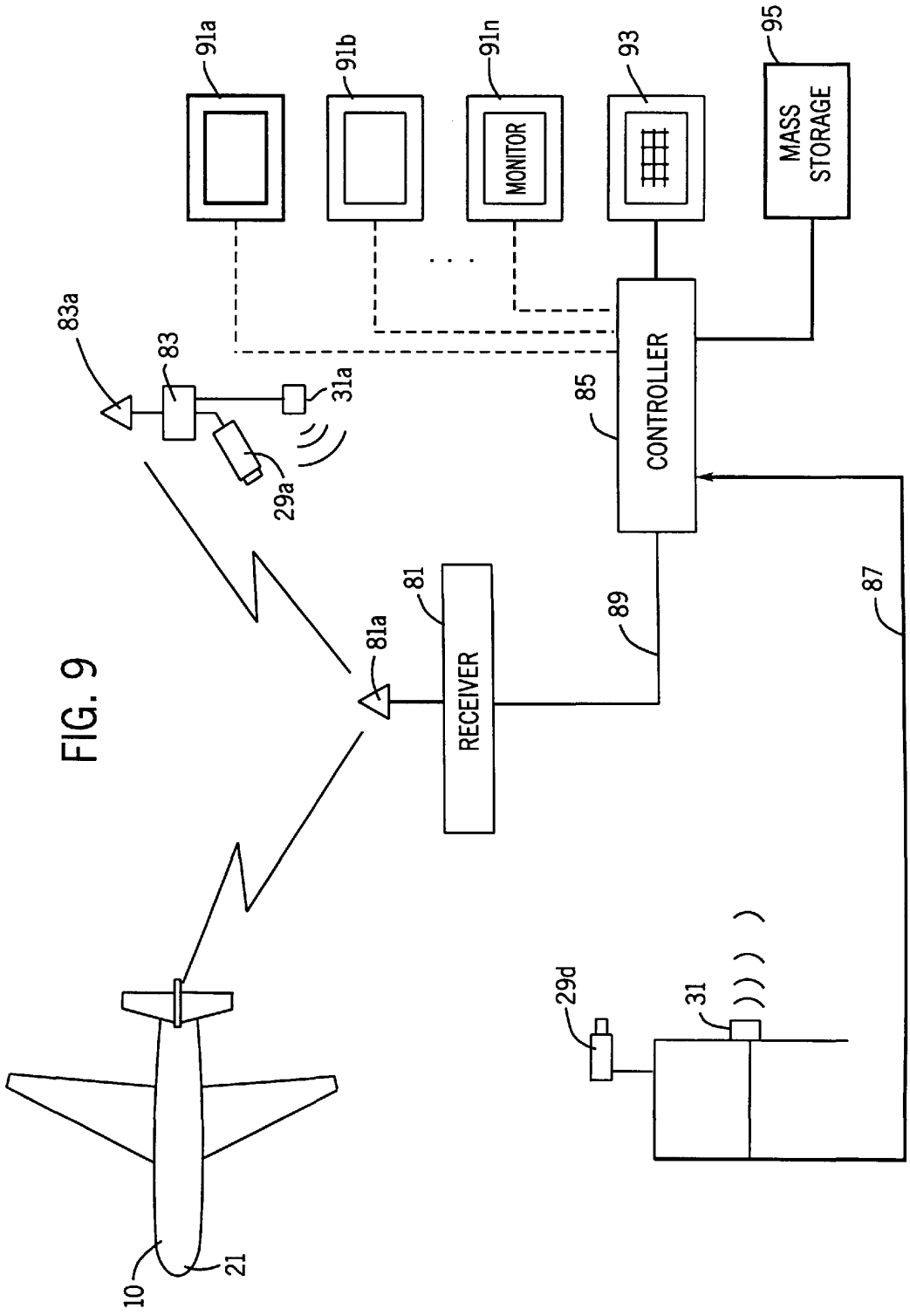

91a
91b
91n
93
95
MONITOR
MASS STORAGE
CONTROLLER
85
83a
83
31a
29a
81
81a
RECEIVER
89
87
29d
31
10
21

FIG. 9

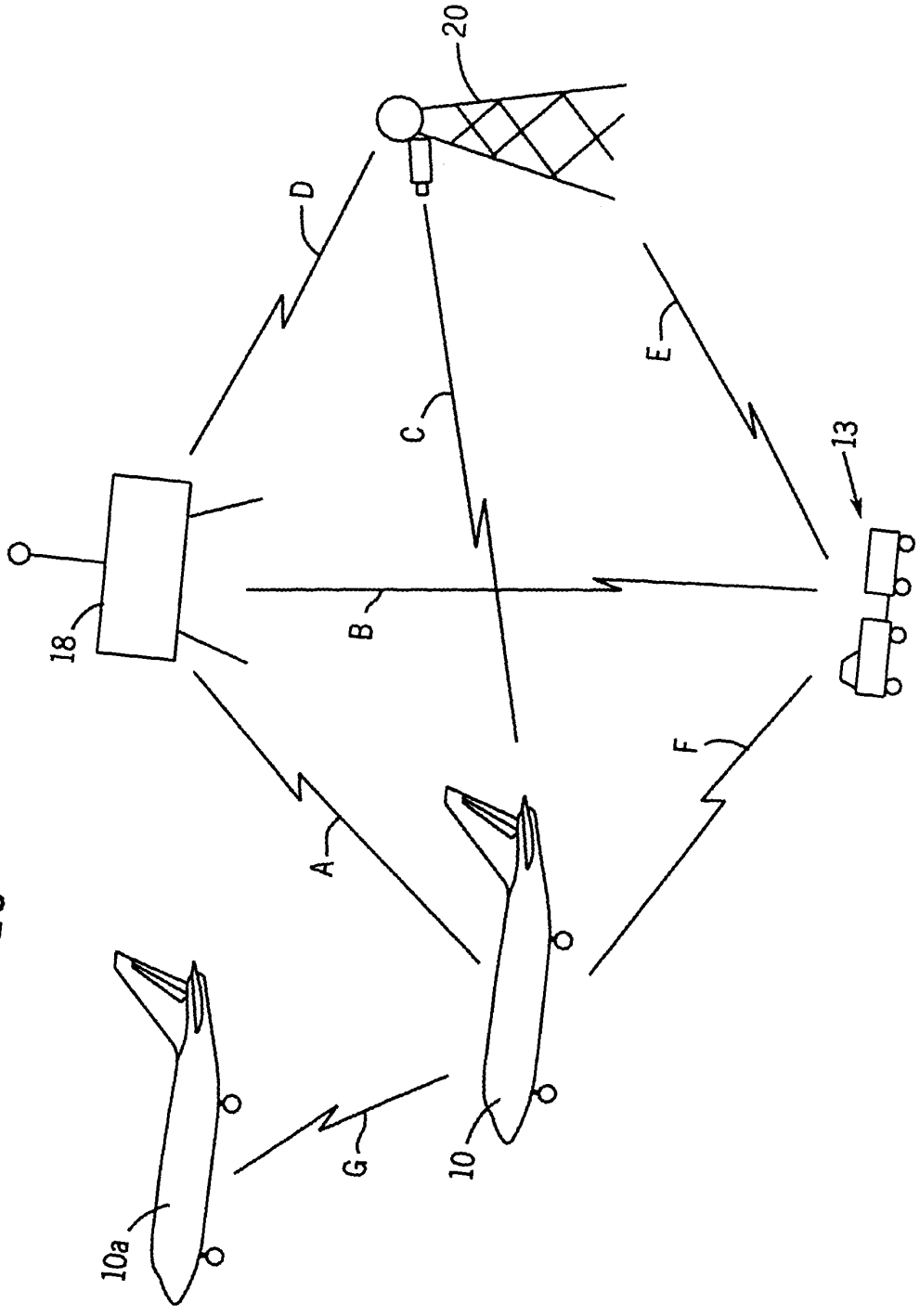


FIG. 10

FIG. 11

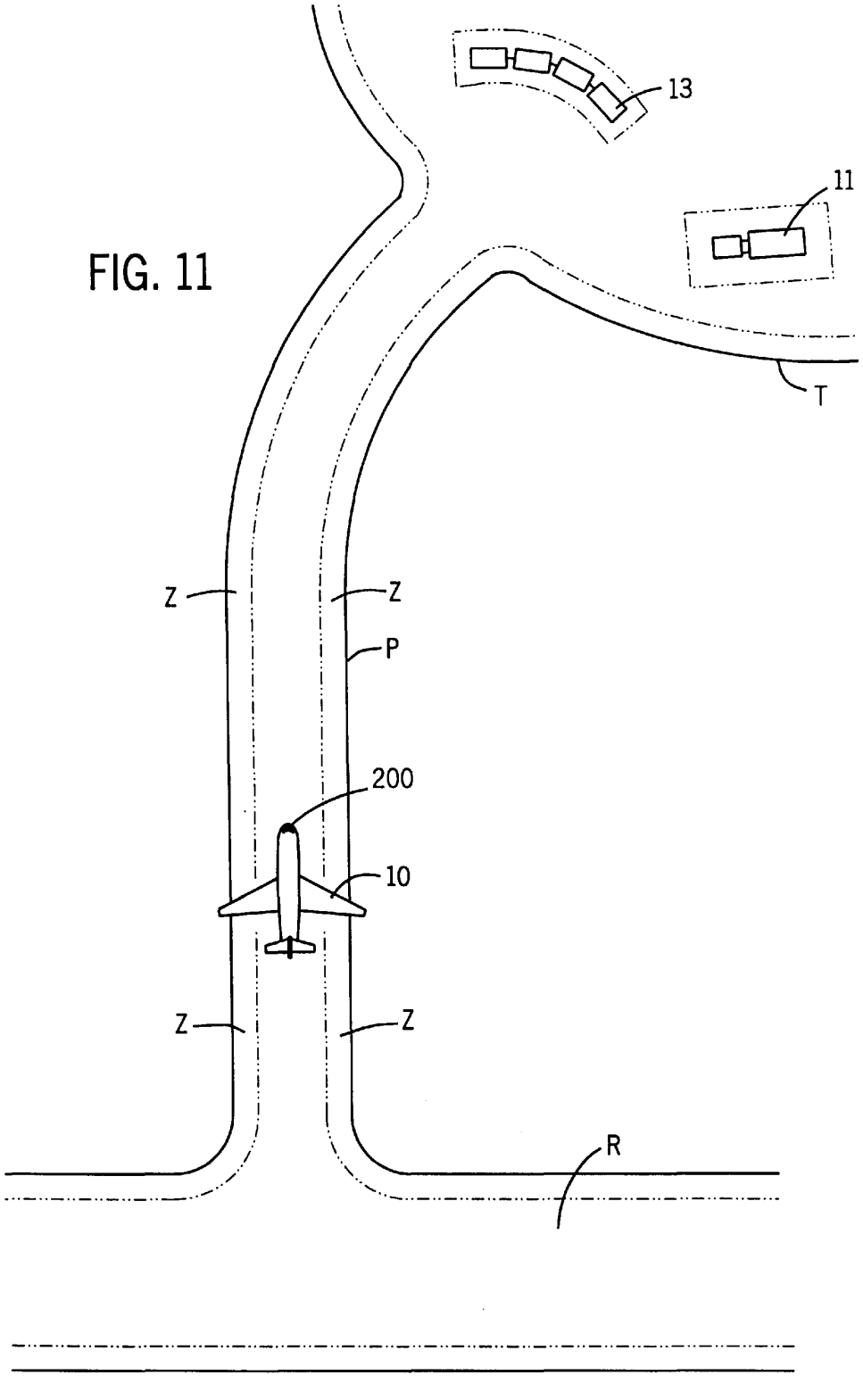


FIG. 12a

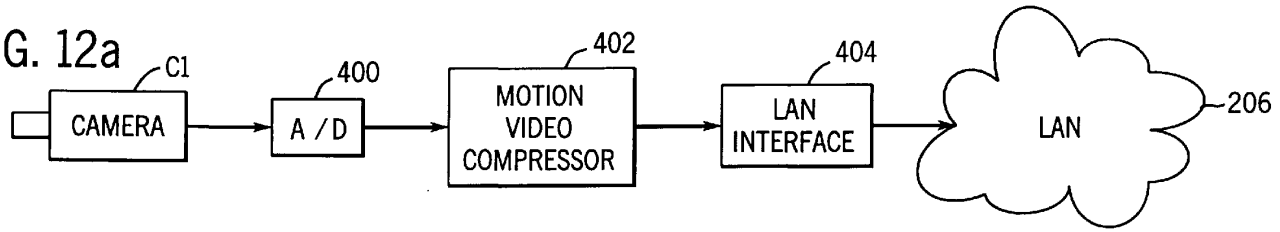


FIG. 12b

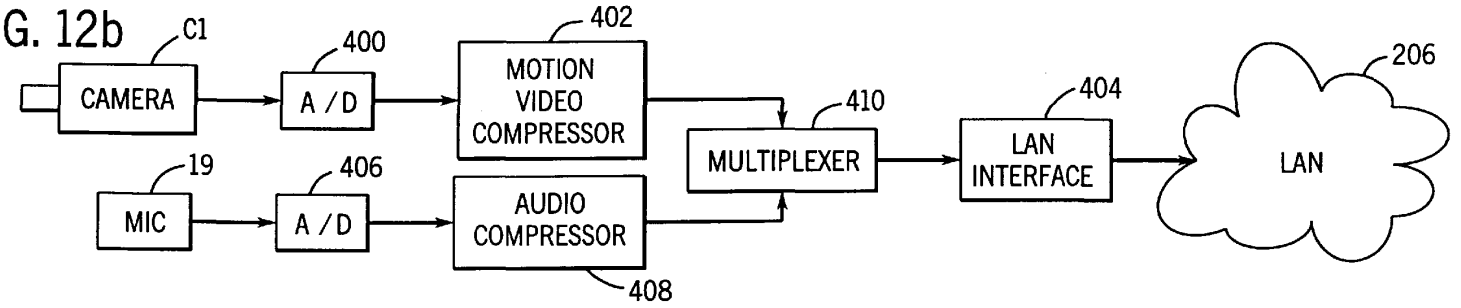
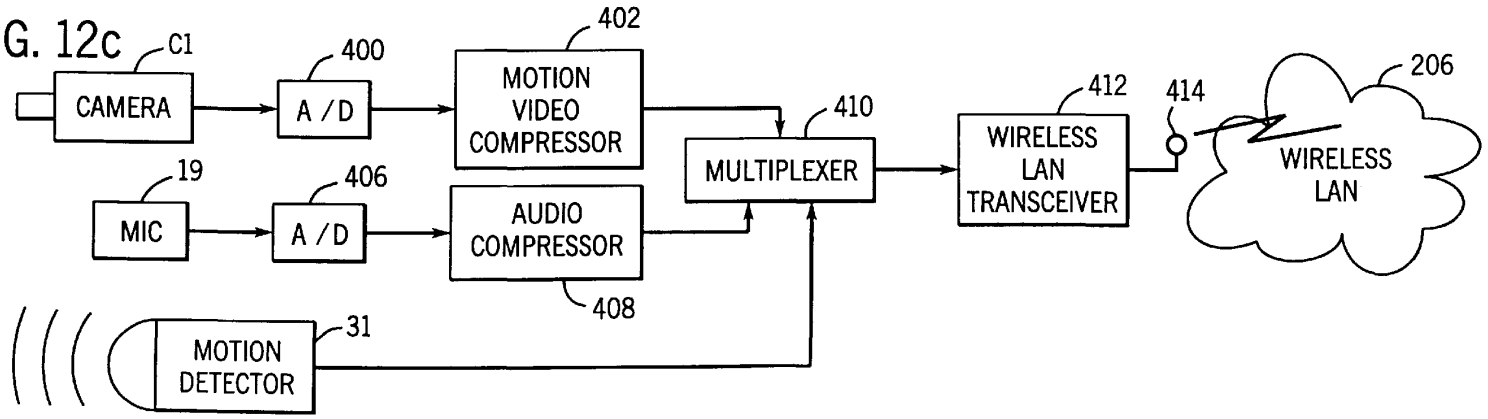


FIG. 12c



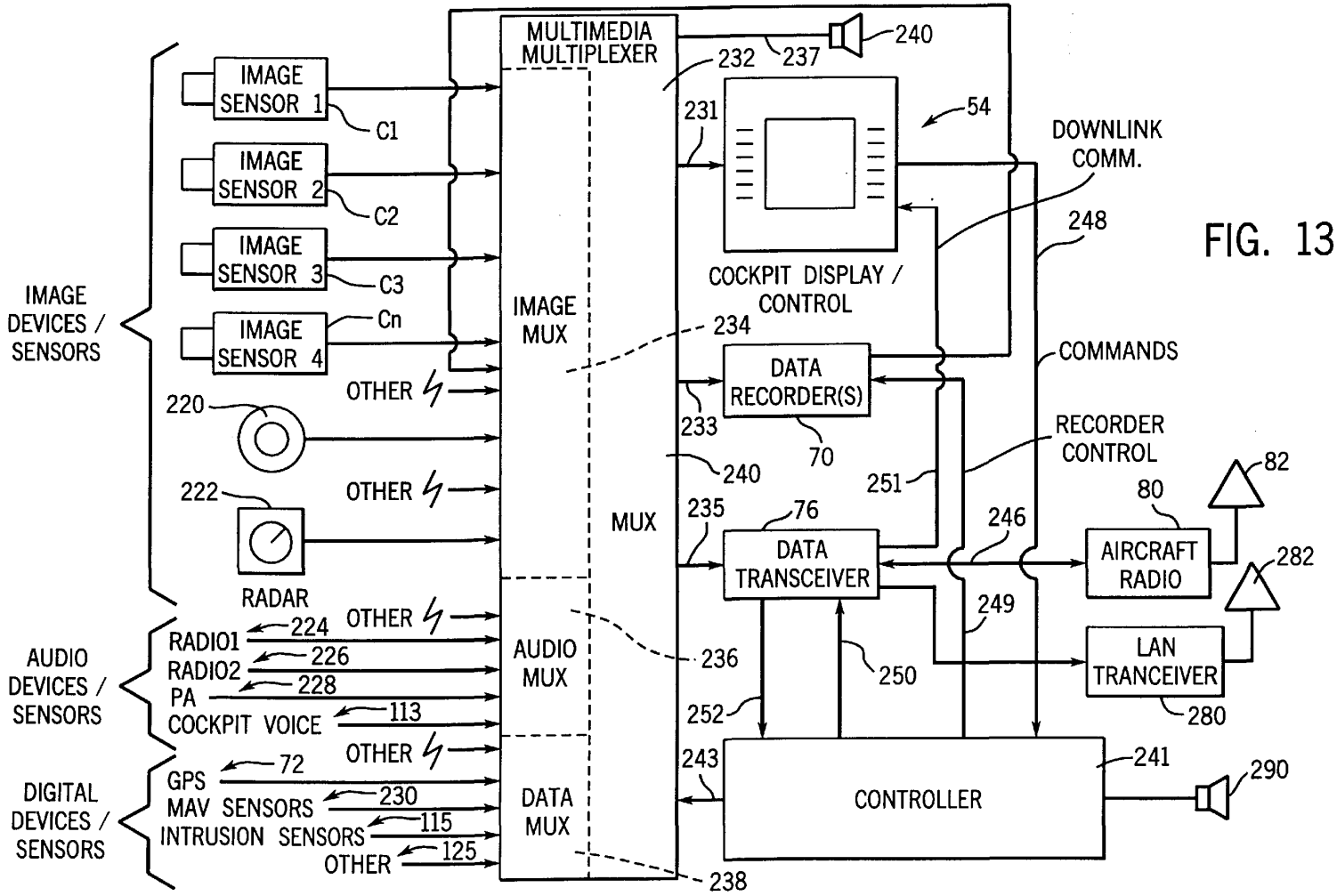


IMAGE DEVICES / SENSORS
IMAGE SENSOR 1
C1
IMAGE SENSOR 2
C2
IMAGE SENSOR 3
C3
IMAGE SENSOR 4
Cn
OTHER
220
OTHER
222
RADAR
OTHER
224
AUDIO DEVICES / SENSORS
RADIO1
226
RADIO2
228
PA
COCKPIT VOICE
113
OTHER
DIGITAL DEVICES / SENSORS
72
GPS
MAV SENSORS
230
INTRUSION SENSORS
115
OTHER
125
MULTIMEDIA MULTIPLEXER
IMAGE MUX
AUDIO MUX
DATA MUX
MUX
232
237
240
231
54
COCKPIT DISPLAY / CONTROL
DOWNLINK COMM.
248
234
DATA RECORDER(S)
70
233
COMMANDS
RECORDER CONTROL
251
240
235
76
DATA TRANSCEIVER
246
AIRCRAFT RADIO
80
82
282
249
LAN TRANCEIVER
280
236
250
252
243
CONTROLLER
241
290
238

FIG. 13

FIG. 14

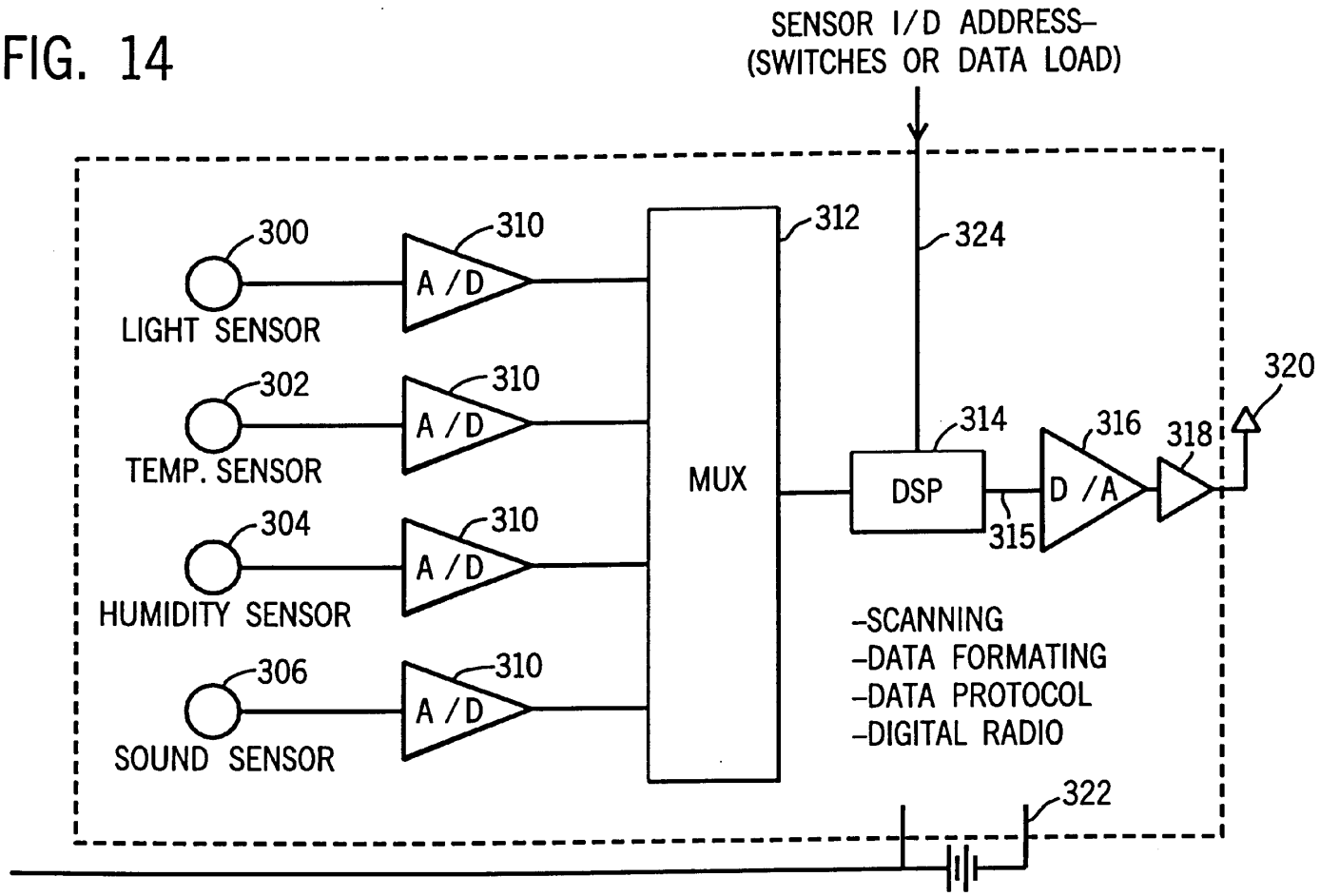

SENSOR I/D ADDRESS–
(SWITCHES OR DATA LOAD)
300
LIGHT SENSOR
302
TEMP. SENSOR
304
HUMIDITY SENSOR
306
SOUND SENSOR
310
A/D
312
MUX
324
314
DSP
315
316
D/A
318
320
322
–SCANNING
–DATA FORMATING
–DATA PROTOCOL
–DIGITAL RADIO

FIG. 15

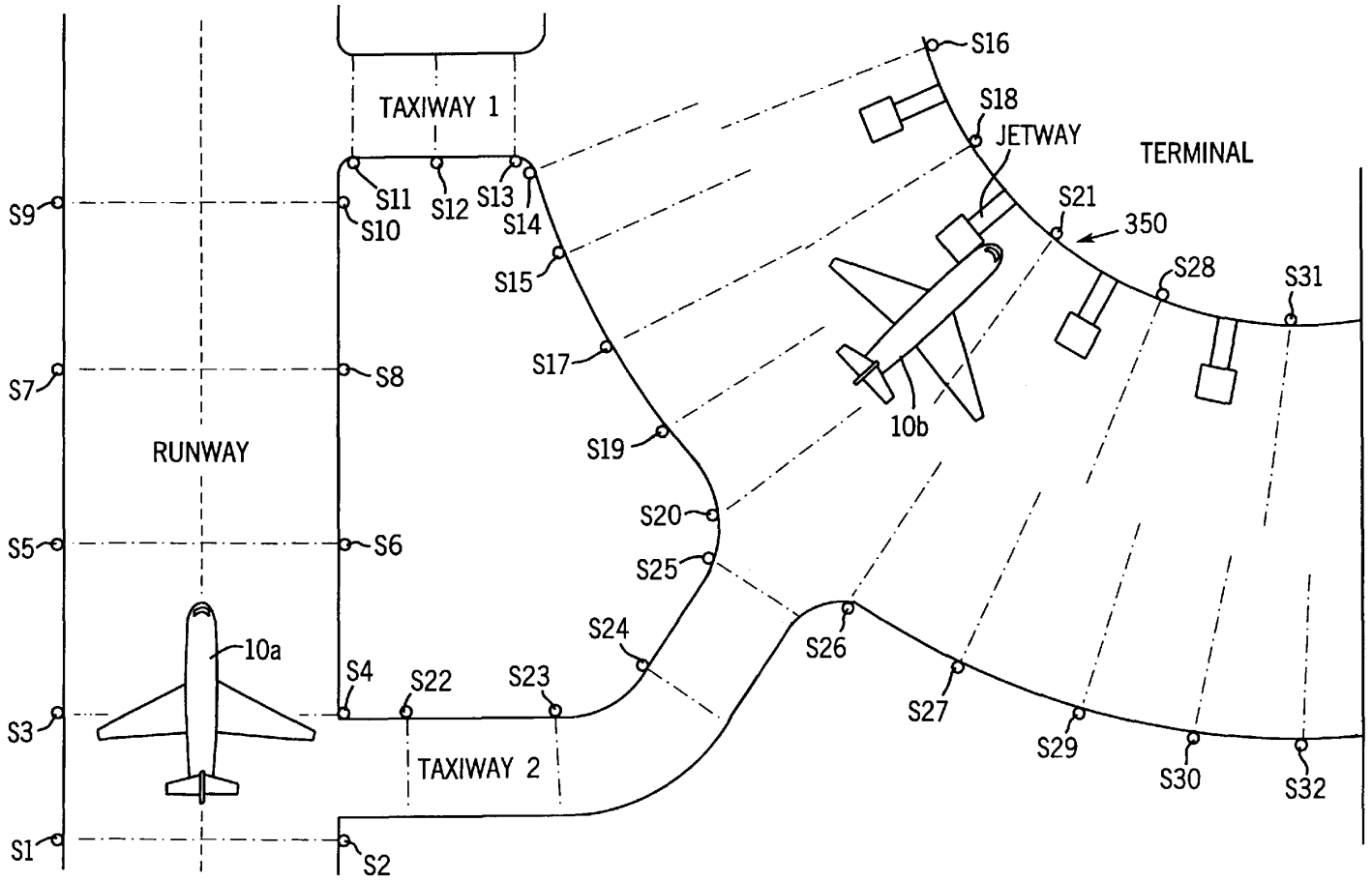
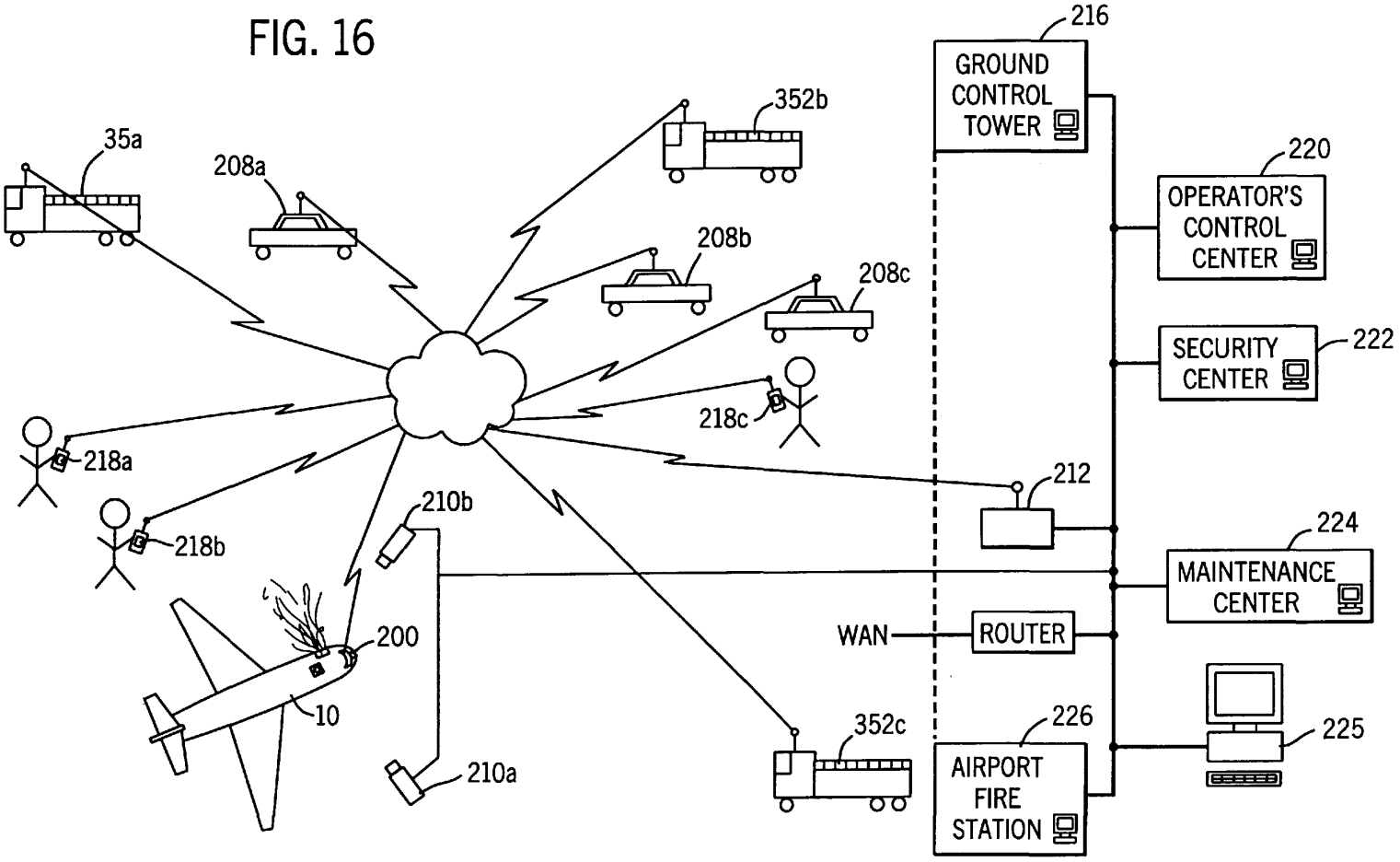

TAXIWAY 1
S16
S18
JETWAY
TERMINAL
S11
S12
S13
S14
S9
S10
S15
S21
350
S28
S31
S17
S7
S8
10b
RUNWAY
S19
S20
S5
S6
S25
S24
S26
10a
S4
S22
S23
S27
S29
S30
S32
S3
TAXIWAY 2
S1
S2

FIG. 16


216
GROUND CONTROL TOWER
352b
35a
208a
208b
208c
220
OPERATOR'S CONTROL CENTER
SECURITY CENTER
222
218c
218a
212
210b
224
MAINTENANCE CENTER
218b
WAN
ROUTER
200
10
352c
226
225
AIRPORT FIRE STATION
210a

TERMINAL BASED TRAFFIC MANAGEMENT AND SECURITY SURVEILLANCE SYSTEM FOR AIRCRAFT AND OTHER COMMERCIAL VEHICLES

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a related to my copending applications entitled: Wireless Transducer Data Capture and Retrieval System for Aircraft, Ser. No. 08/745,536, filed on Nov. 12,1996; Video and Data Capture Retrieval Surveillance System for Aircraft, U.S. Ser. No. 08/729,139, filed on Oct. 11, 1996; and Acoustic Catastrophic Event Detection and Data Capture and Retrieval System for Aircraft, U.S. Ser. No. 08/738,487, filed on Oct. 28, 1996 now U.S. Pat. No. 5,798,458, and my copending applications Ground Based Security Surveillance System for Aircraft and Other Commerical Vehicles; Apparatus for and Method of Collecting and Distributing Event Data to Strategic Security Personnel and Response Vehicles; Ground Link with On-Board Security Surveillance System for Aircraft and Other Commercial Vehicles; and, Network Communication Techniques for Security Surveillance and Safety System, filed on even date herewith.

BACKGROUND OF INVENTION

1. Field of Invention

The subject invention is generally related to safety and surveillance equipment for aircraft, ships and other commercial vehicles and is specifically directed to a comprehensive multi-media traffic management and security surveillance system for same while in port or terminal and/or unattended whether taxiing or parked. The system of the subject invention also permits tracking while en route.

2. Discussion of the Prior Art

Security is of ever increasing importance. This is particularly true with respect to commercial airlines as more and more people and freight are moved in this manner and aircraft and other commercial transports increasingly become the targets of terrorists activities. The airways are becoming increasingly crowded with traffic. Global tracking systems are now in place to monitor the flight of the aircraft from the moment it lifts off until it safely lands at its destination. Radar and navigational positioning systems are commonplace both on the aircraft and at the ground tracking stations. All of these electronic systems have increased the overall safety record of commercial traffic to new standards as the number of miles flown continues to escalate.

In addition, the on board avionics including electronic monitoring and diagnostic equipment, particularly on large commercial jets, continues to evolve, giving both the on board crew and the ground assets more complete, accurate and up to date information regarding the condition of the aircraft while in flight. Flight recorders long have been incorporated in order to provide a record of each flight and in order to provide critical information to aid in the determination of the causes of an accident or multifinction should one occur.

However, one area which has been neglected with the ever increasing availability of electronic surveillance is the security of the aircraft or other vehicles or vessels, including, but not limited to, over-the-road vehicles, ships and other commercial transports (collectively referred to as commercial transports), particularly when unattended. Typically, when an aircraft is on the ground, or in port, and unattended the only security provided is the security of the location. If the security of the area in which the commercial transport is stored is breached, the commercial transport is an easy target. In most cases, even the access doors are left open and further, for obvious safety reasons, are designed not to be locked from the outside. Many critical areas of the commercial transport are left exposed such as in an aircraft, by way of example, the landing gear, the engine housing and critical wing and tail components.

In addition, most of the ground traffic control relies on pilot visual information and onboard avionics providing an in adequate, at best, traffic management system utilizing already overworked equipment. The limited control and management of terminal traffic including not only the commercial transports, but also ground personnel, security vehicles and fuel trucks and other support vehicles, creates a dangerous and hazardous condition at most highly congested terminals. There are not any monitoring devices to assure that such traffic is in its assigned zones or to alert when a commercial transport is at risk because of breach of a restricted zone by unauthorized personnel or unauthorized vehicles, including overlapping exclusive occupancy zones by more than one commercial transport.

In addition, with terrorism and sabotage an increasing problem there is significant need to develop an integrated system capable of providing good physical/visual and/or audio surveillance as well as monitoring- of the environmental, security and motion conditions of the commercial transport and various components while the commercial transport is on the ground. For example, a good visual surveillance system would give instant evidence of a breach of commercial transport security, could sound an alarm and could immediately secure the area.

Such a system would also permit the recording of visual information to provide a history for later review, providing yet another source of information for increasing the overall security of commercial transportation.

While such a system would be of great benefit to the commercial transport and airline industries in general and to the commercial airlines in particular, there are no integrated systems currently available which adequately meets these needs.

SUMMARY OF THE INVENTION

The subject invention is directed to a comprehensive multi-media safety, tracking and/or surveillance system, which in the preferred form provides both visual and/or audio information as well as critical data such as location, direction, intrusion, fire and/or smoke detection and/or status of environmental conditions and/or transport systems status. In my aforementioned patent and copending applications, incorporated herein by reference, detection and sensor systems are utilized to provide the flight crew and/or a ground tracking station for commercial aircraft critical information during flight and/or to record the information and data generated during flight for later reconstruction of catastrophic events. The subject invention is an expansion of this concept and adds not only ground security and surveillance, but tracking while in port or on the ground as well as while in route, as well as incorporating the onboard systems of the aforementioned patent and applications. It is an important feature of the invention that the transmitting network for provides a comprehensive communications link between stationary and mobile stations on the ground, the craft or vehicle being monitored and strategic sensors both onboard the commercial transport and the sensors on the ground. In

the preferred embodiment of the invention, a wireless LAN (local area network), WAN (wide area network) or other wireless transmission scheme is used as the transmission system of choice. A digital wireless voice intercom is provided for security purposes and for communication between the onboard crew and the ground based personnel. In the preferred embodiment video intercom is also provided. Digital wireless telecommunication capability provides for text communications. Digital wireless (such as, by way of example, LAN) based file communication capability permits the transmission of information such as route or flight plans or gate and dock information. As an example, a LAN or WAN has worldwide tracking capability adapted to be used in connection with a global satellite communication system such as IRIDIUM, wherein the entire path and status of the commercial transport may be monitored while airborne over satellite connections. While wireless systems provide the preferred form of communication, many features of the invention may be practiced using other communication links within the scope and spirit of the invention.

One important feature of the invention is the ability to remotely monitor a commercial transport while on the ground, whether or not the commercial transport is attended. This will permit detection of unexpected events, breach of security, change in environmental conditions and other activities both on and in the vicinity of the commercial transport. A GPS system may be included to provide accurate positioning information of the commercial transport, establishing the parked position of the commercial transport at any time, as well as tracking its movements.

Once in port, the system of the subject invention permits complete monitoring of on ground movement, and allows the monitoring of other commercial transport in the area to assure that the various transports do not interfere with one another. This provides collision avoidance, and can be utilized both on the ground and in the air or in route via water or land. Current airborne collision avoidance is accomplished by use of a radar transponder. Aircraft position is located by radar "echo" response and altitude by a "reporting altimeter" reading being returned to the radar system encoded in the transporter return. Use of a satellite based LAN or WAN will provide an "intranet in the sky", providing much more accurate GPS position, altitude, heading, speed and other navigational information to the FAA and other operators and computer tracking and monitoring stations, thus enhancing collision avoidance information.

In its preferred form, a plurality of sensor units, which may include at least one video or image sensor/device and/or at least one audio sensor and/or at least one motion sensor, are placed strategically about the interior and exterior of the commercial transport and at strategic ground based locations. In addition, strategically placed motion detectors, fire sensors, smoke sensors, door or latch sensors and other monitoring equipment are incorporated in the system. A comprehensive system incorporating these various sensing devices provide a broad based, multimedia safety, security and surveillance system for monitoring commercial transports at any time, whether or not attended.

In addition to safety and/or surveillance issues, the comprehensive data collection scheme of the subject invention provides a system permitting enhanced monitoring and/or response to crew generated work orders or re-supply orders, and may even avoid the requirement that the crew order certain supplies. For example, by monitoring the fuel, fresh water, waste water and/or hydraulic levels onboard and transmitting this to a ground station, refueling, water delivery and/or hydraulic fluid check and supply may be initiated by the station crew and prepared for delivery when the commercial transport arrives in port. The performance parameters of the commercial transport may also be monitored and may be utilized for initiating maintenance procedures, for example, even before the commercial transport is in port. Pre-flight or pre-mission checklists may be enhanced or automated by monitoring the critical functions and criteria via the system of the subject invention. The system of the subject invention greatly enhances maintenance procedures and efficiency. Where desired, the system is capable of permitting the commercial transport to carry its detailed maintenance record onboard, permitting full access to such information at remote locations. The maintenance record can be routinely updated or polled from the home based maintenance station using the system's unique uplink capability. The ability to both send and receive information will support remote control of the commercial transport onboard systems such as lighting, strobes, alarm setting/resetting, environmental controls, locking systems, siren or other audible signals, fuel flow, fire detection and the like.

Situational awareness is also provided by the subject invention. All transports in the terminal area are provided with a GPS location sensor such that the home or ground crew will be able to track and identify the location of every transport in the terminal. This provides better flow of the commercial transports in the terminal area, assuring that proper distance is maintained and appropriate pathways are followed.

The system also permits full situational awareness capability where all ground or water transports in the are provided with GPS location information such that the ground crew will know where all assets are at any point in time. This can provide both collision avoidance as described and also check to assure that the transports are in an authorized area. A composite of all transport location information can be used to provide a "live" display of all assets in the area. Logging of this information will provide good archival information in the event a reconstruction of events, such as a security breach or collision, is required.

The comprehensive multi-media system of the subject invention permits the collection and dissemination of virtually all data associated with the commercial transport at any time, both while in port or in service. In the preferred embodiment a combination of sensors systems are used, with sensors being installed within the transport, on its exterior and at ground-based locations for monitoring the transport when is in port. In such areas where ground based systems are not available, the transport-installed systems still provide useful and enhanced information over the prior art. Likewise, in those areas where unequipped transports enter a system equipped port; the ground based system of the subject invention can communicate via standard ground-to-air radio to provide useful information such as perimeter surveillance and the like. For example, even without the use of on-board systems, the identification number (such as the tail number on an aircraft), owner, state or country of origin and other identifying information can be matched with available data to provide immediate and accurate identification of a specific commercial transport. This permits efficient tracking and response capability of the transport in port, on the ground, or anywhere in the world using satellite communications.

In the preferred embodiment, fixed view and steerable video cameras may be incorporated either on the commercial transport or independently of the transport at ground based sites where commercial transport is located in order to

monitor movements around the perimeter of the monitored commercial transport. It is also desirable to include focusing and/or timing functions so that selective pan, tilt and/or zoom (x,y,z) positioning can be utilized. The cameras may be activated and/or aimed and/or focused based on the location data provided by a GPS system integral to the monitored commercial transport, may automatically pan an area, or may be manually operated by crew or ground personnel. Automatic tracking of each transport in the terminal by one or more tracking cameras in conjunction with a recording device can provide an archival record of each asset in case of a detrimental event, such as fire, terrorist event, theft, collision and the like.

Several video cameras may be placed such that the lens of each is aimed through a window opening provided in the fuselage or body in order to provide video imaging of the engines, tail section, and/or landing gear and other functional components of an aircraft. Cameras may be placed throughout the interior of the commercial transport on the flight deck, in the cargo hold, in passenger cabin and/or other desired spaces including on the ground outside the commercial transport. The audio sensors/transducers and/or other sensors and detectors are also strategically located throughout the commercial transport and positioned at strategic locations both internal and external of the fuselage. External sensors based on the ground area surrounding the commercial transport may also be added.

In its simplest form, current sensors are already on the commercial transport coupled with strategically based ground sensors and may be used to provide surveillance and/or warning system. Thus, a basic system may be implemented with a minimum of alteration to the commercial transport and a minimum of expense.

Within the commercial transport, the system may be hardwired or may use wireless transmission and receiving systems. The wireless system is particularly useful for adapting the system as a retrofit on existing equipment and also provides assurances against disruption of data transmission during structural catastrophes such as fire or airframe breakup. In the preferred embodiment, the wireless system is fully self-contained with each sensor unit having an independent power supply and where appropriate, a sensor light source. The ground sensors may likewise be hardwired or use wireless transmission and receiving of video and/or alarm telemetry signals. The ground security system may include motion sensitive, weight sensitive, infrared sensitive, audio sensitive, or other typed activation system so that the equipment is not activated until some event is detected, i.e., the system is action triggered. The ground communications link, monitoring and/or recording systems for collecting and/or transmitting the data as disclosed in my copending applications may be adapted for processing the information gathered by the onground security system and, in the preferred embodiment. The wireless system may use radio frequency transmission and may incorporate the wireless communication system already in place as an integral component of the system. Where desired, a wireless local area network (LAN) or other wireless system may also be utilized for intercommunication among the system components. Preferably, the entire capture, retrieval, monitor and archive system is installed utilizing the wireless transmitting/receiving system in order to assure that transmission will not be lost in the event of a power shutdown or a failure causing possible open or shorted circuit conditions which could occur in a hard wired system.

A commercial transport equipped with the ground surveillance system of the subject invention may not always be located at a port or terminal equipped with a ground security system. In the preferred embodiment of the invention, the on-board system is self-contained and can operate on a stand-alone basis at sites where compatible comprehensive electronic ground security is not available. In those sites with a compatible ground surveillance system, the onboard system communicates with the site-based system to provide information to airport ground personnel and security personnel. The system of the present invention also lends well to a deployable surveillance device carried by the transport, which can be deployed at unequipped sites to permit offcraft monitoring while the commercial transport is at the port or terminal. The system can be positioned at a strategic location within the site whenever the commercial transport is unattended to permit monitoring of the commercial transport from a remote location. The deployable device is then retrieved and stowed in the commercial transport when the commercial transport departs from the site.

In the preferred embodiment, the system will transmit any detected information to a monitor system located at a ground control security station, typically located somewhere within the terminal, tower and/or safety sites such as security stations and fire stations. Detection of activity or fire can sound local and/or remote alarms and/or dial emergency numbers. The data may also be recorded on the standard recorders provided onboard the commercial transport and/or on ground based recorders of conventional type, digital type or a computer based logging system. The security station has instant live access to all of the image and/or audio signals as they are captured by the sensors, and where used, the commercial transport recorder will make an historic record of the images for archive purposes. Where random access recording techniques are used, such as, by way of example, digital random access memory storage devices, the information by be readily searched for stored information.

If unauthorized personnel breaches the security area and the audio and/or video equipment is activated, signals will be immediately transmitted to the security station. This will give immediate access to information identifying the activity and the personnel involved. Further, in the preferred embodiment of the invention, an alarm system will be activated for securing the immediate area and taking counter measures to tighten security such as remote operation of lights and doors, and respond to a breach of same.

In the one embodiment. information from the plurality of sensors on the transport is synchronized through an on board capture/multiplexing system whereby the plurality of data, including visual image data, may be displayed, recorded, and/or transmitted in either a split screen or serial fashion. A "time-stamp" or chronology signal may also be incorporated in the data scheme. Any signal which is capable of being captured and stored may be monitored in this manner. Utilizing the wireless system of the invention in combination with the battery back-up power supply, it is possible to continue collecting information without using ground power or commercial transport power. This assures that the system will operate even if power is disrupted for any reason such as, by way of example, tampering by unauthorized personnel or by fire. In its simplest form, only triggered (activated) sensors are active, i.e., an activity at the site causes a triggering effect and activates the sensor, and only the signals generated thereby are transmitted to the security station. In such a system, multiplexing of continuous signals is not nearly as critical. The "time-stamp" is particularly useful as an aid in reconstructing the events in a "postevent" investigation.

In the one embodiment, the system includes a plurality of strategically located video image sensors and/or audio

sensors, each sensor adapted for transmitting the signals to a multiplexer for distributing the signals to monitors and/or archival recorders. The data multiplexer combines all of the signals from the various detector circuits to provide a data stream suitable for transmission over the wireless system.

The LAN transceiver is the interface into the LAN. The LAN transceiver can accept software downloads from various system elements to enable the multi-media sensor system to be maintained or upgraded to perform other functions. Other sensors may also be incorporated in the system, such as motion sensors, smoke and/or fire sensors and the like. The system is configured for selectively transmitting all of the data on a "real-time" or "near real-time" basis, i.e., the data is delivered with only delays for processing time such as compression/decompression, multiplexing and the like. The system is also adapted to provide the monitors access to serial, synchronized full screen view of each of the cameras, in sequential viewing, or alternatively to provide split screen or multi-monitor viewing of a plurality of cameras. The system may be hardwired or wireless transmission may be utilized to further minimize the possibility of a malfunction at the onset of a catastrophic occurrence and to make the system more tamper resistant.

The comprehensive surveillance/communication of the subject invention supports communication of monitored data and/or commands or operational data between the ground or base station and the transport. between the transport and ground or terminal support vehicles and/or equipment, between the transport and various monitoring stations or systems, between transports, between the ground station and the support vehicles, between the monitoring station and support vehicles and between the monitoring stations or systems and the support vehicles. This permits the ground station to monitor and/or determine the identity, location, and heading of any vehicle in its range for tracking and collision avoidance, as well as monitoring sensor information, alarm conditions, emergency conditions, servicing requests, maintenance information, navigational information, requests for information such as flight plans, weather information, route maps, message traffic such as e-mail and the like. Similar information may be transmitted and received between transports, between transports and support vehicles and any of these and the ground station. The ground station may also send operational commands to the various monitoring systems both on-board the transport and ground mounted, such as camera tilt, pan and zoom and sensor activation. Other command signals such as "lock-on" a specific condition or transport, sensor download, activation such as "lights-on" or alarm (e.g., siren) activation and the like.

In a typical application. when an alarm from a specific transport is sent to the ground station it will be tagged with the GPS coordinates of the transport. The alarm will also be reported to a security system, typically including a computerized center that distributes the information of the wireless LAN and. where used, the wired LAN. The mobile and/or personal security units will also report their GPS coordinates to the central computer so that the system knows the location of all security personnel at ant point in time. Once the alarm signal is received, the system can search and identify the closest appropriate personnel and alert them of the alarm condition. This is accomplished by calculating the length of the vectors between the transport GPS and the various personnel GPS signals. The shortest vectors are the nearest personnel and these can be alerted to respond to the alarm condition.

The selected personnel are then signaled by the security system of the present invention to respond. Audio, text and graphic communications may be utilized to inform the selected personnel of the condition and location. The system can also use its "mapping" function to assist the personnel in determining the best route to take in response. Because of the em comprehensive nature of the system of the subject invention, both audio and image conditions of the transport can be communicated directly to the selected personnel, using video conferencing compression techniques of the LAN. If the desired, the personnel can switch cameras to obtain different views, or gain control of the steerable camera disclosed herein and survey the scene as appropriate via remote control. The two-way communication capability of the system would also permit the personnel to communicate conditions and the need for additional personnel or equipment both to the system computer and directly to other personnel. The security computer system will register the GPS location of the selected personnel as well as the location of additional or "back-up" personnel in order to coordinate their movements and actions. The system can then provide essential audio, video and communications to the selected back-up personnel in order to coordinate the entire operation. The coordinates of fixed sensors may also be entered into the system so that personnel can determine the proximity of each available sensor to his GPS location.

It should be noted that the request for back-up can be programmed to be automatically activated under certain conditions. For example, if a security personnel personal system detects an explosion or a gunshot, an automatic alarm condition can be activated to alert central security other personnel in the vicinity to indicated "potential bomb blast" or "potential automatic weapon", all based on the audio signal which is picked up by the sensors by comparing them to known acoustic signatures of these types of events. Shock and vibration detectors may also be included both on board, at fixed locations on the ground and in the portable or mobile units. For example, if a personal unit is dropped, an alarm would be generated. Smoke and heat detectors may also be incorporated to monitor the safety of the environment of personnel.

It is a primary object of the subject invention to provide the means and apparatus for a comprehensive, multi-media traffic management, surveillance and monitoring system for monitoring and tracking a commercial transport vehicle while in port or while in route.

It is a further object and feature of this invention to provide a comprehensive surveillance and monitoring system supported by a wireless transmission system whereby communication of all data including live video and/or audio transmissions can transmitted between the transport, ground or base stations, remote sensor systems, remote or mobile monitoring systems and other transports.

It is another object and feature of this invention to provide tracking capability to assure that a transport stays in an assigned zone while either in route or in the port or terminal.

It is a further object and feature of this invention to provide communication capability for monitoring and/or responding to supply needs on board the transport in order to permit support personnel to expedite response and/or re-supply when the transport arrives in port.

It is also an object and feature of this invention to provide for monitoring of situational conditions of and surrounding the transport both while in port and while in route.

It is yet another object and feature of this invention to provide means for archiving performance parameters for later recall in order to review performance and/or reconstruct events.

It is an additional object and feature of this invention to provide a ground surveillance and security system for detecting the breach of commercial transport security while the commercial transport is on the around or in a port or terminal and is unattended.

It is another object and feature of the subject invention to identify that a commercial transport is on the ground and needs to be monitored for tracking its exact location, and its orientation on the ramp.

It is also an object and feature of the subject invention to provide a security system, which is integral with the commercial transport for providing ground security.

It is a further object and feature of the subject invention to provide communications between the commercial transport and a ground security station to assure commercial transport security while the commercial transport is parked or unattended.

It is another object and feature of the subject invention to provide a comprehensive, multi-media data generating, collecting, displaying, transmitting, receiving and/or storage safety and/or surveillance scheme for commercial transport.

It is also an object and feature of the subject invention to provide an on ground security system which incorporates the in-flight surveillance system in order to minimize the number of additional components required to implement the system.

It is also an object and feature of the subject invention to store video, images, audio and/or transducer data on the commercial transport being protected and/or at the ground security station

It is yet another object and feature of the subject invention to provide apparatus for permitting ground and/or base personnel to receive video, images, audio information and/or data relating to critical components and areas of a commercial transport and operational data such as dispatch information.

It is still another object and feature of the invention to permit the monitoring, storing and retrieval of any of a variety of video, images, audio signals and/or performance data by the tracking, surveillance and/or imaging equipment on board the commercial transport.

Other objects and features of the subject invention will be readily apparent from the accompanying drawings and detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a basic diagram of a ground based security and surveillance system incorporating the teachings of the subject invention.

FIGS. **2***a* and **2***b* are diagrams of a simplified, basic camera/transmitter to base station system utilizing a conventional wireless transmission system between transport and the base station, and adapted for converting generally incompatible systems in order to make the system of the subject invention of universal application.

FIGS. **3***a* and **3***b* are diagrams of a simplified, basic camera to base station utilizing a digital wireless transmission system such as, by way of example, a digital radio, wireless digital LAN or other wireless communication system.

FIGS. **4***a* and **4***b* are diagrams of an expanded system similar to FIG. **3***b*, but showing use of an on-board hardwired system and on-board wireless system, respectively.

FIG. **5** is a perspective view of a multimedia camera tracking system for use in connection with the subject invention.

FIG. **6** is an expanded system incorporating the teachings of FIG. **1**, including a remote mobile security unit and utilizing a local area network (LAN) as the signal transmitting and receiving system applied to the fixed components of the system, a wireless network such as a wireless LAN (W-LAN) for the signal transmitting and receiving system applied to the mobile components of the system and a wide are network (WAN) as the signal transmitting and receiving system applied to distant components of the system.

FIG. **7** is an illustration of an aircraft as an exemplary commercial transport and shows the incorporation of on board systems with the comprehensive tracking and monitoring system of the subject invention.

FIG. **8** shows a typical ground based system.

FIGS. **9** is an expansion of the system shown in FIG. **1**, utilizing a remote receiver and monitor station in combination with hardwired ground components, wireless ground components and an aircraft system interface.

FIG. **10** is a simplified diagrammatic illustration of a wireless LAN or WAN networked system illustrating the versatility of information transmission and monitoring capabilities.

FIG. **11** is a diagrammatic illustration of the system being used in a taxi protection and/or tracking mode.

FIGS. **12***a*, **12***b* and **12***c* are illustrations of various system configurations for LAN and wireless local area network (W-LAN) systems.

FIG. **13** is a detailed diagram of the onboard surveillance system for use in connection with transport two-way radio and/or the wireless LAN system of FIGS. **12***a*, **12***b* and/or **12***c*.

FIG. **14** is an integrated sensor/wireless LAN subsystem using DSP technology.

FIG. **15** is a diagrammatic illustration of the positioning of tracking sensors on the ramp, particularly well-suited for tracking assets without internal positional or tracking sensors.

FIG. **16** is a diagrammatic illustration of the selection process techniques for identifying and alerting personnel upon the occurrence and detection of an event requiring response.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

It will be readily understood that the various components and features of the subject invention can be utilized in connection with a tracking, security and/or surveillance system for any of a variety of commercial transports. For purposes of brevity, the features of the invention are described in detail herein as applied to commercial aircraft. This is primarily because it is assumed that aircraft systems are likely to incorporate the most complex and comprehensive surveillance systems of the subject invention due to the importance of securing this commercial transport while on the ground and both the importance and complexity of monitoring and tracking same while in port or in route. The system may be scaled up or scaled down depending upon application. For example, land vehicles such as railroad rolling stock or over the road trucks may need only door sensors, motion sensors and brake monitors, whereas aircraft, as described, will require a substantially more comprehensive system in order to provide adequate surveillance. In the preferred embodiment for aircraft as described in detail herein, the comprehensive surveillance system utilizes the onboard aircraft system in combination with a

ground-based wireless system. The wireless configuration can also be applied to the sensors on board the aircraft using the same architecture as described here for the ground based portion of the system. That is, the on board elements may be hardwired, may communicate through wireless radio, or may utilize wireless LAN as herein described, or a combination. The LAN radio provides a wireless LAN connection to other system elements. This is a well-know but evolving technology that allows high bandwidth wireless data transmission between multiple devices. Several different techniques are available from a variety of manufacturers, including Raytheon Systems Corporation, the assignee of the subject invention. Many of these techniques may be utilized in the subject invention.

The comprehensive system includes various condition sensors, motion and audio detectors, video cameras, light detectors, sound detectors, contact switches, temperature detectors and control systems for controlling light, and sound transmissions to the aircraft. A temperature and/or humidity detector may be used for general monitoring functions such as predicting the icing of the wings in winter conditions, or for fire alarm functions. The temperature detector may be any known form for temperature transducer, such as a PTC, NTC, thermistor, or semiconductor element. More advanced semiconductor elements may be used, such as integrated circuit types that may include integral temperature and/or humidity sensors, references, analog/digital convertors, protocol engines and serial driver. Further, integrated circuits can incorporate on-board digital radio elements such as DSP based radios to be completely integrated self-contained chips. The temperature analog/digital convertor adapts the ambient temperature of the environment into a digital data stream. This digitizer runs at suitable rates for continuous temperature monitoring. A signal processor can be used to provide correction to the temperature and/or humidity elements, such as processing out non-linear characteristics of the sensors. It can also be used to look for profiles such as rapidly rising temperature/humidity conditions that may indicate a fire or open door or other security breach. Detection of such an event would trigger a specified unique alarm condition to be transmitted back to other elements of the system.

One of the most significant factors in determining the overall complexity of the system is the cost associated with the various sensor components. For example, in certain applications it may be desirable to add a humidity detector or a carbon monoxide detector. A digital camera may be used, or an analog camera may be used in combination with an analog to digital convertor, or digital with internal digitization circuits, or digital compressed with an internal analog to digital convertor and a motion video compressor. In the preferred embodiment, the camera runs at full-motion rates. However, it will be readily understood that the camera can run at lesser rates for still frame or step video applications. In all cases, accurate information can be supplied on a "real-time" basis, i.e., the information can be transmitted, received and acted upon by man or machine in a timely fashion, sometimes with slight delays, to permit adequate response to an event. The video analog/digital convertor is functional to adapt the analog light modulated signal representing the video scene into a digital data stream. This digitizer can run at "real-time" rates for processing full motion video, or could operate at lesser rates for still frame or step video applications. The signal processor/motion video compressor is flexible and will provide various functions depending upon application. For example, the video processor/compressor subsystem can be programmed to perform functions such as motion detection in several well-known manners and methods. Several techniques are utilized to accomplish motion detection, but the most general method involves capturing repeated video frames and comparing differences in those repeated frames over time. Other techniques such as edge analysis, which looks for specific characteristics in the image, and the changes in such characteristics, may also be used. The processor/compressor subsystem can also be used to image process the video for purposes of contrast enhancement, dynamic range improvement, noise reduction and/or other well-known video processing methods, or other circuitry so configured to perform the processing by well-known techniques. When the video processor/compressor is used for motion detection, any detection will generate a specified unique "alarm condition" to be transmitted to other elements of the system.

FIG. **1** is an illustration of a basic ground based security and surveillance system for aircraft. The aircraft **10**, **10***a*, **10***b*. . . **10***n* will be within the view of video sensors or cameras **210**, **210** *a* . . . *n* when on the airport ramp. The video processor/compressor can also be used to perform still image compression to reduce the amount of data required to be transmitted over the network. This can be accomplished by using any suitable image compression algorithm, such as the industry standard JPEG algorithm, wavelet compression, DjVu from AT&T, or other techniques. For full motion video surveillance applications, the compressor **406** may be used to provide bandwidth reduction motion video transmissions. In this application, the amount of data representing a full motion video stream would be reduced by using full motion video compression techniques such as Motion JPEG compression, MPEG compression, motion wavelet compression, or other techniques. This allows better bandwidth utilization of the wireless and wired communications channel used by the system.

The aircraft will transmit various identification signals, such as tail number, GPS location and the like, as indicated at **12**, **12***a* . . . *n*, to a ground based receiver **14**. The camera **210**, **210***a* . . . *n* will also transmit video signals to the receiver **14**, as indicated at **15**, **15***a* . . . *n*. The location of the cameras will be fixed, but may be either permanent locations or "drop and place" movable units dispatched as needed, based on changing security situations. It is also possible that portable cameras will be transported by the aircraft then deployed on the ground, permitting ground surveillance in those airports where a permanent ground security system is not installed. The GPS coordinates of ground based cameras will be stored at the ground or base security station **18**, or as preferred in the case of drop and place units, will be sensed by on-board GPS receivers and transmitted to the base station. The received videos from cameras may be converted by optional convertor **16** as required and transmitted to the monitor of the ground based security station **18**. The convertor is used to provide compatibility between the transport's format and the ground system format. For example, for analog transmission an aircraft may transmit analog NTSC video in the United States and PAL in England. Digital transmission may be accomplished by placing the convertors at each camera transmitting unit (see FIG. **3**) thereby supporting digital data transmission for permitting transmission by the preferred wireless digital system, such as a LAN or W-LAN.

