respond (e.g., the signal RECD was not presented in response to transmission of the signal TEST) within a predetermined time interval. The operator may take steps for diagnosis, repair, replacement, etc. for the TPM sensor and/or other elements of the TPM system (e.g., the immobilizer **102**, the receiver **106**, etc.) without having expended significant time and cost associated with mounting the TPM sensor in a wheel assembly, and mounting the wheel assembly on the vehicle, and testing the TPM sensor operation as is performed in conventional approaches.

[0043] As is readily apparent from the foregoing description, the present invention generally provides an improved system (e.g., the system **100**) and an improved method (e.g., the method **200**) for tire pressure monitoring sensor diagnosis via vehicle anti-theft (e.g., immobilizer) systems and/or entry (e.g., TPM, RKE, or combination TPM/RKE) systems. Such a system and method may provide a new and innovative TPM sensor test and diagnosis, and result in the saving of a significant amount of time and cost when compared to conventional approaches to TPM sensor test and diagnosis.

[0044] While embodiments of the invention have been illustrated and described, it is not intended that these embodiments illustrate and describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A vehicle tire pressure monitoring (TPM) system, the system comprising:

an immobilizer transmitter that transmits at least one low frequency (LF) sensor diagnostic signal;

at least one TPM sensor having a memory, wherein the at least one TPM sensor comprises a transceiver that receives the at least one LF sensor diagnostic signal and, when the at least one TPM sensor is operating properly, presents at least one radio frequency (RF) message signal; and

a TPM receiver that receives the at least one RF message signal and provides an indication to an operator when the at least one RF message signal is received, wherein the LF sensor diagnostic signal is transmitted to determine proper operation of the at least one TPM sensor and re-configure the operating parameters of the at least one TPM sensor.

2. The system of claim 1 wherein the TPM receiver provides an alert to the operator when the at least one RF message signal is not received in response to the LF sensor diagnostic signal.

3. The system of claim 1 wherein the operator initiates transmission of the LF sensor diagnostic signal independently of vehicle immobilization operation and the LF sensor diagnostic signal reconfigures the operating parameters of the at least one TPM sensor by re-flashing the memory of the TPM sensor.

4. The system of claim 3 wherein the immobilizer transmitter transmits at least one second LF signal that is related to at least one vehicle theft deterrent operation.

5. The system of claim 1 wherein the operating parameters of the TPM sensor are reconfigured by re-flashing the memory of the TPM sensor.

6. The system of claim 1 wherein the LF sensor diagnostic signal is transmitted in connection with at least one of a TPM sensor test, a TPM sensor diagnosis, a TPM system diagnosis, a TPM sensor association to the TPM system, and a TPM sensor location association on a vehicle.

7. The system of claim 6 wherein the LF sensor diagnostic signal is transmitted in connection with a TPM sensor association to the TPM system includes the LF sensor diagnostic signal being transmitted having a TPM sensor identification that is selected from a bank of sensor identifications stored in the immobilizer.

8. The system of claim 6 wherein the LF sensor diagnostic signal is transmitted in connection with a TPM sensor association to the TPM system includes the LF sensor diagnostic signal being transmitted having a TPM sensor identification that is selected from another TPM sensor.

9. For use in a vehicle tire pressure monitoring (TPM) system, a method of determining proper operation of a TPM sensor, the method comprising:

transmitting at least one low frequency (LF) sensor diagnostic signal via an immobilizer transmitter;

providing at least one TPM sensor, wherein the at least one TPM sensor comprises a transceiver that receives the at least one LF command signal and presents at least one radio frequency (RF) message signal;

presenting the RF message signal when the at least one TPM sensor is operating properly; and

providing an indication to an operator when the at least one RF message signal is received by a TPM receiver, wherein the LF sensor diagnostic signal is transmitted to determine proper operation of the at least one TPM sensor and re-configure the operating parameters of the at least one TPM sensor.

10. The method of claim 9 further comprising providing an alert to the operator when the at least one RF message signal is not received by the TPM receiver in response to the LF sensor diagnostic signal.

11. The method of claim 9 wherein the operator initiates transmission of the LF sensor diagnostic signal independently of vehicle immobilization operation.

12. The method of claim 11 wherein the immobilizer transmitter transmits at least one second LF signal that is related to at least one vehicle theft deterrent operation.

13. The method of claim 9 wherein the operating parameters of the TPM sensor are reconfigured by re-flashing the memory of the TPM sensor.

14. The method of claim 9 wherein the LF sensor diagnostic signal is presented in connection with at least one of a TPM sensor test, a TPM sensor diagnosis, a TPM system diagnosis, a TPM sensor association to the TPM system, and a TPM sensor location association on a vehicle.

15. The method of claim 14 wherein the LF sensor diagnostic signal is presented in connection with a TPM sensor association to the TPM system includes the LF sensor diagnostic signal being transmitted having a TPM sensor identification that is selected from a bank of sensor identifications stored in the immobilizer.

16. The method of claim 14 wherein the LF sensor diagnostic signal is transmitted in connection with a TPM

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sensor association to the TPM system includes the LF sensor diagnostic signal being transmitted having a TPM sensor identification that is selected from another TPM sensor.

17. A vehicle tire pressure monitoring (TPM) system having self-diagnostics, the system comprising:

an immobilizer transmitter that transmits at least one low frequency (LF) sensor diagnostic signal;

at least one TPM sensor that comprises a transceiver that receives the at least one LF sensor diagnostic signal, and presents at least one radio frequency (RF) message signal in response to the LF sensor diagnostic signal when operating properly; and

a combination remote keyless entry and TPM receiver that receives the at least one RF message signal and provides an indication to an operator when the at least one RF message signal is received and an alert to the operator when the at least one RF message signal is not received,

wherein the LF sensor diagnostic signal is transmitted to determine proper operation of the at least one TPM sensor and re-configure the operating parameters of the at least one TPM sensor.

18. The system of claim 17 wherein the LF command signal is transmitted in connection with at least one of a TPM sensor test, a TPM sensor diagnosis, a TPM system diagnosis, a TPM sensor association to the TPM system, and a TPM sensor location association on a vehicle.

19. The system of claim 17 wherein the LF sensor diagnostic signal is transmitted in connection with a TPM sensor association to the TPM system includes the LF sensor diagnostic signal being transmitted having a TPM sensor identification that is selected from a bank of sensor identifications stored in the immobilizer.

20. The system of claim 19 wherein the operating parameters of the TPM sensor are reconfigured by re-flashing the memory of the TPM sensor.

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US006941801B2

(12) **United States Patent**
Lemense et al.

(10) **Patent No.: US 6,941,801 B2**
(45) **Date of Patent: Sep. 13, 2005**

(54) **TIRE PRESSURE MONITORING SYSTEM**

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(73) Assignee: **Lear Corporation**, Southfield, MI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 107 days.

(21) Appl. No.: **10/742,490**

(22) Filed: **Dec. 19, 2003**

(65) **Prior Publication Data**

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(52) **U.S. Cl.** **73/146**; 340/440
(58) **Field of Search** 73/146–146.5; 340/440–444

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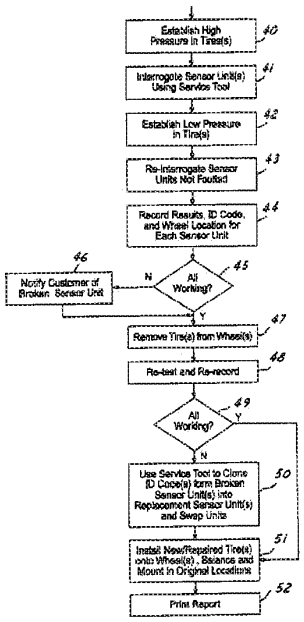
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Primary Examiner—William Oen
Assistant Examiner—Alandra Ellington
(74) *Attorney, Agent, or Firm*—MacMillan, Sobanski & Todd, LLC

(57) **ABSTRACT**

A method is provided for replacing at least one tire of a vehicle on a first wheel in a first wheel position, the vehicle having a tire pressure monitoring system with a first sensor unit having a first ID code mounted to the first wheel. The first sensor unit is interrogated. Either a nominal result or a faulted result of the interrogation is detected. The at least one tire is removed from the first wheel. If the nominal result is detected during the interrogating step, then the first sensor unit is re-interrogated. Either a nominal result or a faulted result of the re-interrogation is detected. If either of the interrogation or the re-interrogation provide a faulted result then the first ID code is cloned into a replacement sensor unit and then the replacement sensor unit is swapped for the first sensor unit on the first wheel. A new tire is installed onto the first wheel. The first wheel is installed onto the vehicle in the first wheel position.

10 Claims, 2 Drawing Sheets



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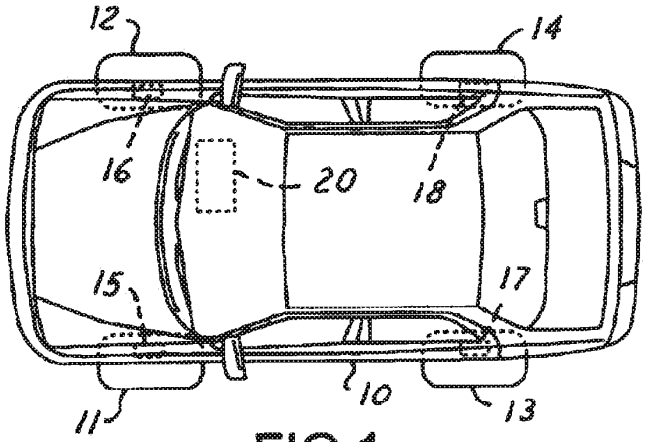


FIG.1

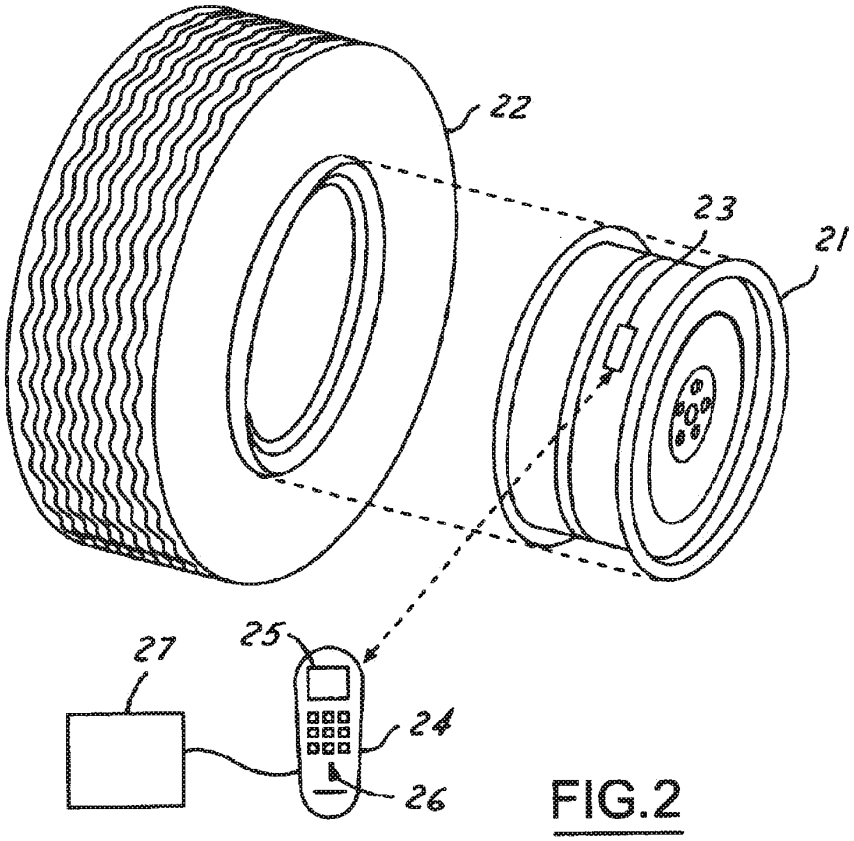


FIG.2

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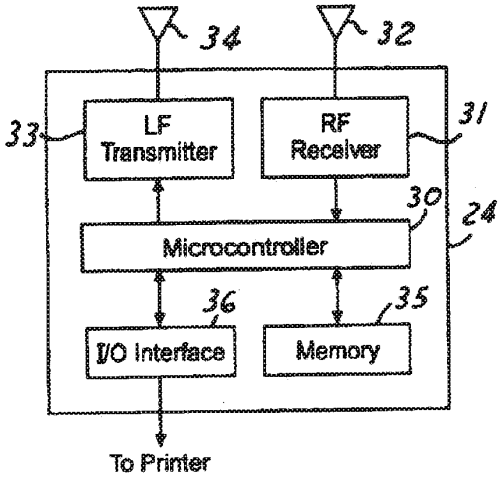


FIG.3

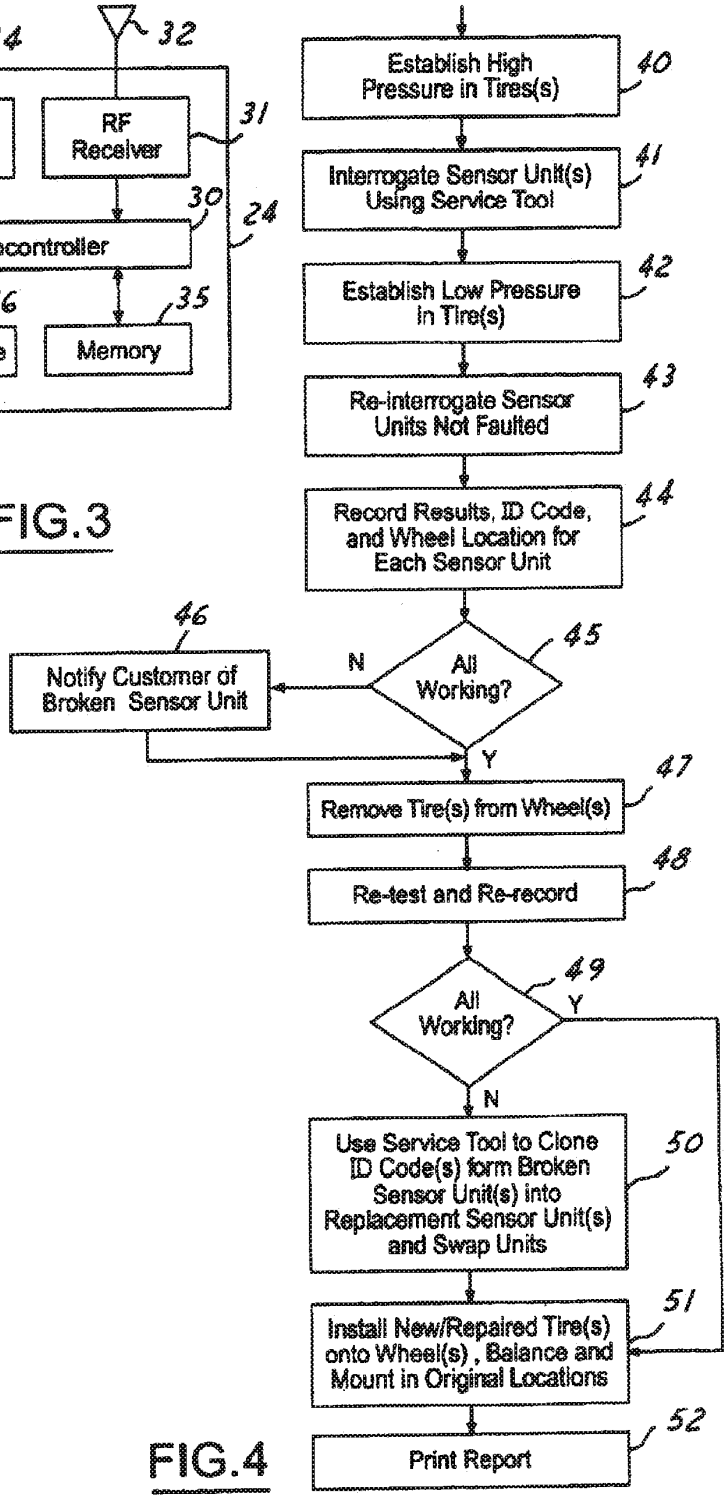


FIG.4

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TIRE PRESSURE MONITORING SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

Not Applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

Not Applicable.

BACKGROUND OF THE INVENTION

The present invention relates in general to vehicular tire pressure monitoring systems, and, more specifically, to replacing or otherwise servicing tires mounted on wheels containing tire pressure sensing units.

Real-time tire pressure monitoring systems (TPMS) can be used for the tires of transportation vehicles such as motor vehicles to alert a driver when proper tire inflation is not being maintained. Proper tire inflation is important to increase tire life, maximize fuel economy, and optimize tire performance in terms of handling, braking distance, and tire integrity.

A self-contained pressure/temperature sensor unit is typically mounted to a wheel in communication with the interior of the tire, e.g., mounted on the wheel spider. Since the wheel and the pressurized interior of a tire are not stationary, the sensor unit usually utilizes a radio transmitter to provide sensor data to a control module in the vehicle. Since each wheel typically has its own respective sensor unit which communicates with a single control module and since nearby vehicles may use the same transmission frequencies and protocols, the sensor transmissions are differentiated by providing a unique ID code within each sensor which is included in the transmissions. The control module must be configured to associate certain ID codes with respective wheel positions on the vehicle (e.g., left-front, right-front, left-rear, and right-rear for a 4-wheel passenger vehicle). Thus, when a particular pressure sensor indicates that an inadequate pressure is being sensed in its respective tire, the control module can alert the driver as to which tire is affected.

The presence of sensor units of tire pressure monitoring systems in or on the wheels of vehicles gives rise to certain difficulties when tires or wheels are repaired or replaced. The act of removing a tire from a wheel may result in inadvertent damage to the sensor unit. If after tire or wheel servicing it is noticed that a sensor unit is inoperative, then it may be difficult or impossible to determine whether the unit was faulty prior to or during servicing. Yet responsibility for assuming the cost of replacing the sensor unit may depend on a determination of when the unit was damaged.

When a sensor unit is replaced, the control module of the prior art has been reconfigured with a new ID code embedded in the replacement sensor so that its transmissions can be associated with the correct wheel position on the vehicle. The control module is typically placed into a "learning mode" and the respective sensor units are made to transmit their ID codes in sequence to the control module. However, this process add time, complexity, and expense when servicing the TPMS system.

SUMMARY OF THE INVENTION

The present invention has the advantage of providing a simple and efficient process for servicing tires in a tire pressure monitoring system so that the time at which a pressure sensing unit was damaged can be determined and reconfiguring of the control module can be avoided.

In one aspect of the invention, a method is provided for replacing at least one tire of a vehicle on a first wheel in a first wheel position, the vehicle having a tire pressure monitoring system with a first sensor unit having a first ID code mounted to the first wheel. The first sensor unit is interrogated. Either a nominal result or a faulted result of the interrogation is detected. The at least one tire is removed from the first wheel. If the nominal result is detected during the interrogating step, then the first sensor unit is re-interrogated. Either a nominal result or a faulted result of the re-interrogation is detected. If either of the interrogation or the re-interrogation provide a faulted result then the first ID code is cloned into a replacement sensor unit and then the replacement sensor unit is swapped for the first sensor unit on the first wheel. A new tire is installed onto the first wheel. The first wheel is installed onto the vehicle in the first wheel position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic view of a vehicle having a tire pressure monitoring system.

FIG. **2** shows a tire pressure sensing unit mounted to a wheel and being interrogated by a service tool.

FIG. **3** shows the service tool in greater detail.

FIG. **4** is a flowchart showing a preferred method of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. **1**, a vehicle **10** includes wheels **11**–**14** having pressure sensor units **15**–**18**, respectively, mounted thereon. Each sensor unit preferably includes a sensing and signal processing section (for generating a data signal indicative of the tire inflation pressure—either a pressure measurement or an indication of pressure being above or below a threshold) and a communication section for transmitting the data signal and an ID code to a control module **20**. Sensor units are known in the art, and may comprise commercially available, specialized components such as the MPXY8000 Series pressure and temperature sensor from Motorola, Inc. The RF link between the sensor units and control module **20** may utilize the same RF channel as is commonly used for remote keyless entry (RKE) systems for automobiles (e.g., a UHF channel at 315 MHz). As known in the art, control module **20** may integrate both the RKE and TPMS functions. Thus, the sensor units may include a commercially available microcontroller/transmitter component such as the MC68HC908RF2 MCU/transmitter chip, also from Motorola, for establishing a communication link from the sensor unit to the control module. For diagnostic and servicing purposes, the sensor unit may also include a wake-up receiver responsive to a low frequency (LF) signal to initiate execution of a sensing/transmission cycle or other predetermined routines. The LF receiver may be comprised of the ATA5283 wake-up receiver IC available from Amtel Corporation, for example, which responds to a 125 kHz wake-up signal.

As shown in FIG. **2**, a sensor unit **23** is mounted to a wheel **21** so that it is exposed to the interior of a tire **22** when it is installed on wheel **21**. A service tool **24** is utilized in the present invention for interacting with sensor unit **23** using the UHF radio link. It preferably includes a display **25** and

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a control keypad **26**. It may further be coupled to a printer **27** in order to create written records showing the results of testing of the sensor units during tire servicing.

FIG. **3** shows service tool **24** in greater detail. A microcontroller **30** is coupled to an RF receiver **31** and to an LF transmitter **33**. RF receiver **31** receives transmissions from a sensor unit via an antenna **32**. LF transmitter **33** sends a wake-up signal under control of microcontroller **30** to a sensor unit via an antenna **34**. Microcontroller **30** is coupled to a memory **35** for storing the results of testing (e.g., interrogating a sensor unit and evaluating the validity of its response) and to an I/O interface **36** which includes display **25**, keypad **26**, and a printing port for connecting to a printer.

Microcontroller **30** is programmed to perform various functions in order to interrogate a sensor unit that is placed within a close proximity (i.e., within the short range of the LF wake-up signal). An overall method of tire servicing according to the present invention is shown in FIG. **4**. In order to establish a known pressure condition for testing a sensor unit, a full (i.e., high) pressure is established in a tire or tires to be serviced in step **40**. The sensor unit(s) is (are) interrogated in step **41** using the service tool to send a wake-up command and to receive a data signal and ID code from each sensor unit involved in the tire replacement or repair. By comparing the data signal (i.e., pressure measurement or pressure range indication) with that expected in view of the full pressure present in the tire, the result of each interrogation can be classified by the service tool as a nominal result of a faulted result. A below normal (i.e., low) pressure is established in the tire or tires being serviced in step **42**. The sensor unit(s) is (are) re-interrogated in step **41** again using the service tool and the result(s) of the re-interrogation(s) are classified. In step **44**, the nominal or faulted results are recorded in memory by the service tool along with the respective ID codes and wheel locations (i.e., left-front, right-front, left-rear, right-rear).

In step **45**, either a tire service technician or the service tool itself makes a determination whether all sensor units for all tires being serviced are working properly. If not, then a vehicle owner or customer is notified of the broken sensor unit in step **46**, prior to actually beginning to service the tire. Thus, it can be clearly established that breakage of the sensor unit was not caused during servicing of the tire. The notification may include a printed report of the results stored in the memory of the service tool.

In step **47**, the tire service technician proceeds to remove the tire(s) from the wheel(s). During time removal, inadvertent damage may occur to the sensor unit because of the prying or jarring that may be required to break the tire seal and clear the tire over the wheel rims. After tire removal, the sensor unit(s) are re-tested and the corresponding results are recorded in step **48**. A check is made in step **49** to determine whether all the sensor units on wheels being serviced are working properly.

In step **50**, any non-working sensor units are replaced. Preferably, the service tool is used to replicate or clone the ID code of a broken sensor unit into a replacement sensor unit over a LF communication link between the service tool and the replacement sensor unit. The replacement sensor unit is swapped with the original (faulted) sensor unit by mounting the replacement to the corresponding wheel prior to re-installing a tire. If sensor unit damage prevents RF communication, then the corresponding ID code may be determined by other means (e.g., reading from a printed label on the sensor unit or obtaining the stored ID code from the control unit) and may then be programmed into the replacement sensor by the service tool. The sensor units may preferably be comprised of a universal replacement sensor of the type described in co-pending U.S. application serial number (Lear attorney docket 4056).

In step **51**, a new or repaired tire is installed onto each wheel being serviced. The wheels are balanced and then mounted in their original locations. Consequently, there is no need to reconfigure the correlation of ID codes with wheel locations stored in the control unit since these have not changed even if a sensor unit has been replaced. It may be desirable to retest each sensor after mounting to ensure that each is still functioning using the same test procedure shown in steps **40** through **43**. If desired, a final-report describing the results of the testing and replacement of sensor units can be printed in step **52**.

What is claimed is:

1. A method of replacing at least one tire of a vehicle on a first wheel in a first wheel position, said vehicle having a tire pressure monitoring system with a first sensor unit having a first ID code mounted to said first wheel, said method comprising the steps of:

interrogating said first sensor unit;

detecting either a nominal result or a faulted result of said interrogation;

removing said one tire from said first wheel;

if said nominal result is detected during said interrogating step, then re-interrogating said first sensor unit;

detecting either a nominal result or a faulted result of said re-interrogation;

if either of said interrogation or said re-interrogation provide a faulted result then cloning said first ID code into a replacement sensor unit and swapping said replacement sensor unit for said first sensor unit on said first wheel;

installing a new tire onto said first wheel; and

installing said first wheel onto said vehicle in said first wheel position.

2. The method of claim **1** wherein said interrogating step and said re-interrogating step each comprises the steps of:

transmitting a low-frequency command from a service tool to said first sensor unit;

said first sensor unit transmitting a radio-frequency response message including sensor data and said first ID code; and

said service tool receiving said radio-frequency response message.

3. The method of claim **1** wherein said interrogating step comprises the steps of:

establishing a high pressure in said one tire;

transmitting a low-frequency command from a service tool to said first sensor unit;

said first sensor unit transmitting a first radio-frequency response message including sensor data and said first ID code;

said service tool receiving said first radio-frequency response message;

establishing a low pressure in said one tire;

transmitting a low-frequency command from said service tool to said first sensor unit;

said first sensor unit transmitting a second radio-frequency response message including sensor data and said first ID code; and

said service tool receiving said second radio-frequency response message.

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4. The method of claim 3 wherein said first detecting step comprises comparing said sensor data in said first and second radio-frequency response messages with predetermined data.

5. The method of claim 1 further comprising the step of:

recording said results of said interrogation and said re-interrogation to establish involvement of said removing step in any faulted result.

6. A method of replacing a plurality of tires of a vehicle on respective wheel in respective wheel positions, said vehicle having a tire pressure monitoring system with respective sensor units having respective ID codes mounted to said respective wheels, said method comprising the steps of:

sequentially interrogating said respective sensor units;

detecting either a nominal result or a faulted result of each of said interrogations;

removing said plurality of tires from said respective wheels;

re-interrogating said respective sensor units for which a nominal result was detected during said respective interrogations;

detecting either a nominal result or a faulted result of each of said re-interrogations;

if either of said interrogation or said re-interrogation for a respective sensor unit provide a faulted result then cloning said respective ID code of said respective sensor unit into a replacement sensor unit and swapping said replacement sensor unit for said respective sensor unit on said respective wheel;

installing a respective new tire onto each of said respective wheels; and

installing said respective wheels onto said vehicle in their respective wheel positions.

7. The method of claim 6 wherein said interrogating steps and said re-interrogating steps each comprise the steps of:

transmitting a low-frequency command from a service tool to a respective sensor unit;

said respective sensor unit transmitting a radio-frequency response message including sensor data and said respective ID code; and

said service tool receiving said radio-frequency response message.

8. The method of claim 6 wherein said interrogating steps each comprise the steps of:

establishing a high pressure in a respective tire;

transmitting a low-frequency command from a service tool to said respective sensor unit;

said respective sensor unit transmitting a first radio-frequency response message including sensor data and said respective ID code;

said service tool receiving said first radio-frequency response message;

establishing a low pressure in said respective tire;

transmitting a low-frequency command from said service tool to said respective sensor unit;

said respective sensor unit transmitting a second radio-frequency response message including sensor data and said respective ID code; and

said service tool receiving said second radio-frequency response message.

9. The method of claim 8 wherein said first detecting step comprises comparing said sensor data in said first and second radio-frequency response messages with predetermined data.

10. The method of claim 6 further comprising the step of:

recording said results of said interrogation and said re-interrogation to establish involvement of said removing step in any faulted result.

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US007079033B2

(12) **United States Patent**
Itou

(10) **Patent No.: US 7,079,033 B2**
(45) **Date of Patent: Jul. 18, 2006**

(54) **ID REGISTRATION METHOD FOR TIRE PRESSURE SENSOR, ID REGISTRATION APPARATUS, ID REGISTRATION TOOL FOR TIRE PRESSURE MONITORING SYSTEM, AND TIRE WITH AIR PRESSURE SENSOR**

(75) Inventor: **Shintarou Itou**, Toyokawa (JP)

(73) Assignee: **Denso Corporation**, Kariya (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 19 days.

(21) Appl. No.: **10/453,638**

(22) Filed: **Jun. 4, 2003**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Jun. 5, 2002 (JP) 2002-164985
Jun. 19, 2002 (JP) 2002-179149

(51) **Int. Cl.**
G08B 13/14 (2006.01)

(52) **U.S. Cl.** **340/572.3**; 340/442; 340/572.1; 340/10.51; 340/10.52; 340/557; 73/146

(58) **Field of Classification Search** ..... 340/572.3, 340/572.1, 442, 445, 447, 443, 461, 525, 340/825.69, 825.72, 10.51, 10.52, 572.8, 340/555–557; 73/146.5, 146.2, 146; 116/34 R; 152/510; 301/95.101; 428/195.1

See application file for complete search history.

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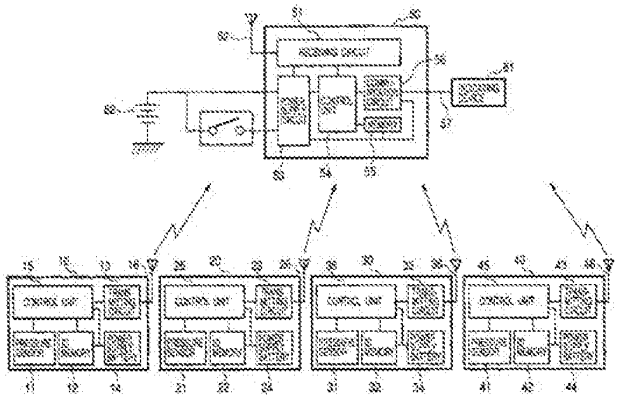
(Continued)

Primary Examiner—Davetta W. Goins
(74) *Attorney, Agent, or Firm*—Posz Law Group, PLC

(57) **ABSTRACT**

Provided is a tire pressure monitoring system capable of preventing mistaken registration of ID due to radio interference. In the system, a tire pressure monitoring apparatus is switched into an ID registration mode while an ID is read out from a bar code or the like and is transmitted to the tire pressure monitoring apparatus. The tire pressure monitoring apparatus registers the received ID in a memory. After the completion of the registration of a necessary number of IDs, the tire pressure monitoring apparatus is switched into a normal mode, before the ID registration operation comes to an end. On the other hand, in the case of tire replacement, through the use of an ID registration tool, an ID is read out from a bar code adhered onto a tire detached and is transmitted to the tire pressure monitoring apparatus. The tire pressure monitoring apparatus removes an ID corresponding to this ID from the memory, and through the use of the ID registration tool, an ID is read out from a bar code adhered onto a tire to be newly mounted and is transmitted to the tire pressure monitoring apparatus to be registered therein.

40 Claims, 79 Drawing Sheets



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6,518,876	B1 *	2/2003	Marguet et al.	340/447
6,710,708	B1 *	3/2004	McClelland et al.	340/442
6,737,965	B1 *	5/2004	Okubo	340/445

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JP	2000-142044	5/2000
JP	2000-238515	9/2000
JP	3212311	7/2001

* cited by examiner

Orange Exhibit No. 2004
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FIG. 1

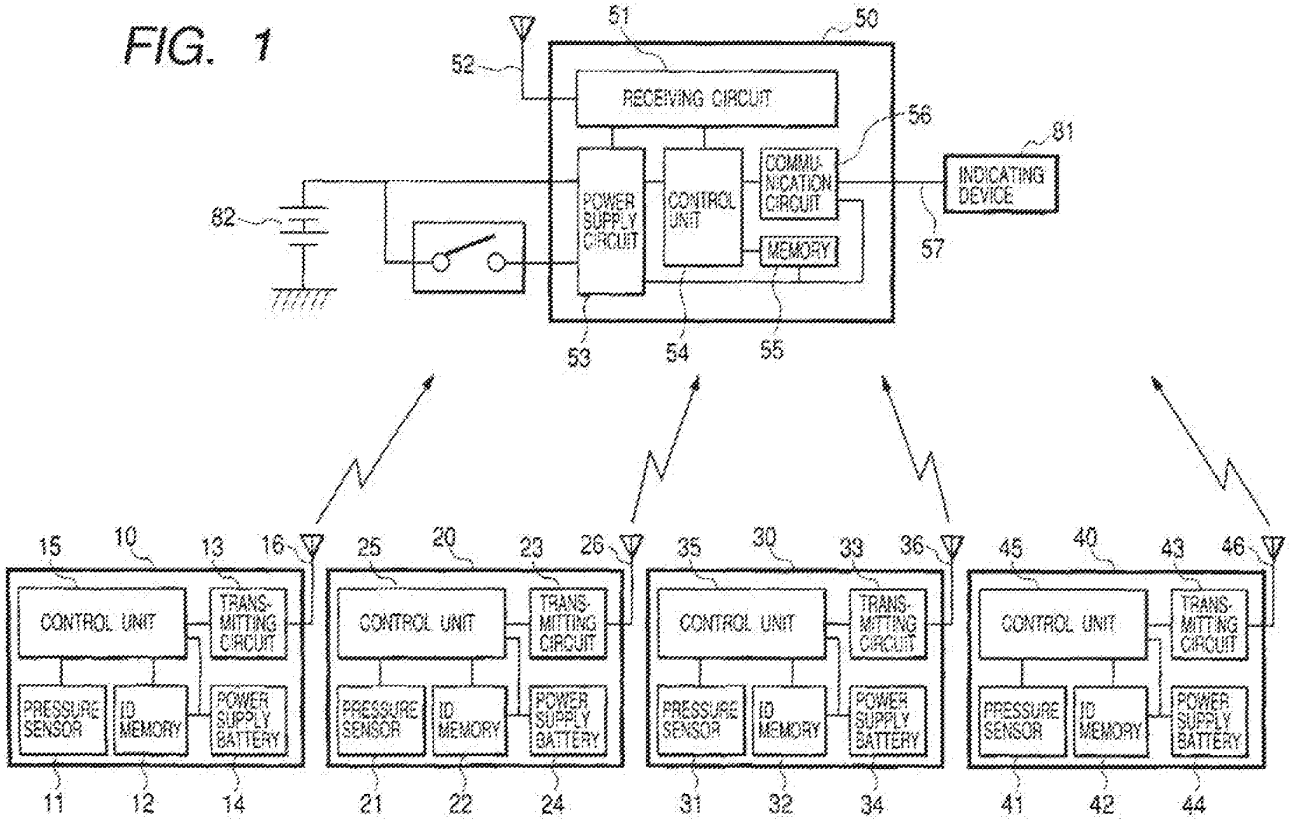

51
50
52
RECEIVING CIRCUIT
56
81
POWER SUPPLY CIRCUIT
CONTROL UNIT
COMMUNICATION CIRCUIT
INDICATING DEVICE
82
MEMORY
57
53
54
55
15
10
13
16
25
20
23
26
35
30
33
36
45
40
43
46
CONTROL UNIT
TRANSMITTING CIRCUIT
PRESSURE SENSOR
ID MEMORY
POWER SUPPLY BATTERY
11
12
14
21
22
24
31
32
34
41
42
44

FIG. 2

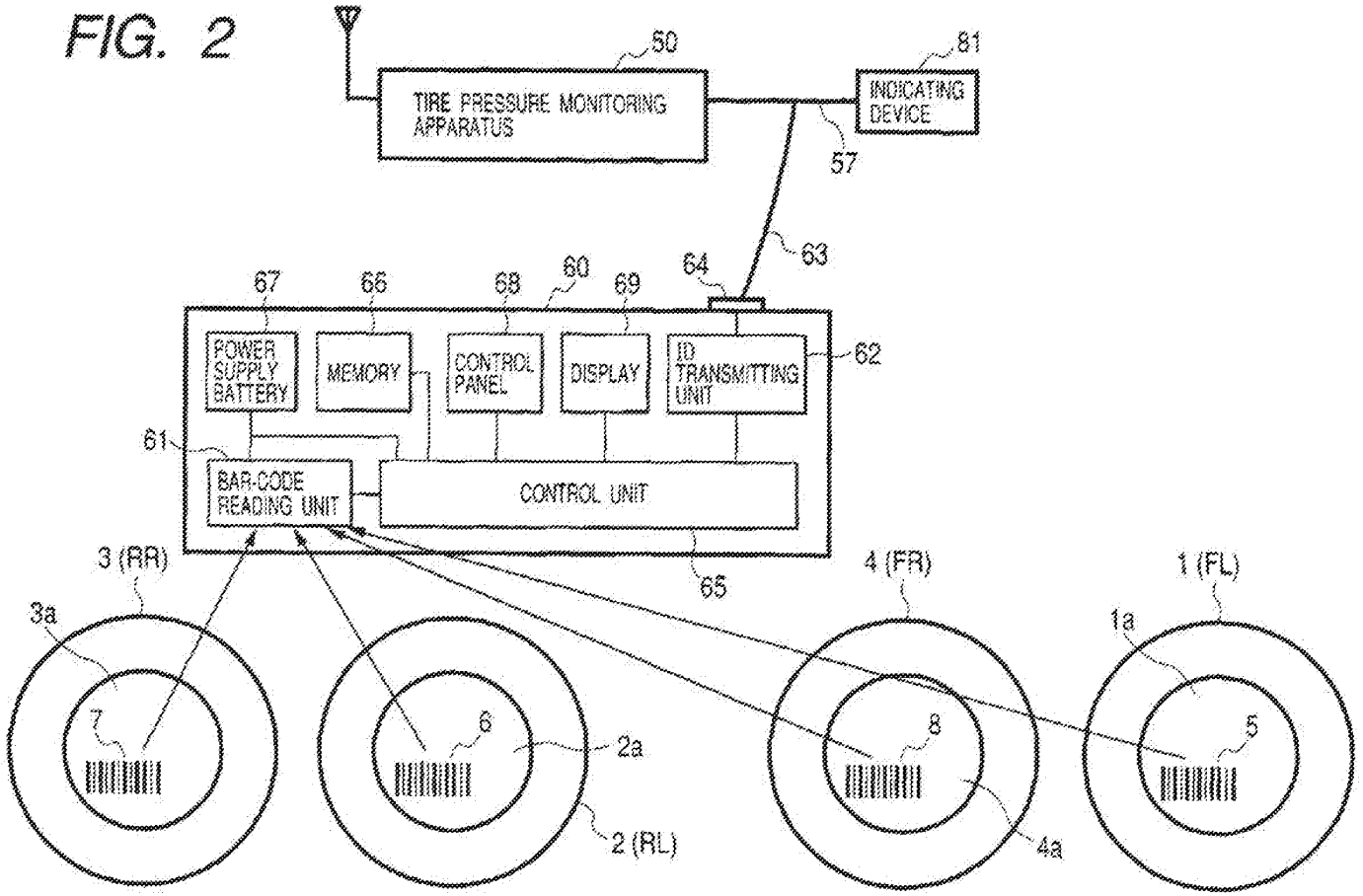
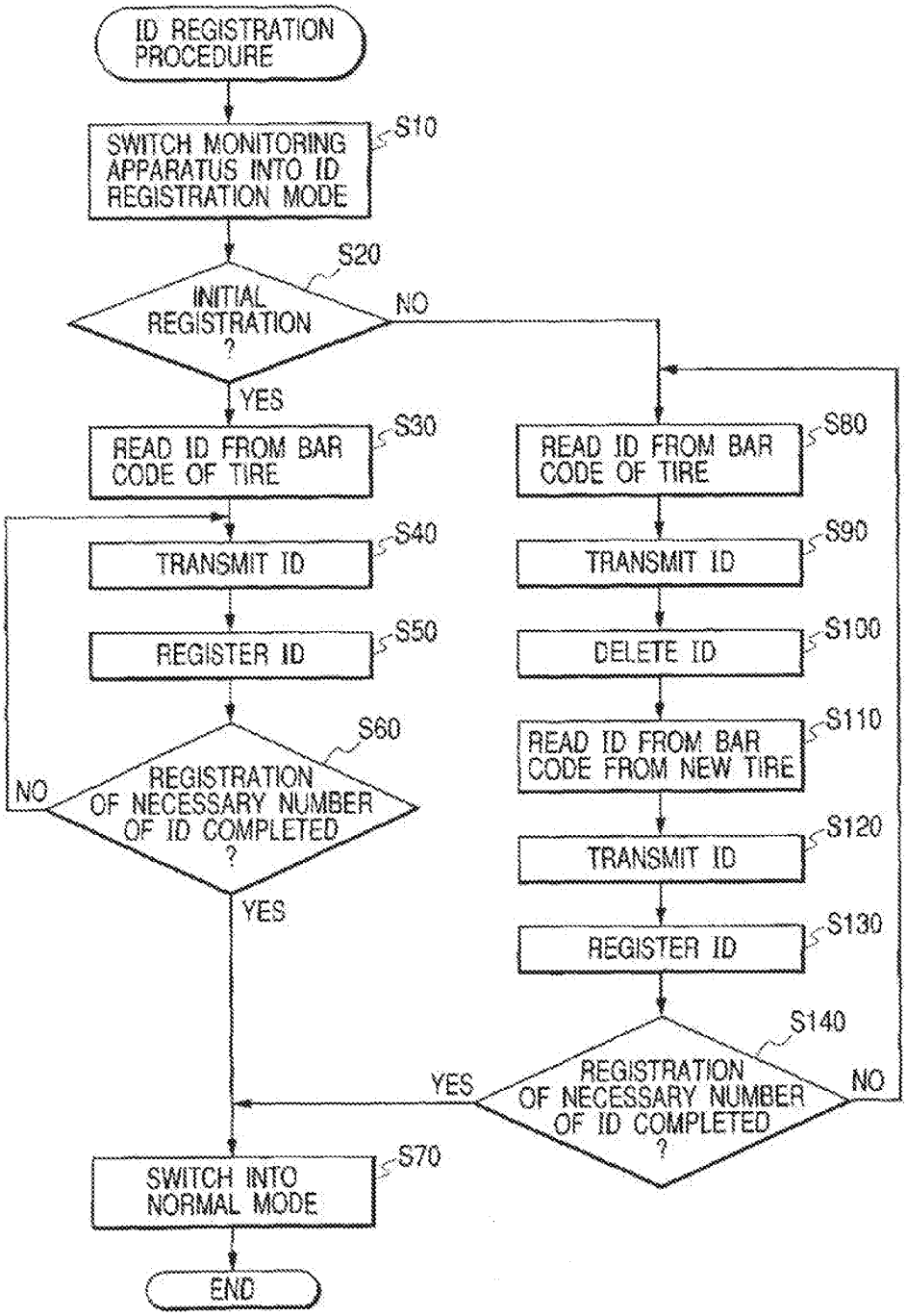
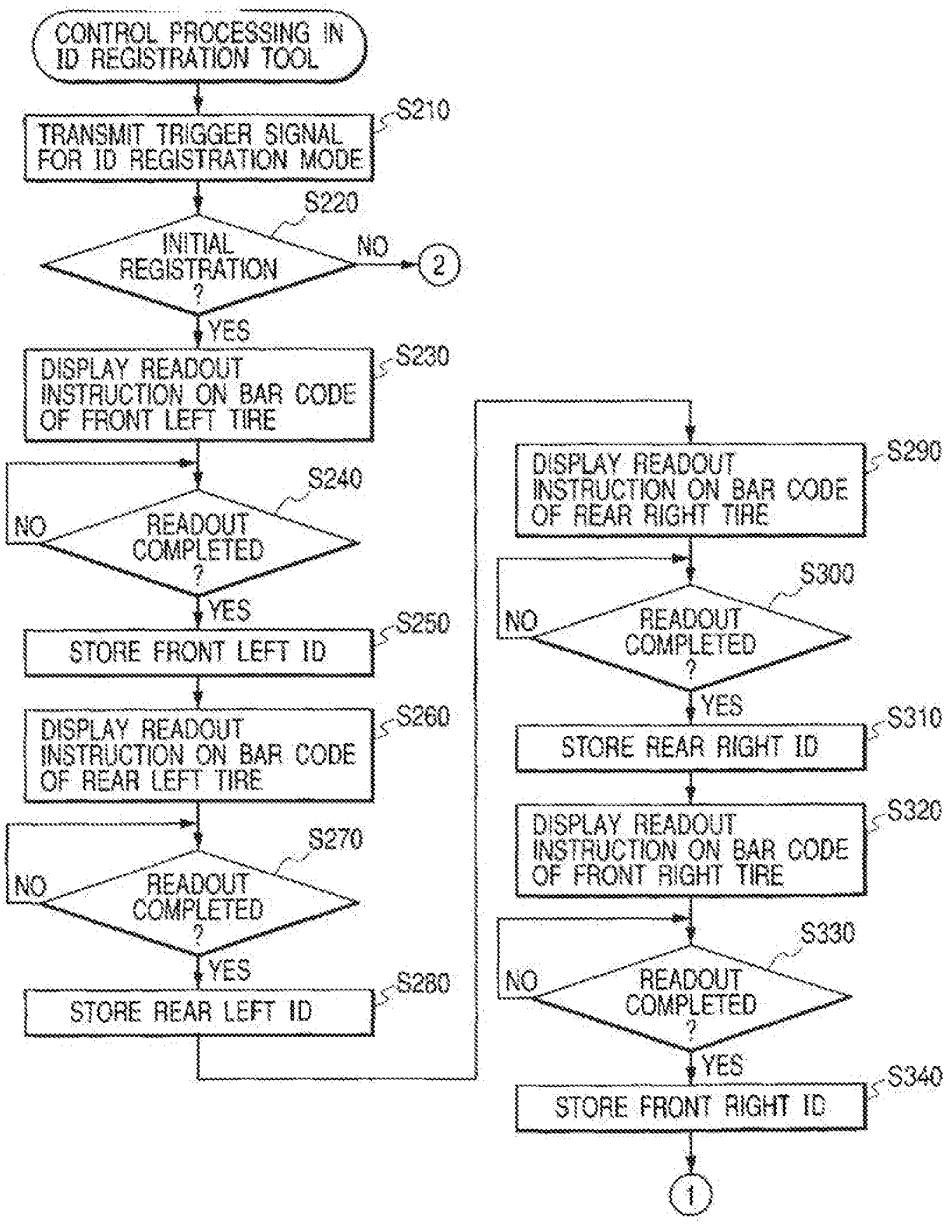

50
TIRE PRESSURE MONITORING APPARATUS
81
INDICATING DEVICE
57
63
64
67
66
68
60
69
62
POWER SUPPLY BATTERY
MEMORY
CONTROL PANEL
DISPLAY
ID TRANSMITTING UNIT
61
BAR-CODE READING UNIT
CONTROL UNIT
65
3 (RR)
4 (FR)
1 (FL)
3a
1a
7
6
2a
8
5
2 (RL)
4a

FIG. 3



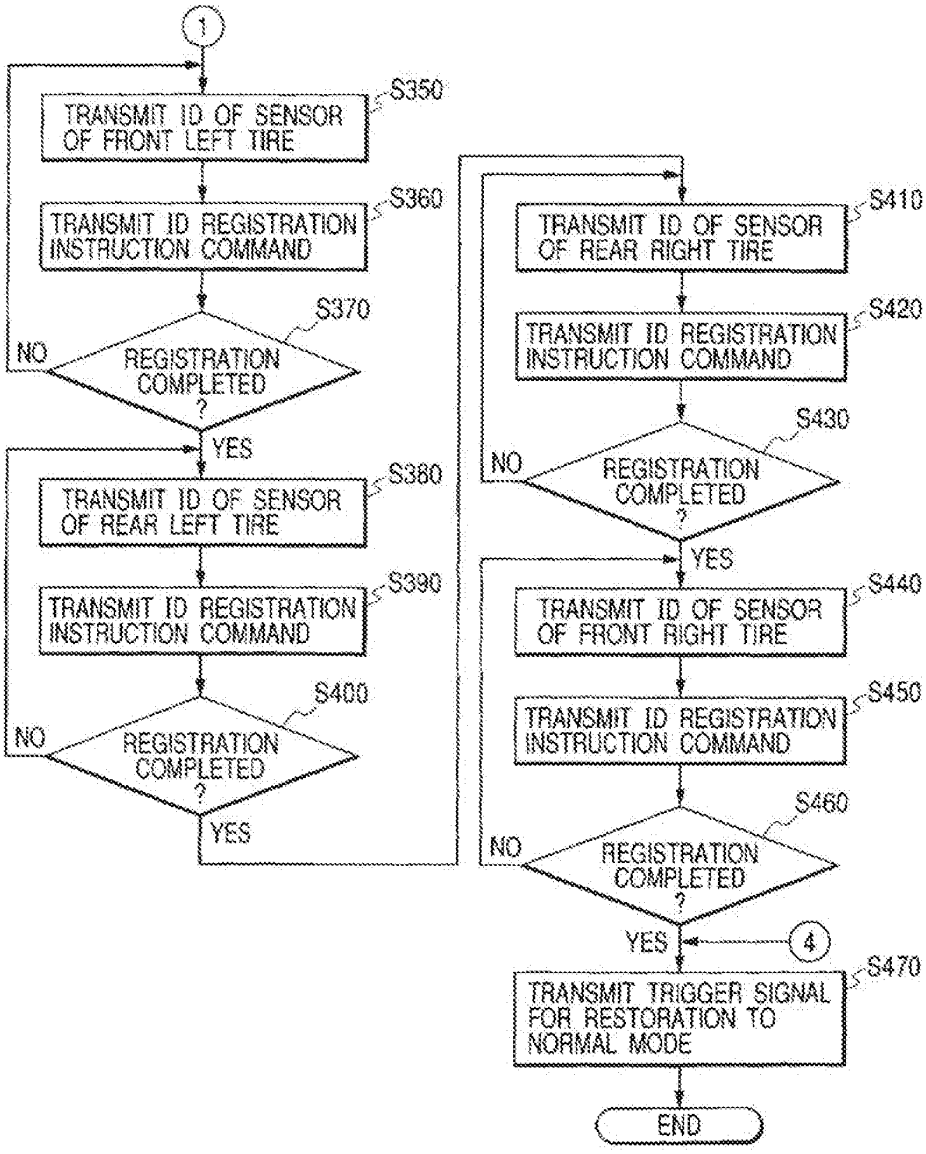
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FIG. 4



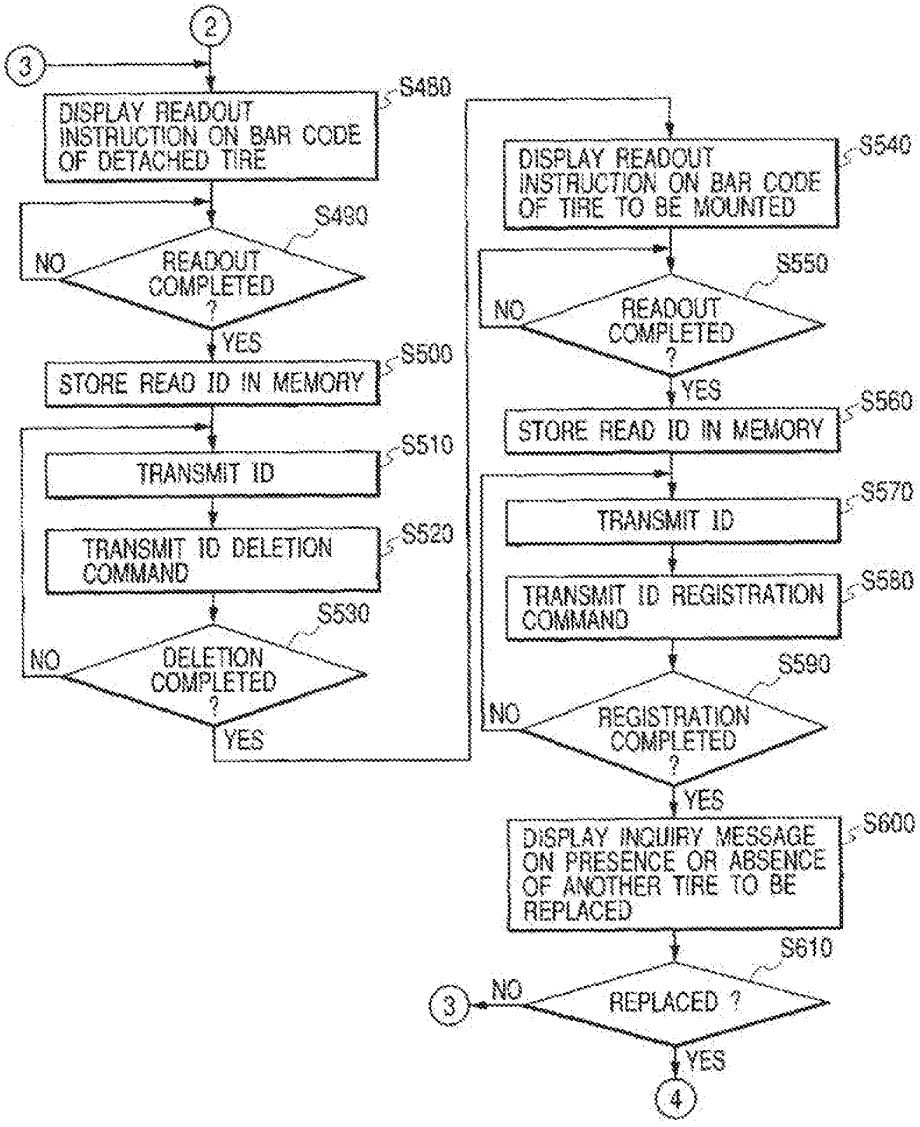
Orange Exhibit No. 2004
IPR2024-00744

FIG. 5



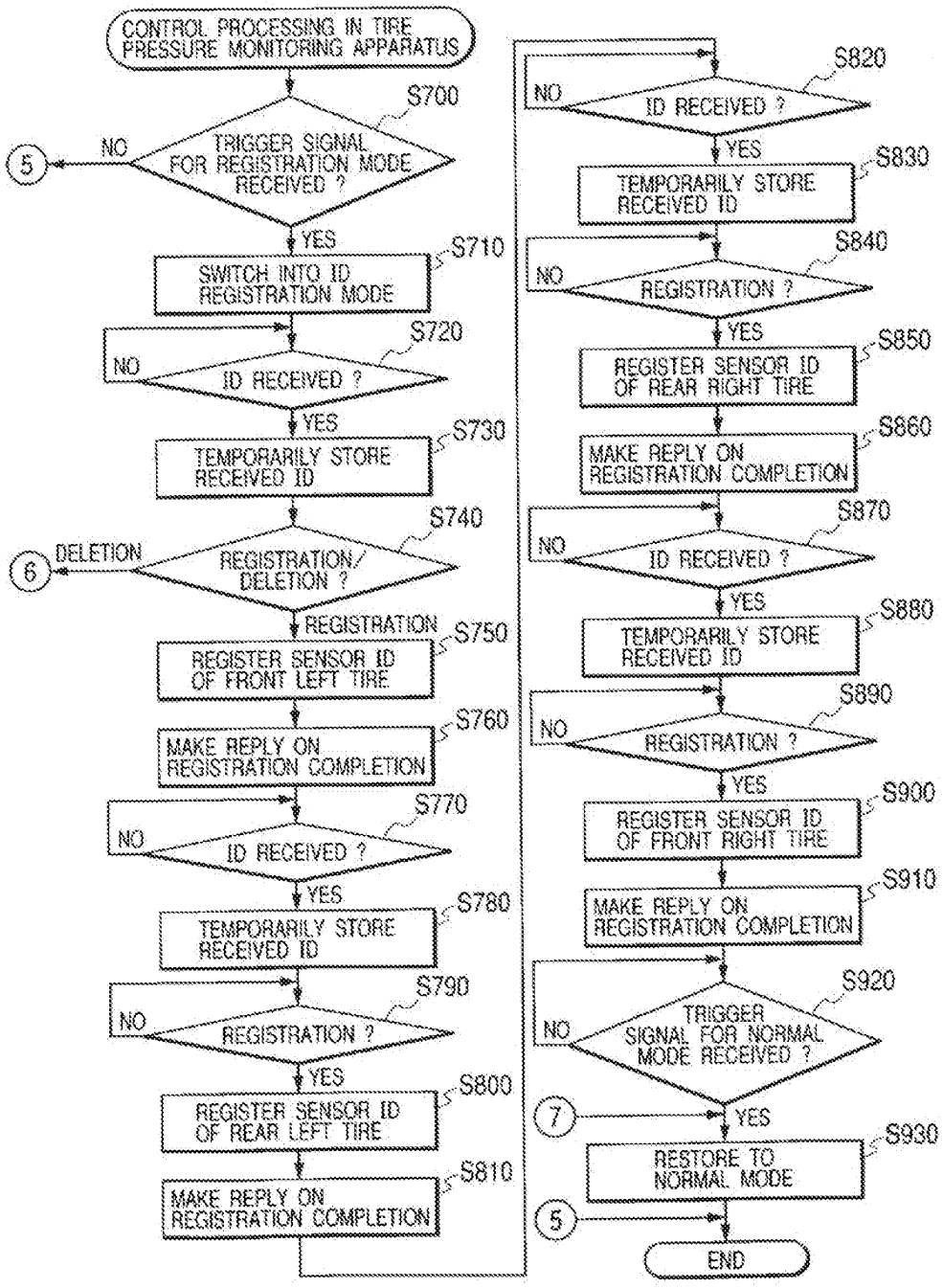
Orange Exhibit No. 2004
IPR2024-00744

FIG. 6



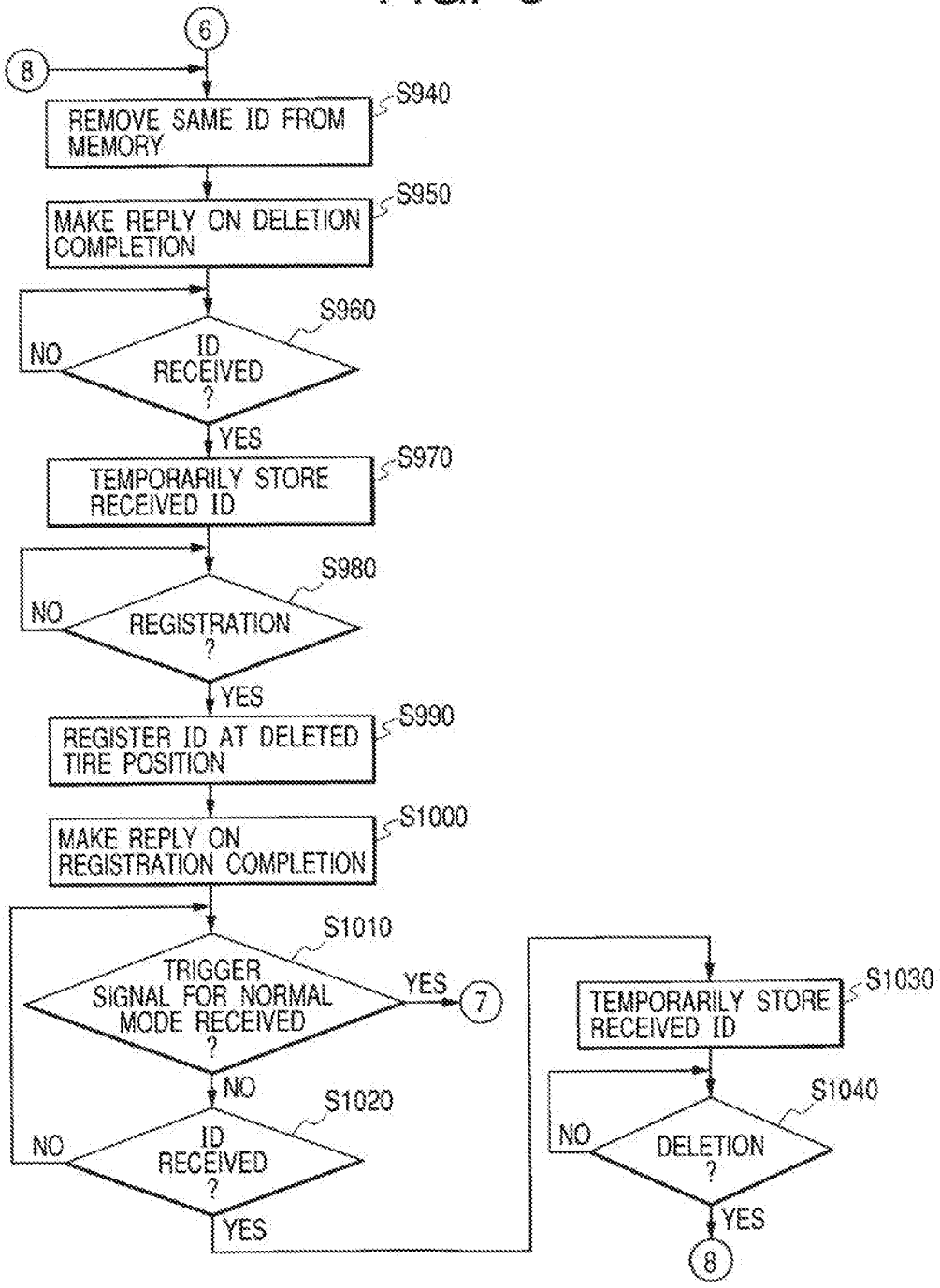
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FIG. 7