By monitoring the identification information from each aircraft, the transmitted video format from the various cameras can be matched to a specific aircraft. The signal is displayed on a monitor at station **18** where it can be viewed and monitored for surveillance and security purposes. In the

event of a breach of security, security personnel may be readily dispatched to the correct aircraft using the GPS location signal to define an accurate position of the aircraft. As will be described, the security signals generated by the system of the subject invention may also be logged and inventoried for later play back, which is particularly useful for reconstruction of events. It will be readily understood that the ground components of the system may be hardwired, or other forms of wireless communication, such as, by way of example, a wireless local area network (LAN) could be utilized using radio frequency or optical communications methods, as will be readily understood by those who are skilled in the art. The system can also be modified to transmit signals from the ground-based station **18** to the various ground sensors and aircraft sensor systems. For example, a camera **210** can receive and respond to remote positioning and zooming signals. Audio warning and activation signals may be sent to the camera locations and to the aircraft to activate audio commands, sirens, lights and the like, which are integral to the system.

FIGS. **2***a* and **2***b* show two different schemes permitting transmission of monitor system data from a transport **10** to a base station monitor **18** using a wireless transmission scheme as indicated at **12**. In FIG. **2***a*, the camera or sensor (for example camera **29**) produces a signal which is transmitted as generated by the aircraft transmitter **76** to the base system receiver **14** and then converted at the base system by format convertor **400** for processing or viewing at the base station in its native format. Where desired, the convertor may be at the sensor site as indicated in FIG. **2***b*. Of course, depending on the various systems being utilized, multiple conversion steps may be utilized. Format conversion capability is required in order to make the system global in nature. For example, the format of each aircraft is often dependent on the country of origin. The United States and Japan generally use an NTSC camera format. France and Russia use SECAM. The United Kingdom typically uses PAL. It is important that the ground or base station be able to recognize and convert any of these formats to a suitable format for processing by the base. Compatibility with multiple, yet different, systems can be automatically accomplished. Instant protocol detection and conversion is shown and described in my copending application, Ser. No. 08/816,399, filed on Mar. 14, 1997, entitled: "Instant Protocol Selection Scheme for Electronic Data Transmission via a Distributive Network".

FIGS. **3***a* and **3***b* show a basic wireless digital system. As shown in FIG. **3***a*, the transport **10** includes a sensor such as the analog camera **29** producing an analog video signal which is converted to a digital signal at convertor **510** and compress at digital compressor **512** for transmission via the wireless transmitter **76** via a digital wireless network **12**. The Receiver **14** collects the signal, decompresses it at decompressor **520** for input to the base station monitor **18**. The system of FIG. **3***b* incorporates two-way communication with the basic digital system of FIG. **3***a*. In this embodiment the transmitter **76** is replaced with a digital transceiver **576** in the transport and the base station receiver **14** is replaced with a digital transceiver **576**. This permits command data generated at the input device **501**, such as, by way of example, a keyboard or mouse orjoystick, to be encoded at encoder **502** and transmitted to the transport via transceivers **514** and **576**. The on-board control decoder **503** then transmits the command or control signal to the device, such as, by way of example, tilt and pan control as indicated at **504** to camera **210**.

FIGS. **4***a* and **4***b* are expansions of the system shown in FIG. **3***b*, adapted for use in connection with a ground-based wireless LAN **512** or a satellite based wireless LAN **612**. In FIG. **4***a*, the on-board wireless LAN transceiver **576** is connected to a hardwired on-board system such as the wired LAN network **590**. Preferably, the on-board sensors would be activated by the base unit on an "on-call" or a programmed intermittent basis to conserve power. The various sensor systems such as camera **210** are connected via a LAN interface **582**. The base station transceiver **514** is connected to the base station LAN **530**, through which the base station workstation **18** and input devices **501** are connected. In the embodiment of FIG. **4***b*, the on-board network is also wireless, such as the on-board LAN **592**. In this embodiment, a local wireless LAN transceiver **578** is used to send and receive signals between the various components such as camera **210** via a local (device dedicated) wireless LAN transceiver **580**. Of course, it will be understood that the base station LAN **530** can also be wired or wireless as a matter of choice.

FIG. **5** is a perspective view of a preferred embodiment of a ground based tracking camera sensor **210**. In the preferred embodiment, the cameras are adapted to respond to several different types of control signals, including but not limited to:

- X-axis position control as indicated by X-axis servomotor **50**;
- Y-axis position control as indicated by Y-axis servomotor **54**;
- Lens zoom control as indicated by motorized zoom lens **58**; and
- Iris control as indicated by iris controller. (The iris may also be automated).

As shown in FIG. **5**, the camera system includes a base or mounting bracket **56** for mounting the system at location. The system body **52** is mounted on a tilt mount **54** (y-axis) and pan mount **50** (x-axis), permitting panning (x direction) and tilting (y direction) of the camera for scanning a wide area. A motorized zoom lens **58** is provided (z direction). The preferred embodiment of the system also includes an audio sensor such as directional microphone **60**. The audio sensor may be an acoustic transducer, such as a microphone, that collects audio information from the surrounding area. The collected audio can be processed to detect potential emergency conditions such as a gunshot or an explosion, or can be routed directly back to the monitoring station. Using the sensors of the subject invention, locational origin of an explosion or a gunshot or the like can be triangulated from multiple sensors and the positional origin can be calculated and displayed on maps as an overlay for assisting in pursuit of a perpetrator. The calculated origin can also be correlated by computer to the nearest appropriate emergency assets, base upon their known positions, and those assets may be automatically dispatched. The audio analog/digital convertor adapts the acoustic signal representing the audio environment into a digital data stream. The digitizer runs at real-time rates for real-time audio monitoring. The audio signal processor/compressor has two functions. It is programmed to perform detection in a number of different manners. For example, the processor algorithms can be adjusted to detect impulse noises such as gunshot or a small explosion. Detection of such an event would trigger a specified unique "alarm" for that condition to be transmitted back to other elements of the system. Other types of detection are also possible. By using frequency analysis transforms and signature profiles, noises from engines, door openings or other distinctive noises could be detected when warranted by the situation or condition. For audio surveil-

lance applications, the compressor can also be used to provide bandwidth reduction for audio transmission. In this application, the amount of data representing a real-time audio stream would be reduced by using audio compression techniques such as LPC-**10**, or other well-known or proprietary algorithms. This allows better bandwidth utilization of the wireless and wired communications channels used by the system.

Illumination means such as the infrared illuminator **62** permits surveillance during low light no light conditions, without detection by unauthorized personnel. A visual light/strobe light **63** can be turned on by locally detected events, by control signal, or by other system elements such as detection by a companion sensor unit signaling over the LAN. This light can illuminate an area of concern, attract attention of security personnel as a signal, or scare away unauthorized personnel or intruders.

An integrated GPS receiver **64** is provided for generating location information. This is particularly useful for "drop-and-place" sensors as opposed to permanent sensors. Other features such as a laser range finder **66** that can measure distance to objects/personnel may be incorporated to further expand and enhance the capability of each sensor component. The camera system shown has full 360 degree field of view capability which may be controlled manually by remote control signals, may be programmed to pan the area on a time sequence, may track a moving transport using GPS signals from the transport or by using image processing "tracking software" processing the camera image, or may be responsive to and activated by an event occurrence such as from sensors distributed throughout the ramp areas, reporting activity over the LAN, in the well known manner. The range finder **66** permits the tracking system to locate objects in a precise manner and then provide control signals to permit accurate surveillance and monitoring of same, such as zooming the camera or positioning of other sensor elements. An onboard dual GPS systems on the aircraft, with one GPS at the tail and one at the nose, used in conjunction with the GPS system **64** permits the system to determine size, heading and distance to the aircraft being monitored, providing accurate location information and permitting the camera to automatically adjust to monitor the entire aircraft within its range. This permits the selection of the correct camera when multiple cameras are available and permits a wide range of viewing possibilities by being able to determine what portion, if not all, of the aircraft is to be monitored at any given time. In those instances where the aircraft is equipped with a single GPS system, much of this versatility is preserved. However, it will be understood that aircraft size then would have to be determined from the aircraft type or by optical means. When the transport is not equipped with the GPS system, the other sensors such as the range finder/tracking camera or ground level sensors would provide data for cameral selection and updating of electronic situational maps. Each sensor and/or camera may incorporate a motion sensor and/or an audio sensor activation device so that the system may be activated when a sound or a motion occurs within the sensor range. The motion detector may comprise any transducer unit that can detect the presence of an intruder and can be a device such as an infrared motion detector, a thermal sensor, an ultrasonic detector, a microwave detector, or any hybrid of two or more of these detectors "fused" together to gain better sensitivity and/or improved detection accuracy. A motion detector convertor may be incorporated to convert the signal from either a single motion detector sensor or a battery of sensors to digital form for processing and/or transmission to other system elements. Multiple elements may be contained within a single sensor system package, or may be fused for multiple sensors in geographically distributed elements with data to be fused being transmitted over the LAN. The motion detector signal processor is adapted for analyzing the sensor data streams from one or more sensors to provide for better sensitivity or improved detection accuracy. Well-known techniques may be implemented to process the transducer data and detect surges over the set thresholds that represent detection. The processor/compressor can also be configured to accept input from multiple sensors and process the inputs in a "fused" manner. For example, signals form an infrared detector and ultrasonic detector may be "added" together, then threshold detection performed. This ensures that both an optical and an acoustic return are detected before an alarm condition is broadcast. These and other more sophisticated well known techniques can be used together to gain better sensitivity and/or improved detection accuracy. Detection of such an even would trigger a specified, unique alarm condition to be transmitted back to the other elements of the system.

Typically, the sensors will "sense" the presence of unauthorized activity and activate recording from the various audio and/or video equipment and activate alarms. This will initiate the generation of a signal at each of the activated units. The generated signals will then be transmitted to the monitoring and recording equipment, as described, to permit both real-time surveillance and recordation of activity at the site. Motion detection may also be determined using video time/change techniques in the well-known manner.

FIG. **6** is an expansion and further refinement of the system of FIG. **1** and is a diagrammatic illustration of the system of the subject invention as configured for a wireless local area network (LAN). In the preferred embodiment the aircraft **10** will include a comprehensive in-flight security system, as better shown in FIG. **7**, which is cutaway diagram of atypical commercial airline fuselage **10**, with the cargo hold **12**, the passenger cabins **15**, **16** and the flight deck or cockpit **21** partially visible and a plurality of sensors **19***a–n*. A more detailed description of this onboard system is shown and described in my aforementioned U.S. Pat. No. 5,798,458 and copending applications Ser. Nos.: 08/729,139, and 08/745,536. In the subject invention, the currently available sensors may be utilized, without additional enhancements or a number of additional sensors may be added. For example, ground surveillance could be accomplished using only the on-board sensors on the aircraft. In the example, a number of video image sensor devices such as, by way of example, analog video cameras, may be mounted inside the skin of the aircraft and aimed through openings or windows provided in the fuselage to focus on critical components of the aircraft, such as the landing gear cameras **20**, **22**, the wing engine camera **24** and the tail camera **26**. Similar devices or cameras may also be strategically placed throughout the interior of the aircraft, such as the passenger cabin cameras **28**, **30**, **32**, **34**, **36**, **38**, **40**, the cargo bay cameras **42**, **44**, **50** and **52**, and the flight deck camera **46**. The sensors **19***a–n* may include smoke and fire detectors, motion detectors and audio sensors strategically placed throughout the aircraft, both internal and external of the fuselage. The placement and number of devices is a matter of choice depending upon the configuration of the aircraft and the level of surveillance desired. In the preferred embodiment the on-board aircraft sensor system is used in combination with the ground based system to provide a comprehensive surveillance and security system of the aircraft while on the ground.

With specific reference to FIG. **6**, in the preferred embodiment the aircraft **10** will also include a nose GPS sensor **200**

and a tail GPS sensor **202**. The dual GPS sensors permit redundancy, very accurate location and directional positioning of the grounded aircraft, as well as providing information identifying the size of aircraft. An aircraft reference signal (such as tail number) country of origin, owner, and the like, may be incorporated in the transmitted signal so that the monitoring station can identify the aircraft, its location and the security condition thereof by monitoring the signal from that specific aircraft. In the wireless embodiment shown, the aircraft is equipped with a wireless transceiver **204** for transmitting all of the collected signals from the sensors and cameras via the wireless network represented by the wireless communication "cloud" **206**. The wireless system shown in FIG. **6** permits transmission not only to the ground control tower and security, but expands the transmission of data to all locations and stations which are part of the wireless system. For example, the signals may be transmitted to a patrolling ground security vehicle **208**, a portable monitoring station **218** and/or to the ground security center via the wireless LAN transceiver **212**. In addition, signals may be transmitted in either a send or receive mode from any unit in the wireless system to any other unit therein. This is particularly useful when trying to coordinate a response to an incident in a quick response mode.

As shown in FIG. **6**, permanent ground units may be hardwired in typical wired LAN system configuration, with a single wireless LAN transceiver **212** serving the permanent ground base portion of the system. Depending on convenience of application, it will be readily understood that any combination of wired or wireless component configurations can be utilized. For example, it the maintenance hangar **214** were a great distance from the ground surveillance center at tower **216** a wireless (RF or optical) LAN communication link may be preferred over a hard-wired system. Use of the wireless LAN will also greatly facilitate the adaptation and retrofitting of airports not having ready cabling capability or infrastructure.

The wireless LAN **206** or other wireless communication system provides a connection between the aircraft **10**, the fixed ground resources via transceiver **212**, mobile ground resources such as the security vehicle **208**, portable ground resources such as the portable ground security station **218** and various functional or operation centers such as the control tower **216**, the operations control center **220**, the security center **222**, the maintenance center **224**, the maintenance hangar **214** and the airport fire station **226**.

In the preferred embodiment, and as shown in FIG.**6**, the portable (or drop in place) camera/sensor/link device **210** (see FIG. **5** and accompanying description) is adapted for providing any combination of video surveillance, audio surveillance, motion detection, acoustic detection, sensor positioning capability and wireless link to other system elements. The security vehicle **208** is equipped with a sensor viewing capability as well as an alarm annunciator to alert the operation for quick response. Typically, the transmission of an alarm signal by the aircraft will trigger a link-up at the various monitoring units and will interrupt routinely monitored signals. The alarm signal will include aircraft identification and location data, as well as an indicator of the sensor triggering the initiation of the alarm signal. The alarm location may also be displayed on a "moving map" display, in the well know manner. This permits a quick response team to focus on the incident causing the generation of the alarm signal. In the preferred embodiment of the invention, the alarm at the sensor location is adapted to operate in either an audible or silent mode, depending on the surveillance operation. For example, a warning signal may be broadcast at the location to scare off intruders who breach a restricted area or, in the alternative, the warning signal may only be transmitted and sounded at the base station and/or security vehicles alerting base personnel of a situational change at the monitored zone. Hand held or belt mounted wireless LAN personal security assistants can also be used. These would allow personnel to have access to critical security information while on foot patrol or making rounds, permitting almost immediate response to activating conditions in their vicinity. This would also allow the automatic signaling and dispatch of personnel based upon their identity or based upon their GPS determined location.

The system wireless LAN transceiver **212** operates as the gateway to the ground based, permanent, wired facilities. A router **228** is provided to bridge the various airport facilities (i.e. an intranet). The router is a typical industry type, as is well known to those skilled in the art, and may be installed in many configurations as required. Where desired, the system may be connected to remote nodes as well, through a wide area network (WAN), permitting connection to FAA regional centers, airline corporate operations or aircraft manufacturer operations, for example. The router may be configured as needed with typical commercial techniques, such as firewalls to protect access, protocol convertors, and encryption devices, as needed to direct secure or unsecured information to the various ports, nodes and centers.

Where desired, only preselected alarm signals may be transmitted to selected centers. For example, any heat or smoke detection, fuel spill detection or medical emergency would generate an alarm signal at the fire control center **226**. The maintenance hangar may have access to fluid sensor data and stored maintenance requests and records. Thus the system can be configured in an information hierarchy format where only useful information is forwarded to the various centers.

The use of the dual GPS receivers **200**, **202** on the aircraft **10** permits the reporting of the general location of the aircraft on the ramp during taxi when parked whether or not attended. The use of two GPS receivers provides redundancy, better accuracy and orientation information for the aircraft by reporting two distinct position datum signals. It will be readily understood by those skilled in the art that other position signal devices could be utilized such as, by way of example, a single GPS receiver and a magnetic compass (which may have to be corrected for local magnetic fields or interference). By linking the position and orientation information to the ground based centers the location and orientation of the aircraft at all times it is on the ground the aircraft may be closely monitored. Such a system provides ground control transmitting signals showing the location and movement of all aircraft while on the ground, in much the same manner the radar transponders provide air controllers with position and movement data while the aircraft is airborne. This is particularly desirable when the movement of aircraft is portrayed on a map display. Other ground vehicles such as fuel trucks, waste water trucks, baggage handling trains, security vehicles and the like can also be tagged with GPS receivers and LAN transceivers for monitoring their position relative to the aircraft on the ramp. An automated computer system can be operating in the background looking for potential collisions and generating alarm messages if such a conditions is detected. Another automated computer function can track vehicles relating to their authorized areas and issue alarms if security is breached. Yet another function can track the presence or absence of needed services, such as the timely appearance of catering trucks, fuel trucks, wastewater trucks, baggage trains and the like

after the arrival of a subject transport. If any of these required services do not arrive at the transport within a prescribed time period, and "alarm" can be reported over the LAN to the missing services vehicle, and/or to the responsible operations center. This function can be completely automated by a controlling computer system.

As shown in FIG. **8**, in a typical installation, external sensors **210***a–g* placed on the ramp in the vicinity of the aircraft to monitor the exterior of the aircraft. For example, a plurality of video cameras **210***a* and **210***b* may be placed along the exterior fence **300** of an airport. In additions, cameras may be placed in other strategic locations such as the camera **210***c* mounted on the terminal building **310** and the remote cameras **210***d–n* mounted on base units **312** located strategically throughout the airport. When an aircraft **10** is parked on a surveyed area of the airport ramp **314**, the various cameras **210***a–n* and or other ground based sensors will provide a secure area for the aircraft. Any activity within the range of the cameras may be viewed and monitored.

The system of the subject invention is designed such that aircraft onboard sensors and ground-based sensors may be used in combination to provide a comprehensive security system. The ground-based sensors may be used alone to provide basic ground security. The aircraft sensors may be used alone to provide some ground based security with a minimum of modification to existing hardware.

In the embodiments shown and described, a multi-media recorder is utilized to record the information for archival purposes. This can be a ground based recorder or the aircraft "black box" recorder **58** (shown as installed in the tail section of the aircraft, see FIG. **7**) may be utilized, in the same manner as the current data and voice black boxes (not shown).

Audio and video monitors are also provided at the base security station to provide near real-time surveillance. The flight deck monitor and control panel **54** is located on the control panel in the cockpit **21** will also have access to this information. Other monitors may be provided where desired.

Turning now to FIG. **9**, the system shown is adapted for wireless installation using both onboard aircraft sensors and ground based remote sensors. The system shown relies on the standard on-board radio of aircraft **10** to transfer all aircraft signals to the base station receiver **81** via antenna **81***a*. In the alternative embodiment of FIG. **9**, the ground-based cameras (camera **210***d*) and a motion sensor **31** are hardwired as shown at **87** to a controller **85**. The on-board signals are input from the receiver via hard wire **89**. Wireless ground based sensors such as the camera **210***a* and the motion detector **31***a* may be used in combination with the hardwired ground based cameras (see camera **210***d*) or other hardwired sensors. This permits maximum flexibility of the system architecture. The wireless signals will be transmitted via a dedicated sensor array transmitter/receiver **83** and antenna **83***a*.

The controller **85** will feed the data signal to a split screen monitor **93**, where all video signals may be simultaneously monitored and/or to a plurality of distinct monitors **91***a–91n*. The split screen technology and methodology is more fully described in my copending application entitled: (Photo Telesis 006), incorporated herein be reference. It will be readily understood that as many monitors and audio output devices as desired may be utilized, permitting surveillance at various locations throughout the port. In the preferred embodiment all of the signals are stored in a recording system as indicated by the mass storage unit **95**. This permits replay of the transmitted signals for reconstruction of events and also provides permanent archive records where desired.

As shown in FIG. **10**, the use of a wireless network provides maximum versatility in the transmission of information and the monitoring and processing capability provided by the system. As indicated in FIG. **10**, the transport **10** both sends and receives information between the ground station **18**, as previously described and as indicated by the wireless data path A. The transport may also transmit and receive between the fixed sensor station(s) **20** as indicated by wireless data path C. The fixed sensor station is also in direct communication with the ground station as indicated by wireless data path D. It should be understood that permanent installations such as the ground station and the fixed sensor station could be hardwired with one another without departing from the scope and spirit of the invention. In addition, support vehicles such as, by way of example, the baggage train **13** may be equipped with sensors such as location sensors and the data generated by this sensor may be transmitted to the ground station via path B, the monitor station via path E and directly to the transport via path F. The ground station **18**, monitor station **20** and transport **10** may also communicate directly with the ground support vehicle **13**. For example, if the ground support vehicle comes within a designated "keep-out" or no trespassing zone or is too close to the transport, a proximity sensor or calculated from the GPS data may be utilized to activate and send a warning signal to the ground support vehicle. As indicated by wireless path G, sensor data may also be communicated between multiple transports **10** and **10***a*.

The comprehensive system of the subject invention not only provides surveillance of the aircraft while at the gate or while unattended, but also provides taxi protection and monitoring. As shown in FIG. **11**, when all ground vehicles such as fuel truck **11** and baggage train **13** are outfitted with GPS receivers as well as the aircraft **10**, the location and safe distance of each vehicle and the aircraft may be monitored. "Train" type vehicles may be outfitted with two or more GPS receivers to relay the length of the vehicle. Each car can have a separate module. A computerized map of the airport tarmac T, the taxiways P and runway R can be generated showing the position, direction and movement of each vehicle and the aircraft. Predefined keep-out "zones "Z" may be established and an alarm may be sounded if the zones are breached. Also, prescribed areas for authorized vehicles may be established and monitored. If a vehicle is outside the designated area, or breaches a zone "Z", an alarm condition will result. This can be prioritized as a cautionary breach, a dangerous breach and so on, depending on proximity of the various vehicles and aircraft to one another. For example, if an aircraft **10** comes too close to a fuel truck **11**, alarms in the aircraft, the fuel truck will be activated. In the situation advances to a danger zone, a second alarm condition may alert ground or base personnel that a breach has occurred so the intervention may be initialized. Logging of the "safety" breaches can be made so that safety improvements or training may be implemented based on need.

A combination of ground sensors in a matrix on the airport ramp (see sensors **210***a–210n* in FIG. **8**) will scan and monitor vehicles. If a vehicle is detected that does not have a GPS identification authorized for that location and alarm condition will result. For example, if a stray baggage train **13** entered the taxiway area, an alarm would sound indicating that the train **13** has entered an unauthorized area. Emergency and security personnel may also be alerted and dispatched if unauthorized or untagged (no GPS identifier) vehicles are present. This protection scheme could be expanded to include personnel as well as vehicles. For example, the ground vehicle can have a sensor that reads a

personnel security token or device such as an encoded digital key. This key information would enable the vehicle and would also be encoded with GPS information and vehicle identification, which is transmitted over the LAN. Security software can then check to determine if the individual is authorized to be present in the vehicle at that time and location, activating an alarm if proper authorization is not confirmed. The vehicle could also be immediately shut down. Visual identification of personnel may also be accomplished using the sensor systems of the subject invention.

FIGS. **12***a*, **12***b* and **12***c* show alternative embodiments permitting use of a wired or wireless LAN transmission system. As shown in FIG. **12***a*, with a camera sensor C**1** for purposes of simplification, the camera C**1** generates an analog signal which is converted to a digital signal at convertor **400** and then compressed at the motion video compressor **402**. This can be accomplished by industry standard techniques such as motion-JPEG, MPEG, or motion wavelet compression or other current or future compression algorithms. The compressed digital signal is then packetized by the LAN interface **404** and transmitted to the LAN **206** in well-known manner. An analog audio sensor such as microphone **19** is added in FIG. **12***b* and is supported the dedicated convertor **406** and compressor **408** for input to the multiplexer **410** where the compressed digital audio signal is combined with the compressed digital video signal to produce a complex multi-media signal for packetization by the LAN **404** interface. As shown in FIG. **12***c*, digital sensors such as motion detector **31** may also be included. The motion detector digital signal does not require conversion and is input directly into the multiplexer **410**. As also shown in FIG. **12***c*, the LAN may be wireless, with a wireless transceiver **412** being incorporated in the system. As previously described, any portion of the system may be wired or wireless depending on ease of installation, mobility requirements and other issues. It may be noted that functions such as the motion video compressor, audio compressor, multiplexer and LAN protocol functions may all be performed as software and could operate on one high speed computer such as a Digital Signal Processor (DSP).

Turning now to FIG. **13**, additional multi-media sensors may be incorporated in the system, as well, and may be wireless or hard wired as appropriate. For example, one or more audio sensors such as a cockpit voice sensor **113** transmit audio signals to multiplexer processor **232**. Various function sensors, such as, by way of example, an entire array of intrusion security sensors **115** may also be incorporated in the multi-media system of the subject invention. Where a plurality of such sensors are utilized, it is desirable to provide a local multiplexer system **238** to minimize the amount of duplicative hardware. In the example shown, all of the intrusive security sensors in array **115** require only a single transmitter and antenna as part of a local multiplexer **238** which may then feed a combined signal to the multi-media multiplexer **232**. In a wireless system, the security sensor array may also be fully self-contained with an independent power supply.

As shown, a variety of image sensor devices may be incorporated, including the video cameras C**1**, C**2**, C**3** . . . Cn, an advanced imaging device such as the FLIR camera **220**, the on board radar **222** and the like. All of these produce a visual signal. In addition, various audio signals may be incorporated utilizing a variety of audio sensor devices, such as a cockpit voice sensor **113**, on board radios **224**, **226** and the aircraft public address system **228**. All of these produce an audio signal. The operational data signals are also incorporated, as previously described, and may include the GPS sensor **72**, other navigational sensors **230**, the various intrusion sensors **115** and other sensors **125**. Thus, the system of the subject invention will accommodate a multiple input, multi-media array incorporating video, audio and digital data signals into a comprehensive database for providing detailed information relating to the aircraft condition at any time.

Each sensor device signal is introduced into a multi-media multiplexer network **232** which includes a image multiplexer subsystem **234**, a dedicated audio multiplexer subsystem **236** and a digital data multiplexer subsystem **238**, all of which produce distinctive multiplexed signals which are introduced into a master multiplexer subsystem **232** for producing a combined, comprehensive output signal, as selected, on each of lines **231**, **233** and **235**. It may also perform decompression functions for compressed command streams and compressed audio or video. The setup and control of the comprehensive output signal is provided by a master controller **241** and input to the multiplexer **232** at **243**. The system controller receives commands and streaming audio information from other system elements and distributes them to controlled devices. The controller performs a command decoding function to sort out command and data streams directed toward specific devices and components of the system.

The visual and textual data is available at a display monitor **54**. The audio signal is output at **237** to an audio output system such as amplified speaker **240**. All of the data, including all video, audio and digital data will be recorded on the recorder system **70**. Information representing audio, video, sensor data, and other vital digital data is fed from the multimedia multiplexer to the recorder **70** over the signal lines **233**. It should be noted that the multimedia multiplexer may be analog, digital, or packetized digital data type, or a combination of technologies based on application. Where desired, selected portions of the systems data on the aircraft may be downlinked to the ground or base station **18** (see FIG. **2**) as the combined, comprehensive output signal on line **246** to be transmitted to the ground station via the aircraft radio system **80** and the antenna **82**. As previously described, the information may also be transmitted to a wireless satellite via transceiver **280** and dedicated antenna **282**. Once the information is generated as a useable data signal, as indicated at line **231**, **233** and **235**, the controller, in combination with commands from ground security, controls the collection, monitoring and review of the information. This permits access to any single sensor signal, or any combination via line **231** by sending a command via line **248** to the controller **241** for controlling the monitor related multiplexing switches via line **243** to control the signal output on line **231**. For example, this may be a single camera view or an array of intrusive motion sensors **115**.

Where desired, a light level detector may be is used for detecting light conditions such as the ambient lighting or transient conditions such as vehicle headlights or a flashlight. The light detector analog/digital convertor adapts the ambient light levels into a digital data stream. this digitizer runs at rear-time rates for teal-time illumination monitoring. The light detector signal processor can be programmed to look for profiles such as rapidly increasing light conditions that may indicate a vehicle or a flashlight as opposed to the rising or setting sun. Detection of such and event would trigger a specified unique alarm condition to be transmitted back to other elements of the system.

External contact sensors may also be deployed and a condition change may be detected and processed by the contact signal processor. These may be devices such as door

contacts, special motion detectors such as trip wires and the like, floor pads and the like which can be connected, either by wires or wireless means to the contact detection circuit. Detection of such an event would trigger a specified alarm condition to be transmitted back to other elements of the system.

An audible speaker system can also be provided in the preferred embodiment and can provide numerous audio outputs such as, by way of example, voice output or a siren. This is a multi-function device and can be activated by local detection events, and by other system elements such as detection by a companion sensor unit signaling over the wireless system. The siren can indicate an area of concern, serve as a signal to security personnel and/or scare of intruders. The audible speaker can also be used to provide voice instructions or signals base on local detection events, and by other system elements. The controller produces the synthesized or stored voice signals. The controller can programmed or downloaded over the wireless system. The speaker system can also be use as a paging system by sending digitized or compressed voice signals over the wireless system to one or more multi-media devices. In addition, the audio speaker can be use conjunction with the audio detector **408** to communicate with the area.

Power is provided in the well-known manner. In the preferred embodiment, system power is used to power up the system through a convertor and a rechargeable battery system comprising a charger/controller and rechargeable battery supply.

In certain applications it may be desirable to combine many of the functions described herein, such as the signal processing, data multiplexing **232**, LAN or WAN network transceiver **330**, control and parts of the network interface, perhaps utilizing software running at high speed in a high speed DSP engine. This would serve to reduce hardware complexity, improve reliability, reduce power consumption, and reduce cost. The network interface provides a wired interface to the system for connecting other system elements in a hardwired configuration. This can be any one of several well known but evolving technologies such as **10**Base-T, the better **100** Base-T or high-speed Gigabit LAN or WAN technology. Such a configuration does not depart from the scope and spirit of the subject invention.

FIG. **14** is a diagrammatic illustration of an integrated sensor/wireless LAN subsystem using DSP technology. As there shown, the various analog sensors such the light sensor **300**, the temperature sensor **302**, the humidity sensor **304**, and the sound or audio sensor **306** (as well as other sensors as previously described herein and as desired for application) produce analog signals which are converted at one of the dedicated analog-to-digital convertors **310** and then introduced into a multiplexer **312**. The multiplexer **312** produces a combined digital output signal which is introduced into the DSP processor **314**, which produces the system output on line **315**, where it is again converted at convertor **316**, amplified at amplifier **318** and transmitted via antenna **320**. In the preferred embodiment, an integral power supply **322** is provided. The Sensor I/D address is on line **324**. This system provides a highly integrated sensor/processor/transceiver and typically can be housed on a single chip using available configuration technology.

FIG. **15** is a diagrammatic illustration of the placement of tracking sensors on the ramp and taxiways of an airport for tracking the movement of the commercial transports such as transports **10***a* and **10***b* as they come into the gate area **350**. The sensors S1–S32, are strategically place to track the transport as it proceeds along the runway, the taxiway and the ramp. This is particularly useful for aircraft which do not have GPS signal generating sensors, making it possible to track and identify the transport at any time. Various sensing devices can be utilized in this configuration such as acoustic sensors, acoustic return "sonar", optical, optical return, microwave, microwave return, contact or weight detection, electronic proximity (underground wire), or similar sensors. The sensor system detects the transport, and where return sensors are used, will also identify the distance. By using sequential sensors, the speed and direction of travel may also be calculated. This type of sensor system will also detect the presence of other assets or personnel in the area.

FIG. **16** is an expanded illustration demonstrating the calculation and signaling of appropriate personnel and equipment to the site of an event requiring emergency response. By way of example, assume the tracking camera **210***a* and **210***b* provided a visual signal indicating smoke at transport **10**. At the same time, the on-board fire and smoke detectors would transmit a signal to the ground based transceiver **212** via the wireless LAN. In addition, the precise location of the transport will be known because of the location signal generated by the transport GPS sensor **200** which is also transmitted over the LAN. The receipt of these various signal will activate several actions. First, all of this information will be transmitted to the ground control tower **216** and to the operations control center **220**, as has been previously described herein. The airport fire station **226** will be alerted to the indication of a fire and smoke event and the security center **222** and maintenance center **224** will receive appropriate information. The automated dispatch computer center **225** will monitor the location signal provided by the transport, as well as the location signal of on ground personnel **218***a*–**218***c*, response vehicles **208***a*–**208***c* and fire support vehicles **352***a*–*c*. By monitoring the type of event that has occurred and both the type and location of available personnel and equipment, the dispatch center can alert and initiate the most efficient appropriate response. The location signals provide sufficient information for the computer system **225** to determine by well-known methods, which asset is closest. For example, ground personnel **218***b* is closest and would receive the first response signal. If a response vehicle was programmed to respond, vehicle **208***a* would be first alerted. Likewise, the closest fire truck is truck **352***c*, which would be the first alerted. As back-up is needed, each of the ground support assets have the capability of signaling for additional support directly back to the dispatch computer. The computer can then select the next closest appropriate asset. The system of the present invention provides a comprehensive, efficient method of collecting, distributing and reacting to critical information to maximize the response of appropriate functional vehicles and personnel on a real time basis while assuring that assignments are prioritized as set by operational personnel. This greatly increases both the timing and the effectiveness of response to critical events.

The multi-media security and surveillance system of the subject invention provides an enhanced security scheme giving instantaneous and live image access to critical components and areas of an aircraft or vehicle, providing the ground based security personnel with additional information while the aircraft or vehicle is not in use and is left unattended. In addition, the permanent tape record will prove invaluable for investigating unauthorized activity or accidents after they have occurred. The preferred embodiment of the system is specifically designed for new commercial aircraft but is equally well suited for retrofit applications and for other safety applications as well, and may be scaled up or scaled down depending on application.

The video recorders, synchronizing networks and multiplexing and split screen hardware are well known and their adaptation will be readily apparent to those of ordinary skill in the art. Any suitable video recording format can be used, for example, an analog video tape recorder, a digitizer and tape, hard drive or optical drive configuration. Digital cameras could be incorporated in lieu of the standard analog type cameras currently in use in most applications. As digital technology becomes more readily available and more cost effective, it is contemplated that most of the imaging, monitoring and-recording equipment will be of a digital format because of the increased reliability and the minimized space requirements. Of course, it should also be understood that the monitoring, transmitting and storage capabilities of the invention are also well suited for capturing any video or visual image generated by the on board avionics of the aircraft.

While certain features and embodiments of the invention have been described in detail herein, it will be readily understood that the invention encompasses all modifications and enhancements within the scope and spirit of the following claims.

What is claimed is:

1. A traffic management, security and surveillance system for ground or in port monitoring and tracking of a commercial transport and related assets, the system comprising:

a. a plurality of ground based sensors, each adapted for monitoring the presence of a commercial transport and/or an asset within the range of each of said sensors and for generating a unique and identifiable data signal representing the specific type of transport and/or asset and the location thereof;

b. a ground based monitoring station having automatic processing capability adapted for generating decisions based on commercial transport and asset location data; and

c. a communication system for transmitting all of the unique location data signals from the ground based sensors to the ground based monitoring station for monitoring the location of the assets and the commercial transport.

2. The system of claim **1**, further including at least one commercial transport based sensor adapted for identifying the commercial transport and for transmitting a transport identification signal to the ground based monitoring station.

3. The system of claim **2**, further including a commercial based location sensor adapted for monitoring the location of the commercial transport and generating a transport location signal in response thereto and transmitting the transport location signal to the ground based monitoring station.

4. The system of claim **1**, wherein each asset includes an asset based sensor adapted for identifying the asset and for transmitting an asset identification signal to the ground based monitoring station.

5. The system of claim **4**, further including an asset based location sensor adapted for monitoring the location of the asset and generating an asset location signal in response thereto and transmitting the asset location signal to the ground based monitoring station.

6. The system of claim **1**, further including means for transmitting location data for all assets and transports from the ground based monitoring station to the commercial transport.

7. The system of claim **1**, further including means for transmitting location data for all assets and transports from the ground based monitoring station to each of the assets.

8. The system of claim **1**, wherein the ground based monitoring station further includes a map generator for generating a map defining the presence and location of all transports and assets within the system.

9. The system of claim **3**, wherein said location sensor is an on-board GPS signal generator.

10. The system of claim **5**, wherein said location sensor is an on-board GPS signal generator.

11. The system of claim **1**, wherein each ground based sensor further includes an integral power supply.

12. The system of claim **11**, wherein each ground based sensor includes a wireless transmitter for transmitting the signal generated thereby to the ground based monitoring station.

13. The system of claim **12**, further including a wireless transmission network for transmitting signals between the sensors and between the sensors and the ground based monitoring station.

14. The system of claim **1**, wherein at least one of the ground based sensors is hardwired to the ground based monitoring station.

15. The system of claim **13**, wherein there is further including a wireless transmission module associated with a plurality of ground based sensors and wherein said plurality of ground based sensors are hardwired to the wireless transmission module.

16. The system of claim **1**, wherein the communication system further comprises:

a. a transmitter associated with the sensor; and

b. a receiver associated with the monitoring station for wireless transmission of the data signals to the ground based monitoring station.

17. The system of claim **1**, wherein the communication system further comprises a wireless network for transmitting the data signals to/from the sensor and the ground based monitoring station.

18. The system of claim **1**, further including:

a. a collector adapted for collecting the plurality of data signals from the plurality of sensors and generating therefrom a combined signal incorporating each of the plurality of signals into a combined output signal; and

b. a processing system for receiving and processing the combined output signal.

19. The system of claim **18**, said collector and said processing system further including a self-contained power supply.

20. The system of claim **9**, wherein said GPS sensor includes two component sensors, with on component sensor mounted at each end of the transport, whereby size and heading of the transport may be detected and monitored.

21. The system of claim **1**, further including an archiving system for storing the data received by the ground based monitoring station.

22. The system of claim **21**, wherein said archiving system is a recorder.

23. The system of claim **1**, wherein each sensor further includes a transmitter adapted for wireless transmission of the data signal to a remote location, and wherein said aground based monitoring station includes a receiver, whereby the sensor signal may be transmitted to the ground based monitoring station.

24. The system of claim **23**, wherein said wireless transmission system is a radio frequency transmitter/receiver.

25. The system of claim **1**, wherein said commercial transport includes a unique identifier which is adapted to be

sensed by the ground based sensor, whereby the ground based sensor can generate an identification signal for specifically identifying the commercial transport within the range of the ground based sensor.

26. The system of claim **1**, further including an alarm generator for generating an alarm whenever an asset or a transport is in an unauthorized zone.

27. The system of claim **1**, further including an alarm generator for generating an alarm whenever an unauthorized asset is in a zone.

28. The system of claim **26**, wherein said alarm is transmitted directly to the commercial transport.

29. The system of claim **1**, further including a portable personnel based unit including a location signal generator for identifying the location of the personnel and a communication system capable of transmitting and receiving information to/from the ground based monitoring station.

* * * * *

US005081667A

United States Patent [19]

Drori et al.

[11] **Patent Number: 5,081,667**

[45] **Date of Patent: Jan. 14, 1992**

[54] **SYSTEM FOR INTEGRATING A CELLULAR TELEPHONE WITH A VEHICLE SECURITY SYSTEM**

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[73] Assignee: **Clifford Electronics, Inc.**, Chatsworth, Calif.

[21] Appl. No.: **497,107**

[22] Filed: **Mar. 20, 1990**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 345,654, May 1, 1989, abandoned.

[51] **Int. Cl.**[5] **H04M 11/00**

[52] **U.S. Cl.** ..... **379/59**; 379/44; 340/426; 340/539; 340/993; 290/38 C

[58] **Field of Search** ..... 290/38 C; 340/441, 425.5, 340/426, 531, 539, 825.31, 993; 379/57-60, 63, 39, 41, 44; 455/33, 54

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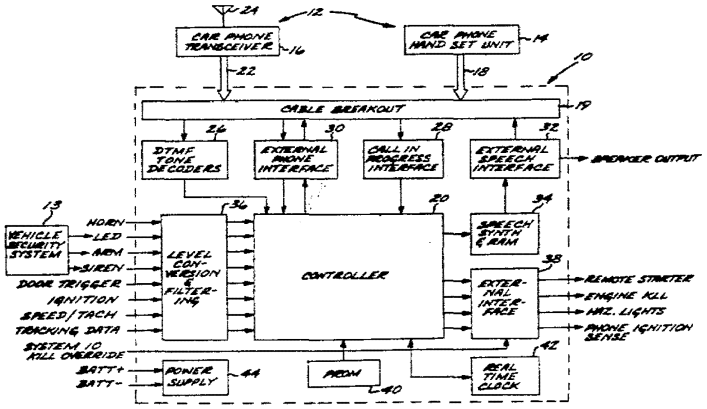
Primary Examiner—James L. Dwyer
Assistant Examiner—Dwayne D. Bost
Attorney, Agent, or Firm—Roberts and Quiogue

[57] **ABSTRACT**

An interfacing system for integrating a wide variety of cellular communication systems with most vehicle security systems. The system includes a controller and an interfacing arrangement for matching the cellular telephone to the controller. The interfacing arrangement includes a library, stored in memory, having a plurality of unique translation tables corresponding to the protocols of a plurality of unique cellular communication systems. The interfacing arrangement further includes an initializing capability for selecting an operating protocol for the interfacing system from the library which is compatible with the protocol of the cellular communication system. Hardware and software are included for interfacing the vehicle security to the controller and for interfacing the controller to the vehicle. In a specific embodiment, the selection of cellular telephone type or make is made from the keypad of the cellular telephone.

92 Claims, 46 Drawing Sheets



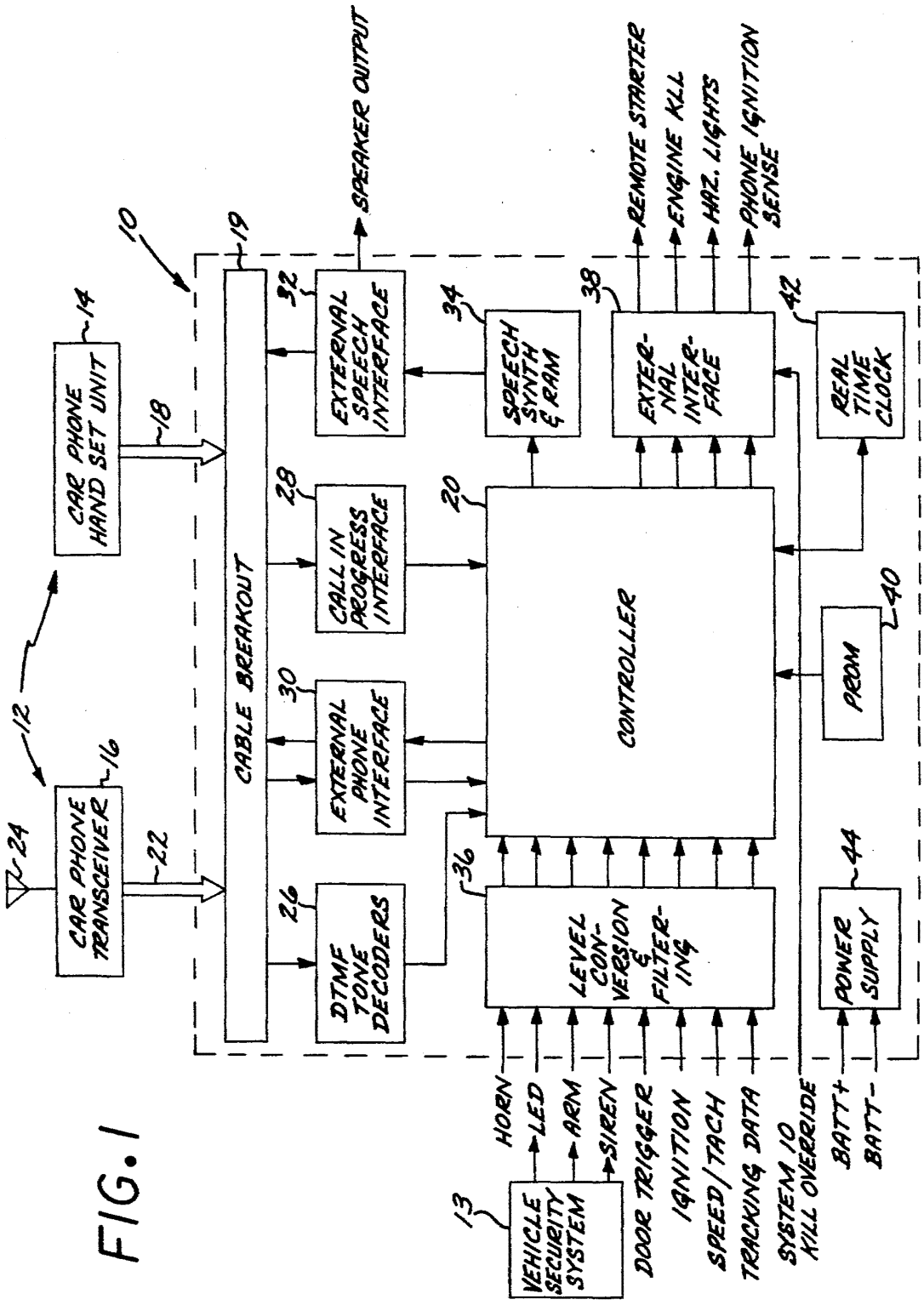

10
12
13
14
16
18
19
20
22
24
26
28
30
32
34
36
38
40
42
44
CAR PHONE HAND SET UNIT
CAR PHONE TRANSCEIVER
CABLE BREAKOUT
EXTERNAL SPEECH INTERFACE
SPEECH SYNTH & RAM
EXTER-NAL INTER-FACE
REAL TIME CLOCK
CALL IN PROGRESS INTERFACE
EXTERNAL PHONE INTERFACE
CONTROLLER
PROM
DTMF TONE DECODERS
LEVEL CON-VERSION & FILTER-ING
POWER SUPPLY
VEHICLE SECURITY SYSTEM
SPEAKER OUTPUT
REMOTE STARTER
ENGINE KILL
HAZ. LIGHTS
PHONE IGNITION SENSE
HORN
LED
ARM
SIREN
DOOR TRIGGER
IGNITION
SPEED/TACH
TRACKING DATA
SYSTEM IO KILL OVERRIDE
BATT+
BATT-

FIG. 1

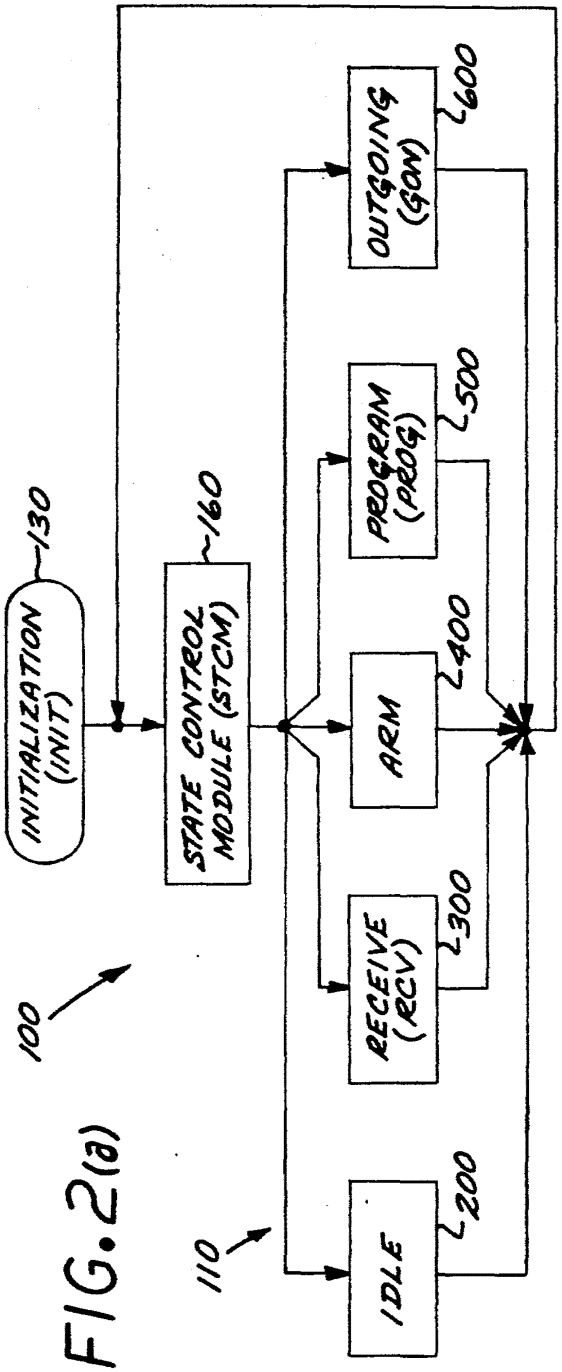

INITIALIZATION (INIT)
130
STATE CONTROL MODULE (STCM)
160
OUTGOING (GON)
600
PROGRAM (PROG)
500
ARM
400
RECEIVE (RCV)
300
IDLE
200
100
110

FIG. 2(a)

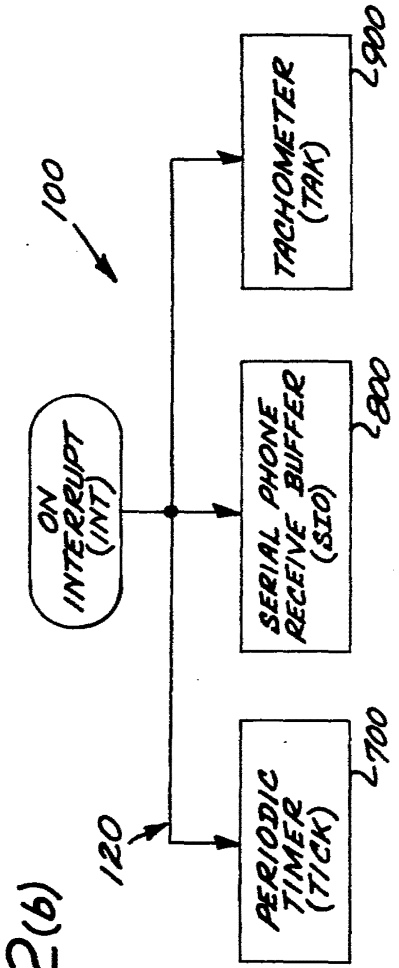

ON INTERRUPT (INT)
TACHOMETER (TAK)
900
SERIAL PHONE RECEIVE BUFFER (SIO)
800
PERIODIC TIMER (TICK)
700
100
120

FIG. 2(b)

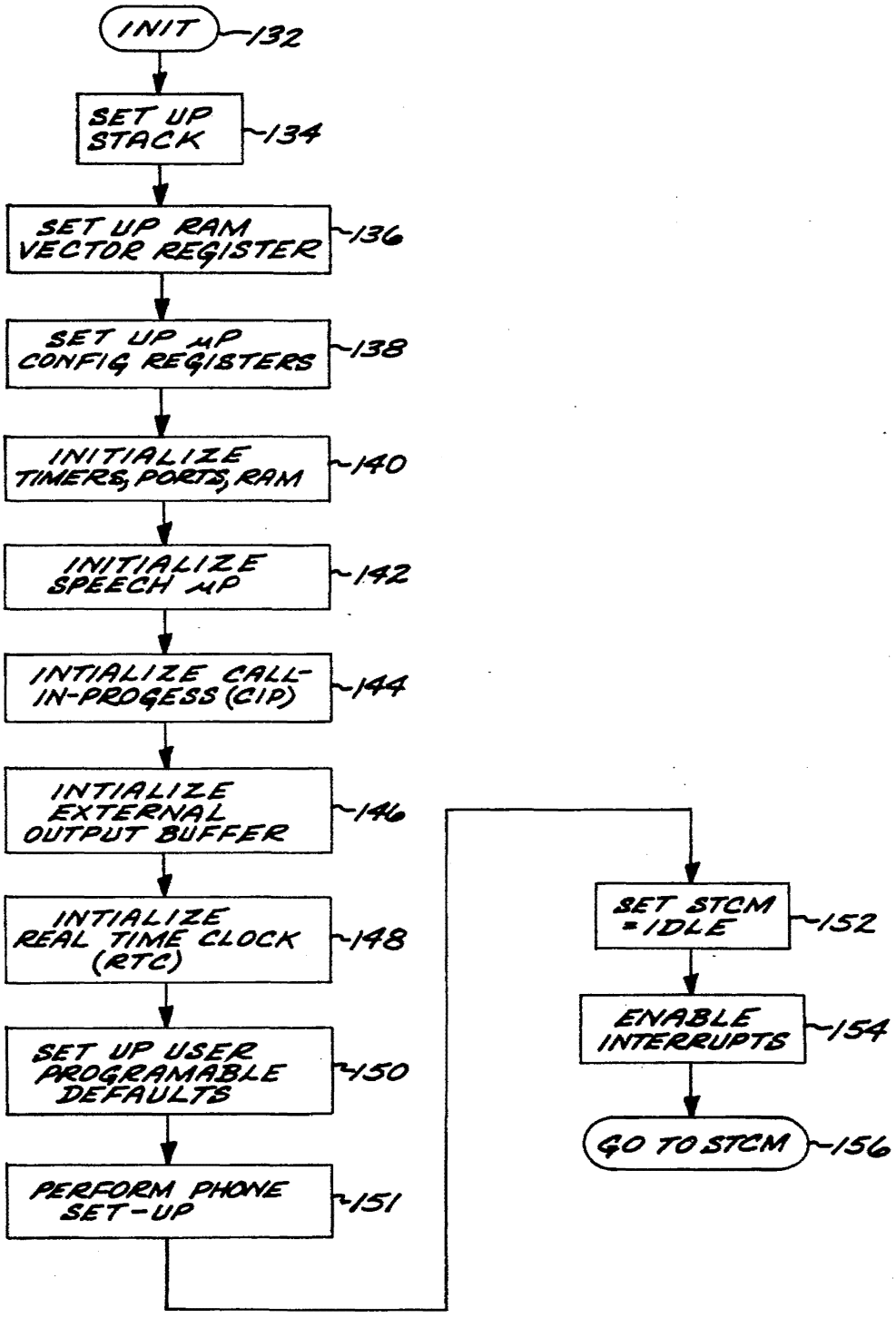

INIT
132
SET UP STACK
134
SET UP RAM VECTOR REGISTER
136
SET UP μP CONFIG REGISTERS
138
INITIALIZE TIMERS, PORTS, RAM
140
INITIALIZE SPEECH μP
142
INTIALIZE CALL-IN-PROGESS (CIP)
144
INTIALIZE EXTERNAL OUTPUT BUFFER
146
INTIALIZE REAL TIME CLOCK (RTC)
148
SET UP USER PROGRAMABLE DEFAULTS
150
PERFORM PHONE SET-UP
151
SET STCM = IDLE
152
ENABLE INTERRUPTS
154
GO TO STCM
156

FIG. 3(a)

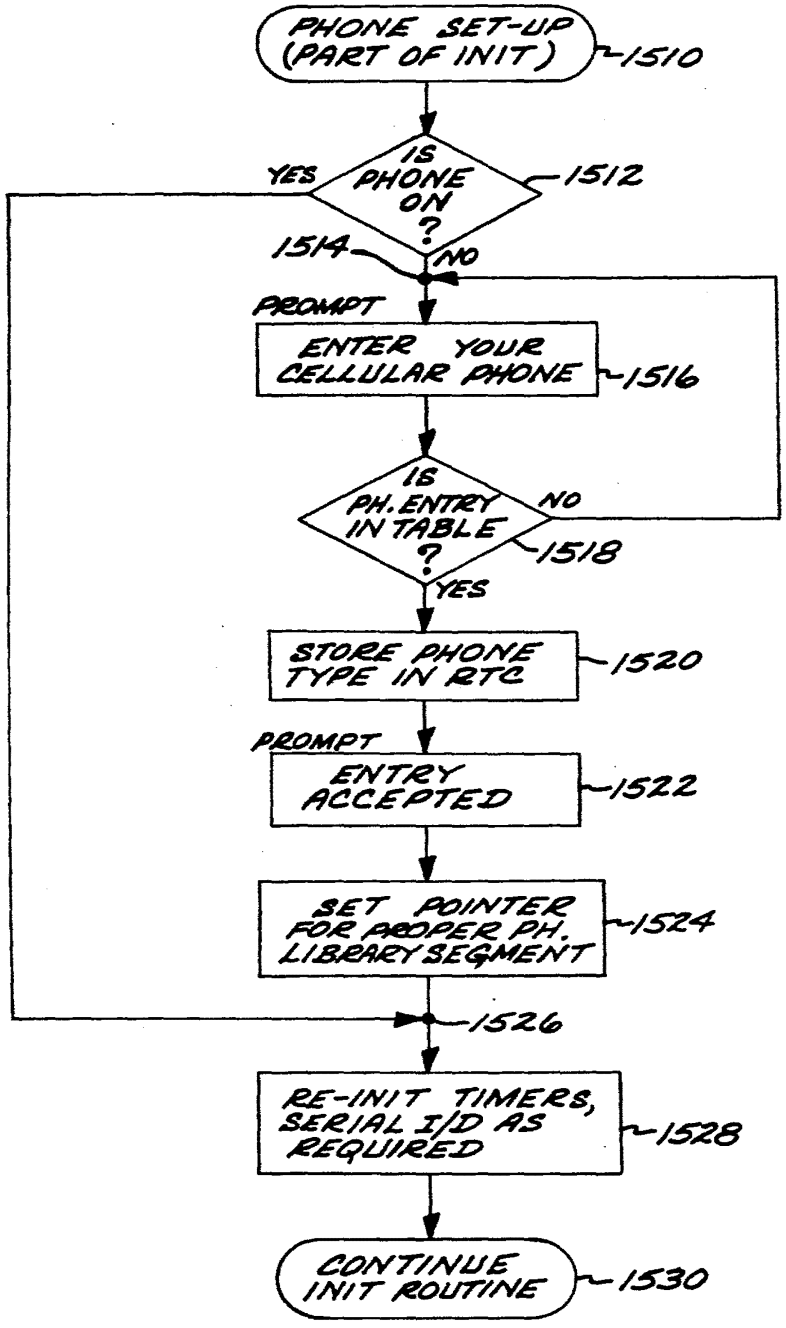

PHONE SET-UP (PART OF INIT)
1510
IS PHONE ON ?
1512
YES
NO
1514
PROMPT
ENTER YOUR CELLULAR PHONE
1516
IS PH. ENTRY IN TABLE ?
1518
NO
YES
STORE PHONE TYPE IN RTC
1520
PROMPT
ENTRY ACCEPTED
1522
SET POINTER FOR PROPER PH. LIBRARY SEGMENT
1524
1526
RE-INIT TIMERS, SERIAL I/D AS REQUIRED
1528
CONTINUE INIT ROUTINE
1530

FIG. 3(b)

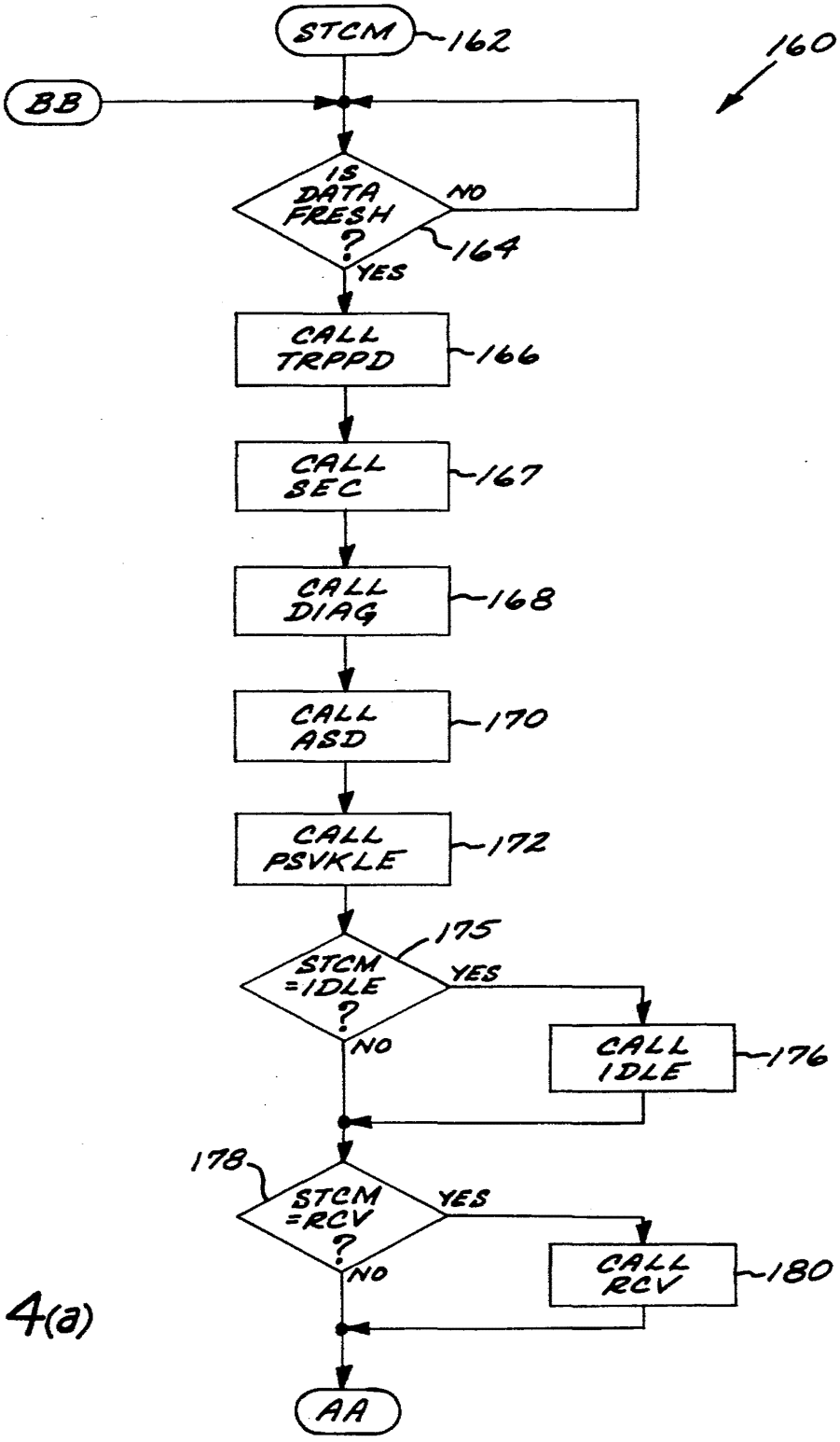

STCM
162
160
BB
IS DATA FRESH ?
NO
164
YES
CALL TRPPD
166
CALL SEC
167
CALL DIAG
168
CALL ASD
170
CALL PSVKLE
172
175
STCM =IDLE ?
YES
NO
CALL IDLE
176
178
STCM =RCV ?
YES
NO
CALL RCV
180
AA

FIG. 4(a)

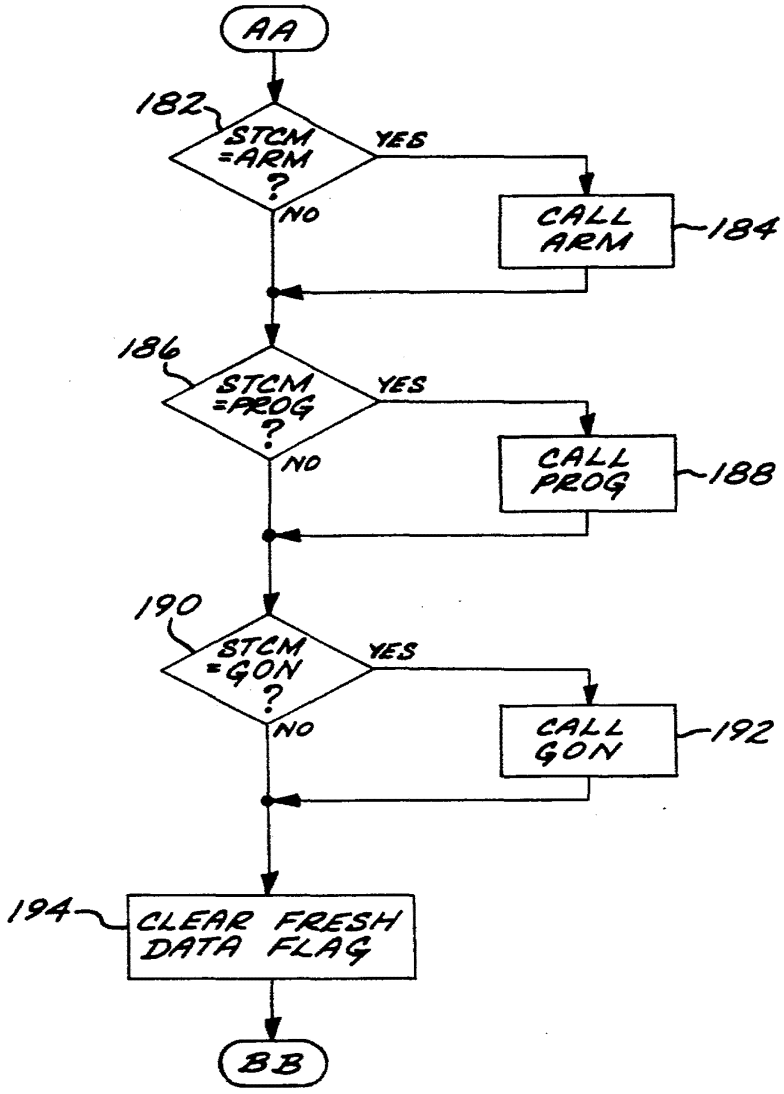

AA
182
STCM =ARM ?
YES
NO
CALL ARM
184
186
STCM =PROG ?
YES
NO
CALL PROG
188
190
STCM =GON ?
YES
NO
CALL GON
192
194
CLEAR FRESH DATA FLAG
BB

FIG. 4(b)

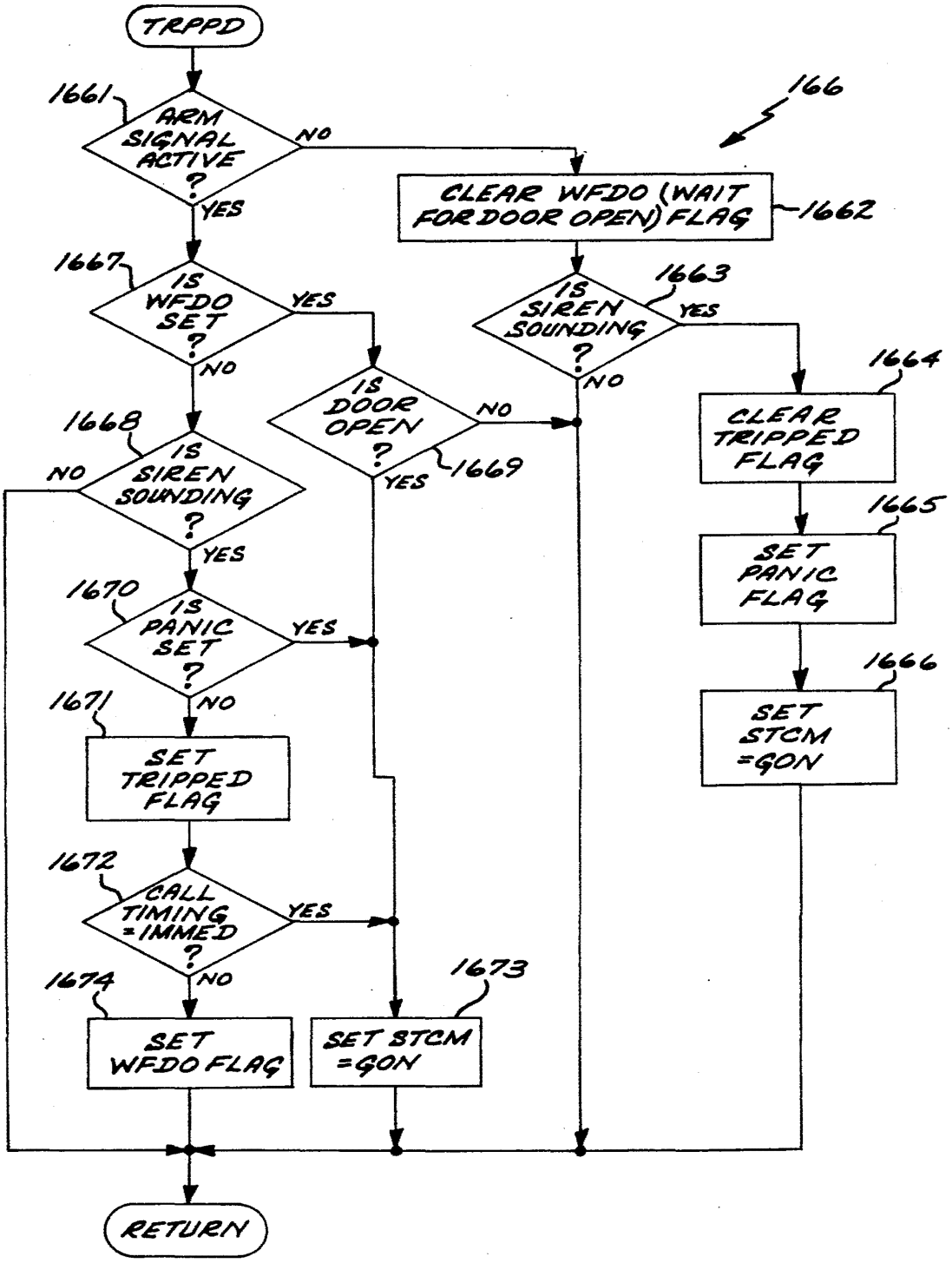

TRPPD
1661
ARM SIGNAL ACTIVE ?
NO
YES
166
CLEAR WFDO (WAIT FOR DOOR OPEN) FLAG
1662
1667
IS WFDO SET ?
YES
NO
1663
IS SIREN SOUNDING ?
YES
NO
1664
CLEAR TRIPPED FLAG
IS DOOR OPEN ?
NO
1669
YES
1668
IS SIREN SOUNDING ?
NO
YES
1665
SET PANIC FLAG
1670
IS PANIC SET ?
YES
NO
1666
SET STCM =GON
1671
SET TRIPPED FLAG
1672
CALL TIMING =IMMED ?
YES
NO
1673
1674
SET WFDO FLAG
SET STCM =GON
RETURN

FIG. 4(c)

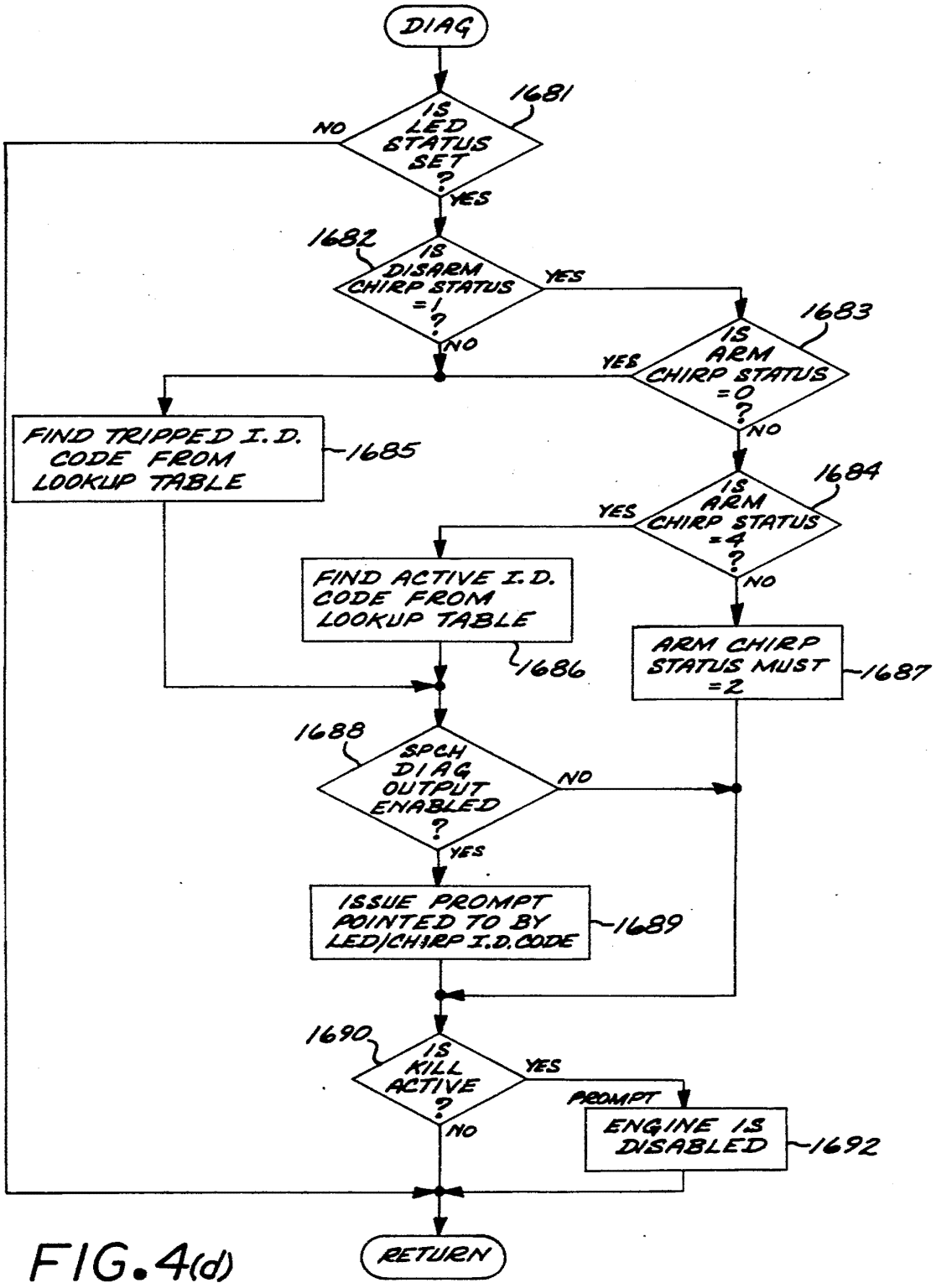

DIAG
1681
IS LED STATUS SET ?
NO
YES
1682
IS DISARM CHIRP STATUS =1 ?
YES
NO
1683
IS ARM CHIRP STATUS =0 ?
YES
NO
FIND TRIPPED I.D. CODE FROM LOOKUP TABLE
1685
1684
IS ARM CHIRP STATUS =4 ?
YES
NO
FIND ACTIVE I.D. CODE FROM LOOKUP TABLE
1686
ARM CHIRP STATUS MUST =2
1687
1688
SPCH DIAG OUTPUT ENABLED ?
NO
YES
ISSUE PROMPT POINTED TO BY LED/CHIRP I.D. CODE
1689
1690
IS KILL ACTIVE ?
YES
NO
PROMPT
ENGINE IS DISABLED
1692
RETURN

FIG. 4(d)

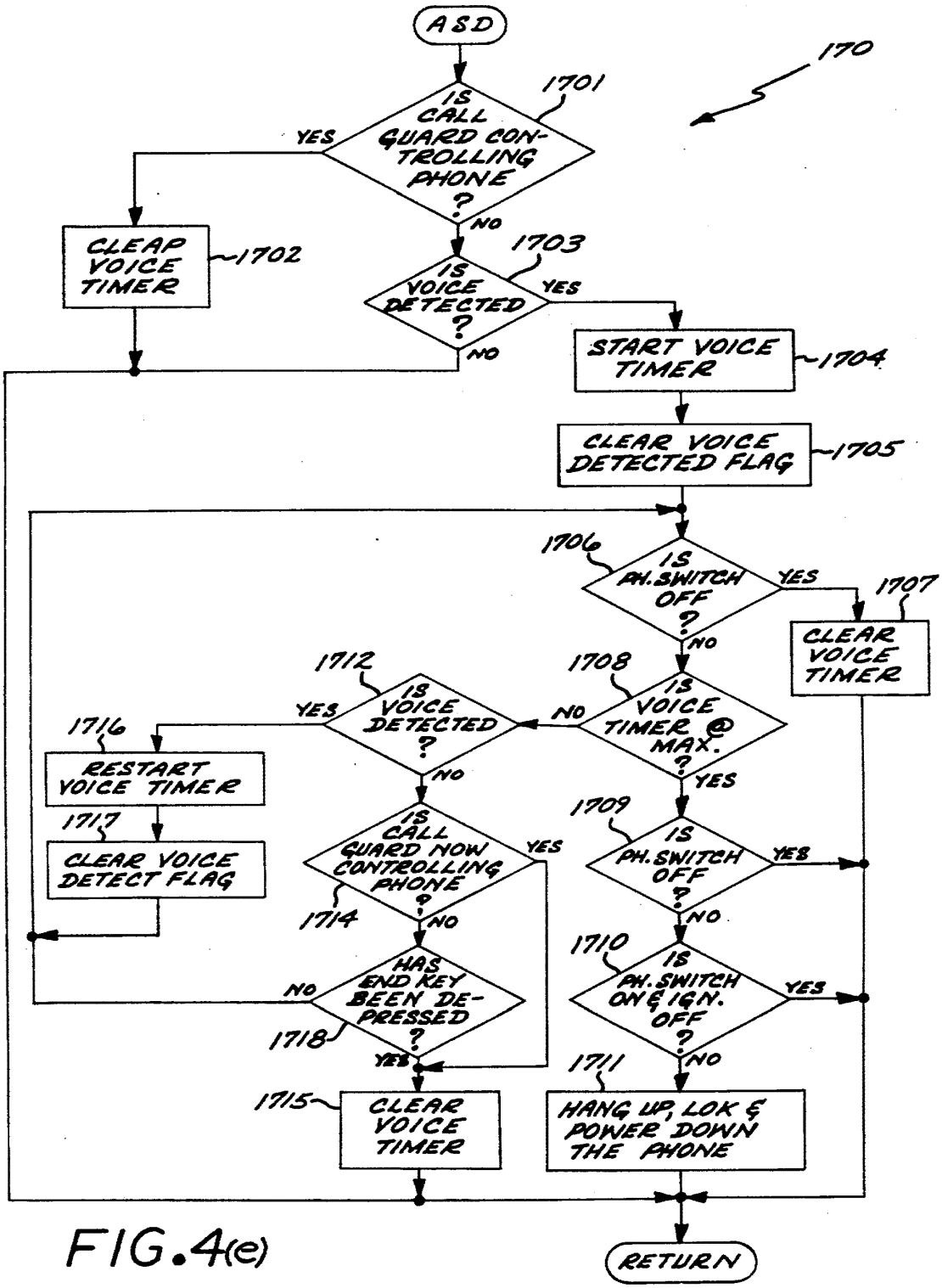

ASD
170
1701
IS CALL GUARD CONTROLLING PHONE ?
YES
NO
CLEAR VOICE TIMER
1702
1703
IS VOICE DETECTED ?
YES
NO
START VOICE TIMER
1704
CLEAR VOICE DETECTED FLAG
1705
1706
IS PH. SWITCH OFF ?
YES
NO
1707
CLEAR VOICE TIMER
1712
IS VOICE DETECTED ?
YES
NO
1708
IS VOICE TIMER @ MAX. ?
NO
YES
1716
RESTART VOICE TIMER
1717
CLEAR VOICE DETECT FLAG
IS CALL GUARD NOW CONTROLLING PHONE ?
YES
1714
NO
1709
IS PH. SWITCH OFF ?
YES
NO
HAS END KEY BEEN DE-PRESSED ?
NO
1718
YES
1710
IS PH. SWITCH ON & IGN. OFF ?
YES
NO
1715
CLEAR VOICE TIMER
1711
HANG UP, LOK & POWER DOWN THE PHONE
RETURN

FIG. 4(e)

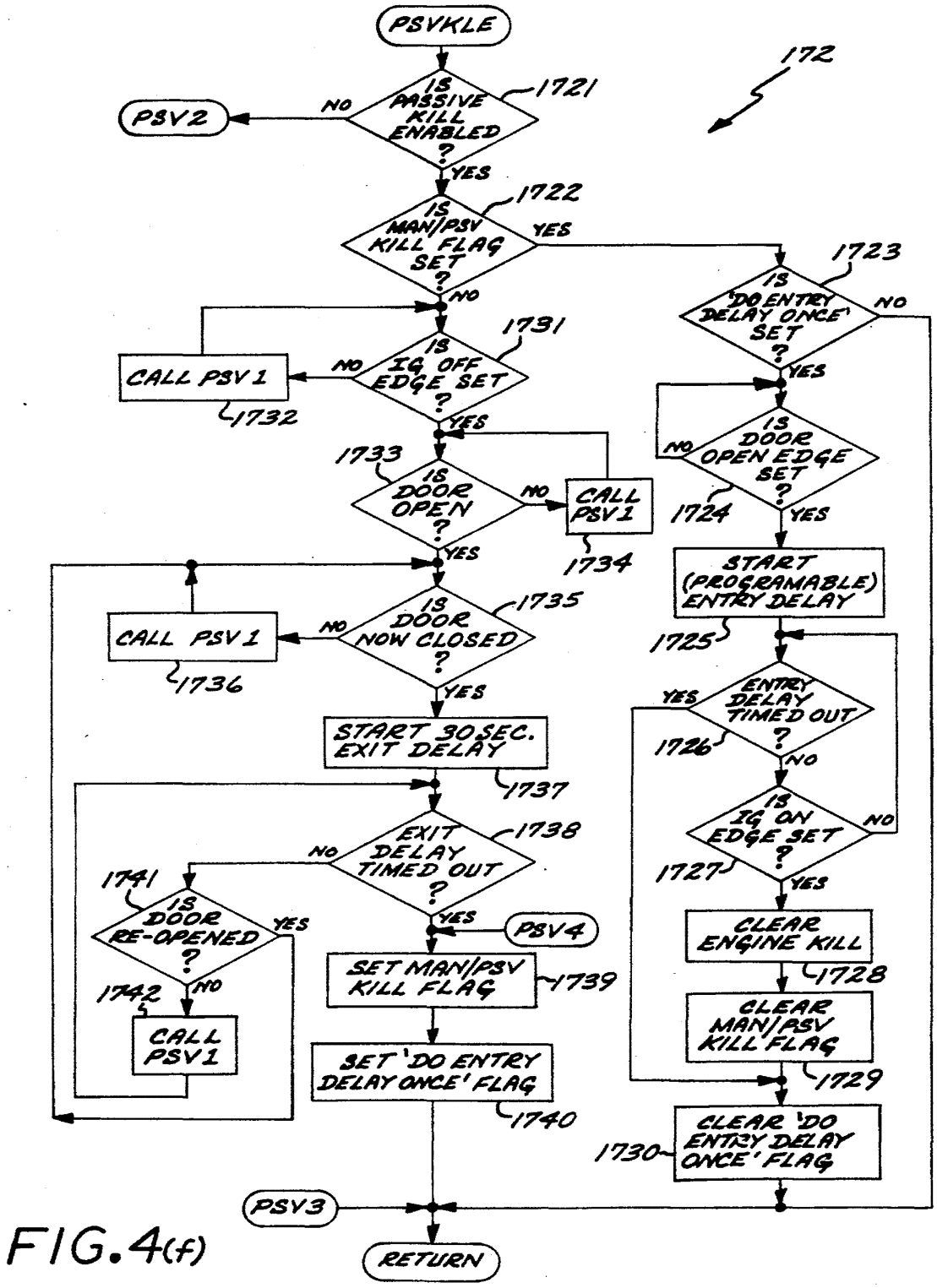

PSVKLE
172
IS PASSIVE KILL ENABLED ?
1721
NO
PSV2
YES
IS MAN/PSV KILL FLAG SET ?
1722
YES
NO
IS 'DO ENTRY DELAY ONCE' SET ?
1723
NO
YES
IS IG OFF EDGE SET ?
1731
NO
CALL PSV 1
1732
YES
IS DOOR OPEN EDGE SET ?
NO
1724
YES
1733
IS DOOR OPEN ?
NO
CALL PSV1
1734
YES
START (PROGRAMABLE) ENTRY DELAY
1725
IS DOOR NOW CLOSED ?
1735
NO
CALL PSV 1
1736
YES
ENTRY DELAY TIMED OUT ?
YES
1726
NO
START 30 SEC. EXIT DELAY
1737
IS IG ON EDGE SET ?
NO
1727
YES
EXIT DELAY TIMED OUT ?
1738
NO
YES
PSV4
CLEAR ENGINE KILL
1728
1741
IS DOOR RE-OPENED ?
YES
NO
1742
CALL PSV1
SET MAN/PSV KILL FLAG
1739
CLEAR MAN/PSV KILL FLAG
1729
SET 'DO ENTRY DELAY ONCE' FLAG
1740
CLEAR 'DO ENTRY DELAY ONCE' FLAG
1730
PSV3
RETURN

FIG. 4(f)

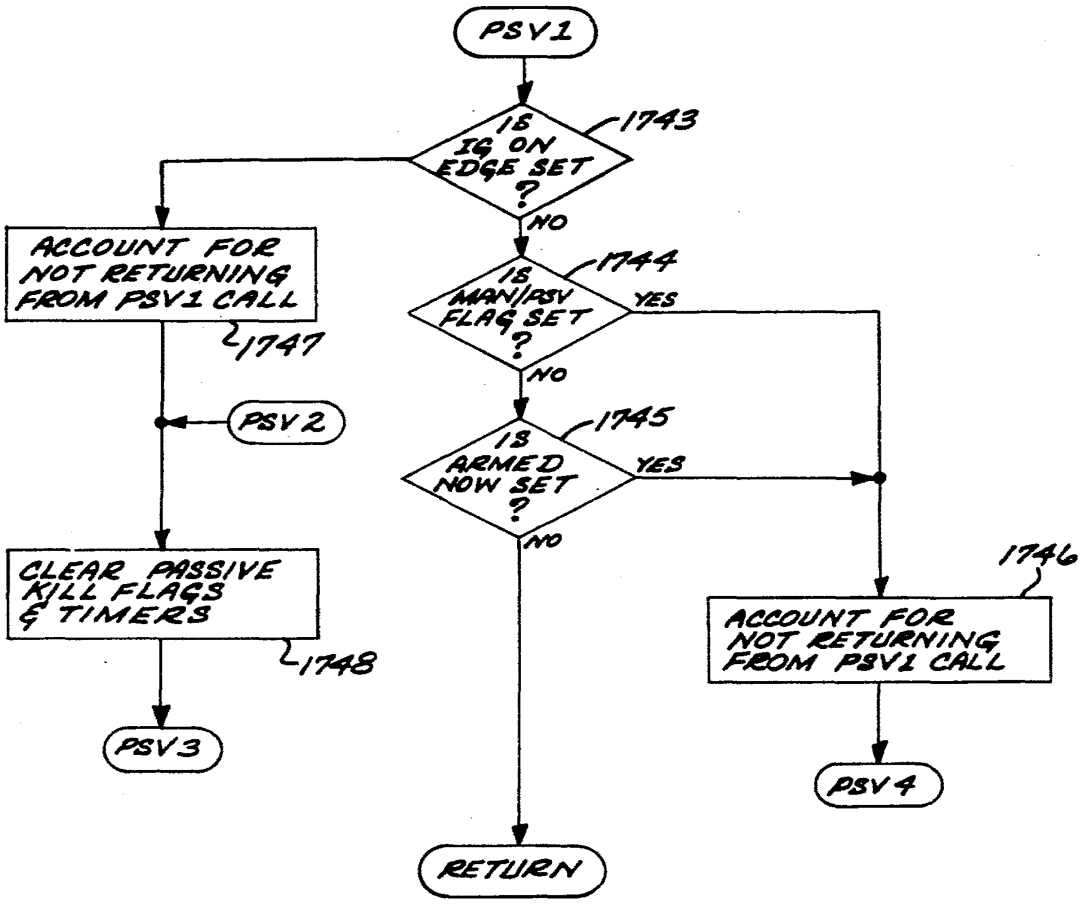

PSV1
IS IG ON EDGE SET ?
1743
NO
IS MAN/PSV FLAG SET ?
1744
YES
NO
IS ARMED NOW SET ?
1745
YES
NO
ACCOUNT FOR NOT RETURNING FROM PSV1 CALL
1747
PSV2
CLEAR PASSIVE KILL FLAGS & TIMERS
1748
PSV3
ACCOUNT FOR NOT RETURNING FROM PSV1 CALL
1746
PSV4
RETURN

FIG. 4(G)

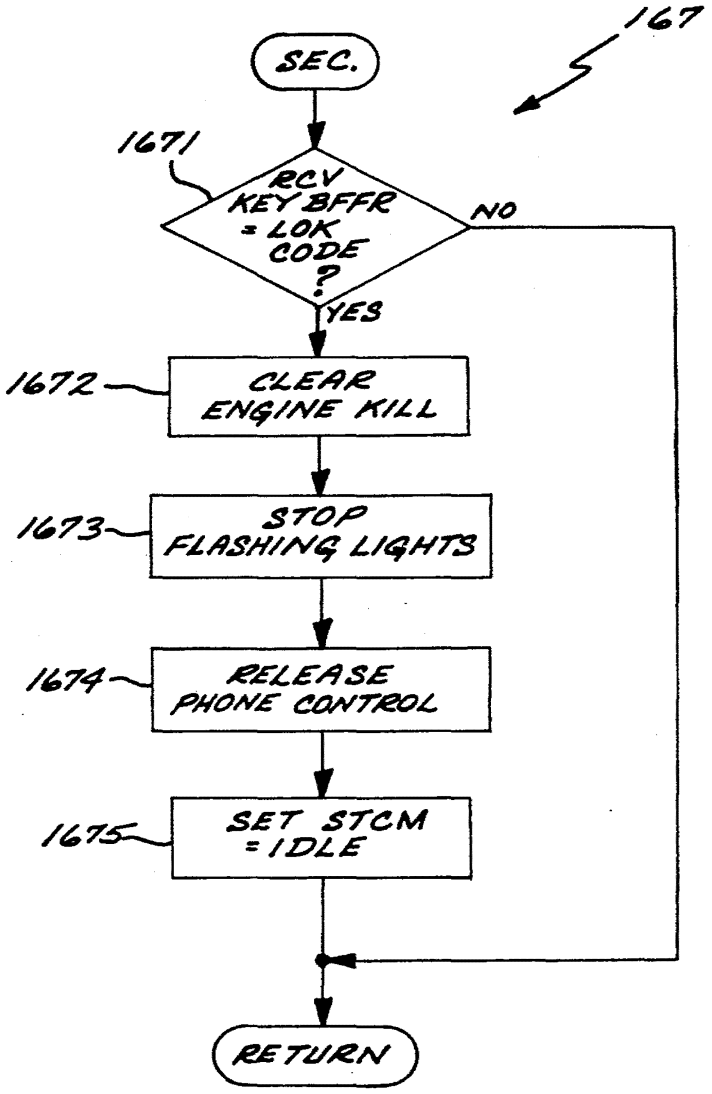

167
SEC.
1671
RCV KEY BFFR = LOK CODE ?
NO
YES
1672
CLEAR ENGINE KILL
1673
STOP FLASHING LIGHTS
1674
RELEASE PHONE CONTROL
1675
SET STCM = IDLE
RETURN

FIG. 4(h)

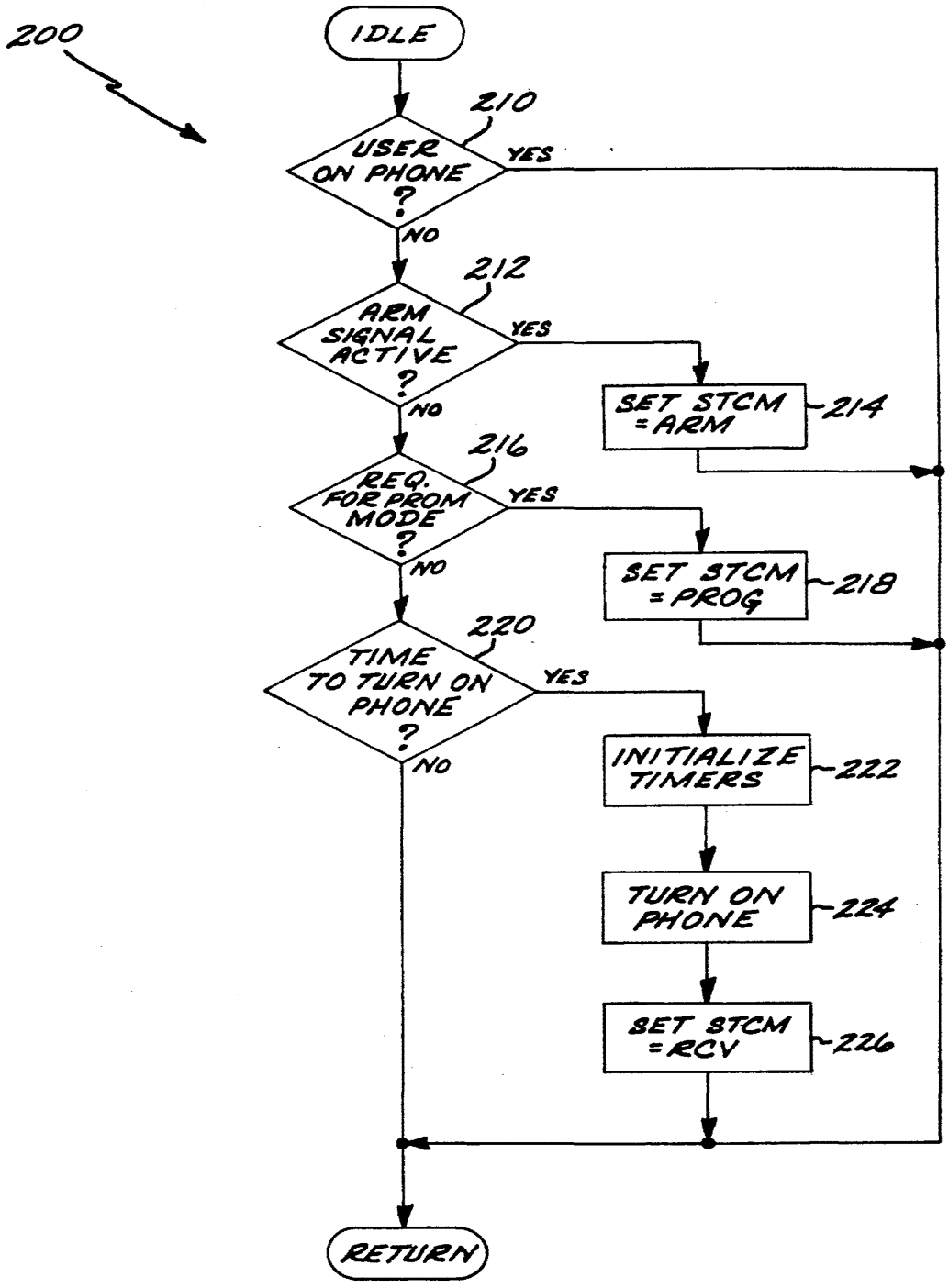

200
IDLE
210
USER ON PHONE ?
YES
NO
212
ARM SIGNAL ACTIVE ?
YES
NO
SET STCM = ARM
214
216
REQ. FOR PROM MODE ?
YES
NO
SET STCM = PROG
218
220
TIME TO TURN ON PHONE ?
YES
NO
INITIALIZE TIMERS
222
TURN ON PHONE
224
SET STCM = RCV
226
RETURN

FIG. 5

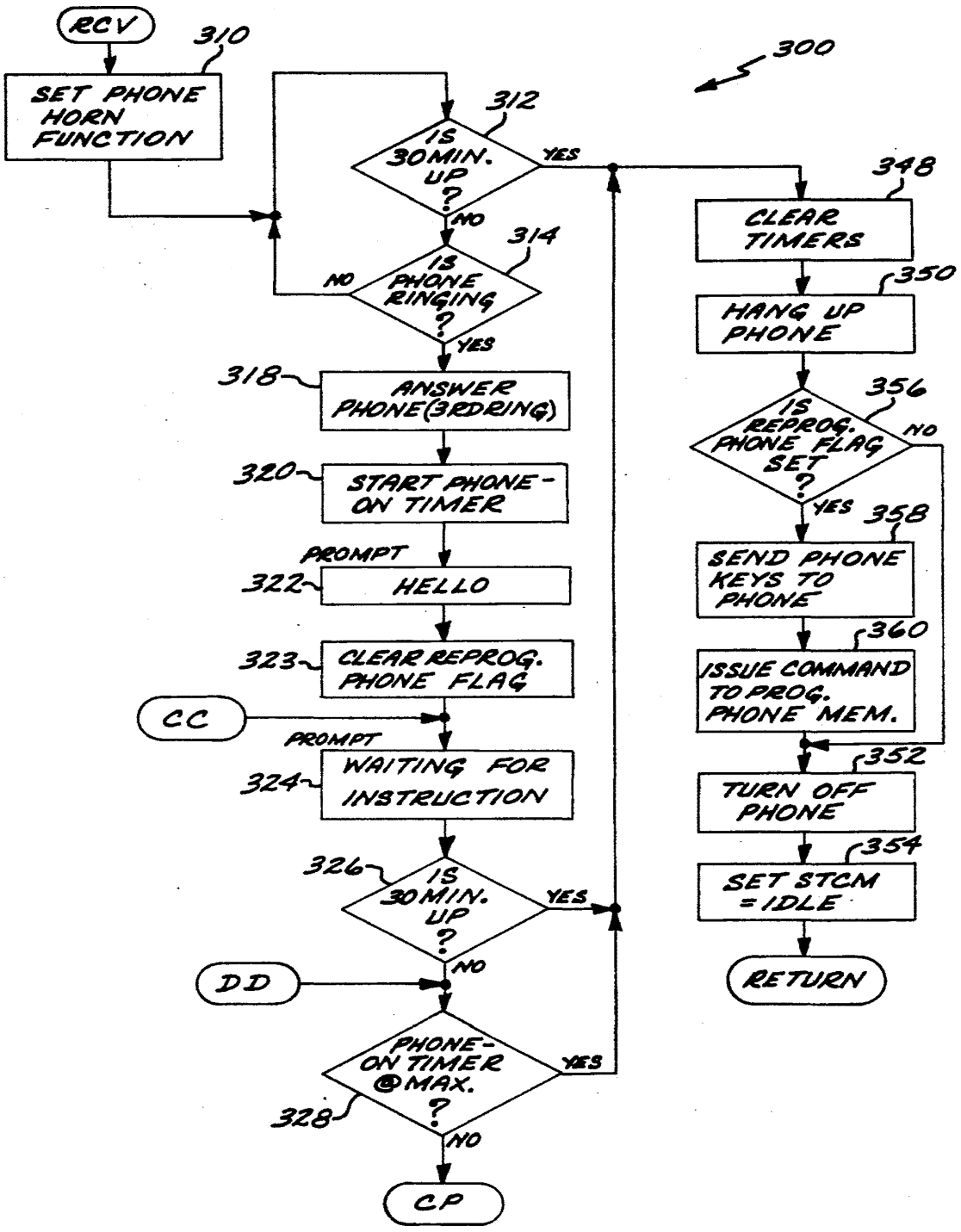
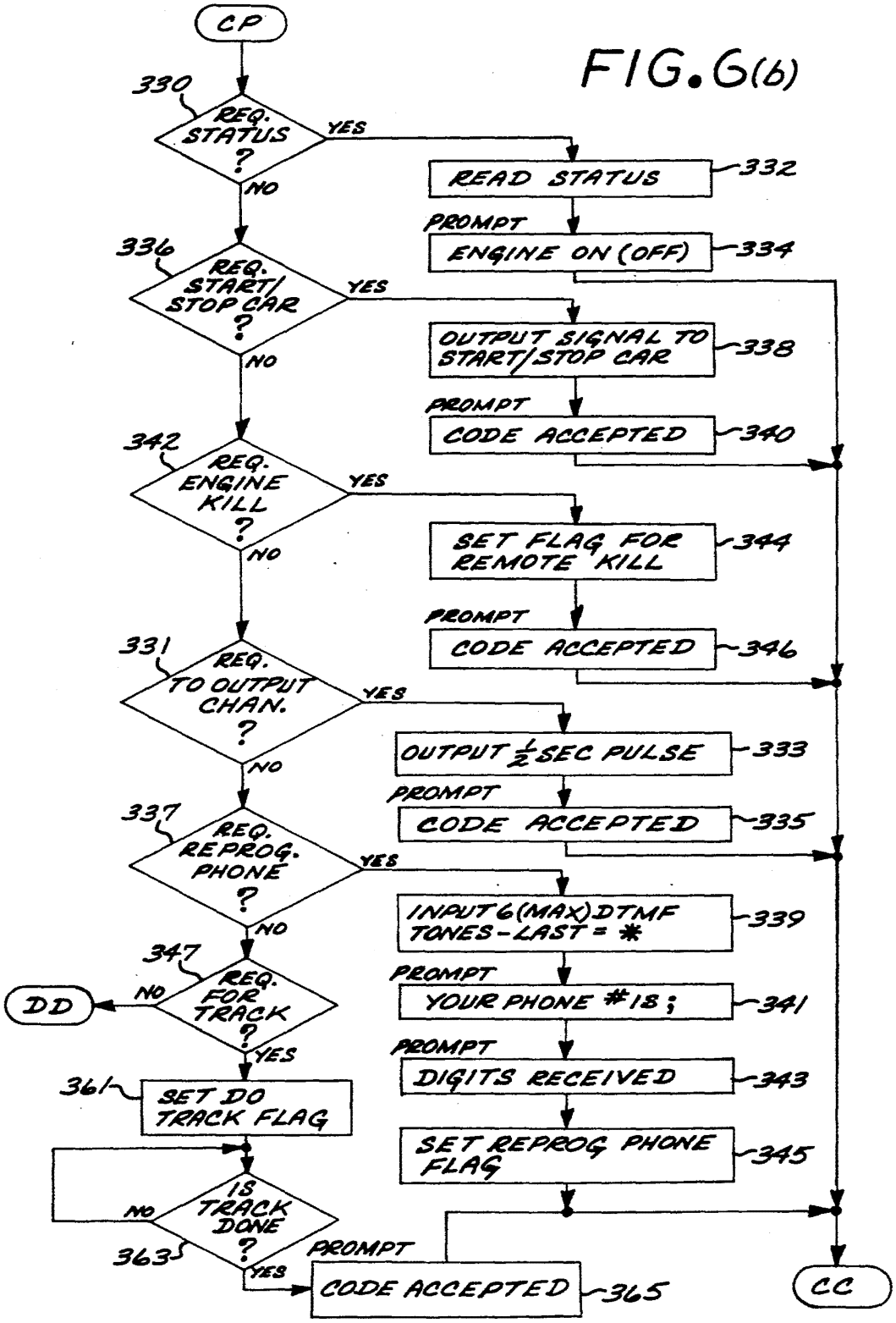

RCV
310
SET PHONE HORN FUNCTION
300
312
IS 30MIN. UP ?
YES
NO
314
IS PHONE RINGING ?
NO
YES
318
ANSWER PHONE(3RDRING)
320
START PHONE-ON TIMER
PROMPT
322
HELLO
323
CLEAR REPROG. PHONE FLAG
CC
PROMPT
324
WAITING FOR INSTRUCTION
326
IS 30MIN. UP ?
YES
NO
DD
PHONE-ON TIMER @MAX. ?
YES
328
NO
CP
348
CLEAR TIMERS
350
HANG UP PHONE
356
IS REPROG. PHONE FLAG SET ?
NO
YES
358
SEND PHONE KEYS TO PHONE
360
ISSUE COMMAND TO PROG. PHONE MEM.
352
TURN OFF PHONE
354
SET STCM = IDLE
RETURN

FIG. 6(a)

FIG. 6(6)


CP
330
REQ. STATUS ?
YES
NO
READ STATUS
332
PROMPT
ENGINE ON (OFF)
334
336
REQ. START/ STOP CAR ?
YES
NO
OUTPUT SIGNAL TO START/STOP CAR
338
PROMPT
CODE ACCEPTED
340
342
REQ. ENGINE KILL ?
YES
NO
SET FLAG FOR REMOTE KILL
344
PROMPT
CODE ACCEPTED
346
331
REQ. TO OUTPUT CHAN. ?
YES
NO
OUTPUT ½ SEC PULSE
333
PROMPT
CODE ACCEPTED
335
337
REQ. REPROG. PHONE ?
YES
NO
INPUT 6(MAX) DTMF TONES - LAST = *
339
PROMPT
YOUR PHONE # IS ;
341
PROMPT
DIGITS RECEIVED
343
SET REPROG PHONE FLAG
345
347
REQ. FOR TRACK ?
NO
YES
DD
361
SET DO TRACK FLAG
IS TRACK DONE ?
NO
YES
363
PROMPT
CODE ACCEPTED
365
CC

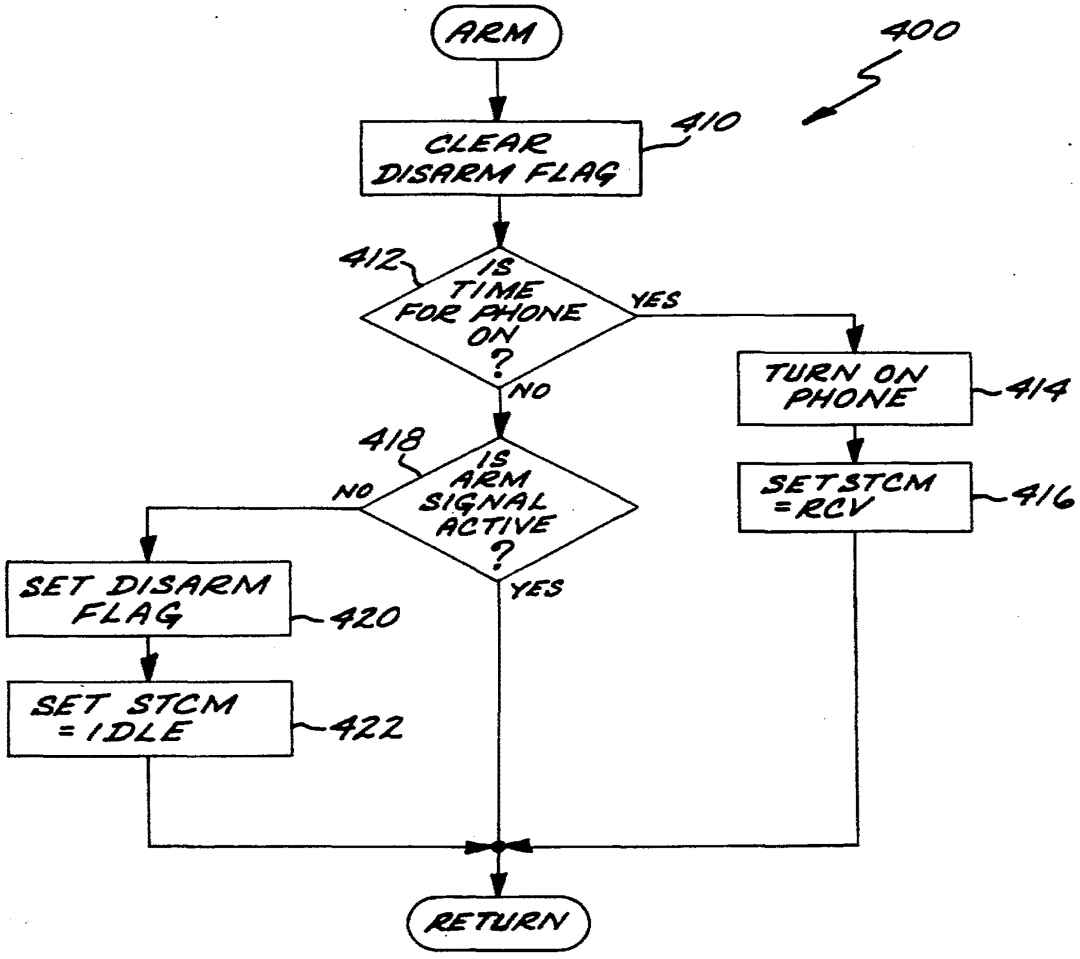
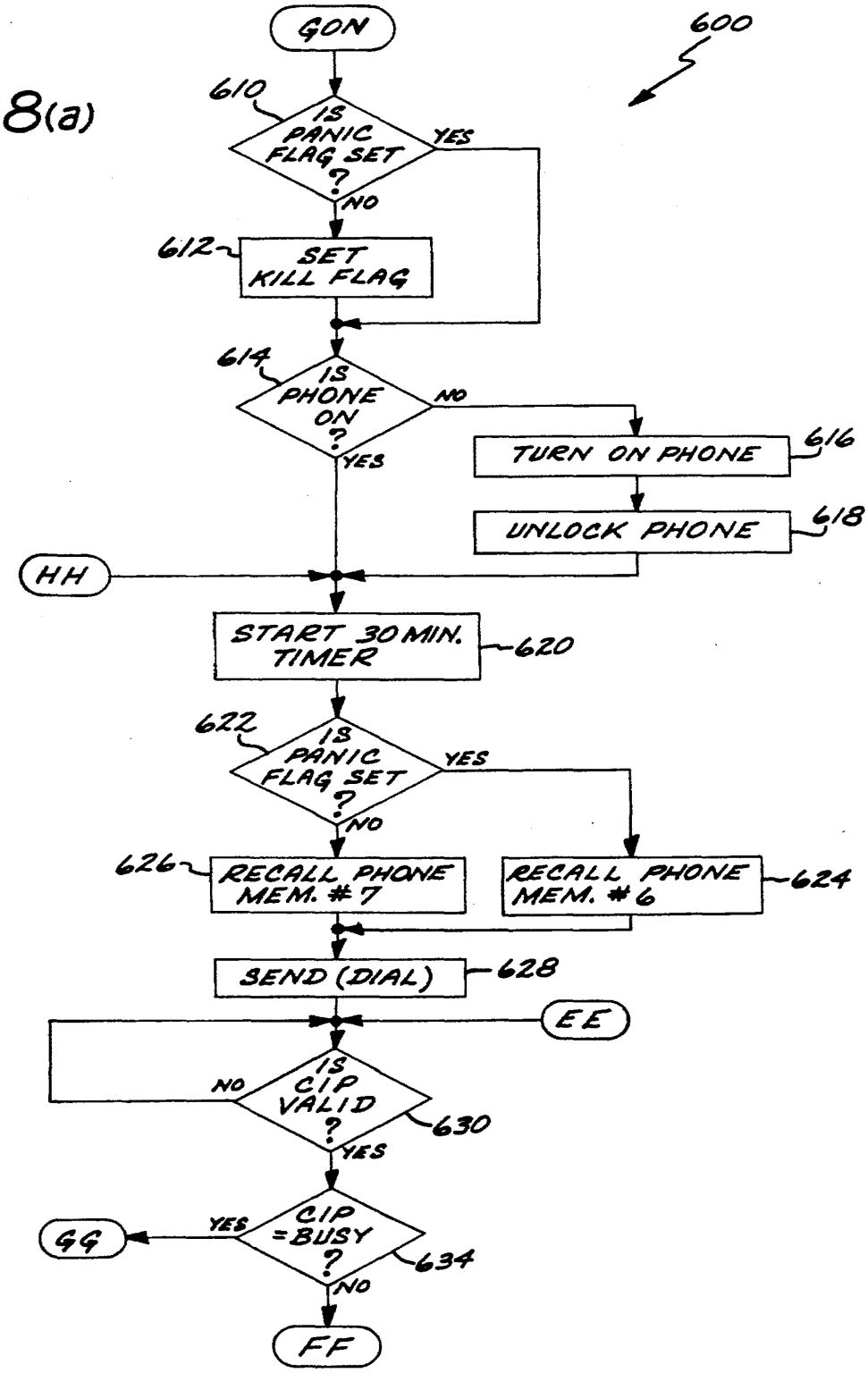

ARM
400
CLEAR DISARM FLAG
410
412
IS TIME FOR PHONE ON ?
YES
NO
TURN ON PHONE
414
418
IS ARM SIGNAL ACTIVE ?
NO
YES
SETSTCM =RCV
416
SET DISARM FLAG
420
SET STCM = IDLE
422
RETURN

FIG. 7

FIG. 8(a)


600
GON
610
IS PANIC FLAG SET ?
YES
NO
612
SET KILL FLAG
614
IS PHONE ON ?
NO
YES
TURN ON PHONE
616
UNLOCK PHONE
618
HH
START 30 MIN. TIMER
620
622
IS PANIC FLAG SET ?
YES
NO
626
RECALL PHONE MEM. #7
RECALL PHONE MEM. #6
624
SEND (DIAL)
628
EE
IS CIP VALID ?
NO
630
YES
CIP =BUSY ?
YES
634
GG
NO
FF

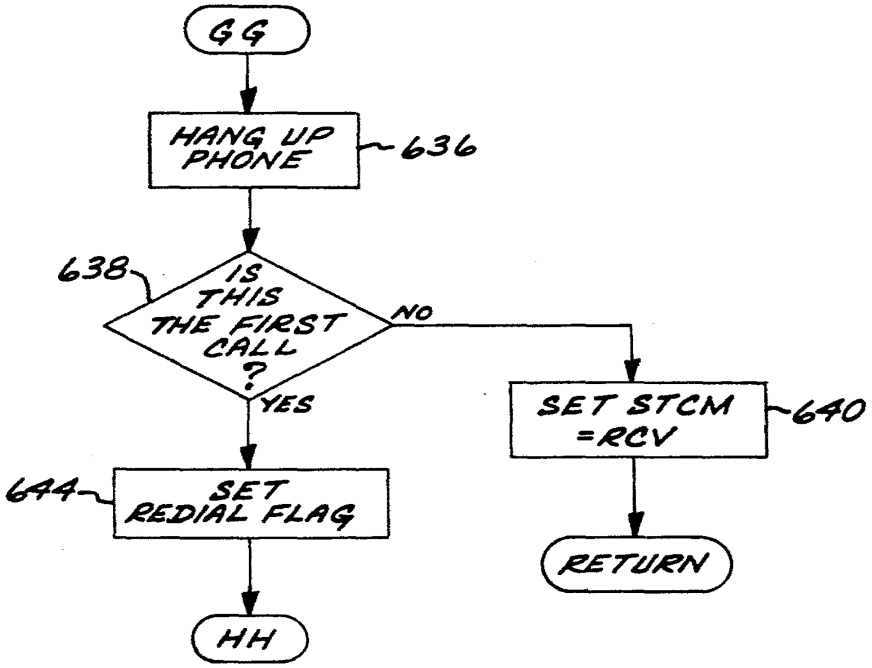
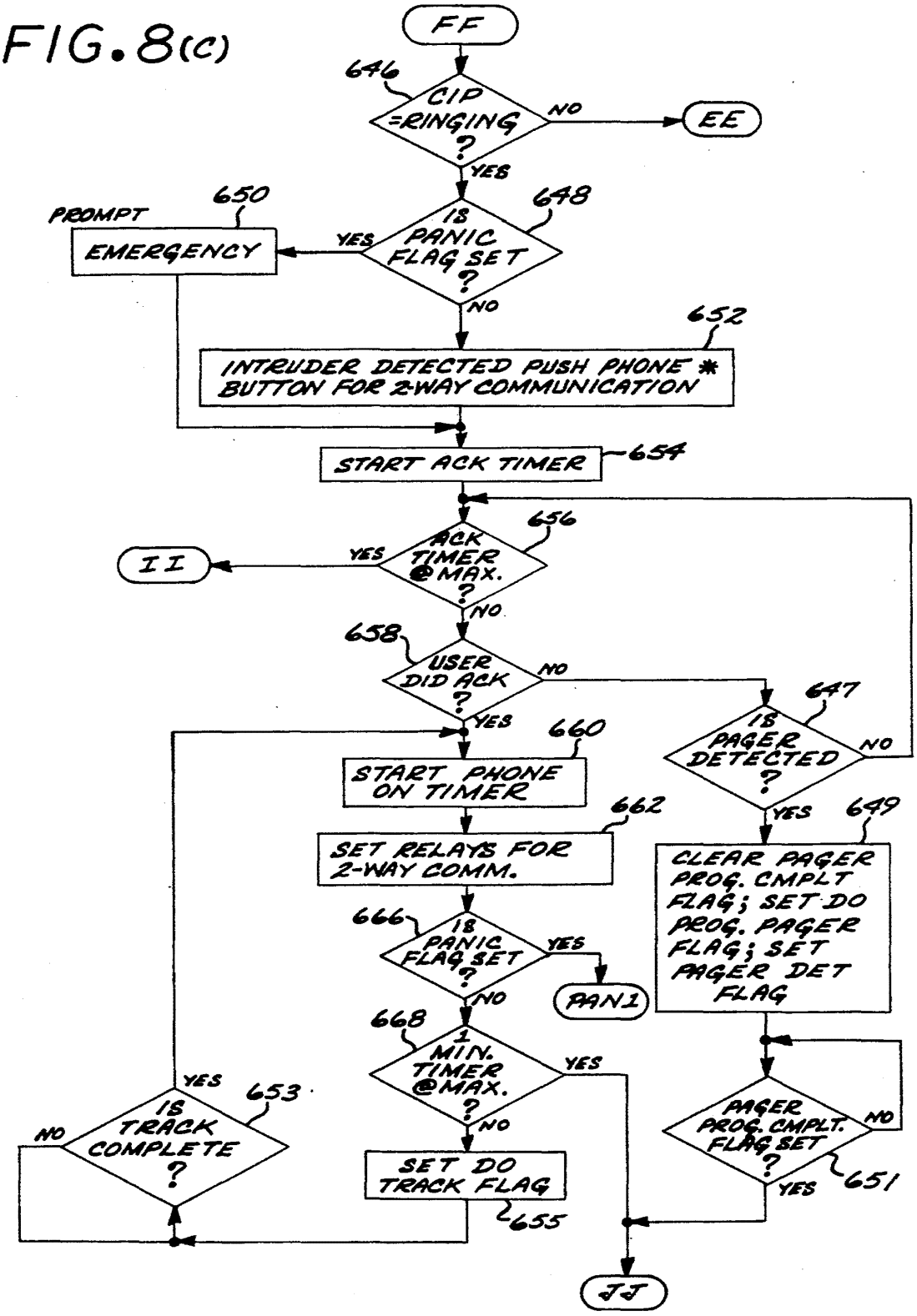

GG
HANG UP PHONE
636
638
IS THIS THE FIRST CALL ?
NO
YES
SET STCM =RCV
640
644
SET REDIAL FLAG
RETURN
HH

FIG. 8(6)

FIG. 8(C)


FF
646
CID =RINGING ?
NO
EE
YES
650
PROMPT
EMERGENCY
YES
648
IS PANIC FLAG SET ?
NO
652
INTRUDER DETECTED PUSH PHONE * BUTTON FOR 2-WAY COMMUNICATION
START ACK TIMER
654
656
ACK TIMER @MAX. ?
YES
II
NO
658
USER DID ACK ?
NO
YES
647
IS PAGER DETECTED ?
NO
YES
649
CLEAR PAGER PROG. CMPLT FLAG; SET DO PROG. PAGER FLAG; SET PAGER DET FLAG
660
START PHONE ON TIMER
662
SET RELAYS FOR 2-WAY COMM.
666
IS PANIC FLAG SET ?
YES
PAN1
NO
668
1 MIN. TIMER @MAX. ?
YES
NO
PAGER PROG. CMPLT. FLAG SET ?
NO
YES
651
YES
653
IS TRACK COMPLETE ?
NO
SET DO TRACK FLAG
655
JJ

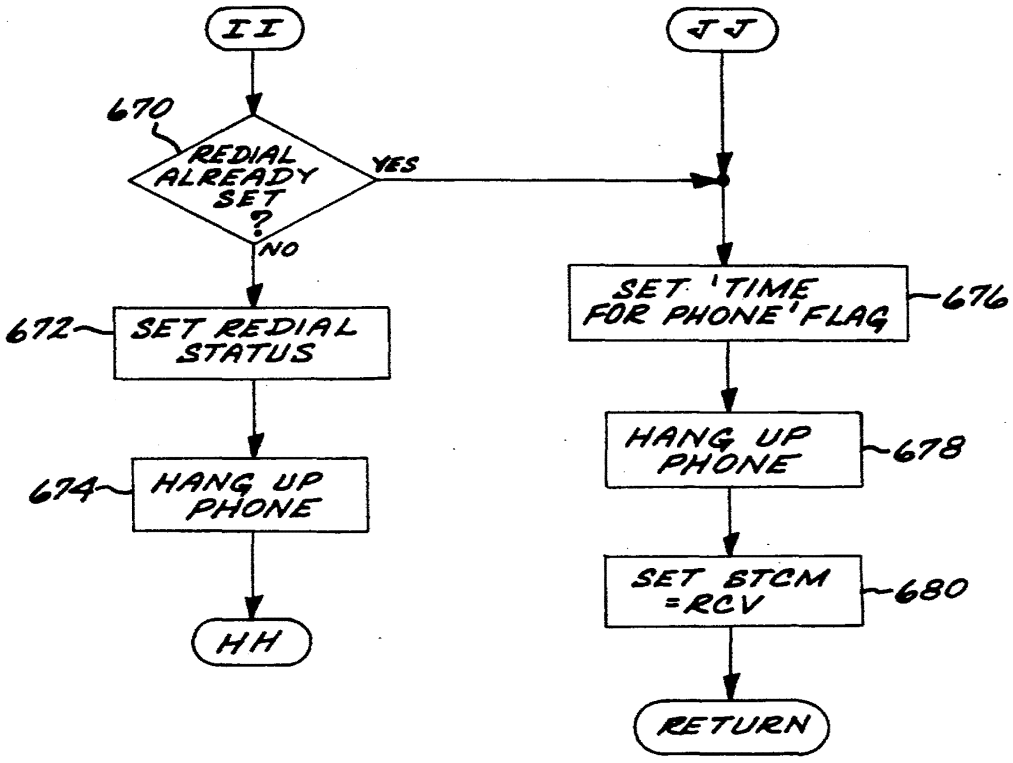

II
JJ
670
REDIAL ALREADY SET ?
YES
NO
672
SET REDIAL STATUS
674
HANG UP PHONE
HH
SET 'TIME FOR PHONE' FLAG
676
HANG UP PHONE
678
SET STCM =RCV
680
RETURN

FIG. 8(d)

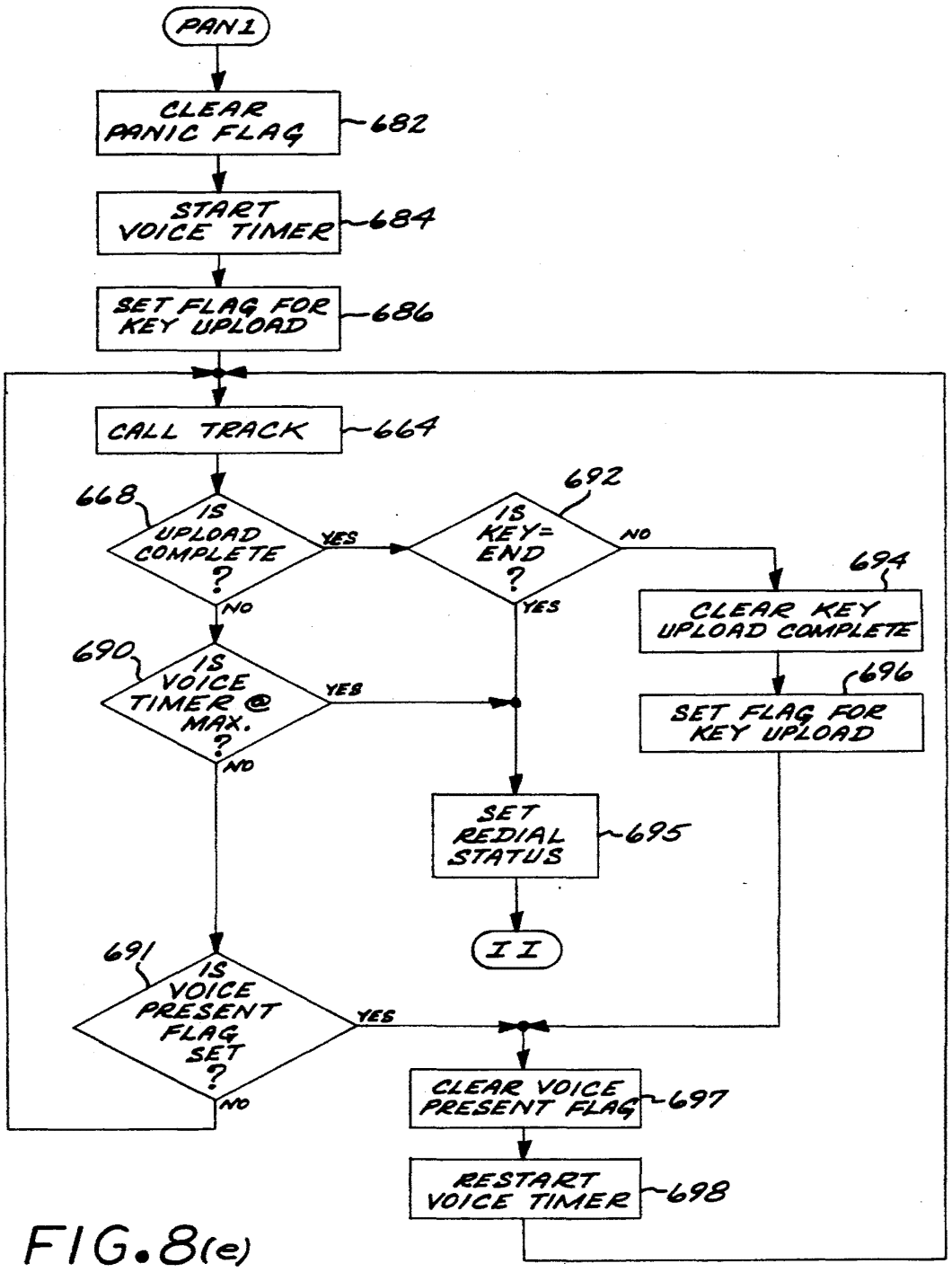

PAN1
CLEAR PANIC FLAG
682
START VOICE TIMER
684
SET FLAG FOR KEY UPLOAD
686
CALL TRACK
664
668
IS UPLOAD COMPLETE ?
YES
NO
692
IS KEY= END ?
NO
YES
694
CLEAR KEY UPLOAD COMPLETE
696
SET FLAG FOR KEY UPLOAD
690
IS VOICE TIMER @ MAX. ?
YES
NO
SET REDIAL STATUS
695
I I
691
IS VOICE PRESENT FLAG SET ?
YES
NO
CLEAR VOICE PRESENT FLAG
697
RESTART VOICE TIMER
698