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FIG. 8



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FIG. 9

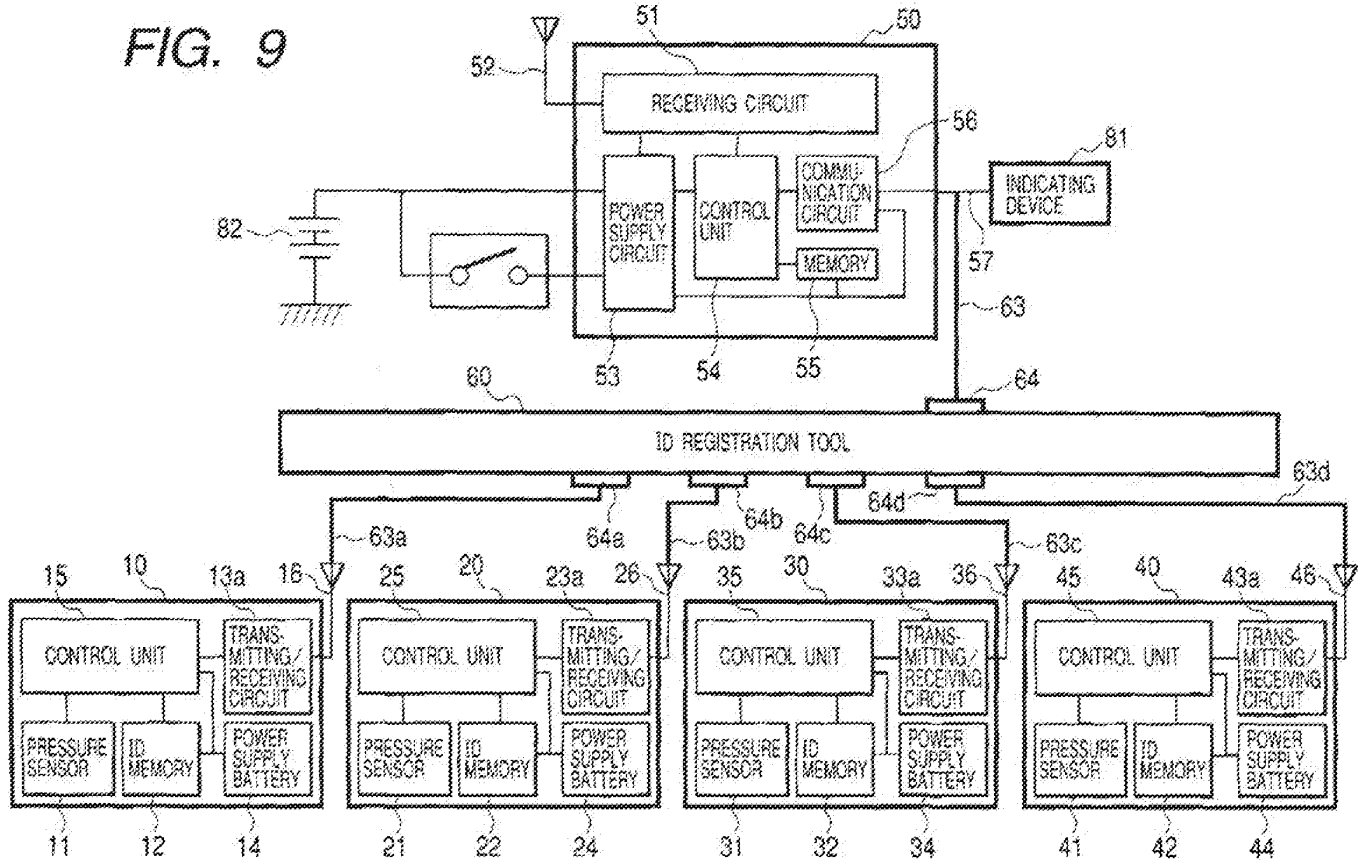
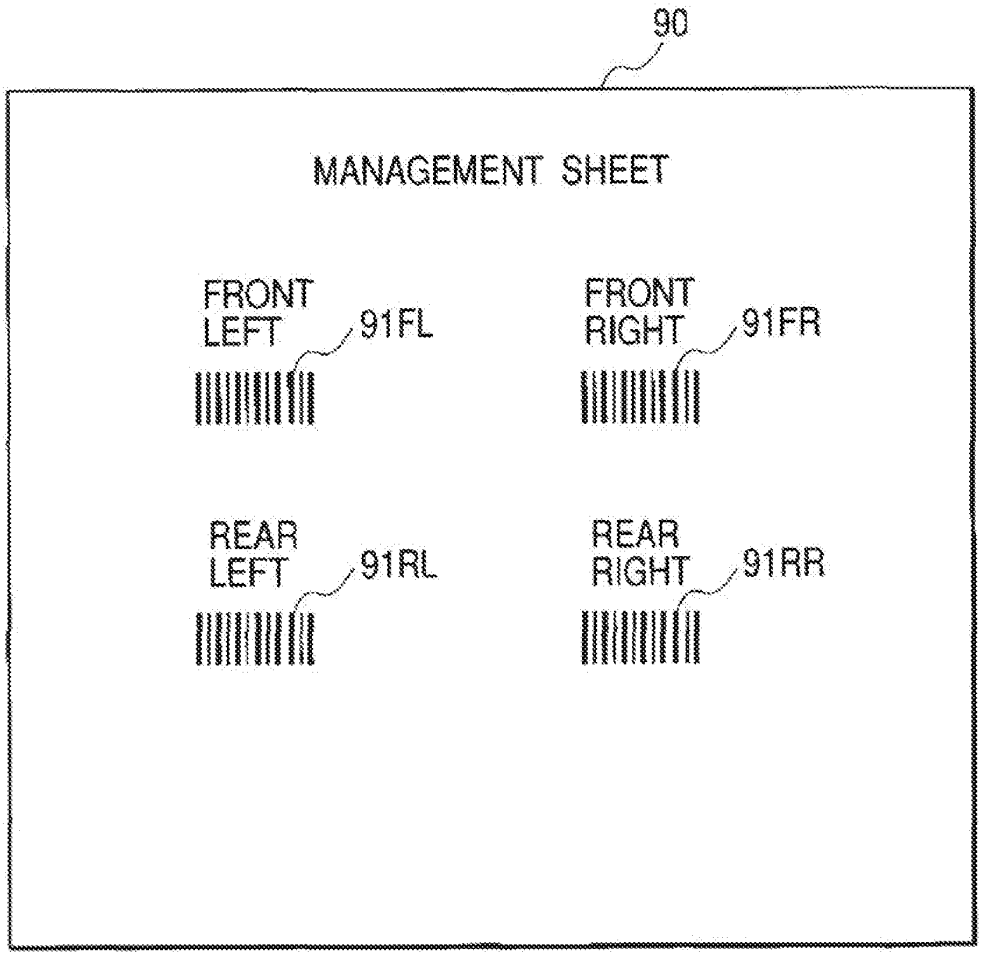
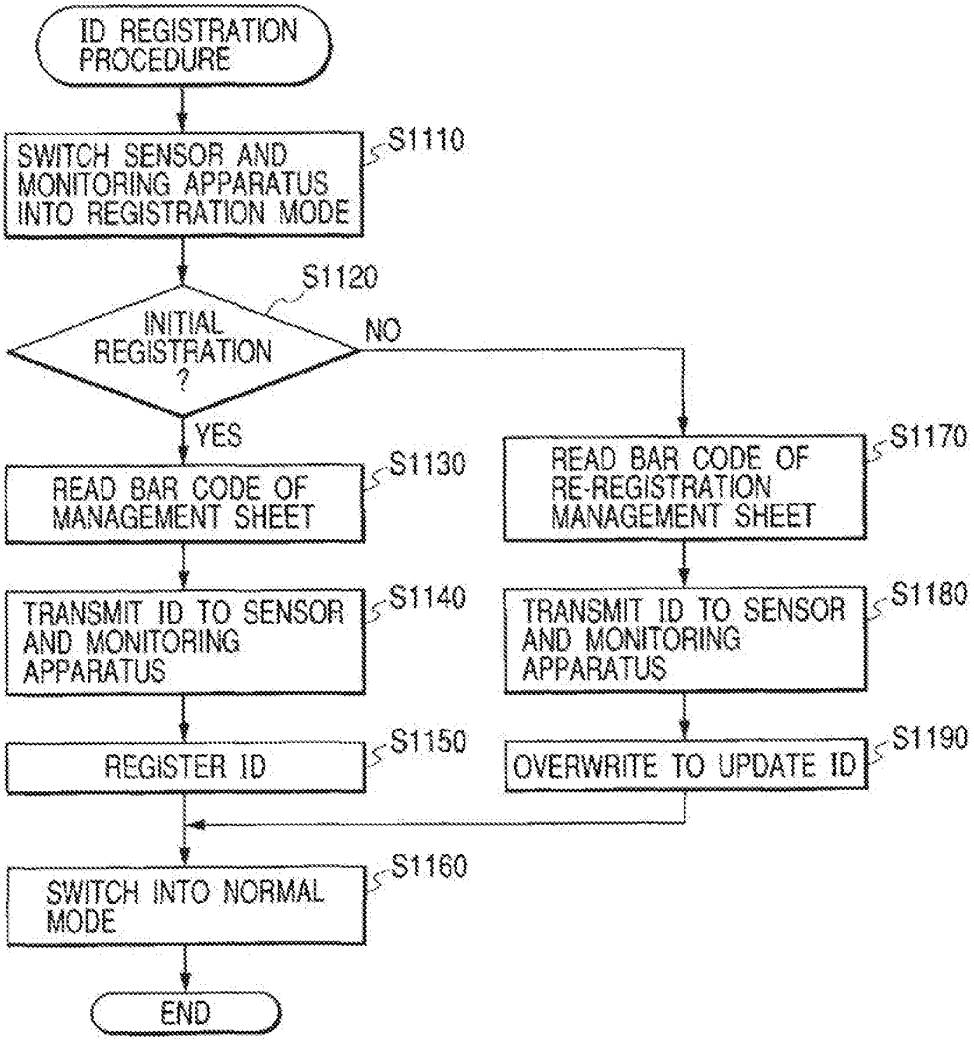

51
50
52
RECEIVING CIRCUIT
56
81
INDICATING DEVICE
82
POWER SUPPLY CIRCUIT
CONTROL UNIT
COMMU-NICATION CIRCUIT
MEMORY
57
63
53
54
55
60
64
ID REGISTRATION TOOL
63d
64d
63a
64a
63b
64b
64c
63c
15
10
13a
16
25
20
23a
26
35
30
33a
36
45
40
43a
46
CONTROL UNIT
TRANS-MITTING/ RECEIVING CIRCUIT
PRESSURE SENSOR
ID MEMORY
POWER SUPPLY BATTERY
11
12
14
21
22
24
31
32
34
41
42
44

FIG. 10



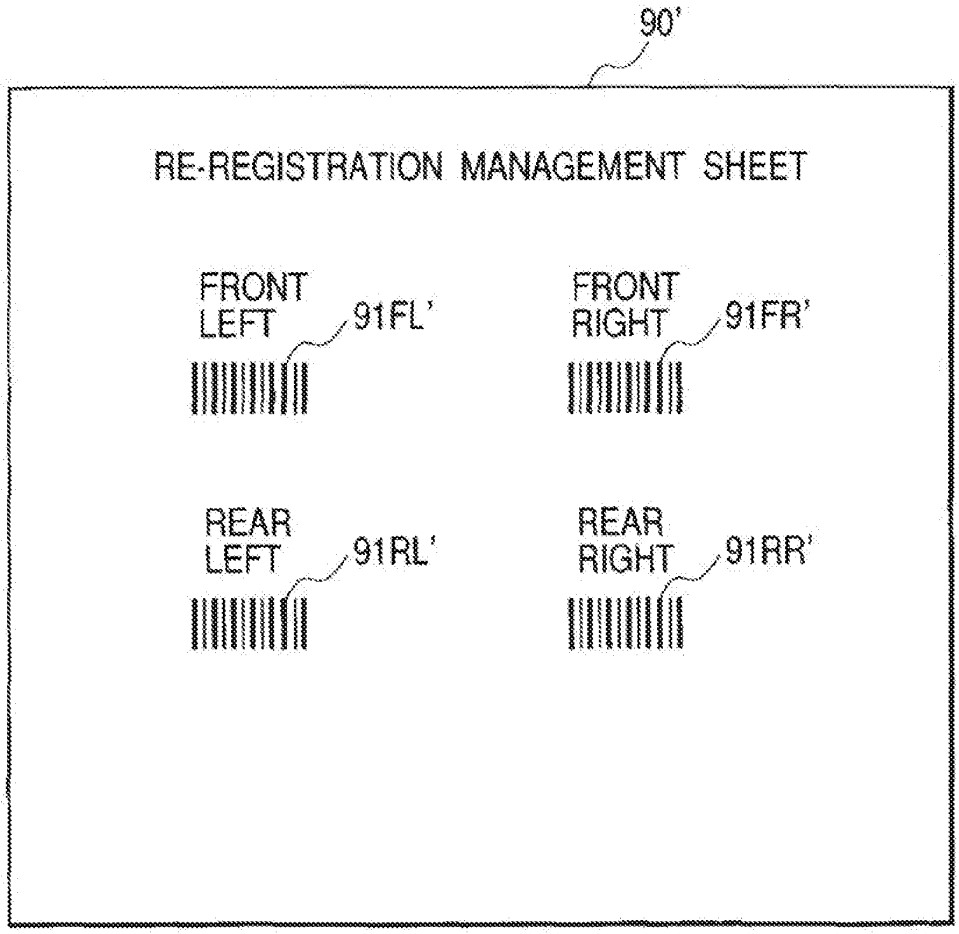
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FIG. 11



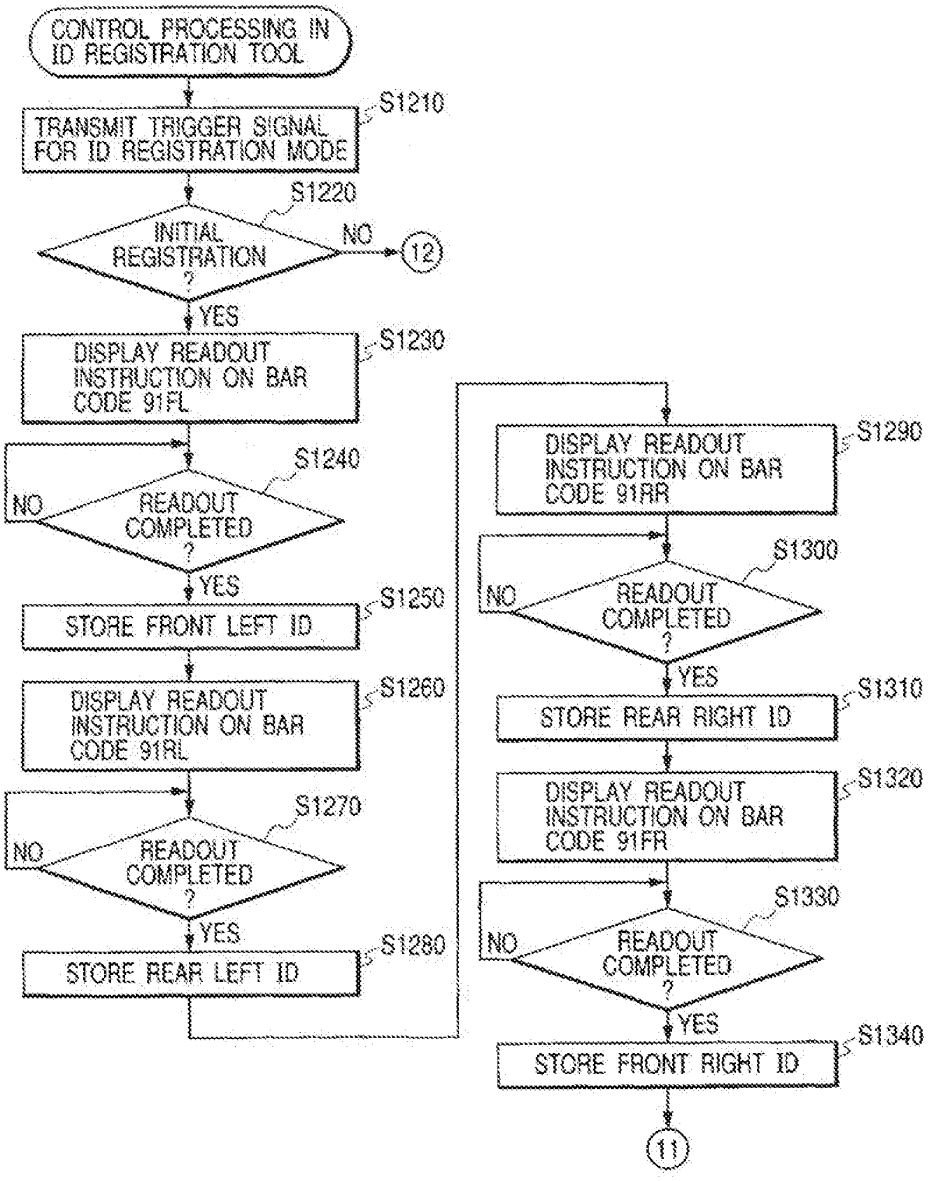
Orange Exhibit No. 2004
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FIG. 12



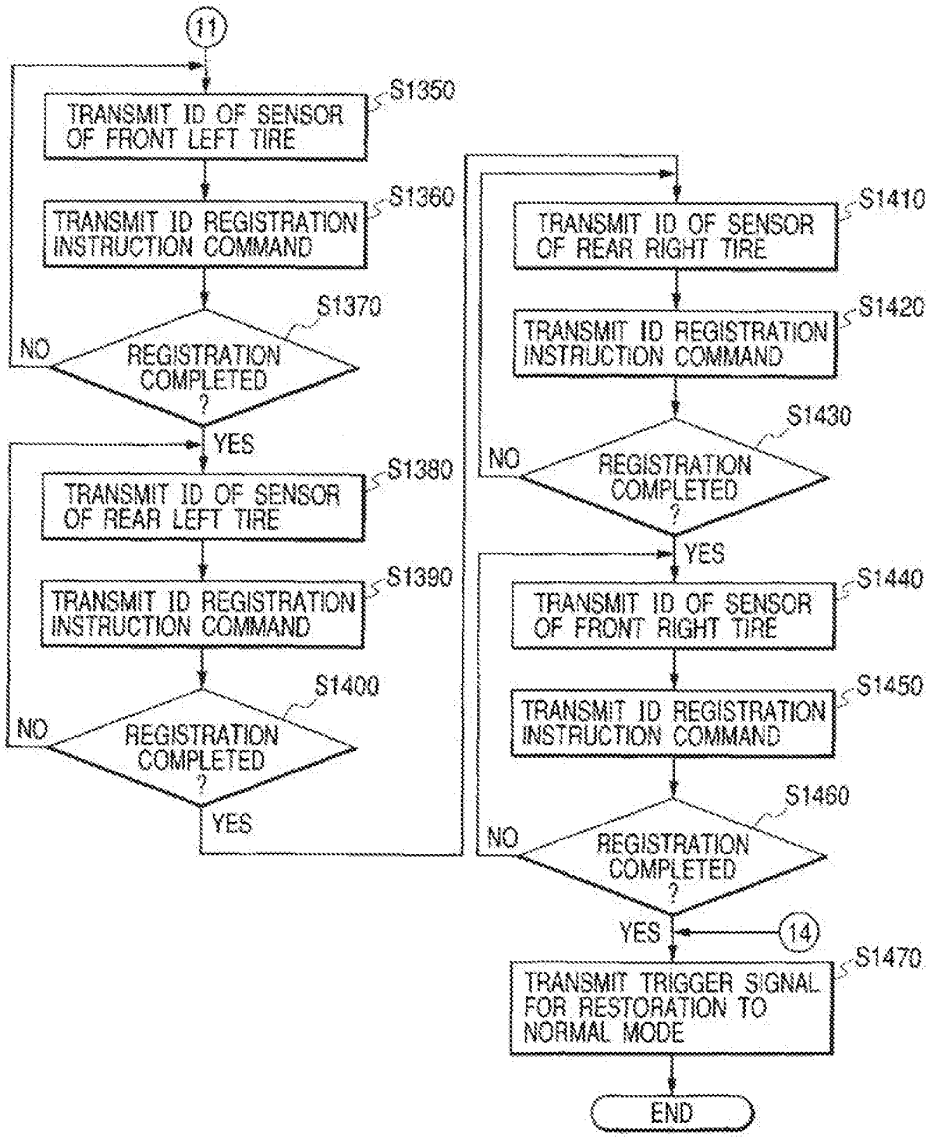
Orange Exhibit No. 2004
IPR2024-00744

FIG. 13



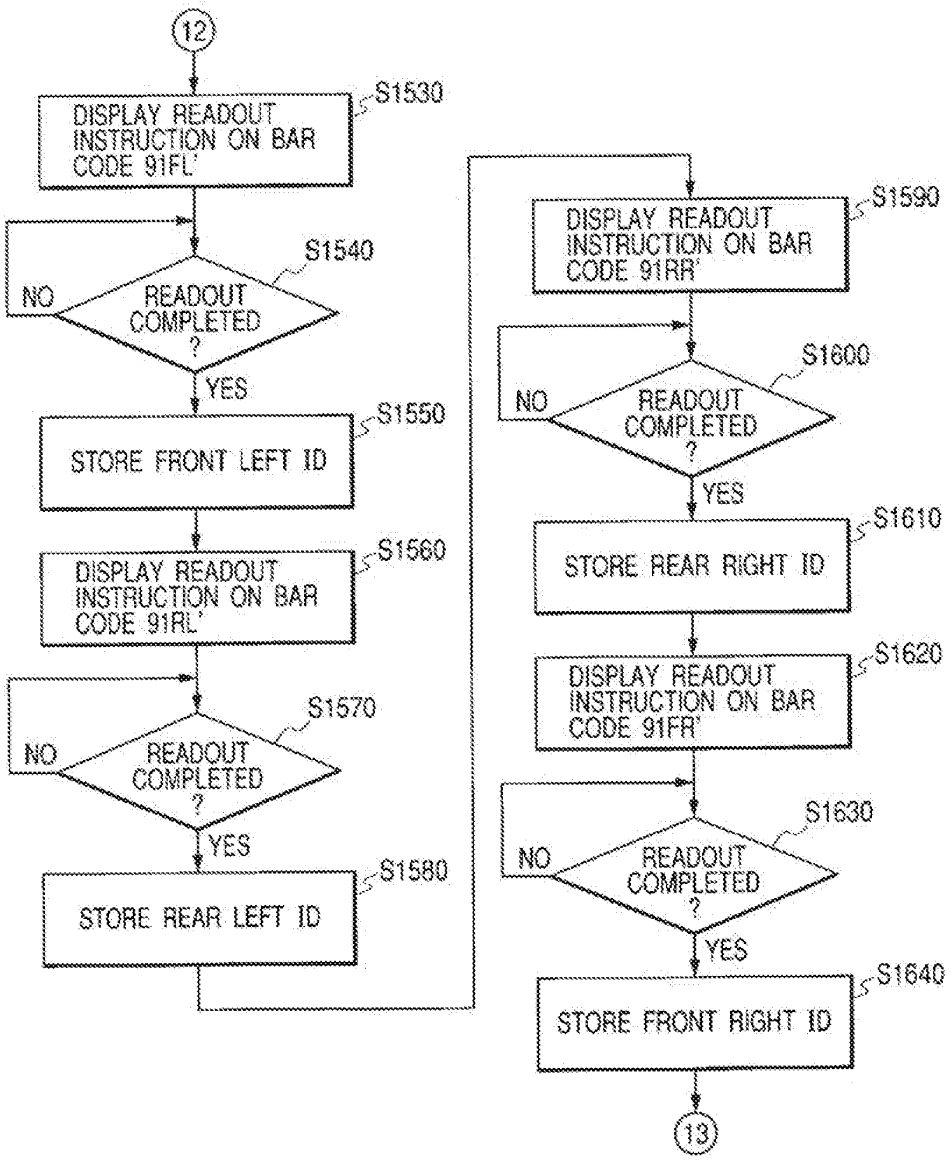
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FIG. 14



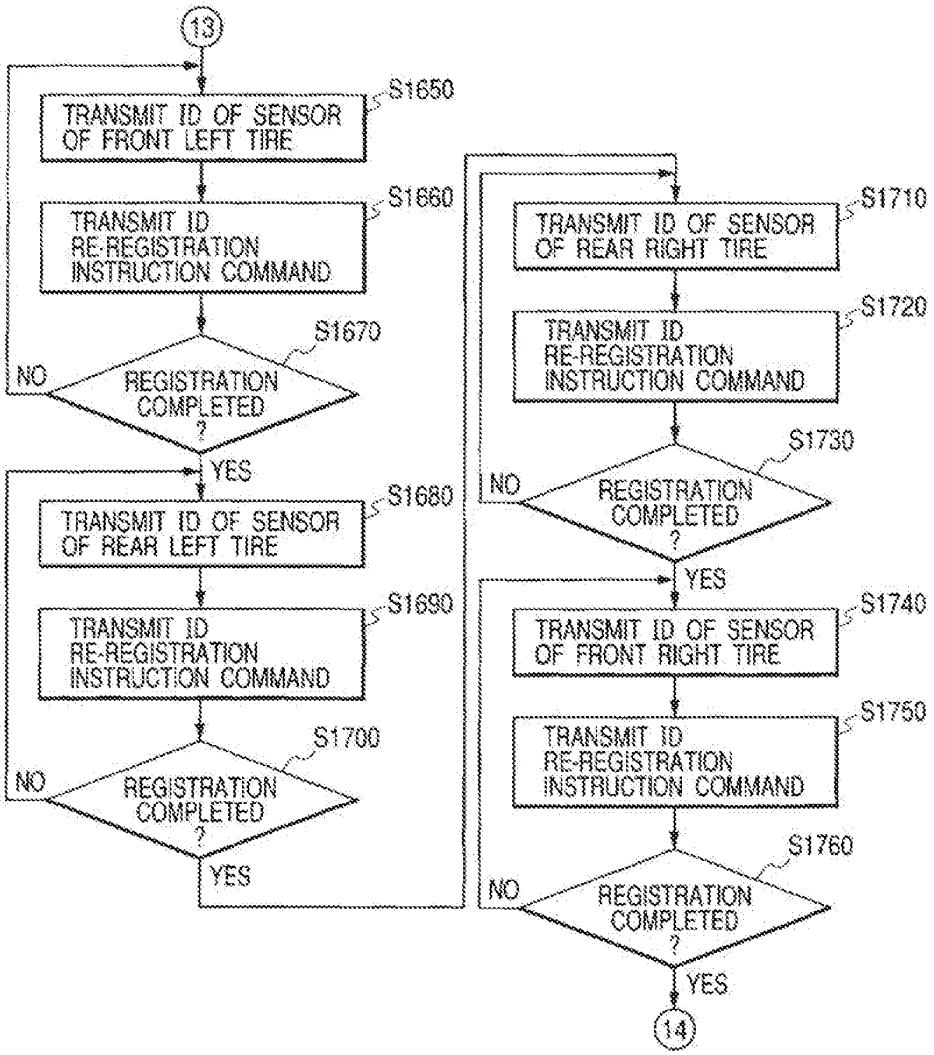
Orange Exhibit No. 2004
IPR2024-00744

FIG. 15



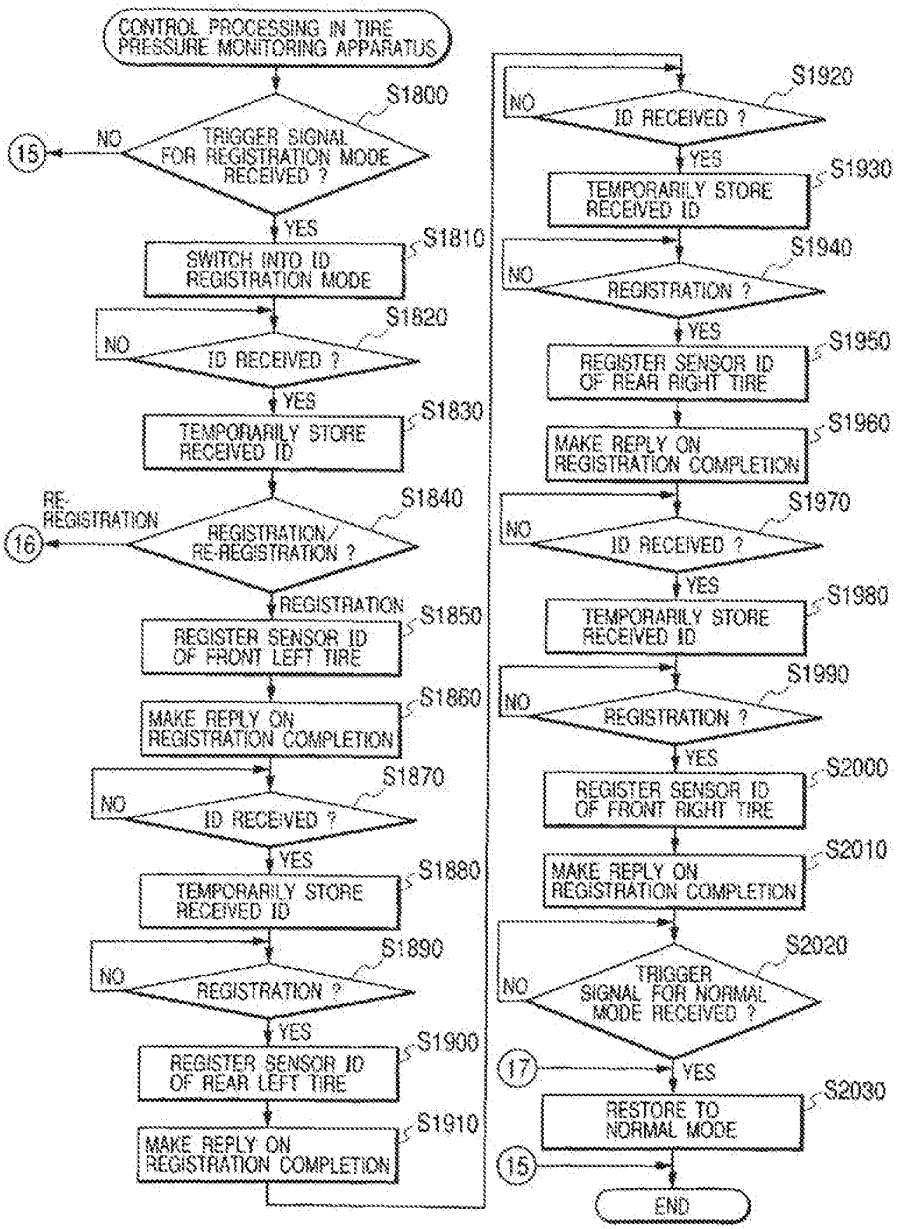
Orange Exhibit No. 2004
IPR2024-00744

FIG. 16



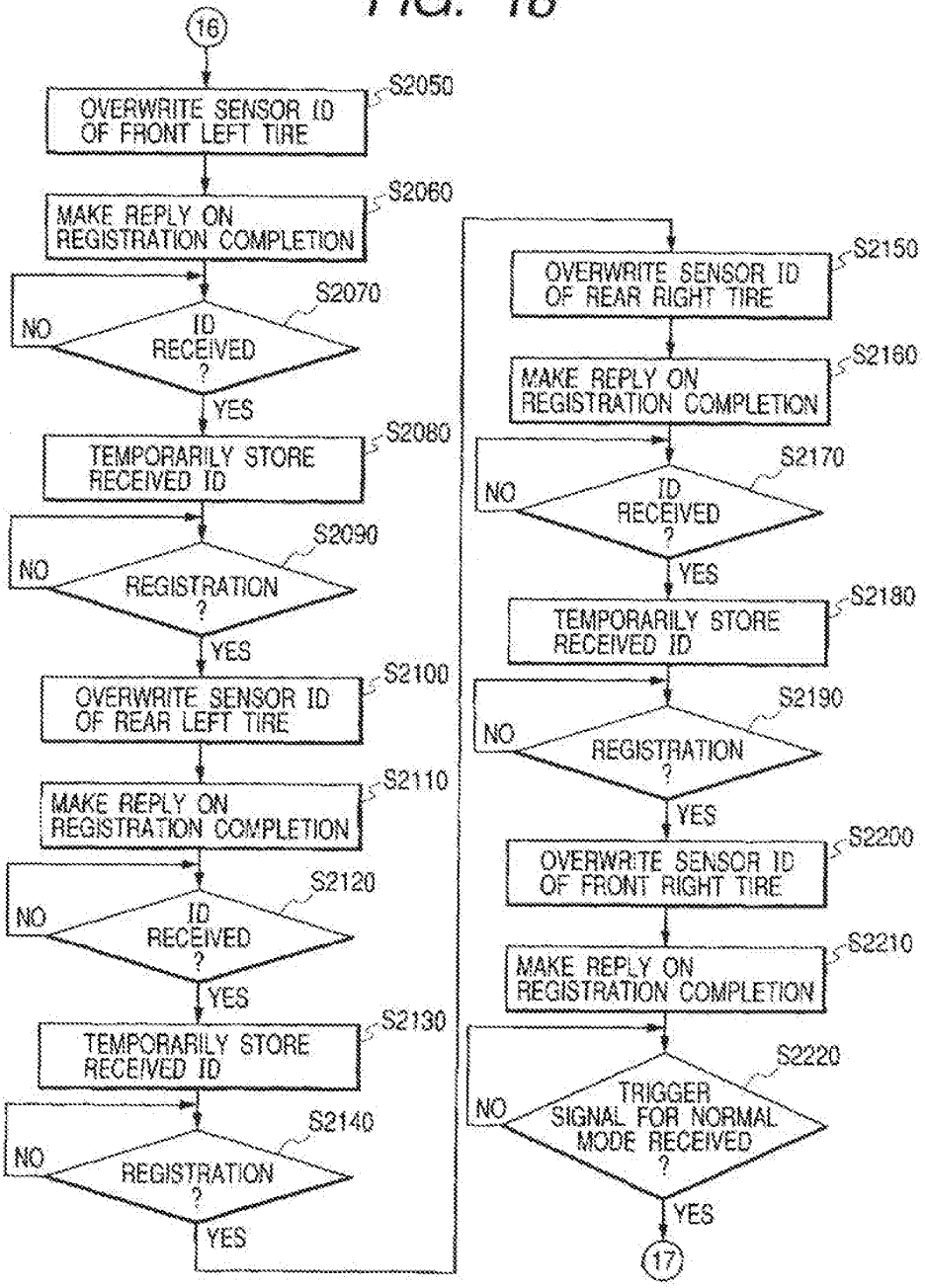
Orange Exhibit No. 2004
IPR2024-00744

FIG. 17



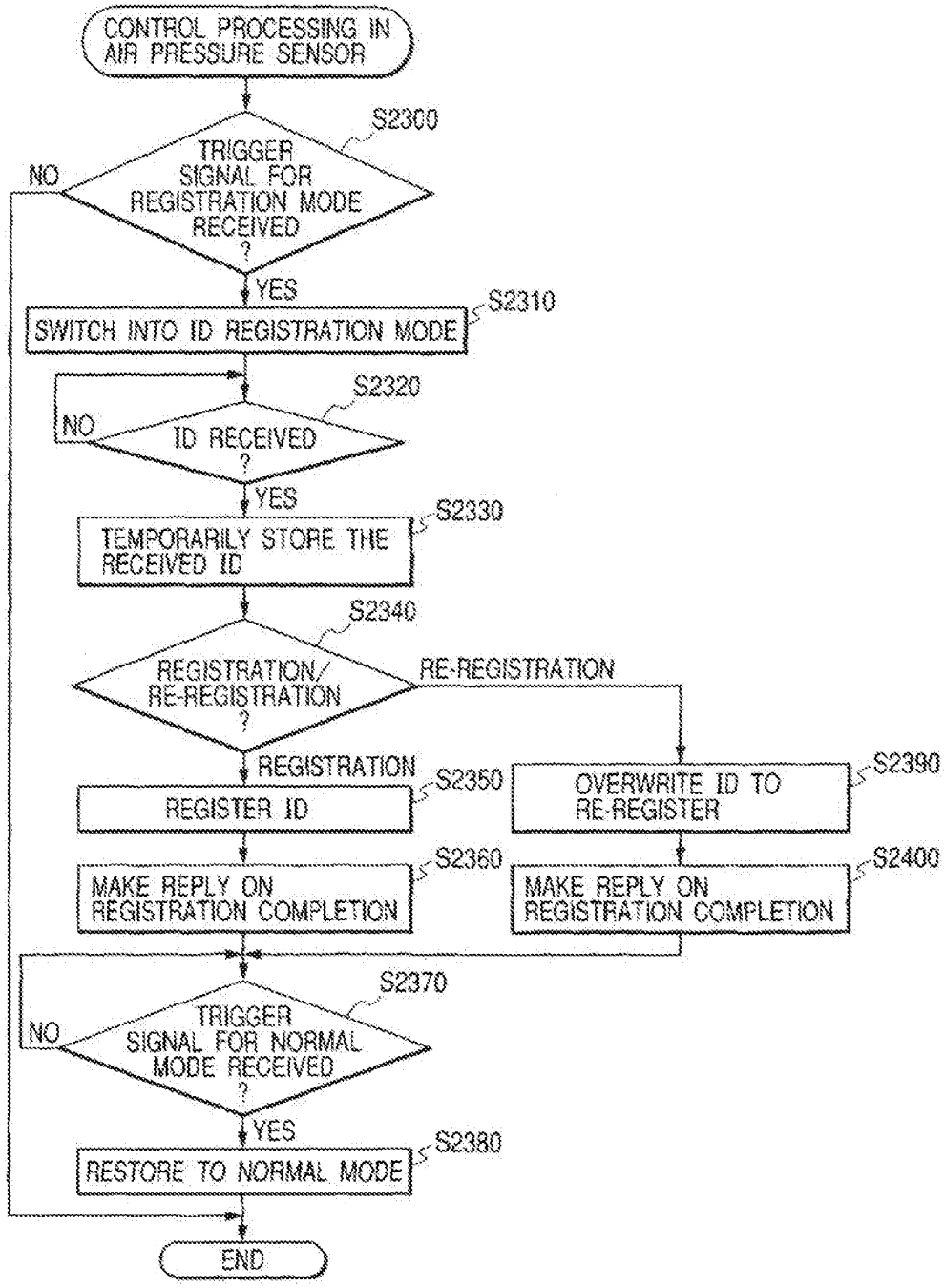
Orange Exhibit No. 2004
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FIG. 18



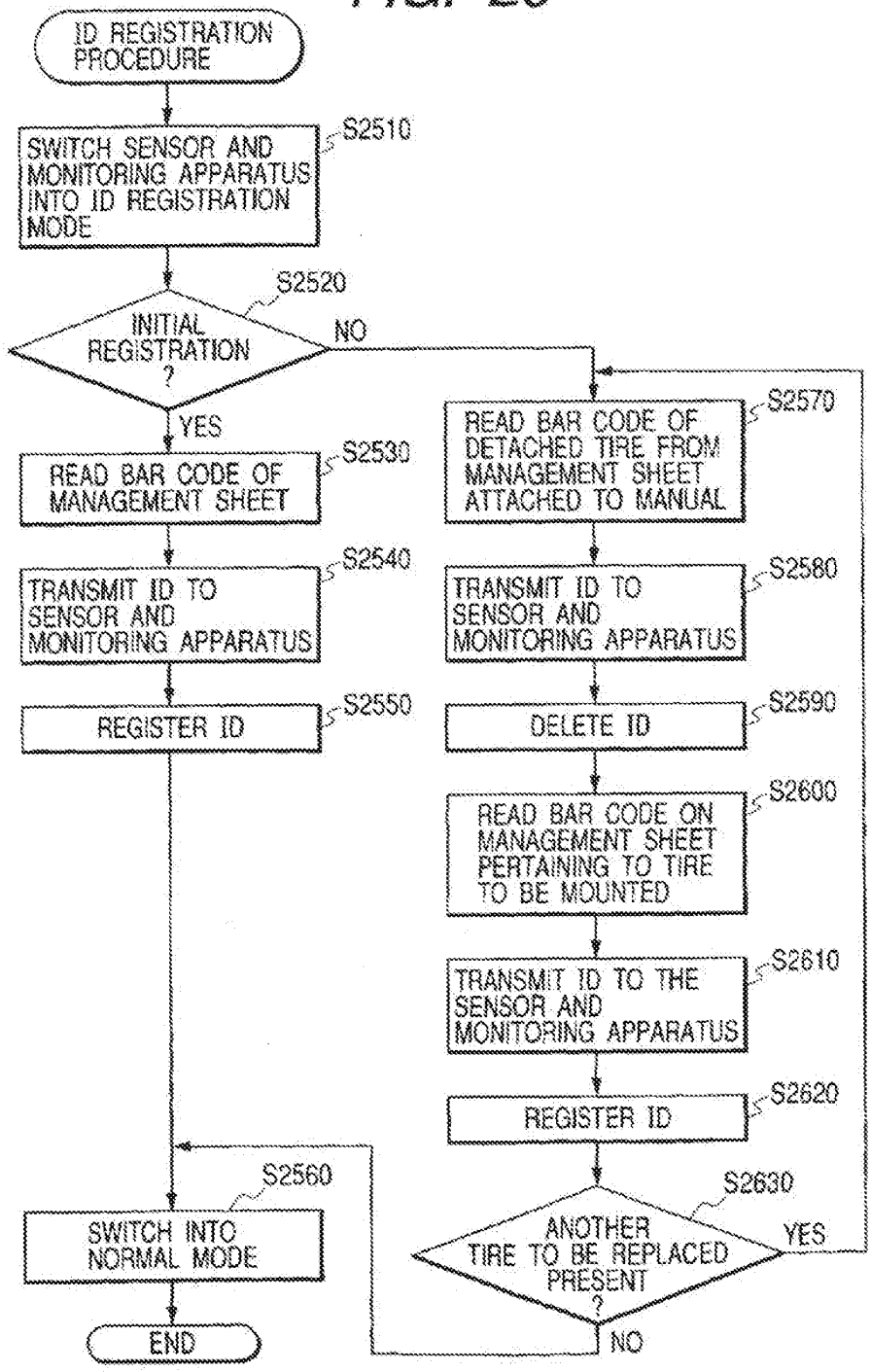
Orange Exhibit No. 2004
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FIG. 19



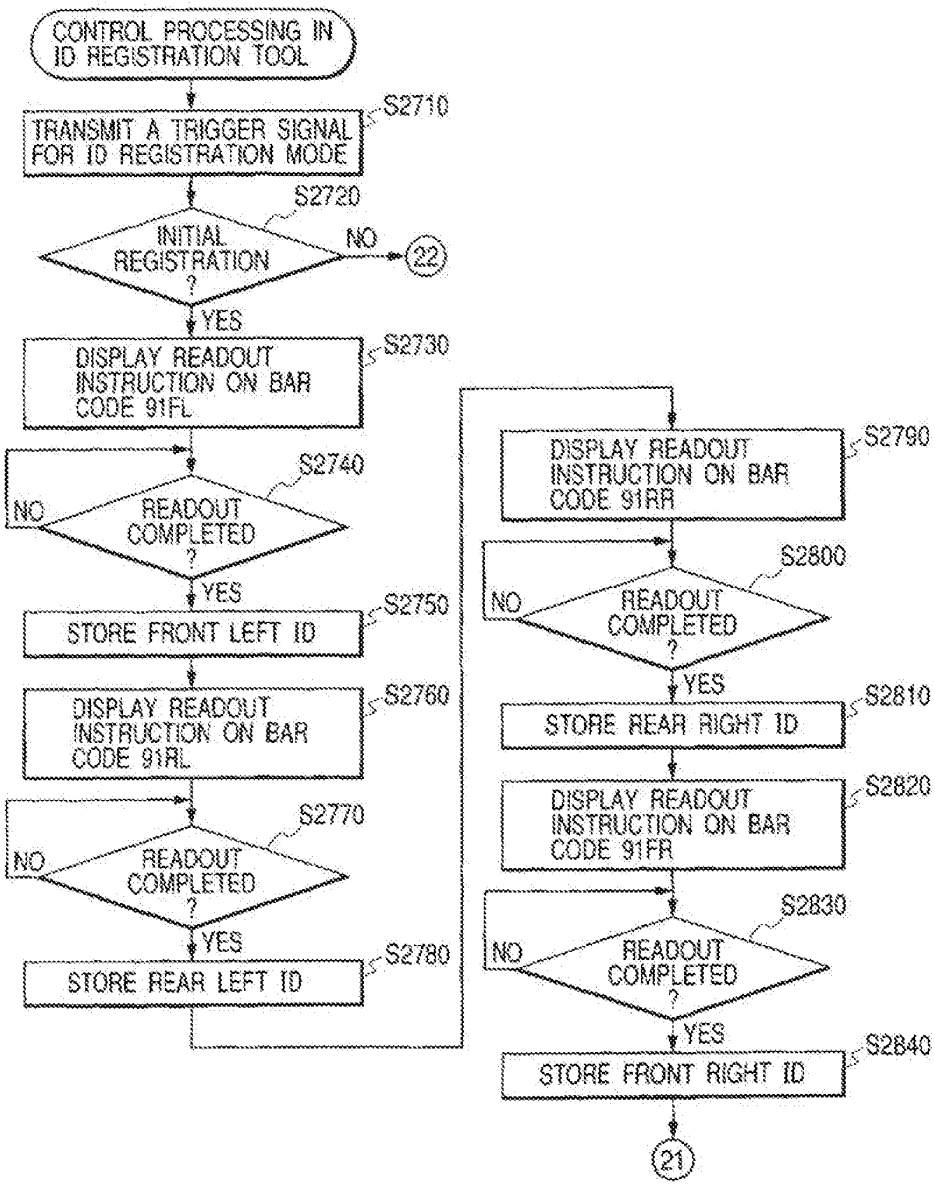
Orange Exhibit No. 2004
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FIG. 20



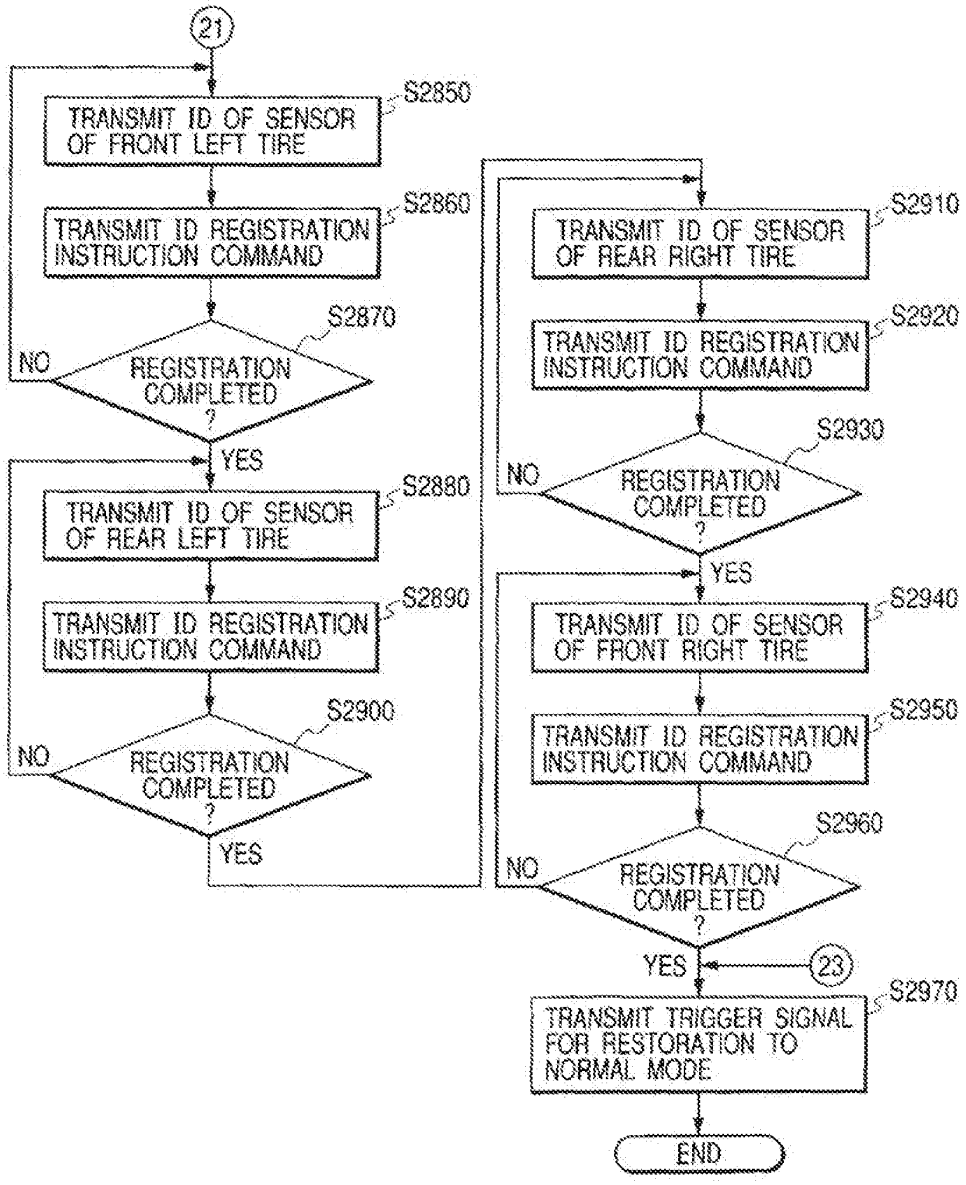
Orange Exhibit No. 2004
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FIG. 21