FIG. 8(e)

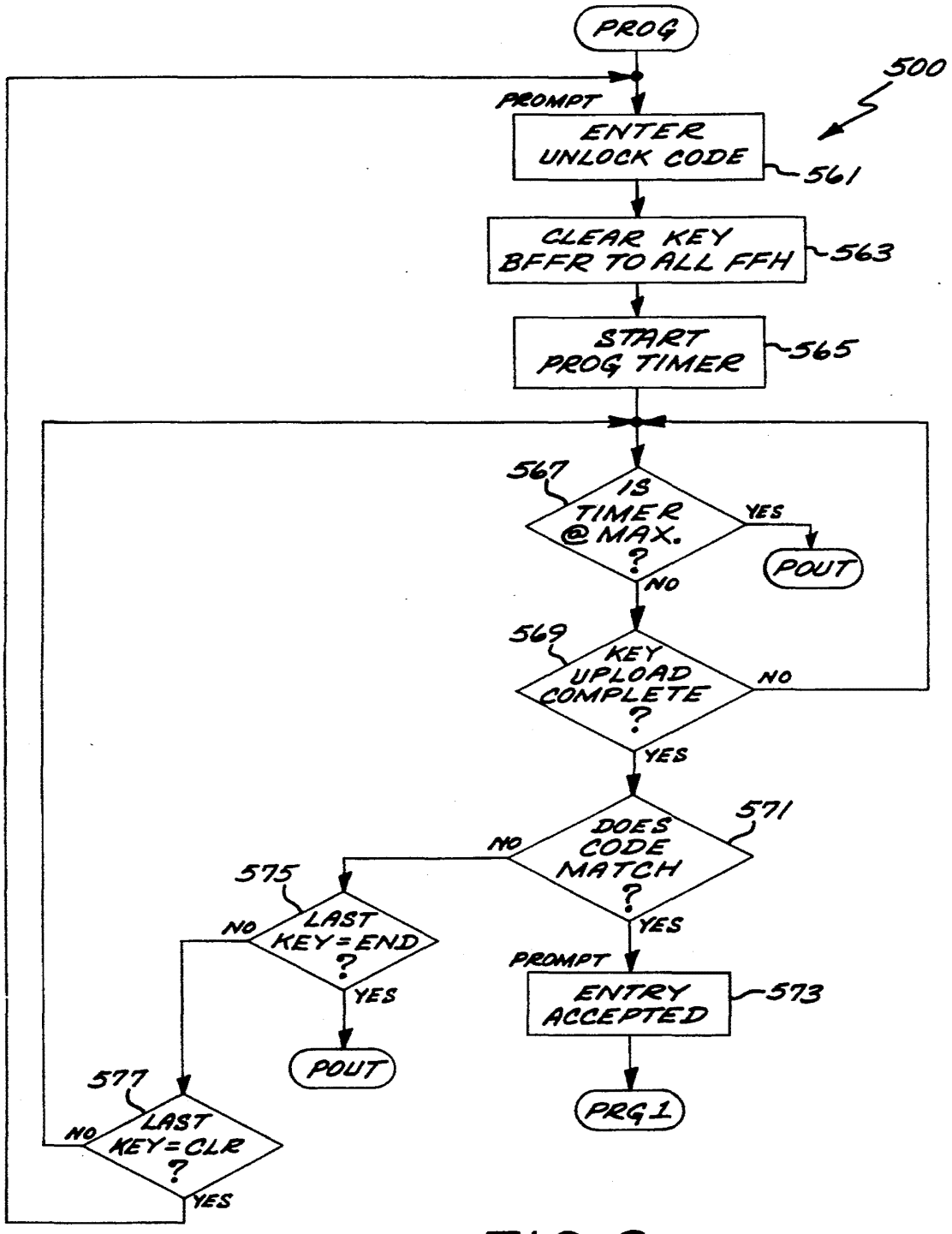

PROG
500
PROMPT
ENTER UNLOCK CODE
561
CLEAR KEY BFFR TO ALL FFH
563
START PROG TIMER
565
567
IS TIMER @ MAX. ?
YES
POUT
NO
569
KEY UPLOAD COMPLETE ?
NO
YES
571
DOES CODE MATCH ?
NO
YES
575
LAST KEY = END ?
NO
YES
POUT
PROMPT
ENTRY ACCEPTED
573
PRG 1
577
LAST KEY = CLR ?
NO
YES

FIG. 9(a)

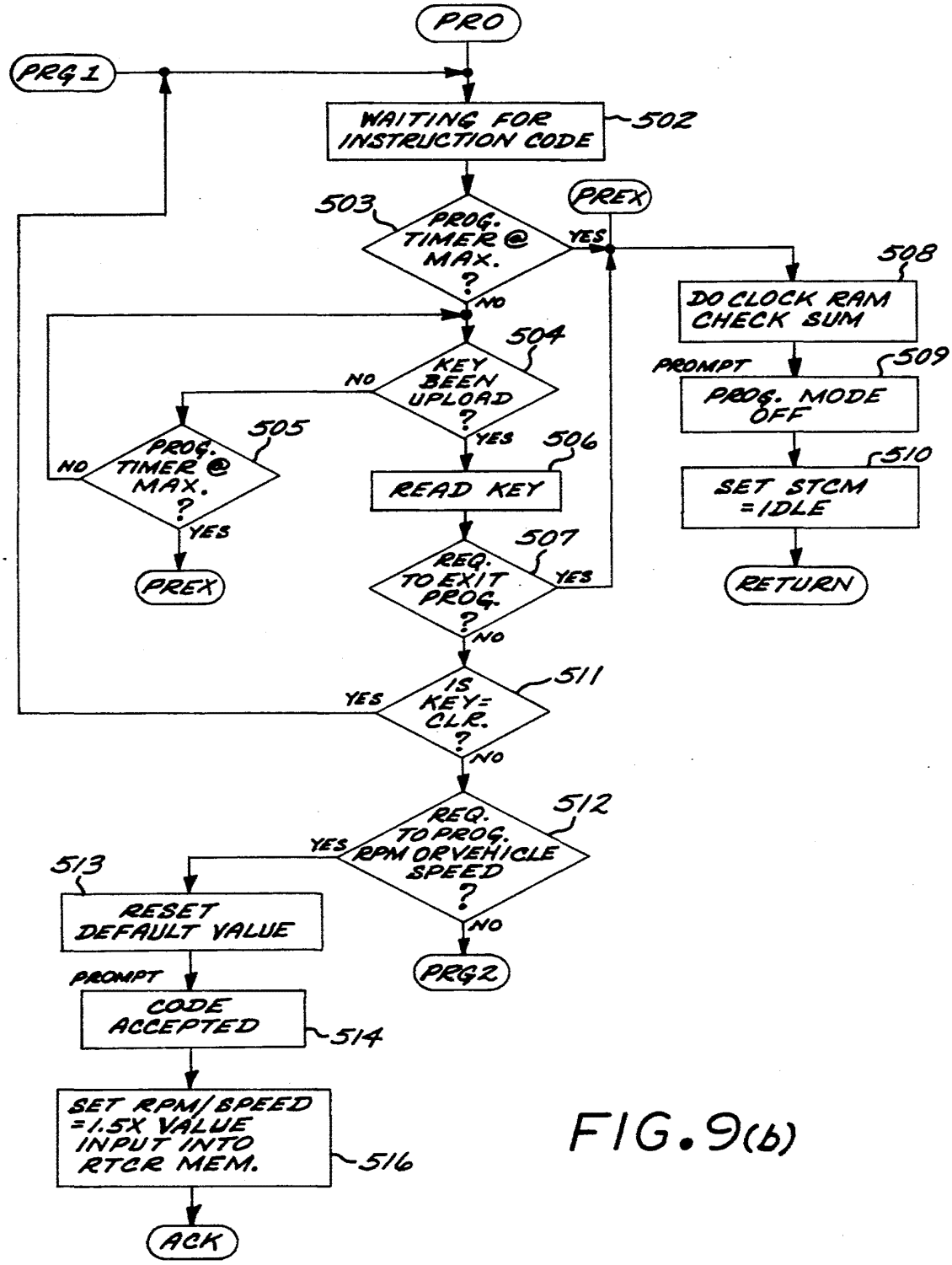

PRO
PRG 1
WAITING FOR INSTRUCTION CODE
502
503
PROG. TIMER @ MAX. ?
YES
NO
PREX
508
DO CLOCK RAM CHECK SUM
PROMPT
509
PROG. MODE OFF
510
SET STCM = IDLE
RETURN
504
KEY BEEN UPLOAD ?
NO
YES
505
PROG. TIMER @ MAX. ?
NO
YES
PREX
506
READ KEY
507
REQ. TO EXIT PROG. ?
YES
NO
511
IS KEY = CLR. ?
YES
NO
512
REQ. TO PROG. RPM OR VEHICLE SPEED ?
YES
NO
513
RESET DEFAULT VALUE
PRG2
PROMPT
CODE ACCEPTED
514
SET RPM/SPEED = 1.5X VALUE INPUT INTO RTCR MEM.
516
ACK

FIG. 9(b)

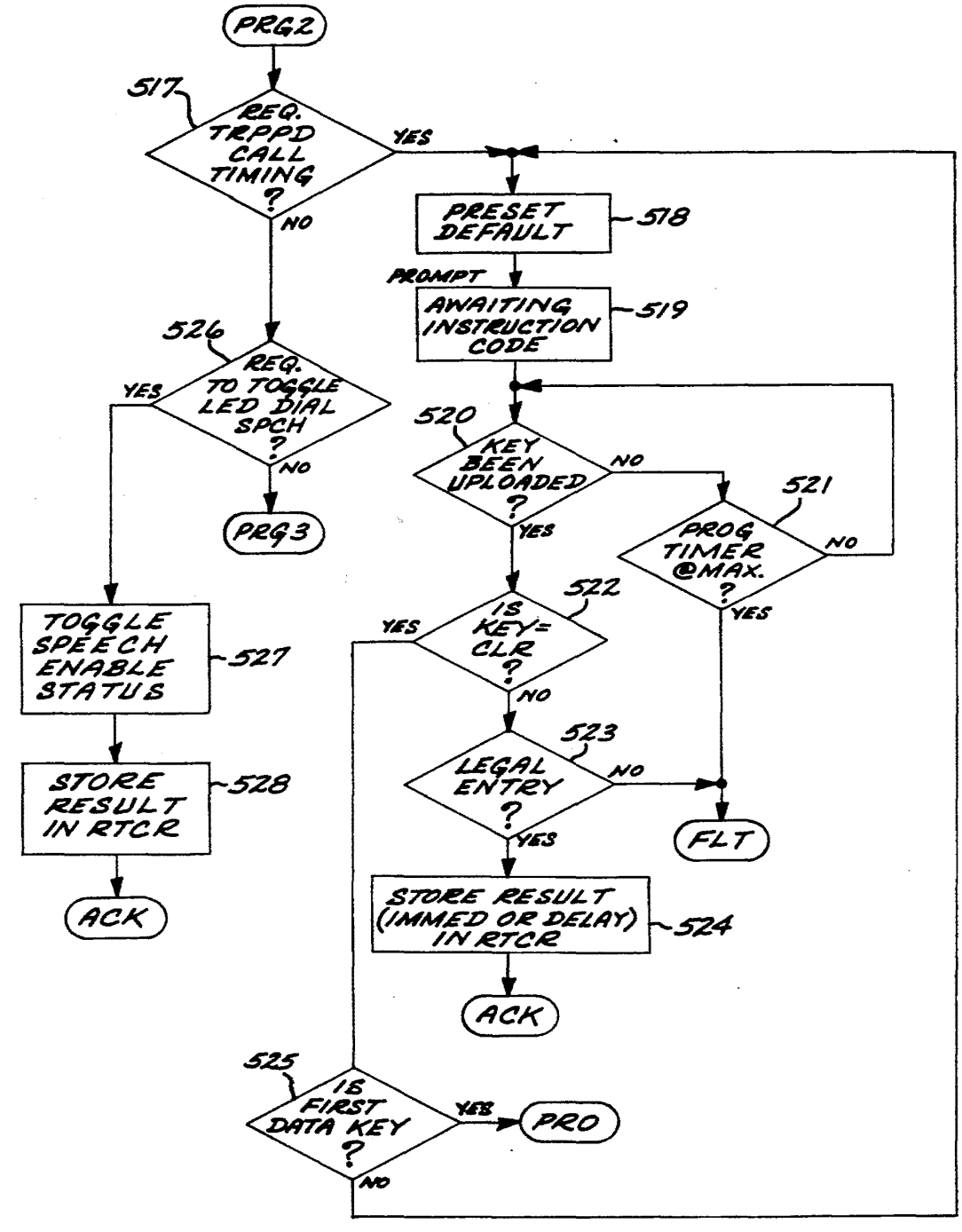

PRG2
517
REQ. TRPPD CALL TIMING ?
YES
NO
PRESET DEFAULT
518
PROMPT
AWAITING INSTRUCTION CODE
519
526
REQ. TO TOGGLE LED DIAL SPCH ?
YES
NO
PRG3
520
KEY BEEN UPLOADED ?
NO
YES
521
PROG TIMER @MAX. ?
NO
YES
522
IS KEY= CLR ?
YES
NO
523
LEGAL ENTRY ?
NO
YES
FLT
TOGGLE SPEECH ENABLE STATUS
527
STORE RESULT IN RTCR
528
ACK
STORE RESULT (IMMED OR DELAY) IN RTCR
524
ACK
525
IS FIRST DATA KEY ?
YES
NO
PRO

FIG. 9(c)

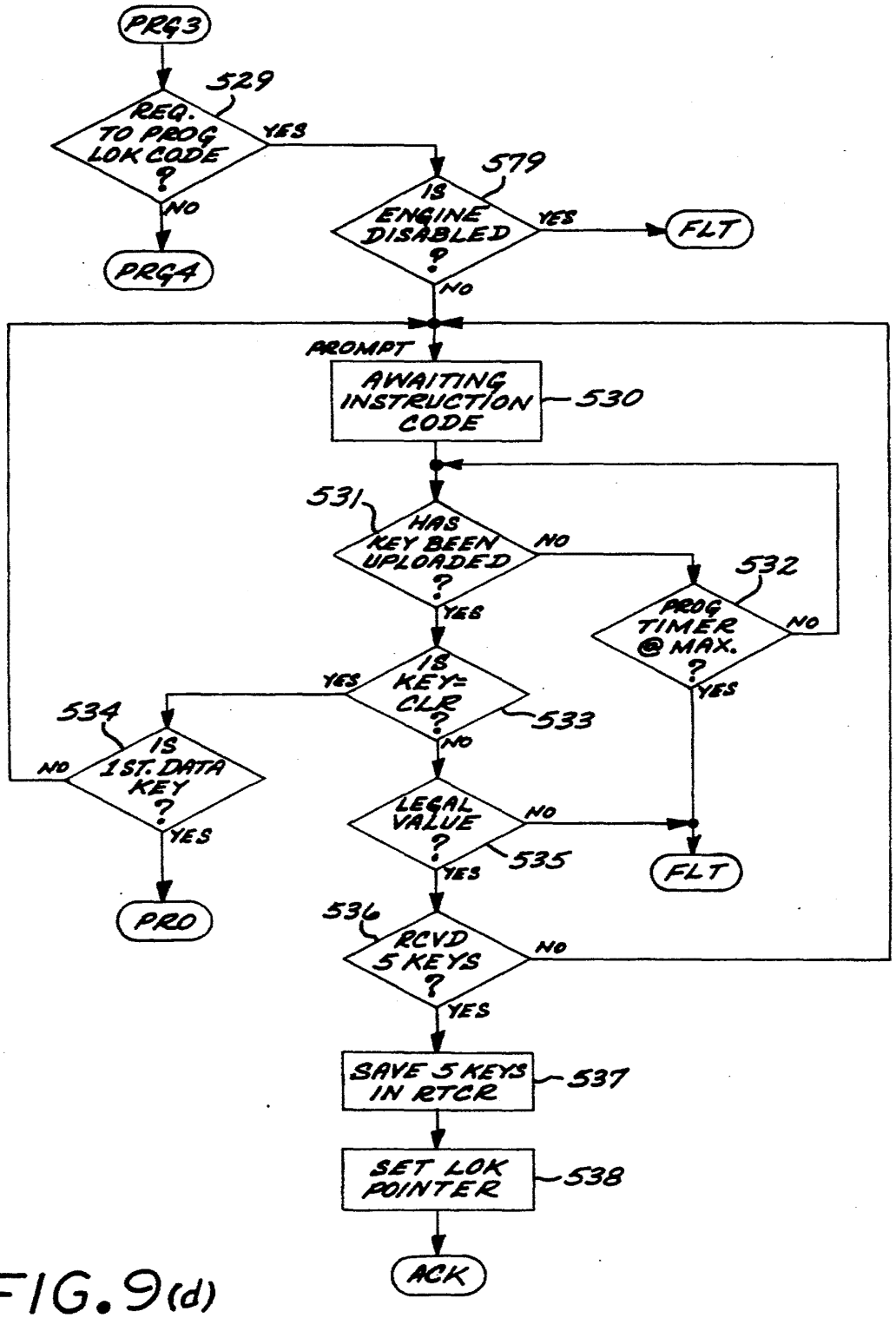

PRG3
529
REQ. TO PROG LOK CODE ?
YES
NO
PRG4
579
IS ENGINE DISABLED ?
YES
FLT
NO
PROMPT
AWAITING INSTRUCTION CODE
530
531
HAS KEY BEEN UPLOADED ?
NO
YES
532
PROG TIMER @ MAX. ?
NO
YES
IS KEY= CLR ?
533
YES
NO
534
IS 1ST. DATA KEY ?
NO
YES
LEGAL VALUE ?
NO
YES
535
FLT
PRO
536
RCVD 5 KEYS ?
NO
YES
SAVE 5 KEYS IN RTCR
537
SET LOK POINTER
538
ACK

FIG. 9(d)

FIG. 9(e)

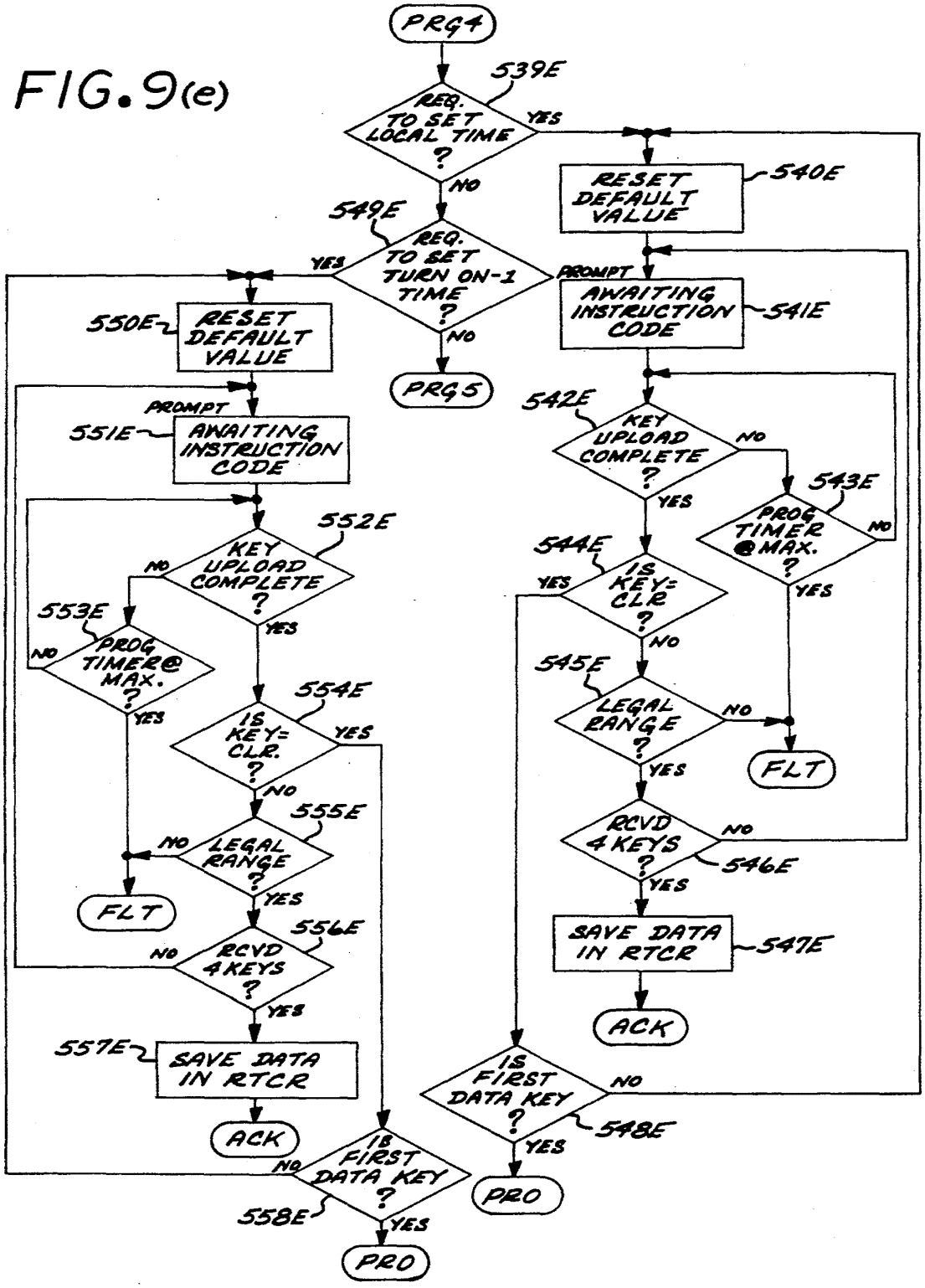

PRG4
539E
REQ. TO SET LOCAL TIME ?
YES
NO
RESET DEFAULT VALUE
540E
549E
REQ. TO SET TURN ON-1 TIME ?
YES
NO
PROMPT
AWAITING INSTRUCTION CODE
541E
550E
RESET DEFAULT VALUE
PRG5
PROMPT
551E
AWAITING INSTRUCTION CODE
542E
KEY UPLOAD COMPLETE ?
NO
YES
543E
PROG TIMER @ MAX. ?
NO
YES
552E
KEY UPLOAD COMPLETE ?
NO
YES
544E
IS KEY= CLR ?
YES
NO
553E
PROG TIMER @ MAX. ?
NO
YES
554E
IS KEY= CLR. ?
YES
NO
545E
LEGAL RANGE ?
NO
YES
FLT
555E
LEGAL RANGE ?
NO
YES
FLT
RCVD 4 KEYS ?
NO
YES
546E
556E
RCVD 4 KEYS ?
NO
YES
SAVE DATA IN RTCR
547E
ACK
557E
SAVE DATA IN RTCR
ACK
IS FIRST DATA KEY ?
NO
YES
548E
IS FIRST DATA KEY ?
NO
YES
558E
PRO
PRO

FIG. 9(f)

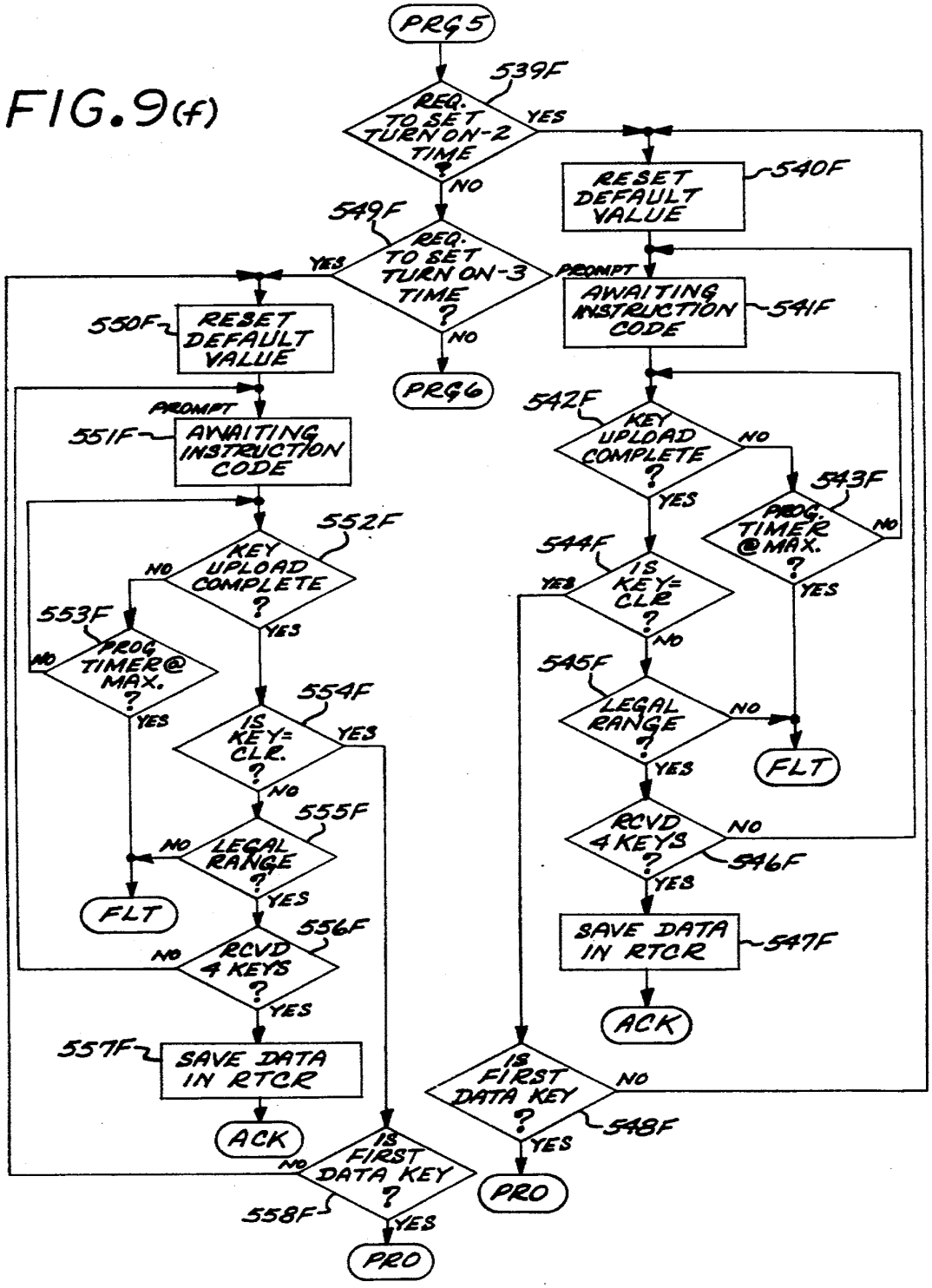

PRG5
539F
REQ. TO SET TURN ON-2 TIME ?
YES
NO
RESET DEFAULT VALUE
540F
549F
REQ. TO SET TURN ON-3 TIME ?
YES
NO
PROMPT
AWAITING INSTRUCTION CODE
541F
550F
RESET DEFAULT VALUE
PRG6
PROMPT
551F
AWAITING INSTRUCTION CODE
542F
KEY UPLOAD COMPLETE ?
NO
YES
543F
PROG. TIMER @ MAX. ?
NO
YES
552F
KEY UPLOAD COMPLETE ?
NO
YES
544F
IS KEY= CLR ?
YES
NO
553F
PROG. TIMER @ MAX. ?
NO
YES
554F
IS KEY= CLR. ?
YES
NO
545F
LEGAL RANGE ?
NO
YES
FLT
555F
LEGAL RANGE ?
NO
YES
FLT
RCVD 4 KEYS ?
NO
546F
YES
556F
RCVD 4 KEYS ?
NO
YES
SAVE DATA IN RTCR
547F
ACK
557F
SAVE DATA IN RTCR
ACK
IS FIRST DATA KEY ?
NO
548F
YES
IS FIRST DATA KEY ?
NO
558F
YES
PRO
PRO

FIG. 9(g)

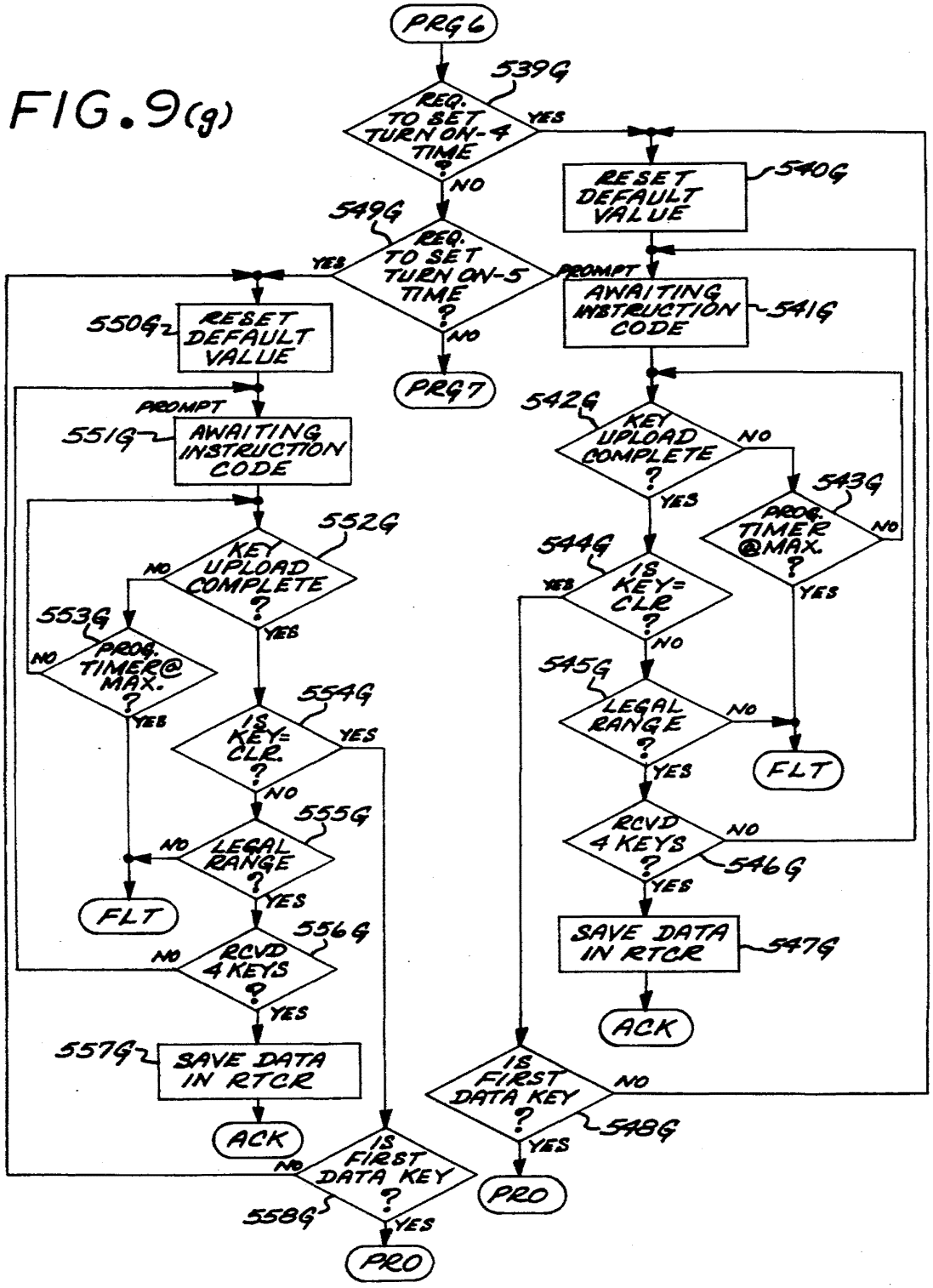

PRG 6
539G
REQ. TO SET TURN ON-4 TIME ?
YES
NO
540G
RESET DEFAULT VALUE
549G
REQ. TO SET TURN ON-5 TIME ?
YES
NO
PROMPT
AWAITING INSTRUCTION CODE
541G
550G
RESET DEFAULT VALUE
PRG 7
PROMPT
551G
AWAITING INSTRUCTION CODE
542G
KEY UPLOAD COMPLETE ?
NO
YES
543G
PROG. TIMER @MAX. ?
NO
YES
552G
KEY UPLOAD COMPLETE ?
NO
YES
544G
IS KEY= CLR ?
YES
NO
553G
PROG. TIMER@ MAX. ?
NO
YES
554G
IS KEY= CLR. ?
YES
NO
545G
LEGAL RANGE ?
NO
YES
FLT
555G
LEGAL RANGE ?
NO
YES
FLT
RCVD 4 KEYS ?
NO
546G
YES
556G
RCVD 4 KEYS ?
NO
YES
SAVE DATA IN RTCR
547G
557G
SAVE DATA IN RTCR
ACK
ACK
IS FIRST DATA KEY ?
NO
548G
YES
IS FIRST DATA KEY ?
NO
558G
YES
PRO
PRO

FIG. 9(h)

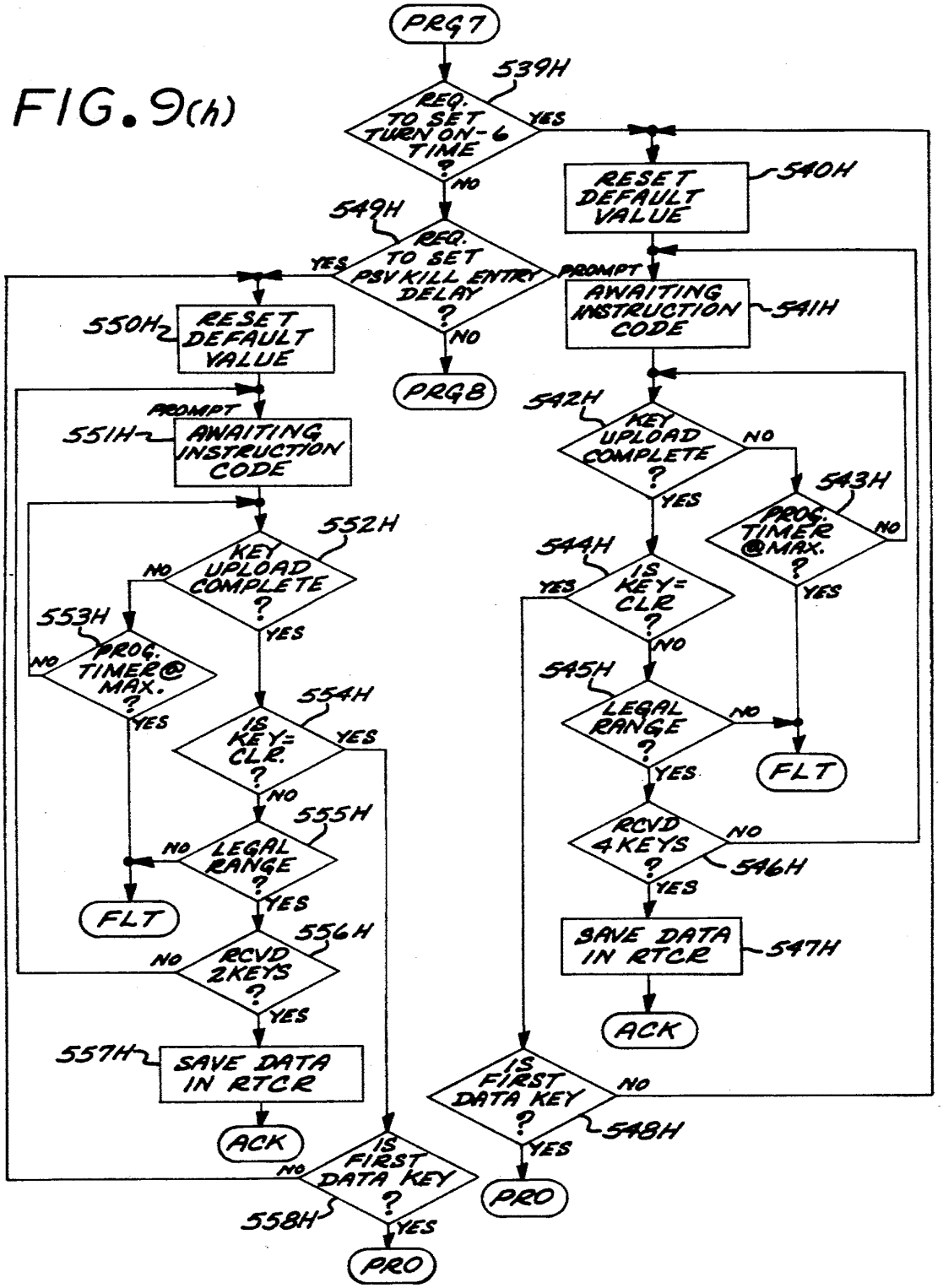

PRG7
539H
REQ. TO SET TURN ON-G TIME ?
YES
NO
RESET DEFAULT VALUE
540H
549H
REQ. TO SET PSV KILL ENTRY DELAY ?
YES
NO
PROMPT
AWAITING INSTRUCTION CODE
541H
550H
RESET DEFAULT VALUE
PRG8
542H
KEY UPLOAD COMPLETE ?
NO
YES
543H
PROG. TIMER @MAX. ?
NO
YES
PROMPT
551H
AWAITING INSTRUCTION CODE
552H
KEY UPLOAD COMPLETE ?
NO
YES
544H
IS KEY= CLR ?
YES
NO
553H
PROG. TIMER @ MAX. ?
NO
YES
554H
IS KEY= CLR. ?
YES
NO
545H
LEGAL RANGE ?
NO
YES
FLT
555H
LEGAL RANGE ?
NO
YES
FLT
RCVD 4 KEYS ?
NO
YES
546H
556H
RCVD 2 KEYS ?
NO
YES
SAVE DATA IN RTCR
547H
ACK
557H
SAVE DATA IN RTCR
ACK
IS FIRST DATA KEY ?
NO
548H
YES
IS FIRST DATA KEY ?
NO
YES
558H
PRO
PRO

FIG. 9(i)

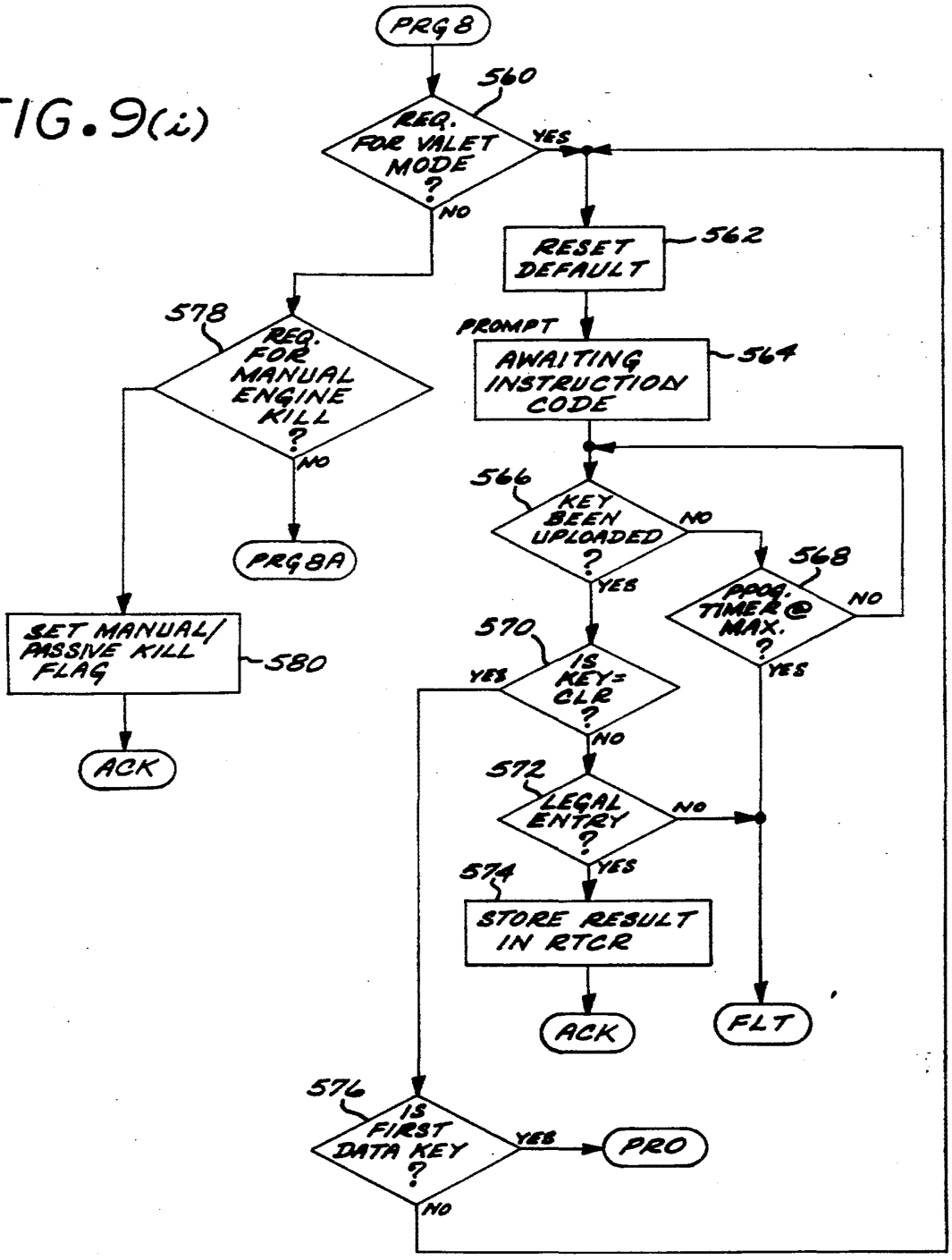

PRG 8
560
REQ. FOR VALET MODE ?
YES
NO
562
RESET DEFAULT
578
REQ. FOR MANUAL ENGINE KILL ?
PROMPT
564
AWAITING INSTRUCTION CODE
NO
566
KEY BEEN UPLOADED ?
NO
568
PROG. TIMER @ MAX. ?
NO
PRG 8A
YES
YES
570
IS KEY = CLR ?
SET MANUAL/ PASSIVE KILL FLAG
580
YES
NO
572
LEGAL ENTRY ?
NO
YES
574
STORE RESULT IN RTCR
ACK
ACK
FLT
576
IS FIRST DATA KEY ?
YES
PRO
NO

FIG. 9(J)

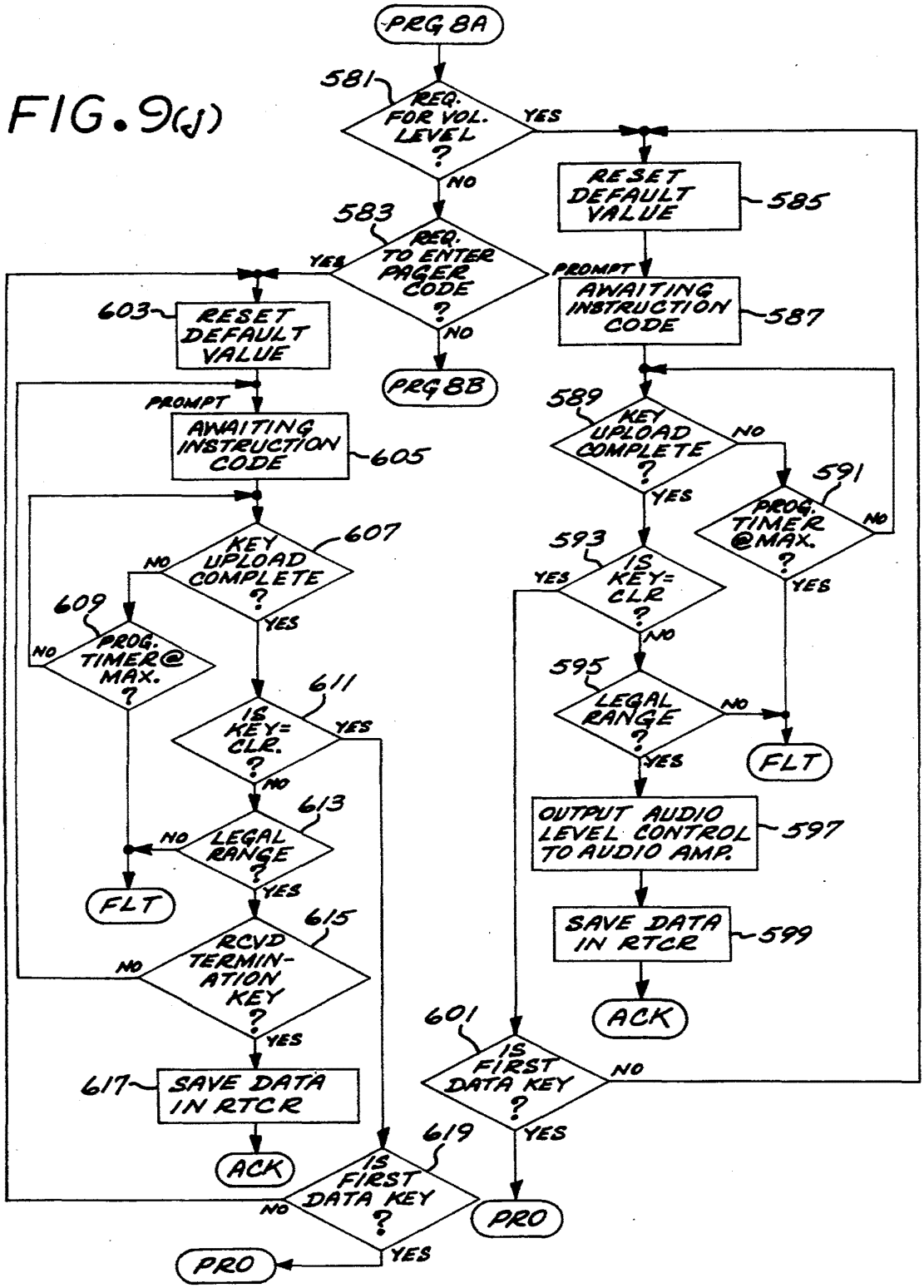
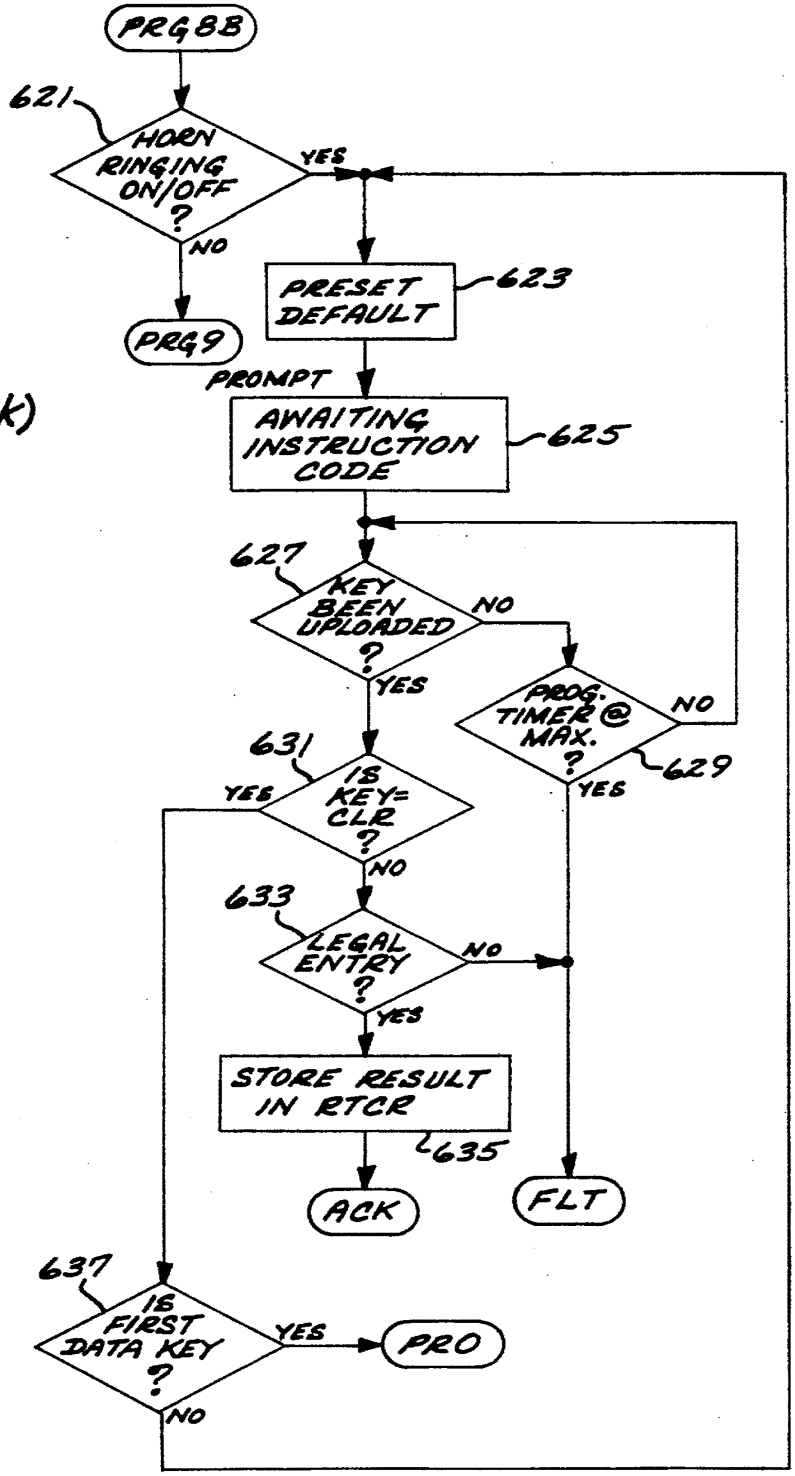

PRG 8A
581
REQ. FOR VOL. LEVEL ?
YES
NO
RESET DEFAULT VALUE
585
583
REQ. TO ENTER PAGER CODE ?
YES
NO
PROMPT
AWAITING INSTRUCTION CODE
587
603
RESET DEFAULT VALUE
PRG 8B
PROMPT
AWAITING INSTRUCTION CODE
605
589
KEY UPLOAD COMPLETE ?
NO
YES
591
PROG. TIMER @MAX. ?
NO
YES
607
KEY UPLOAD COMPLETE ?
NO
YES
593
IS KEY= CLR ?
YES
NO
609
PROG. TIMER@ MAX. ?
NO
595
LEGAL RANGE ?
NO
YES
611
IS KEY= CLR. ?
YES
NO
FLT
613
LEGAL RANGE ?
NO
YES
FLT
OUTPUT AUDIO LEVEL CONTROL TO AUDIO AMP.
597
615
RCVD TERMIN- ATION KEY ?
NO
YES
SAVE DATA IN RTCR
599
ACK
601
IS FIRST DATA KEY ?
NO
YES
617
SAVE DATA IN RTCR
ACK
619
IS FIRST DATA KEY ?
NO
YES
PRO
PRO

FIG. 9(k)


PRG8B
621
HORN RINGING ON/OFF ?
YES
NO
PRESET DEFAULT
623
PRG9
PROMPT
AWAITING INSTRUCTION CODE
625
627
KEY BEEN UPLOADED ?
NO
YES
PROG. TIMER @ MAX. ?
NO
YES
629
631
IS KEY= CLR ?
YES
NO
633
LEGAL ENTRY ?
NO
YES
STORE RESULT IN RTCR
635
ACK
FLT
637
IS FIRST DATA KEY ?
YES
PRO
NO

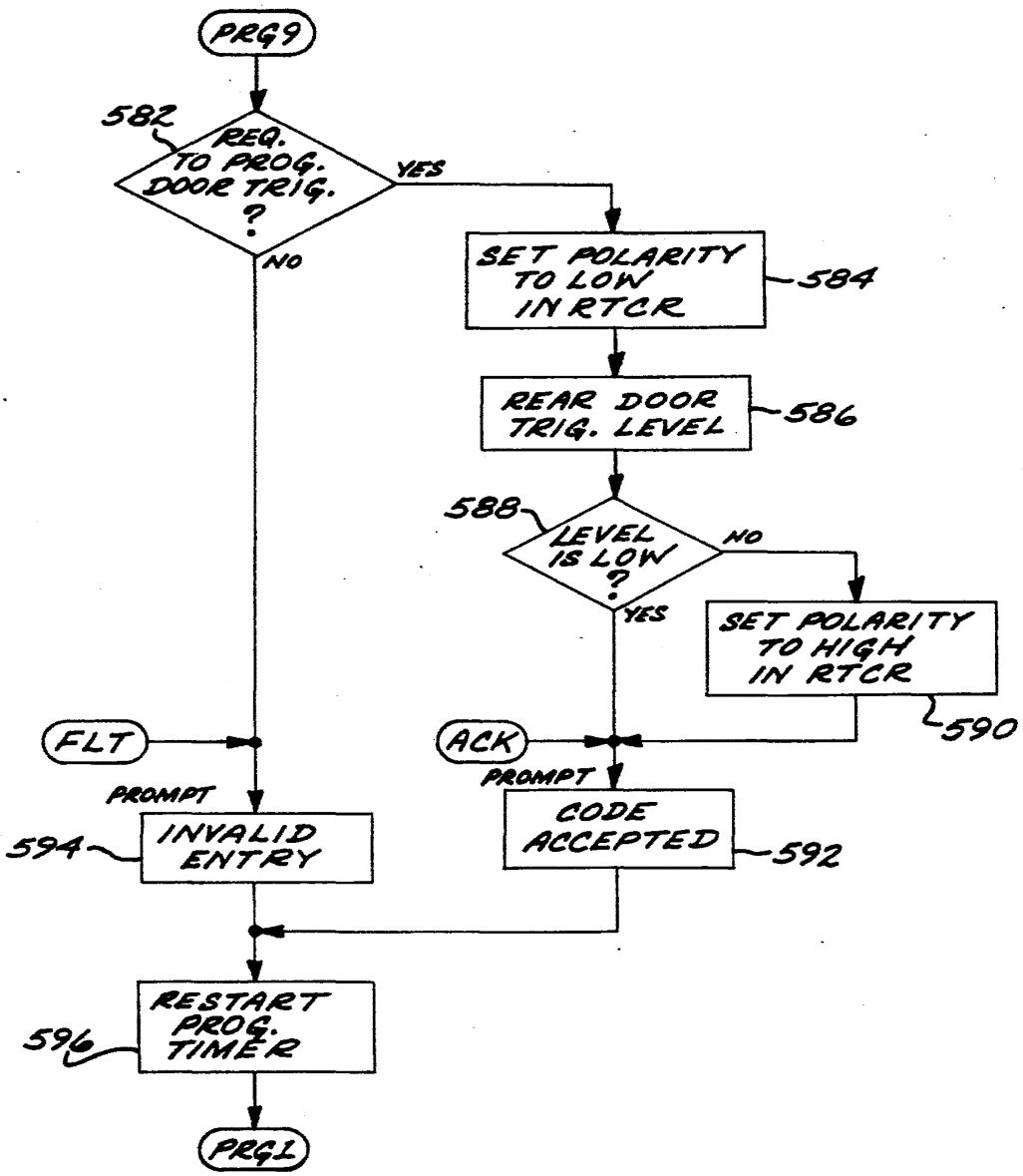
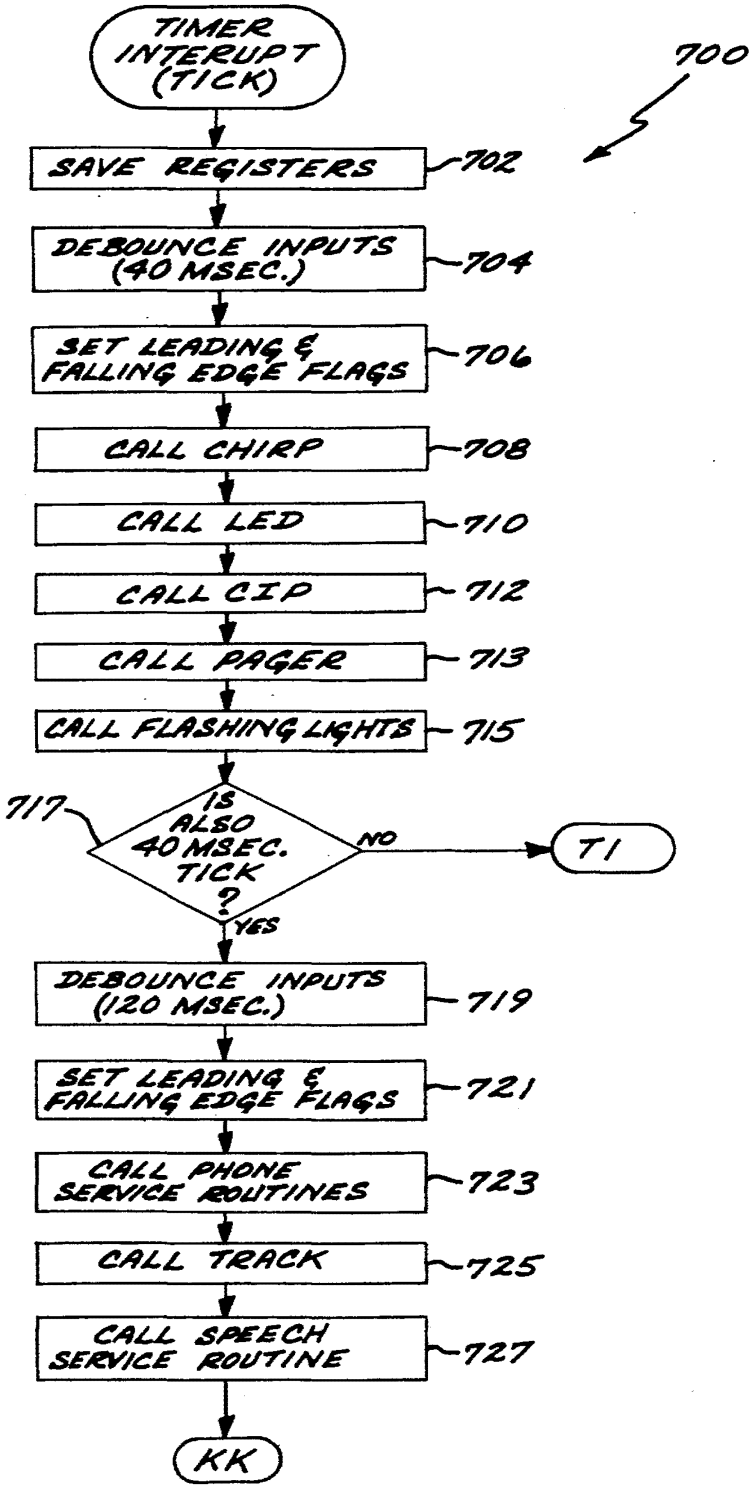

PRG9
582
REQ. TO PROG. DOOR TRIG. ?
YES
NO
SET POLARITY TO LOW IN RTCR
584
REAR DOOR TRIG. LEVEL
586
588
LEVEL IS LOW ?
NO
YES
SET POLARITY TO HIGH IN RTCR
590
FLT
ACK
PROMPT
PROMPT
INVALID ENTRY
594
CODE ACCEPTED
592
RESTART PROG. TIMER
596
PRG1

FIG. 9(l)

FIG. 10(a)


TIMER INTERUPT (TICK)
700
SAVE REGISTERS
702
DEBOUNCE INPUTS (40 MSEC.)
704
SET LEADING & FALLING EDGE FLAGS
706
CALL CHIRP
708
CALL LED
710
CALL CIP
712
CALL PAGER
713
CALL FLASHING LIGHTS
715
717
IS ALSO 40 MSEC. TICK ?
NO
T1
YES
DEBOUNCE INPUTS (120 MSEC.)
719
SET LEADING & FALLING EDGE FLAGS
721
CALL PHONE SERVICE ROUTINES
723
CALL TRACK
725
CALL SPEECH SERVICE ROUTINE
727
KK

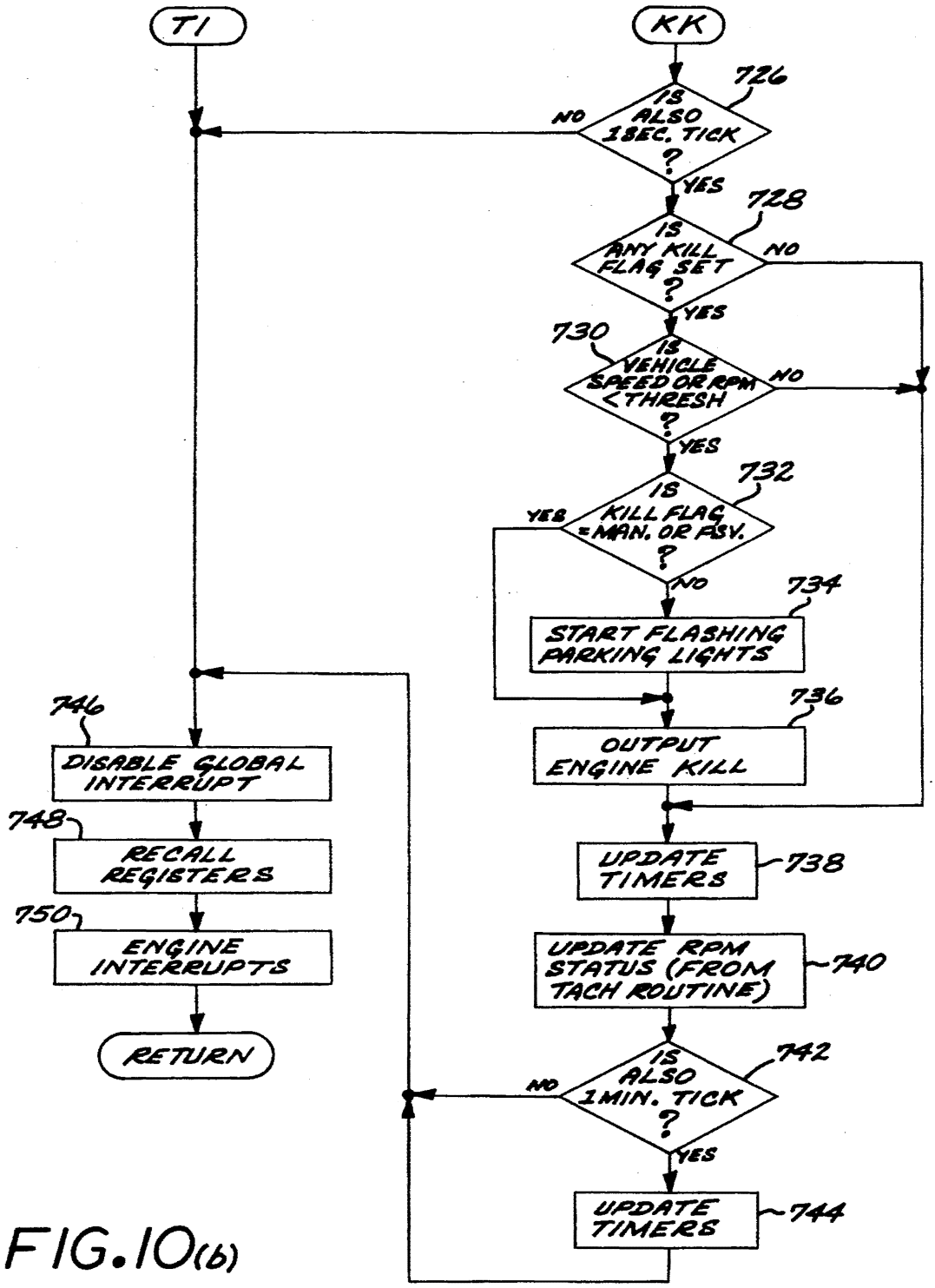

T1
KK
726
IS ALSO 1SEC. TICK ?
NO
YES
728
IS ANY KILL FLAG SET ?
NO
YES
730
IS VEHICLE SPEED OR RPM < THRESH ?
NO
YES
732
IS KILL FLAG = MAN. OR PSV. ?
YES
NO
734
START FLASHING PARKING LIGHTS
736
OUTPUT ENGINE KILL
738
UPDATE TIMERS
740
UPDATE RPM STATUS (FROM TACH ROUTINE)
742
IS ALSO 1MIN. TICK ?
NO
YES
744
UPDATE TIMERS
746
DISABLE GLOBAL INTERRUPT
748
RECALL REGISTERS
750
ENGINE INTERRUPTS
RETURN

FIG. 10(b)

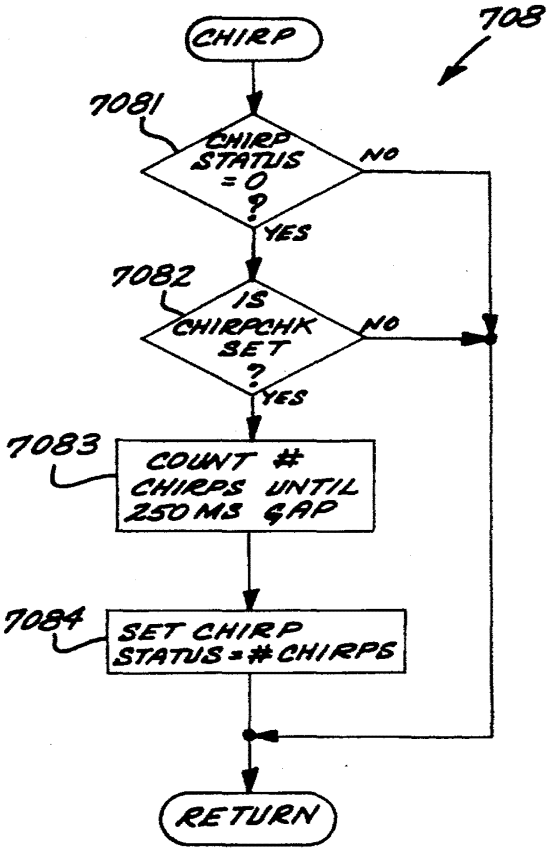


FIG. 10(c)

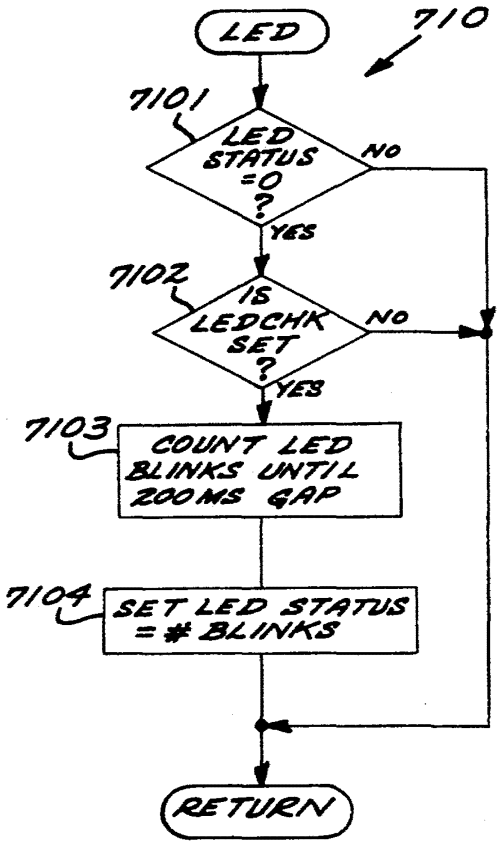


FIG. 10(d)

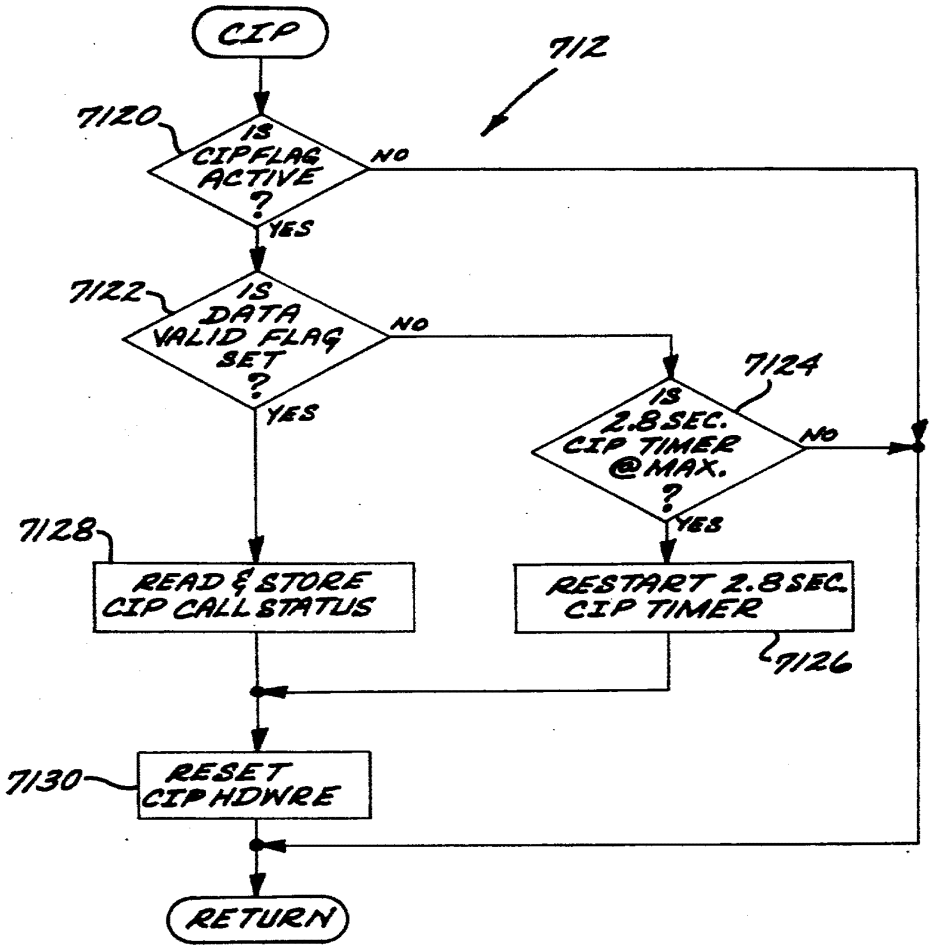

CIP
712
7120
IS CIPFLAG ACTIVE ?
NO
YES
7122
IS DATA VALID FLAG SET ?
NO
YES
7124
IS 2.8SEC. CIP TIMER @MAX. ?
NO
YES
7128
READ & STORE CIP CALL STATUS
RESTART 2.8SEC. CIP TIMER
7126
7130
RESET CIP HDWRE
RETURN

FIG. 10(e)

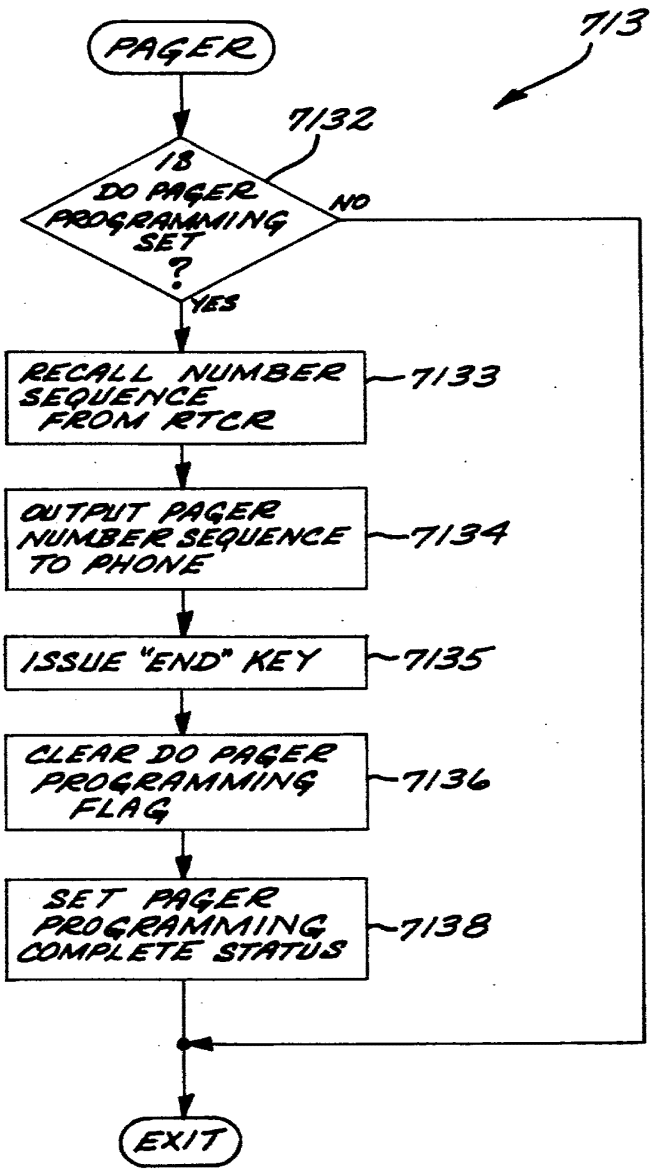

713
PAGER
7132
18 DO PAGER PROGRAMMING SET ?
NO
YES
RECALL NUMBER SEQUENCE FROM RTCR
7133
OUTPUT PAGER NUMBER SEQUENCE TO PHONE
7134
ISSUE "END" KEY
7135
CLEAR DO PAGER PROGRAMMING FLAG
7136
SET PAGER PROGRAMMING COMPLETE STATUS
7138
EXIT

FIG. 10(f)

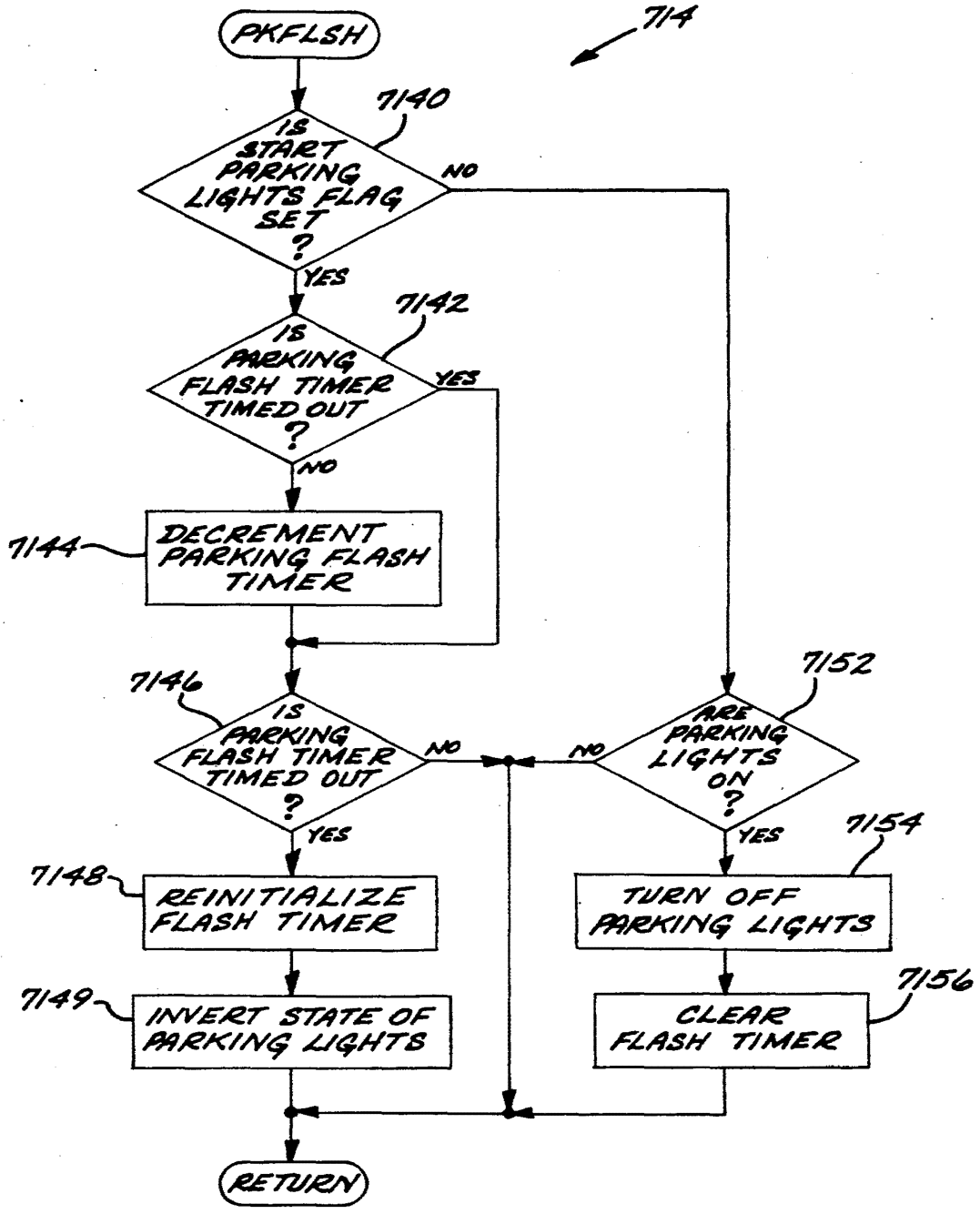

PKFLSH
714
7140
IS START PARKING LIGHTS FLAG SET ?
NO
YES
7142
IS PARKING FLASH TIMER TIMED OUT ?
YES
NO
7144
DECREMENT PARKING FLASH TIMER
7146
IS PARKING FLASH TIMER TIMED OUT ?
NO
YES
7148
REINITIALIZE FLASH TIMER
7149
INVERT STATE OF PARKING LIGHTS
7152
ARE PARKING LIGHTS ON ?
NO
YES
7154
TURN OFF PARKING LIGHTS
7156
CLEAR FLASH TIMER
RETURN

FIG. 10(g)

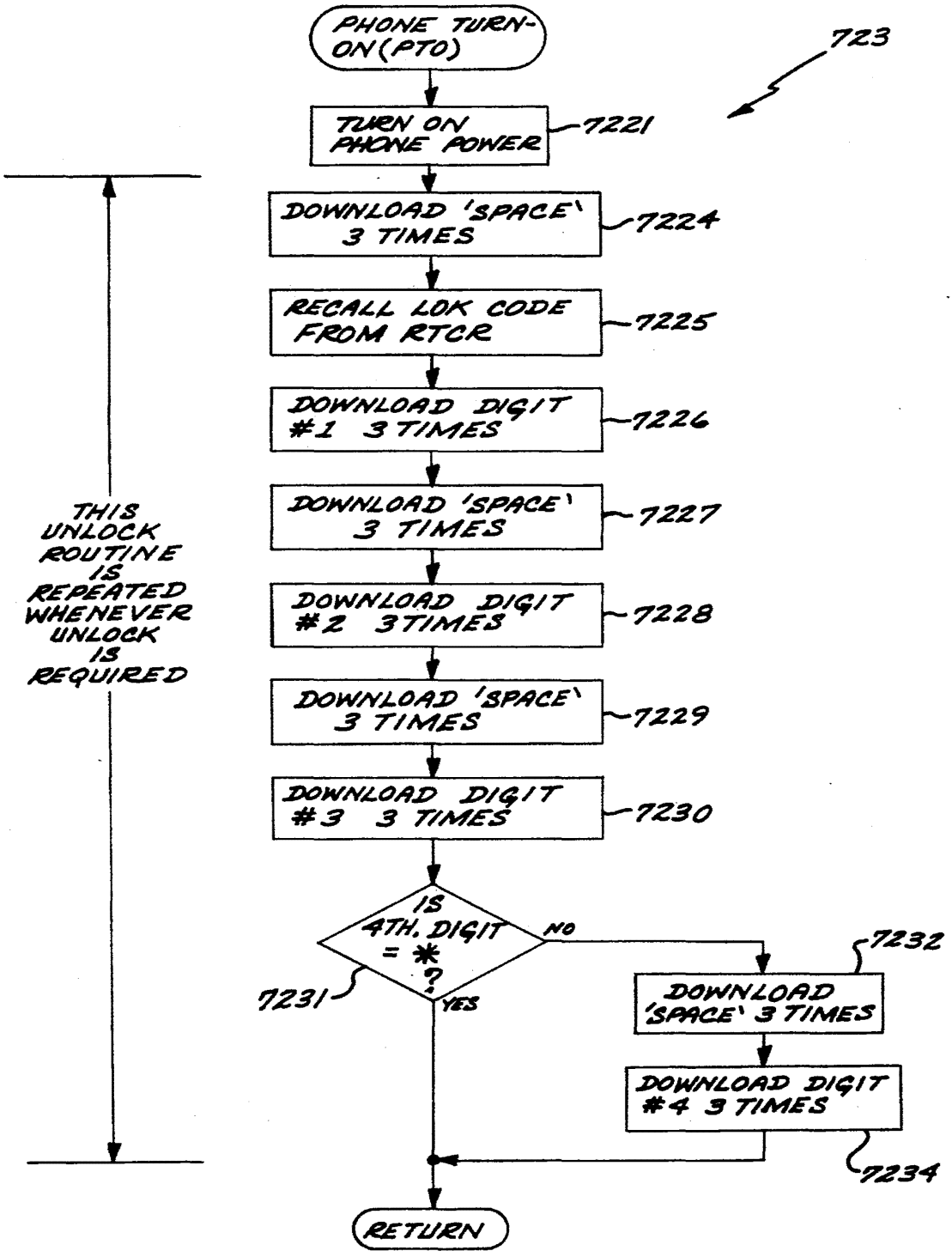

PHONE TURN-ON (PTO)
723
TURN ON PHONE POWER
7221
DOWNLOAD 'SPACE' 3 TIMES
7224
RECALL LOK CODE FROM RTCR
7225
DOWNLOAD DIGIT #1 3 TIMES
7226
DOWNLOAD 'SPACE' 3 TIMES
7227
DOWNLOAD DIGIT #2 3TIMES
7228
DOWNLOAD 'SPACE' 3 TIMES
7229
DOWNLOAD DIGIT #3 3 TIMES
7230
IS 4TH. DIGIT = * ?
7231
NO
YES
7232
DOWNLOAD 'SPACE' 3 TIMES
DOWNLOAD DIGIT #4 3 TIMES
7234
RETURN
THIS UNLOCK ROUTINE IS REPEATED WHENEVER UNLOCK IS REQUIRED

FIG. 10(h)

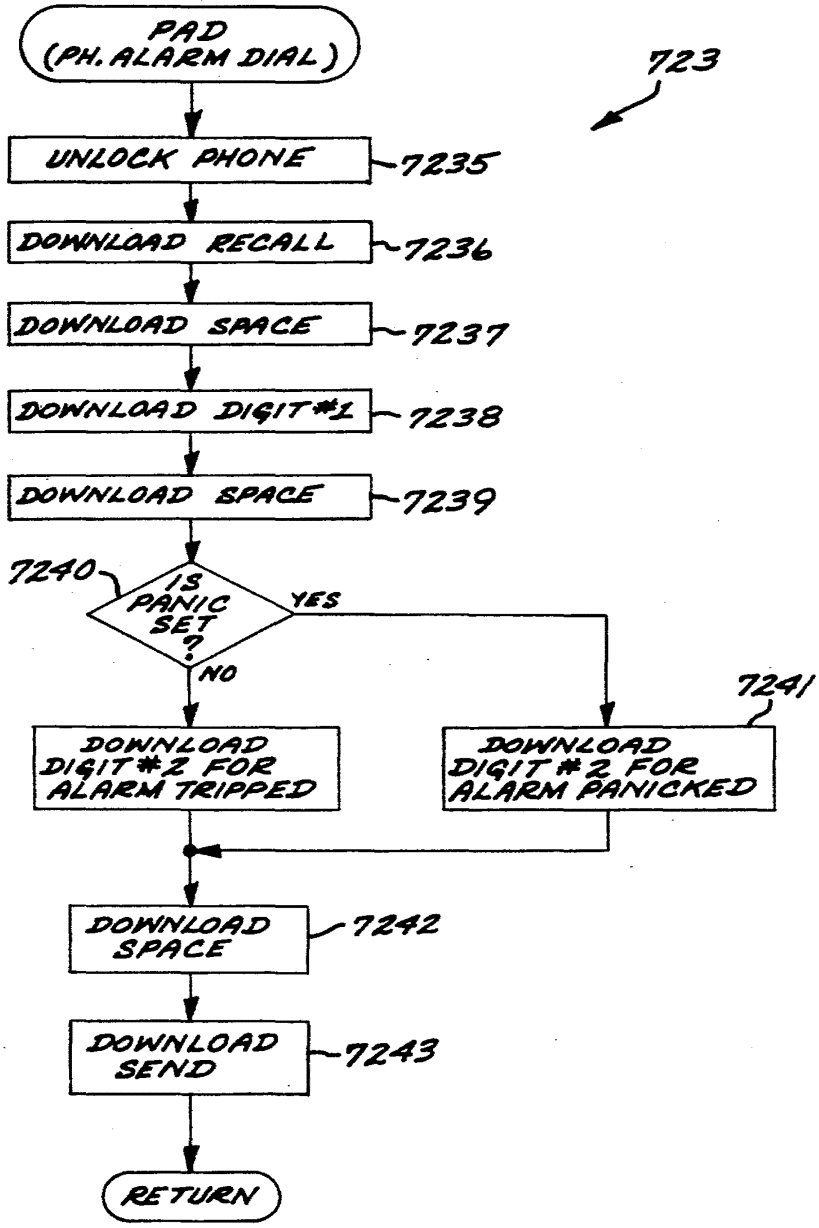

PAD
(PH. ALARM DIAL)
723
UNLOCK PHONE
7235
DOWNLOAD RECALL
7236
DOWNLOAD SPACE
7237
DOWNLOAD DIGIT #1
7238
DOWNLOAD SPACE
7239
7240
IS PANIC SET ?
YES
NO
7241
DOWNLOAD DIGIT #2 FOR ALARM TRIPPED
DOWNLOAD DIGIT #2 FOR ALARM PANICKED
DOWNLOAD SPACE
7242
DOWNLOAD SEND
7243
RETURN

FIG. 10(i)

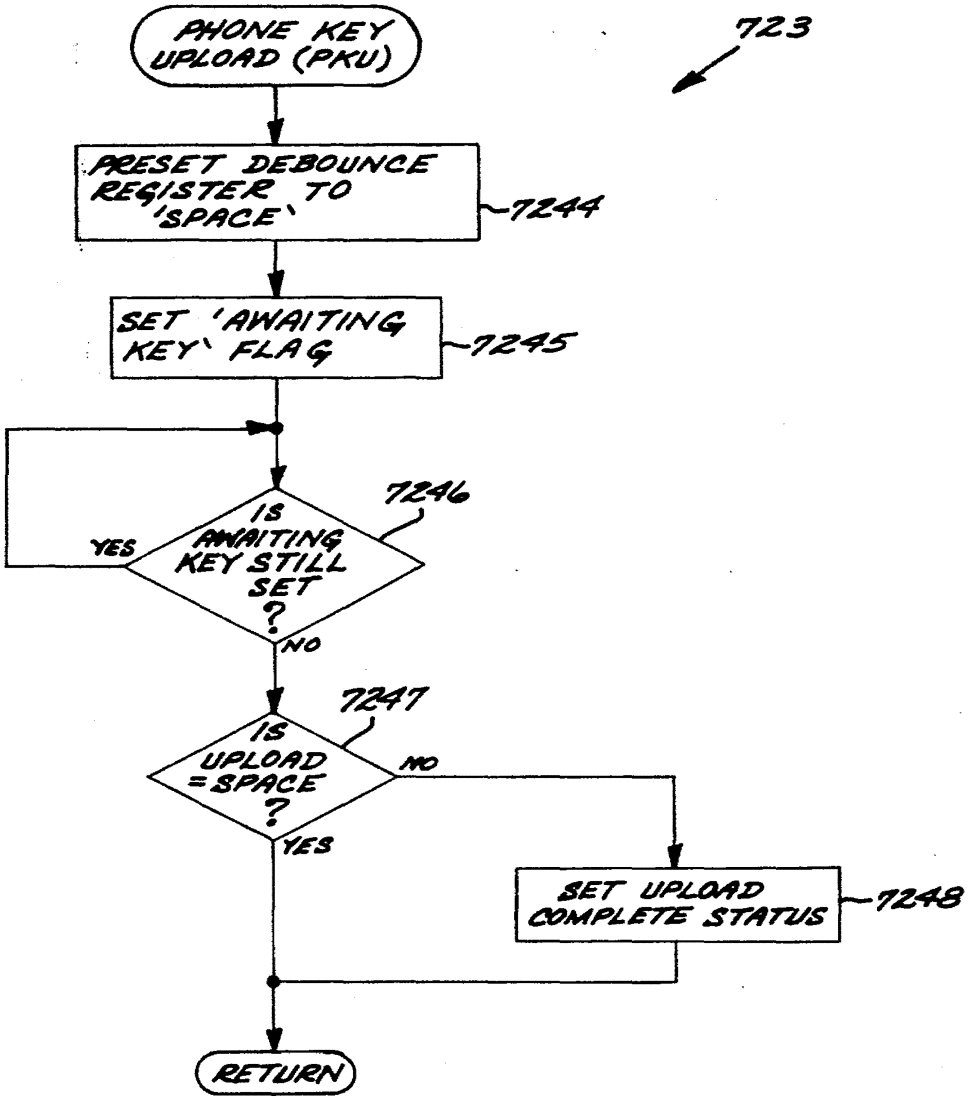

PHONE KEY UPLOAD (PKU)
723
PRESET DEBOUNCE REGISTER TO 'SPACE'
7244
SET 'AWAITING KEY' FLAG
7245
7246
IS AWAITING KEY STILL SET ?
YES
NO
7247
IS UPLOAD = SPACE ?
NO
YES
SET UPLOAD COMPLETE STATUS
7248
RETURN

FIG. 10(j)

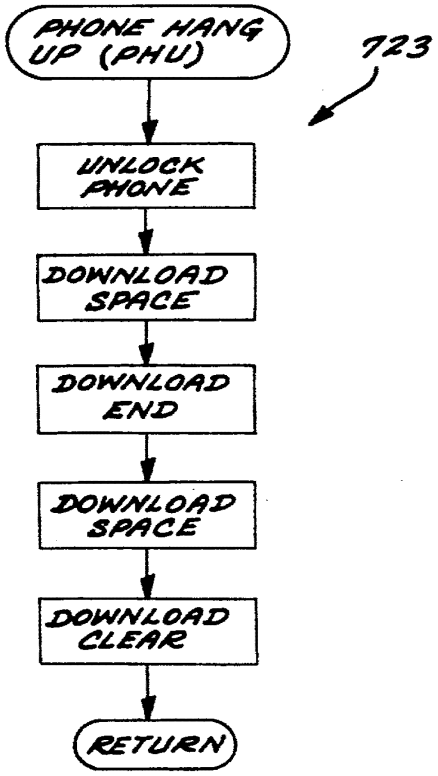


FIG. 10(k)

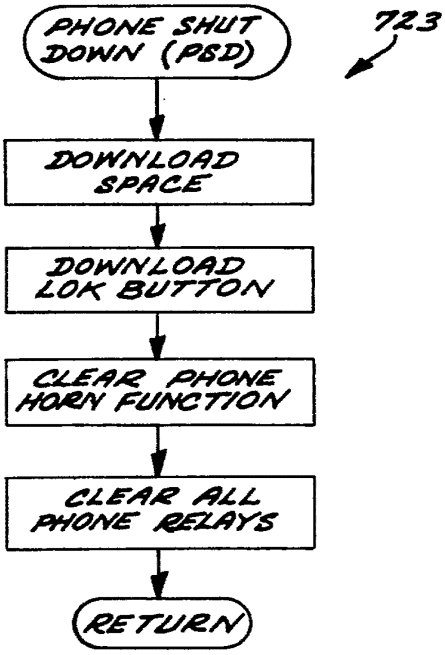


FIG. 10(l)

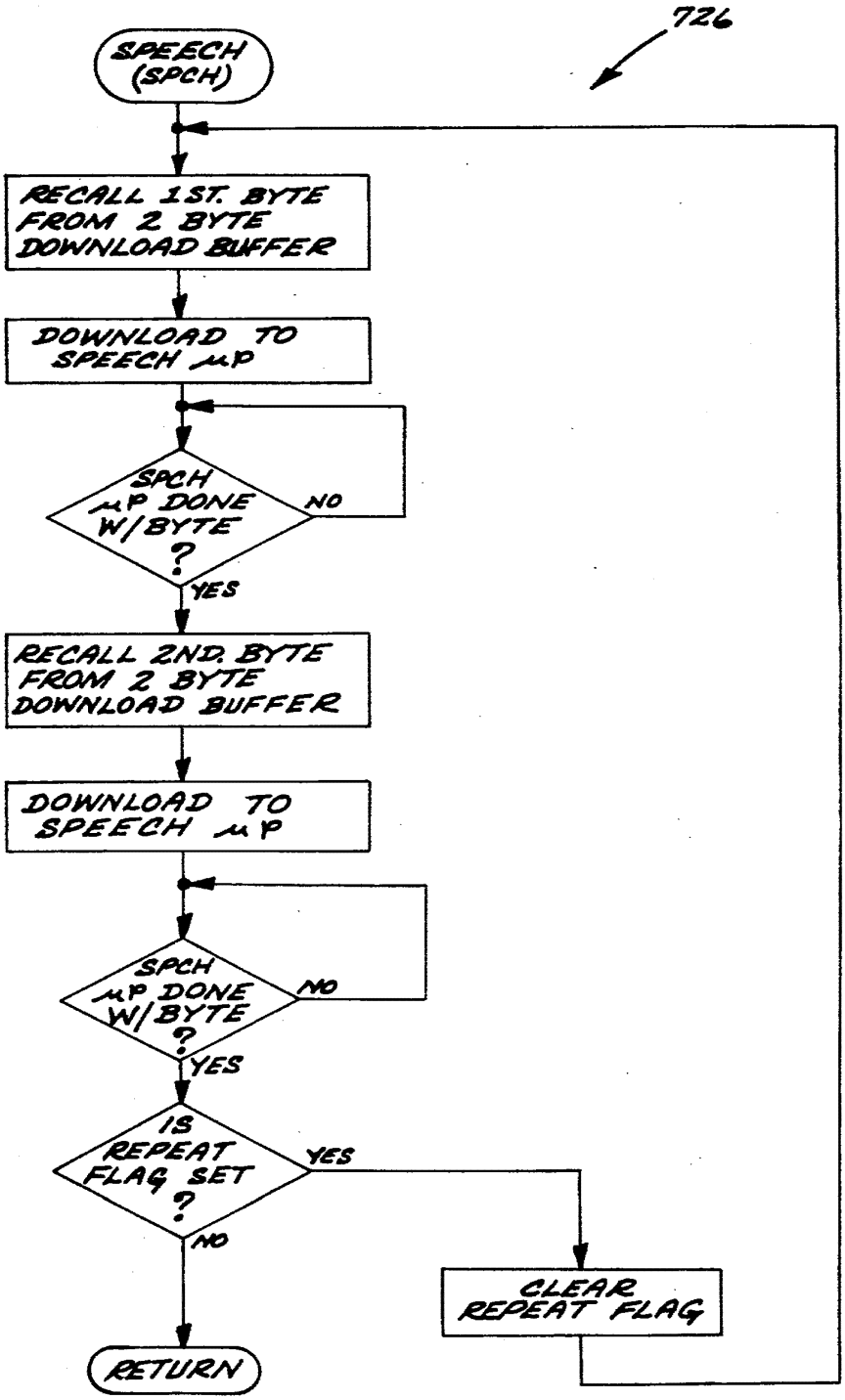

726
SPEECH (SPCH)
RECALL 1ST. BYTE FROM 2 BYTE DOWNLOAD BUFFER
DOWNLOAD TO SPEECH μP
SPCH μP DONE W/BYTE ?
NO
YES
RECALL 2ND. BYTE FROM 2 BYTE DOWNLOAD BUFFER
DOWNLOAD TO SPEECH μP
SPCH μP DONE W/BYTE ?
NO
YES
IS REPEAT FLAG SET ?
YES
NO
CLEAR REPEAT FLAG
RETURN

FIG. 10(m)

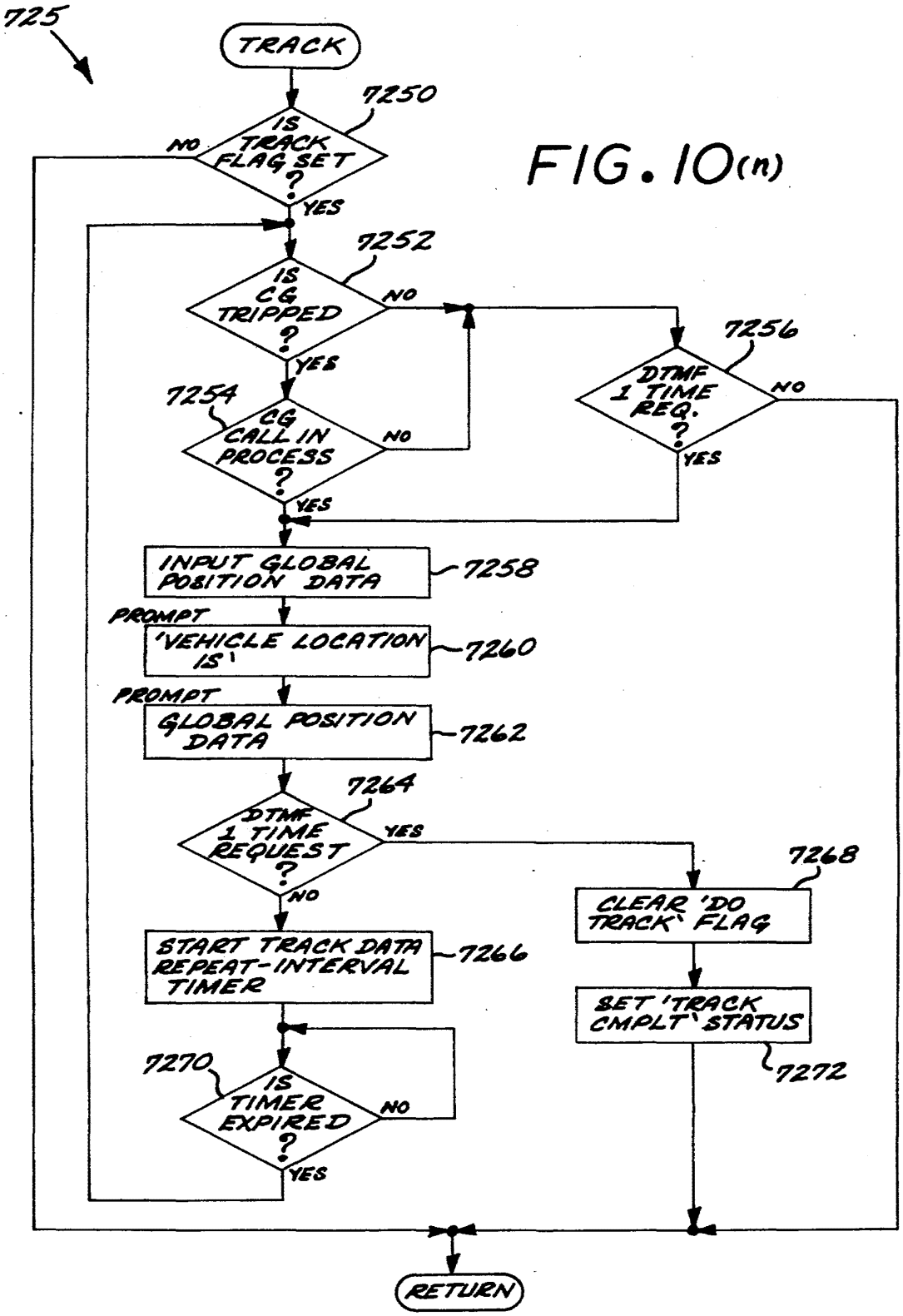

725
TRACK
7250
IS TRACK FLAG SET ?
NO
YES
7252
IS CG TRIPPED ?
NO
YES
7254
CG CALL IN PROCESS ?
NO
YES
7256
DTMF 1 TIME REQ. ?
NO
YES
INPUT GLOBAL POSITION DATA
7258
PROMPT 'VEHICLE LOCATION IS'
7260
PROMPT GLOBAL POSITION DATA
7262
7264
DTMF 1 TIME REQUEST ?
YES
NO
7268
CLEAR 'DO TRACK' FLAG
SET 'TRACK CMPLT' STATUS
7272
START TRACK DATA REPEAT-INTERVAL TIMER
7266
7270
IS TIMER EXPIRED ?
NO
YES
RETURN

FIG. 10(n)

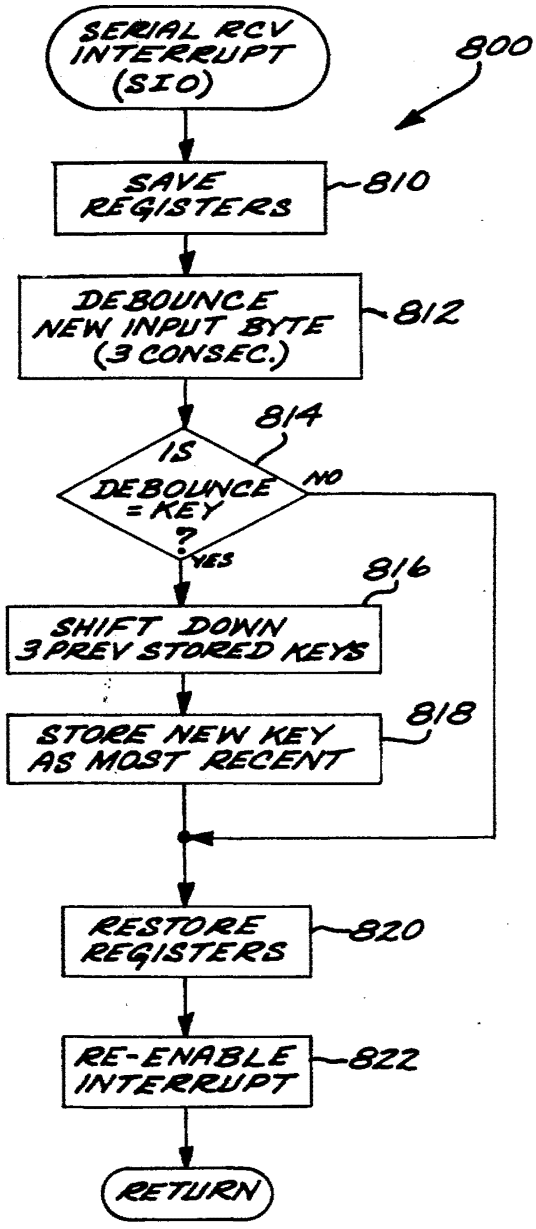

SERIAL RCV INTERRUPT (SIO)
800
SAVE REGISTERS
810
DEBOUNCE NEW INPUT BYTE (3 CONSEC.)
812
814
IS DEBOUNCE = KEY ?
NO
YES
816
SHIFT DOWN 3 PREV STORED KEYS
STORE NEW KEY AS MOST RECENT
818
RESTORE REGISTERS
820
RE-ENABLE INTERRUPT
822
RETURN

FIG. 11

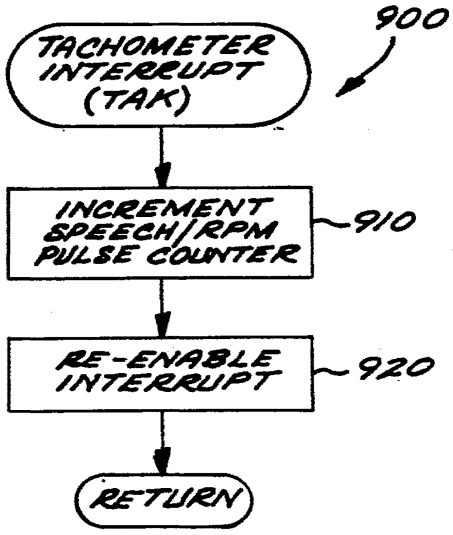

TACHOMETER INTERRUPT (TAK)
900
INCREMENT SPEECH/RPM PULSE COUNTER
910
RE-ENABLE INTERRUPT
920
RETURN

FIG. 12

SYSTEM FOR INTEGRATING A CELLULAR TELEPHONE WITH A VEHICLE SECURITY SYSTEM

This is a continuation-in-part of application Ser. No. 07/345,654, filed 5-1-89, (Abandoned) entitled "System for Integrating a Cellular Telephone With a Vehicle Security System".

BACKGROUND OF THE INVENTION

The present invention relates to cellular telephone systems, automobile security systems and associated apparatus.

Cellular telephone usage has grown rapidly in recent years out of a recognition of the value of ambulatory voice and data communication capabilities. There has been an associated growth in products and services related to the cellular telephone. Many manufacturers have introduced and continue the introduction of a myriad of cellular telephones with varied features, functions and protocols. Presently, with an appropriate interface, a cellular telephone may be interconnected to a facsimile machine, an answering machine, or an autodialer to name a few. While the capability of the typical cellular telephone system has grown, cellular telephones have not heretofore been adequately adapted to enhance the security of the host vehicle. This task has remained almost exclusively in the province of vehicle security systems.

Vehicle security systems have been available for a longer period of time relative to cellular telephones. Nonetheless, vehicle security systems have also grown in capability and sophistication in recent years. For example, systems currently on the market provide for remote arming and disarming of the alarm, locking and unlocking of the vehicle's doors, controlling the windows, or opening the trunk. An exemplary security system is described in U.S. Pat. No. 4,887,064. However, the remote capability of a typical conventional security system is limited. These remote controls have a typical operating range of less than one hundred yards since they generally rely on a radio or infrared link of very limited range. Further, these systems generally provided simple on, off, or status indications, yet there are many situations that require a broader, more versatile, and more powerful communication link.

U.S. Pat. Nos. Re 32,856, reissued Feb. 7, 1989, to Millsap et al.; 4,809,316 issued Feb. 28, 1989, to Namekawa; and 4,821,309, issued Apr. 11, 1989, to Namekawa show systems integrating cellular telephone systems with alarm systems. Millsap's system is adapted to provide an alarm system for protected premises at a fixed location and is therefore not applicable to vehicle protection. The Namekawa systems require the use of a proprietary cellular telephone system and therefore do not allow for use with cellular telephones manufactured by others. Thus, none of the large variety of cellular telephone systems already installed in vehicles will readily accept the system described in U.S. Pat. Nos. 4,809,316 and 4,821,309.

Thus, there is a need in the art for a versatile cellular security system which is compatible with a wide variety of cellular telephones.

SUMMARY OF THE INVENTION

The need in the art is addressed by the present invention which provides a system that interfaces between a variety of vehicle security systems and most cellular communication systems whether already sold and installed in vehicles or yet to be marketed. The system includes a system controller and an interfacing arrangement. The interfacing arrangement includes a first library, stored in memory, having a plurality of unique translation tables corresponding to the protocols of a plurality of unique cellular communication systems. The interfacing arrangement further includes an initializing capability for selecting an operating protocol for the interfacing system from the first library means which is compatible with the protocol of the cellular communication system. The library may be updated by adding to it the protocol of new cellular communication systems as they become available. Hardware and software are included for interfacing the vehicle security system to the controller and for interfacing the controller to the vehicle. In a specific embodiment, the selection of the desired cellular telephone type or make is made from the keypad of the cellular telephone by spelling the telephone type in English via the telephone keypad's buttons.

Other features of the system include an ability to expand and update the system's library with a protocol of new types and models of cellular phones. The system further includes means for starting the vehicle engine and verifying the engine's status from any direct dial telephone anywhere in the world. Another feature enables the vehicle's owner to telephone the vehicle once it has been discovered that the vehicle has been stolen and stop the engine. If the vehicle is being driven while the command to stop the engine is received, the command will be registered. However, the execution of the command will take place only when the engine's RPM or vehicle speed are below a preset level, at which point the engine will be disabled and the lights will flash. The system further includes means to electronically lock the telephone keypad preventing an intruder from interrupting or terminating any incoming or outgoing command or calls.

Another feature allows the owner to listen in or have a two-way voice communication with an intruder, even though the telephone's handset is resting in its cradle. Another feature of the system enables the vehicle's owner to call the system from any direct dial telephone in the world and program into the system either a pager number or a telephone number at which the owner can be reached and notified in case of intrusion into the vehicle.

Another feature of the invention activates a navigation system when the alarm is triggered and repeatedly transmits at certain time intervals over the communication system the coordinates identifying the vehicle location.

Another feature of the invention provides synthesized voice guiding and prompting for the operation and control of the system. Another feature of the invention provides for programming through the cellular telephone keypad such features as entry delay, valet mode enabling, horn sounding and sound loudness control. These and other features and advantages will become more apparent from the following description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the present invention will become more apparent from the following detailed description of an exemplary embodi-

ment thereof, as illustrated in the accompanying drawings, in which:

FIG. **1** is a simplified block diagram of the system for integrating a communication system with a security system of the present invention.

FIG. **2**(*a*) is a top level flow diagram of the foreground routines of the program of the present invention.

FIG. **2**(*b*) is a top level flow diagram of the background routines of the program of the present invention.

FIG. **3**(*a*) is a flow diagram of the Initialization routine of the program of the present invention.

FIG. **3**(*b*) is a flow diagram of the Telephone Set-Up subroutine called by the Initialization routine of the program of the present invention.

FIG. **4**(*a*) and **4**(*b*) are flow diagrams of the State Control Module of the program of the present invention.

FIG. **4**(*c*) through **4**(*h*) are flow diagrams of the subroutines called by the State Control Module of the program of the present invention.

FIG. **5** is a flow diagram of the Idle foreground routine of the program of the present invention.

FIGS. **6**(*a*) and **6**(*b*) are flow diagrams of the Receive foreground routine of the program of the present invention.

FIG. **7** is a flow diagram of the Arm foreground routine of the program of the present invention.

FIGS. **8**(*a*) through **8**(*e*) are flow diagrams of the Outgoing foreground routines of the program of the present invention.

FIGS. **9**(*a*) through **9**(*l*) are flow diagrams of the Program foreground routines of the program of the present invention.

FIGS. **10**(*a*) and **10**(*b*) are flow diagrams of the Periodic Timer background routine of the program of the present invention.

FIGS. **10**(*c*) through **10**(*m*) are flow diagrams of the subroutines called by the Periodic Timer background routine of the program of the present invention.

FIG. **10**(*n*) is a flow diagram of the tracking background routine of the program of the present invention.

FIG. **11** is a flow diagram of the Serial Telephone Receiver Buffer background routine of the program of the present invention.

FIG. **12** is a flow diagram of the Tachometer background routine of the program of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Illustrative embodiments and exemplary applications will now be described with reference to the accompanying drawings to disclose the advantageous teachings of the present invention.

Hardware

FIG. **1** is a simplified block diagram of the system for integrating a communication system with a security system of the present invention. In the preferred embodiment, the system **10** is adapted for use with a cellular telephone system **12**. The system **10** is interposed between the handset unit **14** and the transceiver **16** of the cellular telephone system **12**. That is, the cable **18**, which would ordinarily connect the handset **14** to the transceiver **12**, is connected to a cable breakout or terminating strip **19**. Cable breakout **19** includes relays and other switching elements for providing digital and audio interfacing. A second cable **22** is connected between the cable breakout **19** and the transceiver **16**. The cables **18** and **22** are terminated at the cellular ends with connectors to fit various cellular telephone types. The transceiver **16** is connected to a conventional cellular telephone antenna **24**. The cellular telephone communication link passes through the system **10** unimpeded while the system **10** is idle. When the system **10** is active, it utilizes audio and digital signals from the cellular system **12** and generates audio and digital signals thereto.

The system **10** includes a controller **20** which, in the preferred embodiment, is implemented with a microprocessor. As discussed below, the cable breakout **19** provides interconnection of the cellular telephone system **12** to the controller **20** via plural interface units including a dual tone multiple frequency (DTMF) decoder **26**, a call-in-progress interface **28**, an external telephone interface **30**, and an external speech interface **32**. The DTMF decoder **26** is connected to the cable breakout **19**. The DTMF decoder **26** is a commercially available device, such as a type CD22204 IC chip, which decodes touch tones from the cellular system **12**. The call-in-progress interface **28** detects ringing, busy signals, etc. The call-in-progress interface **28** is also a commercially available device, such as a type NE5900 IC chip. The external telephone interface unit **30** listens for audio in both directions, detects the telephone on/-off status, and provides access thereto for the controller **20**. The unit **30** also performs the functions of signal level conversion, buffering and filtering. The external telephone interface unit **30** also provides access for sending digital commands from the system **10** to the cellular transceivers so that the system **10** may command operation of the telephone. An external speech interface **32** cooperates with a speech synthesizer **34** to provide audio from the synthesizer on command after receiving digital output from the controller **20**. The external speech interface **32** also outputs to an external speaker (not shown). The external telephone and speech interfaces **30** and **32**, respectively, and the speech synthesizer **34** are constructed using commercially available devices.

Inputs from a conventional vehicle security system **13**, from a host vehicle (not shown), and from a global positioning tracker (not shown) are received by the system controller **20** via level conversion and filtering circuits **36**. As may be necessary for a particular input, the level conversion and filtering circuits **36** filter, convert from analog-to-digital, and adjust the level of the signals received from the vehicle and its security system in a manner well known to those of ordinary skill in the art. Thus, from the vehicle, the system controller **20** of the illustrative embodiment of FIG. **1** receives: 1) TACH signal which indicates the rate of revolution of the engine or speed of the vehicle; 2) an IGNITION input which depends on the state of the vehicle ignition switch or accessories switches; 3) a DOOR TRIGGER input from the door switch which indicates whether it is open or closed; and 4) a HORN signal which represents the state of the horn relay of the vehicle. Likewise, from the security system, if any, the system controller **20** receives ARM, SIREN and LED (light emitting diode) signals. Additionally, an input system **10** kill override exists so that a separate auto accessory designed by the assignee of this invention, a remote vehicle starter system, may work in conjunction with the system **10**, while not interfering with or reducing the system **10** in any

way. This input allows the remote starter system to start the car while the system **10** prevents the ignition switch from doing so.

The TACH signal may simply take the form of a signal indicating pulses from the ignition system coil or a spark plug. Alternative arrangements can provide tachometer or speedometer readout signals, for example.

The tracking data input is provided by a global positioning system (such as LORAN or TRAVELPILOT by Blaupunkt) so that, upon demand, e.g., when the security system is tripped or position data is requested by the user via a touchtone telephone, the system **10** processes the tracking data (translates the electronic inputs to a location on a map using a lookup table or other suitable technique) and outputs its location via a voice synthesizer.

The external interface **38** performs a similar functions as the level conversion and filtering circuits **36**. That is, the external interface **38** converts the digital (CMOS) signals, e.g., 5 volts, from the controller **20** to signal levels necessary for the vehicle and the cellular telephone system **12**, e.g., 12 volts. Through the external interface, the controller **20** sends REMOTE STARTER signals to start the engine if the vehicle is so equipped; an ENGINE KILL signal to disable the engine; a HAZARD LIGHTS signal to activate the hazard lights; and a telephone ignition sense signal to activate and deactivate the cellular telephone system **12**. The system **10** may be set up to send and receive other signals without departing from the scope of the invention.

The system **10** also includes a memory **40**, a real time clock **42**, and a power supply **44**. The clock **42** has battery backed-up memory in which engine kill status is stored to maintain the engine in a disabled state in the event the vehicle battery or power is removed from the system **10** and then reinstated. Other selected data is also locked up (stored in the clock memory) as required for operation of the system. Particularly, as discussed more fully below, the telephone type is stored in the clock memory.

In the illustrative embodiment, the memory is implemented as a conventional programmable read-only memory or PROM. The PROM **40** also stores certain telephone specific codes as discussed more fully below. As discussed below, the operation of the system **10** is controlled by the controller **20** through the execution of a program **100** stored in the PROM **40**. In the best mode, the program is written in assembly language.

Software

FIGS. **2**(*a*) and **2**(*b*) provide top level flow diagrams of the program **100** of the present invention. The program includes a number of executive (foreground) routines **110** shown in FIG. **2**(*a*) and a number of utility (background) routines **120** shown in FIG. **2**(*b*). The executive routines **110** are selected by a State Control Module (STCM) **160** and include Idle **200**, Receive **300**, Arm **400**, Program **500**, and Outgoing **600** foreground routines. The utility routines **120** run in the background of the executive routines **110** and include periodic timer (TICK), serial telephone buffer (SIO), and tachometer (TAK) subroutines **700**, **800**, and **900**, respectively.

As shown in FIG. **2**(*a*), the program starts with an initialization routine **130**. The initialization routine is shown in greater detail in FIG. **3**(*a*). As is evident from FIG. **3**(*a*), the initialization routine **130** includes dedicated subroutines **134–150** (even numbers only), **151**, and **152–156** (even numbers only) for setting up the program stack pointers (**134**); setting up RAM vector register (**136**); setting up configuration registers in the controller **20** (**138**); initializing timers, ports and random access memories (RAM) (**140**); initializing the speech synthesizer **34** (**142**); initializing the call-in-progress circuit **28** (**144**); initializing the external output buffer **38** (**146**); initializing the real time clock **42** (**148**); setting up user programmable defaults (**150**); performing telephone set-up (discussed below) (**151**); setting the State Control Module (discussed below) in an idle state (**152**); and enabling interrupts (**154**) respectively.

A particularly novel aspect of the invention is the provision of a library within which translation tables are provided for the protocols of a wide variety of specific, typically unique, cellular telephone communication systems. The telephone set-up subroutine **151** of the initialization routine **130** selects an operation protocol for the interfacing system from the library which is compatible with the protocol of the host cellular communication system. Reference is now made to the Telephone Set-Up routine **151** illustrated in the flow chart of FIG. **3**(*b*) for the following description of the telephone set-up process:

1. First the system **10** is rapidly initialized to a known state at **1510** so that the user sees no transitory aberrations in the operation of the vehicle, telephone, and/or security system.

2. Next at **1512**, the system **10** checks to see if a telephone is attached and turned on. If a telephone-on condition is detected, the system **10** assumes that the telephone type has been previously set and so jumps to **1526** (step #6 below).

3. At this point (**1514**), since the telephone-off condition was detected, the system **10** prompts "Enter Your Cellular Telephone Type" **1516** via the speech synthesizer **34** and looks for a response from the telephone keypad. Since at this point, the system **10** does not know what telephone protocol to use and therefore does not know how to interpret telephone key codes, it looks only at the telephone DTMF tones for identification of each key, see **1518**. Examples of legitimate entries are OKI6, equivalent to 6546 (for OKI model 600 series telephones) or NOVA, equivalent to 6682 (for all Novatel telephones).

4. If no response is detected that matches any one of the telephone protocols currently in the library, after a pause of five seconds, the program goes back to Step #3 (**1514**) above.

5. When the system **10** detects a response that matches one of the library possibilities, it first stores the corresponding telephone type in the Real Time Clock nonvolatile memory at **1520** and then responds with the prompt "Entry Accepted" via the speech synthesizer **34** at **1522**.

6. Next, at **1524**, the pointers for the proper telephone library segment are set and at **1528** the timers and serial input/output routines are reinitialized (reconfigured) for the specific telephone type.

7. The balance of the initialization routine is then processed at **1530**.

The above initialization telephone set-up process is necessary to identify the proper telephone type and key code library vector. However, once the program has identified the telephone to be used, it need not be set again, even if the system has been powered down and reset, until a different telephone type is to be used. To

change telephone types, the existing telephone cable set is replaced with a set specific to the new telephone type and the telephone set-up procedure described above is followed.

The initialization routine **130** then activates the State Control Module **160** (see FIG. **2**(*a*). As shown in FIGS. **4**(*a*) and **4**(*b*), the State Control Module **160** is the highest of the executive level routines **110**. It decides the mode or state of the system **10** by activating the appropriate routine, e.g, Idle **200**, Receiver **300**, Arm **400**, Program **500**, and Outgoing **600**. As shown in FIGS. **4**(*a*) and **4**(*b*), the State Control Module **160** begins by checking a data fresh flag at a decision point **164**. Initially, the flag is not set so the routine waits in a loop. Eventually, e.g., every 10 milliseconds, an interrupt or tick will be sent from the periodic timer **700**. The controller **20** then executes the low level utilities, i.e., it takes care of the telephone, lights, reads and processes tracking data as necessary, updates utilities, status flags, etc. The controller **20** then sets a data fresh flag and returns to the STCM module **160**. Now, with a fresh input data, the STCM module **160** then calls several dedicated subroutines to test for alarm tripped or panic state (**166**), to check LED diagnostics from the vehicle security system **13** (**168**), to check for a need for automatic shutdown after the user has inadvertently left the telephone activated (**170**), to execute a passive engine kill (**172**), and at **167** to call the SEC subroutine **167** (FIG. **4**(*h*) to determine if the proper unlock code has been received **1671**. If so, it clears the engine kill (**1672**), stops any flashing lights (**1673**), releases telephone control (**1674**), and sets the STCM state (register) to IDLE (**1675**). The STCM module **160** (FIG. **4**(*a*)) then calls one of the foreground routines depending on the state of the STCM register which is set as required from within the foreground (and occasionally its background) routine.

The routine TRPPD is shown in FIG. **4**(*c*), and commences with an interrogation of the ARM signal from the security system (**1661**). If the ARM signal is not active, then the "wait for door open" flag WFDO is cleared (**1662**), and the siren signal from the security system is checked (**1663**). If the siren is not sounding, operation returns. If the siren is sounding, then the TRIPPED flag is cleared (**1664**), the PANIC flag is set (**1665**), and the STCM register is set to GON (**1666**), before operation returns. If the ARM signal is active, then the flag WFDO is checked (**1667**). If the flag is set, then if the door is not open (**1669**) (determined by checking the door trigger status), operation returns. If the door is closed, operation returns. If the door is open, the STCM register is set to GON (**1673**) and operation returns. If the flag WFDO is not set at **1667**, the siren signal is checked (**1668**), and if not sounding, operation returns. If the siren is sounding, then the flag PANIC is checked (**1670**), and if the flag is set, the STCM variable is set to GON (**1673**) and operation returns. If the PANIC flag is not set, the TRIPPED flag is set (**1671**) and the call timing is tested (**1672**). If "call immediate" is set, the STCM register is set to outgoing (**1673**) and operation returns. If "call immediate" is not set (**1672**), the WFDO (wait for door open) flag is set (**1674**) and operation returns. If the siren is not sounding back at **1668**, operation returns.

FIG. **4**(*d*) illustrates the routine DIAG, used in conjunction with security systems equipped with a diagnostic function; one such system is described in U.S. Pat. No. 4,887,064. At **1681**, the LED signal status from the security system is checked, and if not set, operation returns, since there is no diagnostic information available. If the LED signal status is set, then a variable DISARM CHIRP STATUS is checked (**1682**), and if set to one, then at **1683**, the variable ARM CHIRP is checked to see if it is zero. If so, operation proceeds to **1685**. If not, then the variable ARM CHIRP status is checked for equivalence to four, and if equivalent, the active identification code corresponding to the LED signal status is found from a lookup table (**1686**). If a flag SPCH DIAG OUTPUT has been enabled (**1688**), then a speech synthesized prompt is issued, pointed to by the LED/chirp identification code (**1689**). Next, the flag KILL is checked (**1690**, and if active, a synthesized speech prompt is issued "engine is disabled" (**1692**). At **1685**, the tripped sensor or trigger identification code is found from a lookup table before operation proceeds to **1688**. If the ARM CHIRP variable does not equal four at **1684**, then the variable must equal two (**1687**) and operation proceeds to **1690**.

FIG. **4**(*e*) illustrates the ASD (automatic telephone shutdown) routine. At **1701**, if the system **10** is not controlling the telephone, e.g., if the system **10** is in the idle routine, then the call-in-progress interface **28** is checked to determine whether voice has been detected (**1703**). If not, operation returns. If the interface system is controlling the telephone, then at **1702** a voice timer is cleared, and operation returns. At **1703**, if voice is detected, then the voice timer is started (**1704**), the VOICE DETECTED flag is cleared (**1705**), and operation proceeds to determine if the telephone switch is off (**1706**). If it is off, then the voice timer is cleared (**1707**) and operation returns. If the switch is on, the the voice timer is checked (**1708**), and if it has reached its maximum state, operation returns if the telephone switch is off (**1709**). If the switch is on, operation returns if the vehicle ignition switch is off (**1710**). If the ignition switch is not off, then at **1711**, the telephone is electronically hung up, locked and powered down. If the voice timer has not reached its maximum (**1708**), then at **1712** if voice is detected, the voice timer is restarted (**1716**), the VOICE DETECT flag is cleared (**1717**), and operation loops back to **1706**. If voice is not detected (**1712**), a fresh decision is made as to whether the interface system is now controlling the telephone (**1714**) and if not, the END button of the telephone is checked and if it has been depressed (**1718**), the voice timer is cleared (**1715**) and operation returns. If the system is controlling the telephone, the voice timer is cleared (**1715**) and operation returns.