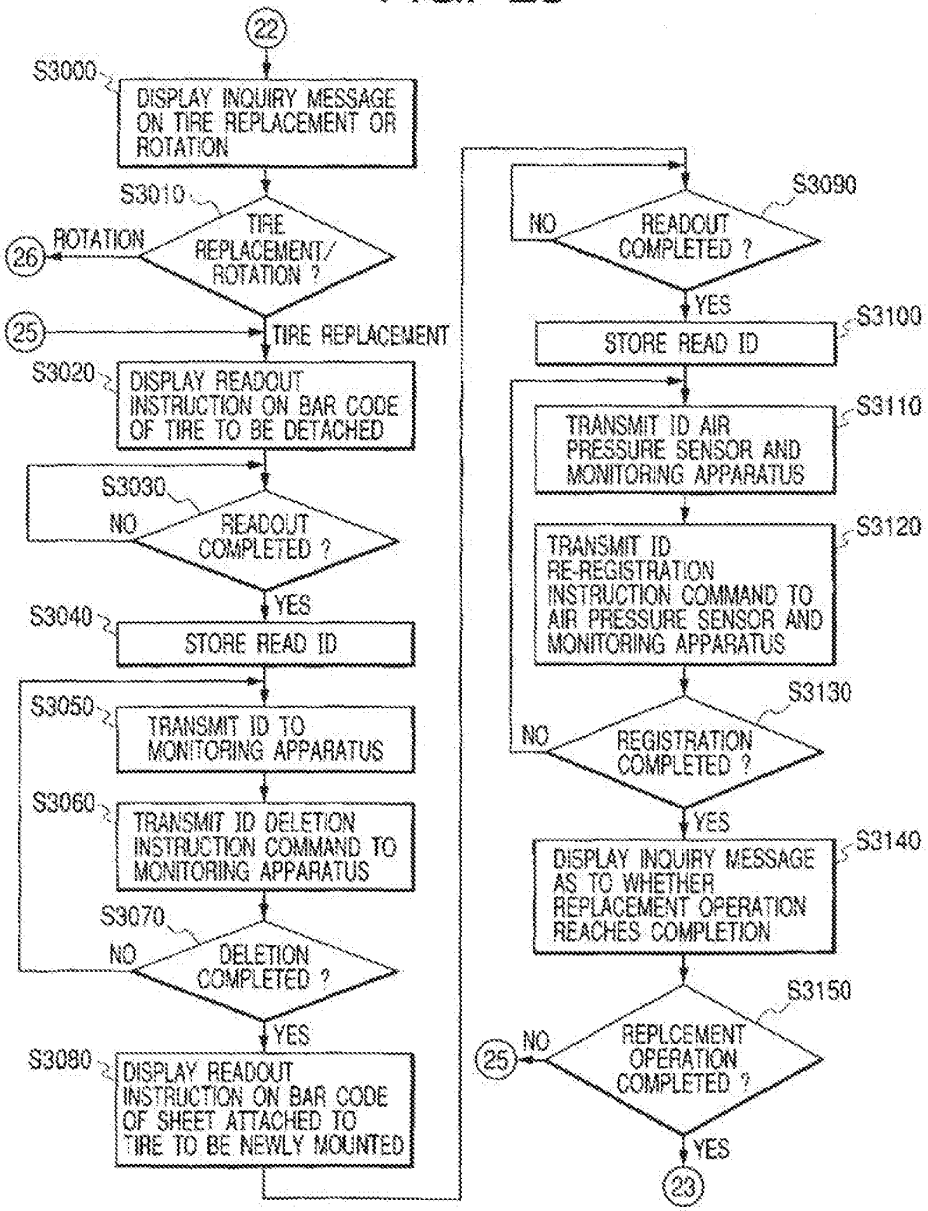
Orange Exhibit No. 2004
IPR2024-00744

FIG. 22



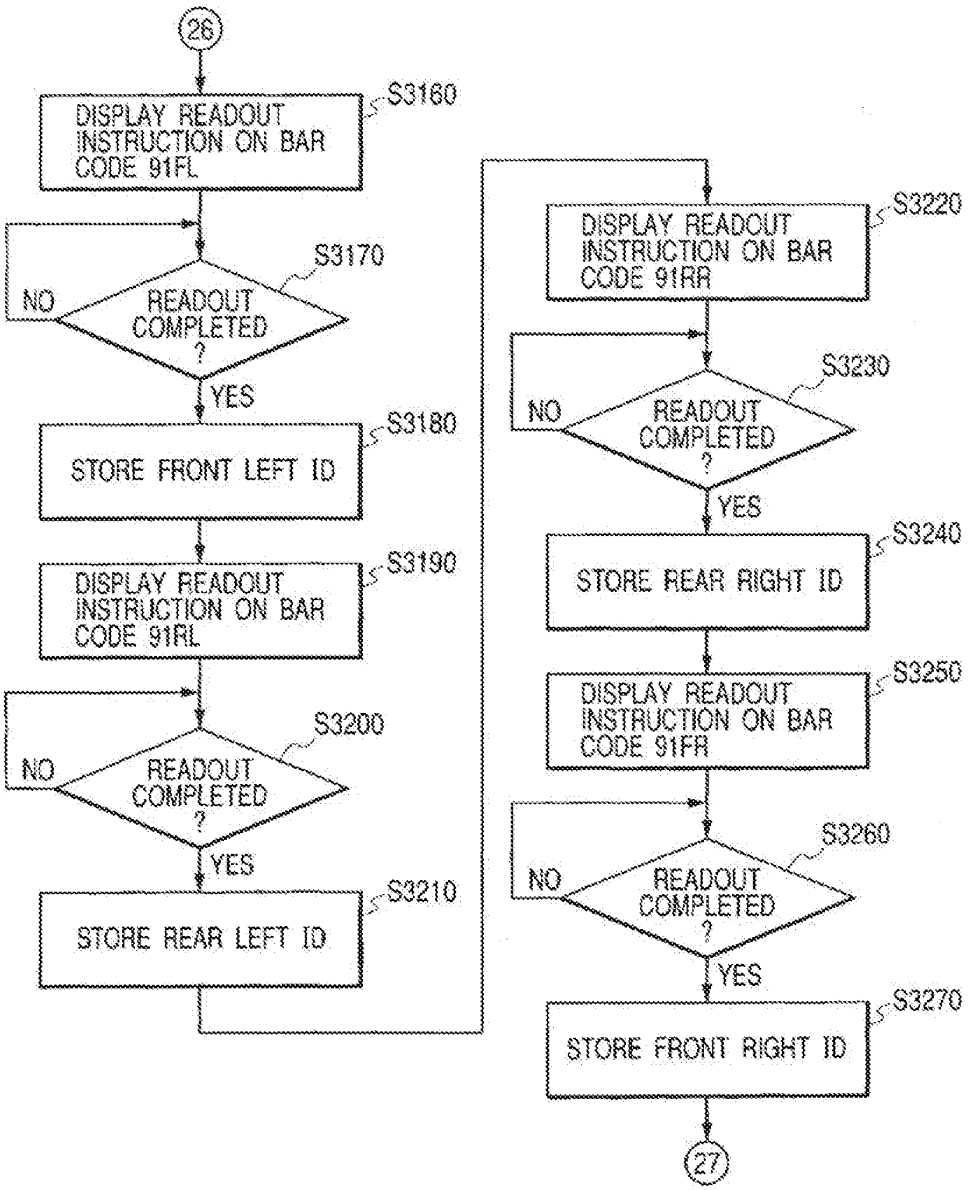
Orange Exhibit No. 2004
IPR2024-00744

FIG. 23



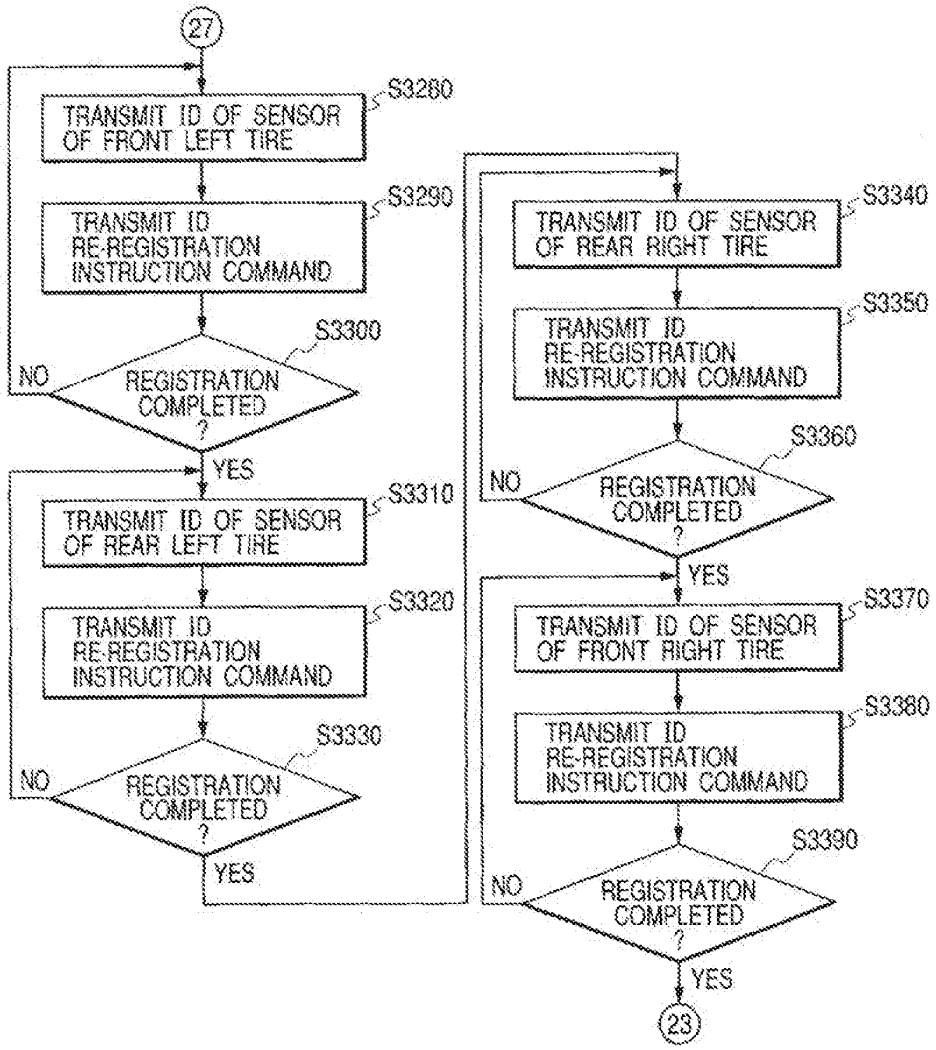
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FIG. 24



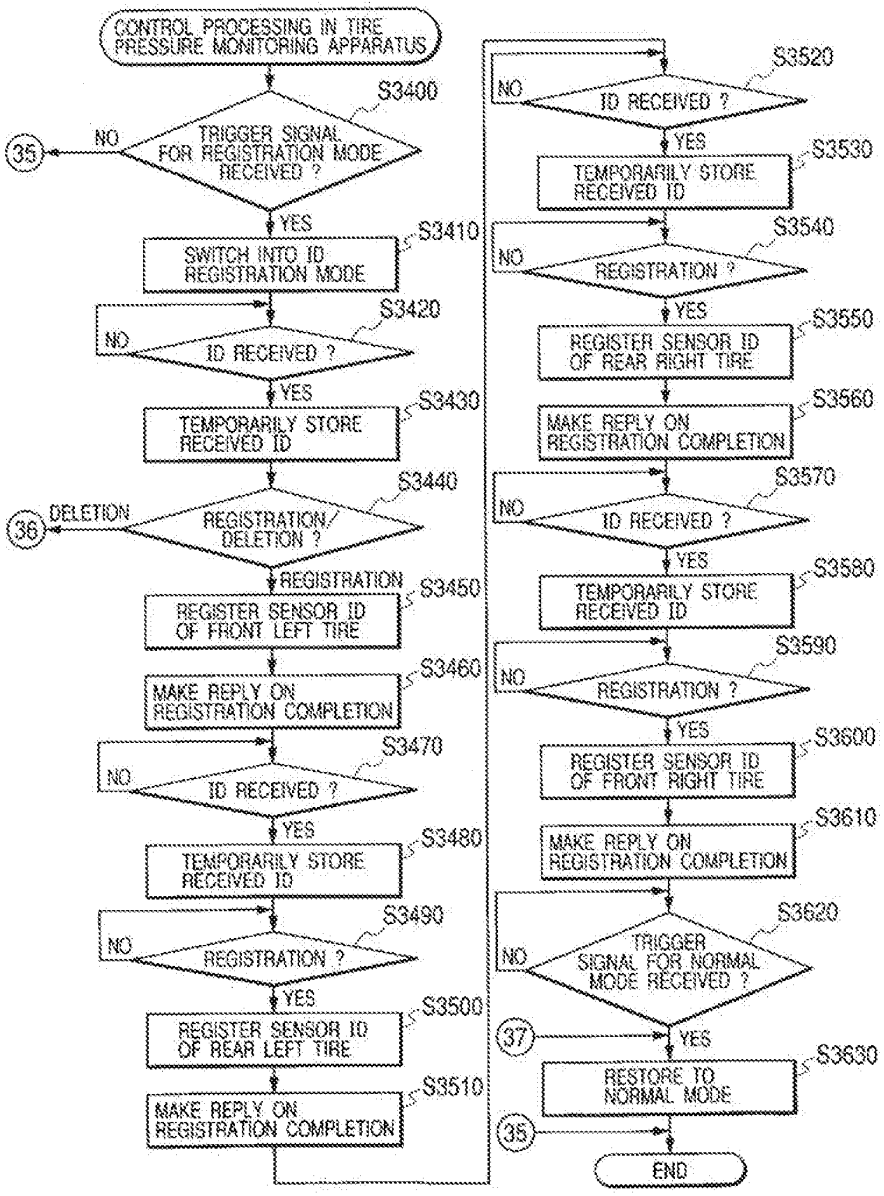
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FIG. 25



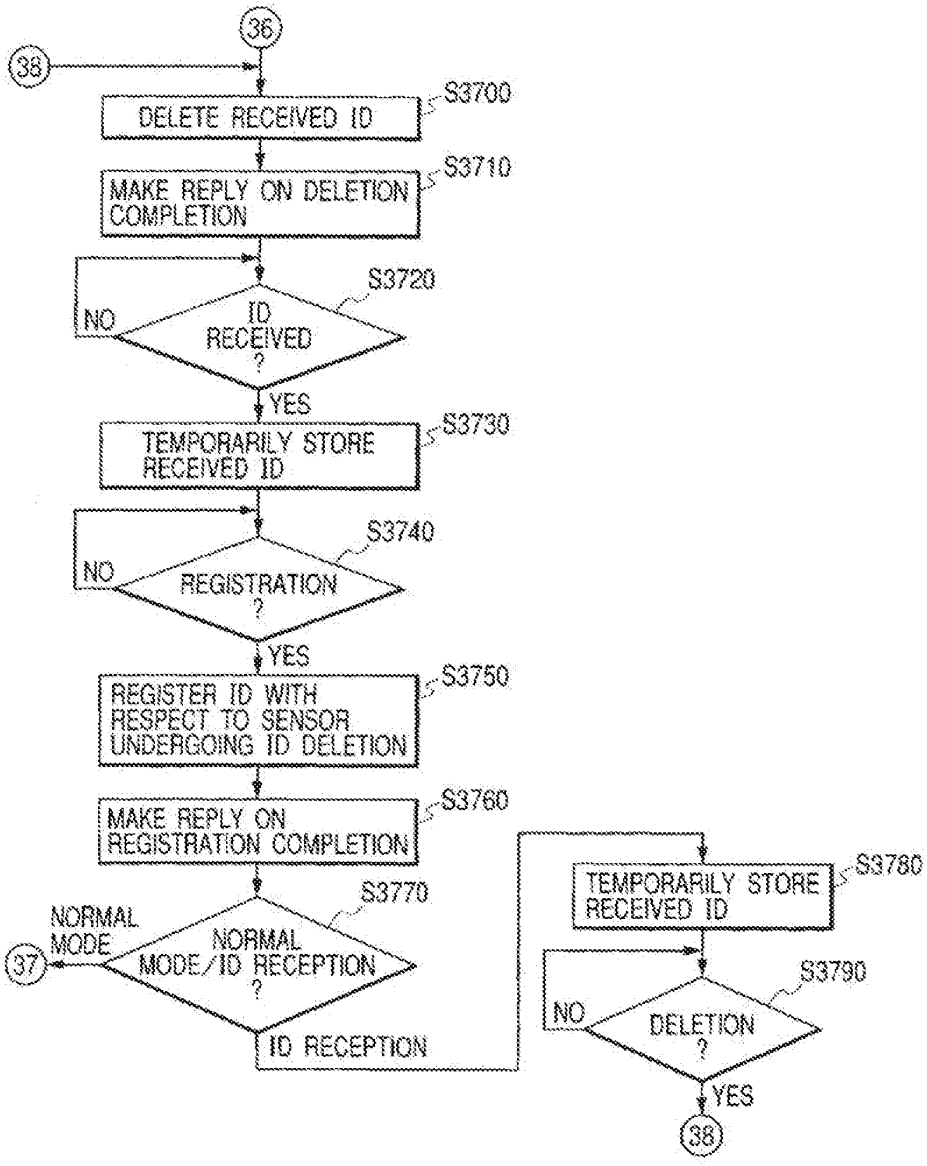
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FIG. 26



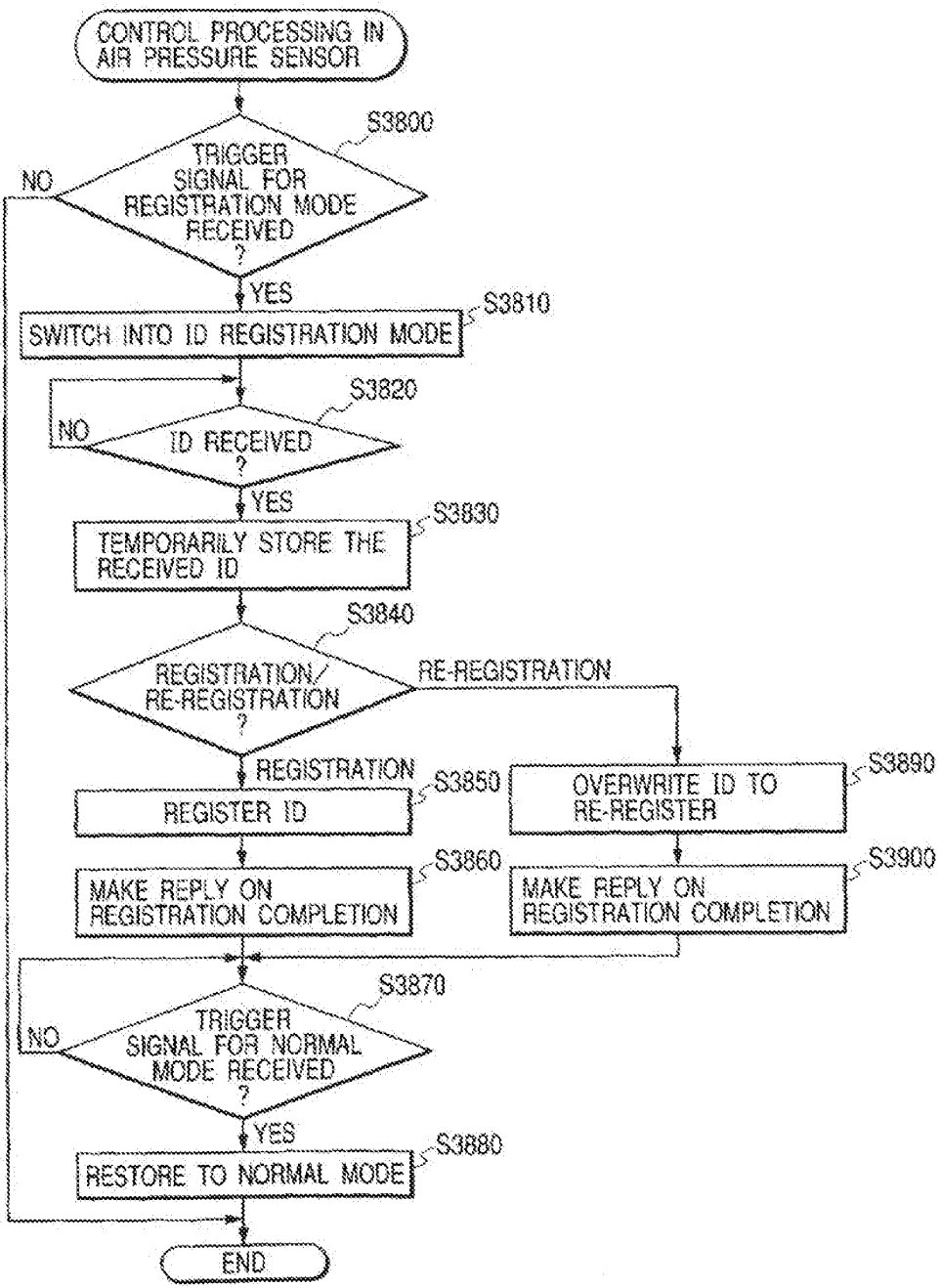
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FIG. 27



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FIG. 28



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FIG. 29A

DATA CODE

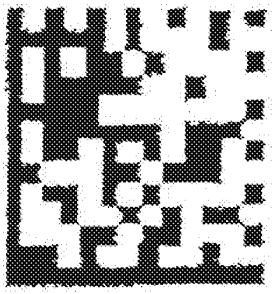


FIG. 29B

QR CODE

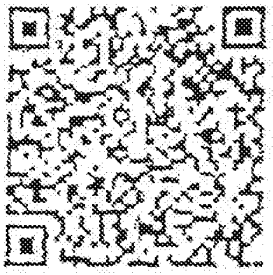


FIG. 29C

MAXI CODE

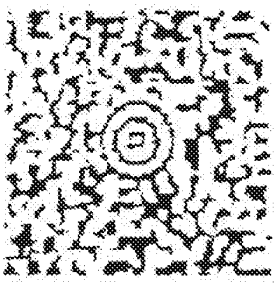
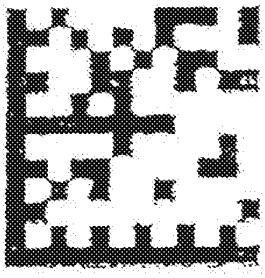


FIG. 29D

CP CODE



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FIG. 30A

EXAMPLE OF TWO-DIMENSIONAL BAR CODE

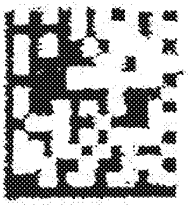
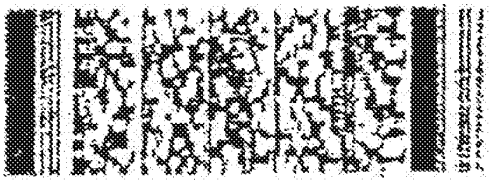


FIG. 30B

EXAMPLE OF TWO-DIMENSIONAL BAR CODE



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FIG. 31A

PDF 417

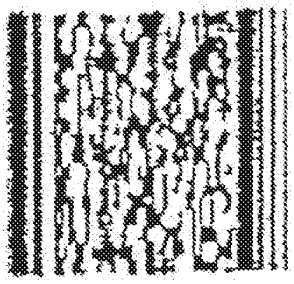


FIG. 31B

CODE 49

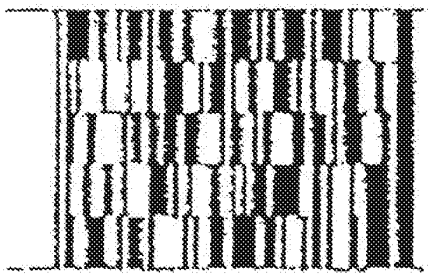


FIG. 31C

CODE 16K

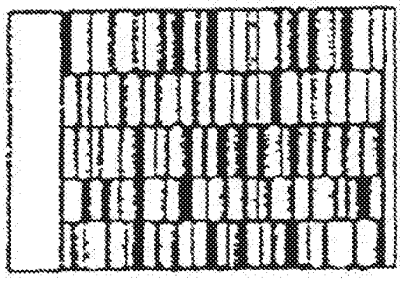
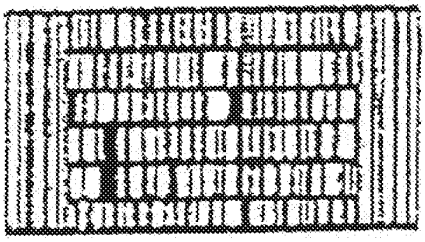


FIG. 31D

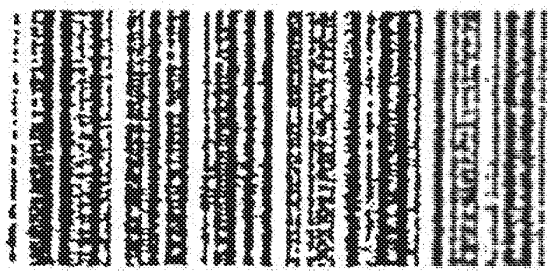
CODER BLOCK



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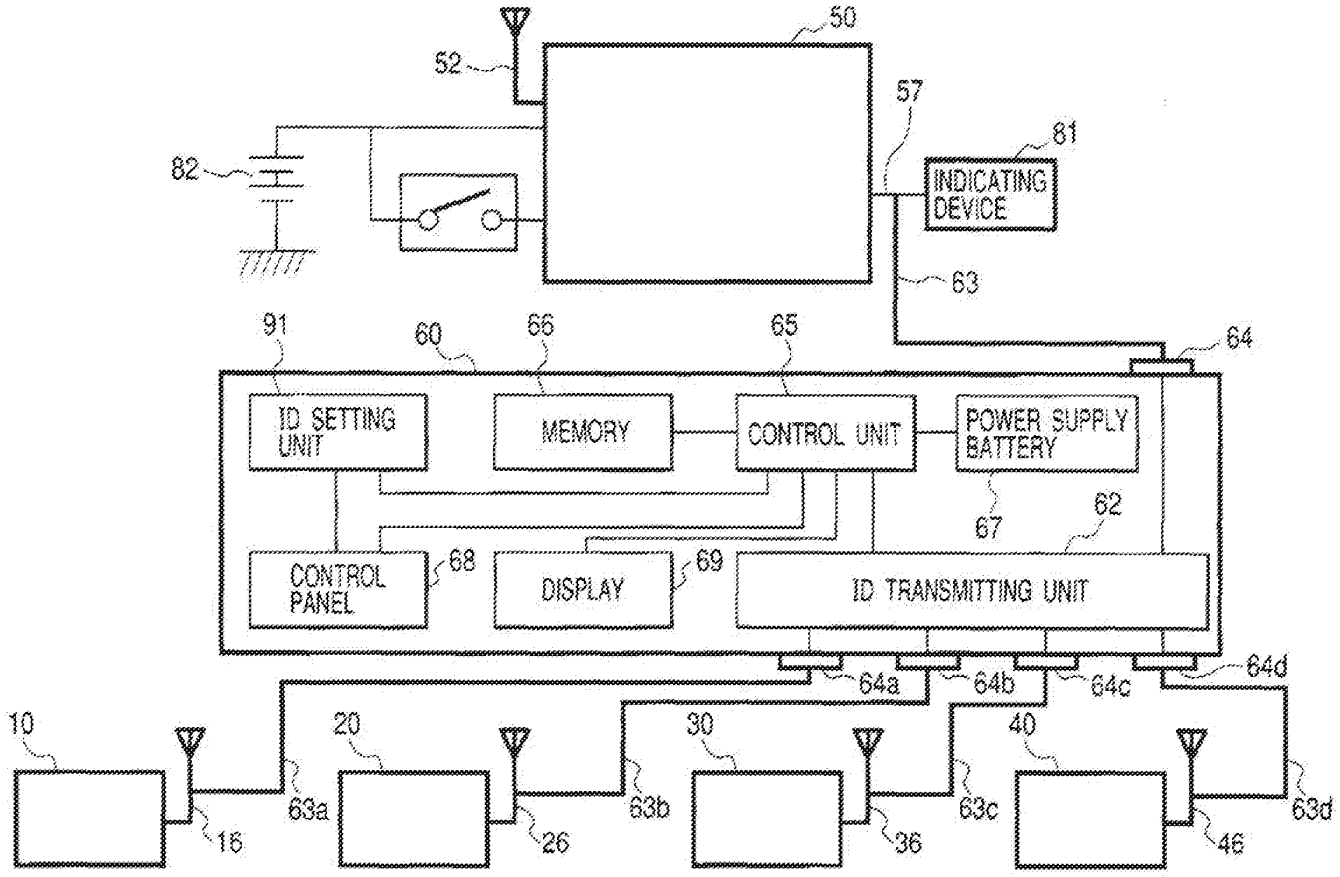
FIG. 32

EXAMPLE OF ONE-DIMENSIONAL BAR CODE



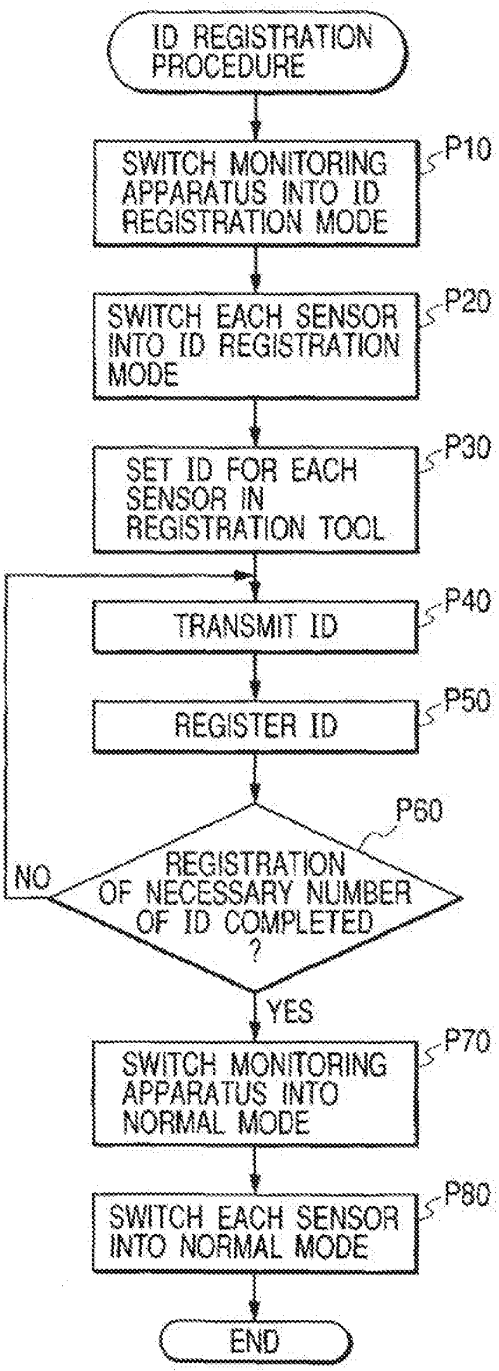
Orange Exhibit No. 2004
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FIG. 33



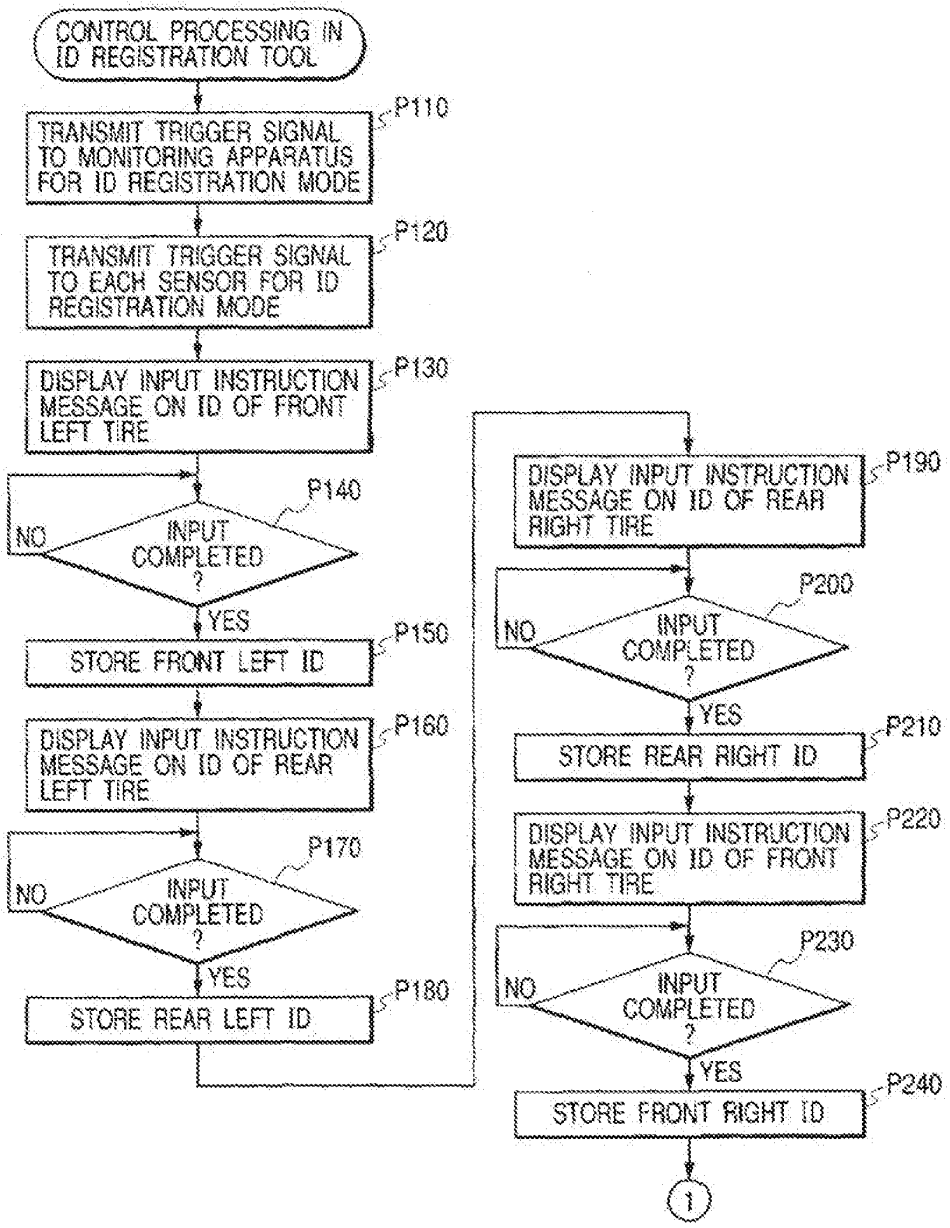
Orange Exhibit No. 2004
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FIG. 34



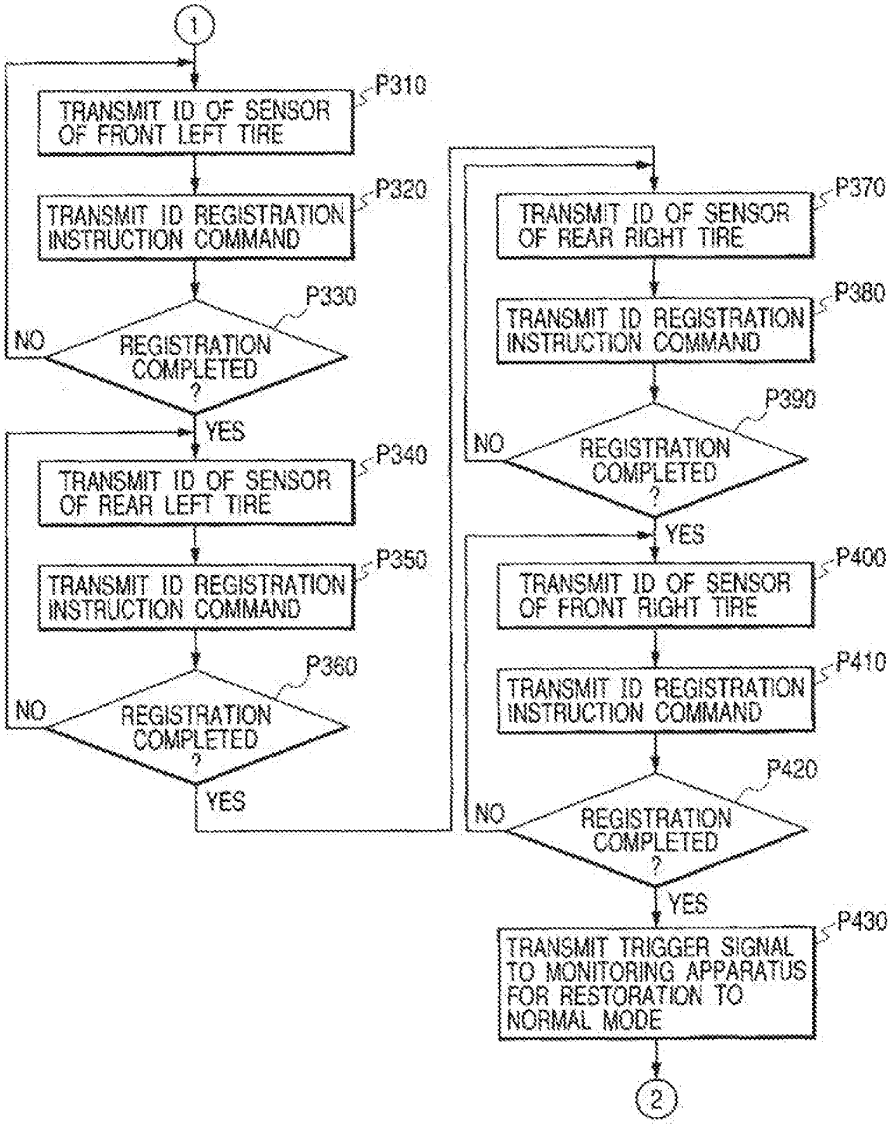
Orange Exhibit No. 2004
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FIG. 35



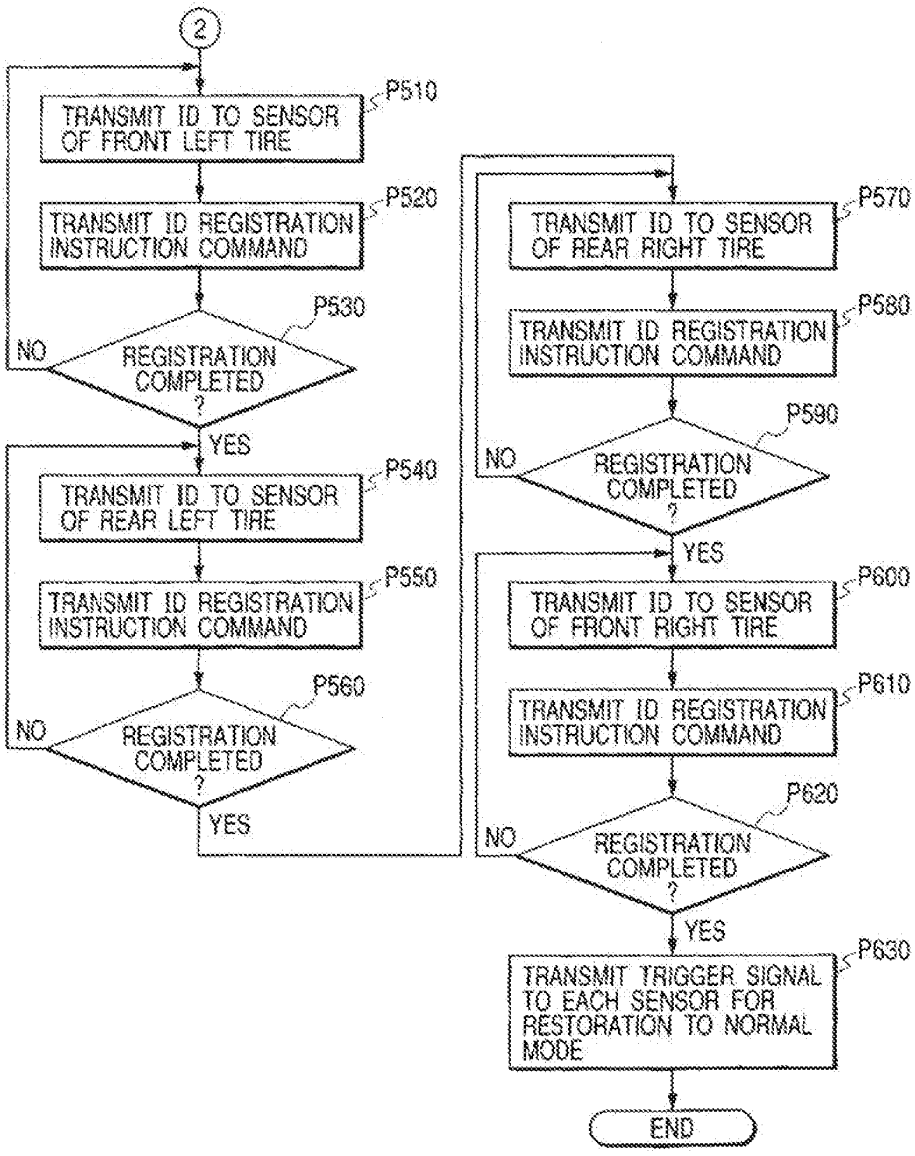
Orange Exhibit No. 2004
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FIG. 36



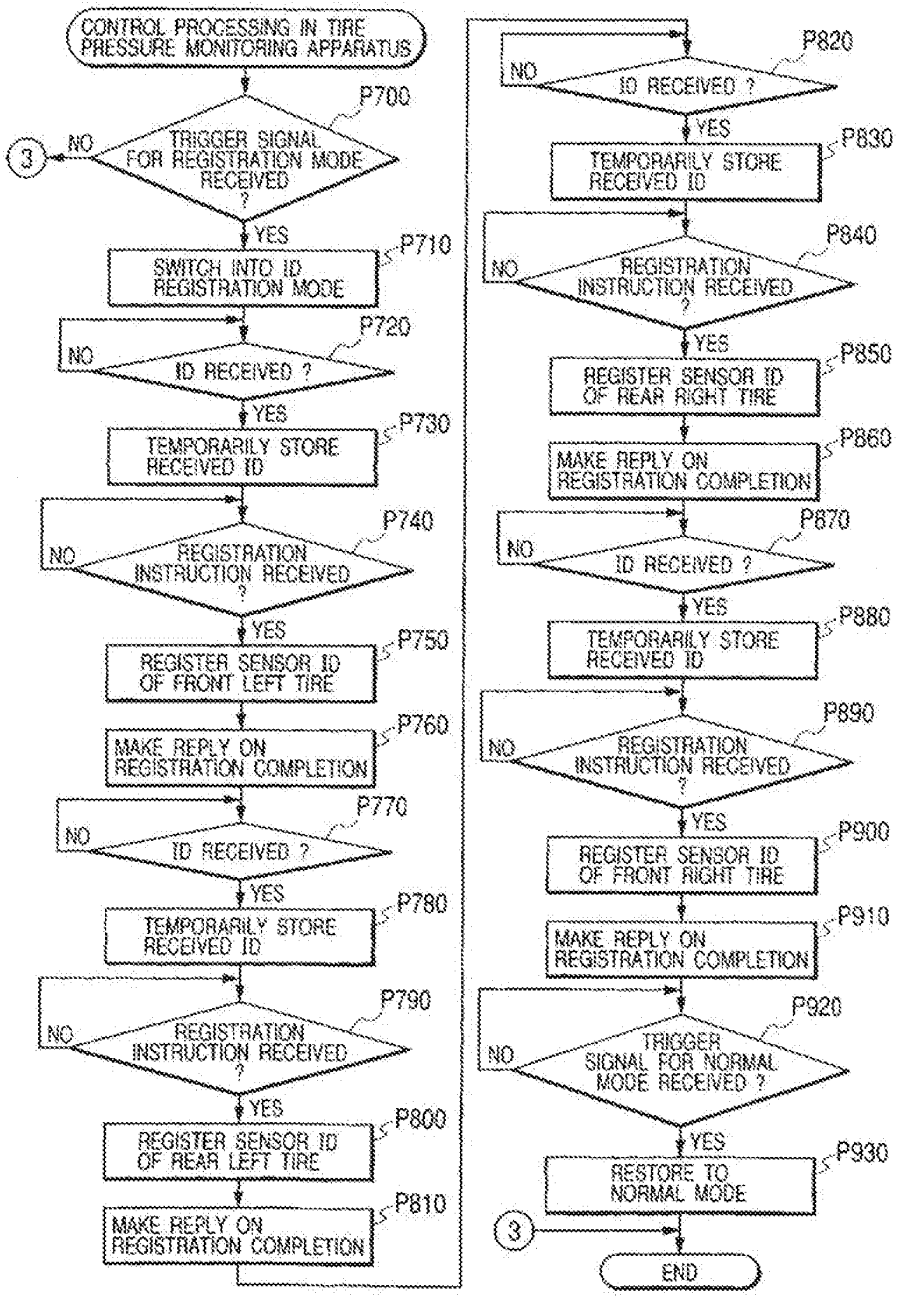
Orange Exhibit No. 2004
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FIG. 37



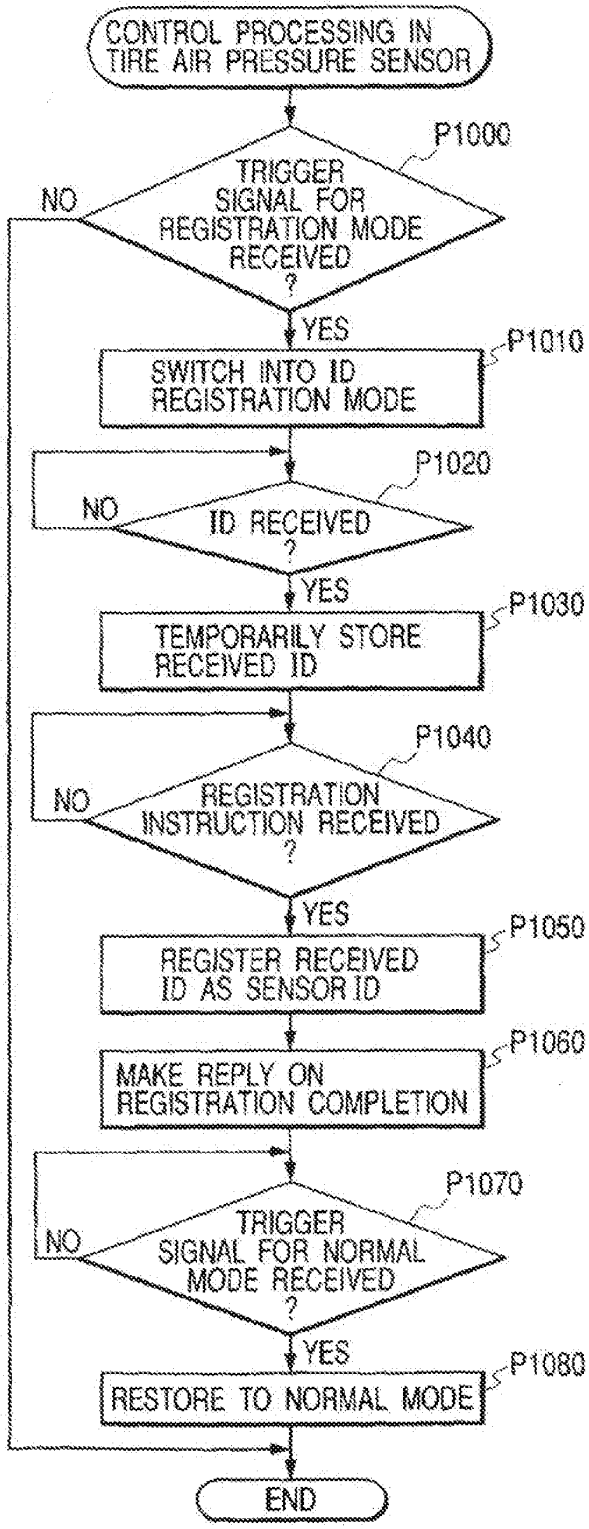
Orange Exhibit No. 2004
IPR2024-00744

FIG. 38



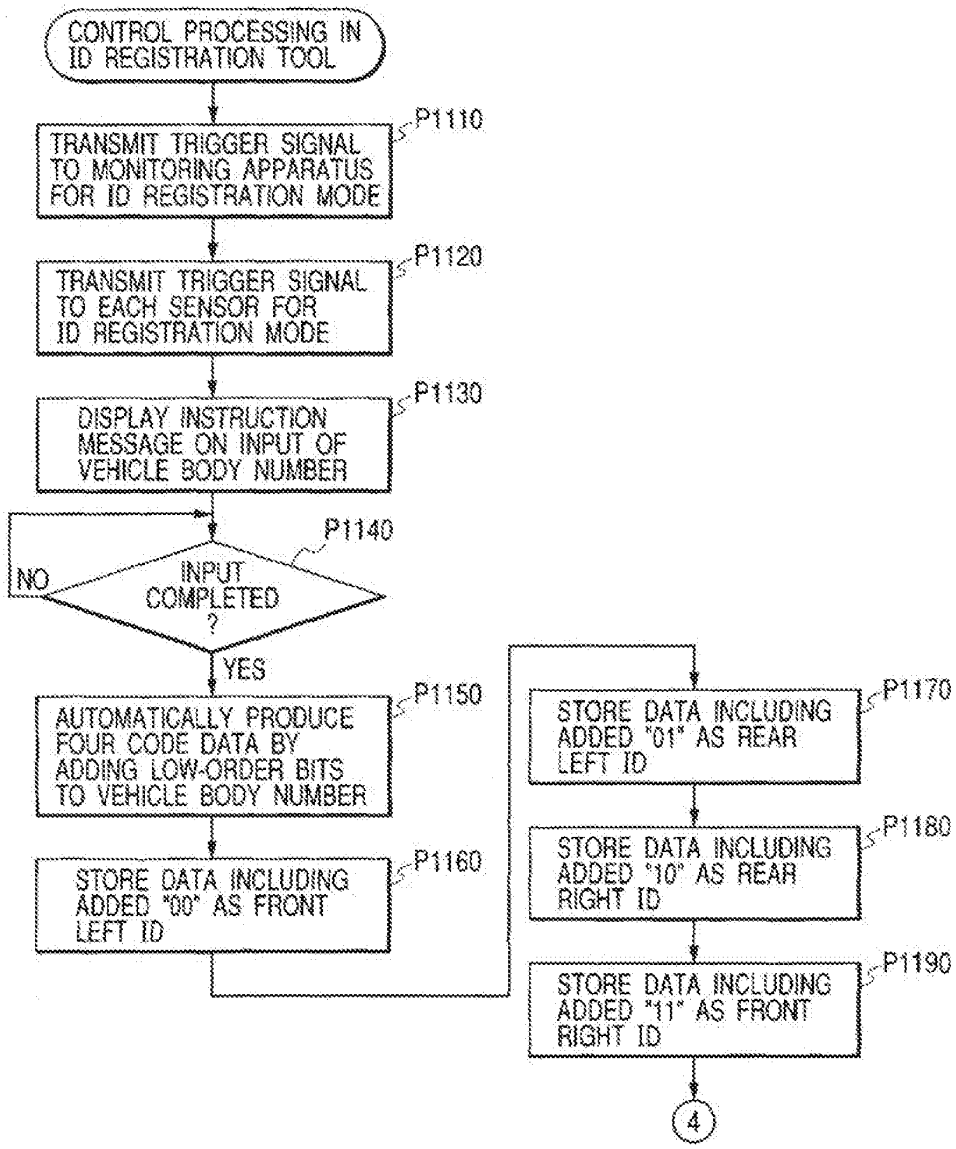
Orange Exhibit No. 2004
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FIG. 39



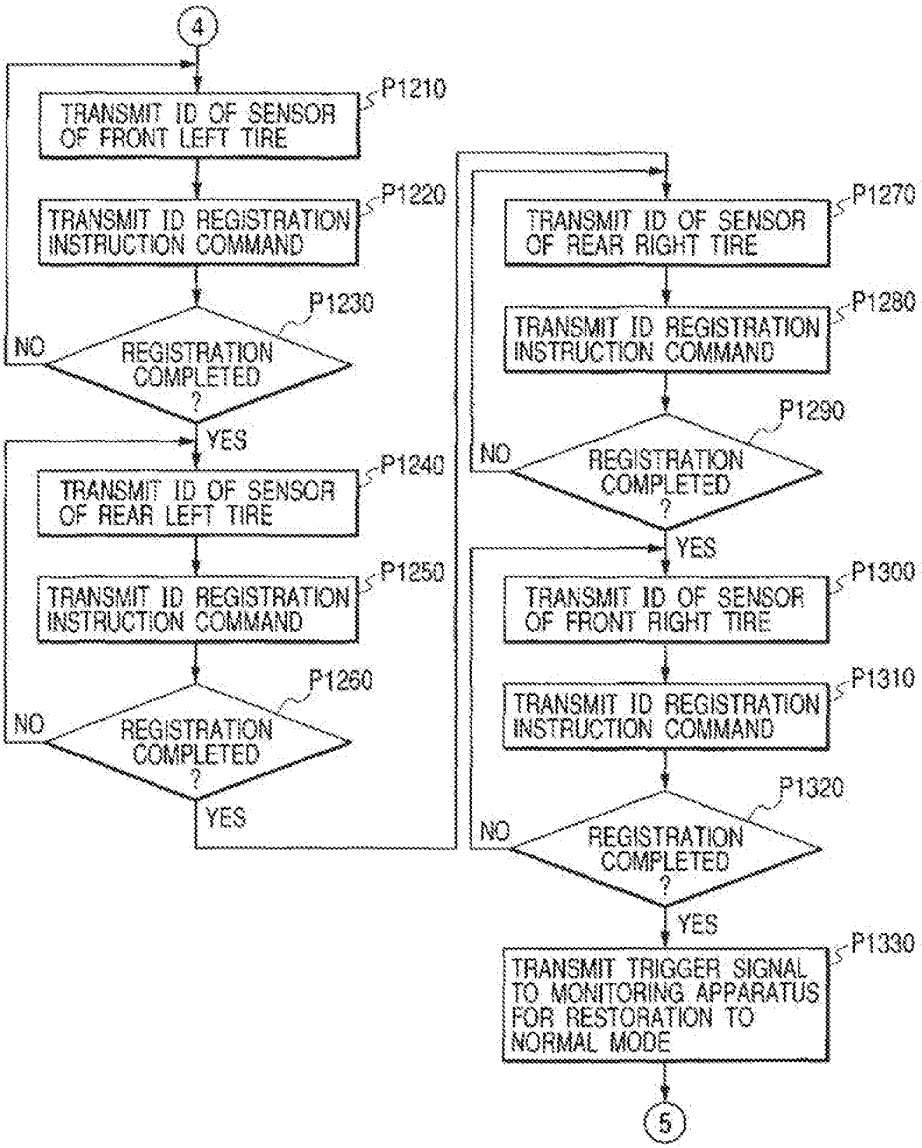
Orange Exhibit No. 2004
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FIG. 40



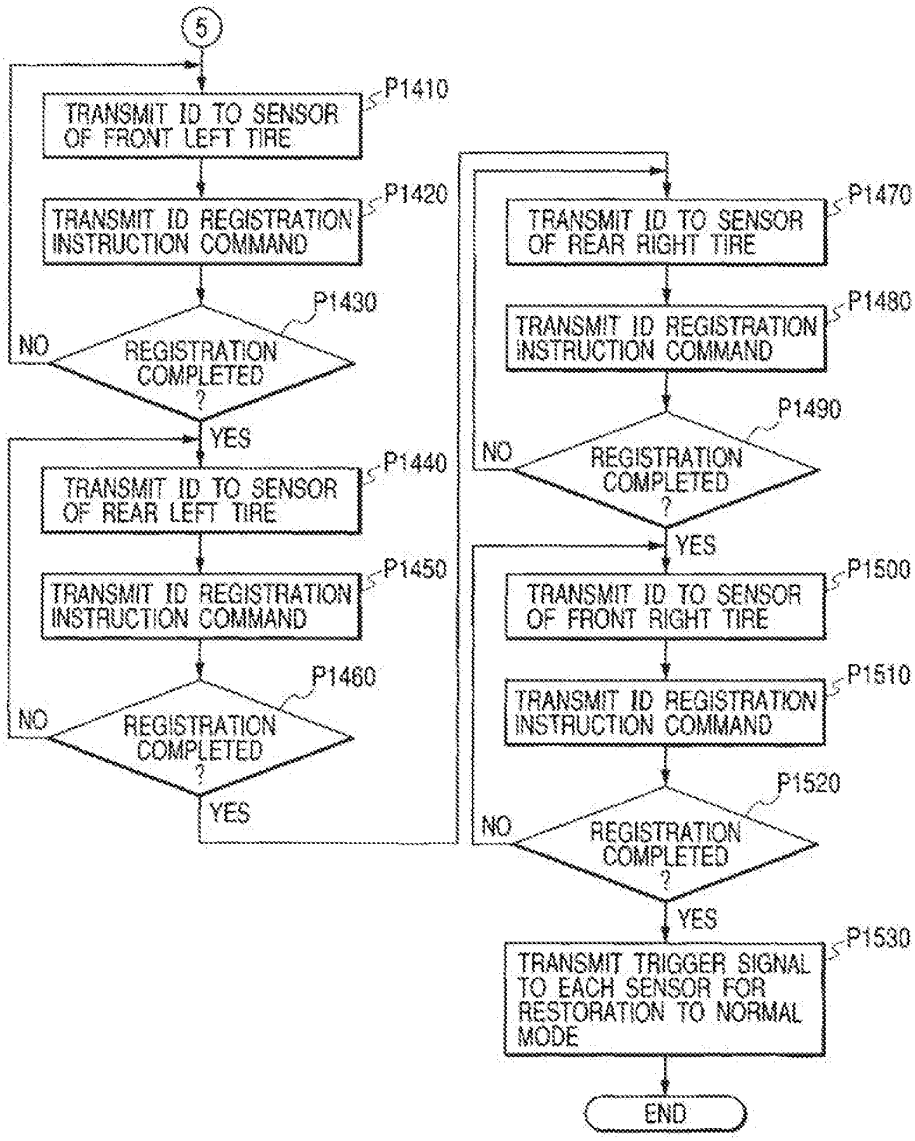
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FIG. 41