FIG. **4**(*f*) illustrates the PSVKLE routine, the valet mode (passive kill) routine. If this feature is not enabled (**1721**), operation branches to node PSV2. Otherwise the flag MAN/PSV KILL is checked (**1722**) and if set, the flag DO ENTRY DELAY ONCE is checked (**1723**). If this flag is not set, operation returns. If the flag is set, then the door trigger signal is checked until an edge is detected (**1724**), when the entry delay time is started (**1725**). The timer is checked (**1726**) and if timed out, the DO ENTRY DELAY ONCE flag is cleared (**1730**) and operation returns. If the delay timer has not expired, the ignition switch signal is checked (**1727**) and if the ignition-on edge (transition) is not detected, operation loops back to **1726**. If the transition is detected, the flag ENGINE KILL is cleared (**1728**), the flag MAN/PSV KILL is cleared (**1729**), and operation proceeds to **1730**. Returning now to **1722**, if the flag MAN/PSV KILL is not set, the routine PSVI is called

(1732) and operation loops back to 1731. If the flag is set, then at 1733 the door trigger signal is checked (1733), and if the door is not open, the routine PSVI is called (1734), and operation loops back to 1733. Once the door has been opened, it is checked to determine if the door has now closed (1735); if not, the routine PSVI is called (1736) and operation returns to 1735. Once the door has closed, the thirty second exit delay is started (1737), and once the exit delay timer has expired (1739), the flags MAN/PSV KILL and DO ENTRY DELAY ONCE are set (1739 and 1740) and operation returns. If the delay timer has not expired, the door trigger is checked to see if the door has been reopened (1741) and if so, operation loops back to 1735. If not, the routine PSVI is called (1742) and operation loops back to 1738.

FIG. 4(*g*) illustrates the routine PSVI called from the routine PSVKLE. At 1743, the flag IG ON EDGE is checked and if set, the software accounts for not returning from the PSVI call (1747), the flags PASSIVE KILL and the associated timers are cleared (1748), and operation proceeds to node PSV3 (FIG. 4(*f*)). If the flag IG ON EDGE is not set, then the flag MAN/PSV is checked (1744) and if set, the software accounts for not returning from the PSVI call (1746) and operation returns. If the flag is not set (1744), then the ARMED signal is checked (1745) and if set, operation proceeds to 1746. Otherwise, operation returns.

The Idle routine 200 is shown in detail in FIG. 5. Basically, the Idle routine 200 checks for the use of the telephone system 12 by the user. If the telephone is in use (210), it maintains the system 10 in an idle state. If the telephone is not in use, the routine checks for arm (212), program mode request (126), and time to turn on telephone (220) indications. If any of these singals are present, the STCM register is set accordingly and control is returned to the STCM module 160.

If the STCM resister is set to RCV, that is, if it is time to turn on the telephone 12, the Receive routine 300 is called by the State Control Module 160. The Receive routine 300 is shown in FIGS. 6(*a*) and 6(*b*). Basically, this routine is called during preprogrammed time periods to allow the user to remotely access the system 10. For a predetermined time during these periods, the Receive routine 300 sets the cellular telephone conventional horn function (310) and waits for the telephone to ring (314). When the telephone 12 rings, the routine 300 waits for a predetermined ring, e.g., the third ring, to give an occupant an opportunity to answer the telephone (318). It then starts a timer (320) and answers the telephone with a verbal "hello" (322) via the speech synthesizer 34. The REPROG TELEPHONE flag is cleared (323). Next, if thirty minutes has still not expired, the routine 300 waits up to one minute (324, 326, 328) for instruction via DTMF tones regarding engine status (FIG. 6(*b*) at 330, 332, 334), command to reprogram the telephone's outgoing number if the system 10 needs to place a call (337, 339, 341, 343, 345) or output a discrete signal to a user designated option (333, 335), commands to start or stop the engine (336, 338, 340), to give current tracking position (347, 361, 363, 365), or to kill the engine (342, 344, 346). Finally, it clear the timers (348), hangs up the telephone 12 (350), and checks the REPROG TELEPHONE flag (356). If the flag is set, the telephone key data are sent to the telephone (358) and a command is issued to program the telephone memory (360) before turning off, setting the STCM flag to IDLE (354) and returning to STCM module 160. For each user action, the system 10 responds with a verbal acknowledgement.

The DTMF tones generated by the user on a touch-tone telephone to instruct the system 10 during the receive mode in the exemplary embodiment include the following:

COMMAND	FUNCTION
STRT	Remotely starts/stops a remote unit such as the vehicle engine.
STOP	Engine kill (disable)
CHAN	External channel output
RPMS	Engine on/off status
PHON	Reprogram outgoing telephone call number
TRAK	Request vehicle position data

If the STCM register is set to ARM, that is, if the security system is set to the armed mode, the STCM module 160 calls the Arm routine 400. As shown in more detail in FIG. 7, the Arm routine 400 essentially checks to determine if it is time to turn on the telephone 12 in accordance with a preprogrammed turn-on time (412) as discussed above. If so, it turns on the telephone (414), sets the STCM register to RCV (416) and exits. The STCM module 160 then calls the Receive routine 300. If it is not time to turn on the telephone 12, the Arm routine 400 checks the state of the ARM flag (418). If the ARM flag is not active, the Arm routine 400 sets the DISARM flag (420) and sets the STCM register to IDLE (422). If it is not time to turn on the telephone 12 and the ARM flag is active, the Arm routine 400 returns.

Bypassing the programming routine 500 momentarily, if there is a need for the system 10 to place a call, that is, if the GON flag is set, the Outgoing routine 600 is called by the STCM module 160. The Outgoing routine 600 is shown in detail in FIGS. 8(*a*)–8(*e*). Basically, the Outgoing routine 600 checks a PANIC flag (610) and sets an engine KILL flag if the PANIC flag is not set (612). The outgoing routine (600) allows the system to place a call if the user is in or near the vehicle and activates a panic function or, if an intruder is present (the security system was tripped), the system disables the engine. The routine 600 then turns on (616) and unlocks (618) the telephone if it is not on (614) and starts a thirty minute timer (620). It then selects and retrieves a number in memory based on whether the PANIC flag is set (622, 624, 626), and dials the selected number (628). The CIP interface 28 is checked in a wait loop for CIP validity (630). Once CIP validity is established and the CIP status is not "busy," operation proceeds to node FF (FIG. 8(*c*)). If the CIP indicates a "busy" signal, operation cation, the telephone is electronically hung up (636). If this was the first call, the REDIAL flag is set and operation proceeds to node HH at FIG. 8(*a*). If this is not the first call, the STCM variable is set to RCV (640) and operation returns.

Referring now to FIG. 8(*c*), once the telephone is answered (646), a voice synthesized prompt message is generated, depending on whether the flag PANIC is set (648). If the flag is set, the prompt is "Emergency" (650); if not set, the prompt is "Intruder detected—push phone * button for two-way communication" (652). An acknowledge timer is then started (654) and operation proceeds to node II (FIG. 8(*d*)) if the timer has reached its maximum value (656). If the timer has not reached its maximum, and the user has not acknowledged the

prompt for two-way communication (658), a test is performed as to whether a pager service is detected (647). If not, operation loops back to 656. If a pager service is detected, then at 649 the flag PAGER PROG CMPLT is cleared, and the flags DO PROG PAGER and PAGER DET are set. Operation then waits (651) until the flag PGR PROG COMPLT is set, at which time operation proceeds to node JJ (FIG. 8(*d*)). Returning now to 658, if the user did acknowledge the two-way communication prompt, then the "telephone on" timer is started (660), the relay is set for two-way communication (662), and the PANIC flag is checked (666). If set, operation proceeds to node PAN1 (FIG. 8(*e*)). If not set, operation proceeds to node JJ if the one minute timer has reached its maximum. If the timer has not reached its maximum, the flag DO TRACK is set (655), and operation "waits" at 653 until the track operation is completed. Operation then proceeds to 660.

At 670 (FIG. 8(*d*)), if the flag REDIAL is not already set, the redial status is set (672) and the telephone is electronically hung up (674) before operation proceeds to node HH (FIG. 8(*a*)). If the flag is set, then the flag TIME FOR PHONE is set (676), the telephone is hung up (678), the STCM register is set to RCV (680) and operation returns.

From the node PAN1 (FIG. 8(*e*)), the PANIC flag is cleared (682), the voice timer is started (684), and the flag for KEY UPLOAD is set (686). At 664, the TRACK routine is called. Upon return, if the upload is complete (668), and the key was the "end" key (692), the redial status is set (695) and operation proceeds to node II (FIG. 8(*d*)). If the key is not the "end" key, the flag KEY UPLOAD COMPLETE is cleared (694), and the flag for KEY UPLOAD is set (696). The flag VOICE PRESENT is cleared (697), the voice timer is restarted (698), and operation loops back to 664. Returning now to 668, if the upload is not complete at this point, the voice timer is checked (690) and if it has reached its maximum, operation proceeds to 695. Otherwise, at 691, if the flag VOICE PRESENT is not set, operation loops back to 664. If the flag is set, operation proceeds to 697.

Thus, as shown in FIG. 8(*c*)–8(*e*), when the telephone is answered, if answered by a digital pager service, upon receiving the pager program tones, the system 10 outputs a predesignated telephone number to the pager and then terminates the call. Otherwise, the routine issues a verbal statement appropriate for the situation and periodically outputs its current location based on tracking data input from a global positioning system. It may be output as speech, DTMF codes, modem mark/space digital data, or any other desired format. If a panic state exists, it allows the user to speak. If an intruder is present, it configures the system to allow the user to talk to the intruder in the vehicle and to disable the engine. Thereafter, for the next 10 times that the intruder turns on the ignition, the cellular telephone will be turned on, the keypad locked out, and the telephone set to receive all incoming calls from its owner.

While the security system is in the "Armed State," the system 10 will not enter the Program mode, preventing unauthorized modification of any system parameters. Furthermore, if the security system is in the "Disarmed" state, before the user may alter any parameters, he must enter his cellular unlock code. As a third tier of security, the system 10 will not allow reprogramming of the cellular unlock code while it has the vehicle engine disabled.

When the system 10 detects no security breach and receives a request from the handset 14 to enter the program mode, the STCM module 160 calls the Program routine 500. As shown in detail in FIGS. 9(*a*)–9(*l*), once the unlock code has been entered (561 through 573) and until a program timer expires (FIG. 9(*b*), (503)), the Program routine 500 provides verbal prompts and acknowledgements which help the user to program or configure the system 10 including, for example, and without limitation: setting the engine RPM threshold or vehicle speed threshold (so that the engine is not disabled at higher RPM or speed) (FIG. 9(*b*)), setting the timing for system 10 outgoing call immediately when an alarm is tripped or after an alarm is tripped and the vehicle door is opened as well (FIG. 9(*c*)), setting the cellular telephone lock for use by the SEC routine 228 (FIG. 9(*d*)), setting the local time (FIG. 9(*e*)), setting any number of telephone turn-on times (FIGS. 9(*e–h*)), setting the polarity of the door trigger (FIG. 9(*l*)), enabling or disabling the security system speech diagnostics function (FIG. 9(*c*)), selecting or deselecting a passive engine disable (for a valet mode) (FIG. 9(*i*)), programming a telephone number to be output should a pager answer the system's (10) outgoing call (FIG. 9(*j*)), programming the system 10 to place itself in an idle state, enabling or disabling horn sounding on incoming calls (FIG. 9(*k*)), to set the system audio level for the user (FIG. 9(*j*)), to set the entry delay before a passive engine disable is set (FIG. 9(*h*) and setting a manual engine disable (FIG. 9(*i*)). If the user needs assistance, the system 10 can prompt the user for assistance programming every feature through a programming menu. The user may opt for the direct access (no prompt) mode in which case the user enters 4 digit mnemonics (e.g., 7767=RPMS).

While in the programming mode, the use selects a particular feature to be programmed by entering a predetermined instruction code via the cellular telephone keypad. In the disclosed embodiment, the following exemplary instruction codes may be employed.

Code	Feature
RPMS	Engine idle speed value.
TRIP	"Tripped" call timing (immediate or delayed until door opened)
DIAG	Synthesized speech for security system diagnostic function
CODE	Program cellular unlock code
TIME	Set current time.
RECX	X = 0–6, to set receive times 1–6 (REC0 clears all stored times)
DLAY	Passive engine disable entry delay.
STOP	Engine disable
AUDX	X = 1–9 for nine different audio levels
PAGE	Record number to be called if pager system answers outgoing call.
HORN	Enable/disable horn ringing when cellular telephone rings.
TRIG	Program door trigger polarity
OFFF	Turn system 10 on/off

The PROG routine 500 is shown in FIG. 9(*a*), and is called from the state control module (FIG. 2(*a*)). At 561, the prompt "Enter unlock code" is issued via the speech synthesizer. The key buffers are cleared (563) and the program timer is started (565). Once the timer reaches its maximum value (567), operation proceeds to node POUT. At 569, operation loops back to 567 until the keypad upload operation is complete, i.e., until the user has completed entering the code. If the entered

code matches a stored code value (571), the prompt "entry accepted" is issued and operation proceeds to node PRG1 (FIG. 9(*b*)). If the code does not match, and the last key was the "end" key, operation proceeds to node POUT. If the last key was not the "end" key, operation loops back to 567 unless the last key was the "clear" key, in which case operation loops back to 561 to repeat the process.

From node PRG1 (FIG. 9(*b*)), the prompt "Waiting for instruction code" is issued (502), and the program timer is checked (503). If the timer is at the maximum value, then at 508 a clock RAM check sum operation is performed, and the prompt "Program mode off" is issued (509). The STCM register is then set to IDLE (510) and operation returns. If the timer has not reached its maximum, a wait stage is entered until a key has been uploaded or the timer reaches its maximum (504, 505). Once the timer reaches its maximum, operation proceeds to node PREX. Once the most recent key has been uploaded, the key is read (506), and if it indicates a request to end the program mode, operation proceeds to 508. If the key is the "clear" key, operation loops back to 502. If the keys uploaded indicate a request to program the RPM or vehicle speed threshold feature (performed while the vehicle engine is idling), the default value is preset (513), and the current engine speed is read by monitoring the TACH signal. A prompt "code accepted" is issued (514), and a threshold value equal to 1.5 times the idle value read from the TACH input is stored in the real time clock memory (516). Operation then proceeds to node ACK. If the keys uploaded do not indicate a request to program the RPM or speed value, operation proceeds to node PRG2.

At node PRG2 (FIG. 9(*c*)), if the keys entered indicate that the tripped call timing feature is to be programmed (517), (i.e., whether the outgoing telephone call made when the security system is tripped is made immediately upon tripping or only after the door is opened) then the default value is preset (518), the prompt "awaiting instruction code" is issued (519). A wait state is entered until another key has been uploaded or the program timer reaches its maximum value (520 and 521). If the program time reaches its maximum value before a new key is uploaded, operation proceeds to node FLT. If the key is the "clear" key (522) and if the key was the first data key (525), operation proceeds to node PRØ (FIG. 9(*b*)). Otherwise, operation loops back to 518. If the key was not the clear key, and if it was a "legal" entry (523), the result (immediate or delay) is stored in the memory (524), and operation proceeds to node ACK. If the entry was not a legal entry, operation proceeds to node FLT. Returning now to 517, if the keys uploaded were not an indication that tripped call timing was to be programmed, if the uploaded keys indicate that the LED diagnostic speech feature is to be enabled/disabled (526), then the status of this feature is toggled (527), and the resulting status for this feature is stored in memory (528). Operation then proceeds to node ACK.

At node PRG3 (FIG. 9(*d*)), if the entered keys indicate a request to program the lock code (529), only if the engine is not disabled (579) will this feature be programmed. If the engine is not disabled, the prompt "awaiting instruction code" is issued (530), and five key values are entered by the user (531–536). The five keys are entered in the memory (537) and the LOK pointer is set (538), before operation proceeds to node ACK.

At node PRG4 (FIG. 9(*e*)), if the entered keys indicate a request to set the local time, the user is allowed to enter values to set the time (540E–546E) via four keys, at which time the values are stored in memory before operation proceeds to node ACK. If the entered keys indicate a request to set the first telephone turn-on time (549E), steps 550E–557E illustrate the sequence of steps performed to enter and store a date in memory. FIGS. 9(*f*)–9(*h*) illustrate the steps to program the second through sixth telephone turn-on times, respectively. Also shown in FIG. 9(*h*) are the steps for programming the passive kill entry delay time (549H–557H). FIG. 9(*i*) shows the steps for programming the valet mode (560, 562, 564, 568, 570, 572, 574, 576) and for activating the manual engine kill (578, 580). FIG. 9(*j*) shows the steps for programming the volume level (585, 587, 589, 591, 593, 595, 597, 599) and for entering a new pager code (583, 603, 605, 607, 609, 611, 613, 615, 617). FIG. 9(*k*) shows the steps for programming the system so that the horn ringing feature is either enabled or disabled. FIG. 9(*l*) shows the steps for programming the polarity of the door trigger recognized by the system.

Now for the utility routines 120. The Periodic Timer routine 700 is shown in FIGS. 10(*a*) and 10(*b*). As mentioned above, the Periodic Timer routine 700 periodically interrupts the execution of the high level routines and performs miscellaneous housekeeping functions. These functions are called by numerous subroutines and provide for a check of the status of the (optional) security system (13), the status of the call-in-progress interface 28 (712), the programming of a pager (713), processing of tracking data (725), the execution of telephone and speech synthesizer service subroutines (723 and 727), and updates of general input/output status (702, 704, 706, 708, 710, 715, 719, 721). The subroutines called by the Periodic Timer routine 700 are shown in FIGS. 10(*c*)–10(*m*).

FIG. 10(*c*) illustrates the steps for updating the chirp status variable which indicates the number of audible chirps generated by the security system via the siren signal. Similarly, FIG. 10(*d*) illustrates the subroutine for updating the security system LED status variable to indicate the number of LED blinks. The number of blanks and chirp provide status and diagnostic information regarding the security system.

FIG. 10(*e*) shows the CIP subroutine for reading and storing the status of the call-in-progress interface 28.

FIG. 10(*f*) shows the pager subroutine 713 which is called when an outgoing call placed by the system 10 is answered by a pager system. If the flag DO PAGER PROGRAMMING is set (7132), the pager number sequence is recalled from memory (7133), and the number sequence is sent to the cellular telephone (7134). An "end" key signal is issued (7135) to terminate the call. The flag DO PAGER PROGRAMMING is cleared (7136), and the flag PAGER PROGRAMMING is set (7138).

FIG. 10(*g*) shows the PKFLSH subroutine for flashing the vehicle parking lights when the security system is tripped.

FIG. 10(*h*) shows the PHONE TURN-ON subroutine for unlocking and turning on the telephone whenever appropriate.

FIG. 10(*i*) shows the PAD subroutine or "phone alarm dial."

FIG. 10(*j*) shows the PHONE KEY UPLOAD subroutine which reads the status of the keys on the telephone keypad.

FIG. **10**(*k*) shows the PHONE HANG-UP subroutine which performs necessary steps to electronically hang up the telephone.

FIG. **10**(*l*) shows the PHONE SHUT DOWN routine turning off the telephone.

FIG. **10**(*m*) shows the SPEECH subroutine for controlling the speed synthesizer to generate the voice messages employed to communicate with the user and vehicle occupants.

FIG. **10**((*n*) shows the TRACK subroutine which is the tracking data routine. If the flag TRACK is set (**7250**), and the interface system has been tripped (**7252**, indicating an intrusion, then once an outgoing call is in progress (**7254**) to the predetermined telephone number, global position data is entered from the external tracking inputs (**7258**), a prompt is issued, for example, "vehicle location is . . . ," and then the prompt ". . . [position data] . . . " is issued (**7262**). This output may be in the form of speech, DTMF signals, modem codes or other format. Then, if the request for tracking data was a one-time request (**7264**), the flag DO TRACK is cleared (**7268**) and the status of the "track complt" variable is set (**7272**) before operation returns. If the request was not a one-time request, the track data repeat-interval timer is stated (**7266**), and a wait loop (**7270**) is entered before operation returns to **7252**.

The serial interrupt and tachometer routines **800** and **900** are shown in FIGS. **11** and **12**, respectively. These routines provide for interrupts to the foreground routines from the keypad of the handset **14** and the vehicle tachometer or other RPM (or speed)-indicating device (not shown).

The program **100** of the present invention has a modular structure within which the executive routines **110** call selected input/output modules as required to perform an operation. For example, to place a call, the following modules (among others) are called: Turn-on **224**, Unlock **618**, Dial **628**, Hang-up **250**, and Horn Alert **310**. Within each input/output module (e.g., Turn-on), the telephone type is checked in the library and the sub-module containing the protocols from the translation table specific to that telephone type is used. Each input/output module contains a series of commands representing either key depressions or telephone responses (to key depressions). For each request to send a key, or receive a key, a subroutine call is made to the telephone key-code library to fetch the appropriate hex code (representing a key depression or release).

At the entry to the telephone library, the telephone type is used to vector to the appropriate telephone key-code translation table. Each translation table consists of a list of possible telephone keys and their corresponding on/off codes. Table I below provides an exemplary key-on table for a cellular telephone. The key-off code may either be the same code for all keys (also shown below for 'key release') or may be derived by adding to, subtracting from, or otherwise processing the 'key-on' code.

TABLE I

```
; MODEL SERIES XX PHONES
PHIKEY: MVI L, OECH ;KEYPAD 'SPACE' CODE
        MVI L, OBDH ;KEYPAD 0 CODE
        MVI L, 08DH ;KEYPAD 1 CODE
        MVI L, OCDH ;KEYPAD 2 CODE
        MVI L, 04DH ;KEYPAD 3 CODE
        MVI L, OEDH ;KEYPAD 4 CODE
        MVI L, 06DH ;KEYPAD 5 CODE
        MVI L, 0ADH ;KEYPAD 6 CODE
```

TABLE I-continued

```
; MODEL SERIES XX PHONES
        MVI L, 02DH ;KEYPAD 7 CODE
        MVI L, 0FDH ;KEYPAD 8 CODE
        MVI L, 07DH ;KEYPAD 9 CODE
        MVI L, 0DDH ;KEYPAD # CODE
        MVI L, 03DH ;KEYPAD * CODE
        MVI L, 01DH ;KEYPAD LOK CODE
        MVI L, 09DH ;KEYPAD END CODE
        MVI L, 086H ;KEYPAD CLR CODE
        MVI L, 0A6H ;KEYPAD FCN CODE
        MVI L, 0A6H ;KEYPAD RCL CODE
        MVI L, 05DH ;KEYPAD SEND CODE
        MVI L, 0C6H ;KEYPAD STORE CODE
        MVI L, 0E9H ;KEYPAD RELEASE CODE
        MVI L, 026H ;KEYPAD ONHOOK
        MVI L, 0F6H ;KEYPAD OFFHOOK
        POP V ;RETRIEVE ACC
        RET ;
```

Thus, a series of tables such as Table I are provided which contain a data segment that can be called from anywhere in the program. A set of variables is used to select the appropriate table for a given telephone type and selected key code within a given table. That is, the selected telephone type sets one variable, e.g., "x," which selects the appropriate table and the software sets a second variable, e.g., "y," to a place in the table to acquire the appropriate code corresponding to a given key for the selected telephone type. Thus, the complete variable expression might take the form x,y. The variables are passed by a suitable routine (not shown). Those skilled in the art will recognize that the table is essentially an assembly language program with the telephone-specific table from which the appropriate key code hex value is returned to the calling subroutine with nonselected codes acting as no-ops. Note that actual cellular key codes are proprietary to the particular manufacturer; this table is representative of a typical table but any correspondence to an actual cellular telephone is purely coincidental.

The tables are stored in a nonvolatile memory such as PROM **40**. In order to update the system **10** with new protocol tables, so that the system will interface with protocols defined after the system is installed, the nonvolatile memory can be changed to a memory in which the new protocol tables have been added.

Operation

The operation of the system **10** of the present invention is essentially set forth in the flow diagrams shown and discussed above. However, exemplary functions which may be performed by the invention are set forth below to illustrate particularly advantageous aspects thereof.

The system may be set to receive incoming calls up to a predetermined number of times per day at user programmable times while the host vehicle is unattended. This allows the user to remotely start and stop the engine, reprogram outgoing telephone numbers stored in the cellular telephone, output an external signal to an accessory of the user's choice, receive engine (off/running) status, request tracking data to identify the location of the vehicle, issue a command to disable the engine and communicate directly with any occupant of the vehicle (e.g., an intruder). See, e.g., FIGS. **6**, **10**(*e*), **10**(*h*), **10**(*k*), **10**(*l*), **10**(*n*) and **12**.

The user can manually issue an engine disable command from the cellular telephone keypad **14** prior to

leaving the vehicle. See, e.g., FIGS. **9**(*a*), **9**(*b*), **9**(*i*) and **12**.

If the security system has been tripped, the system **10** issues an immediate engine disable and makes an outgoing call to a user-designated telephone number. If the telephone call was not completed, the system **10** will try again to place the call. If the call is completed, tracking data (vehicular position) will be periodically output, and the receiving party (user) may communicate with any vehicle occupant. If a pager number is called, upon receipt of the pager program tones, the system **10** will output a predesignated telephone number (previously stored in program mode) and then terminate the call. Thereafter, whenever the ignition is on, the system turns on the telephone system **12** and checks for an incoming call from the user so that the user may communicate with the intruder. See, e.g., FIGS. **4**(*c*), **4**(*d*), **7**, **8**(*a*)–**8**(*e*), **10**(*c*)–**10**(*e*), **10**(*f*), **10**(*g*)–**10**(*i*), **10**(*k*)–**10**(*n*) and **12**.

The system **10** may be programmed to passively kill the engine after an exit delay (triggered by ignition off and door open) has expired. The user can program his entry delay, during which, if the ignition is turned on, the engine disable is cleared; if the delay expires, the disable must be removed by the user with a LOCK security code. See, e.g., FIGS. **4**(*c*), **4**(*f*), **4**(*g*), **5**, **5**(*b*), **7**, **9**(*a*), **9**(*h*), **9**(*i*), **10**(*j*).

The system **10** detects a Panic state and immediately places a call to a user-designated number. It repeatedly verbalizes a programmed statement until stopped by the user when he or she is ready to speak. See, e.g., FIGS. **8**(*a*)–**8**(*e*).

On detection of either panicked or tripped security system status, the vehicle hazard lights are activated and continue to flash until the disable command is cleared. See, e.g., FIG. **10**(*g*).

The system **10** communicates with the user by verbally identifying itself both in the vehicle and over the telephone, acknowledging remote cellular telephone commands, prompting the user through programming steps, if the engine is disabled, notifying the user upon entry to the vehicle, to clear the engine disable, and when used with security systems having LED diagnostics, verbalizing security system status. See, e.g., FIGS. **2**(*b*), **4**(*a*), **4**(*b*), **10**(*a*), **10**(*b*) **10**(*m*) and **11**.

The system **10** provides cellular telephone auto-shutoff when the user is finished with a user-placed call, minimizing telephone charges in case the call was not terminated by the user properly. See, e.g., FIGS. **4**(*e*), **10**(*e*), **10**(*k*), **10**(*l*).

The design of the present system provides a powerful versatile system which allows for the provision of numerous feature including an ability to expand and update the system's library with a protocol of new types of models of cellular telephones. The system further includes means for starting the vehicle engine and verifying the engine's status from any direct dial telephone anywhere in the world. As discussed above, another feature enables the vehicle's owner to telephone the vehicle once it has been discovered that the vehicle has been stolen and stop the engine. (See, e.g., FIGS. **4**(*c*), **6**, **10**(*e*), **10**(*g*), **10**(*h*), **10**(*k*), **10**(*l*), **10**(*n*) and **12**.) If the vehicle is being driven while the command to stop the engine is received, the command will be registered. However, the execution of the command will take place only when the engine's RPM or vehicle speed is below a preset level, at which point the engine will be disabled and the lights will flash. The system further includes means to electronically lock the telephone keypad preventing an intruder from interrupting or terminating any incoming or outgoing command or calls. (See, e.g., FIG. **5**(*b*).

Another feature allows the owner to listen in or have a two-way voice communication with an intruder, even through the telephone's handset is resting in its cradle. (See, e.g., FIGS. **8**(*a*)–**8**(*e*) and **10**(*i*)). Another feature system from any direct dial telephone in the world and program into the system a telephone number at which the owner can be reached and notified in case of intrusion into the vehicle.

As mentioned above, another feature of the invention activates a navigation system when the alarm is triggered and repeatedly transmits at certain time intervals over the communication system the coordinates identifying the vehicle location. Also, the invention provides synthesized voice guiding and prompting for the operation and control of the system. Other features of the invention provide for programming through the cellular telephone keypad such features as entry delay, valet mode enabling, horn sounding and sound loudness control. (See, e.g., FIGS. **4**(*g*), **5**, **6**, **7**, **9**(*a*)–**9**(*l*), **10**(*j*) and **12**).

All user-programmable features are accessed via the user's cellular telephone keypad; no obtrusive hardware need be visible in the passenger compartment. These and other features and advantages will become more apparent from the following description and claims.

Thus, the present invention has been described herein with reference to a particular embodiment for a particular application. Those having ordinary skill in the art and access to the present teachings will recognize additional modification, applications and embodiments within the scope thereof.

It is intended by the appended claims to cover any and all such applications, modifications and embodiments within the scope of the present invention.

What is claimed is:

1. An interfacing system installed in a vehicle for integrating a cellular communication system having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular communication system to said system controller, said first means including:

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular communication systems;

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular communication system; and

a speech synthesizer for generating predetermined voice messages;

second interfacing means for interfacing said security system to said controller; said

means for communicating said voice messages to an occupant of the vehicle;

thereby enabling said security system to be compatible with a variety of cellular communication systems to permit communication between a user and the vehicle security system via said communication system.

2. An interfacing system installed in a vehicle for integrating a cellular telephone communication system

having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller;

first means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular telephone systems;

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system;

second means for interfacing said security system to said controller;

said system controller comprising a digital computer means for executing a computer program and a first memory means for storing a program for execution by said controller, and wherein said program includes a state control module for executing any of a plurality of foreground routines thereby controlling the operating mode of said system for integrating said cellular telephone system with said vehicle security system, said program including a foreground routine for allowing said system for integrating said cellular telephone system with said vehicle security system to be programmed through said cellular telephone system, said program further including a foreground routine for allowing said system for integrating said cellular telephone system with said vehicle security system to place an outgoing telephone call through said cellular telephone; and

means for remotely changing the outgoing call number;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit a communication between a user and the vehicle security system via said cellular telephone system.

3. An interfacing system installed in a vehicle for integrating a cellular communication system with a vehicle security system which is tripped when an alarm condition is detected, said interfacing system comprising:

a system controller comprising means for storing at least one outgoing telephone call number;

first interfacing means for interfacing said cellular communication system to said system controller;

second interfacing means for interfacing said security system to said system controller;

means for interfacing a pager system to said controller; and

means for remotely changing the outgoing telephone call number; and

wherein said controller further comprises means for causing an outgoing telephone call to a stored outgoing call number to be placed in the event the vehicle security system is tripped.

4. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller monitoring the armed status of said vehicle security system and programmable during an interfacing system programming mode to program one or more features;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific translation tables corresponding to the different protocols of a plurality of cellular telephone systems;

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system;

second means for interfacing said security system to said controller; and

means for preventing a user from programming any features while the security system is in the armed state;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit communication between a user and the vehicle security system via said communication system.

5. An interfacing system installed in a vehicle for integrating a cellular telephone communication system with a vehicle security system, said interfacing system comprising:

a system controller;

first means for interfacing said cellular telephone system to said system controller;

second means for interfacing said security system to said controller;

said system controller comprising a digital computer means for executing a computer program and a first memory means for storing a program for execution by said controller, and wherein said program includes a state control module for executing any of a plurality of foreground routines thereby controlling the operating mode of said system for integrating said cellular telephone system with said vehicle security system, said program including a foreground routine for allowing said system for integrating said cellular telephone system with said vehicle security system to be programmed through said cellular telephone system, said program further including a foreground routine for allowing said system for integrating said cellular telephone system with said vehicle security system to place an outgoing telephone call through said cellular telephone; and

means for remotely changing the outgoing call number.

6. An interfacing system installed in a vehicle for integrating a cellular telephone communication system with a vehicle security system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller;

second interfacing means for interfacing said security system to said controller; and

means for preventing an intruder in said vehicle from interrupting or terminating any incoming or outgoing telephone call over said cellular system.

7. An interfacing system installed in a vehicle for integrating a cellular telephone communication system with a vehicle security system, said interfacing system comprising:

a system controller monitoring the armed status of said vehicle security system and programmable

during an interfacing system programming mode to program one or more features;

first interfacing means for interfacing said cellular telephone system to said system controller;

second means for interfacing said security system to said controller; and

means for preventing a user from programming any features while the security system is in the armed state.

8. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, the security system characterized by one or more security functions, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific translation tables corresponding to the different protocols of a plurality of cellular telephone systems; and

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system, comprising means for selecting said operating protocol from the keypad of said cellular telephone, said selecting means comprising means activated during a telephone initialization mode for recognizing predetermined sequences of tones generated by user-actuation of said keypad to identify the particular cellular telephone type and select a corresponding operating protocol; and

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in dependence on the particular received message;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit two-way communication between a user and the vehicle security system via said cellular telephone system.

9. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, the security system characterized by one or more security functions, said interfacing system characterized by a plurality of user-programmable features, and comprising:

a system controller comprising means for monitoring the armed/disarmed status of the security system;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific translation tables corresponding to the different protocols of a plurality of cellular telephone systems; and

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system;

second interfacing means for interfacing said security system to said controller;

means for preventing the programming of said features via said cellular telephone while the security system is armed;

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in dependence on the particular received message;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit two-way communication between a suer and the vehicle security system via said cellular telephone system.

10. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller which is programmable during an interfacing system programming mode to program one or more features;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including;

first library means for storing a plurality of specific translating tables corresponding to the different protocols of a plurality of cellular telephone systems;

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system;

second interfacing means for interfacing said security system to said controller;

a speech synthesizer controlled by said system controller to generate a plurality of voice messages indicative of the status of said security system;

means for selectively disabling the operation of said vehicle;

means preventing the enabling of said program mode while the vehicle disabling means is activated;

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in response to the particular received message;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit communication between a user and the vehicle security system via said telephone system.

11. An interfacing system installed in a vehicle for integrating a cellular communication system comprising a cellular telephone having an operating protocol and a telephone keypad with a vehicle security system, the security system characterized by one or more security functions, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular communication system to said system controller, said first interfacing means including:

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular communication systems; and

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular communication system, said initializing means includes a tone decoder connected between said telephone and said controller for decoding tones received from the telephone, and means activate during telephone initialization mode for recognizing predetermined sequences of tones generated by actuation of said keypad that identifies the particular telephone type and electronically selects a corresponding operating protocol; and

second interfacing means for interfacing said security system to said controller; and

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in dependence on the particular received message;

thereby enabling said security system to be compatible with a variety of cellular communication systems to permit two-way communication between a user and the vehicle security system via said cellular communication system.

12. An interfacing system installed in a vehicle for integrating a cellular telephone system with a vehicle security system which is tripped when an alarm condition is detected, said interfacing system comprising:

a system controller;

first means for interfacing said cellular communication system to said controller;

second means for interfacing said security system to said system controller; and

means for interfacing a pager system to said controller via said cellular telephone system, said pager system characterized in that it is responsive to telephone tones received at a predetermined pager system telephone number; and

wherein said pager system interfacing means comprises means for placing an outgoing call via said cellular telephone system to said pager telephone number, means for detecting an answering by said pager system at said telephone number, and means for generating a predetermined sequence of tones after detecting said answering for transmission over said cellular telephone to said pager system; and

wherein said controller further comprise means for causing an outgoing telephone call to be placed to said pager system telephone number and said sequence of tones to be generated in the event the vehicle security system is tripped.

13. The system of claim **12** further comprising means responsive to the tripping of said security system and the ignition switch of said vehicle being in the "on" position, and once said outgoing call to said pager telephone has been completed, to turn on said cellular telephone system and check for an incoming call so that a remote user may communicate with persons inside said vehicle.

14. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle positioning system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular communication system to said system controller;

second interfacing means for interfacing said vehicle positioning system to said system controller to provide the capability of remotely communicating vehicle position indicating signals via said cellular communication system, said signals comprising voice-synthesized messages which describe the current location of the vehicle; and

wherein said controller is responsive to commands received via said cellular telephone system to communicate said position indicating signals via said cellular telephone system.

15. The invention of claim **14** wherein said controller comprises means for storing a telephone number, and wherein said controller comprises means for calling a stored telephone number in response to said position interrogation commands to communicate said position indicating signals.

16. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, the security system characterized by one or more security functions, said interfacing system comprising:

a system controller;

first interfacing means to interfacing said cellular telephone system to said system controller, said first means including;

first library means for storing a plurality of specific translation tables corresponding to the different protocols of a plurality of cellular telephone systems, and

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system, said initializing means comprising means responsive to data entered via the cellular telephone by the user which defines the particular cellular telephone system;

second interfacing means for interfacing said security system to said controller; and

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in dependence on the particular received message;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit two-way communication between a user and the vehicle security system via said cellular telephone system.

17. The invention of claim **16** wherein said initializing means includes tone decoder for decoding tones gener-

ated by said cellular telephone system and generating decoder output signals indicative of the particular tone, and wherein said unique cellular telephone system defining data comprises predetermined sequences of said decoder output signals, whereby a user may enter the particular data sequence during an initializing mode which identifies to the controller the particular unique table corresponding to the user's particular cellular telephone.

18. An interfacing system installed in a vehicle for integrating a cellular communication system comprising a cellular telephone having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller;

first means for interfacing said cellular communication system to said system controller, said first means including;

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular communication systems;

data input means responsive to data input by the system user or installer to identify the particular type of cellular communication system installed in said vehicle, said data input means for providing a signal to the controller identifying said particular type of cellular communication system; and

means responsive to said signal for selecting from said library means a particular one of said sets of data corresponding to the protocol for said identified type of cellular communication system;

second means for interfacing said security system to said controller;

said system controller comprising means for monitoring the armed status of said security system and the "system tripped" status of said security system, said controller further comprising means for making an outgoing call to a user-designated telephone number via said cellular telephone and providing a message indicating that the security system has been tripped.

19. The system of claim **18** wherein said means permitting two-way communication with said occupant is responsive to a voice-synthesized prompt from said interfacing system and communicated over said communication system to accept a command from a remote user authorizing said two-way communication.

20. The system of claim **18** wherein said means for making an outgoing call in the event said security system is tripped comprises means for detecting that the call was not completed, and trying again to make the call.

21. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular telephone systems;

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system;

second interfacing means for interfacing said security system to said controller; and

means for preventing an intruder in said vehicle from interrupting or terminating any incoming or outgoing telephone call over said cellular system;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit communication between a user and the vehicle security system via said telephone system.

22. The invention of claim **21** wherein said preventing means comprises means for electronically locking the keypad of said telephone in the event said security system is tripped.

23. The invention of claim **21** wherein said security system is further characterized by a plurality of programmable features, and said interfacing system further comprises means for programming said features via said cellular telephone.

24. An interfacing system installed in a vehicle for integrating a cellular telephone system having an operating protocol with a security system and an automated vehicle position indication system, the position indication system characterized in that it does not rely on user input in normal use, comprising:

a system controller;

first means for interfacing said cellular telephone system to said system controller; and

means for interfacing the security system to said interfacing system controller;

means for interfacing said vehicle positioning system to said system controller to provide the capability of communicating vehicle position indicating signals remotely to a user via said cellular telephone system, said signals comprising voice-synthesized messages which describe the current position of the vehicle; and

wherein said controller further comprises means activated when the security system is tripped for communicating said position indicating signals via said cellular telephone.

25. The invention of claim **24** wherein said first means includes:

first library means for storing a plurality of unique translation tables corresponding to the protocols of a plurality of unique cellular communication systems; and

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular communication system.

26. The invention of claim **24** wherein said controller comprises means for storing a telephone number to be called in the event the security system is tripped, and wherein said communicating means comprises means for calling a stored telephone number in the event the security system is tripped to communicate said position indicating signals.

27. The invention of claim **24** wherein said controller further comprises means activated in response to position interrogation signals received via said cellular telephone for communicating said voice-synthesized message.

28. The invention of claim **24** wherein said voice-synthesized messages define coordinates of the vehicle position.

29. The system of claim **24** wherein said means activated when the security system is tripped for communicating said position indicating signals comprises means

for placing an outgoing telephone call to a predetermined telephone number and periodically communicating messages describing the current location of said vehicle.

30. The system of claim **24** wherein said means activated when the security system is tripped for communicating said position indicating signals comprises means for placing an outgoing telephone call to a predetermined telephone number, and said system further comprises means for remotely changing the outgoing telephone number.

31. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular telephone systems;

initializing means for selecting an operating protocol for said interfacing system from said first library means which is compatible with the protocol of said cellular telephone system;

second interfacing means for interfacing said security system to said controller; and

means for receiving commands via said telephone from a remote user during predetermined time intervals to activate one or more predetermined functions;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit communication between a user and the vehicle security system via said cellular telephone system.

32. The invention of claim **31** wherein said functions include remote starting of the vehicle engine.

33. The invention of claim **31** wherein said functions include issuance of a command to disable the vehicle engine.

34. The invention of claim **31** wherein said functions include programming an outgoing telephone number, to be called by said interfacing system in the event the vehicle security system is tripped.

35. The invention of claim **31** wherein said functions include a command to communicate data to the user via said telephone indicative of the vehicle's position.

36. The system of claim **31** wherein said functions include the communication of engine status data via said cellular telephone system in response to engine status commands.

37. The system of claim **31** wherein said functions include communication with an occupant of the vehicle via said cellular telephone system.

38. An interfacing system installed in a vehicle for integrating a cellular communication system with a vehicle security system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular communication system to said system controller, said first means including a speech synthesizer for generating predetermined voice messages;

second interfacing means for interfacing said security system to said controller; and

means for selectively communicating said voice messages to an occupant of the vehicle.

39. The system of claim **38** further characterized in that said voice messages comprise verbal statements describing said security system status under predetermined conditions.

40. The system of claim **38** further characterized in that said controller is programmable during an interfacing system programming mode to program one or more features, and wherein said voice messages prompt the user through programming steps.

41. The system of claim **38** further comprising means for selectively disabling the operating of the vehicle engine, and said voice messages comprise messages which notify the user upon entry to the vehicle to clear the engine displacement.

42. The system of claim **28** wherein said voice messages provide voice prompting for the operation and control of said interfacing system.

43. An interfacing system installed in a vehicle for integrating a cellular telephone system with a vehicle security system, the security system characterized by one or more security functions, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller;

second interfacing means for interfacing said security system to said controller; and

third interfacing means for interfacing said controller to said vehicle to selectively interact with one or more operating systems of said vehicle;

means activated by said controller for disabling the operation of the vehicle; and

wherein said controller further comprises means permitting a message regarding the security system status to be sent via said cellular telephone system to a remote communication destination, means permitting messages to be received via said cellular telephone system, and means for acting on said received messages to control one or more predetermined security system functions in dependence on the particular received message, said function controlling means comprising means for activating said disabling means in response to a vehicle disable command received via said cellular telephone system.

44. The invention of claim **43** wherein said interfacing system further comprises means for providing a speed signal indicative of the engine speed of said vehicle engine or the speed of the vehicle, and said controller is responsive to said speed signal and said vehicle disable command to activate said vehicle disabling means after receipt of said command and at such time as the engine speed or the vehicle speed is at or below a predetermined threshold value.

45. The invention of claim **44** wherein said speed signal is an engine tachometer signal.

46. The invention of claim **43** wherein said controller further comprises means for placing an outgoing telephone call to a predetermined telephone number in response to tripping of said security system and communicating a message indicating that the security system has been tripped, and said activating means acts in response to disable commands received as a result of said message that the security system has been tripped.

47. The invention of claim **46** wherein said vehicle is characterized by an ignition switch, and said interfacing

means further comprises means activated in response to said tripping of said security system for activating said telephone system and placing it in condition to receive incoming telephone calls whenever said vehicle ignition switch is turned on, thereby permitting said vehicle disable command to be received at any time said ignition switch is turned on.

48. The invention of claim **43** wherein said controller further comprises means for turning on said telephone system at predetermined time intervals to permit incoming telephone calls to be received, wherein said engine disable commands may be received during said predetermined time intervals.

49. An interfacing system installed in a vehicle for integrating a cellular telephone system characterized by a telephone keypad with a vehicle operation disabling means, comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller;

second interfacing means for interfacing said vehicle operation disabling means to said controller; and

wherein said system controller further comprises means for enabling the operation of said disabling means under predetermined conditions, and means for disabling the operation of said vehicle disabling means upon receipt of a security code entered via said telephone keypad.

50. The system of claim **49** wherein said vehicle operation disabling means comprises means for disabling the vehicle engine ignition system.

51. The system of claim **49** wherein said means for enabling the operation of said disabling means comprises means for automatically enabling said operation a given time delay after the vehicle ignition has been turned off and the vehicle driver's door has been opened and closed.

52. The system of claim **51** wherein said controller further comprises means for programming said time delay by data entered via said keypad during a system programming mode.

53. An interfacing system installed in a vehicle for integrating a cellular telephone communication system having an operating protocol with a vehicle security system, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular telephone system to said system controller, said first means including:

first library means for storing a plurality of specific translating tables corresponding to the different protocols of a plurality of cellular telephone systems;

data input means responsive to data input by the system user or installer to identify the particular type of cellular telephone system installed in said vehicle, said data input means for providing a signal to the controller identifying said particular type of cellular telephone system; and

means responsive to said signal for selecting from said library means a particular one of said sets of data corresponding to the protocol for said identified type of cellular telephone system;

second interfacing means for interfacing said security system to said controller;

a speech synthesizer controlled by said system controller to generate a plurality of voice messages indicative of the status of said security system;

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in response to the particular received message;

thereby enabling said security system to be compatible with a variety of cellular telephone systems to permit communication between a user and the vehicle security system via said telephone system.

54. The invention of claim **53** wherein said unique translation tables each comprise a list of possible telephone keys and their corresponding on/off codes.

55. The invention of claim **53** wherein said cellular telephone is characterized by an on/off switch, and said system further comprises means for automatically electronically turning the cellular telephone off after the user is finished with a telephone call, but with the telephone switch still "on".

56. The invention of claim **53** wherein said interfacing means comprises means for selectively electronically locking the telephone keypad in response to the tripping of said security system to prevent an intruder from interrupting a telephone call.

57. The invention of claim **53** wherein said interfacing system includes means responsive to a system PANIC state to place a call to a user-designated telephone number and synthesize a verbal statement.

58. The system of claim **57** wherein said means responsive to a system PANIC state comprises means for repeating said verbal statement until a command is received via said telephone system indicating that a person at the user-designated telephone number is ready to speak.

59. The invention of claim **53** wherein said controller is programmable during an interfacing system programming mode to program one or more features.

60. The invention of claim **59** wherein said program mode may be enabled only after the user enters a predetermined code.

61. An interfacing system installed in a vehicle for integrating a cellular communication system having an operating protocol with a vehicle security system, the security system characterized by one or more security functions, said interfacing system comprising:

a system controller;

first interfacing means for interfacing said cellular communication system to said system controller, said first interfacing means including:

first library means for storing a plurality of specific sets of data corresponding to the different protocols of a plurality of cellular communication systems; and

data input means responsive to data input by the system user or installer to identify the particular type of cellular communication system installed in said vehicle, said data input means for providing a signal to the controller identifying said particular type of cellular communication system; and

means responsive to said signal for selecting from said library means a particular one of said sets of data corresponding to the protocol for said identified type of cellular communication system;

second interfacing means for interfacing said security system to said controller; and

wherein said controller comprises means permitting a message regarding the security system status to be sent via said cellular communication system to a remote communication destination, means permitting messages to be received via said cellular communication system, and means for acting on said received messages to control one or more predetermined security system functions in dependence on the particular received message;

thereby enabling said security system to be compatible with a variety of cellular communication systems to permit two-way communication between a user and the vehicle security system via said cellular communication system.

62. The invention of claim **61** wherein said sets of data comprise unique translation tables corresponding to the protocols of a plurality of unique cellular communication systems.

63. The invention of claim **61** including means for detecting any use of the communication system.

64. The invention of claim **61** including means for remotely starting the engine of said vehicle in response to instructions received by said controller via said communication system.

65. The invention of claim **61** including means for monitoring the operating status of the vehicle engine, third interfacing means for interfacing said controller to said monitoring means, and means permitting a user to remotely verify said engine status via said cellular communication system.

66. The invention of claim **61** wherein said unique translation tables each comprise a list of possible telephone keys and their corresponding one/off codes.

67. The invention of claim **61** wherein said cellular communication system comprises a cellular telephone, and further comprising means for automatically shutting off said cellular telephone a predetermined time delay after receipt of the last voice signals over said telephone and while the telephone on/off switch is still "on".

68. The invention of claim **61** wherein said first interfacing means includes a speech synthesizer for generating predetermined voice messages.

69. The invention of claim **68** wherein said interfacing system further comprises means for communicating said voice messages to a user via said cellular communication system indicative of the security system status.

70. The invention of claim **61** wherein said cellular communication system comprises a cellular telephone, said cellular telephone is characterized by an on/off switch, and said system further includes means for automatically electronically shutting off said cellular telephone when a call has been terminated improperly by the user and the telephone switch is still "on".

71. The invention of claim **70** wherein said means for automatically shutting off said cellular telephone comprises means for electronically hanging up and powering down said telephone a predetermined time delay after voice signals over said telephone have ended.

72. The invention of claim **70** wherein said means for automatically shutting off said cellular telephone is not operable if the vehicle ignition switch is turned off.

73. The invention of claim **61** wherein said controller comprises means for monitoring the armed status of said security system and the "system tripped" status of said security system.

74. The invention of claim **73** wherein said interfacing system further comprises a means for selectively disabling the operation of said vehicle, and said controller further comprises means for activating said disabling means when said security system is tripped.

75. The invention of claim **73** wherein said communication system comprises a cellular telephone, and said controller comprises means for making an outgoing call to a user-designated telephone number via said cellular telephone and providing a voice-synthesized message indicating that the security system has been tripped.

76. The invention of claim **75** wherein said interfacing system further comprises means for interfacing an automated vehicle positioning system to said system controller, said positioning system characterized in that it requires no driver input or attention in normal use, and said controller is further responsive to the tripping of the security system to send tracking data messages generated by said automated positioning system over said communication system indicative of the vehicle position, said messages comprising voice-synthesized messages which describe the position of the vehicle.

77. The invention of claim **75** wherein said interfacing system further includes a means for interfacing a pager system to said controller, wherein said controller activates the operation of said pager system in the event said security system is tripped, wherein said pager system is responsive to telephone tones received at a predetermined pager telephone number, said pager interfacing means comprising means for placing an outgoing call via said cellular telephone to said pager telephone number, means for detecting an answering by said pager system at said telephone number, and means for generating a predetermined sequence of tones for transmission over said cellular telephone to said pager system.

78. The invention of claim **61** wherein said controller comprises a digital computer means for executing a computer program and a first memory means for storing a program for execution by said controller, and said program includes a state control module for executing any of a plurality of foreground routines thereby controlling the operating mode of said system for integrating said cellular communication system with said vehicle security system.

79. The invention of claim **78** wherein said cellular communication system comprises a cellular telephone, and said program includes a foreground routine for allowing said system for integrating said cellular system with said vehicle security system to receive and act on an incoming telephone call through said cellular telephone.

80. The invention of claim **78** wherein said cellular communication system comprises a cellular telephone, and said program includes a serial telephone receive buffer routine which provides for interrupts to the foreground routines from the keypad of a handset of said cellular telephone allowing the system to act on commands entered via the cellular telephone keypad.

81. The invention of claim **78** wherein said program includes a tachometer routine for providing interrupts to foreground routines from an engine revolution per minute detecting device associated with a vehicle in which said system for integrating said cellular communication system with said vehicle security system is mounted.

82. The invention of claim **78** wherein said program includes a foreground routine for allowing said interfac-

ing system to be programmed through said cellular communication system.

83. The invention of claim **82** wherein said cellular communication system comprises a cellular telephone, and said program includes a foreground routine for allowing said system for integrating said cellular system with said vehicle security system to place an outgoing telephone call through said cellular telephone.

84. The invention of claim **78** wherein said program includes at least one background routine which performs a variety of functions related to the status of said system for integrating said cellular communication system with said vehicle security system independently of said foreground routines.

85. The invention of claim **84** including a periodic timer routine for checking the status of the security system, the status of the user of the cellular system, general system input/output status, and execution of service subroutines.

86. The invention of claim **84** wherein said program includes a speedometer background routine for providing interrupts to foreground routines from a vehicle speed indicating device.

87. The invention of claim **61** wherein said interfacing system further comprises third interfacing means for interfacing said controller to said vehicle to selectively interact with one or more operating systems of said vehicle.

88. The invention of claim **87** wherein said operating systems of vehicle comprises the vehicle engine system, whereby the controller monitors the operating status of the vehicle engine.

89. The invention of claim **87** wherein said operating system comprises the vehicle engine starting system, and said controller is responsive to an engine start signal received via said cellular communication system to remotely start the vehicle engine.

90. The invention of claim **87** wherein said interfacing system further comprises means activated by said controller for disabling the operation of the vehicle, and said controller further comprises means for activating said disabling means in response to a vehicle disable command received via said cellular communication system.

91. The invention of claim **90** wherein said interfacing system further comprises means for providing a speed signal indicative of the engine speed of said vehicle engine or the speed of the vehicle, and said controller is responsive to said speed signal and said vehicle disable command to activate said vehicle disabling means after receipt of said command and at such time as the engine speed or the vehicle speed is at or below a predetermined threshold value.

92. The invention of claim **91** wherein said speed signal is an engine tachometer signal.

* * * * *

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/773,272	07/03/2007	Kenneth E. Flick	58106CIP1	1046

2590 01/05/2011

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EXAMINER	
NGUYEN, CUONG H	

ART UNIT	PAPER NUMBER
3661	

MAIL DATE	DELIVERY MODE
01/05/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/773,272	FLICK, KENNETH E.	
	Examiner	Art Unit	
	CUONG H. NGUYEN	3661	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 October 2010.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. This Office Action is the answer to a communication received on 10/22/2010.

2. Claims 1-22 are pending.

Response

3. Previous objections and rejections are withdrawn. New grounds of obvious rejections are submitted herein.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-21, are rejected under 35 U.S.C. 103(a) as being unpatentable over Monroe (US Pat. 6,253,064 B1), in view of Brinkmeyer et al. (US Pat. 5,940,007).

A. As to independent claims 1, 4-10, 14-16, and 18-21: Monroe suggests a system to tracking and monitoring different kinds of vehicles (see Monroe, Fig. 1, refs. 10, 10a, and 10b).

Brinkmeyer et al., also teach a vehicle control system comprising:

- a tracking unit and a function unit cooperating therewith, said tracking unit comprising a vehicle position determining device (see Monroe, Fig. 4a-4b; see also Brinkmeyer et al, col. 5, lines 6-16) "_ vehicle is equipped with an antitheft system having a car telephone *and a locating system, such as the Global Positioning System").*

- a wireless communications device, and a tracking controller configured cooperate with said vehicle position determining device and said wireless communications device (see

Monroe, Fig. 4a-4b; see Brinkmeyer et al., Fig. 1); said function unit comprising at least one uniquely coded transmitter to be carried by a user (see Monroe, Fig. 4a-4b "wireless transceiver"; this is also taught in this prior art since remote controlling a car requires a uniquely coded command in order for that command to be received and executed).

Monroe and Brinkmeyer et al., teach that a device can read/write/program/download from/to another device by remotely using proper codes/instructions/ID (see Monroe, Fig. 4a-4b with "transceivers" capabilities; as in pending claims 6-9 and 19-22, see Brinkmeyer et al, Fig.1).

Brinkmeyer et al., (col. 4, lines 22-39, and lines 52-65) clearly disclose: "The transmitter/receiver 4a in the vehicle 4 is connected with the other components of the electric system of the vehicle, via a data bus system ", and "the vehicle-side transmitter/receiver 4a transmits the corresponding control commands via the data bus system to the respective vehicle target component "; i.e. a vehicle data bus has been taught by Brinkmeyer et al.

Brinkmeyer et al., do not disclose that a receiver at the vehicle for receiving signals from said a uniquely coded transmitter, and a function controller at the vehicle and connected to said receiver for learning (i.e., pending claim is about signal transmitting/receiving between vehicles).

However, similar functions as claimed are taught by Monroe, and Brinkmeyer et al., with a wireless receiver I/F - (not necessary disclosing that a receiver and a transmitter must be from different vehicles).

Since the pending claims are physical structures/units, Monroe and Brinkmeyer et al., system obviously performs claimed devices/components.

As for accepting a command – a particular definition for "learning" a uniquely coded transmitter to permit control of a vehicle function by the user (see Brinkmeyer et al., Figs. 4A, 4C, col. 2 lines 23-42, "... *activating a* learn mode, in which they can receive the new authorization code from the newly programmed remote control unit by way of a special antenna, if the remote control unit is brought into the direct vicinity and is caused to send the new authorization code.. ".

Brinkmeyer et al., also do not disclose that an alert function would acknowledge a user for accepting a new unique code in "said function controller configured to cooperate with said wireless communications device of said tracking unit to send an alert indication *of whether at least one new uniquely coded transmitter has been learned".*

However, this action is obvious for a remote device to acknowledge a user/operator wirelessly that it starts to accept a new unique code (e.g., from a control tower) – also this is a clear example of wirelessly programming a garage door to accept a specific code (as taught by Brinkmeyer et al).

It would have been obvious to one of ordinary in the art at the time this invention was made to combine both Monroe and Brinkmeyer et al.'s systems by clearly disclosing that a communication between related vehicles, an extra feature to alert/drawing attentions of a user (by available voice/sound/image/text generator) that a new unique code would be effective from now on as a reminder to that user.

B. As per claims 2-3, and 13: The rationales and reference for a rejection of claim 1 are incorporated.

It is submitted that downloading/(sending signals) by using a (temporary) directed wire (connecting directly to an I/F) has been quite well-known.

C. As per claim 10: The rationales and reference for a rejection of claim 1 are incorporated.

It is submitted that Brinkmeyer et al., taught about a garage door opener (e.g., a claimed "remote keyless entry function").

D. As per claim 11: The rationales and reference for a rejection of claim 1 are incorporated.

It is submitted that Monroe Figs. 4a-4b, and Brinkmeyer et al., taught about using a GPS receiver (see Brinkmeyer et al., col. 5 line 9).

E. As per claim 12: The rationales and reference for a rejection of claim 1 are incorporated.

It is submitted that Monroe and Brinkmeyer et al., taught about a housing to contain a GPS, a wireless communication device, a controller, and communication I/F (see Brinkmeyer et al., Figs. 1-2).

F. As per claim 17: The rationales and reference for a rejection of claim 1 are incorporated.

It is submitted that Monroe and Brinkmeyer et al., taught about wireless communication devices: a remote transmitter, and communication I/F to remotely control a device/component (see Brinkmeyer et al., Fig. 3 "the garage door opener").

Conclusion

5. Pending claims are rejected.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CUONG H. NGUYEN whose telephone number is 571-272-6759. (email address is cuong.nguyen@uspto.gov). The examiner can normally be

reached on 9:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, THOMAS G. BLACK can be reached on 571-272-6956. The Rightfax number for the organization where this application is assigned is 571-273-6956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Please provide support, with page and line numbers, for any amended or new claim in an effort to help advance prosecution; otherwise any new claim language that is introduced in an amended or new claim may be considered as new matter, especially if the Application is a Jumbo Application.

/CUONG H. NGUYEN/
Primary Examiner
Art Unit 3661

Electronic Acknowledgement Receipt	
EFS ID:	38002438
Application Number:	90014419
International Application Number:	
Confirmation Number:	8770
Title of Invention:	Vehicle Tracking Unit with Downloadable Codes and Associated Methods
First Named Inventor/Applicant Name:	KENETH E. FLICK
Correspondence Address:	- - - - - - - - - -
Filer:	Mark B. Garred/Andrea Levine
Filer Authorized By:	Mark B. Garred
Attorney Docket Number:	CAAMP-001X
Receipt Date:	11-DEC-2019
Filing Date:	
Time Stamp:	17:02:14
Application Type:	Reexam (Third Party)

Payment information:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-N-60246463-Witham.pdf	4062479 0433ed85ebf2269ae29e28a72223ac13dc61810e	no	30
Warnings:					
Information:					
2	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibi-O-60222777-Flick.pdf	1022257 5a7fbf938770c7cf69698c67a415ebc0ec4661a6	no	29
Warnings:					
Information:					
3	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-P-60205178-Flick.pdf	751384 5e8d97ef28bfae0a273caf113c507a4f5049a65f	no	23
Warnings:					
Information:					
4	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-Q-US5719551-Flick.pdf	1502077 fdf6b0256a7fd37aa76d4942bff559d3aad8ddb0	no	17
Warnings:					
Information:					
5	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-R-US5940007-Brinkmeyer.pdf	610590 a0d69240bf28484c795b60f1a2650b59b0992271	no	10
Warnings:					
Information:					
6	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-S-US6253064-Monroe.pdf	1945960 82dd5f7172f48db012e4d4aafa8e5735f3b6cf2c	no	31
Warnings:					
Information:					
7	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-T-US5081667-Drori.pdf	3977691 f42458844ddf3e80157cb0a34a6ca82f2f4a2342	no	64
Warnings:					
Information:					

8	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-U-SpaceDailyTrimble_PDF.pdf	231463 9ad592adbefd9531cbf3df62a962ddffc7da0060	no	2
Warnings:					
Information:					
9	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-V-Mateja_PDF.pdf	96168 68f1f4563da3806caae980c8985e9f3025b5e55f	no	4
Warnings:					
Information:					
10	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-W-Holusha_PDF.pdf	181832 64dea65f3ea434ea889b6f810897d39da19bee48	no	3
Warnings:					
Information:					
11	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-X-278-OfficeAction-1052011.pdf	1064307 bfa97de29aa31e3167f51871ad486c833ac96758	no	7
Warnings:					
Information:					
12	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit-Y-278-Office-Action4052011.pdf	699074 95d315793857418b1862c53523e16bb3c986876b	no	5
Warnings:					
Information:					
		Total Files Size (in bytes):	16145282		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

US008032278B2

(12) **United States Patent**
Flick

(10) **Patent No.: US 8,032,278 B2**
(45) **Date of Patent: Oct. 4, 2011**

(54) **VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS**

(75) Inventor: **Kenneth E. Flick**, Douglasville, GA (US)

(73) Assignee: **Omega Patents, L.L.C.**, Douglasville, GA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 840 days.

(21) Appl. No.: **11/773,272**

(22) Filed: **Jul. 3, 2007**

(65) **Prior Publication Data**

US 2007/0279283 A1 Dec. 6, 2007

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/076,259, filed on Mar. 9, 2005, now Pat. No. 7,720,597, which is a continuation of application No. 10/383,496, filed on Mar. 7, 2003, now Pat. No. 7,149,623, which is a continuation of application No. 09/859,972, filed on May 17, 2001, now Pat. No. 6,606,561.

(60) Provisional application No. 60/264,811, filed on Jan. 29, 2001, provisional application No. 60/258,005, filed on Dec. 22, 2000, provisional application No. 60/251,552, filed on Dec. 6, 2000, provisional application No. 60/252,125, filed on Nov. 20, 2000, provisional application No. 60/236,890, filed on Sep. 29, 2000, provisional application No. 60/246,463, filed on Nov. 7, 2000, provisional application No. 60/222,777, filed on Aug. 3, 2000, provisional application No. 60/205,178, filed on May 17, 2000.

(51) **Int. Cl.**
G01C 21/00 (2006.01)

(52) **U.S. Cl.** **701/36**; 701/33; 382/104; 382/988; 455/575.9

(58) **Field of Classification Search** 701/36, 701/207–209; 340/500, 506, 515, 531, 533–534
See application file for complete search history.

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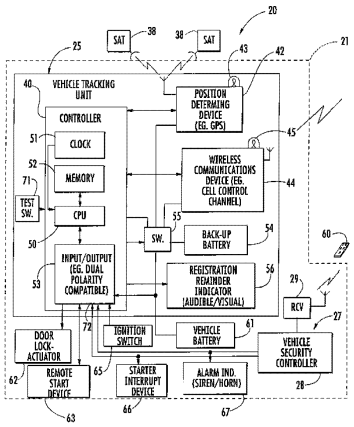
(Continued)

Primary Examiner — Cuong H Nguyen
(74) *Attorney, Agent, or Firm* — Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A multi-vehicle compatible tracking unit is for a vehicle including a vehicle data bus extending throughout the vehicle. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a multi-vehicle compatible controller for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The multi-vehicle compatible controller may be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles. A downloading interface may be included for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller.

22 Claims, 13 Drawing Sheets



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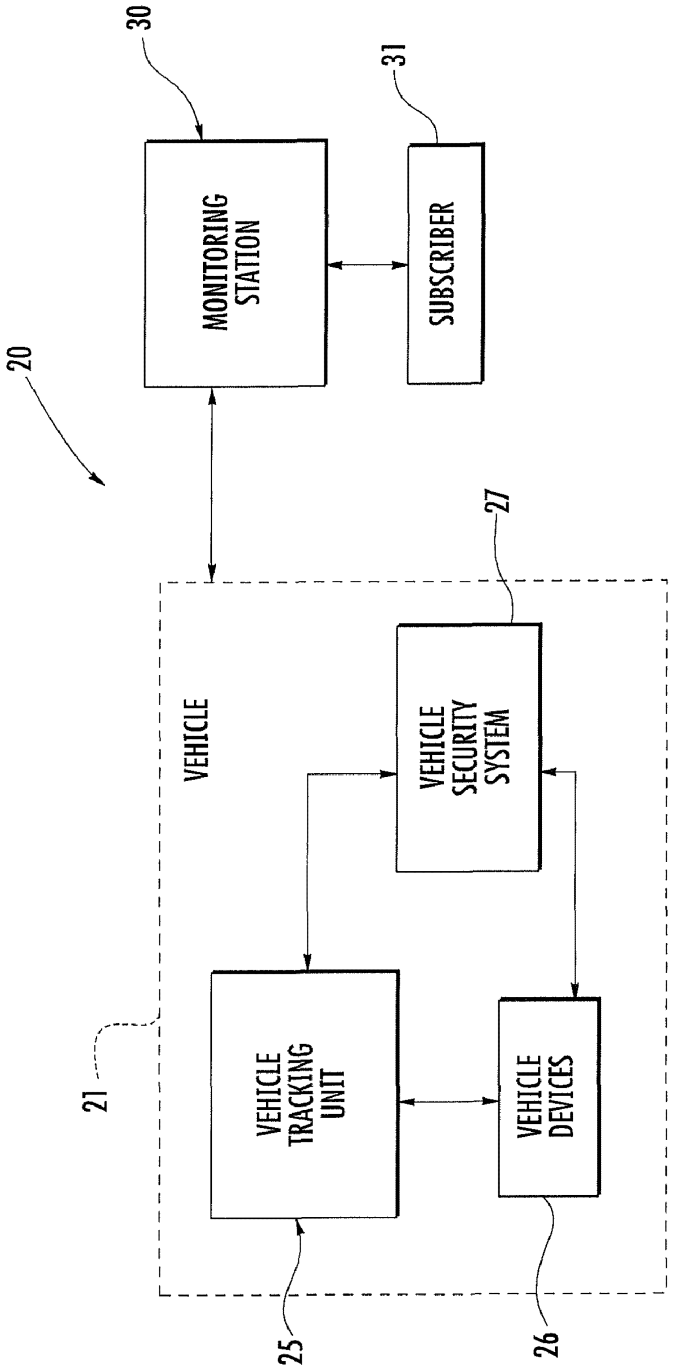

FIG. 1

Ex. 1008 - Page 357

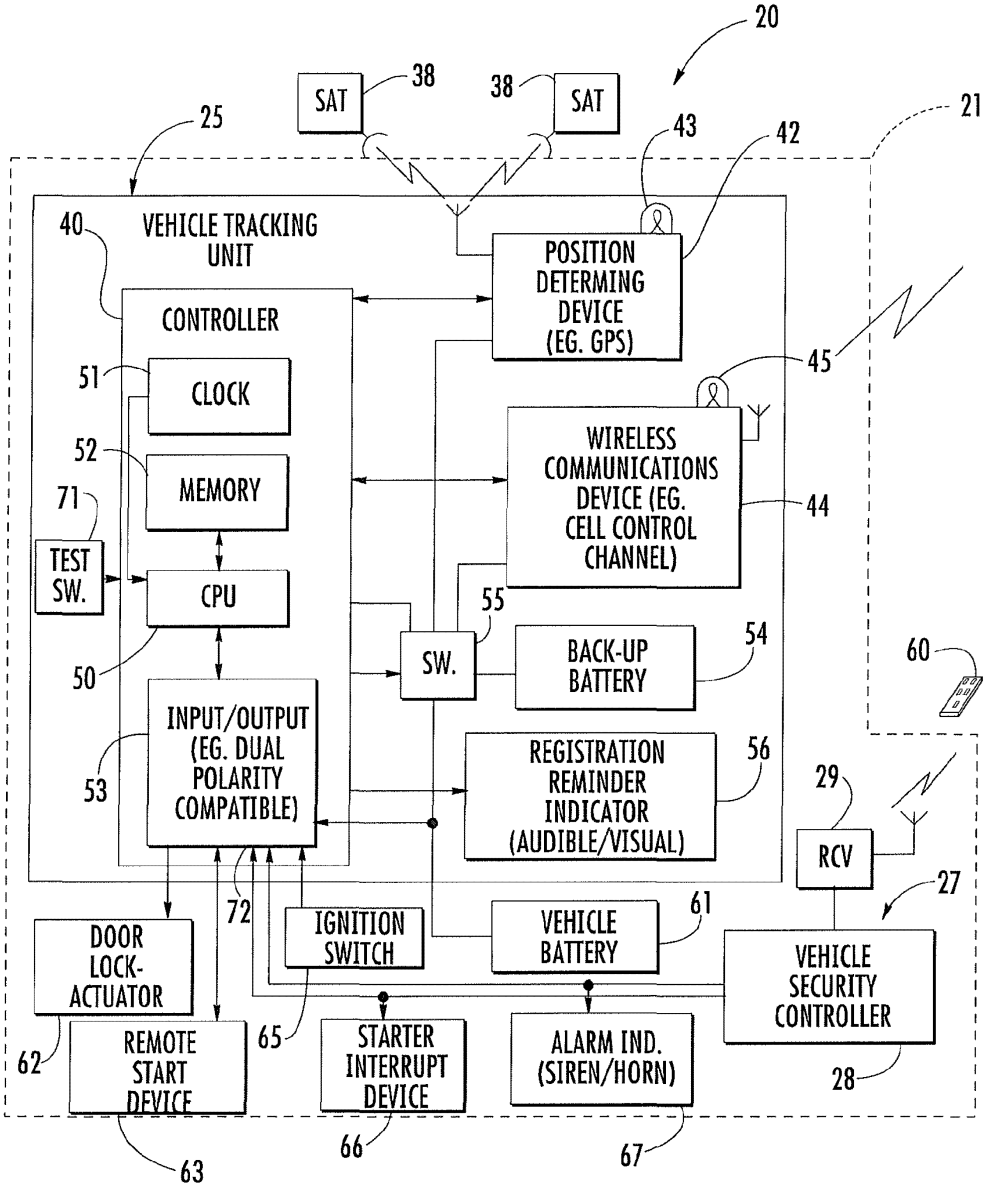
20
SAT
38
38
SAT
25
21
43
42
40
VEHICLE TRACKING UNIT
POSITION DETERMING DEVICE (EG. GPS)
CONTROLLER
45
51
CLOCK
WIRELESS COMMUNICATIONS DEVICE (EG. CELL CONTROL CHANNEL)
52
MEMORY
71
44
TEST SW.
CPU
55
60
SW.
BACK-UP BATTERY
54
50
INPUT/OUTPUT (EG. DUAL POLARITY COMPATIBLE)
53
REGISTRATION REMINDER INDICATOR (AUDIBLE/VISUAL)
56
29
RCV
27
72
IGNITION SWITCH
VEHICLE BATTERY
61
DOOR LOCK-ACTUATOR
VEHICLE SECURITY CONTROLLER
62
REMOTE START DEVICE
65
STARTER INTERRUPT DEVICE
ALARM IND. (SIREN/HORN)
28
63
66
67

FIG. 2

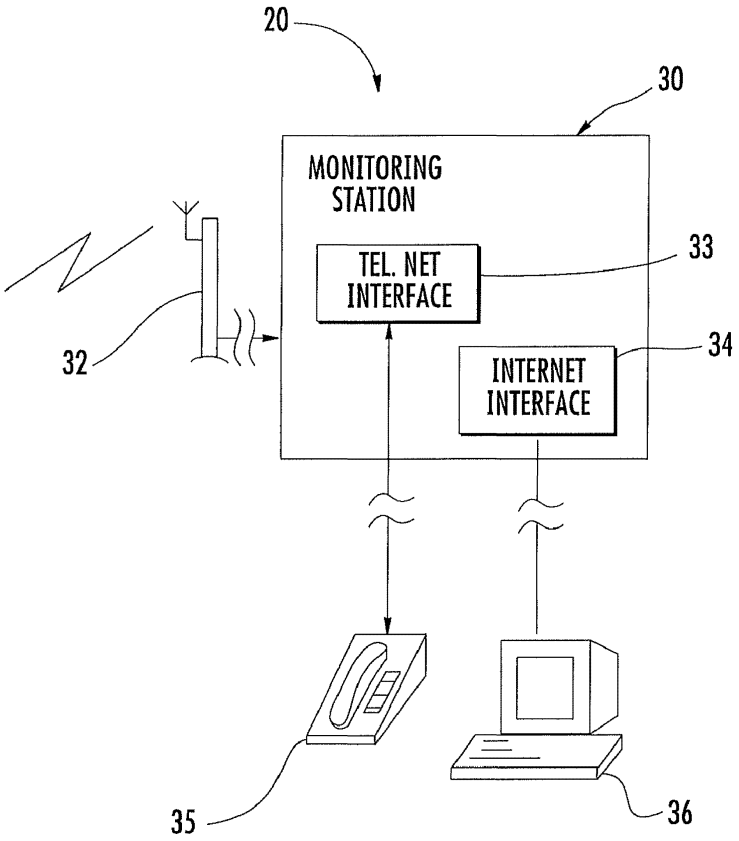
20
30
MONITORING STATION
TEL. NET INTERFACE
33
INTERNET INTERFACE
34
32
35
36

FIG. 3

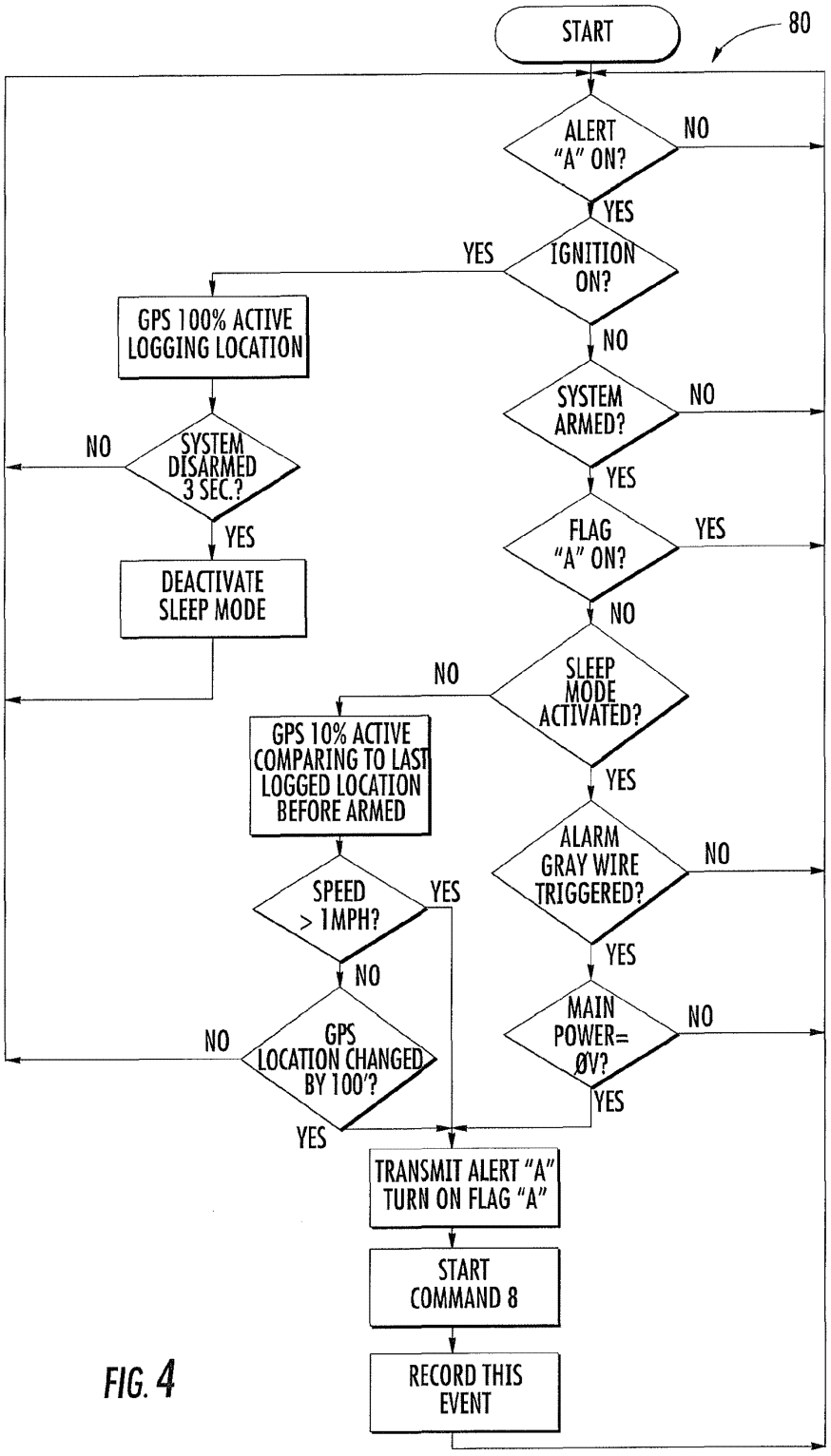
START
80
ALERT "A" ON?
NO
YES
IGNITION ON?
YES
GPS 100% ACTIVE LOGGING LOCATION
NO
SYSTEM ARMED?
NO
YES
SYSTEM DISARMED 3 SEC.?
NO
YES
DEACTIVATE SLEEP MODE
FLAG "A" ON?
YES
NO
SLEEP MODE ACTIVATED?
NO
GPS 10% ACTIVE COMPARING TO LAST LOGGED LOCATION BEFORE ARMED
YES
ALARM GRAY WIRE TRIGGERED?
NO
YES
SPEED > 1MPH?
YES
NO
MAIN POWER= ØV?
NO
YES
GPS LOCATION CHANGED BY 100'?
NO
YES
TRANSMIT ALERT "A" TURN ON FLAG "A"
START COMMAND 8
RECORD THIS EVENT

FIG. 4

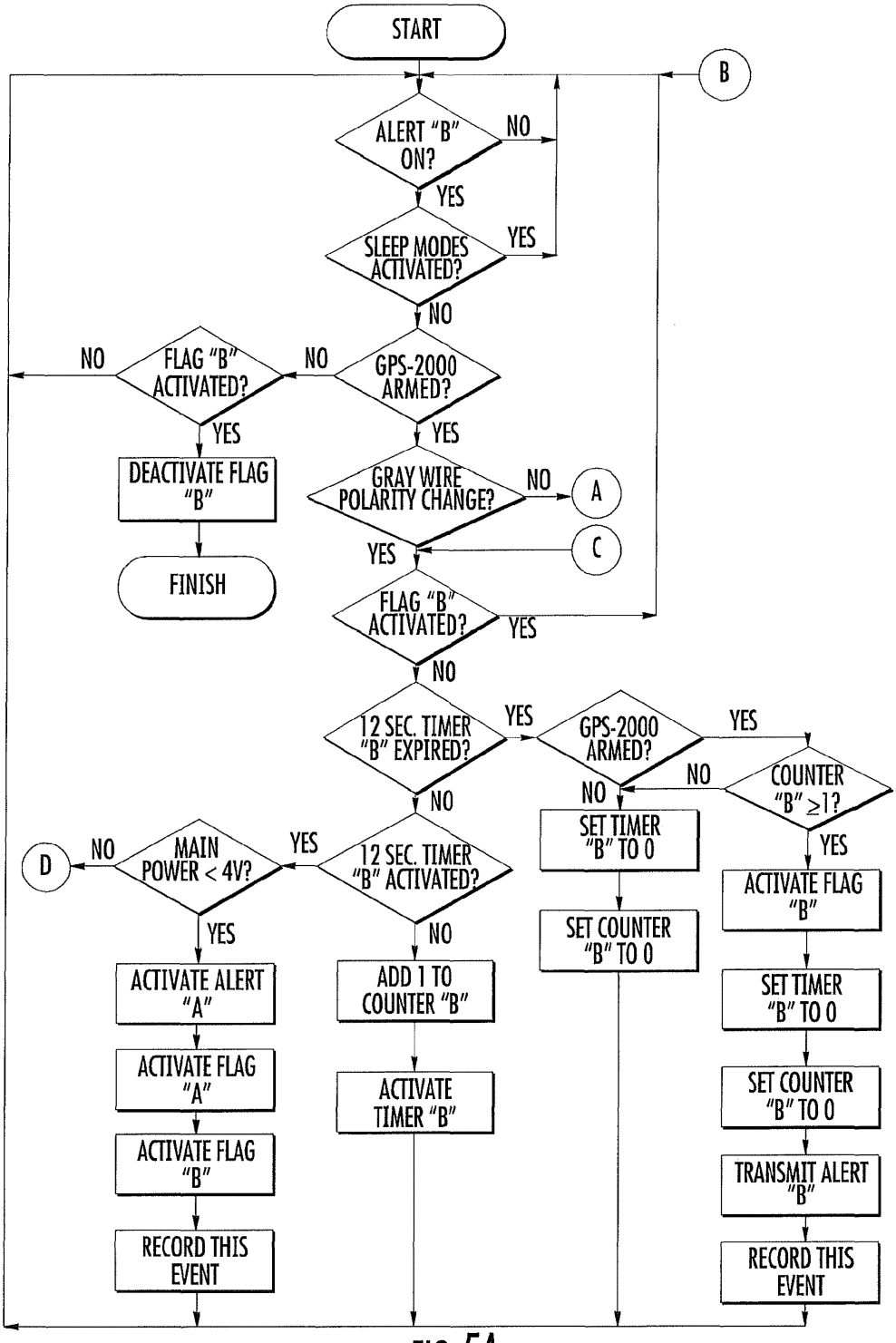
START
B
ALERT "B" ON?
NO
YES
SLEEP MODES ACTIVATED?
YES
NO
FLAG "B" ACTIVATED?
NO
GPS-2000 ARMED?
NO
YES
YES
DEACTIVATE FLAG "B"
GRAY WIRE POLARITY CHANGE?
NO
A
C
YES
FINISH
FLAG "B" ACTIVATED?
YES
NO
12 SEC. TIMER "B" EXPIRED?
YES
GPS-2000 ARMED?
YES
NO
NO
COUNTER "B" ≥1?
NO
SET TIMER "B" TO 0
YES
D
NO
MAIN POWER < 4V?
YES
12 SEC. TIMER "B" ACTIVATED?
ACTIVATE FLAG "B"
SET COUNTER "B" TO 0
YES
NO
ACTIVATE ALERT "A"
ADD 1 TO COUNTER "B"
SET TIMER "B" TO 0
ACTIVATE FLAG "A"
ACTIVATE TIMER "B"
SET COUNTER "B" TO 0
ACTIVATE FLAG "B"
TRANSMIT ALERT "B"
RECORD THIS EVENT
RECORD THIS EVENT

FIG. 5A

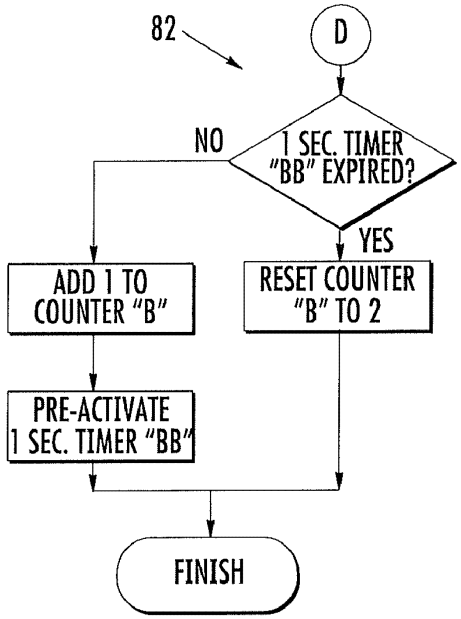
82
D
1 SEC. TIMER "BB" EXPIRED?
NO
YES
ADD 1 TO COUNTER "B"
RESET COUNTER "B" TO 2
PRE-ACTIVATE 1 SEC. TIMER "BB"
FINISH

FIG. 5B

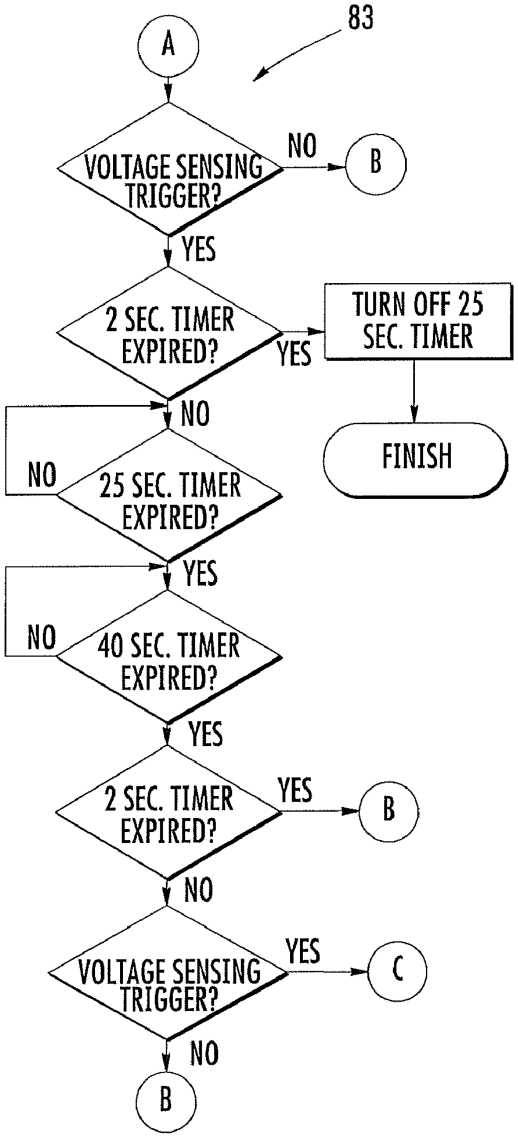
83
A
VOLTAGE SENSING TRIGGER?
NO
B
YES
2 SEC. TIMER EXPIRED?
YES
TURN OFF 25 SEC. TIMER
FINISH
NO
NO
25 SEC. TIMER EXPIRED?
YES
NO
40 SEC. TIMER EXPIRED?
YES
2 SEC. TIMER EXPIRED?
YES
B
NO
VOLTAGE SENSING TRIGGER?
YES
C
NO
B

FIG. 5C

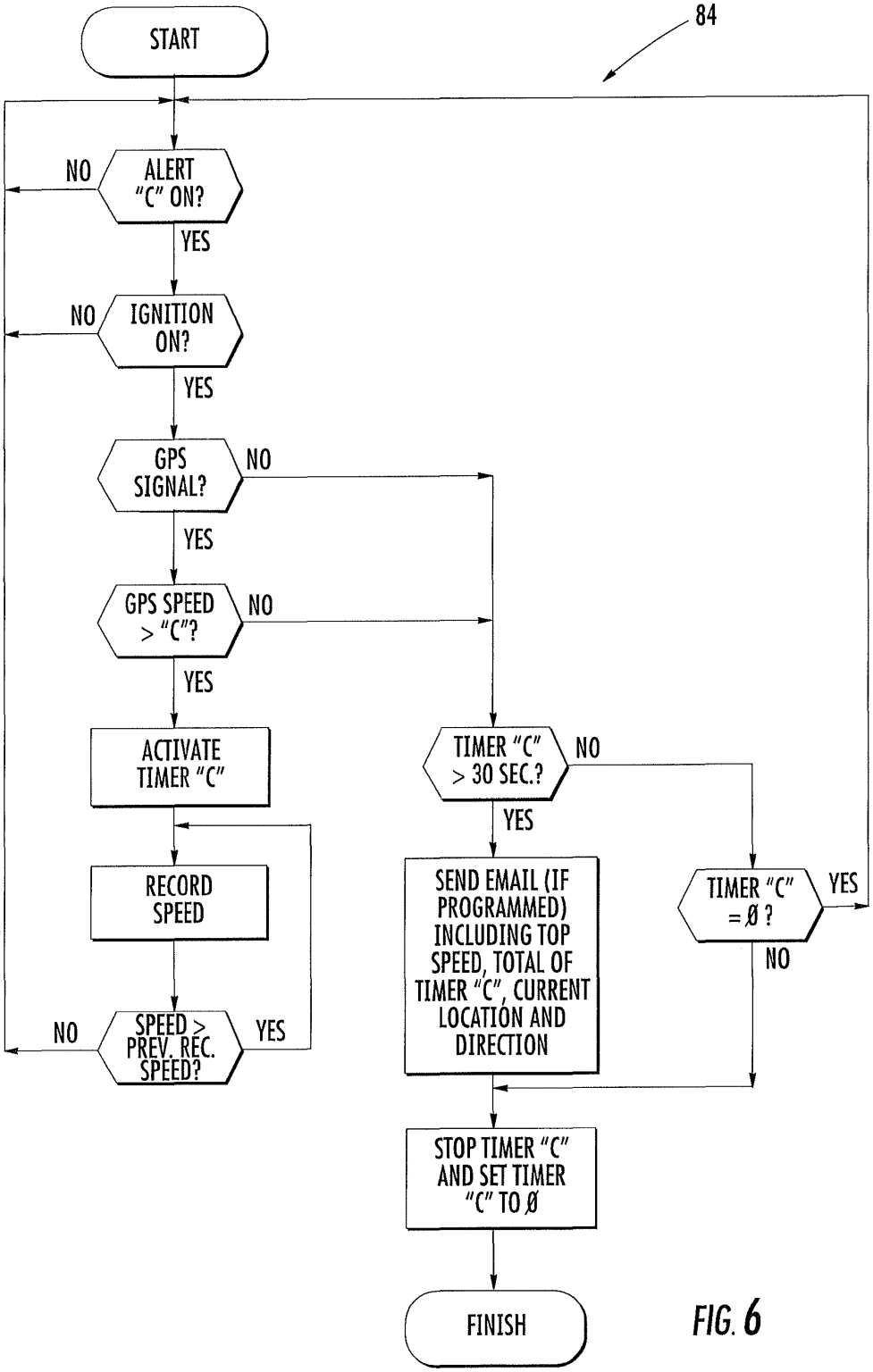
84
START
ALERT "C" ON?
NO
YES
IGNITION ON?
NO
YES
GPS SIGNAL?
NO
YES
GPS SPEED > "C"?
NO
YES
ACTIVATE TIMER "C"
RECORD SPEED
SPEED > PREV. REC. SPEED?
NO
YES
TIMER "C" > 30 SEC.?
NO
YES
SEND EMAIL (IF PROGRAMMED) INCLUDING TOP SPEED, TOTAL OF TIMER "C", CURRENT LOCATION AND DIRECTION
TIMER "C" = Ø ?
YES
NO
STOP TIMER "C" AND SET TIMER "C" TO Ø
FINISH

FIG. 6

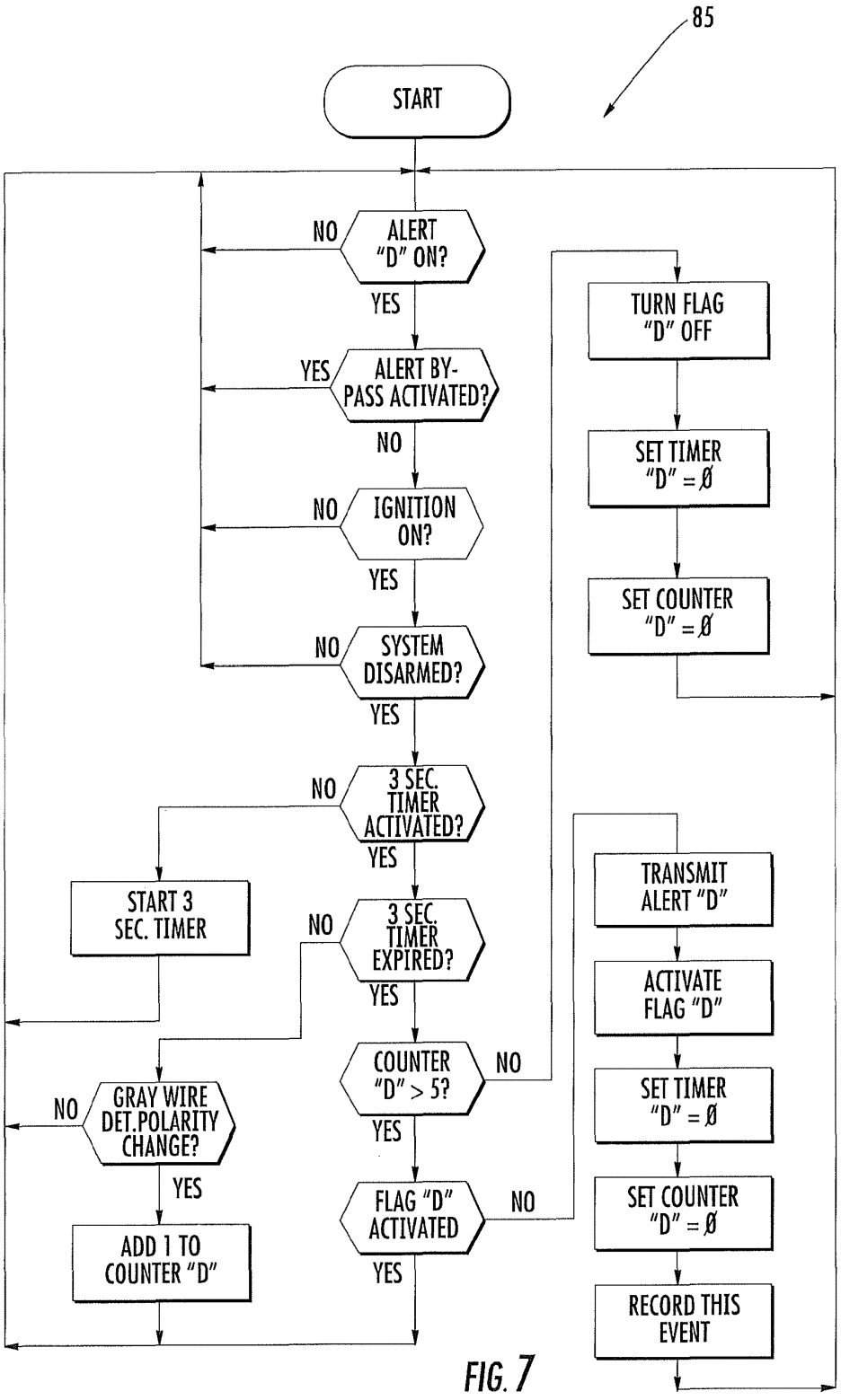
85
START
NO
ALERT "D" ON?
YES
YES
ALERT BY-PASS ACTIVATED?
NO
NO
IGNITION ON?
YES
NO
SYSTEM DISARMED?
YES
NO
3 SEC. TIMER ACTIVATED?
YES
START 3 SEC. TIMER
NO
3 SEC. TIMER EXPIRED?
YES
COUNTER "D" > 5?
NO
YES
NO
GRAY WIRE DET.POLARITY CHANGE?
YES
ADD 1 TO COUNTER "D"
FLAG "D" ACTIVATED
NO
YES
TURN FLAG "D" OFF
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
TRANSMIT ALERT "D"
ACTIVATE FLAG "D"
SET TIMER "D" = Ø
SET COUNTER "D" = Ø
RECORD THIS EVENT

FIG. 7

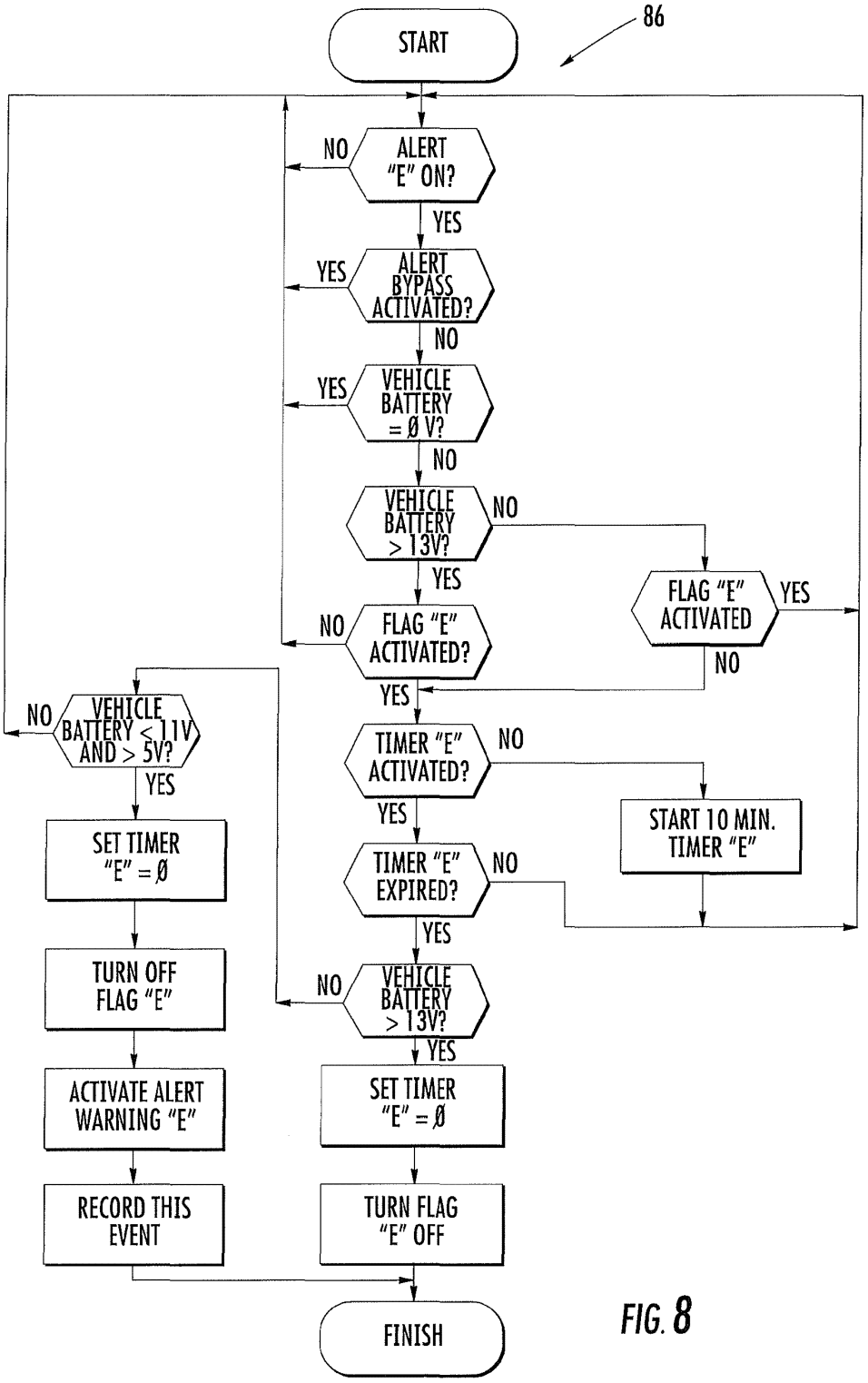
86
START
ALERT "E" ON?
NO
YES
ALERT BYPASS ACTIVATED?
YES
NO
VEHICLE BATTERY = Ø V?
YES
NO
VEHICLE BATTERY > 13V?
NO
YES
FLAG "E" ACTIVATED
YES
NO
FLAG "E" ACTIVATED?
NO
YES
VEHICLE BATTERY < 11V AND > 5V?
NO
YES
TIMER "E" ACTIVATED?
NO
YES
START 10 MIN. TIMER "E"
SET TIMER "E" = Ø
TIMER "E" EXPIRED?
NO
YES
TURN OFF FLAG "E"
VEHICLE BATTERY > 13V?
NO
YES
ACTIVATE ALERT WARNING "E"
SET TIMER "E" = Ø
RECORD THIS EVENT
TURN FLAG "E" OFF
FINISH

FIG. 8

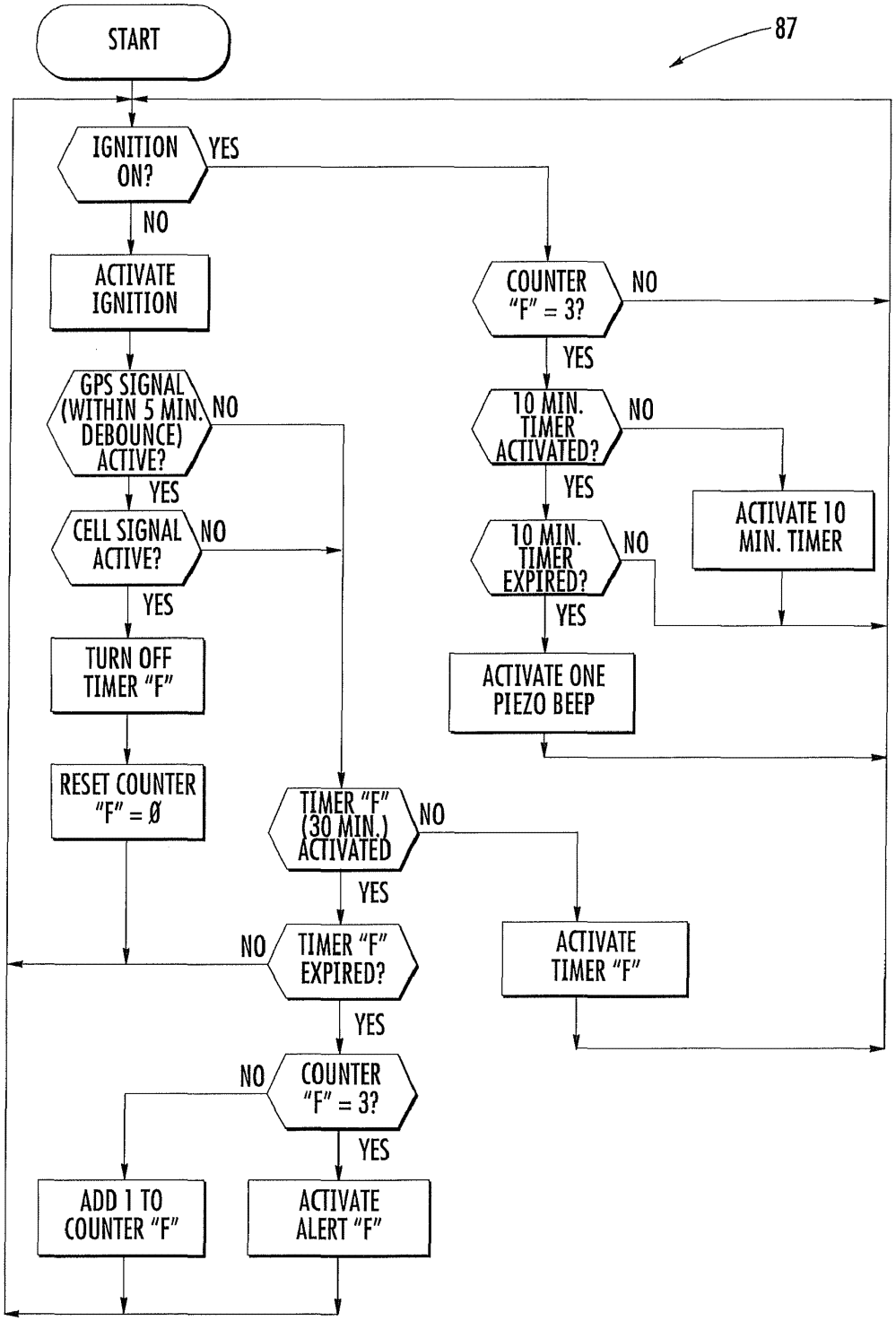
87
START
IGNITION ON?
YES
NO
ACTIVATE IGNITION
GPS SIGNAL (WITHIN 5 MIN. DEBOUNCE) ACTIVE?
NO
YES
CELL SIGNAL ACTIVE?
NO
YES
TURN OFF TIMER "F"
RESET COUNTER "F" = Ø
TIMER "F" (30 MIN.) ACTIVATED
NO
YES
NO
TIMER "F" EXPIRED?
YES
NO
COUNTER "F" = 3?
YES
ADD 1 TO COUNTER "F"
ACTIVATE ALERT "F"
COUNTER "F" = 3?
NO
YES
10 MIN. TIMER ACTIVATED?
NO
YES
ACTIVATE 10 MIN. TIMER
10 MIN. TIMER EXPIRED?
NO
YES
ACTIVATE ONE PIEZO BEEP
ACTIVATE TIMER "F"

FIG. 9

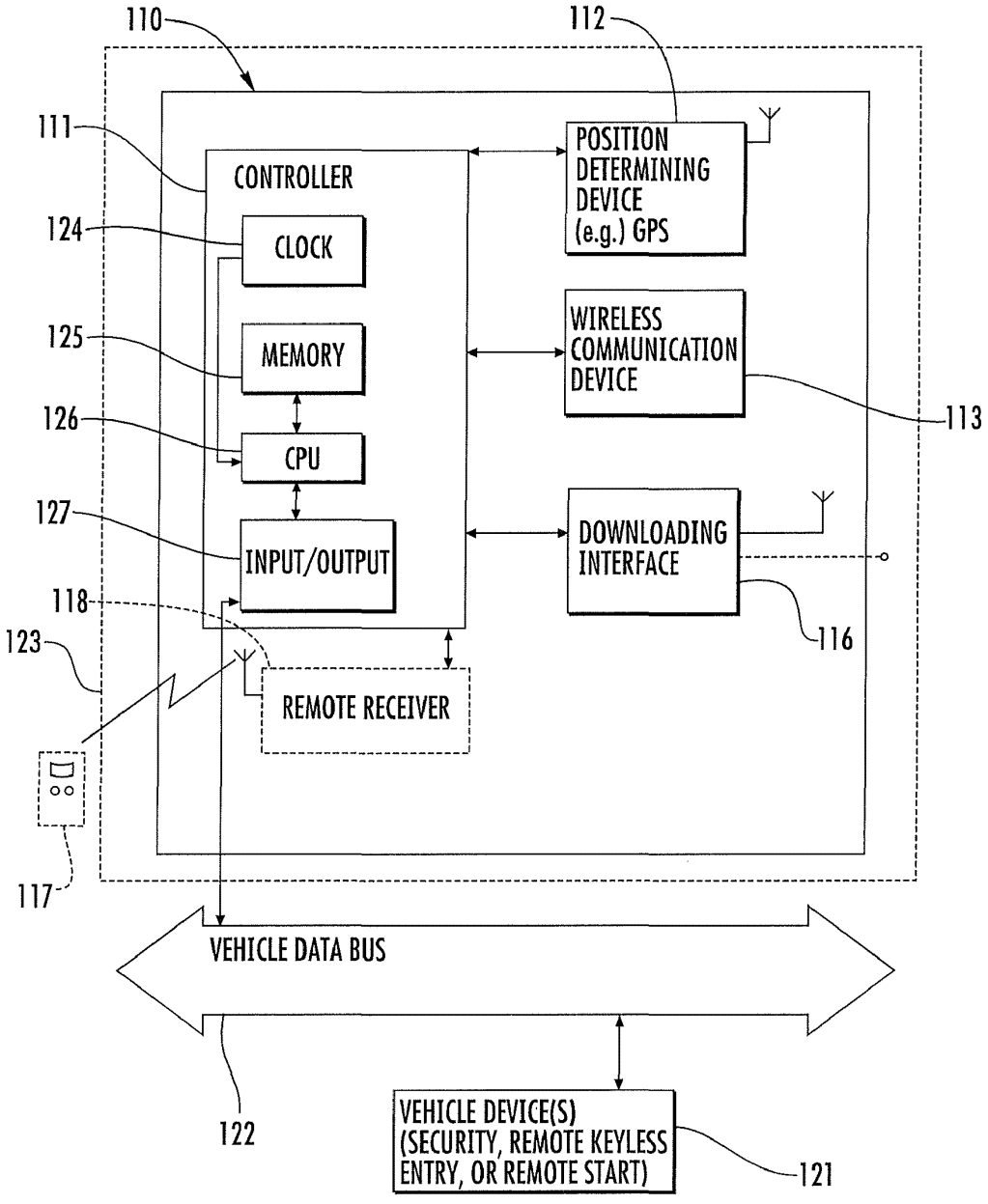
110
112
111
CONTROLLER
POSITION DETERMINING DEVICE (e.g.) GPS
124
CLOCK
125
MEMORY
WIRELESS COMMUNICATION DEVICE
113
126
CPU
127
INPUT/OUTPUT
DOWNLOADING INTERFACE
116
118
123
REMOTE RECEIVER
117
VEHICLE DATA BUS
122
VEHICLE DEVICE(S) (SECURITY, REMOTE KEYLESS ENTRY, OR REMOTE START)
121

FIG. 10

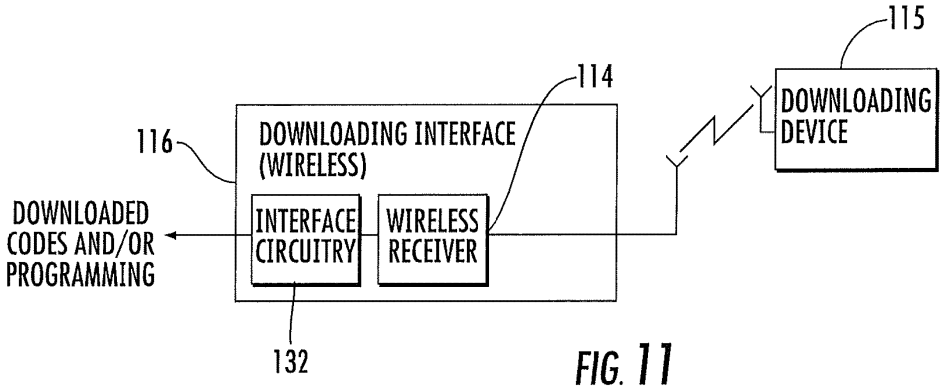

FIG. 11

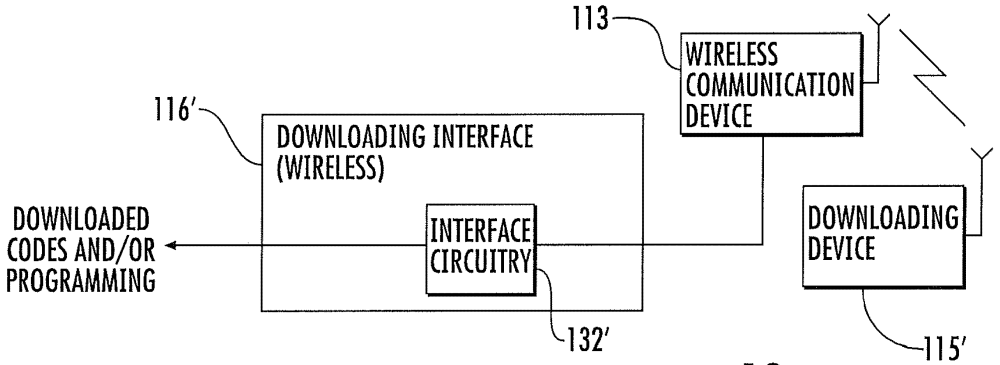

FIG. 12

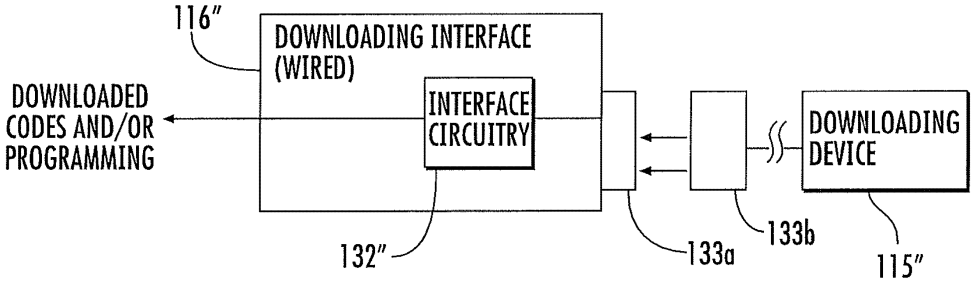

FIG. 13

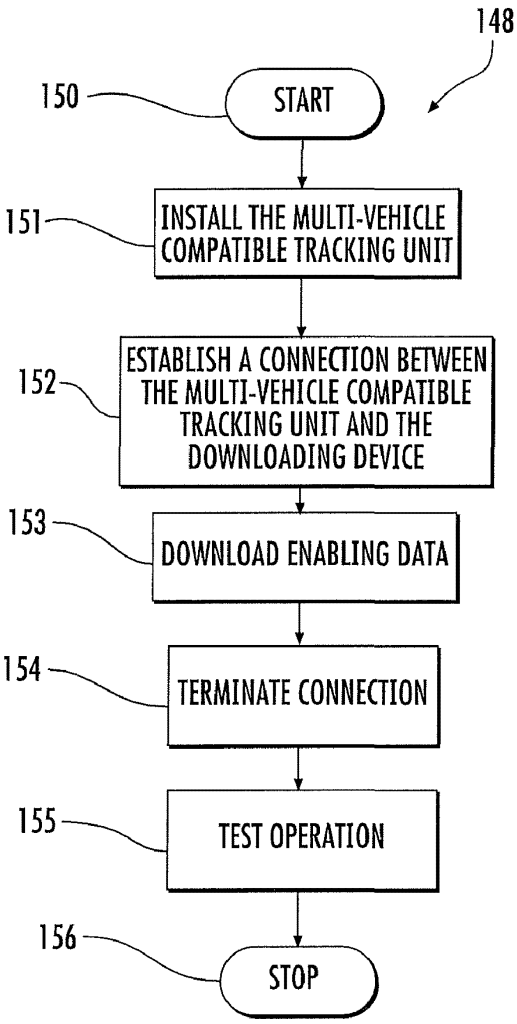
148
150
START
151
INSTALL THE MULTI-VEHICLE COMPATIBLE TRACKING UNIT
152
ESTABLISH A CONNECTION BETWEEN THE MULTI-VEHICLE COMPATIBLE TRACKING UNIT AND THE DOWNLOADING DEVICE
153
DOWNLOAD ENABLING DATA
154
TERMINATE CONNECTION
155
TEST OPERATION
156
STOP

FIG. 14

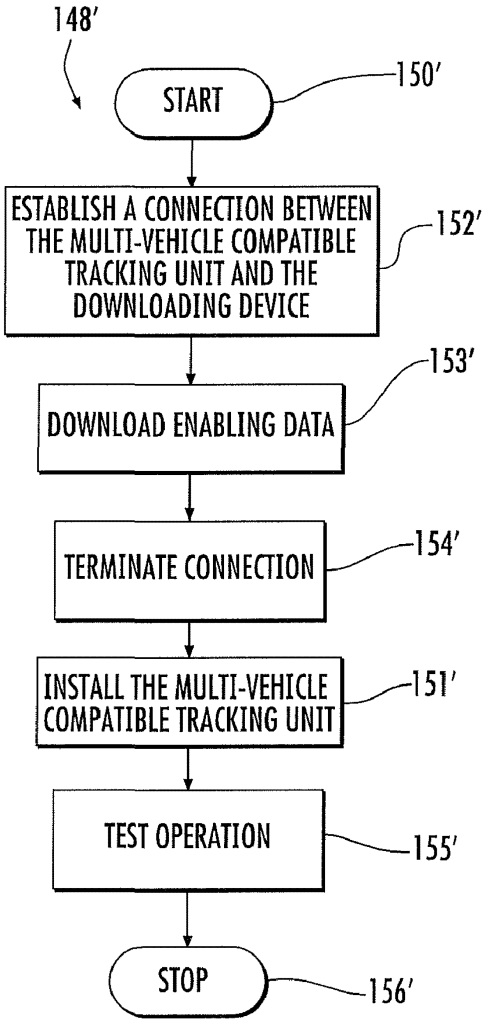
148'
150'
START
152'
ESTABLISH A CONNECTION BETWEEN THE MULTI-VEHICLE COMPATIBLE TRACKING UNIT AND THE DOWNLOADING DEVICE
153'
DOWNLOAD ENABLING DATA
154'
TERMINATE CONNECTION
151'
INSTALL THE MULTI-VEHICLE COMPATIBLE TRACKING UNIT
155'
TEST OPERATION
156'
STOP

FIG. 15

VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS

RELATED APPLICATIONS

The present application is a continuation-in-part of U.S. patent application Ser. No. 11/076,259 filed Mar. 9, 2005 now U.S. Pat. No. 7,720,597, which is a continuation of U.S. patent application Ser. No. 10/383,496 filed Mar. 7, 2003 now U.S. Pat. No. 7,149,623, which is a continuation of U.S. patent application Ser. No. 09/859,972 filed on May 17, 2001 now U.S. Pat. No. 6,606,561 which, in turn, was based upon provisional patent application Ser. Nos. 60/264,811 filed on Jan. 29, 2001; 60/258,005, filed Dec. 22, 2000; 60/251,552, filed Dec. 6, 2000; 60/252,125, filed Nov. 20, 2000; 60/236,890, filed Sep. 29, 2000; 60/246,463, filed Nov. 7, 2000; 60/222,777, filed Aug. 3, 2000; and 60/205,178, filed May 17, 2000, the entire contents of each of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to the field of vehicle devices, and, more particularly, to a tracking system for vehicles, and related methods.

BACKGROUND OF THE INVENTION

Motor vehicles, such as passenger cars, trucks, busses, fleet vehicles, etc. are widely used and knowing the locations of such vehicles is often desired. For example, should a vehicle be stolen, it would be beneficial to know the vehicle's location so that authorities could be promptly and accurately directed to retrieve the vehicle. Indeed, the tracking system could plot the getaway path of the thief.

For a company with hired drivers, it may be desirable to know the driver's whereabouts during the course of the day. Similarly, a rental car agency or other fleet operator, for example, may wish to know the whereabouts of its fleet of vehicles.

It may also be desirable to track the location of a vehicle as it is used throughout the course of a normal day. For parents of younger or older drivers, for example, knowledge of the vehicle's location may provide some assurance that the driver is at designated locations and following a prescribed route.

A number of patents disclose various systems and approaches to tracking vehicles. For example, U.S. Pat. No. 5,223,844 discloses a tracking system including a control center and a mobile unit installed in the vehicle. The mobile unit may send security warnings to the command center via a wireless transceiver. Position information for the vehicle is determined using a GPS receiver at the vehicle.

U.S. Pat. No. 5,515,043 discloses a similar system which may send one or more preprogrammed telephone messages to a user when away from the vehicle. The user may remotely access location information or cause certain commands to be carried out by entering a personal identification number (PIN).

The widespread availability and use of the Internet has prompted a number of vehicle tracking systems to also make use of the Internet. For example, TelEvoke, Inc. proposed such a system in combination with Clifford Electronics. The system was to provide notification, control and tracking services via the telephone or the Internet. Users could be notified via phone, e-mail, or pager of events such as a car alarm being triggered. Users could control the vehicle remote devices via phone, web, or PDA such as unlocking car doors. Additionally, users could track TelEvoke-enabled vehicles on the Internet or via the telephone. An Internet map could be viewed by the user showing the actual and prior vehicle locations. TelEvoke offered its services via a centralized fully automated Network Operations Center. To reduce the communications costs, it was proposed to use the control channel of the cellular telephone network.

There are, of course, a number of vehicles which come from the manufacturer with some form of security system already installed. In addition, a number of vehicles are also equipped with aftermarket security systems. Many conventional vehicle tracking units may not be readily installed in vehicles, particularly those vehicles already including a vehicle security system. In addition, complexity of installation may significantly increase the system costs.

A number of patents disclose various security and control systems that address data bus interoperability. For example, U.S. Pat. No. 5,719,551, assigned to Omega Patents, LLC, the assignee of the present invention, discloses a vehicle security system for a vehicle including a data bus connecting a plurality of vehicle devices. A signal enabling circuit enables the alarm controller to operate using a set of desired signals selected from a plurality of possible sets for different vehicles. U.S. Pat. No. 6,011,460, assigned to Omega Patents, LLC, discloses a similar system where the set of desired signals from the plurality of different sets of signals for different vehicles is obtained, such as by connection and communication with a downloading device. Additionally, U.S. Pat. No. 6,756,885, also assigned to Omega Patents, LLC, discloses a multi-vehicle control system whereby a multi-vehicle compatible controller stores a set of device codes for a given vehicle device for a plurality of different vehicles. Device codes are read from the data communications bus, and a match between a read device code and the stored device codes is determined to provide compatibility with different vehicles.

Unfortunately, such advanced techniques for dealing with multiple device codes for a vehicle having a data communications bus have not yet been developed for vehicle tracking units.

SUMMARY OF THE INVENTION

In view of the foregoing background, it is therefore an object of the present invention to provide a multi-vehicle compatible tracking unit which may be used to control operable vehicle devices, and/or read information therefrom via the vehicle data communications bus and related methods.

This and other objects, features, and advantages in accordance with the present invention are provided by a multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle. The multi-vehicle compatible tracking unit may include a vehicle position determining device, a wireless communications device, and a multi-vehicle compatible controller for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The multi-vehicle compatible controller may be coupled to the vehicle data bus for communication thereover with at least one vehicle device. The at least one vehicle device may use at least one corresponding vehicle device code from among a plurality thereof for different vehicles. The tracking unit may also include a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller. Accordingly, the multi-vehicle compatible

tracking unit may be used to control operable vehicle devices, and/or read information therefrom via the vehicle data communications bus.

The downloading interface may comprise either a wired or wireless signal downloading interface. The wired signal downloading interface may comprise a connector for temporary connection to a downloading device, for example. The wireless signal downloading interface may include a wireless receiver for temporary connection to a downloading device. The wireless signal downloading interface may also be in the form of a connection to the wireless communications device used for sending position information. The downloading interface may also be for permitting downloading of at least one programming instruction for the multi-vehicle compatible controller, in some embodiments.

The corresponding at least one vehicle code may be for reading from the at least one vehicle device, and/or for writing to the at least one vehicle device. Further, the multi-vehicle compatible tracking unit may comprise a remote transmitter. At least one vehicle remote control function responsive to the remote transmitter may be performed by the multi-vehicle compatible controller. For example, the at least one vehicle remote control function may include at least one of a vehicle security function, a remote keyless entry function, and a remote engine starting function. Also, the wireless position determining device may comprise a Global Positioning System (GPS) receiver. A tracking unit may also include a common housing for its various components.

A method aspect is for using a multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle. The multi-vehicle compatible tracking unit may include a vehicle position determining device, a wireless communications device, and a multi-vehicle compatible controller for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The multi-vehicle compatible controller may be coupled to the vehicle data bus for connection thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality of thereof for different vehicles. The method may include downloading the enabling data related to at least one corresponding vehicle device code for use by the multi-vehicle compatible controller via a downloading interface.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a simplified block diagram of a vehicle tracking system in accordance with the present invention.

FIG. **2** is a more detailed block diagram of the vehicle tracking unit as shown in FIG. **1**.

FIG. **3** is a more detailed block diagram of the monitoring station as shown in FIG. **1**.

FIG. **4** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle stolen alert.

FIGS. **5**A-**5**C are a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle alarm sounding alert.

FIG. **6** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a vehicle speeding alert.

FIG. **7** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating an unauthorized transmitter learned alert.

FIG. **8** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a low battery alert.

FIG. **9** is a flowchart for operation of the vehicle tracking system as shown in FIG. **1** illustrating a GPS or cellular unit failure alert.

FIG. **10** is a simplified block diagram of a multi-vehicle compatible tracking unit in accordance with the invention.

FIG. **11** is a more detailed block diagram of an embodiment of the downloading interface as shown in FIG. **10**.

FIG. **12** is a more detailed block diagram of another embodiment of a downloading interface as shown in FIG. **10**.

FIG. **13** is a more detailed block diagram of yet another embodiment of the downloading interface as shown in FIG. **10**.

FIG. **14** is a flowchart showing a method in accordance with the invention.

FIG. **15** is a flowchart showing another embodiment of a method in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout, and prime notation and multiple prime notation are used to indicate similar elements in alternate embodiments.

Referring to FIGS. **1-3**, the vehicle tracking system **20** in accordance with the invention is now initially described. The vehicle system **20** illustratively includes a vehicle tracking unit **25** to be mounted in the vehicle **21** and a monitoring station **30** which is remote from the vehicle and which is typically in a fixed location. In the illustrated embodiment, the vehicle tracking unit **25** interfaces with various vehicle devices, such as may include security sensors, door locks, etc. as will be appreciated by those skilled in the art.

The vehicle tracking unit **25** is also illustratively connected to a separate vehicle security system **27** as may already be installed in the vehicle **21**, from the factory or installed as an aftermarket product. Those of skill in the art will appreciate that in some embodiments of the vehicle tracking system **20** a separate vehicle security system **27** may not be needed, and/or various features thereof can be readily incorporated in the vehicle tracking unit **25**.