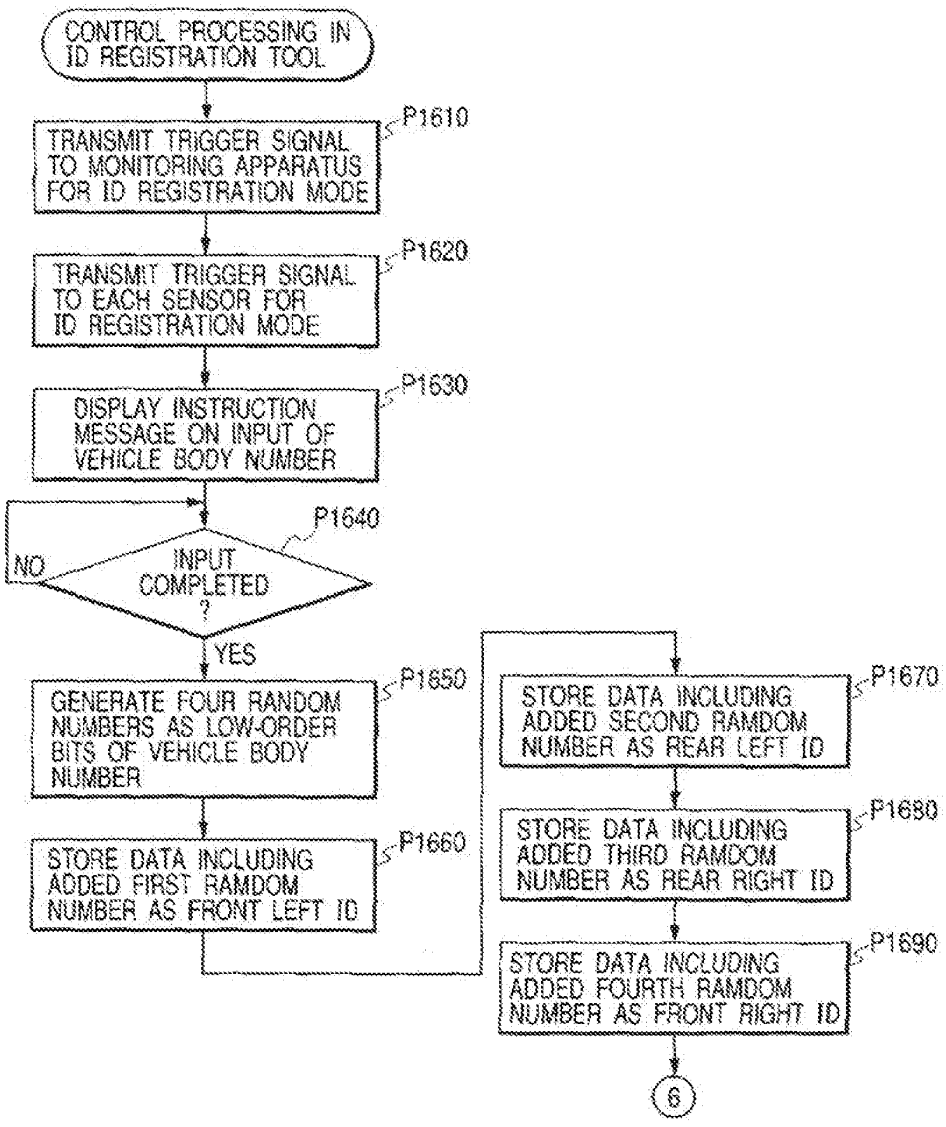
Orange Exhibit No. 2004
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FIG. 42



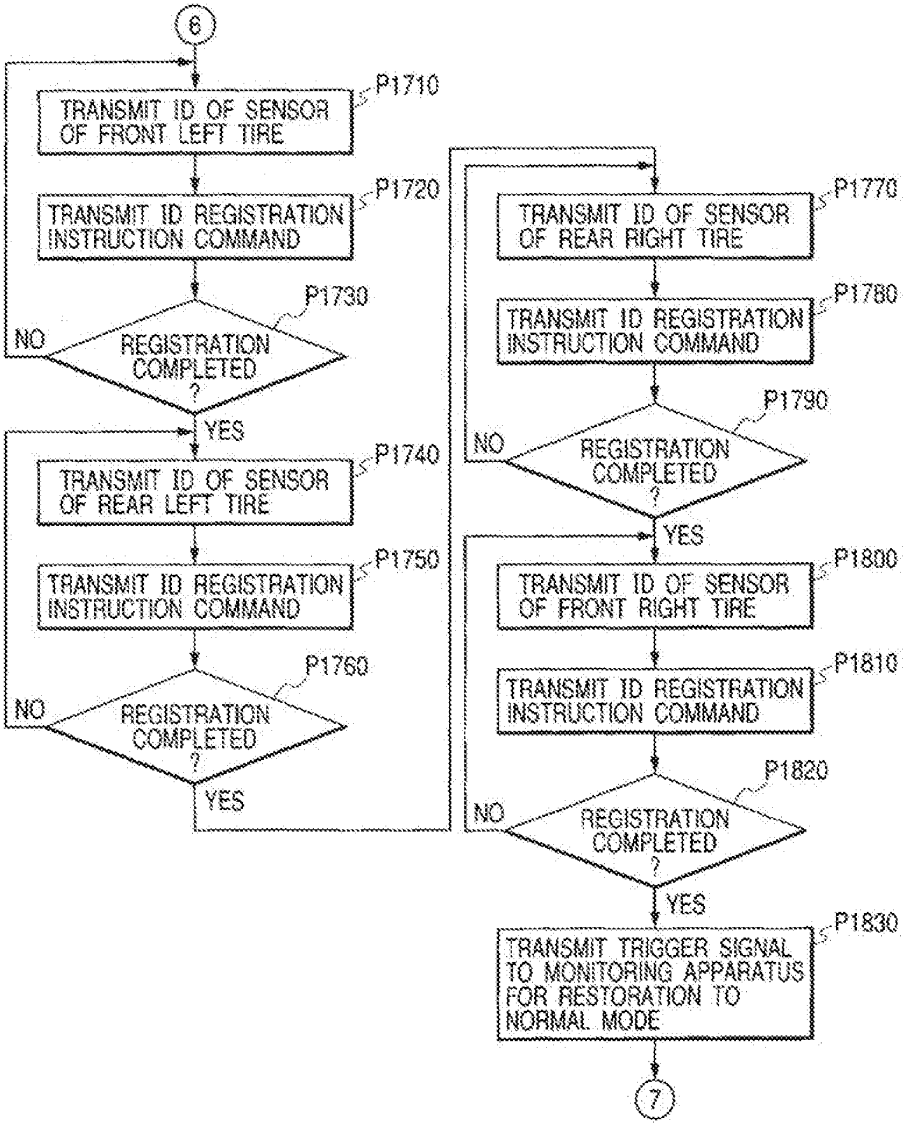
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FIG. 43



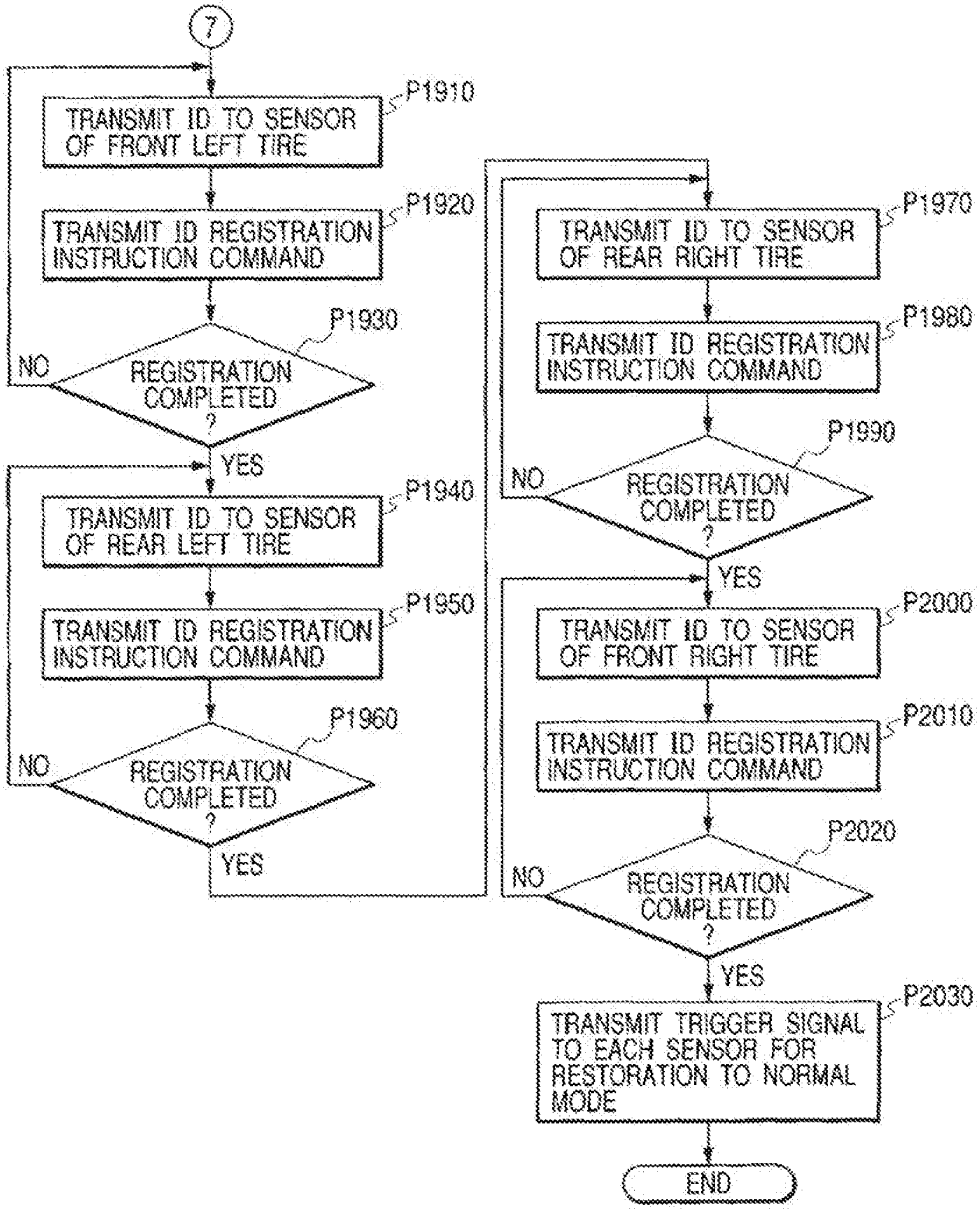
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FIG. 44



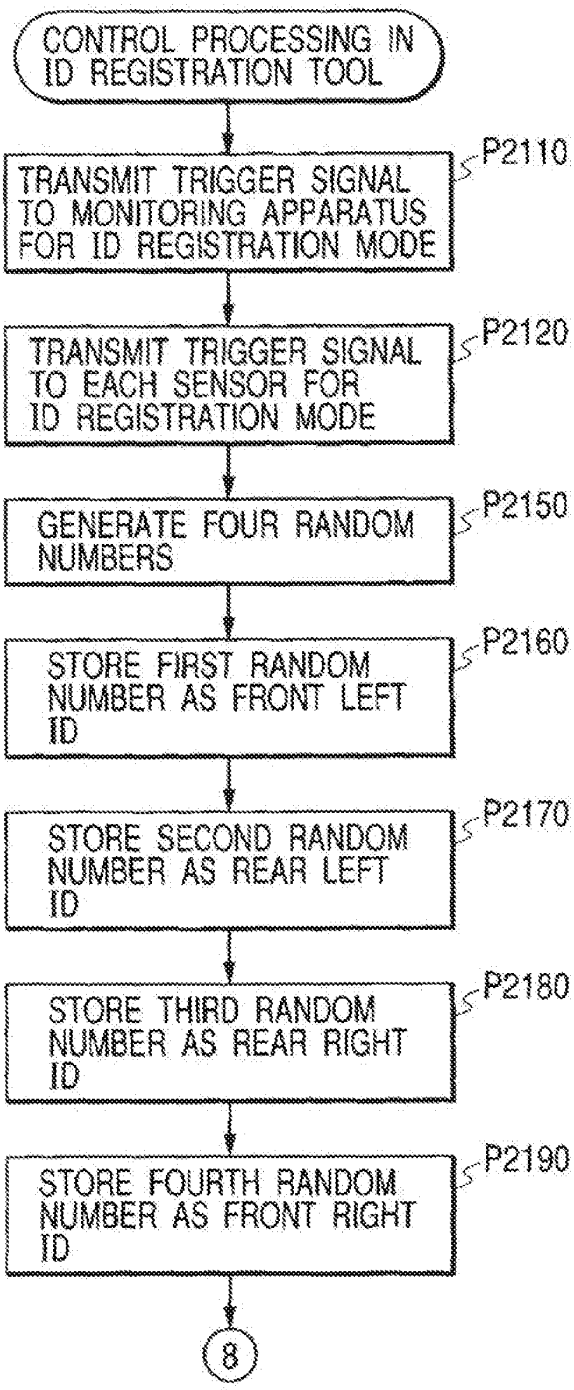
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FIG. 45



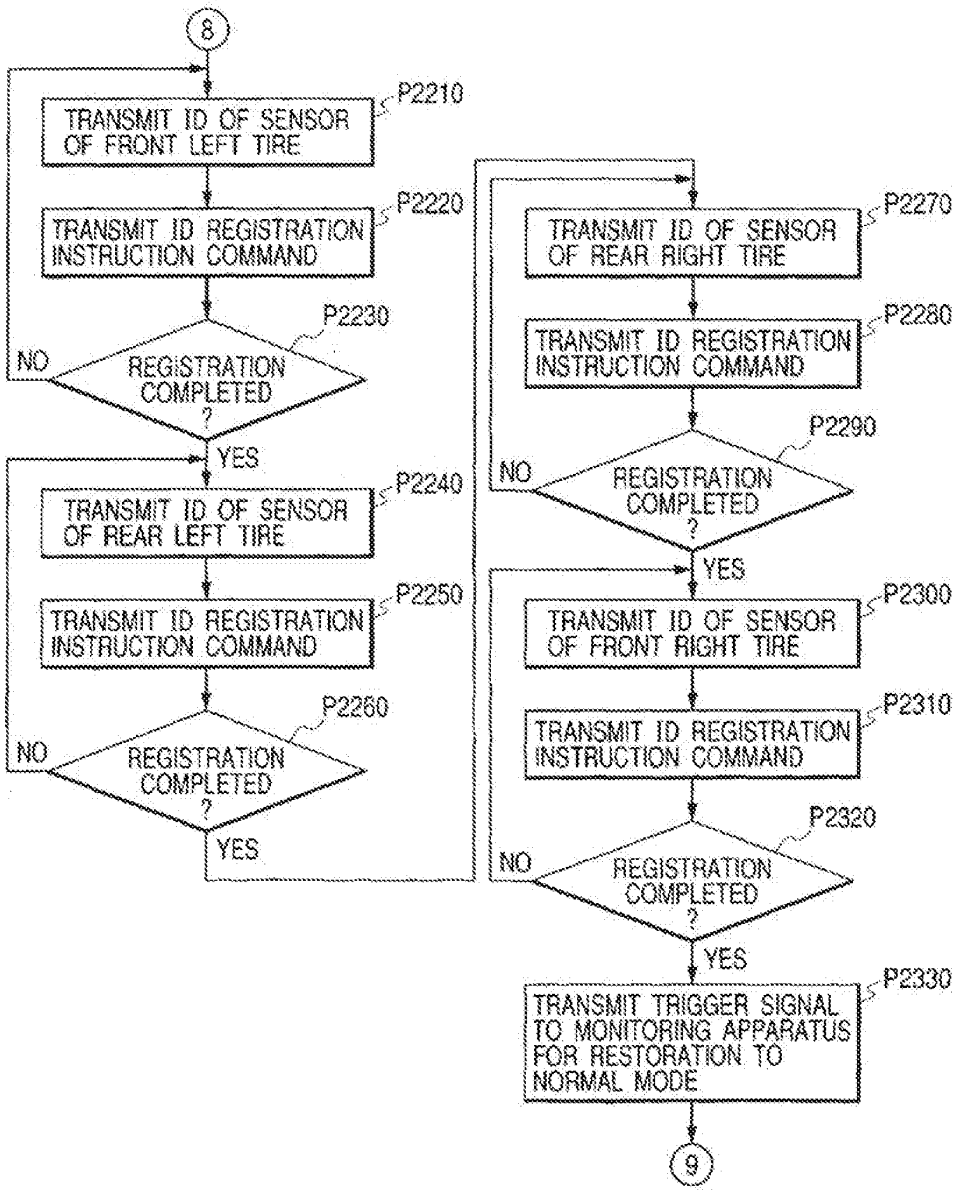
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FIG. 46



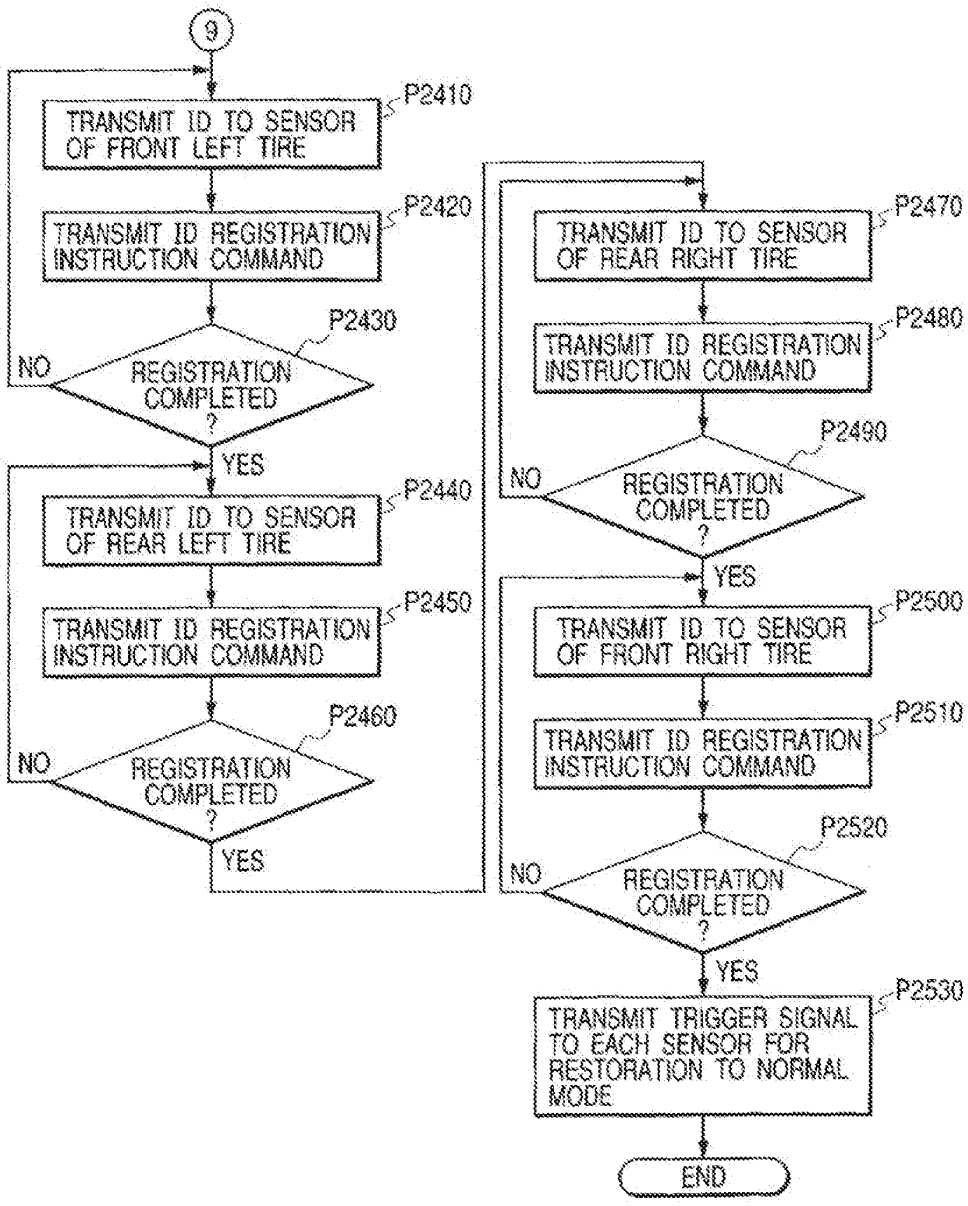
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FIG. 47



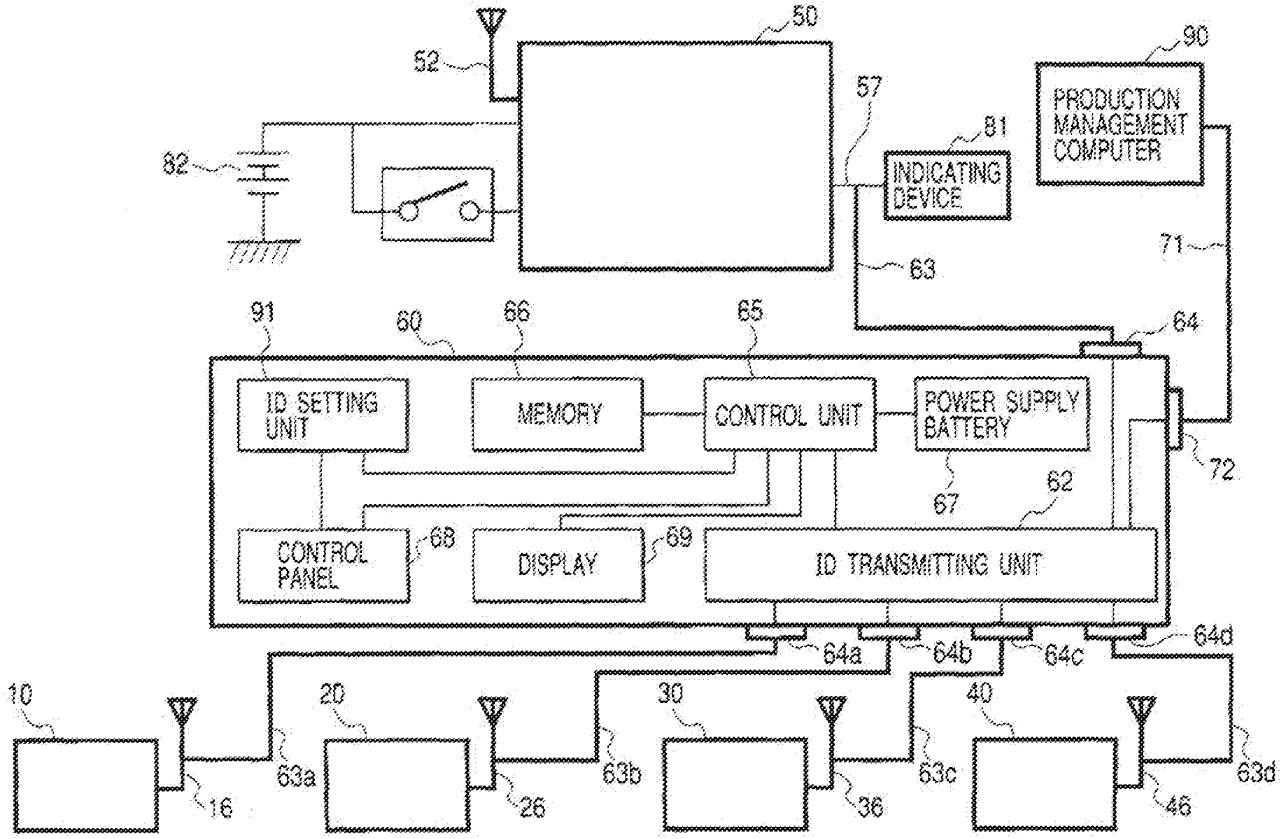
Orange Exhibit No. 2004
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FIG. 48



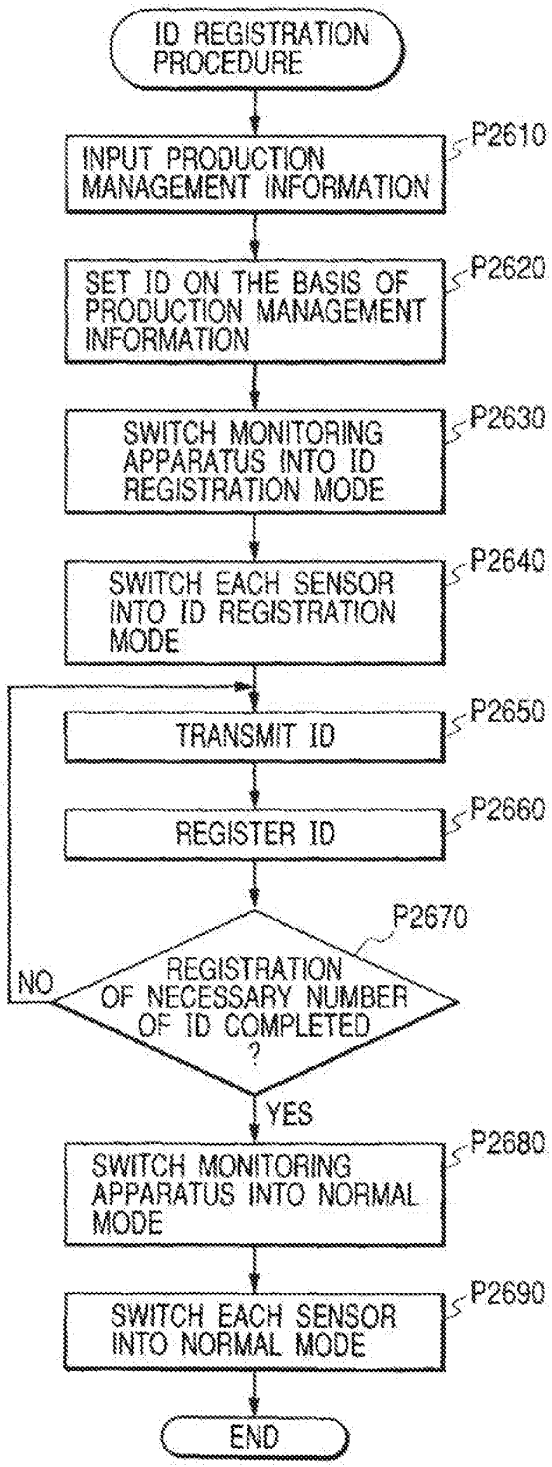
Orange Exhibit No. 2004
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FIG. 49



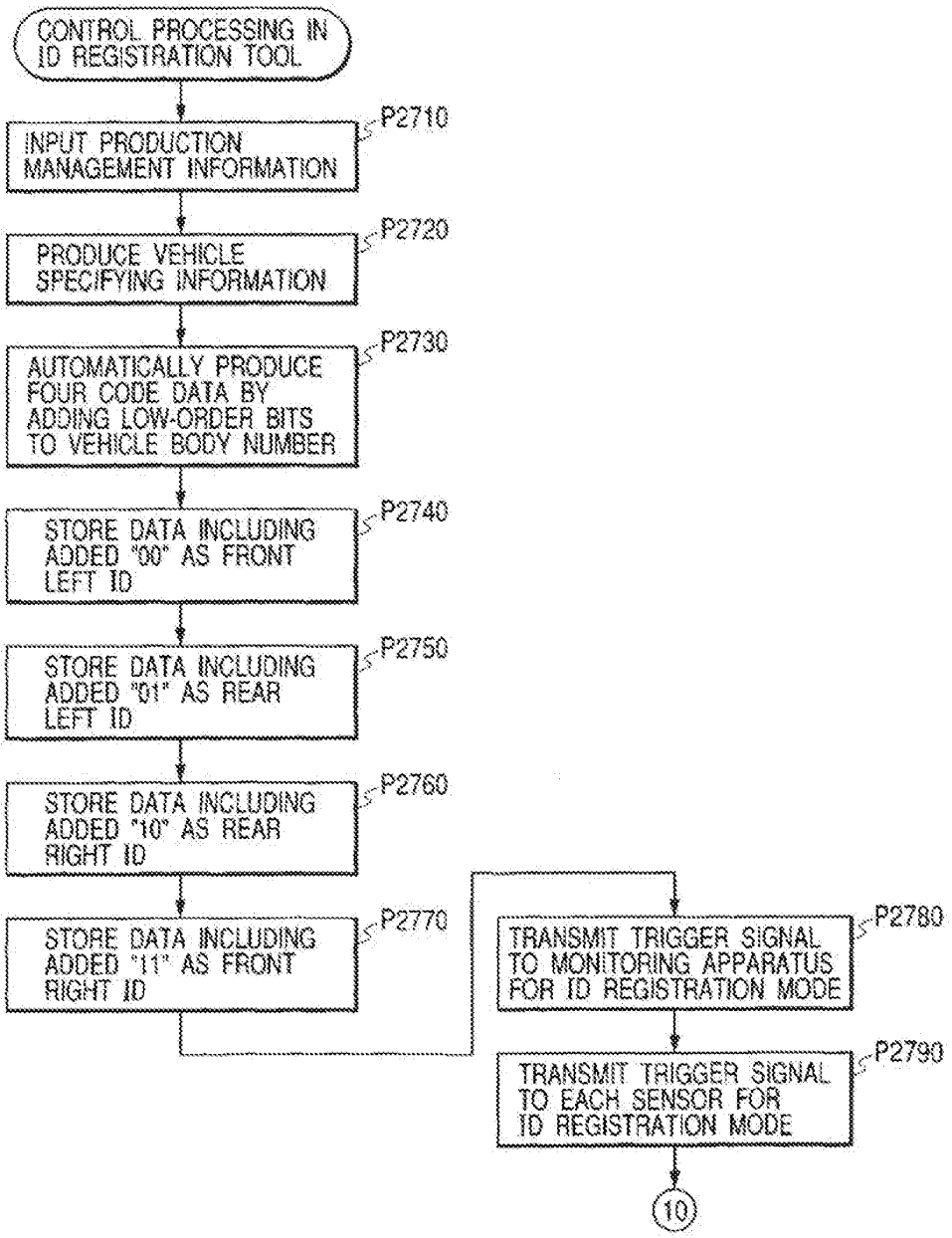
Orange Exhibit No. 2004
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FIG. 50



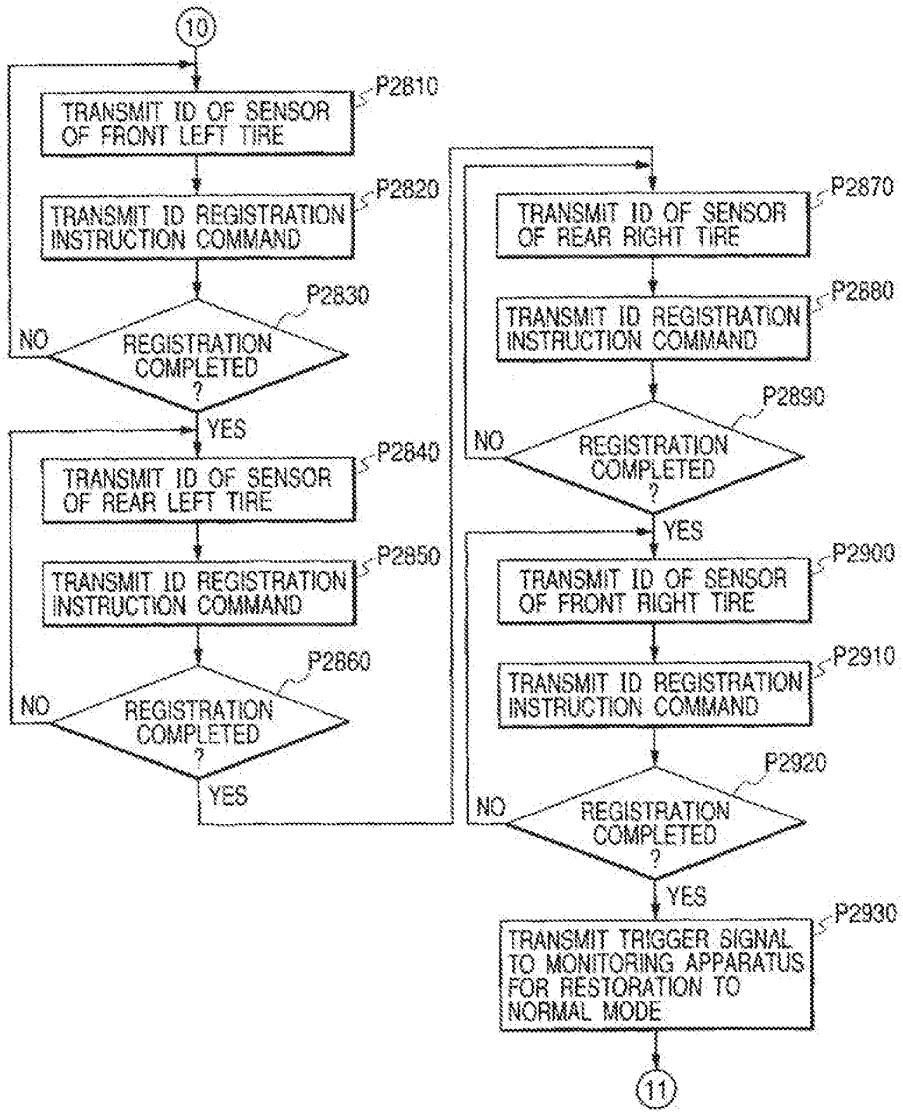
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FIG. 51



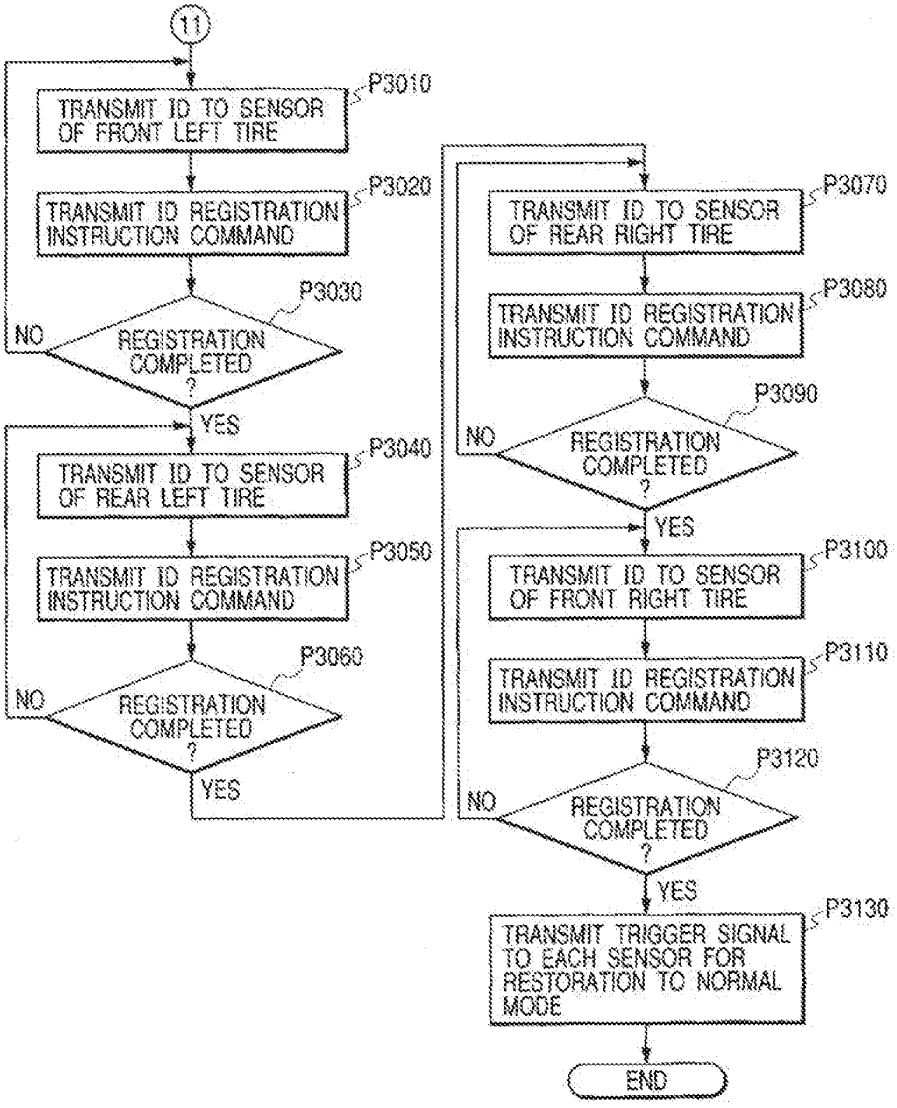
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FIG. 52



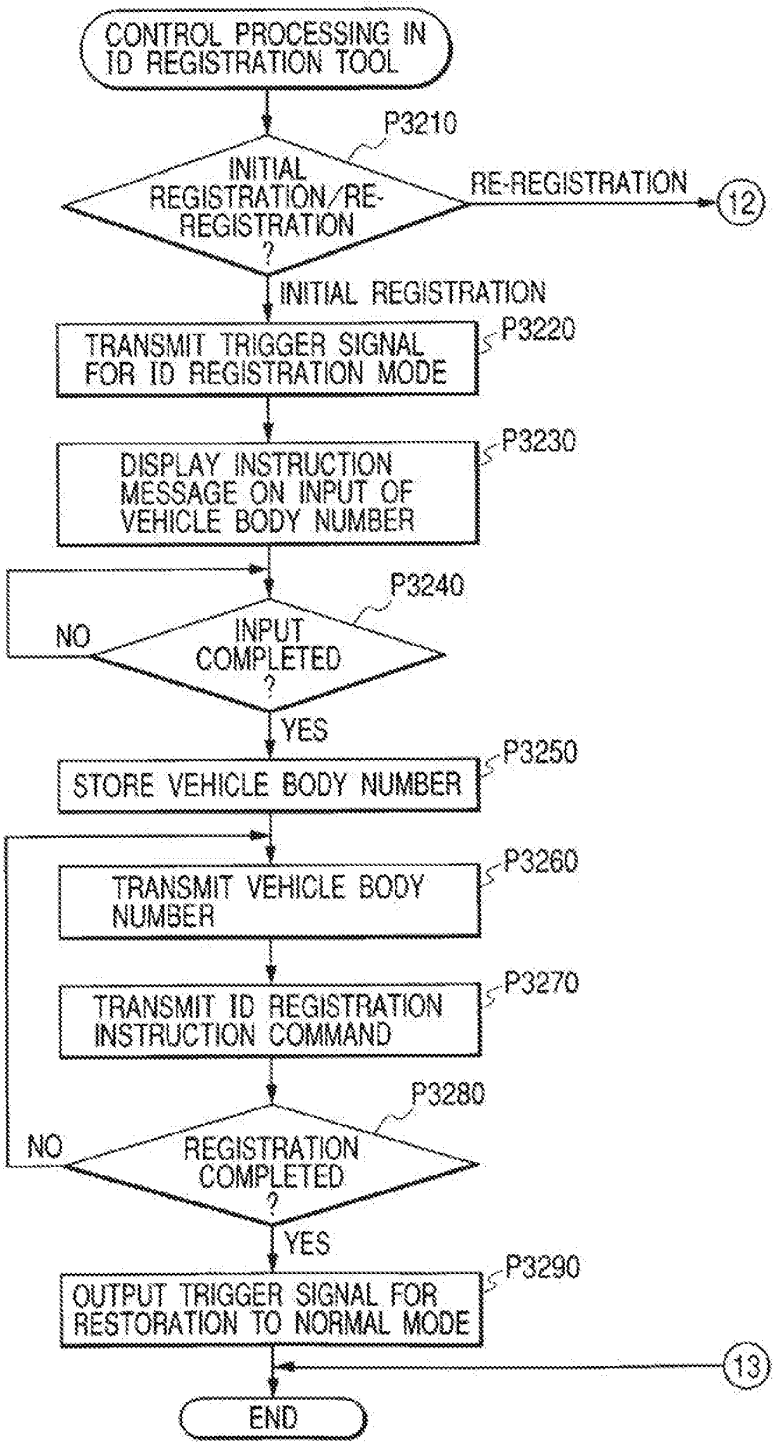
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FIG. 53



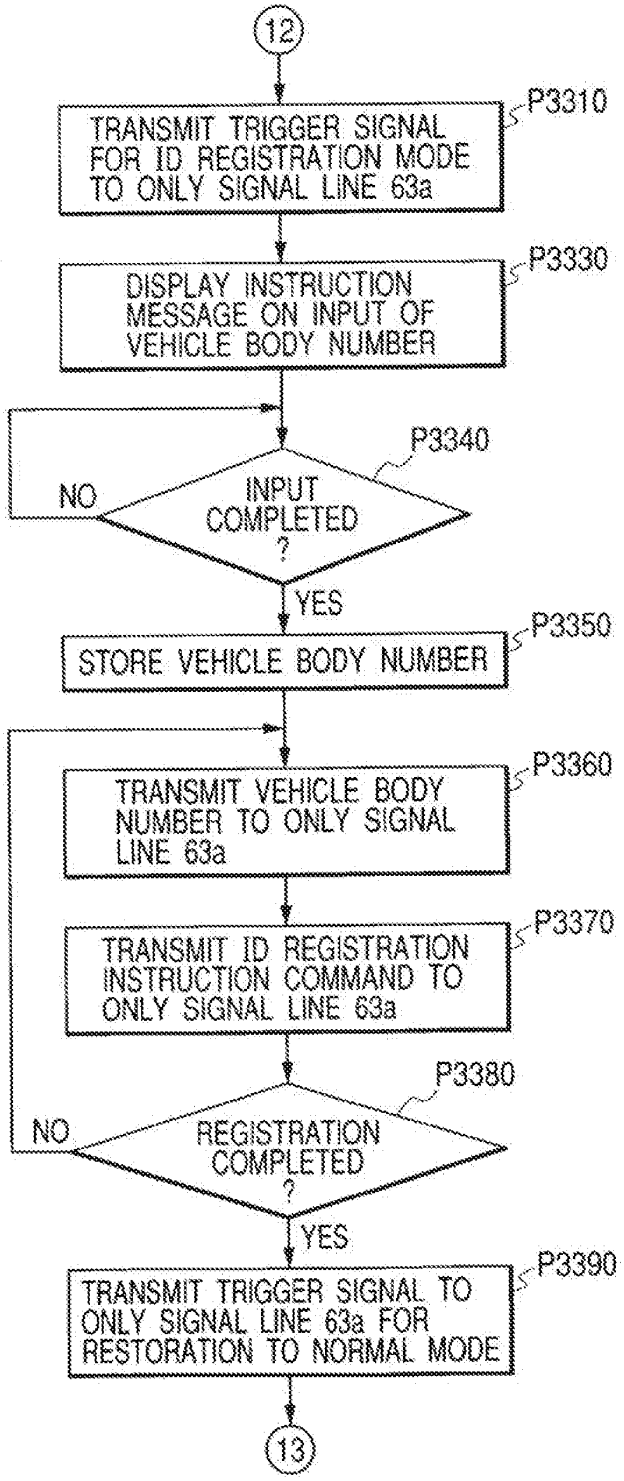
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FIG. 54



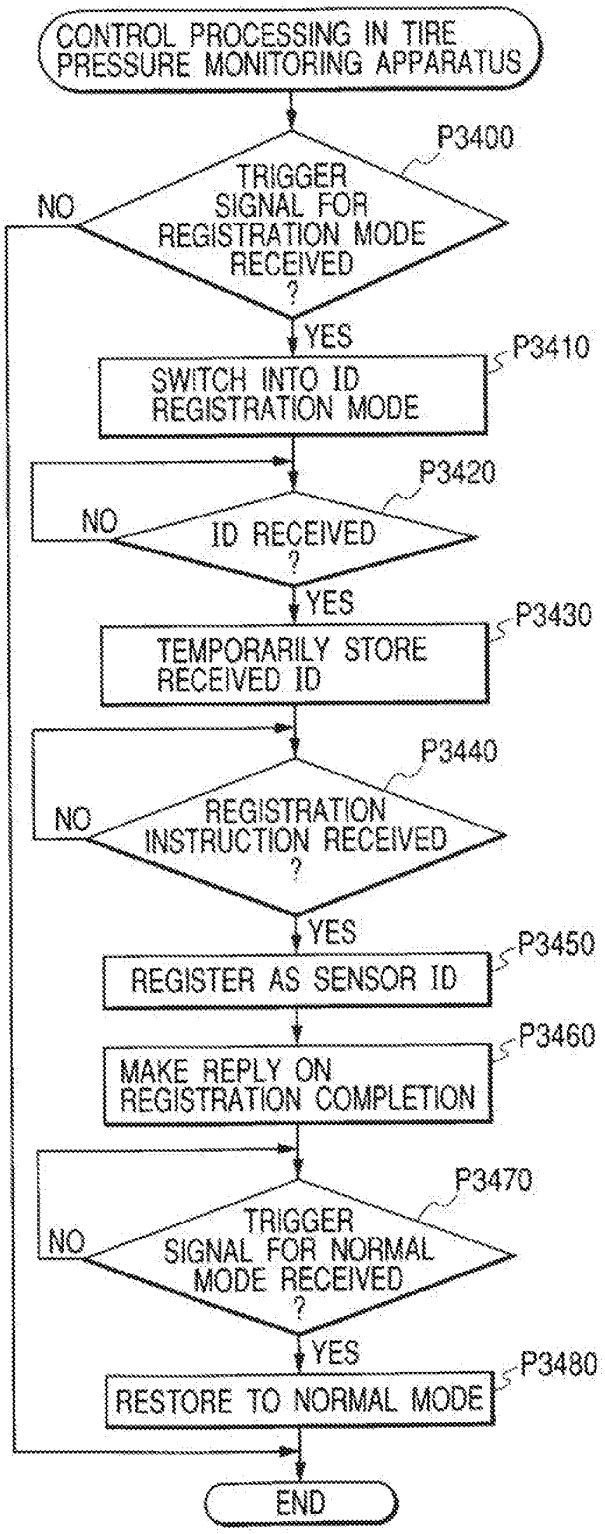
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IPR2024-00744

FIG. 55



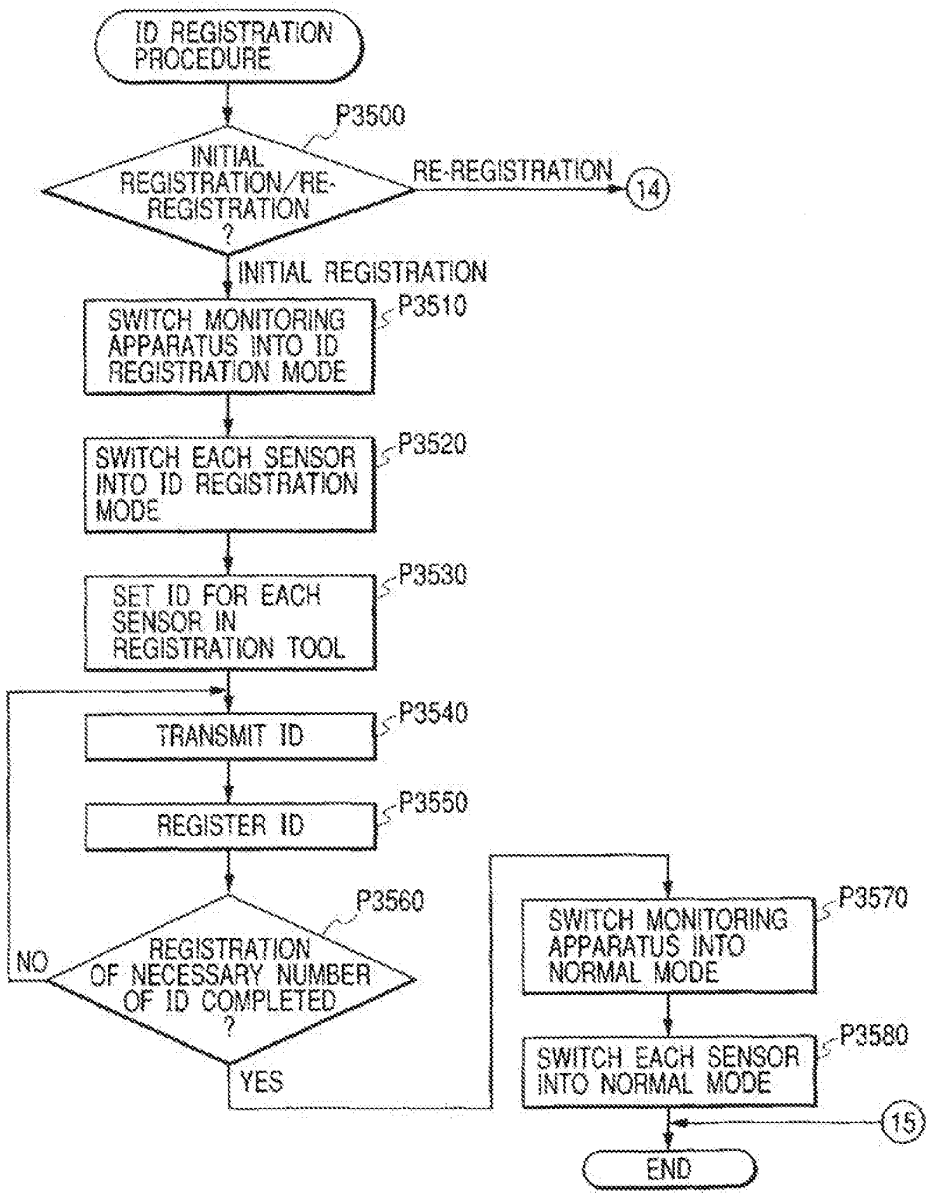
Orange Exhibit No. 2004
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FIG. 56



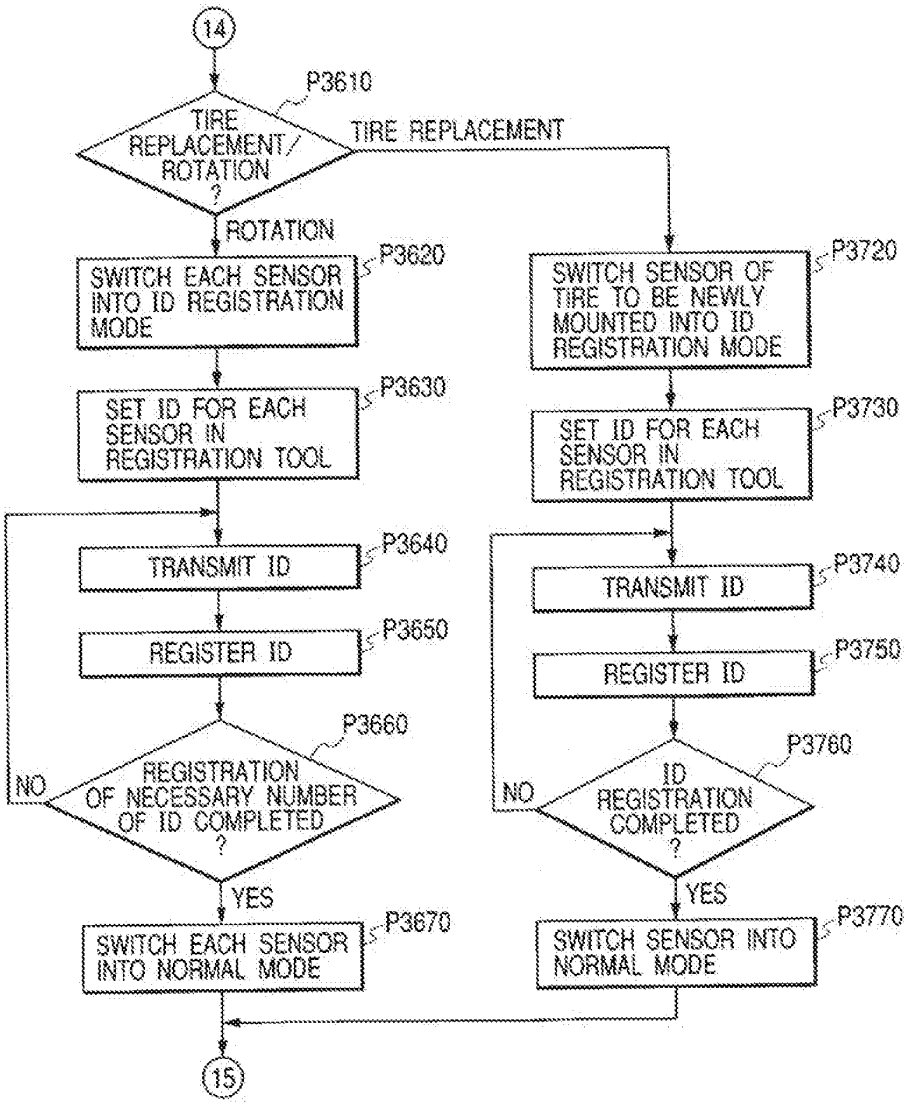
Orange Exhibit No. 2004
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FIG. 57



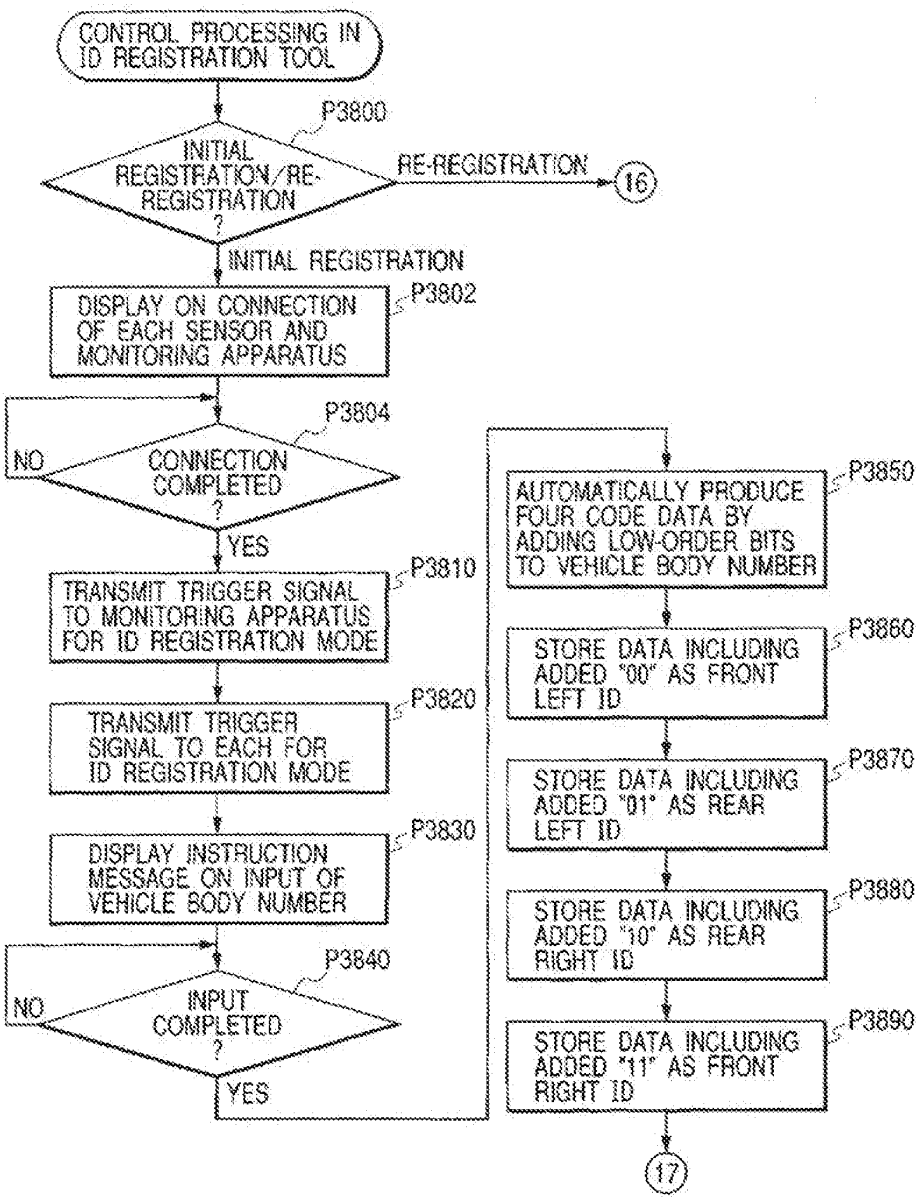
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FIG. 58



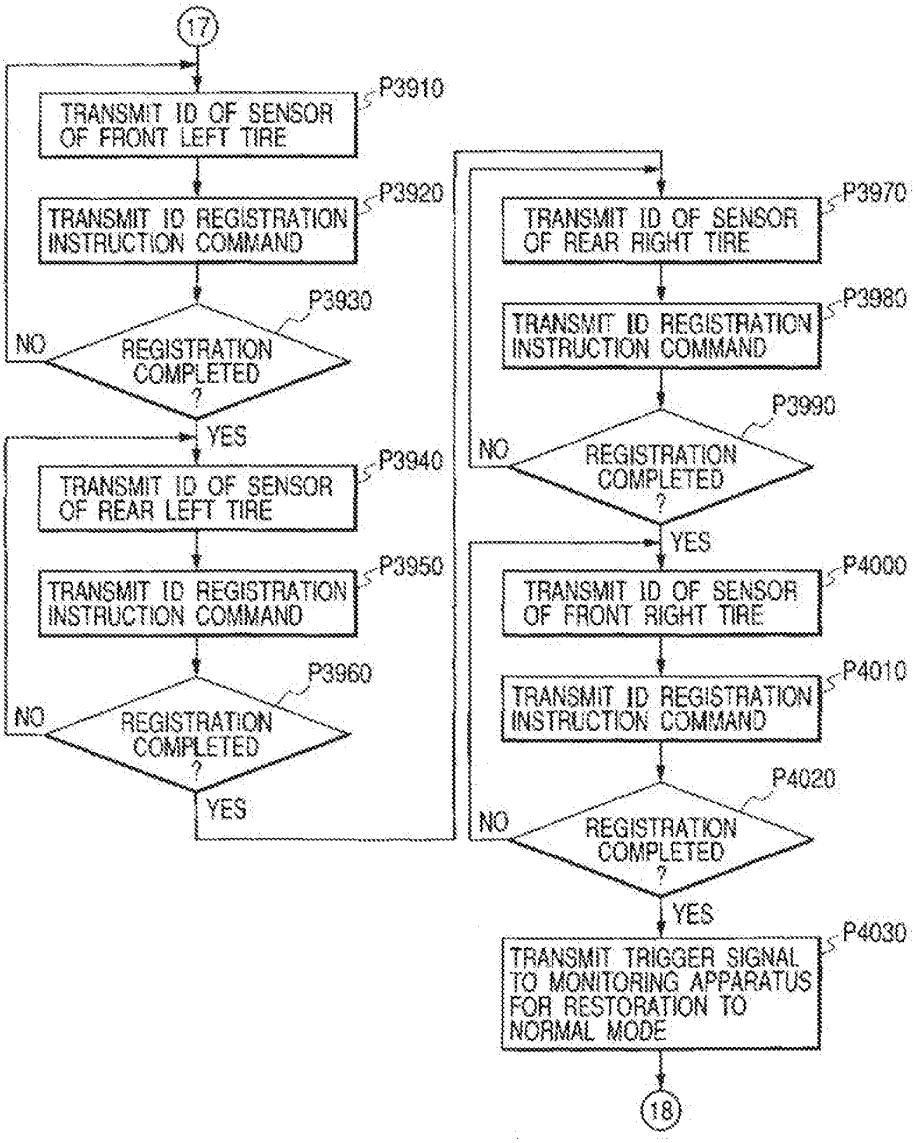
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FIG. 59



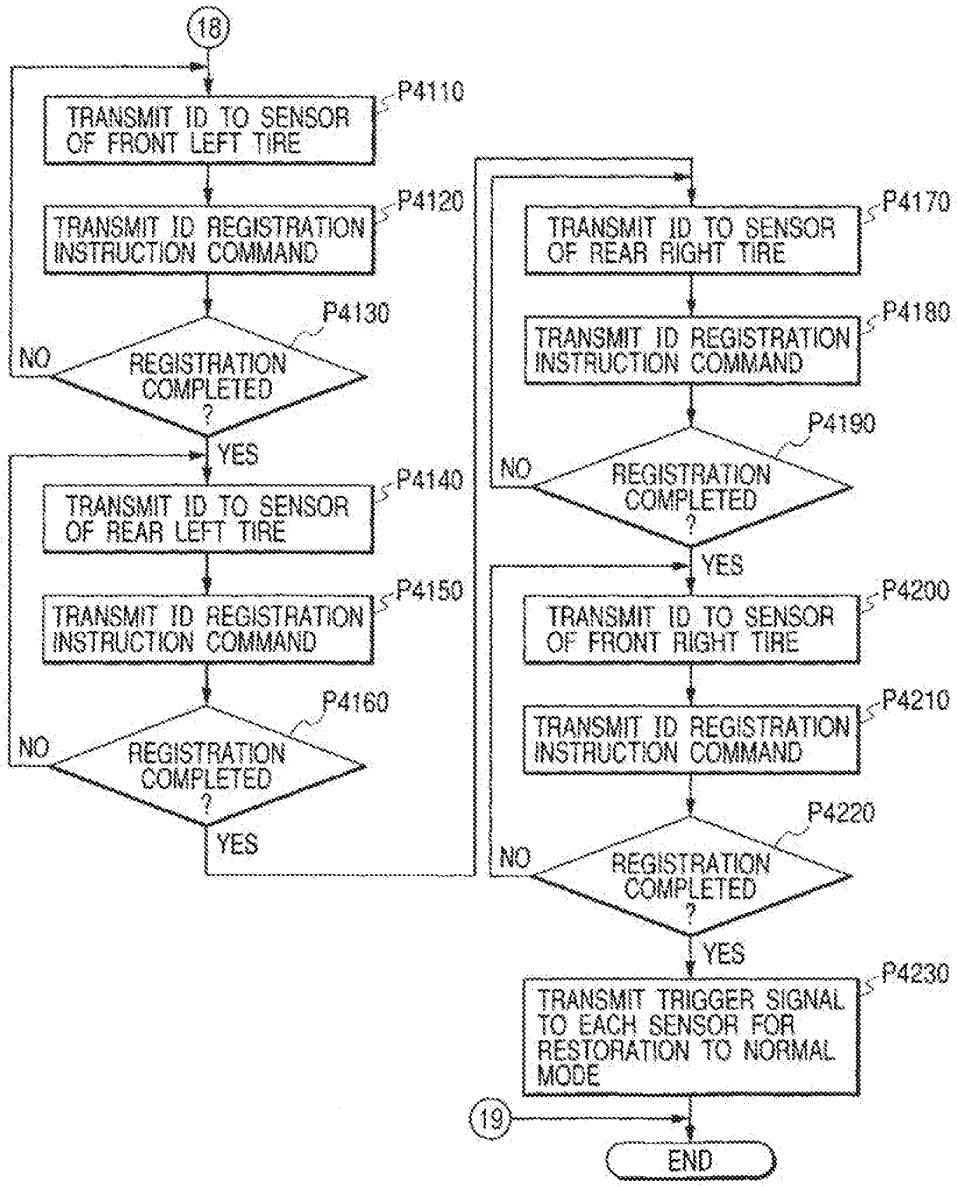
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FIG. 60



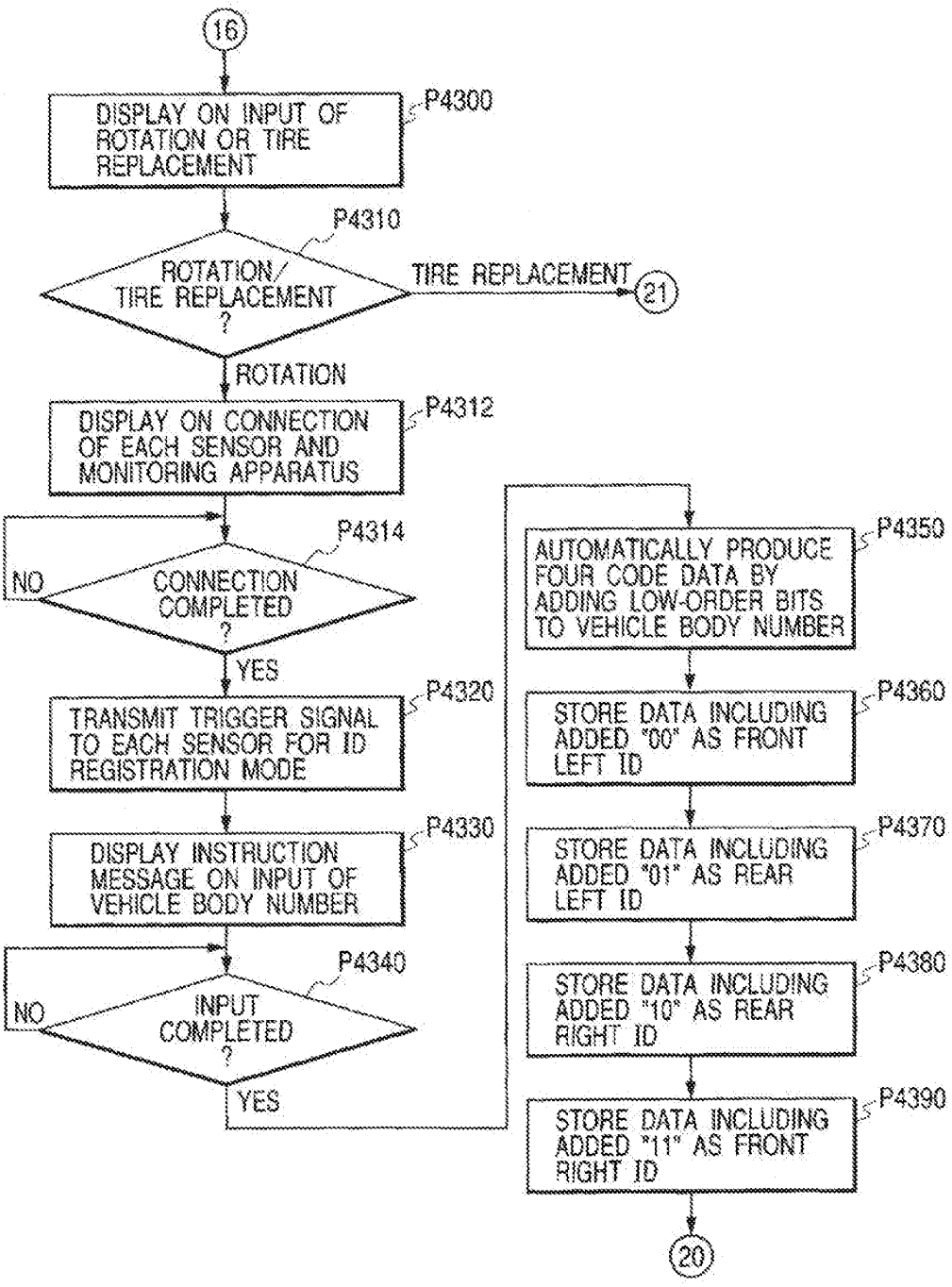
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FIG. 61



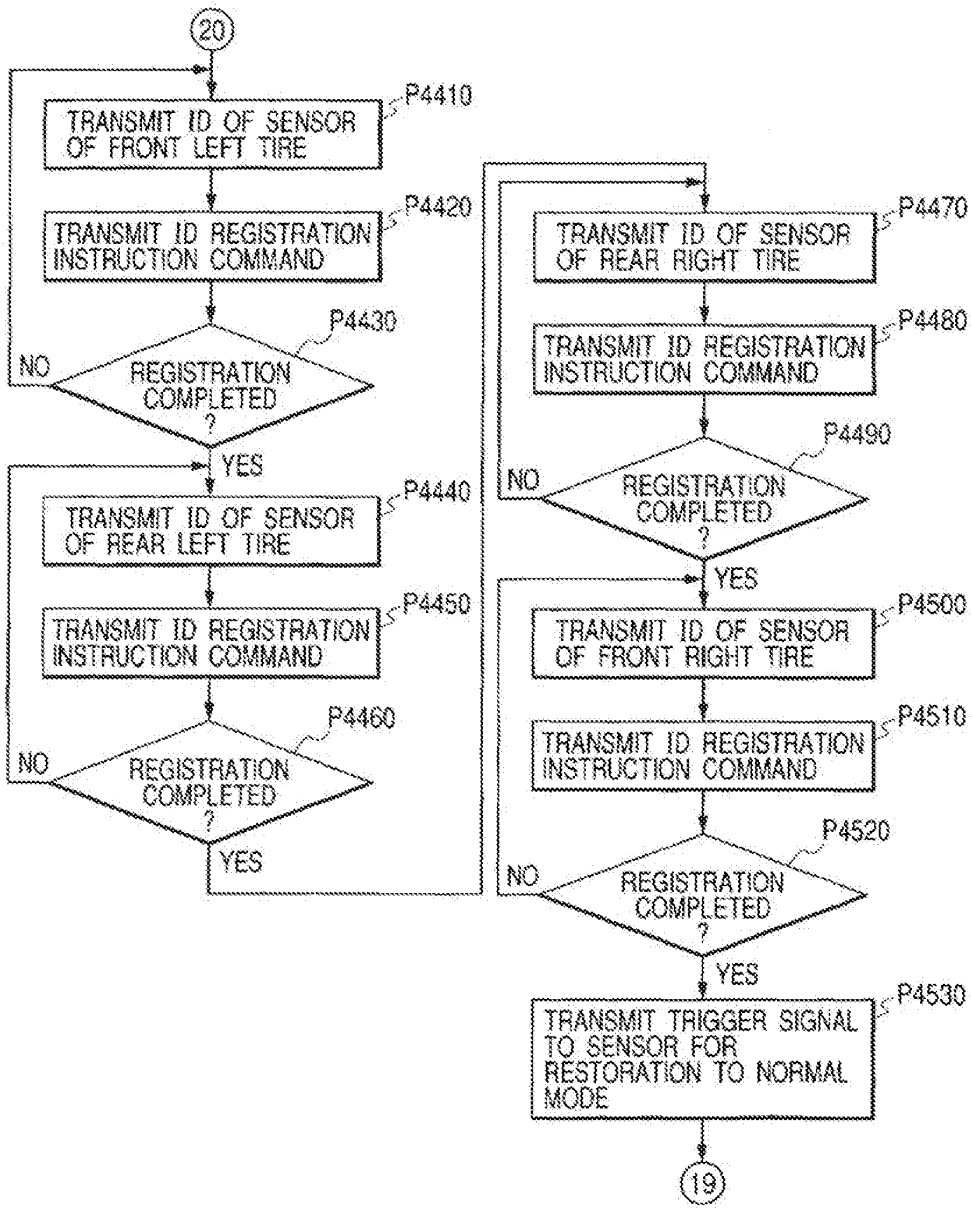
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IPR2024-00744

FIG. 62



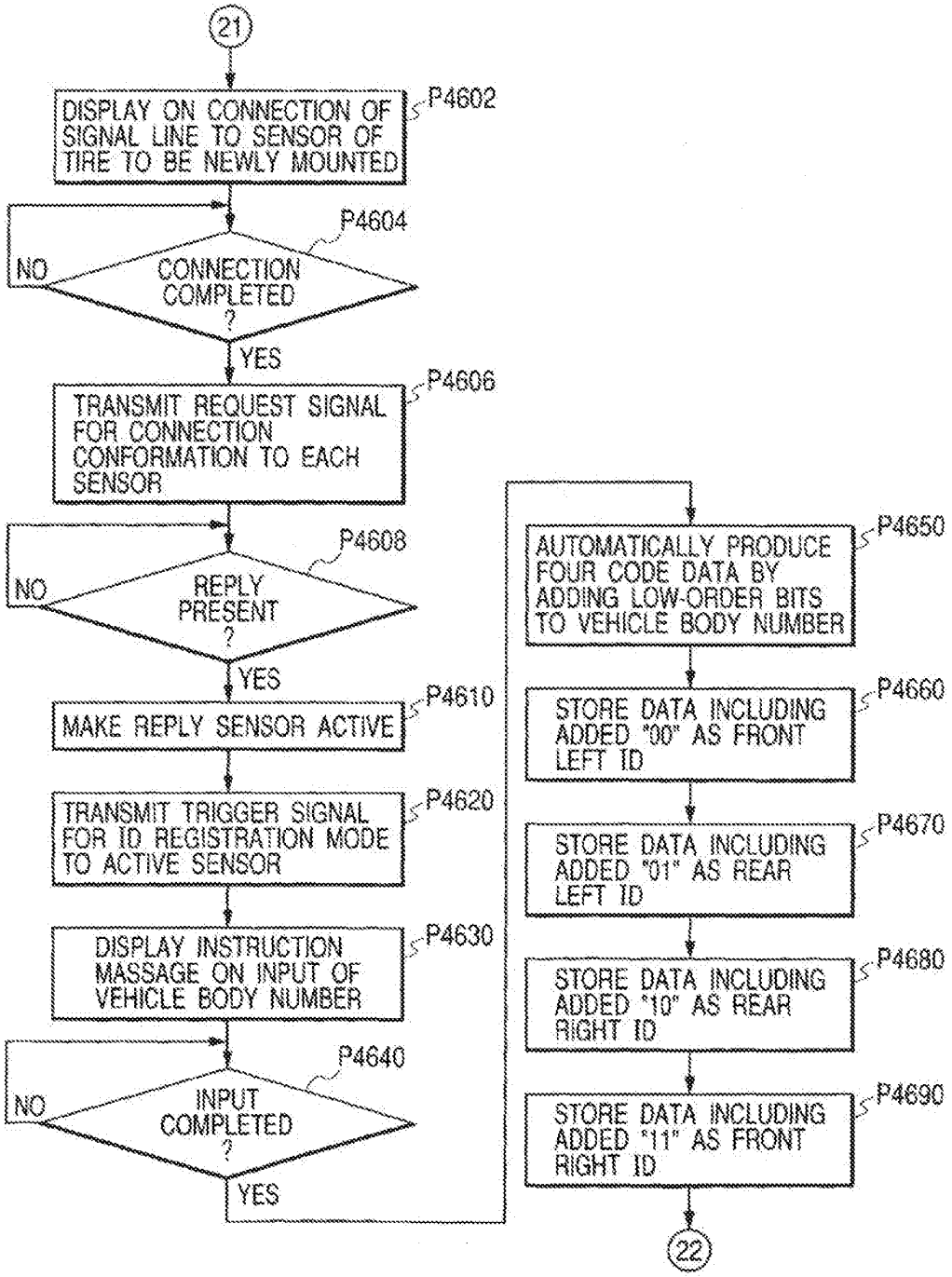
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FIG. 63



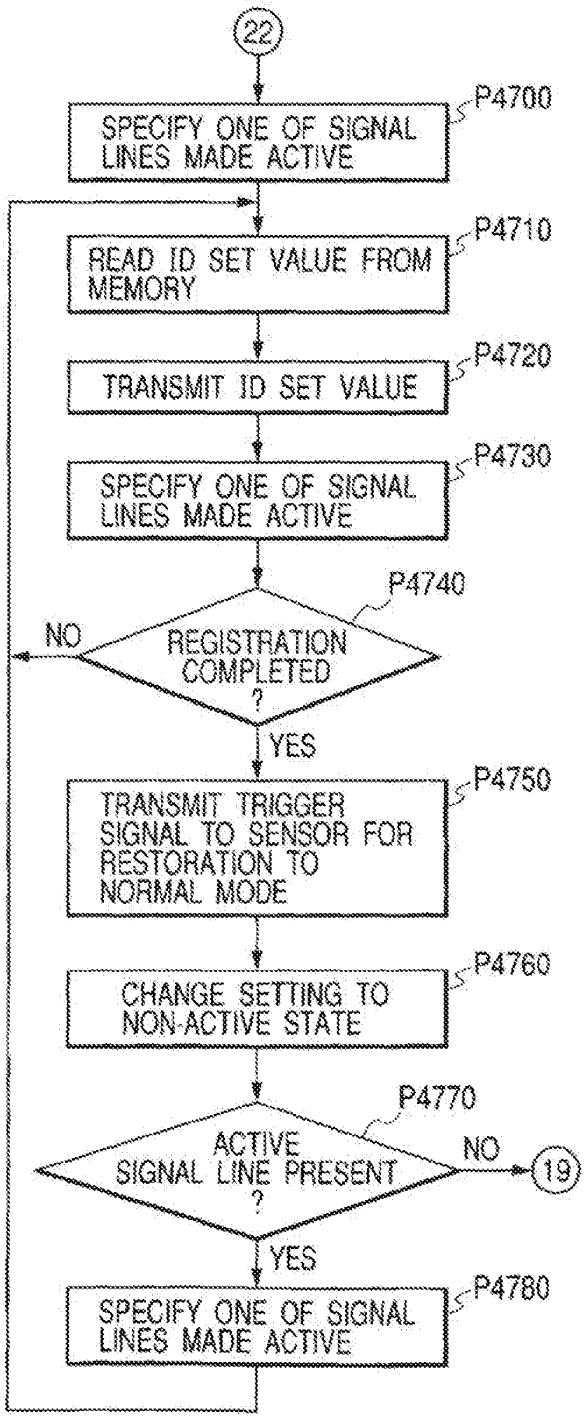
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FIG. 64



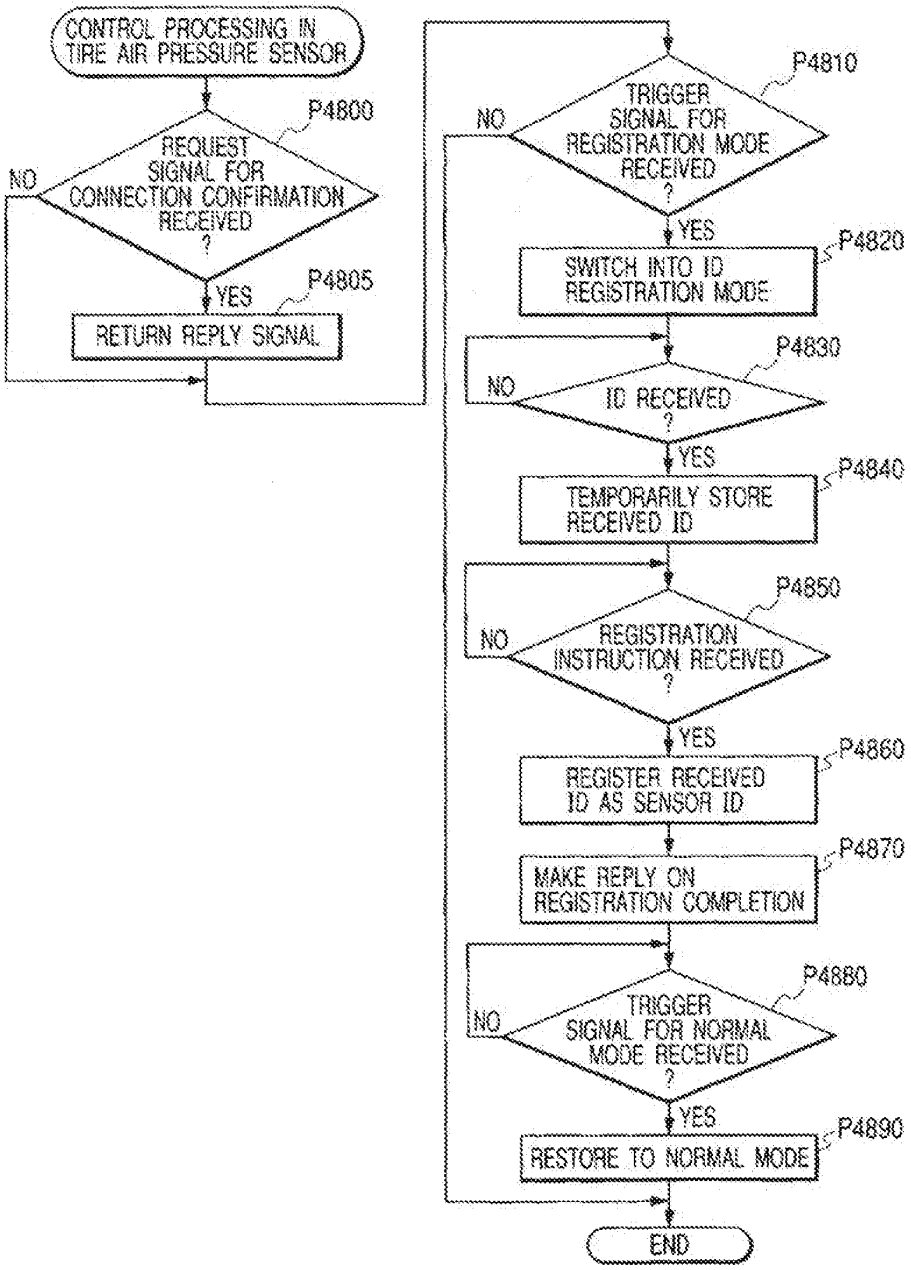
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FIG. 65



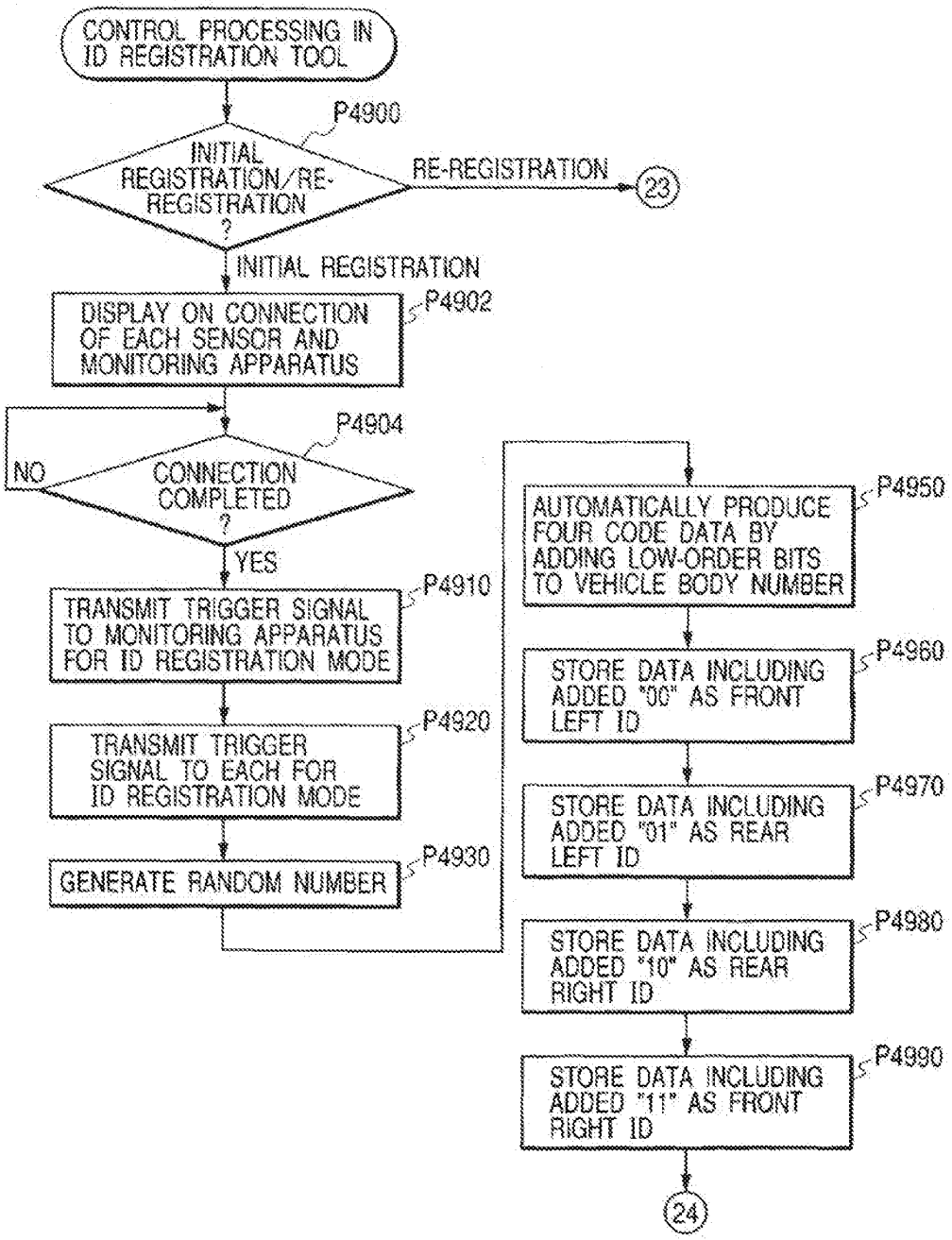
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FIG. 66



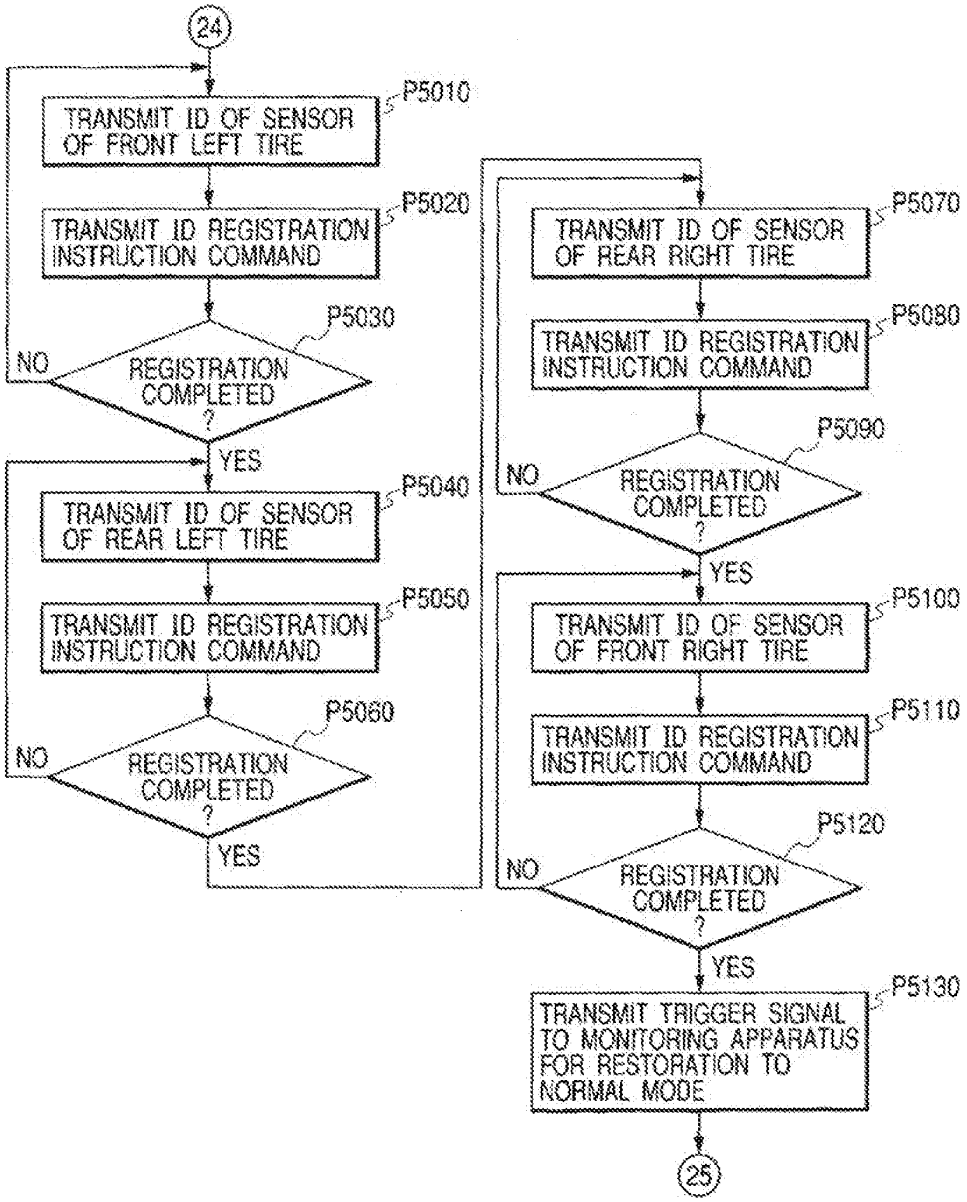
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FIG. 67



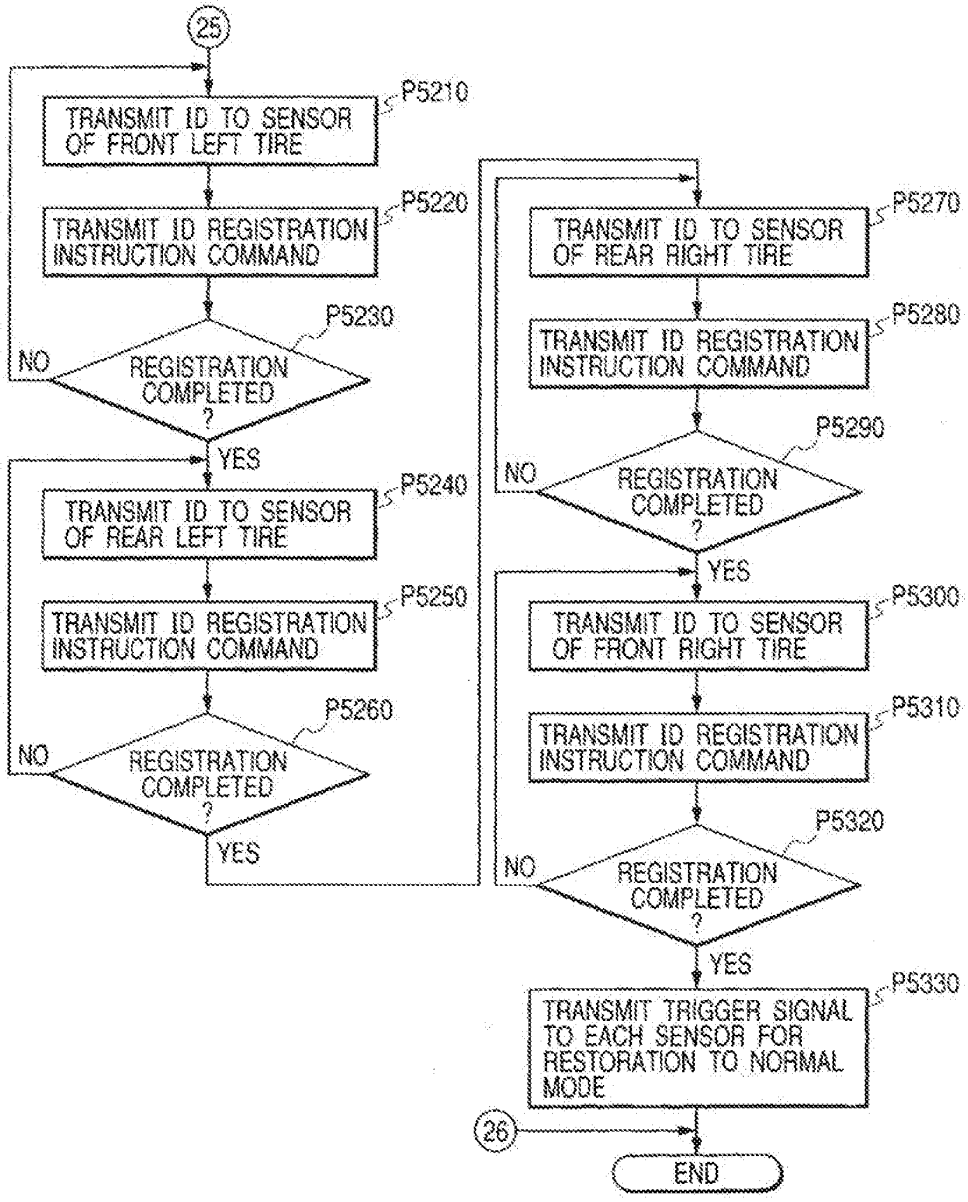
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FIG. 68



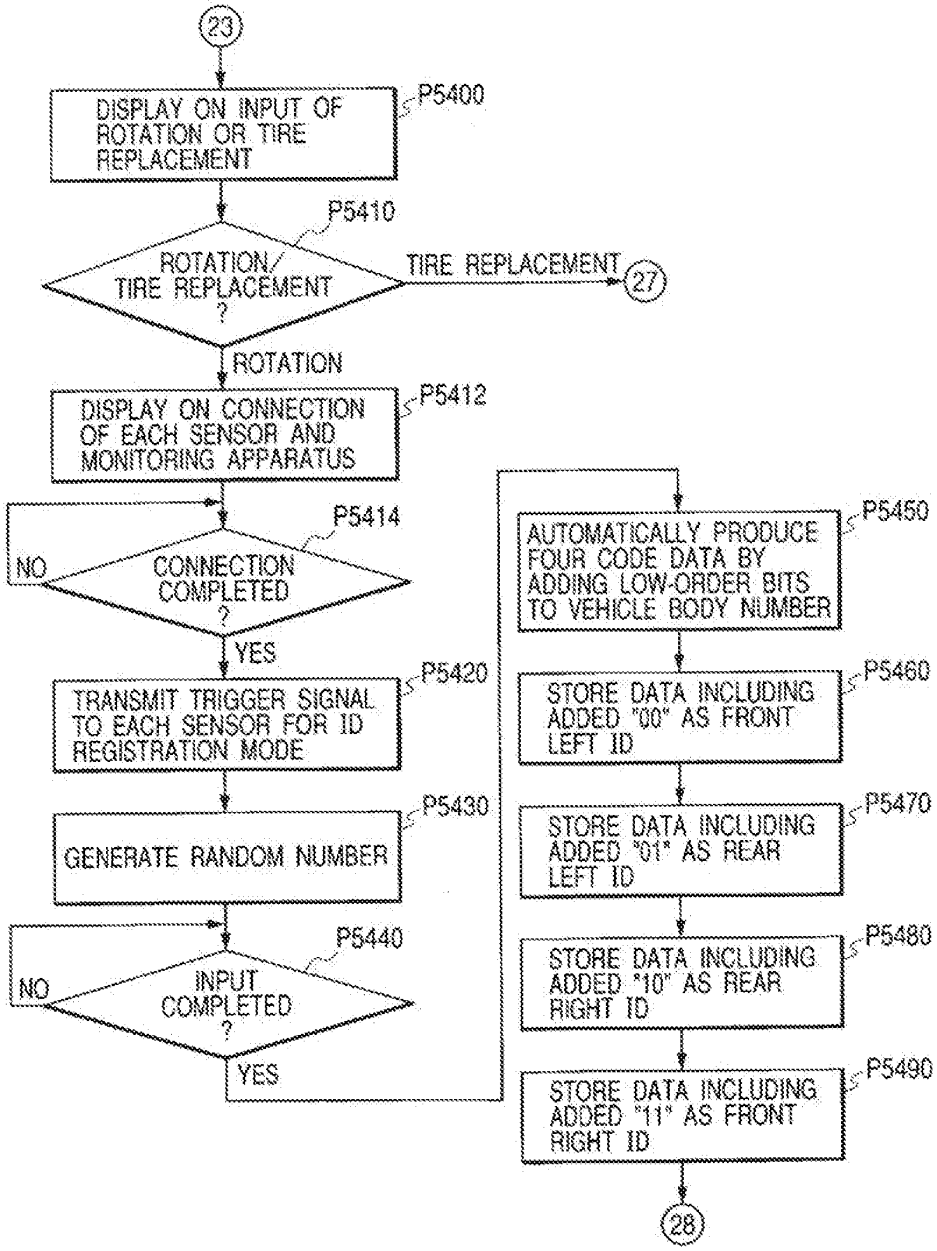
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FIG. 69



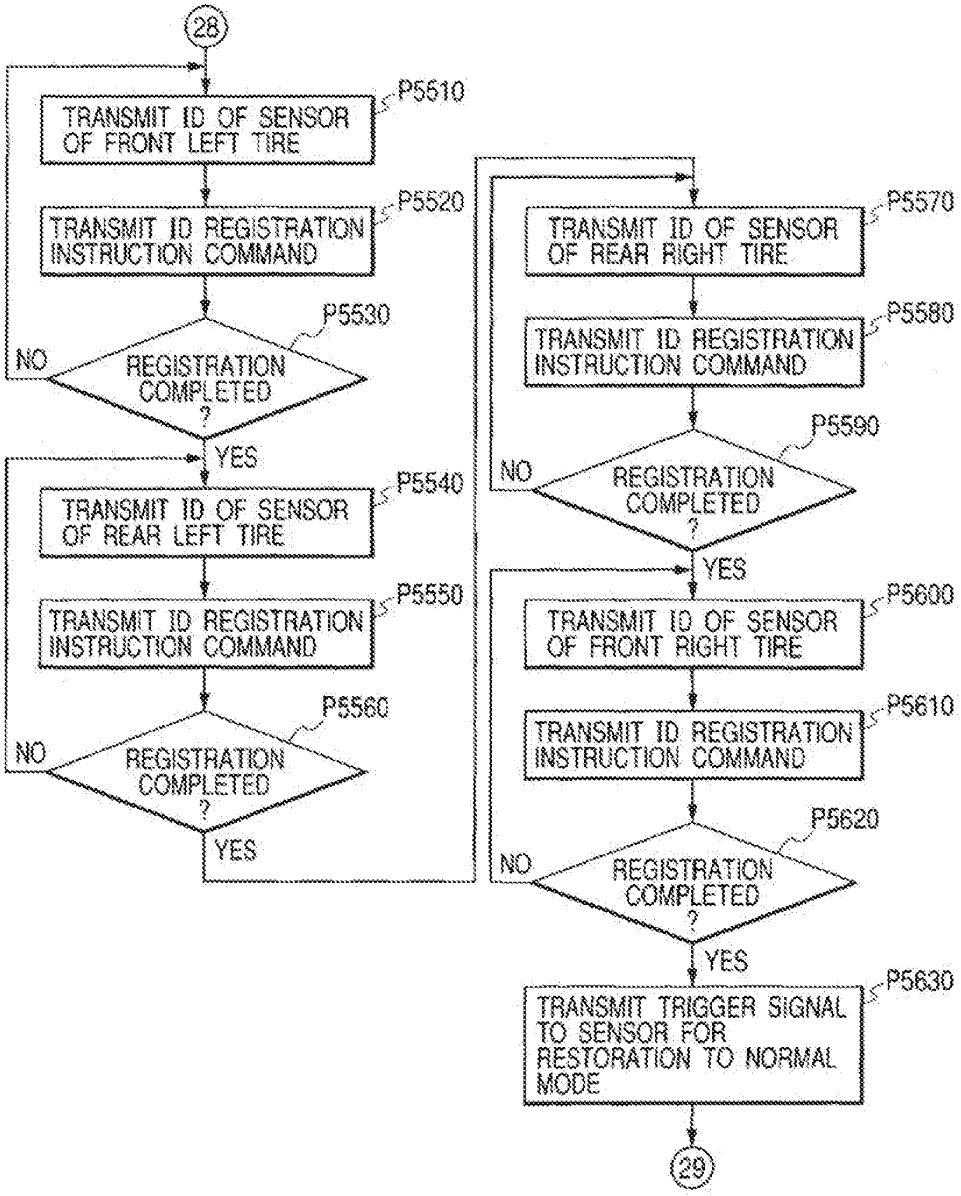
Orange Exhibit No. 2004
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FIG. 70



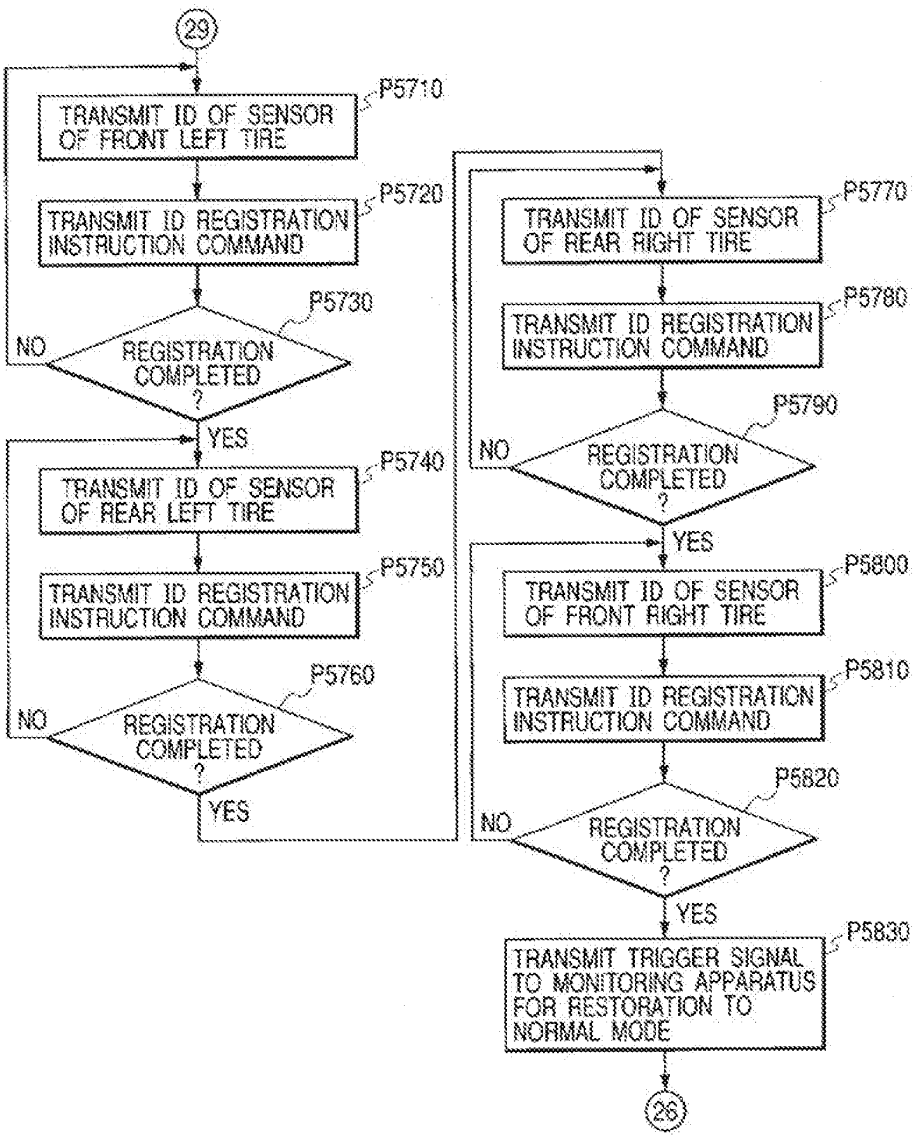
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FIG. 71



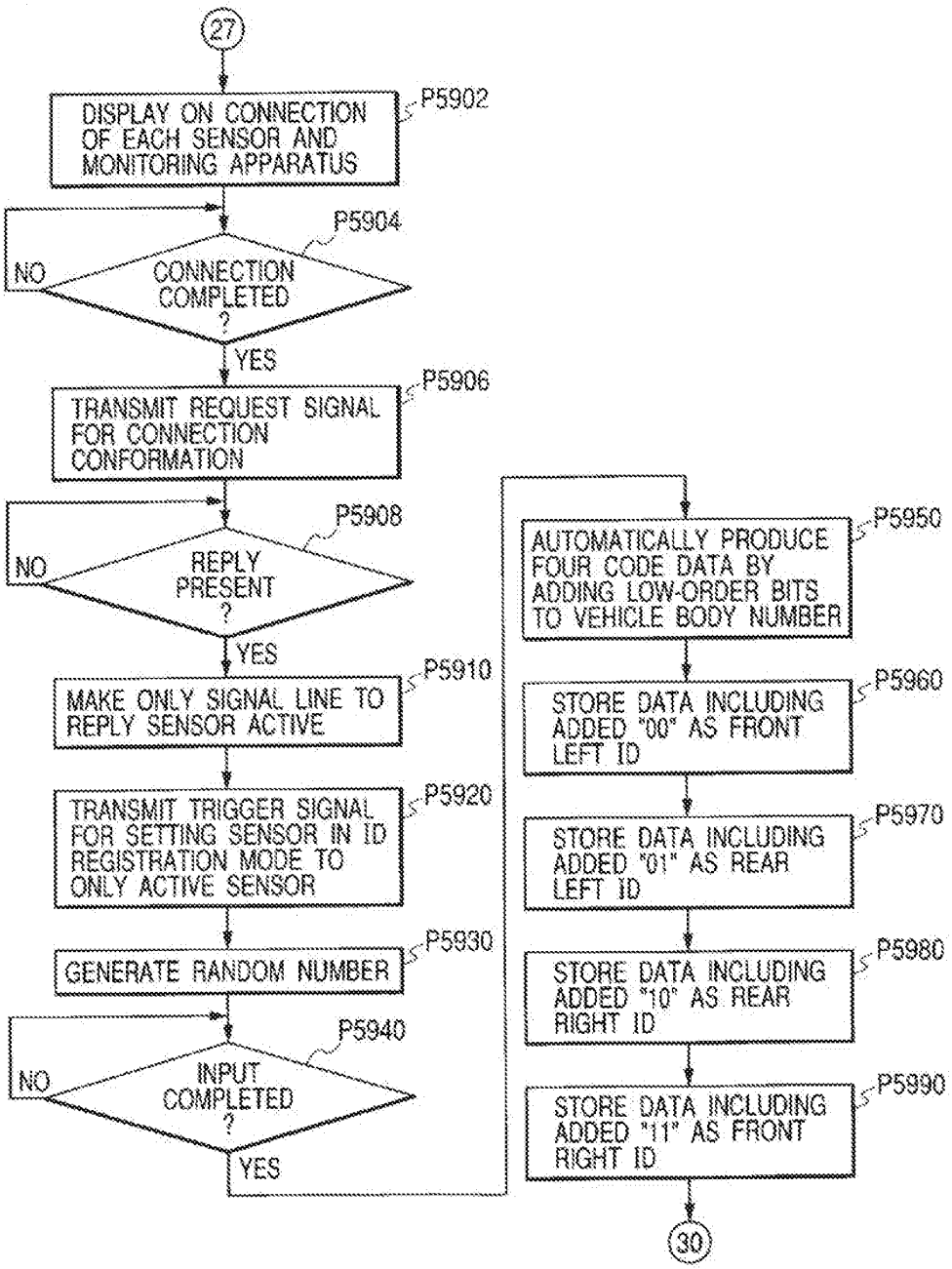
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FIG. 72



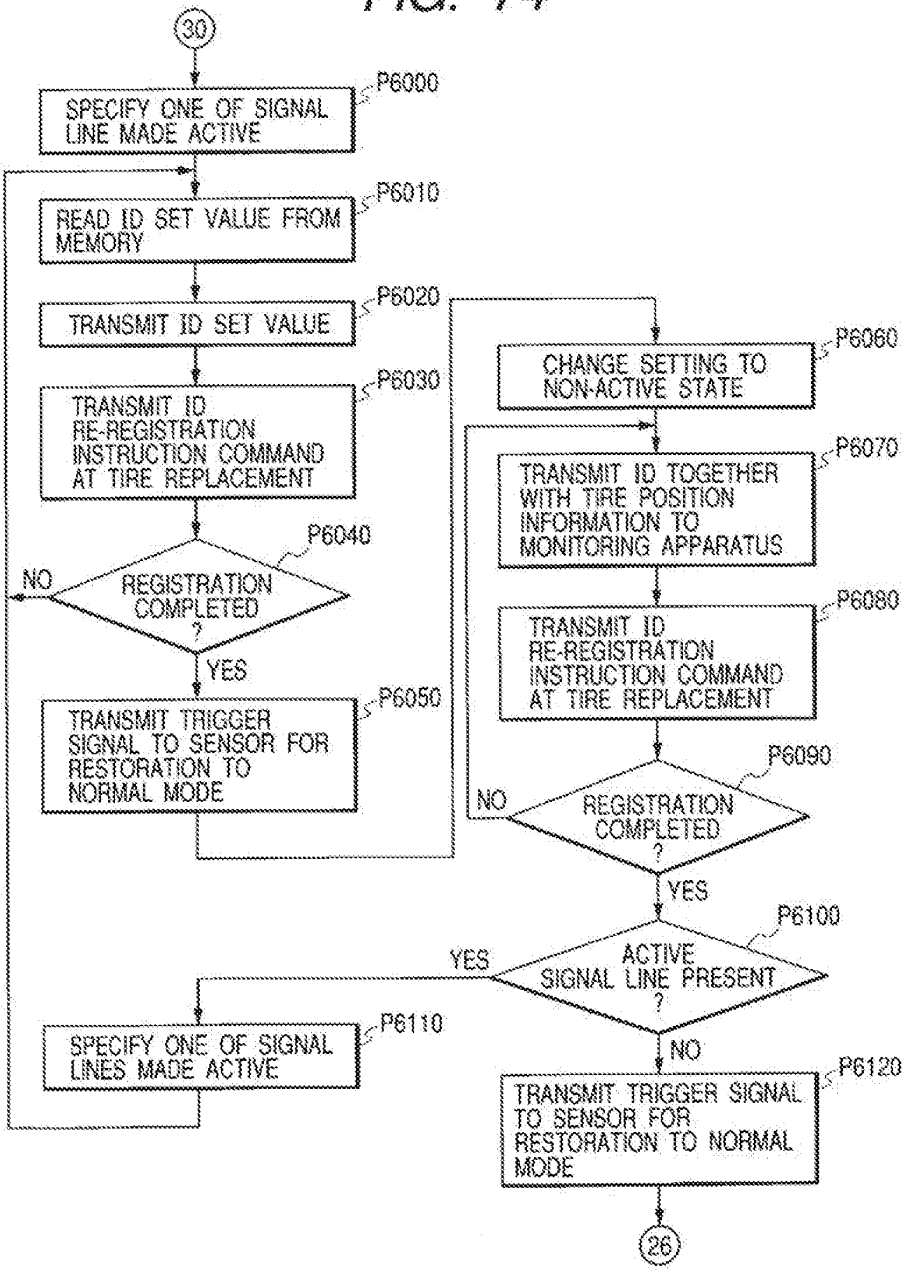
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FIG. 73



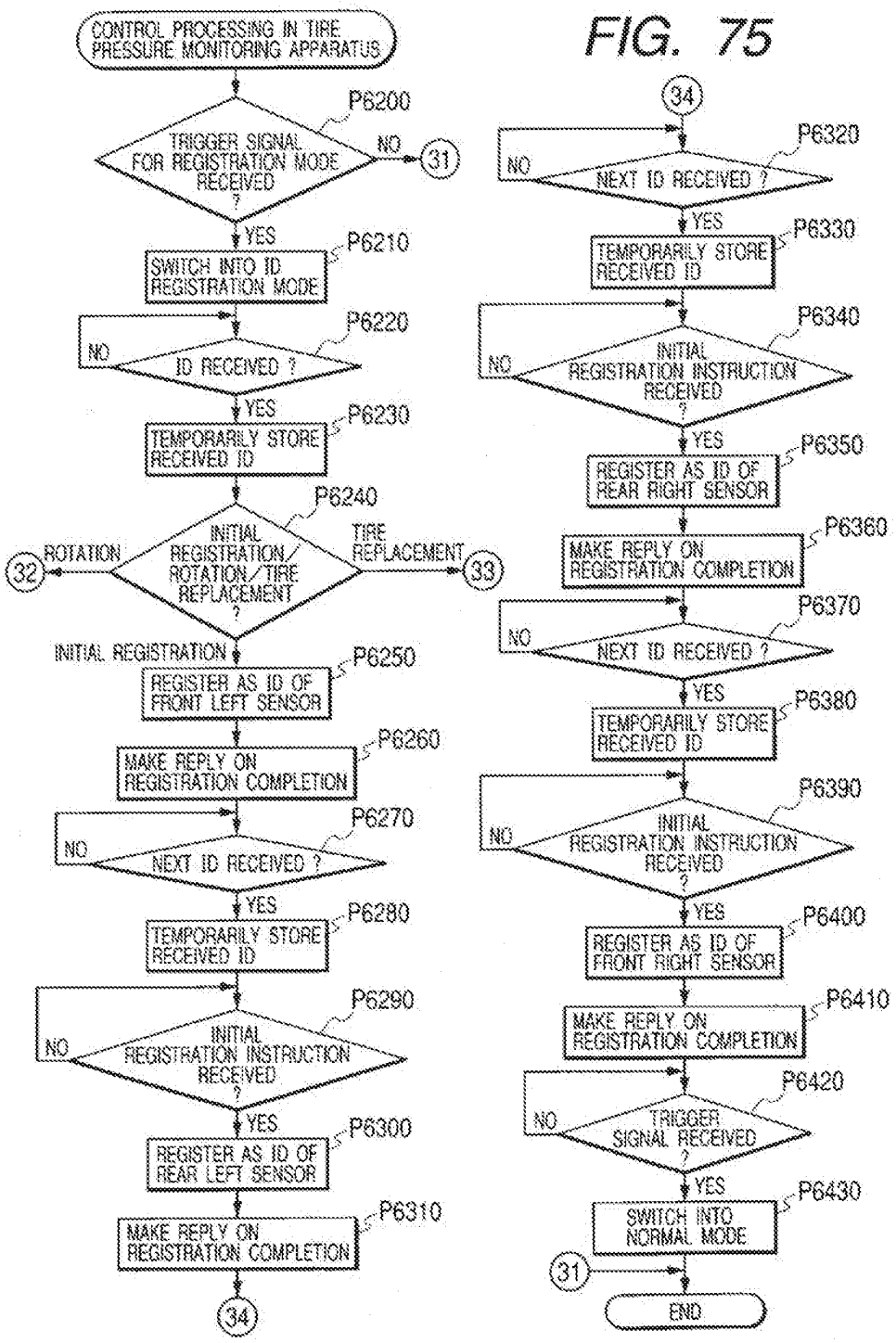
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FIG. 74