The monitoring station **30** may typically service a number of subscribers **31**. As shown perhaps best in FIG. **3**, the monitoring station **30** may include a user interface, such as the schematically illustrated telephone network interface **33** and the internet interface **34** which are schematically coupled to a telephone **35**, and a computer **36**, respectively. Of course in other embodiments, other interfaces may be used and only one of the illustrated interfaces may be needed. Those of skill in the art will also recognize that messages may be sent to a subscriber or user via preprogrammed voice messages, e-mail messages, facsimile messages, pager alerts, etc. In addition commands or instructions from the subscriber can also be input to the monitoring station **30** via the telephone network interface **33** and/or the internet interface **34**, from the subscribers telephone **35** or computer **36**.

The monitoring station **30** is illustratively connected to a cellular telephone tower **32** which, in turn, may communicate with the vehicle tracking unit **25** in some embodiments. Of course, in other embodiments other communications

approaches are also contemplated, such as, for example, including satellite communications.

The monitoring station **30** may typically include the necessary modems, and other communications electronics, and computers for its functions which are described in greater detail below. The configuration of such components and their details will be readily apparent to those skilled in the art. Accordingly, no further discussion of these details is needed.

Referring now more specifically to FIG. **2**, additional details of the vehicle tracking unit **25** and devices at the vehicle are now further described. The vehicle tracking unit **25** illustratively includes a controller **40**, a vehicle position determining device **42**, and a wireless communications device **44** connected together. The vehicle position determining device **42** may be provided by a GPS receiver, for example. The GPS receiver typically operates by receiving multiple signals from spaced apart satellites **38** as will be appreciated by those skilled in the art.

In other embodiments, the vehicle position determining device **42** may be provided based upon communications with the cellular telephone network, or based upon other satellite transmissions, for example. As a particular example, time of arrival techniques are available based upon multiple reception paths to determine position via the cellular telephone network as will be appreciated by those skilled in the art. The vehicle position determining device **42** also illustratively includes an indicator **43** associated therewith, such as for indicating an operating mode, or proper operation of the device as will be addressed in greater detail below.

The wireless communications device **44** may be provided by a cellular telephone transceiver configured to operate on a control channel of the cellular network. Such a control channel may provide nearly universal coverage for the tracking system **20** as will be appreciated by those skilled in the art. In addition, the control channel may offer relatively inexpensive communications between the monitoring station **30** and the vehicle tracking unit **25** as will be appreciated by those skilled in the art. The wireless communications device **44** also illustratively includes an optional status indicator **45** with a similar function as the indicator **43** for the vehicle position determining device.

The wireless communications device **44** in other embodiments, may transmit in the voiceband of the cellular network. Alternately, the wireless communications device may communicate over other networks, such as over satellite, or via wireless internet services, as will be appreciated by those skilled in the art.

The controller **40** illustratively includes a central processing unit (CPU) **50** or other logic circuitry which is connected to a clock signal generator **51** and a memory **52**. In other embodiments, the memory **52** may be an embedded memory in the CPU **50**. The controller **40** also includes schematically illustrated input/output circuitry **53** to interface with various vehicle devices. In particular the input/output circuitry **53** may provide dual polarity compatibility for one or more inputs or outputs as will be described in greater detail below. One or more of the terminals of the input/output circuitry **53** may also provide both input and output functions as will also be described in greater detail below. This may significantly simplify and accelerate installation of the vehicle tracking unit **25** in the vehicle **21**.

Also illustratively shown as part of the vehicle tracking unit **25** are a back-up battery **54**, and switch **55** connected thereto for selectively powering certain of the components based upon the controller **40**. Of course, the vehicle **21** also includes an electrical system including the vehicle battery **61**. Powering of the vehicle tracking unit **25** is described in greater detail below.

The vehicle **21** also includes a number of other components that may relate to vehicle tracking, security, and/or convenience features provided by the vehicle tracking system **20**. For example, the vehicle **21** may include one or more door lock actuators **62**, an optional remote starting device **63**, a starter interrupt device **66** and an alarm indicator **67**. For example, the alarm indicator may be provided by a vehicle horn or vehicle siren, and/or flashing of the lights.

The optional separate security system **27** illustratively includes a vehicle security controller **28** and a receiver **29** connected thereto. As is conventional, the vehicle security system **27** may be switched between armed and disarmed modes, for example, by one or more uniquely coded remote transmitters **60**. The vehicle security controller **28** may also be capable of learning a new uniquely coded remote transmitter **60** as will be appreciated by those skilled in the art. The vehicle security controller **28** also illustratively is connected to the starter interrupt device **66** and the alarm indicator **67**.

For ease of explanation, a number of the features of the vehicle tracking system **20** are now described. The vehicle tracking system **20** includes a number of features that may simplify installation and maintenance. For example, as shown in FIG. **2**, the vehicle tracking unit **25** may have a test switch **71** connected to the controller **40**.

In normal operation, the controller **40** may be called upon to operate at least one vehicle device. Of course, the controller **40** also cooperates with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. Moreover, the controller **40** may be switchable to a test mode for test operation of the at least one vehicle device responsive to activation of the test switch **71**.

In some embodiments, the at least one vehicle device may be a plurality of vehicle devices that are tested by operation in sequence. For example, the at least one vehicle device may comprise at least one door lock actuator **62**. The at least one vehicle device may also comprise the starter interrupt device **66**, or the engine remote starter **63** if remote starting is an implemented feature. The at least one vehicle device which is tested, may also be the alarm indicator **67**. Accordingly, an installer, for example, can quickly check that the tracking unit has been properly installed.

To further provide for ready determination of proper operation of the vehicle tracking unit **25**, one or both of the position determining and wireless communications devices **42**, **44** may include associated indicators **43**, **45** as mentioned briefly above, and which provide an indication relating to proper operation. Each indicator **43**, **45** may indicate a mode of operation of the device, its proper operation, or a partial or complete failure of the device.

Another aspect of the invention is that the controller **40** may provide a selectable polarity for the at least one vehicle device based upon sensing thereof. Accordingly, a predetermined activation of the test switch **71** may cause the controller **40** to sense and select the proper polarity. Pressing the test switch **71** for a predetermined time or in a predetermined pattern may sense and set the polarity.

Another feature of the vehicle tracking unit **25** and vehicle tracking system **20** relates to conservation of the number of codes or messages that need to be sent to the vehicle tracking unit. In particular, the controller **40** may have a plurality of different controller states and respond differently to a same message from the monitoring station **30** at different times depending upon the controller state at a given time. Accord-

ingly, a number of codes or messages used by the system can be conserved. Various messages are described in greater detail below.

A controller state may change based upon several different occurrences or events. For example the controller may change states in response to a change in at least one vehicle device, or based upon a message received by the wireless communications device **44** from the monitoring station **30**, and/or based upon elapsed time. The controller states, for example, may include an alert sent state based upon an alert message being sent from the wireless communications device **44**. Thereafter, receipt of a predetermined message by the wireless communications device **44** when the controller **40** is in the alert sent state may confirm receipt of the alert message by the monitoring station.

Receipt of the predetermined message by the wireless communications device **44** when the controller **40** is in another state different than the alert sent state may thus cause a different response by the controller. The alert sent state may comprise at least one of a vehicle stolen alert sent state, a vehicle alarm sounding alert sent state, a vehicle speeding alert sent state, an unauthorized remote transmitter alert sent state, a low vehicle battery alert sent state, and a device malfunction alert sent state. The various alert messages and confirmation thereof are described in greater detail below.

The code or message conservation aspects of the vehicle tracking system **20** also permit sending a sequence of codes or messages within a predetermined time to also cause a different response at the vehicle tracking unit **25**. In other words, the plurality of controller states may comprise a received first message state based upon a first message being received by the wireless communications device **44** from the monitoring station **30**. Receipt of a second message by the wireless communications device **44** when the controller **40** is in the received first message state, such as within a predetermined time window, for example, may thus cause a different response by the controller than does receipt of the second message when the controller is in another state than the received first message state.

The plurality of controller states may comprise a vehicle finder state sounding an audible signal via the alarm indicator **67** at the vehicle **21**. In this state the controller **40** would bypass sending a vehicle alarm sounding alert to the monitoring station **30**.

Another aspect of the vehicle tracking system **20** is the provision of certain power conservation and management techniques, such as to permit extended periods where the vehicle **21** is not in operation. During such extended periods, the vehicle battery **61** provides power to the vehicle tracking unit **25** as well as other vehicle devices. Accordingly, the voltage of the vehicle battery **61** drops over time. The vehicle tracking unit **25** may provide a significant drain on the vehicle battery **61** because of the power consumed by the wireless communications device **44** during transmission as will be appreciated by those skilled in the art.

The vehicle position determining device **42**, the wireless communications device **44** and the controller **40** may be considered as defining a power load of the vehicle tracking unit **25**. The controller **40** may operate the schematically illustrated power switch **55** to isolate the back-up battery **54** from the power load as a voltage of the vehicle battery **61** drops until reaching a threshold. After or below the threshold the controller **40** may cause the back-up battery **54** to selectively power only a first portion of the power load while a second portion of the power load remains powered by the vehicle battery.

For example, the wireless communications device **44** may have a higher operating voltage than the vehicle position determining device **42**. The first portion of the power load that is selectively powered despite the low vehicle battery voltage may thus be the wireless communications device **44**. In particular, the wireless communications device **44** may be powered for transmission. Accordingly, the back-up battery **54** can be saved for limited communication using the higher voltage wireless communications device **44**. This provides useful features even after an extended period during which the vehicle **21** is left unattended and the vehicle battery **61** gradually discharges.

To further conserve power, the controller **40** may reduce operation of the power load as vehicle battery voltage falls. Conversely, the controller **40** may restore operation of the power load based upon the voltage of the vehicle battery **61** rising again, such as upon being recharged.

Also relating to power consumption, the controller **40** further causes transmission of a low vehicle battery voltage alert to the monitoring station **30** based upon the voltage of the vehicle battery **61** falling below the threshold. The user or subscriber may cause the monitoring station **30** to issue a remote start command. The controller **40** may then generate a remote start output to the remote start device **63** to thereby start the engine and recharge the vehicle battery.

Another feature of the vehicle tracking system **20** is that the vehicle tracking unit **25** may be readily installed and connected to a vehicle **21**, such as in the illustrated embodiment where the vehicle includes a starter interrupt device **66** and a separate vehicle security controller **28**. More particularly, the controller **40** may switch between an armed mode and a disarmed mode based upon operation of the engine starter interrupt device **66**. The controller **40** when in the armed mode may cooperate with the wireless communications device **44** to send an alert message to the monitoring station **30** and including vehicle position information, for example, based upon the vehicle position determining device **42**. The controller **40** is also for selectively operating the engine starter interrupt device **66** to provide additional security features.

In one advantageous embodiment, the controller **40** preferably comprises a combination input and output terminal for connection to the engine starter interrupt device. This terminal is at the input/output circuitry **53** and is schematically illustrated by reference numeral **72**. The controller **40** may switch to the armed mode when in the disarmed mode and based upon the engine starter interrupt device **66** being operated to disable engine starting. Conversely, the controller **40** may switch to the disarmed mode based upon the engine starter interrupt device **66** being operated to enable engine starting. In other words, the vehicle tracking unit **25** can piggyback its arming and disarming off the existing vehicle security system **27**, for example.

The controller **40** may also selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. The controller **40** may selectively operate the engine starter interrupt device **66** based upon a command message from the monitoring station **30**. Alternately, or in addition thereto, the controller **40** may selectively operate the engine starter interrupt device **66** based upon the ignition switch **65**.

The following descriptive portions relate to various user or subscriber notifications and features provided by the vehicle tracking system **20**. Of course, the controller **40** preferably cooperates with the wireless communications device **44** to send an alert message. The monitoring station **30** may comprise a user interface, such as one or both of the telephone

network or internet interfaces **33**, **34**, respectively (FIG. **3**), for generating a sequence of alert message notifications based upon receiving the alert message sent from the vehicle tracking unit **25**. More particularly, the monitoring station interface permits canceling any remaining alert message notification based upon a cancellation command response from a user or subscriber having already received the alert message notification. The user may send the cancellation response via the telephone **35** or computer **36** (FIG. **3**), for example. Thus, if the user may be reached at different telephone numbers or different users are desirably notified of the alert, this aspect of the vehicle tracking system **20** can make the notifications efficiently and without making unnecessary notifications.

The vehicle tracking system **20** may provide any of a number of very useful alerts, as discussed herein. For example, the alert message sent from the vehicle tracking unit may comprise at least one of a vehicle stolen alert message, and a vehicle alarm sounding alert message. The alert message may be one of a vehicle speeding alert message, and a vehicle acceleration alert message. In addition, the alert message may comprise an unauthorized remote transmitter alert message. Also, the alert message may be at least one of a low vehicle battery alert message, and a device malfunction alert message.

The speeding alert may be based upon exceeding a speed threshold for greater than a certain time, which may be user selectable. The acceleration alert may also be useful as such is also indicative of aggressive driving along with the speeding alert. The unauthorized remote transmitter alert increases overall security since a user will be notified if a would-be thief learns an unauthorized transmitter to operate the controller. These alerts are described in greater detail below.

The vehicle tracking system **20** may be implemented as a service to a subscriber. In other words, the subscriber pays a monthly fee for the service. Accordingly, it may be important to encourage a user to register. Similar subscriber or registrations systems in the past have suffered revenue losses since some users would wait to activate the system until the vehicle was stolen. In other words, the user would only subscribe or register and pay a single month's fee.

In accordance with this aspect of the vehicle tracking system **20** prompt user registration is encouraged. In particular, the vehicle tracking unit **25** may include the user registration reminder indicator **56** and the controller **40** may be switchable from an unregistered mode to a registered mode. In the registered mode, the controller **40** may cooperate with the wireless communications device **44** and the vehicle position determining device **42** to determine and send vehicle position information to the monitoring station **30**. In the unregistered mode, the controller **40** may activate the user registration reminder indicator **56** to encourage registration by the user.

The controller **40** may be switchable to the registered mode based upon an activation message from the monitoring station **30**. For example, when the registration payment has been received, the monitoring station can send one or more messages to the vehicle tracking unit **25** to stop activation of the registration reminder indicator **56**. The indicator **56** may be audible, visual or both. For example, the registration reminder indicator **56** could be a beeping sound generated by a small piezoelectric transducer every ten minutes or so when the ignition **65** is on.

In other words, the user registration reminder indicator **56** may provide a minor but irritating annoyance to the user to encourage registration. Upon successfully registering, the annoyance is abated. Accordingly, a relatively straightforward approach is provided to encourage user registration.

Along these lines, the controller **40** when in the unregistered mode may have reduced features compared to the registered mode. For example, the controller **40** when in the unregistered mode may be restricted or limited in sending messages with the wireless communications device **44**. Accordingly, usage of the wireless communications network may be reduced. Transmissions from the vehicle tracking unit **25** may also be beneficially suppressed during original installation, for example.

Returning again to features of the vehicle tracking unit **25** which facilitate installation, the controller **40** may send an alarm indication alert responsive to a continuous activation of the alarm indicator **67** for greater than a predetermined time. Alternately, or in addition thereto, the controller **40** may send an alarm indication alert responsive to a repetitive pattern of alarm indicator **67** activations. In other words, the controller may be configured to distinguish between normal operation of a vehicle horn by the driver, and activation of the horn by the security system **27**. As mentioned above, the controller **40** may also monitor signals of at least one of a first and second polarity. The controller **40** thus advantageously piggybacks off the alarm indication generated by the vehicle security system **27** to determine and send a vehicle alarm sounding alert to the monitoring station **30**.

In one variation, the controller **40** may monitor signals delivered directly to the vehicle alarm indicator by the vehicle security controller **28**. In another variation, the controller **40** monitors signals of voltage dips of the vehicle battery **61**. Circuitry is conventionally and readily available for both such functions, as will be readily appreciated by those skilled in the art.

The controller **40** may also include a dual polarity compatible output in the input/output circuitry **53** for a vehicle device, such as the vehicle alarm indicator **67**. The controller **40** may further monitor signals relating to activation of the vehicle alarm indicator **67** and send an alarm indication alert with position information from the vehicle position determining device and using the wireless communication device.

For the dual polarity output compatibility, the controller **40** may generate a first polarity output pulse followed by a second polarity output pulse. The controller **40** may also generate a repeating pattern of a first polarity output pulse followed by a second polarity output pulse on the dual polarity compatible output. In yet other embodiments, the controller **40** may sense an actual polarity of the device and thereafter use the actual polarity for the dual polarity compatible output.

Where the vehicle device is a vehicle horn, the controller **40** may typically be configured to generate a negative polarity output on the dual polarity compatible output. Conversely, wherein the vehicle device is a vehicle alarm indicator siren, the controller **40** may be configured to generate a positive polarity output on the dual polarity compatible output.

Another aspect of the vehicle tracking system **20** relates to conserving memory space and/or reducing transmission time over the communications network. In accordance with this advantageous feature, the controller **40** may determine the vehicle position information including a vehicle location and an associated stationary period for each occurrence of the vehicle remaining stationary for greater than a predetermined period. In one embodiment, the controller **40** may cooperate with the wireless transmission device **44** to send the vehicle position information to the monitoring station based upon each occurrence of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the monitoring station **30** may associate a time with each occurrence of the vehicle remaining stationary for greater

than the predetermined period. In other words, the monitoring station **30** may time stamp the received information.

In another embodiment, the controller **40** cooperates with the wireless transmission device **44** to send the vehicle position information to the monitoring station **30** for a plurality of occurrences of the vehicle remaining stationary for greater than the predetermined period. In this embodiment, the controller **40** may associate a time with each occurrence of the vehicle remaining stationary for greater than the predetermined period. In other words, the controller time stamps the position and stationary period information.

As an example, the predetermined time which determines whether the vehicle **21** is stationary and the position should be determined, may be less than about three minutes. This time may filter out vehicle stops in normal traffic, but which will keep track of stops where the driver likely leaves the vehicle **21**. Accordingly, only the important information necessary to track the vehicle need be stored and/or transmitted thereby reducing the system costs. If the vehicle **21** is stationary overnight, for example, unnecessary position information need not be determined, stored, and/or transmitted to the monitoring station **30**.

The controller **40** may comprise the memory **52** for storing the vehicle position information therein. In one configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined schedule. In another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined event. In yet another configuration, the controller **40** downloads the vehicle position information from the memory **52** to the monitoring station **30** based upon a predetermined percentage of memory usage.

Having now described certain general features and advantages of the vehicle tracking system **20**, this description now turns to additional specific details which are provided as examples. In particular, vehicle tracking system **20** preferably implements one or more of the following features:

a. Detects the vehicle being stolen and transmits a signal to the monitoring station to contact up to 3 people, for example, predetermined by the user, of theft of the vehicle and then starts tracking the vehicle. The contact may be by one or more of the following: an e-mail message, a pager alert, a cellular telephone call, or other telephone call.

b. Detects an optional vehicle security or alarm system activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them the vehicle's alarm is being activated.

c. Detects an optional vehicle alarm system's remote PANIC activation and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of the vehicle's PANIC being activated.

d. Detects a vehicle being programmed to operate from an unauthorized remote transmitter, key transponder, other transponder, or other device that has a unique coding, and the vehicle unit transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of this occurrence. The system can also make available information relating to a number of such coded devices, or a change therein, or when a change occurred. A message can be sent to the user or the information can be available to the user on the website. The vehicle would be equipped with a security system as disclosed in U.S. Pat. No. 5,654,688, for example, which determines an unauthorized transmitter and provides an alert feature. This patent is incorporated herein in its entirety by reference.

e. Detects the vehicle traveling over a predetermined speed, such as for a predetermined time, and transmits a signal to the monitoring station to send a message, such as an e-mail informing the user (and/or others) of this occurrence. Of course, the message could also be sent via a telephone call or page, should additional urgency be required. The vehicle's predetermined maximum speed limit and duration thereof can be selected by the user.

f. Detects a low battery voltage such as for a predetermined time and transmits a signal to the monitoring station to contact up to 3 predetermined people to inform them of vehicle's low battery voltage. This is especially advantageous during winter so that the vehicle could be started, for example, to prevent a problem before it happens. The time setting is preferably selectable by the user.

g. Detects the vehicle not moving for a predetermined time and transmits a signal to the monitoring station to send, for example, a nightly e-mail informing the user of all the vehicle's location and stationary time occurrences. The stationary time length is also selectable. This may be advantageous to encourage patrolling personnel not to remain for a long time in a same location.

h. The vehicle unit preferably includes a back-up battery system making it more reliable.

The vehicle unit may be relatively inexpensive. In addition, the monitoring fee that includes sending up to 60 e-mails and making up to 6 phone calls per month, may also be relatively low. The relatively low monitoring fee is based, at least in part, on the current relatively low rates charged for use of the control channel of the cellular telephone network. It is also noted that access to the control channel provides coverage for almost the entire U.S., for example.

The user or subscriber also preferably has access to an Internet site that will display a map and silently contact the vehicle to acquire its current location, speed, direction of travel, and previous multiple locations with speeds, for example, the user's personal identification number (PIN) can be quickly activated by a telephone call. No additional installation may be required.

Certain annual pre-pay package arrangements may be available. For example, up to 10 access entries per month can be provided on a low monthly billing. Up to 30 access entries could be provided also for a relatively low monthly fee.

The present invention provides a number of other significant advantages including optional access from any phone or from any computer to access the monitoring station internet site. The user may control various vehicle functions remotely via the telephone or the internet site. The only charge may be for additional equipment and installation.

Additional features can also be included with the system and subscribed to by the user in accordance with the invention. For example, these include Hijack, Car Finding, Unlock Doors and Unauthorized Transmitter Alert Features. The equipment and installation is relatively inexpensive. For the hijack feature: from any phone or computer, the user may activate vehicle starter interrupt and sound the horn until the vehicle is retrieved (Command 4).

For the Car Finding feature: from any phone or computer, the user may activate the vehicle's horn, or siren and sound same for 30 seconds. This allows the user to find his vehicle in a crowded parking lot (Command 5).

For the Lock/Unlock vehicle doors feature: from any phone or computer a predetermined command (Command 7)

activates unlocking of vehicle doors to retrieve keys, for example, that may have been accidentally locked inside the vehicle. Of course, the system can also be used to lock vehicle doors if this was forgotten (Command 6). The unauthorized transmitter alert feature is similarly selected as described above.

In addition, a remote vehicle start feature may also be provided, such as to start the vehicle's engine to heat or cool the vehicle prior to entry. The equipment and installation for remote starting may be relatively low. Some further details of a specific embodiment of the vehicle tracking unit **25** are provided below as relating to use of red and green LED indicators as may be coupled to the controller **40** and operated thereby. Also various representative wires, designated by color, are provided as an example embodiment.

The red LED verifies the GPS receiving signal. With a yellow wire having positive 12 volts, the red LED blinking indicates searching GPS location, constant indicates found location, and off indicates no GPS signal found. With the yellow wire not having positive 12 volts, if the red LED is off, the LED is not functioning.

The green LED verifies receiving the cell tower signal. With the yellow wire having positive 12 volts, blinking indicates the cell control channel signal is detected, constant indicates sending a micro burst signal (LED stays on 5 seconds after each transmission), and off indicates no cell tower signal received. With the yellow wire not having positive 12 volts, off indicates the green LED is not functioning.

An example of representative DIP switch feature selection is as follows. A first switch may be used for adding the orange wire for controlling arm/disarming of the system. When on, the orange wire controls arm/disarm as follows: to arm, the orange wire is grounded and the yellow wire does not have 12 volts positive. To disarm, the orange wire is not grounded. When the first switch is off, then only the yellow wire controls arm/disarm as follows: to arm, the yellow wire is without 12 volts positive, and 30 seconds after continued arm mode then the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed. To disarm, the yellow wire is connected to 12 volts positive.

A main 5-pin plug may be provided on the vehicle unit and connected as follows:

a. The Red Wire is connected to the 12 vdc power. An alert warning "E" is given if the system is armed and the battery voltage becomes lower than 11 volts for longer than ## minutes. This alert feature "E" will not operate again until the voltage is above 12 volts to re-set this feature.
b. The black wire is connected to ground.
c. The yellow wire is connected to the ignition 12 volts so that if the key is on, 12 volts is supplied thereto and if the key is off, the yellow wire is connected to ground. Further: if the system is in an armed mode and the Lat/Long changes, then Alert "A" is given. If the system is disarmed and within 2.5 seconds after the yellow wire receives 12 volts and the gray wire detects 3 or more positive pulses the system activates Alert "D". If the first DIP switch is in the off position then: if 12 volts is on yellow wire, the system is disarmed and the orange wire discontinues from the 500 ma ground, and if the yellow wire sees ground or neutral, then the system is armed and 30 seconds after the continued arm mode the orange wire activates a constant 500 ma grounded output to operate an external starter interrupt relay until the system is disarmed.
d. The gray wire is for input and output, and can be connected to an alarm siren or horn positive terminal. In addition:
    i. With the system armed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "T" alarm activation is given.
    ii. With system disarmed and if the gray wire detects +12 v pulsing on/off or on constant for more than 10 seconds from an alarm siren or horn honking activation, then alert warning "C" panic activation is given.
    iii. With system disarmed and if the Gray wire detects 3 or more 12 volt positive pulses within 2.5 seconds of yellow wire receiving +12 v and the gray wire by-pass not being activated, then alert warning "D" is given.
    iv. The gray wire bypass operates as follows:
        1. After alert warning "B" bypass all future alert "B" signals until system is disarmed.
        2. After alert warning "C" bypass all future alert "C" signals until system is armed.
        3. After alert warning "D" bypass all future alert "D" signals until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire having 12 volts.
    v. With the system armed or disarmed. The Output: Internal +12 v, 1 amp transistor with pulses 1 second on and 1 seconds off to activate siren or honk car horn or flashing light relay.
        1. Non-stop activation from (Command "4")
        2. 30-second activation from (Command "5")
    vi. Turn off the above alert "A" from (Command "1").
i. The orange wire is for the starter interrupt and arm/disarm system, and operates as follows:
    i. If first DIP switch is in the:
        1. On position and: the orange wire has 12 volts or neutral, the system switches to the disarmed mode; the orange wire is grounded, then the system is switched to the armed mode; and the starter interrupt output will not automatically operate. It can only be activated from "Command 4"
        2. Off position and the orange wire does not effect the arming or disarming of the system; 30 seconds after system arms the orange wire will automatically activate constant 500 ma ground until the system is disarmed. And from "command #4". Connect to Starter interrupt relay output.
    ii. Command 4 activates Orange wire to have 500 ma. negative until Command 1 is received.
    iii. After alert warning "B" is activated the first time it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

The vehicle unit may also include a Door Lock Plug configured as follows, for example. A green wire provides a 250 ma, negative 1 second pulse for Lock Doors. (Command "6"). A red wire provides a constant 12 v output from the red power wire. A blue wire provides a 250 ma., negative 1 second pulse for Unlock Doors (Command "7"). A pink wire provides a 250 ma., negative 1 second pulse for remote Car Starter (Command "2").

An installation test button may also be provided to work as follows. Pressing the button activates the orange wire for 10-seconds (starter interrupt), with these circuits in sequence. First, it activates the gray wire for 1-second (siren/horn). After the first stops, it activates the green wire for 1 second to lock the doors. After the second stops, it activates the blue

wire for 1 second to unlock the doors. After the third stops, it activates the pink wire for 1 second to activate an optional item.

Representative warning alerts are as follows:

a. Alert Warning "A" (FIG. **4**): Automatic activation of "Command 8" and the vehicle unit contacts monitoring station to instantly call 3 phone numbers with the message "Your vehicle is stolen please confirm then call 911 to advise police of website and your pin # so police can locate the vehicle". This is detected with the system armed and the GPS indicating movement. Bypasses all future alert warning "A" signals until the system is re-armed.

b. Alert Warning "B" (FIGS. **5**A-**5**C): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the following message "Vehicle alarm activated please confirm". This is with the system armed and detecting gray wire having 12 volts pulsing or on constant for longer than 10-seconds. After alert warning "B" is activated the first time, it is thereafter bypassed while the orange wire remains grounded. Alert warning "B" is re-set to operate again 3 seconds after orange wire becomes ungrounded.

c. Alert Warning "C" (FIG. **6**): the vehicle unit contacts the monitoring station to instantly send e-mail message "vehicle was traveling faster than your preset amount of "###" and time limit of "##" seconds. Indicates the vehicle speed and location that the speeding started and how long speeding accrued" (Detected from GPS). This aspect is further understood with reference to the enclosed flowchart **84** of FIG. **6**.

d. Alert Warning "D" (FIG. **7**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Unauthorized remote transmitter was just programmed to operate your vehicle." This is with the system disarmed and the Gray wire detecting three or more 12 volt pulses within 2.5 seconds of the yellow wire having seen 12 volts positive. All future alerts "D" are bypassed until no 12 volt pulses are detected on the gray wire within 3 seconds of the yellow wire seeing 12 volts. This aspect is further understood with reference to the enclosed flowchart **85** of FIG. **7**.

e. Alert Warning "E" (FIG. **8**): the vehicle unit contacts the monitoring station to instantly call 3 phone numbers with the message "Vehicle has low battery voltage and system has changed to low voltage mode". This is with the system armed and detecting the red wire with lower than 11 volts for ## minutes. All future alerts "E" are bypassed until, first, more than 13.5 volts are detected on the red wire and, second, after the yellow wire stops having positive voltage the red wire then must detect more than 12 volts.

The following are representative commands for use in the system:

Command 1: Reset all circuits and system remains asleep until the ignition key is turned on. Resets the triggered mode and unit is asleep to prevent power drain on vehicle battery.

Command 2: (Accessory activation) monitoring station Command to the system to activate Pink wire to pulse 250 ma negative for 1 second.

Command 3: (Vehicle Location) website to indicate present location and past events in memory.

Command 4: (Hijack or Stolen) monitoring station Command to vehicle system to activate:

iv. Gray wire to pulse 1 sec on/1 sec off with 1 amp positive output and which continues until receive command # 1.

v. Orange wire to have 500 ma ground and which continues until receive command # 1.

Command 5: (Car Find) monitoring station Command to system activating Gray wire for 30 seconds pulsing 1 sec on/1 sec off with 1 amp positive output.

Command 6: (Lock Doors) monitoring station Command to system activating Green wire to pulse 1 second with 250 ma negative.

Command 7: (Unlock Doors) monitoring station Command to system to activate Blue wire to pulse 1 second with 250 ma negative.

Command 8: (Start Constant Vehicle Tracking) sends previous 2 events in memory and then every 120 seconds get update of location information sent to the Web site.

The system is also operable in a battery saver mode which operates as follows:

i. With the ignition key off, if the battery voltage drops below 11.5 volts for more than 5 seconds, the GPS verification wakes up to look:
ii. Once instantly.
iii. Once in 1 hour if at the same location.
iv. Once in 6 hours if at the same location.
v. Once in 12 hours if at the same location.
vi. Once every 24 hours if at the same location.
vii. Activate alert "E" when the battery saver mode is activated, and bypass sending all future Alert "E" until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

Another aspect of the invention relates to automatic vehicle alert e-mails sent containing some or all of the previous system events. This sending can be triggered as follows:

a. At a user selected predetermined time ## (01-24) of each day, or
b. At a predetermined memory fill level, such as full or near full.

In addition, each system event may contain one or more of the following:

a. Vehicle Location
b. Vehicle total time at location
c. Time of day
d. Mph traveling
e. Total time traveling above MPH
f. Direction traveling
g. Delta
h. Special Alert messages, if any, including:
i. GPS signal not received for longer than 5 minutes.
ii) Traveling above ###MPH for ## minutes.
iii) Vehicle is stolen.
iv) Alarm activated.
v) Unauthorized remote transmitter alert.
vi) Battery saver mode activated
vii) Command 1: Reset all circuits and system remains asleep until the ignition key is turned on.
viii) Command 2: (Accessory activation)
ix) Command 3: (Vehicle Location was retrieved)
x) Command 4: (Hijack or Stolen mode activated)
xi) Command 5: (Car Find mode activated)
xii) Command 6: (Locked Doors)
xiii) Command 7: (Unlocked Doors)
xiv) Command 8: (Started 2-second incremental Vehicle Tracking)

Another feature of the invention relates to the selectable threshold conditions causing an event to be recorded into the memory of the vehicle unit. For example, this may include: while the yellow wire has 12 volts, record events every "??" default 15 minutes time if the GPS location has changed. If the GPS location is the same then only update stationary total

time. If the GPS antenna is not receiving any signal then enter last known GPS location and with an indication that this was the last known GPS location before the GPS signal stopped, how long no GPS signal was received, and the GPS location in the on-hold file, when the vehicle is traveling above ### MPH for ##-minutes.

The monitoring station may also provide a number of automated phone calls as described above. These may include:

The user's vehicle has issued a stolen alert:

If vehicle is stolen, after receiving the phone message the user then calls 911 to advise police of the theft, and gives the police the website address and an identification number, such as the user's PIN, to allow the police to locate where your vehicle has been, where it is now and keep tracking it until the police can retrieve the vehicle.

If this is a false alert due to vehicle being towed away for service, for example, then the user may press "1" to put the vehicle in an off mode. Once the ignition key is turned on again the system will reset back to its normal operation mode.

The user's vehicle has issued an alarm activated for more than 10 seconds alert. The system will not respond to this alert again until ignition key is turned on again to reset this feature.

The vehicle battery voltage is low or has been disconnected. The tracking system is in low voltage mode. The system will not respond to this alert again until the battery voltage goes above 13 volts for 10 minutes to reset this feature.

The backup battery may be sized according to the GPS receiver and processing power draw. In addition, the battery may also be sized based upon estimated micro burst transmitting power draw. Such transmissions are typically at about 3 watts power to the antenna.

The system according to the invention including the vehicle unit and monitoring station provides a number of significant advantages and features. For example, the police may be directly contacted by the user when the vehicle is stolen. The user receives the telephone message from the monitoring station, and this is done without requiring the intervention of a manual security monitoring operator, such as an ADT operator, for example. In addition, once in the stolen mode, the vehicle unit will periodically continue to send out its location, so that the police may track the vehicle via the WEB, for example. This location sending feature may begin immediately, that is, without requiring the user to contact the vehicle to begin tracking. Having the vehicle contacting the monitoring station is considerably less expensive than other schemes where the vehicle is periodically polled via the cellular network, for example.

The system may also be interfaced to a breath alcohol sensor at the vehicle, for example, and this information recorded in memory. The information could be passed along to the monitoring station, which, in turn, could send out a notification message (e-mail or telephone) that the vehicle is being operated by a driver who may be impaired by alcohol. The vehicle's location could then be tracked to permit the police to detain the driver.

Another aspect of the unit is that it may be able to recognize the desirability to bypass certain security breach triggers or other events. For example, a car finding feature can be provided that will allow the user to sound the horn or siren when near the vehicle to help locate the vehicle, as in a crowded parking area. Without the bypass feature, the unit could recognize the horn or siren as a security breach and transmit such information to the monitoring center. In accordance with this aspect of the invention, the unit would recognize the car finding feature was activated and thereby bypass sending a security breach transmission, for example. Again, false alarms and unneeded usage and expense of the communications infrastructure would be avoided.

Yet another aspect of the invention relates to thwarting a would-be thief who attempts to disable the alarm by cutting the battery cable or power supplied to the system. The unit preferably includes a back-up battery. More particularly, upon being in an armed mode and sensing a breach of security, such as the hood opening, for example, the unit will send out a signal indicating the alarm or security breach and while the alarm is indicated, if the battery is disconnected then the unit will send out a message indicating the vehicle is stolen, and also providing the vehicle's current position. Accordingly, the would-be thief is not able to defeat the security system by quickly disrupting power to the unit during an alarm indication or security breach. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowchart **80** (FIG. **4**).

Still another aspect of the invention relates to how the unit can discriminate between ordinary usage or honking of the horn as compared to a security system triggered alarm. Most vehicle security systems will provide a pattern of horn soundings as an alarm indication, and this can be determined and used to reduce false alarm transmissions from the unit. For example, the unit can look at the number of leading and trailing edges of the power pulse used to sound the horn. A single pressing of the horn switch by the user will cause two edges within a predetermined time, such as about 10 to 12 seconds. Accordingly, the unit can be configured to not send a security breach transmission to the control center based upon detecting two transitions. Since a number of vehicle security systems may have a continuous sounding of the horn within the predetermined time, the unit can send the transmission upon detecting only a single transition.

A number of other vehicle security systems provide a series of pulses or horn soundings within the predetermined time. Accordingly, the unit may also be configured to send a security breach transmission upon detecting greater than a predetermined number of transitions, such as greater than nine, for example. This number is also typically higher than a user would generate honking the horn several times within the predetermined time. In other terms, the number of transitions of the horn pulses can be counted, and if equal to one, or greater than nine, for example, the transmission is triggered, and otherwise the sounding of the horn is ignored. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. This aspect is further understood with reference to the enclosed flowcharts **81**-**83** (FIGS. **5**A-**5**C).

Yet another feature of the invention relates to a low vehicle battery alert. For example, the unit may monitor the battery voltage over a predetermined time such as ten minutes. The ten minute window prevents false tripping, for example, when the voltage dips during engine cranking. In particular, the voltage can be sensed and it can be determined whether it is greater than zero (e.g. greater than six volts) and less than a high value (e.g. eleven or twelve volts), and, if so, a low battery voltage transmission can be communicated to the monitoring station, and ultimately to the vehicle user when away from the vehicle. If the vehicle is being serviced and the battery is disconnected, this will cause the battery voltage to

be equal to zero. Then, the low battery voltage transmission will not be communicated to the monitoring station. Also, to prevent additional alerts, this message is prevented from being transmitted again until the user returns to the vehicle to disarm the system and/or turn on the ignition so that the unit sees a voltage above 13 volts, indicating the vehicle has started using the owner's ignition key. Again, false triggerings are reduced. This aspect is further understood with reference to the enclosed flowchart **86** (FIG. **8**).

Yet another advantageous feature of some embodiments of the invention relates to the ability to conserve electrical power. More particularly, when the vehicle is stopped and in the armed mode, the GPS receiver may be periodically operated to determine the vehicle position. If the vehicle position changes, this is indicative that the vehicle is being moved or stolen. For example, the GPS receiver may be operated to generate new vehicle position information every 29 seconds. These relatively quick successive position determinations or readings are generally termed hot start. These are relatively less complicated than a cold start position determination which takes longer, since the cold start position determination requires greater time to acquire and receive data from multiple satellites, as will be appreciated by those skilled in the art.

Unfortunately, this relatively high repeated usage of the GPS receiver may cause unnecessary battery drain, especially when the vehicle is left armed and unattended by the user for an extended period. Accordingly, the power conserving feature of the invention permits the GPS receiver to be turned off when the vehicle is in the armed mode, and the GPS receiver is turned on only when needed. For example, a vehicle sensor, such as a shock sensor, motion sensor, ignition sensor, door sensor, or other sensor, or combinations thereof could be used to start the GPS receiver. This sensor could also be used to trigger an alarm if desired; however it need not be so used in all embodiments. The GPS receiver, once turned on, could operate in the normal periodic fashion as described above, or for a fixed period of time. The GPS receiver could also be turned off again after some predetermined time if no further sensor signal is received, or if the position fails to change on subsequent position readings or determinations.

Yet another feature relates to permitting more colorful audible alert messages to be generated for the user. The user can, in some embodiments, access an internet site to type or enter the text for a message to be sent, such as to alert the user that his vehicle is being stolen. The audible message then communicated by a telephone call to the user is generated by a speech message synthesizer based upon the entered text. In accordance with this aspect of the invention, the user could type in phonetically spelled words or phrases, such as to create more colorful messages including slang terms, various accents, and/or to mimic various dialects, for example. The speech synthesizer would then generate the desired message customized for the user. Of course, the system could also permit the user to test or preview the pronunciation generated by the speech message synthesizer based on the entered text message prior to its adoption.

Another aspect relates to requesting GPS position information from a vehicle. If a command is sent downstream to the vehicle requesting that GPS information in turn be sent upstream from the vehicle, and the GPS information is not received within a predetermined time, such as about four minutes, then another command may be sent to the vehicle requesting the GPS information. This may keep repeating until GPS information is received, for a predetermined number of tries, or until a user instructs stopping of the requests. This helps to ensure and confirm the activation and reception of GPS tracking coordinates from the vehicle.

Yet another aspect relates to reducing a frequency with which GPS information is sent from the vehicle. More particularly, the unit may be configured to activate GPS information transmission upstream every 2 minutes. To reduce system usage expense and power consumption at the vehicle, this rate of transmission of GPS information could be progressively decreased over time. For example, in one embodiment, upon activation the GPS location signals could be sent every 2 minutes during the first hour, then once an hour for the next 23 hours, after which only one signal would be sent per day.

Turning now to the flowchart **87** of FIG. **9**, still another aspect relates to warning the user of an inoperable or malfunctioning GPS or cellular telephone section. More particularly, if the GPS or cellular telephone antenna wire is cut or the mounting position of either is changed causing the antenna to stop receiving the signal the user would not ordinarily know of this problem quickly. In accordance with one embodiment, if the ignition is turned on a predetermined number of times, such as about three, and each time ignition turns on if no GPS or no cell signal is received for a minimum time, such as about 15 to 30 minutes or longer, an audible warning beeper may be activated in the vehicle. This beeper may be sounded once every 15-minutes. At anytime if the GPS or cell signal is received properly then the system re-sets automatically stopping the beeper sound.

As an example, if the ignition key is turned on and no GPS or no Cell signal is being received for 15-minutes, and the vehicle ignition stays on for 45-minutes and there is still no GPS or no cell signal, the unit counts one. Thereafter, if the ignition key is turned on and no GPS or no cell signal is being received for 15-minutes, and the vehicle ignition stays on for 60-minutes and there is still no GPS or no cell signal, a second count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is received for 10-minutes, and the vehicle ignition stays on for only 10-minutes and there is still no GPS or no cell signal, no count is determined. Thereafter, if the ignition is turned on and no GPS or no cell signal is being received for 15-minutes, a third count is determined and the beeper is activated as described above. This beeping may continue every 15-minutes while the vehicle ignition stays on as long as the vehicle ignition stays on for 16-minutes and still no GPS or no Cell signal is being received. If thereafter, the ignition is turned on and no GPS or no cell signal is being received, the beeper beeps once and again beeps once every 15-minutes while vehicle ignition stays on. If in 10-minutes both GPS or cell signal is being received, the beeper system is turned off and the warning count is reset.

By way of example, if the ignition key is turned on and no GPS or no cell signal is being received for only 5, 10 or 12 minutes (with the threshold set at 15 minutes), then no count is determined.

In certain circumstances, the GPS signal may fail, but the cell signal may still be working. Accordingly, it may be desirable to send an indication of the failure of the GPS signal to the central monitoring station to thereby alert the user as described above. If the cell signal also failed, or if the cell signal failed by itself, in other embodiments a separate paging device would transmit the failure or loss of the cell signal information to the central monitoring station, to thereby alert the user.

Yet another feature is directed to efficient use of a relatively small number of codes available to communicate with the tracking unit from the cellular network and central station.

More particularly, a typical arrangement may provide eight basic codes and two Awildcard@ codes. The two wildcard codes are reserved for future or other uses. A particular tracking device will respond directly to any of the eight basic codes. For example, the doors could be locked or unlocked, a present location downloaded from the vehicle, etc.

In accordance with this feature, the tracking device may respond differently to the same code or command depending upon the state or condition of the tracking device. For example, if an alarm is triggered at the vehicle, it may be desired that the tracking device continue to send the alarm signal until confirmation is received that the central monitoring station has received the alarm signal. This confirmation can be sent using the same code as may provide another function if the device were not indicating an alarm. Any of a number of such tracking device conditions may trigger a different message to be interpreted from the received code. For example, if any of the above Alerts A-E were triggered, the receipt of a predetermined code, such as code eight, would confirm receipt of the alert by the central station, and this receipt of code eight would not cause the other response (no alarm triggered) in the tracking device. Of course this concept can be extended to other features as will be appreciated by those skilled in the art.

In accordance with another feature, the rate of sending the location or position data (or change in position data) from the vehicle may be varied to reduce system usage and thereby reduce expenses. More particularly, in one embodiment, the rate of sending may be based upon how long the vehicle has remained stationary. This time period may be selected by the user. For example, the selected time may be in the range of 15 minutes to six hours. If the vehicle has been stationary for the selected time period, then the rate of transmission may be reduced. This reduces or eliminates the need to send home position data and send all the over 15-minute stops made that day. Otherwise, that is when the vehicle is moving, the device may send data at a faster rate. Of course, a system user would not likely be interested in quick updates, especially where the position information is not changing. Conversely, if the vehicle is being moved, it may be desirable to receive more frequent position updates.

Another variation of this transmission rate conservation feature bases the rate of transmission on the vehicle position. For example, a reduced rate of transmission may be selected if the vehicle is in a predetermined area where the user has a lesser interest in quickly updated position information. The user may also have a reduced interest in an area that can be defined outside of a predetermined distance from a reference point.

Yet another variation of the vehicle position transmission rate conservation feature is based upon the vehicle's speed, such as the vehicle's average or maximum speed, for example. Accordingly, if the vehicle is traveling above a preset speed, the rate of transmission may be increased.

In accordance with another aspect of the invention, the tracking device may send the alert indication a predetermined number of times without receiving an acknowledgment as described above, and then wait until the vehicle position has changed before trying again or the cell re-registers or its RSS (received signal strength) changes. Thus, power is conserved. When the vehicle has moved to a new position, any obstructions may no longer be present thereby increasing the likelihood of a successful communication. In addition, the change in position may be determined when the vehicle is sensed to be moving about a predetermined relatively small speed, such as greater than 1 mph, for example.

In all of the embodiments and variations described herein, the tracking device may communicate with one or more other vehicle devices via a vehicle data communications bus. Further aspects of interfacing with a vehicle data communications bus are described in U.S. Pat. Nos. 5,719,551 and 6,011,460 assigned to the assignee of the present invention, the entire contents of which are incorporated herein by reference.

Yet another aspect relates to efficient use of available codes on the cellular telephone control channel. In one particular example, ten codes may be available to be transmitted from the monitoring station to the vehicle trackers. The first eight or nine codes are command codes that will cause a specific action by the tracking device at the vehicle. The other one or two codes may be wildcard codes as mentioned above, that may set a stand-by mode for one or a group of vehicles, for example.

It may be desirable to provide more than eight commands at the vehicle responsive to the corresponding eight available codes. For example, it may be desirable to set a feature on or off, or to set a different feature setting or threshold. In accordance with this aspect of the invention, the commands at the tracker are determined based upon a series of different command codes being received within a predetermined time window.

For example, the monitoring station may send code 9 that switches the tracker in the car into a stand-by mode for a predetermined time and which causes the tracker to respond with an upstream confirmation code 7 or 9 indicating receiving code 9. During the predetermined time of the stand-by mode another code follows that causes a system programmable feature or setting to change. Note that the second code would otherwise cause a different function at the vehicle. Note that system might operate a function 9 if another code 1-9 is not received in the predetermined time. The following list is exemplary for features resulting from second codes 1-9:

Code 1—Tracker will turn off feature of upstream code caused by vehicle alert being detected.

Code 2—Tracker will turn on feature of upstream code caused by vehicle alert being detected.

Code 3—Tracker deactivates cell receiver from operating due to a non-paying customer for monitoring service. That phone number can then be allocated to another customer.

Code 4—Turn on audio buzzer feature that will sound once each 10 minutes. The monitoring station need only send the command to activate the feature, as the tracker will time the period and drive the buzzer thereafter. The monitoring station will normally not need to send this command because the tracker will be configured out of the box with this feature activated to sound the buzzer every 10 minutes until the next command is received.

Code 5—Turn off the audio buzzer. This is to be sent by the monitoring station after a user has successfully activated his account.

Code 6—Turn on the 80 mph speed limit reporting. This will normally not be sent as this feature will be the default setting of the tracker.

Code 7—a Turn off the 80 mph speed limit reporting.

Code 8—Increase speed limit 5 mph and increase the time 5 minutes.

Code 9—Decrease speed limit 5 mph and decrease the time 5 minutes, and wait 5 minutes if another code number follows. It could operate this way to allow another set of codes to change more features.

In this example, in response to the tracker receiving the system code 1-9, the tracker sends an upstream code 7 to acknowledge receipt of the system code 1-9. Upon receipt of code 9 the tracker waits up to 5 minutes to determine if

another system code is received. If no code is received, then the tracker performs the code 9 operation. Of course, in other embodiments other features or settings can be selected. In general, it may be preferred that the first code sent in a series of two codes, for example, be a code that causes only a minor function to be performed at the vehicle. This is so because if the second code is sent from the monitoring station, but not received at the tracker, only a minor function is performed. For example, the first code may switch between armed and disarmed modes. This is in contrast to using a remote engine starting code or engine shutdown code as the first code. The vehicle may be moving or positioned in a marginal reception area, and the second command may not be received by the tracker within the predetermined time window. As will be appreciated by those skilled in the art, this concept of multiple digit codes, can be extended beyond two digits to three or more.

To further conserve cellular transmissions and as described above, the tracker may be set to record a position based upon a determined event. Only this recorded position information may be downloaded either by user request or at set times. It is desired that such events be relatively few, but that the information still be helpful to the user.

For example, an event for recording of position may be determined based upon the vehicle being stopped for greater than a first time and less than a second time. For example, the first time may be 15 minutes and the second time may be 6 hours. Determination of the vehicle being stopped can be made based upon one or both of the GPS position or the vehicle ignition being turned off. The second time prevents the recording of position information when the vehicle is stopped at the owner's home during the evening, for example. Accordingly, the important information of the vehicle stops being made is recorded and made available to the user, while system communications resources are conserved.

In another example, if the mode is selected to send the vehicle's location every 10 min and the vehicle is in the same location for greater than a set time, then no more vehicle locations are sent until the vehicle location has changed to start the every 10 min reporting again.

Now referring to FIGS. **10** and **11**, in yet another embodiment the potential difficulties of interfacing to a vehicle data bus and devices connected thereto are further discussed. The multi-vehicle compatible tracking unit **110** is for a vehicle comprising a vehicle data bus **122** extending throughout the vehicle. The multi-vehicle compatible tracking unit **110** includes a vehicle position determining device **112**, a wireless communications device **113**, and a multi-vehicle compatible controller **111** for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The vehicle position determining device **112** may be provided by a GPS receiver, for example, or any of the other such devices described in detail above.

The wireless communications device **113** may be provided by a cellular telephone transceiver configured to operate on a control channel of the cellular network, or any of the other such devices described in detail above.

The multi-vehicle compatible controller **111** is coupled to the vehicle data bus **122** for communication thereover with a vehicle device **121**. The controller **111** illustratively includes a central processing unit (CPU) **126** or other logic circuitry which is connected to a clock signal generator **124**, a memory **125**, and input/output circuitry **127** to interface with the vehicle device **121** using at least one corresponding vehicle device code from among a plurality thereof for different vehicles. The corresponding vehicle code may be for reading from the vehicle device **121**. Similarly, the corresponding vehicle code may be additionally or alternatively for writing to the vehicle device **121**.

The multi-vehicle compatible tracking unit **110** also illustratively includes a downloading interface **116** for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller **111**. The enabling data may be the vehicle device code or codes, an instruction to select a code or codes from among those already stored, or the data or sequence to allow the controller **111** to generate the vehicle device code or codes, for example.

In the embodiment as shown in FIG. **11**, the downloading interface **116** is a category of wireless signal downloading interfaces that illustratively include a wireless receiver **114**, such as for temporary connection to the downloading device **115**. The wireless downloading interface **116** may communicate with the downloading device **115** via any one or more of a number of wireless technologies, such as cellular, satellite, IR, Bluetooth or WiFi technologies for example, as will also be appreciated by those skilled in the art. Interface circuitry **132** is included in the wireless signal downloading interface **116** for controlling communication with the downloading device **115**. The interface circuitry **132** may be logic circuitry or other control circuitry along with switching components.

In other embodiments, for example as shown in FIG. **12**, the wireless downloading interface **116'** does not include the wireless receiver **114**, as a temporary wireless communication link is instead provided by sharing the wireless communications device **113** that sends position data as described above.

The downloading interface may also be in the form of a wired signal downloading interface **116"** as shown in FIG. **13**. The wired signal downloading interface **116"** comprises a connector **133***a* for temporary connection to a downloading device **115"** with a mating connector **133***b*. Interface circuitry **132"** is provided for controlling communication with the downloading device **115"**. The wired downloading interface **116"** may connect directly to a downloading device **115"**, such as a laptop computer, via RS232/429 protocol, USB, FireWire, TCP/IP (Internet), or any other wired protocol as will be appreciated by those skilled in the art. The connector **133***a* of the wired downloading interface **116"** may alternatively be in the form of a socket to accept a memory card or other data storage medium capable of transferring data. The downloading interfaces **116**, **116'** and **116"**, may also advantageously be for permitting downloading of programming instructions for the multi-vehicle compatible controller **111**, to allow remote programming, for example, as will also be appreciated by those skilled in the art.

Referring again briefly to FIG. **10**, the multi-vehicle compatible tracking unit **110** further comprises a remote transmitter **117**, such as typically in the form of a small handheld device to be carried by a user when away from the vehicle. The multi-vehicle compatible controller **111** also performs at least one vehicle remote control function responsive to the remote transmitter **117**. The remote transmitter **117** illustratively communicates with the remote receiver **118**, which is coupled to the multi-vehicle compatible controller **111**. The vehicle remote control functions may include a vehicle security function, a remote keyless entry function, and a remote engine starting function, for example, implemented via the data bus **122** using one or more vehicle devices **121**. Such a vehicle device **121** may also include another vehicle controller, as well as a sensor, or actuator as will be appreciated by those skilled in the art.

The multi-vehicle compatible tracking unit **110** illustratively includes a common housing **123** for its various components. In other embodiments, more than one housing may be used for the various components.

Referring additionally to FIGS. **14** and **15**, several methods for using a multi-vehicle compatible tracking unit **110** for a vehicle comprising a vehicle data bus **122** extending throughout the vehicle are described with reference to the respective flowcharts **148**, **148'**. Beginning at Block **150**, the multi-vehicle compatible tracking unit **110** is installed in vehicle (Block **151**). At Block **152** a connection is then established between the multi-vehicle compatible tracking unit **110** and a downloading device **115** using a downloading interface **116**. Enabling data related to at least one corresponding vehicle device code for use by the multi-vehicle compatible controller **111** is downloaded via a downloading interface **116** (Block **153**). Once the enabling data is downloaded, the connection between the multi-vehicle tracking unit **110** and the downloading device **115** is terminated at Block **154**. Of course the multi-vehicle compatible tracking unit **110** may be optionally programmed via the downloading interface while the connection is established. The operation of the tracking unit may be tested at Block **155** before stopping at Block **156**. With particular reference to the flowchart **148'** of FIG. **15**, the multi-vehicle compatible tracking unit **110** may be connected to the downloading device **115** (Block **152'**), etc., before installation in the vehicle (Block **151'**) and testing (Block **155'**).

Other features relating to vehicle control systems are disclosed in copending patent applications entitled VEHICLE TRACKER INCLUDING STATIONARY TIME DETERMINATION AND ASSOCIATED METHODS, Ser. No. 09/859,727 filed May 17, 2001, now U.S. Pat. No. 6,512,465; VEHICLE TRACKER CONSERVING CODES AND RELATED METHODS, Ser. No. 09/859,673 filed May 17, 2001, now U.S. Pat. No. 6,522,267; VEHICLE TRACKER WITH POWER SAVING FEATURES AND RELATED METHODS, Ser. No. 09/859,728 filed May 17, 2001, now U.S. Pat. No. 6,512,466; VEHICLE TRACKER COOPERATING WITH A STARTER INTERRUPT AND RELATED METHODS, Ser. No. 09/859,973 filed May 17, 2001; VEHICLE TRACKER WITH USER NOTIFICATIONS AND ASSOCIATED METHODS, Ser. No. 09/859,733 filed May 17, 2001, now U.S. Pat. No. 6,509,868; VEHICLE TRACKER WITH USER REGISTRATION REMINDER AND RELATED METHODS, Ser. No. 09/859,971 filed May 17, 2001, now U.S. Pat. No. 6,507,786; VEHICLE TRACKER INCLUDING INPUT/OUTPUT FEATURES AND RELATED METHODS, Ser. No. 09/859,972 filed May 17, 2001, now U.S. Pat. No. 6,606,561; and VEHICLE TRACKER WITH TEST FEATURES AND RELATED METHODS, Ser. No. 09/859,729 filed May 17, 2001, now U.S. Pat. No. 6,809,659, the entire disclosures of which are incorporated herein by reference.

Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Accordingly, it is understood that the invention is not to be limited to the embodiments disclosed, and that other modifications and embodiments are intended to be included within the spirit and scope of the appended claims.

That which is claimed is:

1. A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible tracking unit comprising:

a vehicle position determining device;

a wireless communications device;

a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information;

said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and

a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller.

2. The multi-vehicle compatible tracking unit according to claim **1** wherein said downloading interface comprises a wired signal downloading interface.

3. The multi-vehicle compatible tracking unit according to claim **2** wherein said wired signal downloading interface comprises a connector for temporary connection to a downloading device.

4. The multi-vehicle compatible tracking unit according to claim **1** wherein said downloading interface comprises a wireless signal downloading interface.

5. The multi-vehicle compatible tracking unit according to claim **4** wherein said wireless signal downloading interface comprises a wireless receiver for temporary connection to a downloading device.

6. The multi-vehicle compatible tracking unit according to claim **1** wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device.

7. The multi-vehicle compatible tracking unit according to claim **1** wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device.

8. The multi-vehicle compatible tracking unit according to claim **1** wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller.

9. The multi-vehicle compatible tracking unit according to claim **1** further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter.

10. The multi-vehicle compatible tracking unit according to claim **9** wherein the at least one vehicle remote control function comprises at least one of a vehicle security function, a remote keyless entry function, and a remote engine starting function.

11. The multi-vehicle compatible tracking unit according to claim **1** wherein said wireless position determining device comprises a Global Positioning System (GPS) receiver.

12. The multi-vehicle compatible tracking unit according to claim **1** further comprising a housing containing said vehicle position determining device, said wireless communications device, said multi-vehicle compatible controller, and said downloading interface.

13. A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device;

a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information;

said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and

a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller;

said downloading interface comprising a connector for temporary connection to a downloading device.

14. The multi-vehicle compatible tracking unit according to claim **13** wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device.

15. The multi-vehicle compatible tracking unit according to claim **13** wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device.

16. The multi-vehicle compatible tracking unit according to claim **13** wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller.

17. The multi-vehicle compatible tracking unit according to claim **13** further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter.

18. A multi-vehicle compatible tracking unit for a vehicle comprising a vehicle data bus extending throughout the vehicle, the multi-vehicle compatible vehicle tracking unit comprising:

a vehicle position determining device;

a wireless communications device;

a multi-vehicle compatible controller for cooperating with said vehicle position determining device and said wireless communications device to send vehicle position information;

said multi-vehicle compatible controller to be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles; and

a downloading interface for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by said multi-vehicle compatible controller;

said downloading interface comprising a wireless receiver for temporary connection to a downloading device.

19. The multi-vehicle compatible tracking unit according to claim **18** wherein the corresponding at least one vehicle code is for reading from the at least one vehicle device.

20. The multi-vehicle compatible tracking unit according to claim **18** wherein the corresponding at least one vehicle code is for writing to the at least one vehicle device.

21. The multi-vehicle compatible tracking unit according to claim **18** wherein said downloading interface is also for permitting downloading of at least one programming instruction for said multi-vehicle compatible controller.

22. The multi-vehicle compatible tracking unit according to claim **18** further comprising a remote transmitter; and wherein said multi-vehicle compatible controller also performs at least one vehicle remote control function responsive to said remote transmitter.

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United States Patent
Flick

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(45) Certificate Issued: Feb. 6, 2019

(54) VEHICLE TRACKING UNIT WITH DOWNLOADABLE CODES AND ASSOCIATED METHODS

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(73) Assignee: OMEGA PATENTS, L.L.C., Douglasville, GA (US)

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(63) Continuation-in-part of application No. 11/076,259, filed on Mar. 9, 2005, now Pat. No. 7,720,597, which is a continuation of application No. 10/383,496, filed on Mar. 7, 2003, now Pat. No. 7,149,623, which is a continuation of application No. 09/859,972, filed on May 17, 2001, now Pat. No. 6,606,561.

(60) Provisional application No. 60/264,811, filed on Jan. 29, 2001, provisional application No. 60/258,005, filed on Dec. 22, 2000, provisional application No. 60/251,552, filed on Dec. 6, 2000, provisional application No. 60/252,125, filed on Nov. 20, 2000, provisional application No. 60/236,890, filed on Sep. 29, 2000, provisional application No. 60/246,463, filed on Nov. 7, 2000, provisional application No. 60/222,777, filed on Aug. 3, 2000, provisional application No. 60/205,178, filed on May 17, 2000.

(51) **Int. Cl.**

G01C 21/00	(2006.01)
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B60R 25/045	(2013.01)
G08G 1/127	(2006.01)
B60R 25/04	(2013.01)
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B60R 25/104	(2013.01)
B60R 25/33	(2013.01)
B60R 25/102	(2013.01)
G08G 1/00	(2006.01)

(52) **U.S. Cl.**
CPC ***H03F 3/45*** (2013.01); ***B60R 25/04*** (2013.01); ***B60R 25/045*** (2013.01); ***B60R 25/102*** (2013.01); ***B60R 25/104*** (2013.01); ***B60R 25/33*** (2013.01); ***G07C 5/008*** (2013.01); ***G08G 1/127*** (2013.01); ***G08G 1/20*** (2013.01); ***G08G 1/205*** (2013.01); *B60R 2325/202* (2013.01); *B60R 2325/205* (2013.01); *B60W 2550/402* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

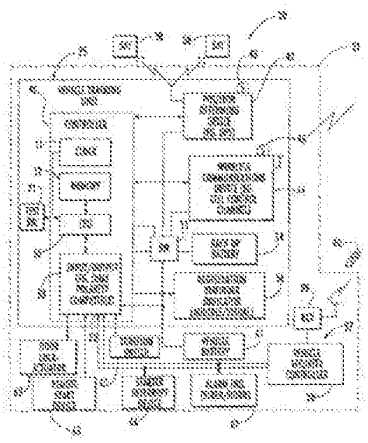
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/013,851, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Karin Reichle

(57) **ABSTRACT**

A multi-vehicle compatible tracking unit is for a vehicle including a vehicle data bus extending throughout the vehicle. The vehicle tracking unit may include a vehicle position determining device, a wireless communications device, and a multi-vehicle compatible controller for cooperating with the vehicle position determining device and the wireless communications device to send vehicle position information. The multi-vehicle compatible controller may be coupled to the vehicle data bus for communication thereover with at least one vehicle device using at least one corresponding vehicle device code from among a plurality thereof for different vehicles. A downloading interface may be included for permitting downloading of enabling data related to the at least one corresponding vehicle device code for use by the multi-vehicle compatible controller.



EX PARTE REEXAMINATION CERTIFICATE

NO AMENDMENTS HAVE BEEN MADE TO THE PATENT

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1-22** is confirmed.

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