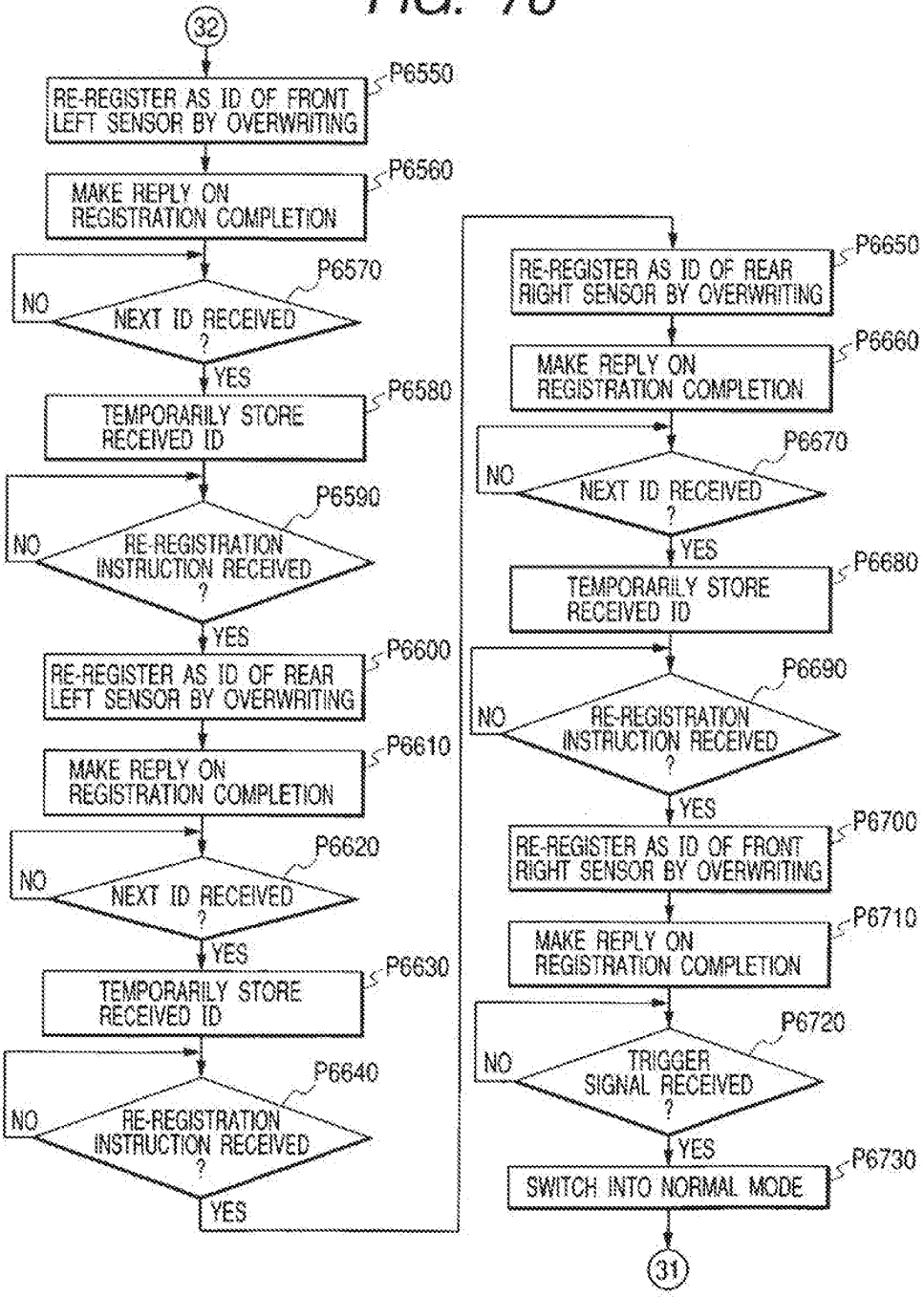
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FIG. 75



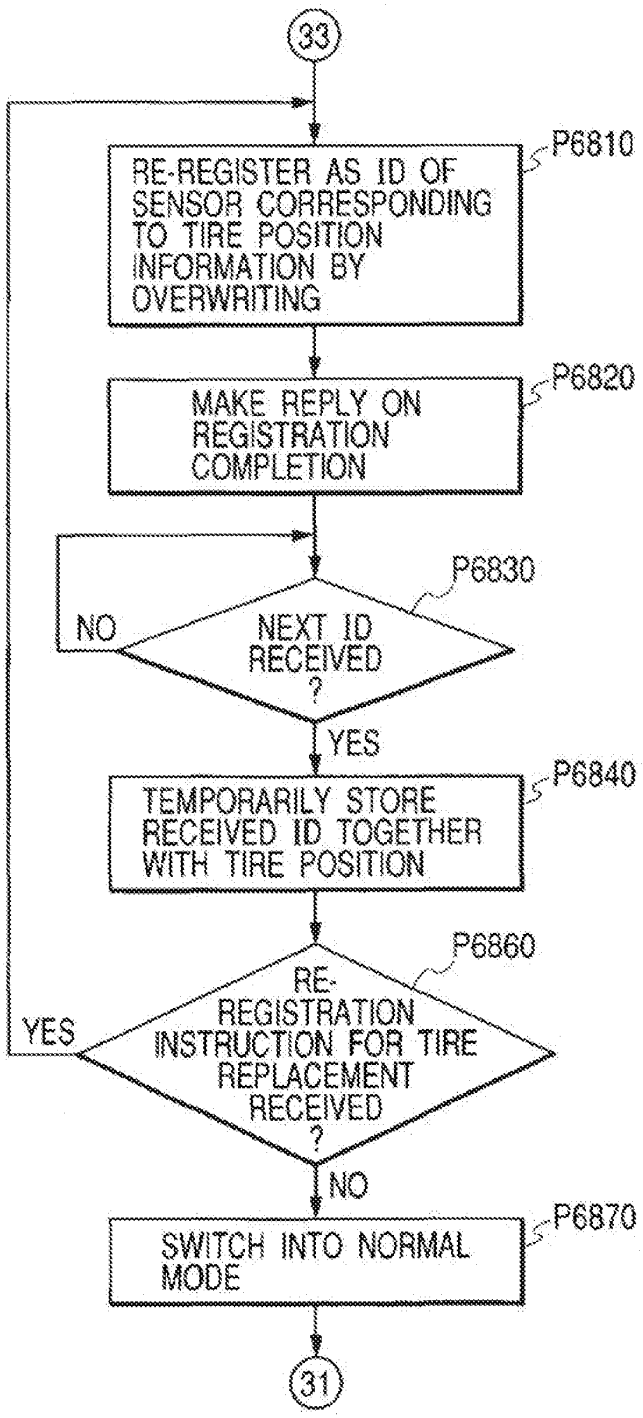
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FIG. 76



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FIG. 77



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FIG. 78
(PRIOR ART)

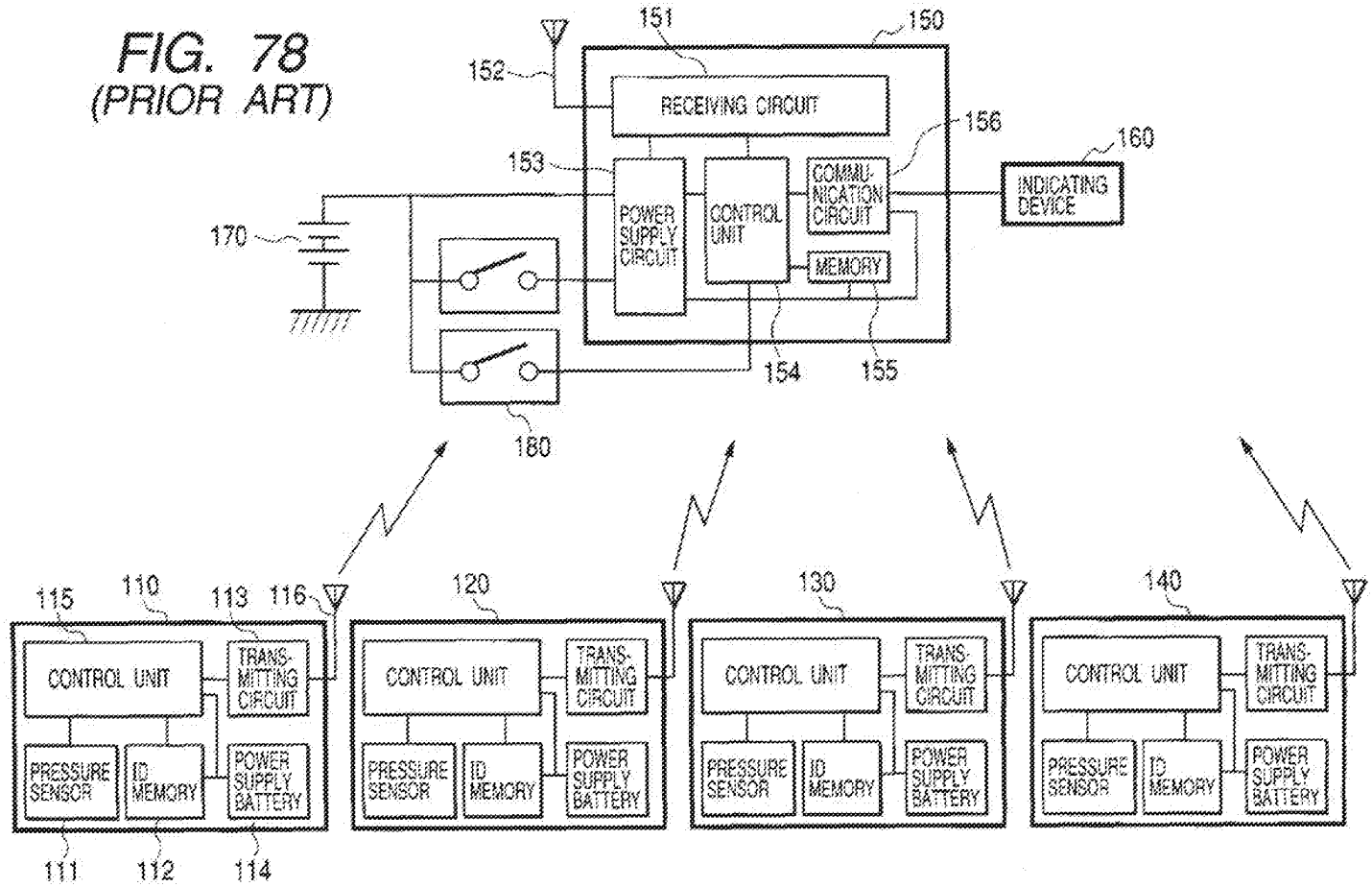
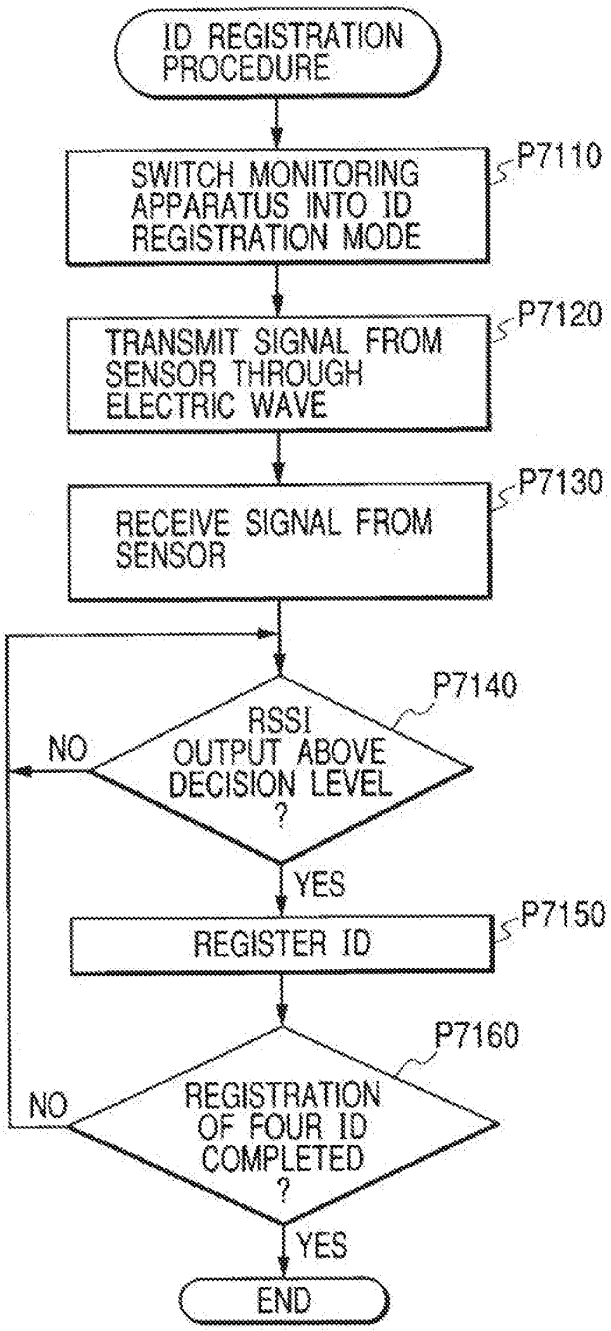


FIG. 79
(PRIOR ART)



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ID REGISTRATION METHOD FOR TIRE PRESSURE SENSOR, ID REGISTRATION APPARATUS, ID REGISTRATION TOOL FOR TIRE PRESSURE MONITORING SYSTEM, AND TIRE WITH AIR PRESSURE SENSOR

BACKGROUND OF THE INVENTION

1) Field of the Invention

The present invention relates to an ID (identification information or identification means) registration method for a tire pressure sensor, and further to an ID registration apparatus for implementing this method, an ID registration tool for a tire pressure monitoring system, a tire with an air pressure sensor, and a tire pressure monitoring apparatus.

2) Description of the Related Art

So far, as a tire pressure monitoring system, there has been known a system disclosed in Japanese Patent No. 3212211.

In such a type of conventional tire pressure monitoring system, an air pressure sensor with a transmitter is mounted on each tire, and an air pressure detection signal, together with the corresponding sensor ID, is transmitted from the air pressure sensor to be received by a tire pressure monitoring apparatus mounted on a vehicle body side so that, when there is, at least, a tire unusual in air pressure, an indication appears on an indicator to issue an alarm.

In this system, the ID for each sensor is also registered (put) in the tire pressure monitoring apparatus, and checking this ID, a decision can be made as to whether or not the received detection signal belongs to an air pressure sensor of a tire of his/her own vehicle.

In a conventional system, this sensor ID is allocated to each sensor by a sensor maker at the stage of shipping, while in a car maker, a tire pressure monitoring apparatus of a vehicle body is set to an ID registration mode in assembling a vehicle to receive an ID transmitted from each sensor for registering it in the tire pressure monitoring apparatus.

More concretely, as shown in a block diagram of FIG. **78**, a conventional tire pressure monitoring system is made up of air pressure sensors **110**, **120**, **130** and **140** mounted on the corresponding tires and a tire pressure monitoring apparatus **150** mounted on a vehicle body. The air pressure sensor **110** includes a pressure sensor **111** for detecting an air pressure in a tire, an ID memory **112** for storing a sensor ID in advance, and a transmitting circuit **113**, a power supply battery **114**, a control unit **115** and a transmitting antenna **116**. The other air pressure sensors **120**, **130** and **140** have the same configuration.

The tire pressure monitoring apparatus **150** includes a receiving circuit **151**, a receiving antenna **152**, a power supply circuit **153**, a control unit **154**, a memory **155** and a communication circuit **156** for transmitting indication data to an indicating device **160** such as an indicator or an LED. Moreover, the power supply to this tire pressure monitoring apparatus **150** is from a vehicle-mounted battery **170**, and as various types of switches, in particular, to the control unit **154**, there is connected a mode switch **180** made to carry out the switching between a normal operating mode and an ID registration mode.

The ID registration in a vehicle manufacturing line is conducted in accordance with a procedure shown in a flow chart of FIG. **79**. That is, the control unit **154** registers a sensor ID included in a received signal in the memory **155** when the receive signal level satisfies a predetermined condition (decision level) (P**7140**, P**7150**). In this way, in the conventional system, the ID of an air pressure sensor actually mounted on each tire of a vehicle is registered in the monitoring apparatus side, and a decision is made as to whether an ID included in a signal received through the receiving antenna **152** agrees with an ID registered in the memory **155** and, if it agrees therewith, a decision is made on a tire pressure state on the basis of a pressure signal received together with that ID and an indication apparatus on the indicating device **160** on the basis of the decision result. In this case, the ID registration is for preventing an indication from being made in error on the basis of a signal from an air pressure sensor of a tire of a vehicle running nearby.

However, in a vehicle assembling process, since an air pressure sensor ID registration work is done in a state where many vehicles flows on the line, a radio interference problem arises in which one vehicle receives an ID signal from an air pressure sensor of other vehicles to conduct mistaken registration. This problem also applies to a case in which a sensor ID is re-registered in a repair shop or the like.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to prevent mistaken ID registration in a tire pressure monitoring system.

For this purpose, in accordance with an aspect of the present invention, there is provided a tire pressure sensor ID registration method of reading ID information readable through some device or through human's eye to write the ID information in an ID storage unit of each of air pressure sensors and in an ID storage unit of a tire pressure monitoring apparatus.

More concretely, in the present invention, for example, an ID, being expressed by a bar code, is read to be written in each ID storage unit of each of the air pressure sensors and the tire pressure monitoring system. With this concrete manner, an ID of an air pressure sensor is stored in the tire pressure monitoring apparatus on the basis of the bar code, which eliminates the conventional problem in that mistaken registration occurs due to the radio interference.

As employable optically-readable information other than the bar code, there are data code, QR code, maxi code, CP code, PDF417, code 49, code 16K, coder block, and others. In the case of the employment of optically-readable information (information holding means) such as a bar code, an optical information reader such as a bar-code reader may be used for the readout of the ID.

In addition, in the case of the bar code, since code information is expressed by numerals or figures, it is also appropriate that an operator reads these numerals and manually inputs them in some tool so that the manually inputted data is forwarded through radio transmission or wired transmission to an air pressure sensor and a tire pressure monitoring apparatus to be put in ID storage units thereof. In the case of the employment of a bar-code reader, the bar-code reader and the air pressure sensor/tire pressure monitoring apparatus can be connected to each other through a signal line (wired means) so that an ID read out from the bar code is transmitted from the bar-code read to the air pressure sensor and the tire pressure monitoring apparatus to be put in the ID storage units thereof. In a case in which an ID is written by means of wired transmission, the radio interference problem is completely solvable.

Still additionally, in a conventional method using electric wave, since other electric waves, such as aeronautical radio waves, are stronger, it is considered that there is a case the reception of an electric wave from a sensor for the ID registration becomes difficult to disenable the ID registra-

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tion. However, the connection between a tool and a sensor/monitoring apparatus through a signal line for the ID registration can solve such a problem at a stroke.

Yet additionally, when an ID read out from a bar code or the like through the use of such a tool is written in any one of tire air pressure sensors connected thereto through a signal line and is further written in the tire pressure monitoring apparatus likewise connected thereto through a signal line, if information on a position of the tire air pressure sensor is also written in the tire pressure monitoring apparatus, in addition to the registration of the ID of the tire pressure sensor, set on the vehicle, in the tire pressure monitoring apparatus, the registration of the position of the tire air pressure sensor is feasible.

Moreover, when the ID read out from the bar code or the like is written in such an air pressure sensor, for example, in the case of a four-wheel vehicle, if it is previously prescribed that the IDs are written in the sensors in the order of a front right wheel, a rear right wheel, a rear left wheel and a front left wheel and the IDs are also written in the tire pressure monitoring apparatus in this order, the registration of the sensor IDs becomes feasible together with the registration of the tire position information.

In this connection, such registration of ID, additionally specifying position, is also possible even if the ID registration is made not only by the wired transmission but also by radio transmission. For example, in a case in which electric waves are used in registering ID from a bar-code reader or the like in each tire pressure sensor, it is sufficiently achievable by means of, for example, the directivity of the electric wave being enhanced. Incidentally, as the information transmission medium in the case of the radio ID registration, in addition to the electric wave, infrared ray, ultrasonic wave or the like is also employable.

In a vehicle which has presently been put into practical use, four receiving antennas are provided in vicinity of the four wheels, respectively, on the monitoring apparatus side to allow the ID registration and the monitoring of the tire air pressure to be done while specifying the tire positions. On the other hand, with the method according to the present invention, as mentioned above, the ID registration is feasible while specifying the one of the four wheels, without increasing the number of receiving antennas in the monitoring apparatus side, and since each of the tire air pressure sensors can be made to have a unique ID, even if only one receiving antenna is provided for the monitoring of the air pressure, a judgment can easily be made as to which of the tires is in what air pressure state. Therefore, the method according to the present invention enables monitoring the air pressures while specifying the tire positions, through the use of a simpler apparatus configuration as compared with a system which has presently been put into practical use.

In addition, the method according to the present invention can exhibit the following effects. For example, let it be assumed that a transmitting unit of an air pressure sensor of any one of tires is broken. In this case, a dealer or a repair shop replaces the air pressure sensor of that tire with new one. At this time, a new bar code is read out by a bar-code reader and a new ID indicated by the read bar code is written in an ID storage unit of an air pressure sensor attached newly. In addition to this, that ID is written in the monitoring apparatus. In this way, through only the registration procedure on the renewed sensor, the ID registration can be completed, thus improving the workability of the ID re-registration incidental to the renewal of a sensor.

In this connection, as a judgment method on a broken sensor, the ID of the sensor from which an air pressure detection signal has not been received within a predetermined period of time when the vehicle is running can be specified through the use of a software or the like on the tire pressure monitoring apparatus side. Accordingly, the specified sensor ID can also be removed from the ID storage unit of the monitoring apparatus in a renewing operation. Incidentally, it is also acceptable that the broken sensor ID is left without removed. This is because the air pressure signal including the ID of the broken sensor is not received eventually and the IDs for the sensors corresponding to the four wheels are correctly registered through the re-registration operation so that any trouble does not occur in the monitoring of the tire air pressure.

As described above, with the method according to the present invention, in a case in which an air pressure sensor breaks down, only the operation for the ID registration in the renewed sensor and the operation for the registration of the ID of the renewed sensor in the monitoring apparatus are required, thus considerably improving the working efficiency. This effect is valuable. That is, in a conventional manner, an requirement exists that, in a case in which an air pressure sensor of any one of tires is replaced with new one, in a state where the monitoring apparatus is placed into an ID registration mode and the ID registration contents of this apparatus are reset, the IDs transmitted from the air pressure sensors of all the tires are again received to be registered in the monitoring apparatus side.

Still additionally, in a case in which any one of sensors breaks down and is replaced with a new one, or when a tire bursts and the entire tire is replaced so that the sensor is replaced with another, the method according to the present invention enables the ID re-registration to be implemented with respect to the air pressure sensors of all the tires and the tire pressure monitoring apparatus through the use of an ID registration tool such as a bar-code reader in a repair shop. In this case, at the re-registration, if the ID registration is done in the form of including information on the implementation of the re-registration, a judgment can thereafter be made easily as to whether or not the sensor or tire replacement has taken place due to the sensor failure or the tire burst, which contributes to the history management on the tires of the vehicle.

Aside from the above-mentioned sensor failure, in the case of the tire burst, for further effectiveness, with respect to a tire to be replaced due to the burst, the ID re-registration in the sensor and monitoring apparatus is implemented on the basis of a bar code or the like including its ID and the information on that fact. This additionally enables the tire history management by reading out the ID registered in the tire pressure monitoring apparatus or the air pressure sensor.

For achieving the above-mentioned purpose, in accordance with a second aspect of the present invention, there is provided a tire air pressure sensor ID registration method in which sensor ID information is placed or indicated as readable information on each tire pressure sensor, each tire, each tire wheel or each tire wheel cover and an ID is read out from the readable information and the readout result is written in an ID storage unit of a tire pressure monitoring apparatus.

More concretely, in the present invention, for example, a bar code indicating the ID registered in a sensor is adhered onto the sensor itself, a tire, a wheel or a wheel cover and this bar code is read through the use of a bar-code reader so that the read information is written in an ID storage unit of a tire pressure monitoring apparatus. According to this concrete method, the ID stored in the air pressure sensor is not transmitted from the air pressure sensor, but the air

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pressure sensor ID is stored in the tire pressure monitoring apparatus on the basis of the bar code, which eliminates a conventional problem such a mistaken registration due to the radio interference which exists in a conventional technique.

Moreover, with this method, in addition to the ID, information indicative of a sensor manufacturing factory or production time can be placed in the bar code. In a state where this information is included therein, the ID information is stored in the monitoring apparatus. In monitoring the air pressure, the sensor collation is made on the basis of only the ID portion. In the meantime, for example, in a case in which the sensor breaks down, the information is read out from the monitoring apparatus side, thereby deriving information representative of a lot offering broken sensors frequently. As effects, this allows a vehicle maker to attain effective information for the management of the in-house vehicles.

Also in this method, in addition to a bar code, various types of optically-readable information, such as data code, QR code, maxi code, CP code, PDF417, code 49, code 16K, coder block, and others are also employable, and an optical information reading device corresponding to the optically-readable information is employable for reading.

In addition, also in this method, in the case of the bar code, since code information is expressed by numerals or figures, it is also appropriate that an operator reads these numerals and manually inputs them in some tool so that the manually inputted data is forwarded through radio transmission or wired transmission to a tire pressure monitoring apparatus to be put in an ID storage unit thereof. In the case of the employment of a bar-code reader, the bar-code reader and the tire pressure monitoring apparatus can be connected to each other through a signal line so that an ID read out from the bar code is transmitted from the bar-code read to the tire pressure monitoring apparatus to be put in the ID storage unit thereof. In a case in which an ID is written by means of wired transmission, the radio interference problem is completely solvable.

Still additionally, in a conventional method using electric wave, since other electric waves, such as aeronautical radio, are stronger, it is considered that there is a case the reception of an electric wave from a sensor for the ID registration becomes difficult to disenable the ID registration. However, the connection between a tool and a monitoring apparatus through a signal line for the ID registration can solve such a problem at a stroke.

Yet additionally, when an ID read out from a bar code or the like through the use of such a tool is written in the tire pressure monitoring apparatus, if information on a position of a tire air pressure sensor is also written in the tire pressure monitoring apparatus, in addition to the registration of the ID of the tire pressure sensor, set on the vehicle, in the tire pressure monitoring apparatus, the registration of the position of the tire air pressure sensor is also feasible.

Moreover, when the ID is read out from the bar code, for example, in the case of a four-wheel vehicle, if it is previously prescribed that the bar codes are read in the order of a front right wheel, a rear right wheel, a rear left wheel and a front left wheel and the bar codes adhered onto sensors, tires, wheels or wheel covers are read in this order, the sensor IDs, together with tire position information, can be registered in the monitoring apparatus side.

In a vehicle which has presently been put into practical use, four antennas are required for the implementation of the ID registration specifying the tire positions. On the other hand, with the method according to the present invention, the ID registration is feasible while specifying any one of the four wheels, without increasing the number of receiving antennas in the monitoring apparatus side, and since each of the tire air pressure sensors can be made to have a unique ID, even if only one receiving antenna is provided for the monitoring of the air pressures, a judgment can easily be made as to which of the tires is in what air pressure state. Therefore, the method according to the present invention enables monitoring the air pressures while specifying the tire positions, through the use of a simpler apparatus configuration as compared with a system which has presently been put into practical use.

In this method, an ID can be read out from the aforesaid readable information and inputted to the aforesaid tire pressure monitoring apparatus, and the ID inputted this time can be removed from the IDs already written in the ID storage unit of the tire pressure monitoring apparatus.

This is effective in the case of the replacement of a sensor or a tire. That is, if an ID is read out from readable information, such as a bar code, adhered onto a detached sensor or tire and this ID is removed from the ID storage unit of the tire pressure monitoring apparatus, then it is possible to prevent useless information from being left in a state registered in the ID storage unit of the monitoring apparatus.

Furthermore, for achieving the above-mentioned purpose, in accordance with a further aspect of the present invention, there is provided a tire air pressure sensor ID registration apparatus comprising an ID indication unit for indicating readable information including an ID, a reading unit for reading the ID from the readable information indicated on the ID indication unit, and an ID writing unit for writing the ID, read by the reading unit, in an ID storage unit of each of air pressure sensors and an ID storage unit of a tire pressure monitoring apparatus. This ID registration apparatus can easily implement the above-described method according to the present invention.

In this configuration, as the ID indication unit, for example, there may be a manufacturing instruction in which each of bar codes indicating IDs to be registered in sensors of four wheels is produced for each vehicle and then put in order for each vehicle, more preferably for each tire, and adhered thereonto. In this case, a bar-code reader can be used as the reading unit, and a handy type is more effective. Moreover, as the writing unit, a manufacture management computer to be connected to the handy type bar-code reader is acceptable, and it is also possible that the bar-code reader itself is used as the writing unit.

Furthermore, in accordance with a further aspect of the present invention, there is provided an ID registration apparatus comprising a readable information indication label, including a sensor ID, adhered onto each air pressure sensor, each tire, each tire wheel or each tire wheel cover, a reading unit for reading the ID from the readable information indication label, and a writing unit for writing the ID, read by the reading unit, in an ID storage unit of the tire pressure monitoring apparatus.

According to this ID registration apparatus, a readable information indication label, including a sensor ID, is previously adhered onto each air pressure sensor, each tire, each tire wheel or each tire wheel cover, and the ID is read from the readable information indication label by the reading unit and the ID read in this way is written in the ID storage unit of the tire pressure monitoring apparatus by the ID writing unit. This can carry out the above-described method according to the present invention.

This ID registration apparatus can be equipped with an ID deletion unit for, when an ID read by the reading unit is inputted in the tire pressure monitoring apparatus, deleting

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the ID, inputted this time, from IDs already written in the ID storage unit of the tire pressure monitoring apparatus.

Thus, for example, in the case of the replacement of a tire, the ID deletion unit reads a bar code adhered onto the tire to be detached and inputs the ID indicated by the bar code in the tire pressure monitoring apparatus to delete the ID, inputted this time, of the IDs already written in the ID storage unit of the tire pressure monitoring apparatus, thereby removing the ID of the sensor mounted on the detached tire.

In this connection, as examples of the readable information employable for the ID registration apparatus according to the present invention, there are bar code, data code, QR code, maxi code, CP code, PDF417, code 49, code 16K, coder block, and others. In the case of the employment of these optically-readable information, an optical information reading unit can be used for the readout of the ID.

In addition, in the ID registration apparatus according to the present invention, the ID writing unit can be connected through a signal line to the tire pressure monitoring apparatus so that the ID to be stored in the tire pressure monitoring apparatus is transmitted through the signal line. The effects of the transmission made through a wire are as mentioned above.

Furthermore, for achieving the above-mentioned purpose, in accordance with a further aspect of the present invention, there is provided an ID registration tool for a tire pressure monitoring system, comprising a reading unit for reading an ID from a readable information indication label, including the ID of a sensor, adhered onto each air pressure sensor, each tire, each tire wheel or each tire wheel cover, an ID transmitting unit for transmitting the ID, read by the reading unit, to a tire pressure monitoring apparatus, and a storage state instruction unit for giving instruction on the registration or deletion of the ID transmitted from the ID transmitting unit.

In the ID registration tool according to the present invention, at the ID registration, the reading unit reads an ID from a readable information indication label, including the ID of a sensor, adhered onto each air pressure sensor, each tire, each tire wheel or each tire wheel cover mounted on a vehicle, and the ID transmitting unit transmits the ID, read out by the reading unit, to the tire pressure monitoring apparatus. Moreover, the storage state instruction unit gives instruction about the registration or deletion of the ID transmitted from the ID transmitting unit. Thus, an air pressure sensor ID of each of the tires mounted on a vehicle carrying the monitoring apparatus is correctly written in the monitoring apparatus.

In this case, the reading unit can be constructed as an optical information reading unit made to optically read optically-readable information, such as bar code, data code, QR code, maxi code, CP code, PDF417, code 49, code 16K, coder block, and others.

In addition, the ID registration tool for use in a tire pressure monitoring system can be equipped with a signal line for making a connection with respect to the tire pressure monitoring apparatus or a connector for the connection of the signal line. When the ID transmission is made through a wire in this way, it is possible to solve the radio interference problem completely and further to prevent a registration-impossible state from being incurred due to electric wave troubles.

Still additionally, the ID registration tool for use in a tire pressure monitoring system can be equipped with a trigger signal transmitting unit for transmitting a trigger signal for an ID registration mode to the tire pressure monitoring apparatus. The trigger signal transmitting unit is provided in this way and, at the implementation of the ID registration, the trigger signal is first transmitted so that the tire pressure monitoring apparatus falls into an ID registration mode before the ID read out by the reading unit is transmitted thereto, thereby enabling the smooth ID registration.

Moreover, for achieving the above-mentioned purpose, in accordance with a further aspect of the present invention, there is provided a tire with an air pressure sensor in which an optically-readable information label indicating information including an ID of an air pressure sensor is adhered onto the air pressure sensor, the tire itself, a tire wheel or a tire wheel cover. In this case, as the optically-readable information labels employable, there are listed a bar code label, a data code label, a QR code label, a maxi code label, a CP code label, a PDF417 label, a code 49 label, a code 16K label, and a coder block label.

In addition, for achieving the above-mentioned purpose, in accordance with a further aspect of the present invention, there is provided a tire air pressure sensor ID registration method in which each of air pressure sensors and a tire pressure monitoring apparatus are together placed into an ID registration mode, and an ID is transmitted to each of the sensors to be stored therein and the same ID is also transmitted to the tire pressure monitoring apparatus to be stored therein.

That is, instead of an ID previously stored in the sensor side being stored in the tire pressure monitoring apparatus, when an ID is initially registered or re-registered in each of air pressure sensors, the ID pertaining to the air pressure sensor of each of tires to be mounted on a vehicle is also initial-registered or re-registered in the tire pressure monitoring apparatus. For this operation, an ID registration tool is used in a more concrete method proposed as one example of the present invention.

As will be described later, preferably, a basic configuration of this ID registration tool includes an ID setting unit and an ID transmitting unit. This ID setting unit can be achieved through the use of such a key-manipulated putting manner that a field operator inputs and sets an ID according to an operating instruction each time. As another mode, it is also appropriate that a body number of a vehicle, or the like, is read out through the use of an optical reading unit or the like and an ID of an air pressure sensor to be mounted on each of tires is automatically produced and set on the basis of the read body number, or that production management data (vehicle body number, vehicle production number, or the like) for the manufacture of the vehicle is putted to the ID registration tool and an ID of each of air pressure sensors of tires of the vehicle is automatically input or automatically produced and set on the basis of the production management data. Moreover, it is also acceptable that a code is produced at random in the tool and a sensor ID is set on the basis of the produced code. In any case, a sensor ID set in the ID registration tool is transmitted from the ID registration tool to each of sensors and a tire pressure monitoring apparatus in one vehicle to be stored therein, thus solving the problem that an ID of an air pressure sensor of a tire of a different vehicle is registered in error.

In this connection, in a case in which the ID registration is made according to the method according to the present invention, considering the vehicle production stages, as the tire air pressure sensor, there may be employed a sensor in which nothing is stored in its ID storage unit or a meaningless code is stored therein. For this reason, the problem of the sensor ID mistaken registration, occurring due to radio interference with a signal transmitted periodically from a tire

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air pressure sensor mounted on a vehicle flowing immediately after the vehicle undergoing the ID registration in a manufacturing line, can naturally be solved.

Although the method according to the present invention may be an easy manner apparently, unlike a conventional technique in which an ID previously registered in the sensor side is transmitted from the sensor by means of the radio transmission and is received in the monitoring apparatus side to be registered therein, since an ID previously set is registered in a sensor and in a monitoring apparatus, it is possible to eliminate the problem incidental to the conventional method at a stroke, thus providing extremely noticeable effects. Moreover, as one example, the employment of a dedicated ID registration tool is proposed for the registration.

In this case, the connections among the ID registration tool, each of the sensors and the monitoring apparatus are made through signal lines so that the ID registration is carried out through these signal lines, thus eliminating the radio interference problem. In addition, in a conventional method using electric wave, since other electric waves, such as aeronautical radio waves, are stronger, it is considered that there is a case the reception of an electric wave from a sensor for the ID registration becomes difficult to disenable the ID registration. However, since the connections among the tool, the sensor and the monitoring apparatus are made through signal lines for the ID registration, such a problem is solvable at a stroke. Still additionally, if the signal lines are correctly connected thereto, for example, in a four-wheel vehicle, in addition to the IDs of the four wheels being registered in the monitoring apparatus side, the ID registration can be done while specifying their positions. This also applies to a case in which the ID registration is carried out through radio transmission instead of the wired transmission and is sufficiently achievable by means of a design, such as enhancing the radio directivity in registering an ID in an air pressure sensor of each tire. Incidentally, as the information transmission medium in the case of the radio ID registration, in addition to the electric wave, infrared ray, ultrasonic wave or the like is also employable. Moreover, as mentioned above, also with the method according to present invention, the ID registration is feasible while recognizing the specified one of the four wheels, without increasing the number of receiving antennas in the monitoring apparatus side, and since each of the tire air pressure sensors has a unique ID, even if only one receiving antenna exists for monitoring the air pressure, a judgment can easily be made as to which of the tires is in what air pressure state. Therefore, likewise, the method according to the present invention enables the use of a simpler apparatus configuration as compared with a system which has presently been put into practical use.

Furthermore, the method according to this aspect of the present invention can exhibit the following effects. For example, as well as the above-described aspect of the invention, let it be assumed that a transmitting unit of an air pressure sensor of any one of tires is broken. In this case, a dealer or a repair shop replaces the air pressure sensor of that tire with new one. At this time, with respect to new air pressure sensor, it is possible that the air pressure sensor ID at the corresponding tire position registered in the tire pressure monitoring apparatus in the vehicle body side is read out through the use of the ID registration tool and is transmitted as a set value to the newly replacing air pressure sensor to be stored therein. In this connection, as a judgment method on a broken sensor, the ID of the sensor from which an air pressure detection signal has not been received within a predetermined period of time when the vehicle is running can be specified through the use of a software or the like on the tire pressure monitoring apparatus side. Accordingly, only the operation for the ID registration in the broken air pressure sensor is required, thus considerably improving the workability. Incidentally, if a rule is made such that the condition of the ID registration at the replacement of a sensor is determined on the basis of some code information, such as a vehicle body number or a production number, peculiar to the vehicle, the ID setting can easily be made by key-inputting the vehicle body number or the like in the ID registration tool or by automatically reading and inputting it through the use of an optical reading unit or the like, without reading out the storage contents on the tire pressure monitoring apparatus side of the vehicle body, thereby further improving the workability.

Still furthermore, as well as the above-described aspect of the invention, in a case in which any one of sensors breaks down and is replaced with a new one, or when a tire bursts and the entire tire is replaced so that the sensor is replaced with another, the method according to the present invention enables the ID re-registration to be implemented with respect to the air pressure sensors of all the tires and the tire pressure monitoring apparatus on the vehicle body side through the use of the ID registration tool in a repair shop. Also in this case, if the ID re-registration is done in the form of including information on the implementation of the re-registration, the history management is feasible with respect to the tires of the vehicle. Moreover, in the case of the tire burst, for further effectiveness, with respect to a tire to be replaced due to the burst, that fact is inputted to the ID registration tool and the ID re-registration is made in the form of including the replacement history information. This additionally enables the tire history management by reading out the registered ID from the tire pressure monitoring apparatus or in the air pressure sensor.

In addition, according to the conventional method, at the ID registration, the tire pressure monitoring apparatus of the vehicle body is set in an ID registration mode and receives an ID signal transmitted periodically (for example, at an interval of 10 minutes) from an air pressure sensor of each of tires to register it as a sensor ID and, hence, the ID registration process takes time. However, with the method according to the present invention, since the ID registration is accomplished by the positive ID transmission from the ID registration tool, it is possible to considerably shorten the time required for the ID registration. That is, the conventional technique waits for the reception of an ID signal-transmitted from a sensor and registers it, whereas, according to the present invention, in the ID registration mode, the ID registration tool positively transmits a sensor ID to register in each sensor and in the monitoring apparatus, thus exhibiting an additional effect of considerably shortening the time needed for the ID registration process.

The above-mentioned various effects also apply not only to the vehicle production process but also to the repair of a vehicle in a dealer or a repair shop.

The above-described method according to the present invention which exhibits the distinguished effects is achievable through the use of the following tire air pressure sensor ID registration apparatus. This tire air pressure sensor ID registration apparatus is made up of a receiver mode switching unit for switching a tire pressure monitoring apparatus, mounted on a vehicle body, into an ID registration mode, a transmitter mode switching unit for switching an air pressure sensor of each of tires, mounted on a vehicle, into an ID registration mode, an ID setting unit for setting a registration ID to be stored in the air pressure sensor, and an ID

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registration tool including an ID transmitting unit for transmitting the set registration ID to the air pressure sensor switched into the ID registration mode by the transmitter mode switching unit and further to the tire pressure monitoring apparatus switched into the ID registration mode by the receiver mode switching unit. This ID registration apparatus can easily realize the method according to the present invention.

In this case, in the tire air pressure sensor ID registration apparatus according to the present invention, the ID registration tool can be connected through signal lines to the air pressure sensor of each of the tires and the tire pressure monitoring apparatus, and the ID to be stored in the air pressure sensor and the tire pressure monitoring apparatus is transmitted thereto through the signal lines. The effects of the signal transmission/reception using the wires are as mentioned above.

In addition, in the tire air pressure sensor ID registration apparatus according to the present invention, the ID registration tool can be made to be connectable to a production management computer, and the ID setting unit can be made to set an ID on the basis of production management information pertaining to each vehicle, such as a vehicle body number or a vehicle production number, given from the production management computer. This configuration enables the sensor ID registration based on the information on the production management peculiar to each vehicle.

Still additionally, for implementing the method according to the present invention, the following ID registration tool for use in a tire pressure monitoring system is employable. This ID registration tool for the tire pressure monitoring system is composed of an ID setting unit for setting a peculiar ID to be stored in an air pressure sensor of each of tires to be mounted on a vehicle and an ID transmitting unit for transmitting the ID, set in the ID setting unit, to the air pressure sensor of each of the tires and further to the tire pressure monitoring apparatus. The employment of this ID registration tool facilitates the realization of the method according to the present invention.

In this case, the ID registration tool for the tire pressure monitoring system according to the present invention can be equipped with signal lines for making connections with respect to the air pressure sensor of each of the tires and the tire pressure monitoring apparatus or a connector for the connections of the signal lines. The effects of the signal transmission/reception using wires are as mentioned above.

Moreover, the ID registration tool for the tire pressure monitoring system can include a trigger signal transmitting unit for transmitting a trigger signal to the air pressure sensor and the tire pressure monitoring apparatus for setting the air pressure sensor and the tire pressure monitoring apparatus in an ID registration mode. At the ID registration, this configuration can switch the air pressure sensor and the tire pressure monitoring apparatus into the ID registration mode through the use of the trigger signal from the ID registration tool. Accordingly, the IF registration tool with this configuration can eliminate the need for the operations such as switch manipulations of the air pressure sensor and the tire pressure monitoring apparatus at the ID registration, thereby improving the working efficiency.

Still moreover, in the ID registration tool for the tire pressure monitoring system, the ID setting unit can be made to include a sensor-peculiar ID producing unit for producing an ID, peculiar to each sensor, on the basis of peculiar vehicle information on production management, such as a vehicle number or a vehicle production number. Alternatively, in the ID registration tool for the tire pressure monitoring system, the ID setting unit can include a random-number generating unit for generating a random number and a sensor-peculiar ID producing unit for producing an ID, peculiar to each sensor, on the basis of the random number generated by the random-number generating unit. In addition, it is also possible that the ID registration tool for the tire pressure monitoring system is made to be connectable to a production management computer, and the ID setting unit can be made to set an ID including a portion of or all of production management information, peculiar to each vehicle, such as a vehicle body number or a vehicle production number, given by the production management computer.

Furthermore, for implementing the method according to the present invention, the following tire air pressure sensor is employable. This tire air pressure sensor is composed of an air pressure detecting unit, an ID storage unit, a transmitting circuit, and a receiving circuit, and when an ID to be stored in the ID storage unit is received through the receiving circuit, the ID is stored in the ID storage unit. That is, although a conventional tire air pressure sensor is not provided with a receiving circuit because of no requirement, for realizing the method according to the present invention, the receiving circuit is essential and, hence, the inventor of this application further invented a novel tire air pressure sensor with the receiving circuit. In this connection, it is also acceptable that the receiving circuit is constructed as a transmitting/receiving circuit integrated with a transmitting circuit, instead of being constructed as a single circuit.

In this case, in the tire air pressure sensor according to the present invention, the receiving circuit can be made to have a circuit arrangement in which the reception of a signal is made through a wired means. The effects of the signal transmission/reception using wires are as mentioned above.

Still furthermore, in the tire air pressure sensor according to the present invention, the ID storage unit can be constructed using a storage element which allows rewriting through overwriting. Thus, in the case of the implementation of the re-registration of a sensor ID in a repair shop or of the ID registration through radio means on a production line, when a sensor ID of the preceding vehicle is registered in the next vehicle on the production line, the registration of the normal sensor ID can easily be done at the ID registration in this next vehicle.

For realizing the method according to the present invention, an air pressure sensor mounted tire is equipped with the above-mentioned tire air pressure sensor according to the invention.

In addition, a tire pressure monitoring apparatus according to the present invention is made up of a signal line connecting unit for making a connection through a signal line to a predetermined ID registration tool, an ID registration mode activating unit for activating an ID registration mode, a tire position judging unit for making a judgment on a tire position on the basis of registration ID data received through the signal line in a state where the ID registration mode is activated, an ID registration unit for registering an ID of each of air pressure sensors in the form of specifying a tire position on the basis of a result of the judgment in the tire position judging unit, a re-registration judging unit for making a judgment on the basis of a command received from the ID registration tool as to whether or not the present registration is re-registration, and a re-registration unit for, when the judgment in the re-registration judging unit indicates the re-registration, re-registering an air pressure sensor ID in a memory on the basis of a result of the judgment in the tire position judging unit so that an ID already registered

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with respect to an air pressure sensor existing at the tire position undergoing the tire position judgment is effectively replaced with the air pressure sensor ID.

With this tire pressure monitoring apparatus according to the present invention, the sensor ID is based on a registration ID received from the ID registration tool through the signal line connecting unit and, hence, the mistaken registration due to the radio interference or the like is preventable. Moreover, at the ID registration, the tire position judging means makes a judgment on a tire position on the basis of the registration ID data, and on the basis of the judgment result, the ID registration unit makes the registration of the sensor ID to permit specifying the tire position. Accordingly, it is possible to easily carry out the monitoring of the tire air pressure while specifying the tire position, which offers the effects of eliminating the need for an increase in number of antennas. Moreover, if the re-registration judging unit makes a judgment that it is the re-registration, the ID re-registration unit re-registers an air pressure sensor ID in the memory so as to substitute it effectively for the already registered ID of an air pressure sensor at the subject tire position. Accordingly, for example, in a case in which only a portion of tires or sensors is replaced, the re-registration operation can be done with respect to only the replacing tire. Incidentally, as the employable registration methods for the effective replacement, for example, there are 1) the subject already registered ID being overwritten by a registration ID newly received and 2) the subject already registered ID being made void through the use of a flag so that a registration ID newly received is separately registered. In addition, in the case of the initial registration or the rotation, the tire position judging unit can also make a judgment on the tire position on the basis of the order of the data reception.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and features of the present invention will become more readily apparent from the following detailed description of the preferred embodiments taken in conjunction with the accompanying drawings in which:

FIG. **1** is a block diagram showing a configuration of a tire pressure monitoring system according to a first embodiment of the present invention;

FIG. **2** is an illustrative view showing a configuration of an apparatus for ID registration according to the first embodiment;

FIG. **3** is a flow chart showing an ID registration procedure according to the first embodiment;

FIG. **4** is a flow chart showing the contents of control processing in an ID registration tool for realizing the ID registration procedure shown in FIG. **3**;

FIG. **5** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **3**;

FIG. **6** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **3**;

FIG. **7** is a flow chart showing the contents of control processing in an tire pressure monitoring apparatus for realizing the ID registration procedure shown in FIG. **3**;

FIG. **8** is a flow chart showing the contents of control processing in an tire pressure monitoring apparatus for realizing the ID registration procedure shown in FIG. **3**;

FIG. **9** is an illustrative view showing a configuration of an apparatus for ID registration according to a second embodiment of the present invention;

FIG. **10** is a plan view showing a management sheet to be used in the second embodiment;

FIG. **11** is a flow chart showing an ID registration procedure according to the second embodiment;

FIG. **12** is a plan view showing a re-registration management sheet to be used in the second embodiment;

FIG. **13** is a flow chart showing the contents of control processing in an ID registration tool for realizing the ID registration procedure shown in FIG. **11**;

FIG. **14** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **11**;

FIG. **15** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **11**;

FIG. **16** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **11**;

FIG. **17** is a flow chart showing the contents of control processing in a tire pressure monitoring apparatus for realizing the ID registration procedure shown in FIG. **11**;

FIG. **18** is a flow chart showing the contents of the control processing in the tire pressure monitoring apparatus for realizing the ID registration procedure shown in FIG. **11**;

FIG. **19** is a flow chart showing the contents of control processing in an air pressure sensor for realizing the ID registration procedure shown in FIG. **11**;

FIG. **20** is a flow chart showing an ID registration procedure according to a third embodiment of the present invention;

FIG. **21** is a flow chart showing the contents of control processing in an ID registration tool for realizing the ID registration procedure shown in FIG. **20**;

FIG. **22** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **20**;

FIG. **23** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **20**;

FIG. **24** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **20**;

FIG. **25** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **20**;

FIG. **26** is a flow chart showing the contents of control processing in a tire pressure monitoring apparatus for realizing the ID registration procedure shown in FIG. **20**;

FIG. **27** is a flow chart showing the contents of the control processing in the tire pressure monitoring apparatus for realizing the ID registration procedure shown in FIG. **20**;

FIG. **28** is a flow chart showing the contents of control processing in an air pressure sensor for realizing the ID registration procedure shown in FIG. **20**;

FIG. **29** is a plan view showing examples of optically-readable information;

FIG. **30** is a plan view showing examples of optically-readable information;

FIG. **31** is a plan view showing examples of optically-readable information;

FIG. **32** is a plan view showing examples of optically-readable information;

FIG. **33** is an illustrative view showing an apparatus configuration for ID registration according to a fourth embodiment of the present invention;

FIG. **34** is a flow chart showing an ID registration procedure according to the fourth embodiment;

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FIG. **35** is a flow chart showing the contents of control processing in an ID registration tool for realizing the ID registration procedure shown in FIG. **34**;

FIG. **36** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **34**;

FIG. **37** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **34**;

FIG. **38** is a flow chart showing the contents of the control processing in the ID registration tool for realizing the ID registration procedure shown in FIG. **34**;

FIG. **39** is a flow chart showing the contents of control processing in a tire air pressure sensor for realizing the ID registration procedure shown in FIG. **34**;

FIG. **40** is a flow chart showing the contents of control processing in an ID registration tool according to a fifth embodiment of the present invention;

FIG. **41** is a flow chart showing the contents of the control processing in the ID registration tool according to the fifth embodiment;

FIG. **42** is a flow chart showing the contents of the control processing in the ID registration tool according to the fifth embodiment;

FIG. **43** is a flow chart showing the contents of control processing in an ID registration tool according to a sixth embodiment of the present invention;

FIG. **44** is a flow chart showing the contents of the control processing in the ID registration tool according to the sixth embodiment;

FIG. **45** is a flow chart showing the contents of the control processing in the ID registration tool according to the sixth embodiment;

FIG. **46** is a flow chart showing the contents of control processing in an ID registration tool according to a seventh embodiment of the present invention;

FIG. **47** is a flow chart showing the contents of the control processing in the ID registration tool according to the seventh embodiment;

FIG. **48** is a flow chart showing the contents of the control processing in the ID registration tool according to the seventh embodiment;

FIG. **49** is an illustrative view showing an apparatus configuration for ID registration according to an eighth embodiment of the present invention;

FIG. **50** is a flow chart showing an ID registration procedure according to the eighth embodiment;

FIG. **51** is a flow chart showing the contents of control processing in an ID registration tool according to the eighth embodiment;

FIG. **52** is a flow chart showing the contents of the control processing in the ID registration tool according to the eighth embodiment;

FIG. **53** is a flow chart showing the contents of the control processing in the ID registration tool according to the eighth embodiment;

FIG. **54** is a flow chart showing the contents of control processing in an ID registration tool according to a ninth embodiment of the present invention;

FIG. **55** is a flow chart showing the contents of the control processing in the ID registration tool according to the ninth embodiment;

FIG. **56** is a flow chart showing the contents of control processing in a tire pressure monitoring apparatus according to the ninth embodiment;

FIG. **57** is a flow chart showing an ID registration procedure according to a tenth embodiment of the present invention;

FIG. **58** is a flow chart showing the ID registration procedure according to the tenth embodiment;

FIG. **59** is a flow chart showing the contents of control processing in an ID registration tool according to the tenth embodiment;

FIG. **60** is a flow chart showing the contents of the control processing in the ID registration tool according to the tenth embodiment;

FIG. **61** is a flow chart showing the contents of the control processing in the ID registration tool according to the tenth embodiment;

FIG. **62** is a flow chart showing the contents of the control processing in the ID registration tool according to the tenth embodiment;

FIG. **63** is a flow chart showing the contents of the control processing in the ID registration tool according to the tenth embodiment;

FIG. **64** is a flow chart showing the contents of the control processing in the ID registration tool according to the tenth embodiment;

FIG. **65** is a flow chart showing the contents of the control processing in the ID registration tool according to the tenth embodiment;

FIG. **66** is a flow chart showing the contents of control processing in a tire air pressure sensor according to the tenth embodiment;

FIG. **67** is a flow chart showing the contents of control processing in an ID registration tool according to an eleventh embodiment of the present invention;

FIG. **68** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **69** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **70** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **71** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **72** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **73** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **74** is a flow chart showing the contents of the control processing in the ID registration tool according to the eleventh embodiment;

FIG. **75** is a flow chart showing the contents of control processing in a tire pressure monitoring apparatus according to the eleventh embodiment;

FIG. **76** is a flow chart showing the contents of the control processing in the tire pressure monitoring apparatus according to the eleventh embodiment;

FIG. **77** is a flow chart showing the contents of the control processing in the tire pressure monitoring apparatus according to the eleventh embodiment;

FIG. **78** is a block diagram showing a configuration of a conventional tire pressure monitoring system; and

FIG. **79** is a flow chart showing an ID registration procedure in the conventional system.

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DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described hereinbelow with reference to the drawings.

First Embodiment

FIG. **1** is a block diagram schematically showing a configuration of a tire pressure monitoring system according to a first embodiment of the present invention. As FIG. **1** shows, the tire pressure monitoring system according to this embodiment is made up of air pressure sensors **10**, **20**, **30** and **40** mounted on tires and a tire pressure monitoring apparatus **50** mounted on a body of a vehicle. The air pressure sensor **10** is composed of a pressure sensor **11** for detecting an air pressure in the interior of a tire, an ID memory **12** for storing a sensor ID in advance, a transmitting circuit **13**, a power supply battery **14**, a control unit **15** and a transmitting antenna **16**. The other air pressure sensors **20**, **30** and **40** have the same configuration.

On the other hand, the tire pressure monitoring apparatus **50** is composed of a receiving circuit **51**, a receiving antenna **52**, a power supply circuit **53**, a control unit **54**, a memory **55**, and a communication circuit **56** for transmitting indication data to an indicating device **81** such as an indicator or LED. This communication circuit **56** is also designed to receive a signal representative of an indication state and others from the indicating device **81**. The power supply to the tire pressure monitoring apparatus **50** is made from a vehicle-mounted battery **82**.

The ID memories **12**, **22**, **32** and **42** of the air pressure sensors **10**, **20**, **30** and **40** store the corresponding IDs (**123456**, **234567**, **345678**, **45678**), respectively. In the tire pressure monitoring system according to this embodiment, the ID of each air pressure sensor is required to be registered in the memory **55** of the tire pressure monitoring apparatus **50**. Therefore, as shown in FIG. **2**, bar codes **5**, **6**, **7** and **8** representative of the IDs of the air pressure sensors **10**, **20**, **30** and **40** are adhered onto wheels **1***a*, **2***a*, **3***a* and **4***a* of tires **1**, **2**, **3**, and **4**. In this embodiment, an ID registration tool **60** is used in order to read the IDs from these bar codes **5**, **6**, **7** and **8** for writing them in the tire pressure monitoring apparatus **50**.

The ID registration tool **60** is composed of a bar-code reading unit **61** and an ID transmitting unit **62** for transmitting the IDs, read by the bar-code reading unit **61**, to the tire pressure monitoring apparatus **50**. Moreover, the ID registration tool **60** is equipped with a connector **64** for the connection of a signal line **63** for making a connection with respect to the tire pressure monitoring apparatus **50**. Incidentally, the signal line **63** has a crocodile clip its tip portion which allows the connection of the signal line **63** to a signal line **57** extending from the communication circuit **56** of the tire pressure monitoring apparatus **50** to the indicating device **81**.

In addition, the ID registration tool **60** includes a control unit **65**, a memory **66**, a power supply battery **67**, a control panel **68** and a display **69**. The control unit **65** is for implementing various processing through the use of the ID registration tool **60**, and comprises a microcomputer including a CPU, ROM, a RAM and other components. The memory **66** comprises a rewritable EEPROM, flash memory, DRAM, or the like. As the power supply battery **67**, there is used a dry cell, a button-like cell, or the like. The control panel **68** has control keys for indicating the contents of processing to be implemented through the use of the ID registration tool **60**. The display **69** is for indicating a numeral of the bar code read by the bar-code reading unit **61**, or for displaying a control mode of the ID registration tool **60**, and for example, comprises an LCD.

Secondly, a description will be given hereinbelow of a method of registering the IDs of the air pressure sensors **10**, **20**, **30** and **40** in the tire pressure monitoring apparatus **50**. For implementing this method, the signal line **63** of the ID registration tool **60** is connected to the connector **64** and the crocodile clip at the tip portion of the signal line **63** is connected to the signal line **57** extending from the communication circuit **56** of the tire pressure monitoring apparatus **50** to the indicating device **81**. The registration operation is made according to a procedure described below.

In the registration operation, as shown in a flow chart of FIG. **3**, first, the monitoring apparatus **50** is switched into an ID registration mode (S**10**), and a decision is made as to whether or not it is the initial registration (S**20**). In the case of the initial registration (S**20**: YES), the IDs are read from the bar codes **5**, **6**, **7** and **8** through the use of the ID registration tool **60** (S**30**), and are transmitted from the ID registration tool **60** to the tire pressure monitoring apparatus **50** (S**40**). The tire pressure monitoring apparatus **50** registers the received IDs in the memory **55** (S**50**). Moreover, it makes a decision as to whether or not the necessary number of IDs are put in its memory **55** (S**60**). If the registration of the necessary number of IDs does not reach completion (S**60**: NO), the step S**40** and subsequent steps are implemented repeatedly. If the registration of the necessary number of IDs has reached completion (S**60**: YES), the monitoring apparatus **50** is switched into a normal mode, then terminating the ID registration operation (S**70**).

On the other hand, in the case of no initial registration, that is, for example, in a case in which a tire(s) is replaced in a repair shop or the like (S**20**: NO), the ID is read out from the bar code adhered onto the detached tire through the use of the ID registration tool **60** (S**80**), and is transmitted from the ID registration tool **60** to the tire pressure monitoring apparatus **50** (S**90**). Upon receipt of this ID, the tire pressure monitoring apparatus **50** deletes an ID corresponding to the received ID from the memory **55** (S**100**). Subsequently, an ID is read out from a bar code adhered onto a tire to be attached newly, through the use of the ID registration tool **60** (S**110**), and is transmitted from the ID registration tool **60** to the tire pressure monitoring apparatus **50** (S**120**). The tire pressure monitoring apparatus **50** registers the received ID in the memory **55** (S**130**). Following this, a decision is made as to whether or not the ID re-registration in the tire pressure monitoring apparatus **50** reaches completion (S**140**). If the ID re-registration does not come to an end (S**140**: NO), the step S**80** and subsequent steps are executed repeatedly. On the other hand, if the ID registration of the necessary number of IDs reaches completion (S**140**: YES), the monitoring apparatus **50** is switched into a normal mode (S**70**), and the ID registration operation comes to an end.

Furthermore, referring to flow charts of FIGS. **4** to **6**, a description will be given hereinbelow of the contents of a program installed in the ID registration tool **60** for the implementation of the above-mentioned registration operation. The following program starts by pushing a predetermined button on the control panel **68** of the ID registration tool **60**. In this program, first of all, a trigger signal is transmitted to place the tire pressure monitoring apparatus **50** into an ID registration mode (S**210**), and after a manipulation of the control panel **68**, a decision is then made as to whether or not it is the initial registration in the tire pressure monitoring apparatus **50** (S**220**).

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In the case of the initial registration (S220: NO), a readout instruction message on a bar code of a front left tire of a vehicle is displayed on the display **69** (S230), and a decision is made on whether or not the readout reaches completion (S240). If the decision shows the completion of the readout (S240: YES), the readout result in a state associated with the tire position (front left) is stored in the memory **66** (S250). Moreover, a readout instruction message on the bar code of the rear left tire is displayed (S260), and a decision is made as to whether or not the readout reaches completion (S270). If the decision shows that the readout reaches completion (S270: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear left) (S280). Still moreover, a readout instruction message on the bar code of the rear right tire is displayed (S290), and a decision is made as to whether or not the readout reaches completion (S300). If the decision indicates that the readout reaches completion (S300: YES), the readout result in a state associated with the tire position (rear right) is stored in the memory **66** (S310). Yet moreover, a readout instruction message on the bar code of the front right tire is displayed (S320), and a decision is made as to whether or not the readout reaches completion (S330). If the decision indicates the completion of the readout therefrom (S330: YES), the readout result is put in the memory **66** in a state associated with the tire position (front right) (S340).

Thereafter, the ID corresponding to the air pressure sensor of the front left tire is first read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (S350), and an instruction command for ID registration is transmitted to the tire pressure monitoring apparatus **50** (S360). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (S370). In a case in which the reply does not come within a predetermined period of time (S370: NO), the operational flow returns to the step S350. On the other hand, in the case of the arrival of the reply indicative of the completion of the registration (S370: YES), the ID corresponding to the air pressure sensor of the rear left tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50**(S380). Moreover, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (S390), and a decision is made as to whether or not a replay indicative of the registration completion comes from the tire pressure monitoring apparatus **50** (S400). If the relay does not come within a predetermined period of time (S400: NO), the operational flow returns to the step S380. On the other hand, in the case of the arrival of the replay indicative of the registration completion (S400: YES), the ID corresponding to the air pressure sensor of the rear right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (S410). Still moreover, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (S420), and a decision is made as to whether or not a reply indicative of the registration completion comes from the tire pressure monitoring apparatus **50** (S430). If the reply does not come within a predetermined period of time (S430: NO), the operational flow returns to the step S410. On the other hand, in the case of the arrival of the reply indicative of the registration completion (S430: YES), the ID corresponding to the air pressure sensor of the front right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (S440). Yet moreover, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (S450), and a decision is made as to whether or not a reply indicative of the registration completion comes from the tire pressure monitoring apparatus **50** (S460). If the reply does not come within a predetermined period of time (S460: NO), the operational flow returns to the step S440. On the other hand, in the case of the arrival of the reply indicative of the registration completion (S460: YES), a trigger signal calling for the restoration (return) to the normal mode is outputted to the tire pressure monitoring apparatus **50**, before terminating the processing (S470).

Meanwhile, in the case other than the initial registration, that is, in the case of the occurrence of re-registration related to the tire replacement (S220: YES), an instruction message on the readout from the bar code of the detached tire is displayed on the display **69** (S480), and a decision is made as to whether or not the readout comes to an end (S490). If the decision indicates the completion of the readout (S490: YES), the readout result is stored in the memory **66** (S500). Moreover, the ID stored in S500 is read out from the memory **66** and is transmitted to the monitoring apparatus **50**(S510). Subsequently, an instruction command for ID deletion is transmitted to the tire pressure monitoring apparatus **50** (S520), and a decision is made as to whether or not a reply indicative of the completion of the deletion comes from the tire pressure monitoring apparatus **50** (S530). If the reply does not within a predetermined period of time (S530: NO), the operational flow returns to the step S510. On the other hand, in the case of the arrival of the reply indicative of the deletion completion (S530: YES), an instruction message to the effect of reading a bar code of a tire to be attached newly is put on the display **69** (S540), and a decision is made on whether or not the readout from the bar code reaches completion (S550). If the decision indicates the completion of the readout (S550: YES), the readout result is put in the memory **66** (S560). Subsequently, the ID stored in S540 is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (S570). Moreover, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (S580), and a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (S590). If the relay does not come within a predetermined period of time (S590: NO), the operational flow returns to the step S570. On the other hand, in the case of the arrival of the reply indicative of the registration completion (S590: YES), an inquiry message as to whether or not there is another tire to be subjected to the re-registration is displayed on the display **69**, and the control waits for a result of a panel manipulation (S600, S610). If input of an instruction indicative of the presence of another tire to be re-registered takes place through the panel manipulation (S610: YES), the step **480** and subsequent processing are implemented repeatedly. On the other hand, in the case of the occurrence of instruction input indicative of the completion of the re-registration (S610: NO), a trigger signal indicating the restoration to the normal mode is outputted to the tire pressure monitoring apparatus **50**, before terminating the processing (S470).

Furthermore, a description will be given hereinbelow of the contents of control processing to be executed in the tire pressure monitoring apparatus **50**. In this control processing, as shown in FIGS. **7** and **8**, first of all, a decision is made as to whether or not the reception of a trigger signal calling for the switching into an ID registration mode takes place (S700). In the case of the reception of the trigger signal indicating the switching into the ID registration mode (S700: YES), the switching into the ID registration mode is carried

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out (S710), and a decision is made as to whether or not the reception of the ID takes place (S720). In the case of the ID reception (S720: YES), this ID is temporarily stored in a work area of the RAM (S730). Moreover, a decision is made as to which of the ID registration instruction and the ID deletion instruction is received (S740). In the case of the reception of the ID registration instruction (S740: Registration), the ID temporarily stored in S730 is registered as the ID of the air pressure sensor of the front left tire in the memory 55 (S750), and a reply indicative of the ID registration completion is then made (S760). Subsequently, a decision is made as to whether the reception of an ID takes place or not (S770). In the case of the ID reception (S770: YES), this ID is temporarily stored in a work area of the RAM (S780). Moreover, a decision is made about the reception of an ID registration instruction (S790). In the case of the reception of the ID registration instruction (S790: YES), the ID stored in S780 is registered as the ID of the air pressure sensor of the rear left tire in the memory 55 (S800), and a reply indicative of the ID registration completion is made (S810). Still moreover, a decision is made about the reception of an ID (S820). In the case of the ID reception (S820: YES), this ID is temporarily stored in a work area of the RAM (S830). Yet moreover, a decision is made as to the reception of an ID registration instruction (S840). In the case of the reception of the ID registration instruction (S840: YES), the ID temporarily stored in S830 is registered as the ID of the air pressure sensor of the rear right tire in the memory 55 (S850), and a reply indicative of the ID registration completion is made (S860). In addition, a decision is made on the reception of an ID (S870). For the reception of the ID (S870: YES), this ID is temporarily stored in a work area of the RAM (S880). Subsequently, a decision is made about the reception of an ID registration instruction (S890). For the reception of the ID registration instruction (S890: YES), the ID temporarily stored in S880 is registered as the ID of the air pressure sensor of the front right tire in the memory 55 (S900), and a reply indicative of the ID registration completion is carried out (S910). Following this, a decision is made about the reception of a trigger signal to the effect that the mode is switched into the normal mode (S920). If received is the trigger signal calling for the switching into the normal mode (S920: YES), the switching into the normal mode is made (S930), and then the processing comes to an end.

On the other hand, after the ID is received in S720 and is temporarily stored in the RAM in S730, if the reception of an ID deletion instruction takes place (S740: deletion), the same ID as the ID temporarily stored in S730 is removed from the memory 55 (S940), and a reply is made which is indicative of the ID deletion completion (S950). Subsequently, a decision is made about the reception of an ID (S960). For the reception of the ID (S960: YES), this ID is temporarily stored in a work area of the RAM (S970). Following this, a decision is made about the reception of an ID registration instruction (S980). For the reception of the ID registration instruction (S980: YES), the ID temporarily stored in S970 is registered in the memory 55 as the ID of the air pressure sensor of the tire at the position corresponding to the ID deleted in S940 (S990), and a reply indicative of the ID registration completion is made (S1000). Thereafter, a decision is made as to whether received is a trigger signal calling for the switching into the normal mode or a new ID (S1010, S1020). In the case of the reception of the new ID (S1010: No, S1020: YES), this ID is temporarily stored in a work area of the RAM (S1030). Moreover, a decision is made on the reception of an ID deletion instruction (S1040). In the case of the reception of the ID deletion instruction (S1040: YES), the operational flow proceeds to the step S940 and subsequent processing. On the other hand, if the decision in S1010 shows the reception of the trigger signal indicting the switching into the normal mode, the operational flow advances to the step S930, where the switching into the normal mode is made, and the processing then comes to an end.

The above-described control processing is conducted in the ID registration tool 60 and the tire pressure monitoring apparatus 50 and, as a result, at the initial registration, the air pressure sensor IDs can be registered in a state associated with the tire positions: front left, rear left, rear right and front right. At this time, mistaken registration due to radio interference or the registration-impossible state due to other electric waves does not occur, unlike the conventional technique. In addition, at the tire replacement or at the tire rotation, through the above-described control processing, the sensor IDs can be registered in a state associated with the tire positions after the replacement. In the case of the tire replacement, the re-registration operation can be conducted with respect to only the replacement tire, thus achieving the reduction of the number of steps. Still additionally, also in the case of rotation, the ID re-registration reflecting a change of position is feasible. Yet additionally, also in this re-registration operation, the problem of the mistaken registration due to the radio interference is solvable.

Second Embodiment

Secondly, a description will be given hereinbelow of a second embodiment of the present invention. In the second embodiment, as shown in FIG. 9, an ID registration tool 60 is connected to a tire pressure monitoring apparatus 50 and further to tire air pressure sensors 10, 20, 30 and 40 through signal lines 63*a*, 63*b*, 63*c* and 63*d*, respectively. The ID registration tool 60 is equipped with connectors 64*a*, 64*b*, 64*c* and 64*d* for connecting these signal lines 63*a*, 63*b*, 63*c* and 63*d* to the tool body. Moreover, each of these signal lines 63*a*, 63*b*, 63*c* and 63*d* has a crocodile clip at its tip portion to be connectable to antennas 16, 26, 36 and 46 of the respective sensors 10, 20, 30 and 40. Still moreover, the sensors 10, 20, 30 and 40 respectively include transmitting/receiving circuits 13*a*, 23*a*, 33*a* and 43*a* made to enable not only the transmission but also the reception. Therefore, the antennas 16, 26, 36 and 46 are also made to perform not only the transmission but also the reception. In addition, the antennas 16, 26, 36 and 46 also act as a connector of a valve for injecting air into tires. Still additionally, ID memories 12, 22, 32 and 42 of the air pressure sensors 10, 20, 30 and 40 may be a non-volatile storage element, such as EEPROM, which allows the rewriting of data by overwriting.

In the second embodiment, as shown in FIG. 10, registration IDs are given in the form of a management sheet 90 for each vehicle. In this management sheet 90, the registration IDs for each vehicle are indicated by bar codes 91FL, 91RL, 91RR and 91FR. The registration operation is conducted in accordance with the following procedure.

For the registration operation, the signal lines 63, 63*a*, 63*b*, 63*c* and 63*d* of the ID registration tool 60 are connected to the respective sensors 10, 20, 30, 40 and the monitoring apparatus 50, and the operation is implemented in accordance with a procedure shown in FIG. 11. First of all, the respective sensors 10, 20, 30, 40 and the monitoring apparatus 50 are switched into an ID registration mode (S1110). Subsequently, a decision is made as to whether or not it is the initial registration (S1120). In the case of the initial

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registration (S1120: YES), the bar codes **91**FL, **91**RL, **91**RR and **91**FR on the management sheet **90** are read through the use of the ID registration tool **60** (S1130). The IDs read out from these bar codes **91**FL, **91**RL, **91**RR and **91**FR are transmitted from the ID registration tool **60** to the respective air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** (S1140). The respective air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** register the received IDs in ID memories **12**, **22**, **32**, **42** and in a memory **55** (S1150).

At this time, the signal lines **63***a*, **63***b*, **63***c* and **63***d* are correctly connected to the air pressure sensors **10**, **20**, **30** and **40** and the readout by the ID registration tool **60** is made in the order of the bar code **91**FL, the bar code **91**RL, the bar code **91**RR and the bar code **91**FR so that the ID indicated by the bar code **91**FL is registered in the air pressure sensor **10**, the ID indicated by the bar code **91**RL is registered in the air pressure sensor **20**, the ID of the bar code **91**RR is put in the air pressure sensor **30**, and the ID of the bar code **91**FR is put in the air pressure sensor **40**. Moreover, in the memory **55** of the monitoring apparatus **50**, the ID of the bar code **91**FL is registered as that of the front left tire, the ID of the bar code **91**RL is registered as that of the rear left tire, the ID of the bar code **91**RR is placed as that of the rear right tire, and the ID of the bar code **91**FR is placed as that of the front right tire.

When the initial ID registrations in the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** reach completion in this way, the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** are switched into a normal mode (S1160), and the ID registration operation comes to an end.

On the other hand, if it is not the initial registration, that is, in the case of the replacement of a tire in a repair shop or the like (S1120: YES), the ID registration tool **60** reads bar codes **91**FL', **91**RL', **91**RR' and **91**FR' on a re-registration management sheet **90**' shown in FIG. **12** (S1170). The IDs read out from these bar codes **91**FL', **91**RL', **91**RR' and **91**FR' are transmitted from the ID registration tool **60** to the respective air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** (S1180).

In the case of rotation, the signal line **63***a* is connected to the air pressure sensor of the front left tire after the rotation, the signal line **63***b* is connected to the air pressure sensor of the rear left tire after the rotation, the signal line **63***c* is connected to the air pressure sensor of the rear right tire after the rotation, and the signal line **63***d* is connected to the air pressure sensor of the front right tire after the rotation. Moreover, in the case of the tire replacement, a signal line is connected to an air pressure sensor of a tire, being mounted newly, in accordance with the mounting position. That is, the signal line **63***a* is connected to the new tire air pressure sensor for the front left position, the signal line **63***b* is connected thereto for the rear left, the signal line **63***c* is connected thereto for the rear right, and the signal line **63***d* is connected thereto for the front right. Likewise, with respect to the air pressure sensors of the tires which do not undergo the replacement, the signal line **63***a* is connected for the front left, the signal line **63***b* for the rear left, the signal line **63***c* for the rear right, and the signal line **63***d* for the front right.

In the respective air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50**, the received ID is overwritten in the ID memories **12**, **22**, **32**, **42** and the memory **55** for the re-registration, thereby implementing the ID updating (S1190).

Also in this case, the ID registration tool **60** implements the readout in the order of the bar code **91**FL', the bar code **91**RL', the bar code **91**RR' and the bar code **91**FR', after the rotation or the tire replacement, the ID of the bar code **91**FL' is registered in the front left air pressure sensor **10**, the ID of the bar code **91**RL' in the rear left air pressure sensor **20**, the ID of the bar code **91**RR' in the rear right air pressure sensor **30**, and the ID of the bar code **91**FR' in the front right air pressure sensor **40**. Moreover, in the memory **55** of the monitoring apparatus **50**, the ID of the bar code **91**FL' is registered as that of the front left tire, the ID of the bar code **91**RL' as that of the rear left tire, the ID of the bar code **91**RR' as that of the rear right tire, and the ID of the bar code **91**FR' as that of the front right tire.

In this way, after the completion of the re-registration of the IDs in the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50**, the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** are switched into a normal mode (S160), and the ID registration operation comes to an end.

Furthermore, referring to flow charts of FIGS. **13** to **16**, a description will be given hereinbelow of the contents of a program installed in the ID registration tool **60** for the above-described registration operation. The following program starts by pressing a predetermined button of the control panel **68** of the ID registration tool **60**. In this program, first of all, a trigger signal is transmitted for the purpose of placing the air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** into an ID registration mode (S1210). Then, a decision is made as to whether or not it is the initial registration after a manipulation of the control panel **68** (S1220).

In the case of the initial registration (S1220: YES), an instruction message on the readout of the bar code **91**FL of the registration sheet **90** is displayed on the display **69** (S1230), and a decision is made as to the completion of the readout (S1240). If the decision shows the completion of the readout (S1240: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front left) (S1250). Subsequently, an instruction message on the readout of the bar code **91**RL of the registration sheet **90** is displayed thereon (S1260), and a decision is made as to the completion of the readout (S1270). If the decision shows the completion of the readout (S1270: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear left) (S1280). Moreover, an instruction message on the readout of the bar code **91**RR thereof is displayed thereon (S1290), and a decision is made as to the completion of the readout (S1300). If the decision shows the completion of the readout (S1300: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear right) (S1310). Still moreover, an instruction message on the readout of the bar code **91**FR thereof is displayed thereon (S1320), and a decision is made as to the completion of the readout (S1330). If the decision shows the completion of the readout (S1330: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front right) (S1340).

Following this, the ID corresponding to the air pressure sensor of the front left tire is first read out from the memory **66** and is transmitted to the air pressure sensor **10** and the tire pressure monitoring apparatus **50** (S1350), and an instruction command for the ID registration is transmitted to the air pressure sensor **10** and the tire pressure monitoring apparatus **50**(S1360). A decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** and the tire pressure moni-

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toring apparatus **50**(S1370). If the reply does not come within a predetermined period of time (S1370:NO), the operational flow returns to the step S1350. On the other hand, if the registration completion reply comes (S1370: YES), the ID corresponding to the air pressure sensor of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** and the monitoring apparatus **50** (S1380), and an instruction command for the ID registration is then transmitted to the air pressure sensor **20** and the monitoring apparatus **50**(S1390). A decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** and the tire pressure monitoring apparatus **50** (S1400). If the reply does not come within a predetermined period of time (S1400:NO), the operational flow returns to the step S1380. On the other hand, if the registration completion reply comes (S1400: YES), the ID corresponding to the air pressure sensor of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** and the monitoring apparatus **50** (S1410), and an instruction command for the ID registration is then transmitted to the air pressure sensor **30** and the monitoring apparatus **50** (S1420). A decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **30** and the tire pressure monitoring apparatus **50** (S1430). If the reply does not come within a predetermined period of time (S1430:NO), the operational flow returns to the step S1410. On the other hand, if the registration completion reply comes (S1430: YES), the ID corresponding to the air pressure sensor of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** and the monitoring apparatus **50** (S1440), and an instruction command for the ID registration is then transmitted to the air pressure sensor **40** and the monitoring apparatus **50**(S1450). A decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **40** and the tire pressure monitoring apparatus **50** (S1460). If the reply does not come within a predetermined period of time (S1460: NO), the operational flow returns to the step S1440. On the other hand, if the registration completion reply comes (S1460: YES), a trigger signal calling for the restoration to the normal mode is outputted to the air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** (S1470), and the processing comes to an end.

Furthermore, if it is not the initial registration, that is, in the case of the re-registration due to the tire replacement (S1220: YES), an instruction message on the readout of the bar code **91**FL' indicated on the re-registration sheet **90**' is displayed on the display **69** (S1530), and a decision is made as to the completion of the readout (S1540). If the decision shows the completion of the readout (S1540: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front left) (S1550). Subsequently, an instruction message on the readout of the bar code **91**RL' thereon is displayed (S1560), and a decision is made as to the completion of the readout (S1570). If the decision shows the completion of the readout (S1570: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear left) (S1580). Moreover, an instruction message on the readout of the bar code **91**RR' thereon is displayed (S1590), and a decision is made as to the completion of the readout (S1600). If the decision shows the completion of the readout (S1600: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear right) (S1610). Still moreover, an instruction message on the readout of the bar code **91**FR' thereon is displayed (S1620), and a decision is made as to the completion of the readout (S1630). If the decision shows the completion of the readout (S1630: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front right) (S1640).

Following this, the ID corresponding to the air pressure sensor of the front left tire is read out from the memory **66** and is transmitted to the air pressure sensor **10** and the tire pressure monitoring apparatus **50** (S1650), and an instruction command for the ID re-registration is then transmitted to the air pressure sensor **10** and the monitoring apparatus **50** (S1660). A decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor **10** and the monitoring apparatus **50** (S1670). If the reply does not come within a predetermined period of time (S1670: NO), the operational flow returns to the step S1650. On the other hand, if the registration completion reply comes (S1670: YES), the ID corresponding to the air pressure sensor of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** and the monitoring apparatus **50** (S1680). An instruction command for the ID re-registration is then transmitted to the air pressure sensor **20** and the monitoring apparatus **50** (S1690). A decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor **20** and the monitoring apparatus **50** (S1700). If the reply does not come within a predetermined period of time (S1700: NO), the operational flow returns to the step S1680. On the other hand, if the registration completion reply comes (S1700: YES), the ID corresponding to the air pressure sensor of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** and the monitoring apparatus **50** (S1710). An instruction command for the ID re-registration is then transmitted to the air pressure sensor **30** and the monitoring apparatus **50** (S1720). A decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor **30** and the monitoring apparatus **50** (S1730). If the reply does not come within a predetermined period of time (S1730: NO), the operational flow returns to the step S1710. On the other hand, if the registration completion reply comes (S1730: YES), the ID corresponding to the air pressure sensor of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** and the monitoring apparatus **50** (S1740). An instruction command for the ID re-registration is then transmitted to the air pressure sensor **40** and the monitoring apparatus **50** (S1750). A decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor **40** and the monitoring apparatus **50** (S1760). If the reply does not come within a predetermined period of time (S1760: NO), the operational flow returns to the step S1740. On the other hand, if the registration completion reply comes (S1760: YES), a trigger signal calling for the restoration to the normal mode is outputted to the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** (S1470), and the processing comes to an end.

Furthermore, a description will be given hereinbelow of the contents of control processing to be conducted in the tire pressure monitoring apparatus **50**. In this control processing, as shown in FIGS. **17** and **18**, first of all, a decision is made as to whether or not the reception of a trigger signal calling for the switching into an ID registration mode takes place (S1800). In the case of the reception of the trigger signal indicating the switching into the ID registration mode (S1800: YES), the switching into the ID registration mode is carried out (S1810), and a decision is made as to whether or

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not the reception of an ID takes place (S1820). In the case of the ID reception (S1820: YES), this ID is temporarily stored in a work area of the RAM (S1830). Moreover, a decision is made as to which of the ID registration instruction and the ID deletion instruction is received (S1840). In the case of the reception of the ID registration instruction (S1840: Registration), the ID temporarily stored in S1830 is registered as the ID of the air pressure sensor of the front left tire in the memory 55 (S1850), and a reply indicative of the ID registration completion is then made (S1860). Subsequently, a decision is made as to whether the reception of an ID takes place or not (S1870). In the case of the ID reception (S1870: YES), this ID is temporarily stored in a work area of the RAM (S1880). Moreover, a decision is made about the reception of an ID registration instruction (S1890). In the case of the reception of the ID registration instruction (S1890: YES), the ID stored in S1880 is registered as the ID of the air pressure sensor of the rear left tire in the memory 55 (S1900), and a reply indicative of the ID registration completion is made (S1910). Still moreover, a decision is made about the reception of an ID (S1920). In the case of the ID reception (S1920: YES), this ID is temporarily stored in a work area of the RAM (S1930). Yet moreover, a decision is made as to the reception of an ID registration instruction (S1940). In the case of the reception of the ID registration instruction (S1940: YES), the ID temporarily stored in S1930 is registered as the ID of the air pressure sensor of the rear right tire in the memory 55 (S1950), and a reply indicative of the ID registration completion is made (S1960). In addition, a decision is made on the reception of an ID (S1970). For the reception of the ID (S1970: YES), this ID is temporarily stored in a work area of the RAM (S1980). Subsequently, a decision is made about the reception of an ID registration instruction (S1990). For the reception of the ID registration instruction (S1990: YES), the ID temporarily stored in S1980 is registered as the ID of the air pressure sensor of the front right tire in the memory 55 (S2000), and a reply indicative of the ID registration completion is carried out (S2010). Following this, a decision is made about the reception of a trigger signal to the effect that the mode is switched into the normal mode (S2020). If received is the trigger signal calling for the switching into the normal mode (S2020: YES), the switching into the normal mode is made (S2030), and then the processing comes to an end.

On the other hand, after the ID is received in S1820 and is temporarily stored in the RAM in S1830, if the reception of an ID re-registration instruction takes place (S2040: re-registration), the ID temporarily stored in S1830 is overwritten as the ID of the air pressure sensor of the front left tire in the memory 55 (S2050). Subsequently, a reply is made which is indicative of the ID registration completion (S2060). Then, a decision is made about the reception of an ID (S2070). For the reception of the ID (S2070: YES), this ID is temporarily stored in a work area of the RAM (S2080). Following this, a decision is made about the reception of an ID re-registration instruction (S2090). For the reception of the ID re-registration instruction (S2090: YES), the ID temporarily stored in S2080 is overwritten and re-registered in the memory 55 as the ID of the air pressure sensor of the rear left tire (S2100), and a reply indicative of the ID registration completion is made (S2110). Thereafter, a decision is made as to the reception of an ID (S2120). In the case of the ID reception (S2120: YES), this ID is temporarily stored in a work area of the RAM (S2130). Moreover, a decision is made on the reception of an ID registration instruction (S2140). In the case of the reception of the ID registration instruction (S2140: YES), the ID temporarily stored in S2130 is overwritten and re-registered in the memory 55 as the ID of the air pressure sensor of the rear right tire (S2150), and a reply indicative of the ID registration completion is made (S2160). In addition, a decision is made as to the reception of an ID (S2170). In the case of the ID reception (S2170: YES), this ID is temporarily stored in a work area of the RAM (S2180). Still additionally, a decision is made as to the reception of an ID re-registration instruction (S2190). In the case of the reception of the ID re-registration instruction (S2190: YES), the ID temporarily stored in S2180 is overwritten and re-registered in the memory 55 as the ID of the air pressure sensor of the front right tire (S2200), and a reply indicative of the ID registration completion is made (S2210). Following this, a decision is made about the reception of a trigger signal to the effect that the mode is switched into the normal mode (S2220). If received is the trigger signal calling for the switching into the normal mode (S2220: YES), the switching into the normal mode is made (S2030), and the processing then comes to an end.

Furthermore, a description will be given hereinbelow of the contents of the control processing to be implemented in the air pressure sensors 10, 20, 30 and 40. In this control processing, as shown in FIG. 19, first of all, a decision is made as to the reception of a trigger signal calling for the switching into the ID registration mode (S2300). If received is the trigger signal calling for the switching into the ID registration mode (S2300: YES), the switching into the ID registration mode is made (S2310), and a decision is made as to whether an ID is received or not (S2320). In the case of the ID reception (S2320: YES), this ID is temporarily stored in a work area of the RAM (S2330). Moreover, a decision is made as to which of the ID registration instruction and the ID re-registration instruction is received (S2340). In the case of the reception of the ID registration instruction (S2340: registration), the ID temporarily stored in S2330 is registered in the ID memories 12, 22, 32 and 42 (S2350), and a reply indicative of the ID registration completion is then made (S2360). Subsequently, a decision is made as to the reception of a trigger signal to the effect that the mode is switched into the normal mode (S2370). If the reception of the trigger signal calling for the switching into the normal mode takes place (S2370: YES), the mode is switched into the normal mode (S2380), and the processing comes to an end. On the other hand, in the case of the reception of the ID re-registration instruction (S2340: re-registration), the ID temporarily stored in S2330 is overwritten to be re-registered in the ID memories 12, 22, 32 and 42 (S2390), and the operational flow shifts to the step S2370 after the implementation of a reply indicative of the ID registration completion (S2400).

When the above-described control processing is conducted in the ID registration tool 60, the tire pressure monitoring apparatus 50 and the respective air pressure sensors 10, 20, 30 and 40, at the initial registration, the air pressure sensor IDs can be registered in a state associated with the tire positions: front left, rear left, rear right and front right. Moreover, at this time, the mistaken registration due to radio interference or the registration-impossible state due to other electric waves does not occur unlike the conventional technique. Still moreover, at the tire replacement or tire rotation, through the above-described control processing, the sensor IDs can be registered in a state associated with the tire positions after the replacement. In the case of the tire replacement, the re-registration operation can be conducted with respect to only the replacement tire, thus achieving the

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reduction of the number of steps. Still additionally, also in the case of the rotation, the ID re-registration reflecting a change of position is feasible. Yet additionally, also in this re-registration operation, the problem of the mistaken registration due to the radio interference is solvable.

Third Embodiment

Furthermore, a description will be given hereinbelow of a third embodiment of the present invention. In the third embodiment, as well as the second embodiment, IDs are registered in the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** through the use of a management sheet, but the re-registration method is different therefrom. The registration operation is conducted in accordance with the following procedure.

For the registration operation, the signal lines **63**, **63***a*, **63***b*, **63***c* and **63***d* of the ID registration tool **60** are connected to the respective sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50**, and the operation is implemented in accordance with a procedure shown in FIG. **20**. First of all, the respective sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** are switched into an ID registration mode (S**2510**). Subsequently, a decision is made as to whether or not it is the initial registration (S**2520**). In the case of the initial registration (S**2520**: YES), the bar codes **91**FL, **91**RL, **91**RR and **91**FR on the management sheet **90** are read through the use of the ID registration tool **60** (S**2530**). The IDs read out from these bar codes **91**FL, **91**RL, **91**RR and **91**FR are transmitted from the ID registration tool **60** to the respective air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** (S**2540**). The respective air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** register the received IDs in the ID memories **12**, **22**, **32**, **42** and in a memory **55** (S**2550**).

At this time, the signal lines **63***a*, **63***b*, **63***c* and **63***d* are correctly connected to the air pressure sensors **10**, **20**, **30** and **40** and the readout by the ID registration tool **60** is made in the order of the bar code **91**FL, the bar code **91**RL, the bar code **91**RR and the bar code **91**FR so that the ID indicated by the bar code **91**FL is registered in the air pressure sensor **10**, the ID of the bar code **91**RL in the air pressure sensor **20**, the ID of the bar code **91**RR in the air pressure sensor **30**, and the ID of the bar code **91**FR in the air pressure sensor **40**. Moreover, in the memory **55** of the monitoring apparatus **50**, the ID of the bar code **91**FL is registered as that of the front left tire, the ID of the bar code **91**RL as that of the rear left tire, the ID of the bar code **91**RR as that of the rear right tire, and the ID of the bar code **91**FR as that of the front right tire. The management sheet **90** used at the initial registration is attached to the manual of the vehicle.

When the initial ID registrations in the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** reach completion in this way, the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** are switched into a normal mode (S**2560**), and the ID registration operation comes to an end.

On the other hand, if it is not the initial registration, that is, in the case of the replacement of a tire in a repair shop or the like (S**2520**: YES), the ID registration tool **60** reads, of the bar codes on the management sheet **90** at the initial registration, attached to the manual, the bar code corresponding to the tire to be detached this time (S**2570**). The ID read out in this way is transmitted from the ID registration tool **60** to the tire pressure monitoring apparatus **50** (S**2580**). The tire pressure monitoring apparatus **50** removes the received ID from the memory **55** (S**2590**). Then, a bar code expressed on a sheet pertaining to a tire to be mounted newly is read through the use of the ID registration tool **60** (S**2600**), and the ID thus read out is transmitted from the ID registration tool **60** to the air pressure sensor of the tire to be mounted newly and the tire pressure monitoring apparatus **50** (S**2610**). The air pressure sensor of the tire to be mounted newly registers the received ID in its ID memory, while the tire pressure monitoring apparatus **50** re-registers the received ID at the tire position, deleted in S**2590**, in the memory **55** (S**2620**).

In addition, a decision is made as to whether or not there is another tire to be replaced (S**2630**). If there is another tire to be replaced (S**2630**: YES), the step S**2570** and subsequent processing are conducted repeatedly. On the other hand, if there exists no tire to be replaced (S**2630**: NO), the air pressure sensors **10**, **20**, **30**, **40** and the monitoring apparatus **50** are switched into a normal mode (S**2560**), and the ID registration operation comes to an end.

Furthermore, referring to flow charts of FIGS. **21** to **24**, a description will be given hereinbelow of the contents of a program installed in the ID registration tool **60** for the implementation of the above-mentioned registration operation. The following program starts by pushing a predetermined button on the control panel **68** of the ID registration tool **60**. In this program, first of all, a trigger signal is transmitted to place the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** into an ID registration mode (S**2710**), and after a manipulation of the control panel **68**, a decision is then made as to whether or not it is the initial registration (S**2720**).

In the case of the initial registration (S**2720**: NO), a readout instruction message on a bar code **91**FL of the registration sheet **90** is displayed on the display **69** (S**2730**), and a decision is made on whether or not the readout reaches completion (S**2740**). If the decision shows the completion of the readout (S**2740**: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front left) (S**2750**). Moreover, a readout instruction message on the bar code **91**RL thereof is displayed (S**2760**), and a decision is made as to whether or not the readout reaches completion (S**2770**). If the decision shows that the readout reaches completion (S**2770**: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear left) (S**2780**). Still moreover, a readout instruction message on the bar code **91**RR thereof is displayed (S**2790**), and a decision is made as to whether or not the readout reaches completion (S**2800**). If the decision indicates that the readout reaches completion (S**2800**: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear right) (S**2810**). Yet moreover, a readout instruction message on the bar code **91**FR is displayed (S**2820**), and a decision is made as to whether or not the readout reaches completion (S**2830**). If the decision indicates the completion of the readout therefrom (S**2830**: YES), the readout result is put in the memory **66** in a state associated with the tire position (front right) (S**2840**).

Thereafter, the ID corresponding to the air pressure sensor of the front left tire is first read out from the memory **66** and is transmitted to the air pressure sensor **10** and the tire pressure monitoring apparatus **50** (S**2850**), and an instruction command for ID registration is transmitted to the air pressure sensor **10** and the tire pressure monitoring apparatus **50** (S**2860**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** and the tire pressure monitoring apparatus **50** (S**2870**). In a case in

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which the reply does not come within a predetermined period of time (S2870: NO), the operational flow returns to the step S2850. On the other hand, in the case of the arrival of the reply indicative of the completion of the registration (S2870: YES), the ID corresponding to the air pressure sensor of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** and the tire pressure monitoring apparatus **50** (S2880). Moreover, an instruction command for the ID registration is transmitted to the air pressure sensor **20** and the tire pressure monitoring apparatus **50** (S2890), and a decision is made as to whether or not a replay indicative of the registration completion comes from the air pressure sensor **20** and the tire pressure monitoring apparatus **50** (S2900). If the relay does not come within a predetermined period of time (S2900: NO), the operational flow returns to the step S2880. On the other hand, in the case of the arrival of the replay indicative of the registration completion (S2900: YES), the ID corresponding to the air pressure sensor of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** and the tire pressure monitoring apparatus **50**(S2910). Still moreover, an instruction command for the ID registration is transmitted to the air pressure sensor **30** and the tire pressure monitoring apparatus **50** (S2920), and a decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor **30** and the tire pressure monitoring apparatus **50** (S2930). If the reply does not come within a predetermined period of time (S2930: NO), the operational flow returns to the step S2910. On the other hand, in the case of the arrival of the reply indicative of the registration completion (S2930: YES), the ID corresponding to the air pressure sensor of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** and the tire pressure monitoring apparatus **50** (S2940). Yet moreover, an instruction command for the ID registration is transmitted to the air pressure sensor **40** and the tire pressure monitoring apparatus **50** (S2950), and a decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor **40** and the tire pressure monitoring apparatus **50** (S2960). If the reply does not come within a predetermined period of time (S2960: NO), the operational flow returns to the step S2940. On the other hand, in the case of the arrival of the reply indicative of the registration completion (S2960: YES), a trigger signal calling for the restoration to the normal mode is outputted to the air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** (S2970), and the processing comes to an end.

Meanwhile, in the case of no initial registration, an message on inquiry about tire replacement or rotation is displayed on the display **69** (S3000), and the control waits for the corresponding panel manipulation (S3010). In the case of the tire replacement (S3010: tire replacement), a message to the effect that the ID of the air pressure sensor of the tire to be detached is read out from the bar codes **91**FL, **91**RL, **91**RR and **91**FR shown on the management sheet **90** attached to the manual is displayed on the display **69** (S3020), and a decision is made as to whether or not the readout comes to an end (S3030). If the decision indicates the completion of the readout (S3030: YES), the readout result is stored in the memory **66** (S3040).

Moreover, the ID stored in S3040 is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (S3050). Subsequently, an instruction command for ID deletion is transmitted to the tire pressure monitoring apparatus **50** (S3060), and a decision is made as to whether or not a reply indicative of the completion of the deletion comes from the tire pressure monitoring apparatus **50** (S3070). If the reply does not within a predetermined period of time (S3070: NO), the operational flow returns to the step S3050. On the other hand, in the case of the arrival of the reply indicative of the deletion completion (S3070: YES), a message to the effect of reading a bar code **91**" shown on a re-registration sheet **90**" attached to the tire to be mounted newly is displayed on the display **69** (S3080), and a decision is made on whether or not the readout reaches completion (S3090). If the decision indicates the completion of the readout (S3090: YES), the readout result is put in the memory **66** (S3100). Subsequently, the ID of the air pressure sensor of the tire to be mounted newly is read out from the memory **66** and is transmitted to the corresponding air pressure sensor and the monitoring apparatus **50**(S3110). Moreover, an instruction command for the ID re-registration is transmitted to this air pressure sensor and the tire pressure monitoring apparatus **50** (S3120), and a decision is made as to whether or not a reply indicative of the registration completion comes from this air pressure sensor and the tire pressure monitoring apparatus **50** (S3130). If the relay does not come within a predetermined period of time (S3130: NO), the operational flow returns to the step S3110. On the other hand, in the case of the arrival of the reply indicative of the registration completion (S3130: YES), an inquiry message as to whether or not all the replacement operations are completed is displayed on the display **69** (S3140), and the control waits for a result of a panel manipulation (S3150). If the panel manipulation is done which is for indicating the completion of all the replacement operations (S3150: YES), a trigger signal calling for the restoration to the normal mode is outputted to the air pressure sensor connected thereto and the tire pressure monitoring apparatus **50** (S2970, and the processing comes to an end. On the other hand, in the case of the panel manipulation indicating that the replacement does not reach completion yet (S3150: NO), the operational flow returns to the step S3020.

Moreover, in the case of the rotation (S3010: rotation), an instruction message on the readout of the bar code **91**FL of the registration sheet **90** attached to the manual is displayed on the display **69** (S3160), and a decision is made as to the completion of the readout (S3170). If the decision shows the completion of the readout (S3170: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front left) (S3180). Subsequently, an instruction message on the readout of the bar code **91**RL thereof is displayed thereon (S3190), and a decision is made as to the completion of the readout (S3200). If the decision shows the completion of the readout (S3200: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear left) (S3210). Moreover, an instruction message on the readout of the bar code **91**RR thereof is displayed thereon (S13220), and a decision is made as to the completion of the readout (S3230). If the decision shows the completion of the readout (S3230: YES), the readout result is stored in the memory **66** in a state associated with the tire position (rear right) (S3240). Still moreover, an instruction message on the readout of the bar code **91**FR thereof is displayed thereon (S3250), and a decision is made as to the completion of the readout (S3260). If the decision shows the completion of the readout (S3260: YES), the readout result is stored in the memory **66** in a state associated with the tire position (front right) (S3270).

Following this, the ID corresponding to the air pressure sensor of the front left tire is first read out from the memory **66** and is transmitted to the air pressure sensor of a tire to be mounted at the front left position after the rotation (S3280),

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and an instruction command for the ID re-registration is transmitted to this air pressure sensor (S3290). A decision is made as to whether or not a reply indicative of the completion of the registration comes from this air pressure sensor (S3300). If the reply does not come within a predetermined period of time (S3300: NO), the operational flow returns to the step S3280. On the other hand, if the registration completion reply comes (S3300: YES), the ID corresponding to the air pressure sensor of the rear left tire is read out from the memory 66 and is transmitted to an air pressure sensor of a tire to be mounted at the rear left position after the rotation (S3310), and an instruction command for the ID re-registration is then transmitted to this air pressure sensor (S3320). A decision is made as to whether or not a reply indicative of the completion of the registration comes from this air pressure sensor (S3330). If the reply does not come within a predetermined period of time (S3330: NO), the operational flow returns to the step S3310. On the other hand, if the registration completion reply comes (S3330: YES), the ID corresponding to the air pressure sensor of the rear right tire is read out from the memory 66 and is transmitted to the air pressure sensor of a tire to be mounted at the rear right position after the rotation (S3340), and an instruction command for the ID re-registration is then transmitted to this air pressure sensor (S3350). A decision is made as to whether or not a reply indicative of the completion of the registration comes from this air pressure sensor (S3360). If the reply does not come within a predetermined period of time (S3360: NO), the operational flow returns to the step S3340. On the other hand, if the registration completion reply comes (S3360: YES), the ID corresponding to the air pressure sensor of the front right tire is read out from the memory 66 and is transmitted to the air pressure sensor of a tire to be mounted at the front right position after the rotation (S3370), and an instruction command for the ID re-registration is then transmitted to this air pressure sensor (S3380). A decision is made as to whether or not a reply indicative of the completion of the registration comes from this air pressure sensor (S3390). If the reply does not come within a predetermined period of time (S3390: NO), the operational flow returns to the step S3370. On the other hand, if the registration completion reply comes (S3390: YES), a trigger signal calling for the restoration to the normal mode is outputted to the air pressure sensors connected thereto and the tire pressure monitoring apparatus 50 (S2970), and the processing comes to an end.

Furthermore, a description will be given hereinbelow of the contents of control processing to be conducted in the tire pressure monitoring apparatus 50. In this control processing, as shown in FIGS. 26 and 27, first of all, a decision is made as to whether or not the reception of a trigger signal calling for the switching into an ID registration mode takes place (S3400). In the case of the reception of the trigger signal indicating the switching into the ID registration mode (S3400: YES), the switching into the ID registration mode is carried out (S3410), and a decision is made as to the reception of an ID (S3420). In the case of the ID reception (S3420: YES), this ID is temporarily stored in a work area of the RAM (S3430). Moreover, a decision is made as to which of the ID registration instruction and the ID deletion instruction is received (S3440). In the case of the reception of the ID registration instruction (S3440: registration), the ID temporarily stored in S3430 is registered as the ID of the air pressure sensor of the front left tire in the memory 55 (S3450), and a reply is then made which is indicative of the ID registration completion (S3460). Subsequently, a decision is made as to whether the reception of an ID takes place or not (S3470). In the case of the ID reception (S3470: YES), this ID is temporarily stored in a work area of the RAM (S3480). Moreover, a decision is made about the reception of an ID registration instruction (S3490). In the case of the reception of the ID registration instruction (S3490: YES), the ID temporarily stored in S3480 is registered as the ID of the air pressure sensor of the rear left tire in the memory 55 (S3500), and a reply is made which is indicative of the ID registration completion (S3510). Still moreover, a decision is made about the reception of an ID (S3520). In the case of the ID reception (S3520: YES), this ID is temporarily stored in a work area of the RAM (S3530). Yet moreover, a decision is made as to the reception of an ID registration instruction (S3540). In the case of the reception of the ID registration instruction (S3540: YES), the ID temporarily stored in S3530 is registered as the ID of the air pressure sensor of the rear right tire in the memory 55 (S3550), and a reply is made which is indicative of the ID registration completion (S3560). In addition, a decision is made on the reception of an ID (S3570). For the reception of the ID (S3570: YES), this ID is temporarily stored in a work area of the RAM (S3580). Subsequently, a decision is made about the reception of an ID registration instruction (S3590). For the reception of the ID registration instruction (S3590: YES), the ID temporarily stored in S3580 is registered as the ID of the air pressure sensor of the front right tire in the memory 55 (S3600), and a reply is made which is indicative of the ID registration completion (S3610). Following this, a decision is made about the reception of a trigger signal to the effect that the mode is switched into the normal mode (S3620). If received is the trigger signal calling for the switching into the normal mode (S3620: YES), the switching into the normal mode is made (S3630), and then the processing comes to an end.

On the other hand, after the ID is received in S3420 and is temporarily stored in the RAM in S3430, if the reception of an ID deletion instruction takes place (S3440: deletion), the same ID as the ID temporarily stored in S3430 is removed from the memory 55 (S3700). Subsequently, a reply is made which is indicative of the ID-deletion completion (S3710). Then, a decision is made about the reception of an ID (S3720). For the reception of the ID (S3720: YES), this ID is temporarily stored in a work area of the RAM (S3730). Following this, a decision is made about the reception of an ID registration instruction (S3740). For the reception of the ID registration instruction (S3740: YES), the ID temporarily stored in S3730 is registered as the ID of the air pressure sensor of the tire existing at the position corresponding to the ID, deleted in S3710, in the memory 55 (S3750). Then, a reply is made which is indicative of the ID registration completion (S3760). Thereafter, a decision is made as to which of a switching instruction command to the normal mode and a new ID is received (S3770). In the case of the reception of the new ID (S3770: YES), this ID is temporarily stored in a work area of the RAM (S3780). Moreover, a decision is made on the reception of an ID deletion instruction (S3790). In the case of the reception of the ID deletion instruction (S3790: YES), the operational flow advances to the step S3700 and subsequent processing. On the other hand, if the decision in S3770 shows the reception of the switching instruction command for the normal mode, the operational flow proceeds to the step S3630 to carry out the switching into the normal mode, and the processing comes to an end.

Furthermore, a description will be given hereinbelow of the contents of the control processing to be implemented in the air pressure sensors 10, 20, 30 and 40. In this control

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processing, as shown in FIG. **28**, first of all, a decision is made as to the reception of a trigger signal calling for the switching into the ID registration mode (S**3800**). If received is the trigger signal calling for the switching into the ID registration mode (S**3800**: YES), the switching into the ID registration mode is carried out (S**3810**), and a decision is made as to the reception of an ID (S**3820**). In the case of the ID reception (S**3820**: YES), this ID is temporarily stored in a work area of the RAM (S**3830**). Moreover, a decision is made as to which of the ID registration instruction and the ID re-registration instruction is received (S**3840**). In the case of the reception of the ID registration instruction (S**3840**: registration), the ID temporarily stored in S**3830** is registered in the ID memories **12**, **22**, **32** and **42** (S**3850**), and a reply is then made which is indicative of the ID registration completion (S**3860**). On the other hand, in the case of the reception of the ID re-registration instruction (S**3840**: re-registration), the ID temporarily stored in S**3830** is overwritten to be re-registered in the ID memories **12**, **22**, **32** and **42** (S**3890**), and a reply is made which is indicative of the ID registration completion (S**3880**). Thereafter, a decision is made about the reception of a trigger signal to the effect of switching the mode into the normal mode (S**3890**). In response to the reception of the trigger signal calling for the switching into the normal mode (S**3890**: YES), the switching into the normal mode is made (S**3900**), and the processing comes to an end.

When the above-described control processing is conducted in the ID registration tool **60**, the tire pressure monitoring apparatus **50** and the respective air pressure sensors **10**, **20**, **30** and **40**, at the initial registration, the air pressure sensor IDs can be registered in a state associated with the tire positions: front left, rear left, rear right and front right. Moreover, at this time, the mistaken registration due to radio interference or the registration-impossible state due to other electric waves does not occur unlike the conventional technique. Still moreover, at the tire replacement or tire rotation, through the above-described control processing, the sensor IDs can be registered in a state associated with the tire positions after the replacement. In the case of the tire replacement, the re-registration operation can be conducted with respect to only the replacement tire, thus achieving the reduction of the number of steps. Still additionally, also in the case of the rotation, the ID re-registration reflecting a change of position is feasible. Yet additionally, also in this re-registration operation, the problem of the mistaken registration due to the radio interference is solvable.

In the above-described embodiments, as the optically-readable information employable, there are various types of information, such as matrix type bar codes including data code, QR code, maxi code and CP code shown in FIGS. **29**A to **29**D, two-dimensional bar codes shown in FIGS. **30**A and **30**B, stack type bar codes including PDF417, code 49, code 16K and coder block shown in FIGS. **31**A to **31**D, one-dimensional bar codes shown in FIG. **32**, and others.

In addition, the bar code can also be adhered onto a sensor itself instead of a tire wheel. Alternatively, it is also appropriate that a bar-code label corresponding to an ID registered in a sensor and the sensor are made to be supplied in a state paired and, in mounting the sensor on a tire in a vehicle manufacturing line, this label is adhered onto a tire wheel or a wheel cover.

Fourth Embodiment

Referring to FIGS. **9** and **33**, a description will be given hereinbelow of a fourth embodiment of the present invention. FIG. **33** is an illustrative view showing an apparatus configuration for ID registration according to the fourth embodiment.

In FIG. **33**, an ID registration tool **60** is composed of an ID setting unit **91** for setting a registration ID to be stored in each of air pressure sensors **10**, **20**, **30** and **40** to be mounted on a vehicle, and an ID transmitting unit **62** for transmitting the registration ID, set in the ID setting unit **91**, to each of the air pressure sensors **10**, **20**, **30** and **40** and further for transmitting it to an air pressure monitoring apparatus **50**. Moreover, the ID registration tool **60** is equipped with connectors **64** and **64***a* to **64***d* for making connections of signal lines **63** and **63***a* to **63***d* for making connections with respect to the air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50**. Incidentally, the signal lines **63** and **63***a* to **63***d* have crocodile clips at their tip portions, respectively. These crocodile clips enable the connection to the antennas **16**, **26**, **36** and **46** of the air pressure sensors **10**, **20**, **30** and **40**, and further to a signal line **57** extending from a communication circuit **56** of the tire pressure monitoring apparatus **50** to an indicating device **81**.

Furthermore, the ID registration tool **60** includes a control unit **65**, a memory **66**, a power supply battery **67**, a control panel **68** and a display **69**. The control unit **65** is for controlling various types of processing to be executed through the use of the ID registration tool **60**, and comprises a microcomputer composed of a CPU, a ROM, a RAM and others. The memory **66** comprises an EEPROM, a flash memory, a DRAM or the like, which is of a rewritable type. As the power supply battery **67**, there is used a dry cell, a button-like cell, or the like. The control panel **68** has control keys for indicating the contents of processing to be implemented through the use of the ID registration tool **60**. The display **69** is for displaying an ID set in the ID setting unit **91** or for indicating a control mode in the ID registration tool **60**, and for example, comprises an LCD.

Secondly, a description will be given hereinbelow of a method of registering the IDs of the air pressure sensors **10**, **20**, **30** and **40** in the tire pressure monitoring apparatus **50**. For implementing this method, the signal lines **63**, **63***a*, **63***b*, **63***c* and **63***d* of the ID registration tool **60** is connected to the connectors **64**, **64***a*, **64***b*, **64***c* and **64***d* and the crocodile clips at the tip portions of the signal lines **63**, **63***a*, **63***b*, **63***c* and **63***d* are connected to the signal line **57** extending from the communication circuit **56** of the tire pressure monitoring apparatus **50** to the indicating device **81** and further to the antennas **16**, **26**, **36** and **46** of the air pressure sensors **10**, **20**, **30** and **40**. The registration operation is made according to a procedure described below.

In the registration operation, as shown in a flow chart of FIG. **34**, first, the monitoring apparatus **50** is switched into an ID registration mode (step P**10**), and each of the sensors **10**, **20**, **30** and **40** is also switched into an ID registration mode (P**20**). Moreover, an ID is set in the registration tool **60** for each sensor (P**30**), and the IDs are transmitted to the monitoring apparatus **50** and the sensors **10**, **20**, **30** and **40** (P**40**). In this case, all the IDs of the four sensors are transmitted to the monitoring apparatus **50**, while the corresponding ID is transmitted to each of the sensors **10**, **20**, **30** and **40** to be stored therein. Upon receipt of the IDs, the monitoring apparatus **50** and the respective sensors **10**, **20**, **30** and **40** carry out the ID registration (P**50**). A decision is made as to the completion of the ID registration in the monitoring apparatus **50** and the sensors **10**, **20**, **30** and **40** (P**60**). In the case of no completion of the ID registration (P**60**: NO), the step P**40** and subsequent processing are implemented repeatedly. In the case of the completion of the

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ID registration (P60: YES), the monitoring apparatus **50** is switched into a normal mode (P70), and each of the sensors **10**, **20**, **30** and **40** is also switched into a normal mode (P80), and the ID registration operation then comes to an end.

Referring to flow charts of FIGS. **35** to **37**, a description will be given hereinbelow of the contents of a program to be installed in the ID registration tool **60** for implementing the above-mentioned registration operation. The following program starts in response to the depression of a predetermined button on the control panel **68** of the ID registration tool **60**. According to this program, first of all, as shown in FIG. **35**, trigger signals are transmitted in order to place the tire pressure monitoring apparatus **50** and each of the sensors **10**, **20**, **30** and **40** into an ID registration mode (P110, P120).

Subsequently, an instruction message to the effect of inputting an ID of the front left tire of the vehicle is displayed on the display **69** (P130), and a decision is made as to whether or not the input from the control panel **68** reaches completion (P140). If the decision shows the completion of the input (P140: YES), the input result is put in the memory **66** in a state associated with the tire position (front left) (P150). Then, an instruction message on the input of the ID of the rear left tire is displayed thereon (P160). A decision is made as to the completion of the input (P170). If the decision shows the completion of the input (P170: YES), the input result is put in the memory **66** in a state associated with the tire position (rear left) (P180). Moreover, an ID input instruction message on the rear right tire is displayed thereon (P190). A decision is made on the completion of the input (P200). If the decision shows the completion of the input (P200: YES), the input result is put in the memory **66** in a state associated with the tire position (rear right) (P210). Still moreover, an ID input instruction message on the front right tire is displayed thereon (P220). A decision is made on the completion of the input (P230). If the decision shows the completion of the input (P230: YES), the input result is put in the memory **66** in a state associated with the tire position (front right) (P240).

In addition, as shown in FIG. **36**, an ID corresponding to the air pressure sensor **10** of the front left tire is read out from the memory **66** and transmitted to the tire pressure monitoring apparatus **50**(P310). Subsequently, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P320). Then, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P330). If the reply does not come within a predetermined period of time (P330: NO), the operational flow returns to the step P310. On the other hand, if the registration completion reply comes therefrom (P330: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P340). Following this, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus (P350). A decision is then made whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P360). If the reply does not come within a predetermined period of time (P360: NO), the operational flow returns to the step P340. On the other hand, if the registration completion reply comes therefrom (P360: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P370). Following this, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus (P380). A decision is then made whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P390). If the reply does not come within a predetermined period of time (P390: NO), the operational flow returns to the step P370. On the other hand, if the registration completion reply comes therefrom (P390: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P400). Following this, an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus (P410). A decision is then made whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P420). If the reply does not come within a predetermined period of time (P420: NO), the operational flow returns to the step P400. On the other hand, if the registration completion reply comes therefrom (P420: YES), a trigger signal calling for the restoration to the normal mode is outputted to the tire pressure monitoring apparatus **50** (P430).

Still additionally, as shown in FIG. **37**, an ID corresponding to the air pressure sensor **10** of the front left tire is read out from the memory **66** and is transmitted to the air pressure sensor **10** (P510). Subsequently, an instruction command for the ID registration is transmitted to the air pressure sensor **10** (P520), and a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** (P530). If the reply does not come within a predetermined period of time (P530: NO), the operational flow returns to the step P510. On the other hand, if the registration completion reply comes therefrom (P530: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** (P540). Subsequently, an instruction command for the ID registration is transmitted to the air pressure sensor **20** (P550), and a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** (P560). If the reply does not come within a predetermined period of time (P560: NO), the operational flow returns to the step P540. On the other hand, if the registration completion reply comes therefrom (P560: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** (P570). Subsequently, an instruction command for the ID registration is transmitted to the air pressure sensor **30** (P580), and a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **30** (P590). If the reply does not come within a predetermined period of time (P590: NO), the operational flow returns to the step P570. On the other hand, if the registration completion reply comes therefrom (P590: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** (P600). Subsequently, an instruction command for the ID registration is transmitted to the air pressure sensor **40** (P610), and a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **40** (P620). If the reply does not come within a predetermined period of time (P620: NO), the operational flow returns to the step P600. On the other hand, if the registration completion reply comes therefrom (P620: YES), a trigger signal calling for the restoration to the normal mode is outputted to each of the air pressure sensors **10**, **20**, **30** and **40** (P630), and the processing comes to an end.

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Furthermore, a description will be given hereinbelow of the contents of control processing to be implemented in the tire pressure monitoring apparatus **50**. In this control processing, as shown in FIG. **38**, a decision is made as to the reception of a trigger signal giving instruction for the switching into the ID registration mode (P**700**). In the case of the reception of the trigger signal calling for the switching into the ID registration mode (P**700**: YES), the switching into the ID registration mode is made (P**710**), and a decision is made on the reception of an ID (P**720**). In the case of the reception of the ID (S**720**: YES), this ID is temporarily stored in a work area of the RAM (P**730**). Then, a decision is made on the reception of an instruction for the ID registration (P**740**). In the case of the reception of the ID registration instruction (P**740**: YES), the ID temporarily stored in the step S**730** is registered as the ID of the air pressure sensor of the front left tire in the memory **55** (P**750**), and a reply is made which is indicative of the completion of the ID registration (P**760**). Subsequently, a decision is made on the reception of an ID (P**770**). In the case of the reception of the ID (S**770**: YES), this ID is temporarily stored in a work area of the RAM (P**780**). Then, a decision is made on the reception of an instruction for the ID registration (P**790**). In the case of the reception of the ID registration instruction (P**790**: YES), the ID temporarily stored in S**780** is registered as the ID of the air pressure sensor of the rear left tire in the memory **55** (P**800**), and a reply is made which is indicative of the completion of the ID registration (P**820**). Following this, a decision is made on the reception of an ID (P**820**). In the case of the reception of the ID (S**820**: YES), this ID is temporarily stored in a work area of the RAM (P**830**). Then, a decision is made on the reception of an instruction for the ID registration (P**840**). In the case of the reception of the ID registration instruction (P**840**: YES), the ID temporarily stored in S**830** is registered as the ID of the air pressure sensor of the rear right tire in the memory **55** (P**850**), and a reply is made which is indicative of the completion of the ID registration (P**860**). Moreover, a decision is made on the reception of an ID (P**870**). In the case of the reception of the ID (S**870**: YES), this ID is temporarily stored in a work area of the RAM (P**880**). Then, a decision is made on the reception of an instruction for the ID registration (P**890**). In the case of the reception of the ID registration instruction (P**890**: YES), the ID temporarily stored in S**880** is registered as the ID of the air pressure sensor of the front right tire in the memory **55** (P**900**), and a reply is made which is indicative of the completion of the ID registration (P**910**). Thereafter, a decision is made as to the reception of a trigger signal to the effect that the mode is switched into the normal mode (P**920**). In the case of the reception of the trigger signal calling for the switching into the normal mode (P**920**: YES), the mode is switched into the normal mode (P**930**), and the processing comes to an end.

In addition, a description will be given hereinbelow of the contents of the control processing to be executed in each of the air pressure sensors **10**, **20**, **30** and **40**. In this control processing, as shown in FIG. **39**, a decision is made as to the reception of a trigger signal giving instruction for the switching into the ID registration mode (P**1000**). In the case of the reception of the trigger signal calling for the switching into the ID registration mode (P**1000**: YES), the switching into the ID registration mode is made (P**1010**), and a decision is made on the reception of an ID (P**1020**). In the case of the reception of the ID (S**1020**: YES), this ID is temporarily stored in a work area of the RAM (P**1030**). Then, a decision is made on the reception of an instruction for the ID registration (P**1040**). In the case of the reception of the ID registration instruction (P**1040**: YES), the ID temporarily stored in S**1030** is registered in the ID memories **12**, **22**, **32** and **42** (P**1050**), and a reply is made which is indicative of the completion of the ID registration (P**1060**). Following this, a decision is made as to the reception of a trigger signal to the effect that the mode is switched into the normal mode (P**1070**). In the case of the reception of the trigger signal calling for the switching into the normal mode (P**1070**: YES), the switching into the normal mode is made (P**1080**), and the processing comes to an end.

In this processing, in the steps P**750**, P**800**, P**850** and P**900**, if an ID has already been registered in the memory **55**, the ID registration is implemented by overwriting. Moreover, also in the step P**1050**, if an ID has already been registered in the sensors **10**, **20**, **30** and **40**, the ID registration is implemented by overwriting. Therefore, in the case of tire replacement or tire rotation, an ID newly set in a repair shop or a dealer can be re-registered in each of the sensors **10**, **20**, **30** and **40** and the monitoring apparatus **50**.

When the above-described control processing is executed in the tire pressure monitoring apparatus **50** and each of the air pressure sensors **10**, **20**, **30** and **40**, the air pressure sensor IDs can be registered in a state associated with the tire positions: front left, rear left, rear right and front right positions. Moreover, at this time, mistaken registration due to radio interference or the registration-impossible state due to other electric waves does not occur, unlike the conventional technique. In addition, at the tire replacement or at the tire rotation, through the above-described control processing, the sensor IDs can be registered in a state associated with the tire positions after the replacement. Still additionally, also in the case of the rotation, the ID re-registration reflecting a change of position is feasible. Yet additionally, also in this re-registration operation, the problem of the mistaken registration due to the radio interference is solvable.

Fifth Embodiment

Furthermore, a description will be given hereinbelow of a fifth embodiment of the present invention. In the fifth embodiment, the ID registration procedure is similar to that of the above-described fourth embodiment. The contents of a program installed in an ID registration tool **60** according to the fifth embodiment will be described hereinbelow with reference to the flow charts of FIGS. **40** to **42**. The following program starts by pushing a predetermined button on a control panel **68** of the ID registration tool **60**. In this program, as shown in FIG. **40**, first of all, trigger signals are transmitted so that the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** are set in an ID registration mode (P**1110**, P**1120**).

Following this, an instruction message to the effect of inputting a vehicle body number is displayed on the display **69** (P**1130**), and a decision is made on the input of the vehicle body number (P**1140**). If the decision shows the input of the vehicle body number (P**1140**: YES), four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the vehicle body number inputted (P**1150**), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear

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right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P1160, P1170, P1180, P1190).

In addition, as shown in FIG. **41**, an ID corresponding to the air pressure sensor of the front left tire is first read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P1210), and an instruction command for the ID registration is then transmitted to the tire pressure monitoring apparatus **50** (P1220). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P1230). If the reply does not come within a predetermined period of time (P1230: NO), the operational flow returns to the step P1210. On the other hand, if the registration completion reply comes therefrom (P1230: YES), an ID corresponding to the air pressure sensor of the rear left tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P1240), and an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P1250). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P1260). If the reply does not come within a predetermined period of time (P1260: NO), the operational flow returns to the step P1240. On the other hand, if the registration completion reply comes therefrom (P1260: YES), an ID corresponding to the air pressure sensor of the rear right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P1270), and an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P1280). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P1290). If the reply does not come within a predetermined period of time (P1290: NO), the operational flow returns to the step P1270. On the other hand, if the registration completion reply comes therefrom (P1290: YES), an ID corresponding to the air pressure sensor of the front right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P1300), and an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P1310). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50**(P1320). If the reply does not come within a predetermined period of time (P1320: NO), the operational flow returns to the step P1300. On the other hand, if the registration completion reply comes therefrom (P1320: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to the tire pressure monitoring apparatus **50** (P1330).

Still additionally, as shown in FIG. **42**, an ID corresponding to the air pressure sensor of the front left tire is read out from the memory **66** and is transmitted to the air pressure sensor **10** of the front left tire (P1410), and an instruction command for the ID registration is then transmitted to the air pressure sensor **10** (P1420). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10**(P1430). If the reply does not come within a predetermined period of time (P1430:NO), the operational flow returns to the step P1410. On the other hand, if the registration completion reply comes therefrom (P1430: YES), an ID corresponding to the air pressure sensor of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** of the rear left tire (P1440), and an instruction command for the ID registration is transmitted to the air pressure sensor **20** (P1450). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** (P1460). If the reply does not come within a predetermined period of time (P1460: NO), the operational flow returns to the step P1440. On the other hand, if the registration completion reply comes therefrom (P1460: YES), an ID corresponding to the air pressure sensor of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** of the rear right tire (P1470), and an instruction command for the ID registration is transmitted to the air pressure sensor **30** (P1480). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **30** (P1490). If the reply does not come within a predetermined period of time (P1490: NO), the operational flow returns to the step P1470. On the other hand, if the registration completion reply comes therefrom (P1490: YES), an ID corresponding to the air pressure sensor of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** of the front right tire (P1500), and an instruction command for the ID registration is transmitted to the air pressure sensor **40** (P1510). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **40** (P1520). If the reply does not come within a predetermined period of time (P1520: NO), the operational flow returns to the step P1500. On the other hand, if the registration completion reply comes therefrom (P1520: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to each of the air pressure sensors **10**, **20**, **30** and **40** (P1530), and the processing comes to an end.

The programs installed in the monitoring apparatus **50** and in the sensors **10**, **20**, **30** and **40** are similar to those in the above-described fourth embodiment.

According to the fifth embodiment, the ID of an air pressure sensor of each of tires is automatically produced on the basis of a vehicle body number and, hence, a peculiar ID can be registered in each of the sensors without duplicating, and the ID setting operation becomes easy. Moreover, since a different ID for each tire is automatically produced on the basis of a vehicle body number, as well as the fourth embodiment, an air pressure sensor ID can be registered in the monitoring apparatus **50** in a state associated with a tire position. Still moreover, in the case of tire replacement or tire rotation, the ID re-registration can be done with respect to only a sensor.

Sixth Embodiment

Furthermore, a description will be given hereinbelow of a sixth embodiment of the present invention. The ID registration procedure of the sixth embodiment is similar to that in the fourth embodiment. The contents of a program installed in an ID registration tool **60** according to the sixth embodiment will be described hereinbelow with reference to the flow charts of FIGS. **43** to **45**. The following program starts by pushing a predetermined button on a control panel **68** of the ID registration tool **60**. In this program, as shown in FIG. **43**, first of all, trigger signals are transmitted so that the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** are set in an ID registration mode (P1610, P1620).

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Following this, an instruction message to the effect of inputting a vehicle body number is displayed on the display **69** (P**1630**), and a decision is made as to the input of the vehicle body number (P**1640**). If the decision indicates the input of the vehicle body number (P**1640**: YES), a random-number generating unit generates first to fourth random numbers (P**1650**). Moreover, in the memory **66**, data in which the first random number is added as a low-order bit of the vehicle body number is stored as an ID for the front left tire, data including the added second random number as an ID for the rear left tire, data including the added third random number as an ID for the rear right tire, and data including the added fourth random number as an ID for the front right tire (P**1660**, P**1670**, P**1680**, P**1690**).

Thereafter, the processing similar to the step P**1210** and subsequent processing in the fifth embodiment is implemented as shown in FIGS. **44** and **45** (P**1710** to P**1830**, P**1910** to P**2030**).

The programs installed in the monitoring apparatus **50** and in the sensors **10**, **20**, **30** and **40** are similar to those in the above-described fourth embodiment.

Also in the sixth embodiment, the IDs of the air pressure sensors of the tires are automatically produced on the basis of a vehicle body number and four random numbers generated in the random-number generating unit of the tool **60** and, hence, a peculiar ID can be registered in each of the sensors without duplicating, and the ID setting operation becomes easy. Moreover, since a different ID for each tire is automatically produced, as well as the fourth embodiment, an air pressure sensor ID can be registered in the monitoring apparatus **50** in a state associated with a tire position.

Seventh Embodiment

Furthermore, a description will be given hereinbelow of a seventh embodiment of the present invention. In the seventh embodiment, the ID registration procedure is similar to that of the above-described fourth embodiment. The contents of a program installed in an ID registration tool **60** according to the seventh embodiment will be described hereinbelow with reference to the flow charts of FIGS. **46** to **48**. The following program starts by pushing a predetermined button on a control panel **68** of the ID registration tool **60**. In this program, as shown in FIG. **46**, first of all, trigger signals are transmitted so that the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** are set in an ID registration mode (P**2110**, P**2120**).

Following this, four, i.e., first to fourth, random numbers are generated through the use of the random-number generating unit (P**2150**). The first random number is stored as an ID for the front left tire, the second random number as an ID for the rear left tire, the third random number as an ID for the rear right tire, and the fourth random number as an ID for the front right tire (P**2160**, P**2170**, P**2180**, P**2190**).

Thereafter, the processing similar to the step P**1210** and subsequent processing in the fifth embodiment is implemented as shown in FIGS. **47** and **48** (P**2210** to P**2230**, P**2410** to P**2530**).

The programs installed in the monitoring apparatus **50** and in the sensors **10**, **20**, **30** and **40** are similar to those in the above-described fourth embodiment.

Also in the seventh embodiment, the IDs of the air pressure sensors of the tires are automatically produced on the basis of the four random numbers generated in the random-number generating unit of the tool **60** and, hence, a peculiar ID can be registered in each of the sensors without duplicating, and the ID setting operation becomes easy. Moreover, since a different ID for each tire is automatically produced, as well as the fourth embodiment, an air pressure sensor ID can be registered in the monitoring apparatus **50** in a state associated with a tire position.

Eighth Embodiment

A description will be given hereinbelow of an eighth embodiment of the present invention. In the eighth embodiment, as shown in FIG. **49**, in addition to connectors **64**, **64***a*, **64***b*, **64***c* and **64***d* for making connections through signal lines **63**, **63***a*, **63***b*, **63***c* and **63***d* to the tire pressure monitoring apparatus **50** and the respective air pressure sensors **10**, **20**, **30** and **40**, an ID registration tool **60** is equipped with a connector **72** for a signal line **71** for making a connection to a production management computer **90**. This ID registration tool **60** is designed to set an ID on the basis of production management information given from the production management computer **90** through the signal line **71**.

In the registration operation, as shown in FIG. **50**, first of all, production management information from the production management computer **90** is inputted thereto (P**2610**), and an ID is set on the basis of this production management information (P**2620**). Then, the monitoring apparatus **50** is switched into an ID registration mode (P**2630**), and each of the sensors **10**, **20**, **30** and **40** are also switched into an ID registration mode (P**2640**). Moreover, the ID is transmitted to the monitoring apparatus **50** and each of the sensors **10**, **20**, **30** and **40** (P**2650**). Upon receipt of this ID, the monitoring apparatus **50** and each of the sensors **10**, **20**, **30** and **40** implement the ID registration (P**2660**). Still moreover, a decision is made as to whether or not the ID registration in the monitoring apparatus **50** and the sensors **10**, **20**, **30** and **40** reach completion (P**2670**). In the case of the completion of the ID registration (P**2670**: YES), the monitoring apparatus **50** is switched into the normal mode (P**2680**) and each of the sensors **10**, **20**, **30** and **40** is also switched into the normal mode (P**2690**), and the ID registration operation comes to an end.

Furthermore, referring to FIGS. **51** to **53**, a description will be given hereinbelow of the contents of a program installed in the ID registration tool for conducting the above-described registration operation. The following program starts by pushing a predetermined button on the control panel **68** of the ID registration tool **60**. In this program, as shown in FIG. **51**, production management information is inputted from the production management computer **90** (P**2710**). In this case, as the production management information, various types of information for the production management, such as a vehicle production number, a lot number and a vehicle type, are inputted thereto. Subsequently, vehicle specifying information for specifying a vehicle is produced on the basis of this production management information (P**2720**). For example, as the vehicle specifying information, there is produced code data, pertaining to a vehicle, which is a combination of a vehicle production number, a lot number and a vehicle type. Following this, four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the vehicle-peculiar code data (P**2730**), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P**2740**, P**2750**, P**2760**, P**2770**). After the ID setting reaches comple-

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tion in this way, trigger signals are transmitted so that the tire pressure monitoring apparatus **50** and each of the sensors **10**, **20**, **30** and **40** are set in an ID registration mode (P2780, P2790).

Thereafter, the processing similar to the step P1210 and subsequent processing in the fifth embodiment is implemented as shown in FIGS. **52** and **53** (P2810 to P2930, P3010 to P3130).

The programs installed in the monitoring apparatus **50** and in the sensors **10**, **20**, **30** and **40** are similar to those in the above-described fourth embodiment.

According to the eighth embodiment, the ID of an air pressure sensor of each of tires is automatically produced and set on the basis of the production management information given from the production management computer **90** and, hence, a peculiar ID can be registered in each of the sensors without duplicating, and the ID setting operation becomes easy. Moreover, since a different ID for each tire is automatically produced, as well as the fourth embodiment, an air pressure sensor ID can be registered in the monitoring apparatus **50** in a state associated with a tire position. Still moreover, since the ID is produced in the form of including a lot number or a vehicle type, it is expectable to offer the effects of smoothly specifying a vehicle type or lot in which a sensor failure has occurred.

Ninth Embodiment

Furthermore, a description will be given hereinbelow of a ninth embodiment of the present invention. First, referring to flow charts of FIGS. **54** and **55**, a description will be given hereinbelow of the contents of a program installed in an ID registration tool **60** according to the ninth embodiment. The following program starts by pushing a predetermined button on a control panel **68** of the ID registration tool **60**. In this program, a decision as to whether for the initial registration or for re-registration is made as shown in FIG. **54**, (P3210). The decision as to whether for the initial registration or for the re-registration can depend on a manner such that an initial-registration button and a re-registration button are provided on the control panel **68** and a judgment is made on which of the initial-registration button and the re-registration button is depressed for activating this program. If the decision shows the initial registration (P3210: initial registration), trigger signals are transmitted so that the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** are set in an ID registration mode (P3220).

Following this, an instruction message to the effect of inputting a vehicle body number is displayed on the display **69** (P3230), and a decision is made as to the input of the vehicle body number (P3240). If the decision indicates the input of the vehicle body number (P3240: YES), the vehicle body number is stored in the memory **66** (P3250).

Subsequently, the vehicle body number is read out from the memory **66** and is then transmitted to all the air pressure sensors **10**, **20**, **30** and **40** and the tire pressure monitoring apparatus **50** (P3260), and an instruction command for the ID registration is transmitted to the air pressure sensors **10**, **20**, **30** and **40** and the tire pressure monitoring apparatus **50** (S3270). A decision is made as to whether or not replies indicative of the completion of the registration come from the air pressure sensors **10**, **20**, **30** and **40** and the tire pressure monitoring apparatus **50** (P3280). If this reply does not come within a predetermined period of time (P3280: NO), the operational flow returns to the step P3260. On the other hand, if the registration completion reply comes therefrom (P3280: YES), a trigger signal calling for the restoration to the normal mode is outputted to the air pressure sensors **10**, **20**, **30** and **40** and the tire pressure monitoring apparatus **50** (P3290), and the processing comes to an end.

On the other hand, the decision at the program activation indicates the re-registration(P3210: re-registration), the operational flow proceeds to the processing of FIG. **55** and a trigger signal is transmitted so that an ID registration mode is set with respect to only the signal line **63***a* (P3310). Subsequently, an instruction message to the effect of inputting a vehicle body number is displayed on the display **69** (P3330), and a decision is made on the input of the vehicle body number (P3340). If the decision indicates the input of the vehicle body number (P3340: YES), this vehicle body number is stored in the memory **66** (P3350).

Following this, the vehicle body number is read out from the memory **66** and is transmitted through the signal line **63***a* (P3360), and an instruction command for the ID registration is transmitted through the signal line **63***a* (P3370). A decision is made as to whether or not a reply indicative of the completion of the registration comes through the signal line **63***a* (P3380). If this reply does not come within a predetermined period of time (P3380: NO), the operational flow returns to the step P3360. On the other hand, if the registration completion reply comes therefrom (P3380: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted through the signal line **63***a* (P3390), and the processing comes to an end.

In this connection, according to this embodiment, at the time of the re-registration, the signal line **63***a* is made to be connected to the air pressure sensor of the tire subjected to the re-registration.

Meanwhile, a program shown in FIG. **56** is installed in the tire pressure monitoring apparatus **50**. That is, a decision is made as to the reception of a trigger signal calling for the switching into the ID registration mode (P3400). If the decision indicates the reception of the trigger signal calling for the switching into the ID registration mode (P3400: YES), the switching into the ID registration mode is made (P3410), and a decision is made on the reception of an ID (P3420). In the case of the ID reception (P3420: YES), this ID is temporarily stored in a work area of the RAM (P3430), and a decision is made on the reception of an instruction on the ID registration (P3440). In the case of the reception of the ID registration instruction (P3440: YES), the ID temporarily stored in P3430 is registered as an ID of the air pressure sensor in the memory **55** (P3450), and a reply indicative of the ID registration completion is made (P3460). Following this, a decision is made on the reception of a trigger signal to the effect that the mode is switched into the normal mode (P3470). In the case of the reception of the trigger signal calling for the switching into the normal mode (P3470: YES), the switching into the normal mode is made (P3480), and the processing comes to an end.

Incidentally, the program installed in each of the air pressure sensors **10**, **20**, **30** and **40** is similar that in the fourth embodiment.

According to the ninth embodiment, a vehicle body number is registered as an ID in each of the air pressure sensors **10**, **20**, **30** and **40** and the monitoring apparatus **50**. Accordingly, the discrimination from air pressure seasors of different vehicles becomes securely feasible. Although the identification of the position of a tire being a monitoring object is unfeasible unlike the above-described fourth to eighth embodiment, a judgment can be made that an abnormality exists in any one of the tires, thus sufficiently achieving a function as a tire pressure monitoring system.

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Moreover, as in the case of the fourth to eighth embodiments, the mistaken registration due to the radio interference in the ID registration is surely avoidable. Still moreover, since the ID registration is made on the basis of a vehicle body number, as mentioned above, in the case of the tire replacement in a repair shop or the like, the ID registration can be done with respect to only the replacing tire, which improves the working efficiency of the ID registration operation at the tire replacement.

Tenth Embodiment

Furthermore, a tenth embodiment of the present invention will be described hereinbelow with reference to flow charts of FIGS. **57** and **58**. According to the tenth embodiment, as shown in FIG. **57**, a decision is made as to whether it is the initial registration or re-registration (P**3500**). In the case of the initial registration (P**3500**: initial registration), the monitoring apparatus **50** is switched into an ID registration mode (P**3510**), and each of the sensors **10**, **20**, **30** and **40** is also switched into an ID registration mode (P**3520**). Moreover, an ID for each sensor is set in registration tool (P**3530**). At this time, the ID is set as information on a combination of a vehicle body number, production number or the like, peculiar to the vehicle, and the tire position. The ID is transmitted to the monitoring apparatus **50** and the sensors **10**, **20**, **30** and **40** (P**3540**). In this case, all the IDs of the four sensors are transmitted to the monitoring apparatus **50**, while the corresponding ID is transmitted to each of the sensors **10**, **20**, **30** and **40**. Upon receipt of the ID, the ID registration is carried out in the monitoring apparatus **50** and each of the sensors **10**, **20**, **30** and **40** (P**3550**). A description is made as to whether or not the ID registration reaches completion in the monitoring apparatus and each of the sensors **10**, **20**, **30** and **40** (P**3560**). In the case of no completion of the ID registration (P**3560**: NO), the step P**3240** and the subsequent processing are repeatedly carried out. In the case of the completion of the ID registration (P**3560**: YES), the monitoring apparatus **50** is switched into the normal mode (P**3570**), and the respective sensors **10**, **20**, **30** and **40** are also switched into the normal mode (P**3580**), and the processing comes to an end.

On the other hand, in the case of the re-registration (P**3500**: re-registration), as shown in FIG. **58**, a decision is made as to whether tire replacement or tire rotation (P**3610**). In the case of the rotation (P**3610**: rotation), the sensors **10**, **20**, **30** and **40** are switched into the ID registration mode (P**3620**), and an ID for each sensor is set in the registration tool **60** (P**3630**). The ID to be set at this time is made to be the same as the ID set in the step P**3530**. The corresponding ID is transmitted to each of the sensors **10**, **20**, **30** and **40** (P**3640**). Upon receipt of the ID, each of the sensors **10**, **20**, **30** and **40** implements the ID re-registration (P**3650**). That is, each of the sensors **10**, **20**, **30** and **40** performs the ID re-registration on a newly received ID by the overwriting on the already registered ID. Subsequently, a decision is made as to whether the ID registration or not the ID registration reaches completion in the sensors **10**, **20**, **30** and **40** (P**3660**). In the case of no completion of the ID registration (P**3660**: NO), the step P**3540** and subsequent processing are repeatedly carried out. In the case of the completion of the ID registration (P**3660**: YES), the sensors **10**, **20**, **30** and **40** are switched into the normal mode (P**3670**, and the ID registration operation comes to an end.

In a case in which the re-registration is due to the tire replacement (P**3610**: tire replacement), a sensor of a tire to be newly mounted is switched into the ID registration mode (P**3720**), and an ID of this sensor is set in the registration tool **60** (P**3730**). The ID to be set at this time is made to the same as the ID set in the step P**3530**. Moreover, this sensor ID is transmitted to the sensor set in the ID registration mode in the step P**3720** (P**3740**), and the sensor receiving this ID carries out the ID registration (P**3750**). Then, a decision is made as to whether or not the ID registration in the sensor comes to completion (P**3760**). In the case of no completion of the ID registration (P**3760**: NO), the step P**3740** and subsequent processing are conducted repeatedly. In the case of the completion of the ID registration (P**3760**: YES), the sensor set in the ID registration mode is switched into the normal mode (P**3780**), and the ID registration operation comes to an end.

Referring to flow charts of FIGS. **59** to **65**, a description will be given hereinbelow of the contents of a program installed in the ID registration tool **60** for carrying out the above-described registation operation. The following program starts by pushing a predetermined button on the control panel **68** of the ID registration tool **60**. In this program, first of all, a decision whether for the initial registration or for re-registration is made as shown in FIG. **59** (P**3800**). The decision as to whether for the initial registration or for the re-registration can depend on a manner such that an initial-registration button and a re-registration button are provided on the control panel **68** and a judgment is made on which of the initial-registration button and the re-registration button is depressed for activating this program. If the decision shows the initial registration (P**3800**: initial registration), an instruction message to the effect that the signal lines **63** and **63***a* to **63***d* are respectively connected to the tire air pressure sensors **10**, **20**, **30** and **40** and the tire pressure monitoring apparatus **50** is put on the display **69** (P**3802**), and the control waits for the panel manipulation for the connections (P**3804**). In response to the completion of the connections (P**3804**: YES), trigger signals are transmitted so that the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** are set in an ID registration mode (P**3810**, P**3820**).

Following this, an instruction message to the effect of inputting a vehicle body number is put on the display **69** (P**3830**), and a decision is made as to the input of the vehicle body number (P**3840**). If the decision indicates the completion of the input thereof (P**3840**: YES), four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the inputted vehicle body number (P**3850**), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P**3860**, P**3870**, P**3880**, P**3890**).

In addition, as shown in FIG. **60**, an ID corresponding to the air pressure sensor **10** of the front left tire is first read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P**3910**), and an instruction command for the ID registration is then transmitted to the tire pressure monitoring apparatus **50** (P**3920**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P**3930**). If the reply does not come within a predetermined period of time (P**3930**: NO), the operational flow returns to the step P**3910**. On the other hand, if the registration completion reply comes therefrom (P**3930**: YES), an ID corresponding to the air pressure

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sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P3940), and an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P3950). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P3960). If the reply does not come within a predetermined period of time (P3960: NO), the operational flow returns to the step P3940. On the other hand, if the registration completion reply comes therefrom (P3960: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P3970), and an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P3980). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P3990). If the reply does not come within a predetermined period of time (P3990: NO), the operational flow returns to the step P3970. On the other hand, if the registration completion reply comes therefrom (P3990: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P4000), and an instruction command for the ID registration is transmitted to the tire pressure monitoring apparatus **50** (P4010). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P4020). If the reply does not come within a predetermined period of time (P4020: NO), the operational flow returns to the step P4000. On the other hand, if the registration completion reply comes therefrom (P4020: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to the tire pressure monitoring apparatus **50** (P4030).

Still additionally, as shown in FIG. **61**, an ID corresponding to the air pressure sensor **10** of the front left tire is read out from the memory **66** and is transmitted to the air pressure sensor **10** (P4110), and an instruction command for the ID registration is then transmitted to the air pressure sensor **10** (P4120). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** (P4130). If the reply does not come within a predetermined period of time (P4130: NO), the operational flow returns to the step P4110. On the other hand, if the registration completion reply comes therefrom (P4130: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** (P4140), and an instruction command for the ID registration is transmitted to the air pressure sensor **20** (P4150). Then, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** (P4160). If the reply does not come within a predetermined period of time (P4160: NO), the operational flow returns to the step P4140. On the other hand, if the registration completion reply comes therefrom (P4160: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** (P4170), and an instruction command for the ID registration is transmitted to the air pressure sensor **30** (P4180). Following this, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **30** (P4190). If the reply does not come within a predetermined period of time (P4190: NO), the operational flow returns to the step P4170. On the other hand, if the registration completion reply comes therefrom (P4190: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** (P4200), and an instruction command for the ID registration is transmitted to the air pressure sensor **40** (P4210). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **40** (P4220). If the reply does not come within a predetermined period of time (P4220: NO), the operational flow returns to the step P4200. On the other hand, if the registration completion reply comes therefrom (P4220: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted (P4230), and the processing comes to an end.

On the other hand, if a decision to the re-registration is made on the basis of the depression of the re-registration button (P3800: re-registration), as shown in FIG. **62**, an input instruction message on the kind of re-registration, i.e., rotation or tire replacement, is put on the display **69** (P4300), and the control waits for the panel manipulation (P4310). In the case of the panel manipulation for the rotation (P4310: rotation), an instruction message to the effect that the signal lines **63***a* to **63***d* are respectively connected to the sensors **10**, **20**, **30** and **40** is put on the display **69** (P4312), and the control waits for the panel manipulation for the indication of the connection completion (P4314). If there is the panel manipulation for the indication of the connection completion (P4314: YES), a trigger signal is transmitted so that the tire air pressure sensors **10**, **20**, **30** and **40** are set in an ID registration mode (P4320).

Thereafter, an instruction message to the effect of inputting a vehicle body number is put on the display **69** (P4330), and a decision is made as to the input from the control panel **68** (S4340). In the case of the completion of the input (P4340: YES), four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as the low-order bits of the inputted vehicle body number (P4350), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P4360, P4370, P4380, P4390).

In addition, as shown in FIG. **63**, an ID corresponding to the air pressure sensor **10** of the front left tire is first read out from the memory **66** and is transmitted to the air pressure sensor **10** (P4410), and an instruction command for the ID registration is then transmitted to the air pressure sensor **10** (P4420). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** (P4430). If the reply does not come within a predetermined period of time (P4430: NO), the operational flow returns to the step P4410. On the other hand, if the registration completion reply comes therefrom (P4430: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** (P4440), and an instruction command for the ID registration is transmitted to the air pressure sensor **20** (P4450). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** (P4460). If the reply does not come within a predetermined period of time (P4460: NO),

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the operational flow returns to the step P4440. On the other hand, if the registration completion reply comes therefrom (P4460: YES), an ID corresponding to the air pressure sensor 30 of the rear right tire is read out from the memory 66 and is transmitted to the air pressure sensor 30 (P4470), and an instruction command for the ID registration is transmitted to the air pressure sensor 30 (P4480). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor 30 (P4490). If the reply does not come within a predetermined period of time (P4490: NO), the operational flow returns to the step P4470. On the other hand, if the registration completion reply comes therefrom (P4490: YES), an ID corresponding to the air pressure sensor 40 of the front right tire is read out from the memory 66 and is transmitted to the air pressure sensor 40 (P4500), and an instruction command for the ID registration is transmitted to the air pressure sensor 40 (P4510). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor 40 (P4520). If the reply does not come within a predetermined period of time (P4520: NO), the operational flow returns to the step P4500. On the other hand, if the registration completion reply comes therefrom (P4520: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to each of the air pressure sensors 10, 20, 30 and 40 (P4530).

Moreover, if the re-registration button is pushed (P3800: re-registration) and the tire replacement is designated (P4310: tire replacement), the operational flow advances to the processing in FIG. 64. An instruction message to the effect that a sensor signal line is connected to a sensor to be newly mounted is put on the display 69 (P4602), and the control waits for the panel manipulation indicating the completion of the connection (P4304). In response to the panel manipulation indicating the connection completion (P4604: YES), for the confirmation of the connection, a request signal is transmitted to each of the sensor signal lines 63*a* to 63*d* (P4606), and the control waits for a reply to the request signal (P4608). If the reply takes place (P4608: YES), only the sensor signal line providing the reply is set in an active state (P4610), and a trigger signal is transmitted to only the signal line made active so that the tire air pressure sensor is set in an ID registration mode (P4620).

Following this, an instruction message to the effect of inputting a vehicle body number is put on the display 69 (P4630), and a decision is made as to the input from the control panel 68 (P4640). If the decision indicates the completion of the input (P4640: YES), four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the inputted vehicle body number (P4650), and in the memory 66, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P4660, P4670, P4680, P4690).

Thereafter, the operational flow proceeds to the processing in FIG. 65 to specify one of the signal lines made active in the step P4610 (P4700). An ID set value at a tire position corresponding to this signal line is read out from the memory 66 (P4710), and this ID set value is transmitted through this signal line (P3720). Then, an instruction command for the ID registration is transmitted to the ID sending signal line (P4730). A decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor through that signal line (P4740). If the reply does not come within a predetermined period of time (P4740: NO), the operational flow returns to the step P4710. On the other hand, if the reply indicative of the registration completion comes therefrom (P4740: YES), a trigger signal is outputted through this signal line for restoring the air pressure sensor to the normal mode (P4750), and this signal line is setting-changed from the active state to the non-active state (P4760). A decision is made as to whether signal lines set in the active state in the step P4610 remain or not (P4770). If they are left (P4770: YES), one of the signal lines left is specified (P4780), and the operational flow returns to the step P4710. On the other hand, if there is no signal line set in the active state (P4770: NO), the processing comes to an end.

The contents of control processing to be implemented in the tire pressure monitoring apparatus 50 is similar to those in the above-described fourth embodiment. Meanwhile, a control processing program, which will be described below, is installed in the air pressure sensors. In this control processing, as shown in FIG. 66, first of all, a decision is made as to the reception of a request signal for the confirmation of the connection (P4800). Upon receipt of the connection confirmation request signal, a reply signal is returned (P4805), and a decision is made on the reception of a trigger signal calling for the switching into an ID registration mode (P4810). In the case of the reception of the trigger signal calling for the switching into an ID registration mode (P4810: YES), the switching into the ID registration mode is made (P4820), and a decision is made on the reception of an ID (P4830). In the case of the reception of the ID (P4830: YES), this ID is temporarily stored in a work area of the RAM (P4840). Then, a decision is made on the reception of an instruction for the ID registration (P4850). If the decision shows the reception of the ID registration instruction (P4850: YES), the ID temporarily stored in the step P4840 is registered in the ID memory (P4860), and a reply indicative of the completion of the ID registration is made (P4870). Following this, a decision is made as to the reception of a trigger signal to the effect that the mode is switched into the normal mode (P4880). In the case of the reception of the trigger signal calling for the switching into the normal mode (P4880: YES), the switching into the normal mode is made (P4890), and the processing comes to an end. On the other hand, in the case of no reception of the request signal for the connection confirmation (P4800: NO), the operational flow jumps the step P4805 and proceeds to the step P4810.

In the step P4860, if an ID has already registered in the sensor ID memory, the ID registration is conducted by overwriting. Therefore, in the case of the tire replacement or rotation, an ID newly set in a repair shop or a dealer can be re-registered in each of the sensors 10, 20, 30 and 40 in conjunction with the tire position. Incidentally, since the sensor ID has been registered in the tire pressure monitoring apparatus 50 in a state associated with the tire position at the initial registration, there is no need to carry out the re-registration at the time of the rotation or tire replacement.

According to the tenth embodiment, the re-registration due to the tire replacement can be carried out with respect to only the sensor of the tire to be newly mounted and, hence, a minimum ID registration operation is needed.

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Eleventh Embodiment

Furthermore, a description will be given hereinbelow of an eleventh embodiment of the present invention. In the eleventh embodiment, a program shown in flow charts of FIGS. **67** to **74** is installed in a ID registration tool **60**, and starts by pushing a predetermined button on the control panel **68** of the ID registration tool **60**. In this program, first of all, a decision whether for the initial registration or for re-registration is made as shown in FIG. **67** (P**4900**). If the decision shows the initial registration (P**4900**: initial registration), an instruction message to the effect that the signal lines **63** and **63***a* to **63***d* are respectively connected to the tire air pressure sensors **10**, **20**, **30** and **40** and the tie pressure monitoring apparatus **50** is put on the display **69** (P**4902**), and the control waits for the panel manipulation for the connections (P**4904**). In response to the completion of the connections (P**4904**: YES), trigger signals are transmitted so that the tire air pressure sensors **10**, **20**, **30**, **40** and the tire pressure monitoring apparatus **50** are set in an ID registration mode (P**4910**, P**4920**).

Following this, a random-number generating unit is activated to generate a random number (P**4930**), and four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the random number (P**4950**), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P**4960**, P**4970**, P**4980**, P**4990**).

Thereafter, the operational flow proceeds to the processing in FIG. **68**, and an ID corresponding to the air pressure sensor **10** of the front left tire is first read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P**5010**), and an instruction command for the ID initial-registration is then transmitted to the tire pressure monitoring apparatus **50** (P**5020**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P**5030**). If the reply does not come within a predetermined period of time (P**5030**: NO), the operational flow returns to the step P**5010**. On the other hand, if the registration completion reply comes therefrom (P**5030**: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P**5040**), and an instruction command for the ID initial-registration is transmitted to the tire pressure monitoring apparatus **50** (P**5050**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P**5060**). If the reply does not come within a predetermined period of time (P**5060**: NO), the operational flow returns to the step P**5040**. On the other hand, if the registration completion reply comes therefrom (P**5060**: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P**5070**), and an instruction command for the ID initial-registration is transmitted to the tire pressure monitoring apparatus **50** (P**5080**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P**5090**). If the reply does not come within a predetermined period of time (P**5090**: NO), the operational flow returns to the step P**5070**. On the other hand, if the registration completion reply comes therefrom (P**5090**: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P**5100**), and an instruction command for the ID initial-registration is transmitted to the tire pressure monitoring apparatus **50** (P**5110**). Then, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the tire pressure monitoring apparatus **50** (P**5120**). If the reply does not come within a predetermined period of time (P**5120**:NO), the operational flow returns to the step P**5100**. On the other hand, if the registration completion reply comes therefrom (P**5120**: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to the tire pressure monitoring apparatus **50** (P**5130**).

In addition, the operational flow advances to the processing in FIG. **69**. An ID corresponding to the air pressure sensor **10** of the front left tire is first read out from the memory **66** and is transmitted to the air pressure sensor **10** (P**5210**), and an instruction command for the ID initial-registration is then transmitted to the air pressure sensor **10** (P**5220**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** (P**5230**). If the reply does not come within a predetermined period of time (P**5230**: NO), the operational flow returns to the step P**5210**. On the other hand, if the registration completion reply comes therefrom (P**5230**: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** (P**5240**), and an instruction command for the ID initial-registration is transmitted to the air pressure sensor **20** (P**5250**). Then, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** (P**5260**). If the reply does not come within a predetermined period of time (P**5260**: NO), the operational flow returns to the step P**5240**. On the other hand, if the registration completion reply comes therefrom (P**5260**: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** (P**5270**), and an instruction command for the ID initial-registration is transmitted to the air pressure sensor **30** (P**5280**). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **30** (P**5290**). If the reply does not come within a predetermined period of time (P**5290**: NO), the operational flow returns to the step P**5270**. On the other hand, if the registration completion reply comes therefrom (P**5290**: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** (P**5300**), and an instruction command for the ID initial-registration is transmitted to the air pressure sensor **40** (P**5310**). Following this, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **40** (P**5320**). If the reply does not come within a predetermined period of time (P**5320**: NO), the operational flow returns to the step P**5300**. On the other hand, if the registration completion reply comes therefrom (P**5320**: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to each of the air pressure sensors **10**, **20**, **30** and **40** (P**5330**), and the processing comes to an end.

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On the other hand, if a decision to the re-registration is made on the basis of the depression of the re-registration button (P4900: re-registration), the operational flow advances to the processing in FIG. **70**. An input instruction message on the kind of re-registration, i.e., rotation or tire replacement, is put on the display **69** (P5400), and the control waits for the panel manipulation (P4540). In the case of the panel manipulation for the rotation (P5410: rotation), an instruction message to the effect that the signal lines **63** and **63***a* to **63***d* are respectively connected to the tire pressure monitoring apparatus **50** and the sensors **10**, **20**, **30** and **40** is put on the display **69** (P5412), and the control waits for the panel manipulation for the indication of the connection completion (P5414). If there is the panel manipulation for the indication of the connection completion (P5414: YES), a trigger signal is transmitted so that the air pressure monitoring apparatus **50** and the tire air pressure sensors **10**, **20**, **30** and **40** are set in an ID registration mode (P5414, P5420).

Following this, a random-number generating unit is activated to generate a random number (P5430), and four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the random number (P5450), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P5460, P5470, P5480, P5490).

Thereafter, the operational flow proceeds to the processing in FIG. **71**. An ID corresponding to the air pressure sensor **10** of the front left tire is first read out from the memory **66** and is transmitted to the air pressure sensor **10** (P5510), and an instruction command for the ID re-registration at the time of the rotation is then transmitted to the air pressure sensor **10** (P5520). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **10** (P5530). If the reply does not come within a predetermined period of time (P5530: NO), the operational flow returns to the step P5510. On the other hand, if the registration completion reply comes therefrom (P5530: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the air pressure sensor **20** (P5540), and an instruction command for the ID re-registration in the case of the rotation is transmitted to the air pressure sensor **20** (P5550). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **20** (P5560). If the reply does not come within a predetermined period of time (P5560: NO), the operational flow returns to the step P5540. On the other hand, if the registration completion reply comes therefrom (P5560: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the air pressure sensor **30** (P5570), and an instruction command for the ID re-registration at the rotation is transmitted to the air pressure sensor **30** (P5580). Then, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **30** (P5590). If the reply does not come within a predetermined period of time (P5590: NO), the operational flow returns to the step P5570. On the other hand, if the registration completion reply comes therefrom (P5590: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the air pressure sensor **40** (P5600), and an instruction command for the ID re-registration at the rotation is transmitted to the air pressure sensor **40** (P5610). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the air pressure sensor **40** (P5620). If the reply does not come within a predetermined period of time (P5620:NO), the operational flow returns to the step P5610. On the other hand, if the registration completion reply comes therefrom (P5620: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to each of the air pressure sensors **10**, **20**, **30** and **40** (P5630).

Following this, the operational flow advances to the processing in FIG. **72**. An ID corresponding to the air pressure sensor **10** of the front left tire is first read out from the memory **66** and is transmitted to the tire pressure monitoring apparatus **50** (P5710), and an instruction command for the ID re-registration in the case of the rotation is then transmitted to the monitoring apparatus **50** (P5720). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the monitoring apparatus **50** (P5730). If the reply does not come within a predetermined period of time (P5730: NO), the operational flow returns to the step P5710. On the other hand, if the registration completion reply comes therefrom (P5730: YES), an ID corresponding to the air pressure sensor **20** of the rear left tire is read out from the memory **66** and is transmitted to the monitoring apparatus **50** (P5740), and an instruction command for the ID re-registration at the rotation is transmitted to the monitoring apparatus **50** (P5750). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the monitoring apparatus **50** (P5760). If the reply does not come within a predetermined period of time (P5760: NO), the operational flow returns to the step P5740. On the other hand, if the registration completion reply comes therefrom (P5760: YES), an ID corresponding to the air pressure sensor **30** of the rear right tire is read out from the memory **66** and is transmitted to the monitoring apparatus **50** (P5770), and an instruction command for the ID re-registration at the rotation is transmitted to the monitoring apparatus **50** (P5780). Subsequently, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the monitoring apparatus **50** (P5790). If the reply does not come within a predetermined period of time (P5790: NO), the operational flow returns to the step P5770. On the other hand, if the registration completion reply comes therefrom (P5790: YES), an ID corresponding to the air pressure sensor **40** of the front right tire is read out from the memory **66** and is transmitted to the monitoring apparatus **50** (P5800), and an instruction command for the ID re-registration at the rotation is transmitted to the monitoring apparatus **50** (P5810). Then, a decision is made as to whether or not a reply indicative of the completion of the registration comes from the monitoring apparatus **50** (P5820). If the reply does not come within a predetermined period of time (P5820: NO), the operational flow returns to the step P5800. On the other hand, if the registration completion reply comes therefrom (P5820: YES), a trigger signal for giving instruction for the restoration to the normal mode is outputted to the monitoring apparatus **50** (P5830).

Moreover, if the re-registration button is pushed (P4900: re-registration) and the tire replacement is designated (P5410: tire replacement), as shown in FIG. **73**, an instruction message to the effect that signal lines is connected to a sensor to be newly mounted and the tire pressure monitoring

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apparatus **50** is put on the display **69** (P5902), and the control waits for the panel manipulation indicating the completion of the connection (P5904). In response to the panel manipulation indicating the connection completion (P5904: YES), for the confirmation of the connection, a request signal is transmitted to each of the sensor signal lines **63***a* to **63***d* (P5906), and the control waits for a reply to the request signal (P5908). If the reply takes place (P5908: YES), only the sensor signal line providing the reply is set in an active state (P5910), and a trigger signal is transmitted to only the signal line made active so that the tire air pressure sensor is set in an ID registration mode (P5920).

Following this, a random-number generating unit is activated to generate a random number (P5930), and four code data are automatically produced in a manner such that "00", "01", "10" and "11" are added as low-order bits of the random number (P5950), and in the memory **66**, the data including the added low-order bits "00" is stored as an ID for the front left tire, the data including the added low-order bits "01" as an ID for the rear left tire, the data including the added low-order bits "10" as an ID for the rear right tire, and the data including the added low-order bits "11" as an ID for the front right tire (P5960, P5970, P5980, P5990).

Thereafter, as shown in FIG. **74**, one of the signal lines made active is specified (P6000), and an ID set value at a tire position corresponding to this signal line is read out from the memory **66** (P6010), and this ID set value is transmitted through this signal line (P6020). Then, an instruction command for the ID re-registration at the tire replacement is transmitted to the ID sending signal line (P6030). A decision is made as to whether or not a reply indicative of the registration completion comes from the air pressure sensor through that signal line (P6040). If the reply does not come within a predetermined period of time (P6040: NO), the operational flow returns to the step P6010. On the other hand, if the reply indicative of the registration completion comes therefrom (P6040: YES), a trigger signal is outputted through this signal line for restoring the air pressure sensor to the normal mode (P6050), and this signal line is setting-changed from the active state to the non-active state (P6060). Then, the ID set value read out in the step P6010, together with the tire position information, is transmitted to the tire pressure monitoring apparatus **50** (P6070). Subsequently, an instruction command for the ID re-registration at the tire replacement is transmitted to the tire pressure monitoring apparatus **50** (P6080), and a decision is made as to whether or not a reply indicative of the registration completion comes from the tire pressure monitoring apparatus **50** (P6090). If the reply does not come within a predetermined period of time (P6090: NO), the operational flow returns to the step P6070. On the other hand, if the reply indicative of the registration completion comes therefrom (P6090: YES), a decision is made as to whether signal lines set in the active state in the step P6010 remain or not (P6100). If they are still left (P6100: YES), one of the signal lines left is specified (P6110), and the operational flow returns to the step P6010. On the other hand, if there is no signal line set in the active state (P6110: NO), a trigger signal is outputted to restore the tire pressure monitoring apparatus **50** to the normal mode (P6120), and the processing comes to an end.

Furthermore, referring to FIGS. **75** to **77**, a description will be given hereinbelow of the contents of control processing to be implemented in the tire pressure monitoring apparatus **50**. In this control processing, as shown in FIG. **75**, a decision is first made as to the reception of a trigger signal giving instruction for the switching into the ID registration mode (P6200). In the case of the reception of the trigger signal calling for the switching into the ID registration mode (P6200: YES), the switching into the ID registration mode is made (P6210), and a decision is made on the reception of an ID (P6220). In the case of the reception of the ID (S6220: YES), this ID, together with tire position information, is temporarily stored in a work area of the RAM (P6230). Then, a decision is made on the reception of an instruction for any one of the ID initial-registration, ID re-registration in the case of the rotation and ID re-registration in the case of the tire replacement (P6240). In the case of the reception of the ID initial-registration instruction (P6240: initial registration), the ID temporarily stored in the step S6230 is registered as the ID of the air pressure sensor of the front left tire in the memory **55** (P6250), and a reply is made which is indicative of the completion of the ID registration (P6260). Subsequently, a decision is made on the reception of an ID (P6270). In the case of the reception of the ID (S6270: YES), this ID is temporarily stored in a work area of the RAM (P6280). Then, a decision is made on the reception of an instruction for the ID initial-registration (P6290). In the case of the reception of the ID initial-registration instruction (P6290: YES), the ID temporarily stored in S6280 is registered as the ID of the air pressure sensor of the rear left tire in the memory **55** (P6300), and a reply is made which is indicative of the completion of the ID registration (P6310). Following this, a decision is made on the reception of an ID (P6320). In the case of the reception of the ID (S6320: YES), this ID is temporarily stored in a work area of the RAM (P6330). Then, a decision is made on the reception of an instruction for the ID initial-registration (P6340). In the case of the reception of the ID initial-registration instruction (P6340: YES), the ID temporarily stored in S6330 is registered as the ID of the air pressure sensor of the rear right tire in the memory **55** (P6350), and a reply is made which is indicative of the completion of the ID registration (P6360). Moreover, a decision is made on the reception of an ID (P6370). In the case of the reception of the ID (S6370: YES), this ID is temporarily stored in a work area of the RAM (P6380). Then, a decision is made on the reception of an instruction for the ID initial-registration (P6390). In the case of the reception of the ID initial-registration instruction (P6390: YES), the ID temporarily stored in S6380 is registered as the ID of the air pressure sensor of the front right tire in the memory **55** (P6400), and a reply is made which is indicative of the completion of the ID registration (P6410). Thereafter, a decision is made as to the reception of a trigger signal to the effect that the mode is switched into the normal mode (P6420). In the case of the reception of the trigger signal calling for the switching into the normal mode (P6420: YES), the mode is switched into the normal mode (P6430), and the processing comes to an end.

Still furthermore, in the step P6240, in the case of the reception of the ID re-registration instruction for the rotation (P6240: rotation), as shown in FIG. **76**, the ID temporarily stored in the step P6230 is re-registered by overwriting as the ID of the air pressure sensor of the front left tire in the memory **55** (P6550), and a reply is carried out which is representative of the ID registration completion (P6560). Then, a decision is made on the reception of an ID (P6570). In the case of the reception of the ID (P6570: YES), this ID is temporarily stored in a work area of the RAM (P6580). A decision is made on the reception of an ID initial-registration instruction (P6590). In the case of the reception of the ID initial-registration instruction (P6590: YES), the ID temporarily stored in the step P6580 is re-registered by overwriting

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as an ID of the air pressure sensor of the rear left tire in the memory **55** (**P6600**), and a reply is made which is representative of the ID registration completion (**P6610**). Then, a decision is made on the reception of an ID (**P6620**). In the case of the reception of the ID (**P6620**: YES), this ID is temporarily stored in a work area of the RAM (**P6630**). A decision is made on the reception of an ID initial-registration instruction (**P6640**). In the case of the reception of the ID initial-registration instruction (**P6640**: YES), the ID temporarily stored in the step **P6630** is re-registered by overwriting as an ID of the air pressure sensor of the rear right tire in the memory **55** (**P6650**), and a reply is made which is representative of the ID registration completion (**P6660**). subsequently, a decision is made on the reception of an ID (**P6670**). In the case of the reception of the ID (**P6670**: YES), this ID is temporarily stored in a work area of the RAM (**P6680**). A decision is made on the reception of an ID initial-registration instruction (**P6690**). In the case of the reception of the ID initial-registration instruction (**P6690**: YES), the ID temporarily stored in the step **P6680** is re-registered by overwriting as an ID of the air pressure sensor of the rear right tire in the memory **55** (**P6700**), and a reply is made which is representative of the ID registration completion (**P6710**). Thereafter, a decision is made as to the reception of a trigger signal to the effect that the mode is switched into a normal mode (**P6720**). In the case of the reception of the trigger signal calling for the switching into the normal mode (**P6720**: YES), the switching into the normal mode is done (**P6730**), and the processing comes to an end.

Yet furthermore, in the step **P6240**, in the case of the reception of the ID re-registration instruction for the tire replacement (**P6240**: tire replacement), as shown in FIG. **77**, the ID temporarily stored in the step **P6230** is read out therefrom and is registered by overwriting as the ID of the air pressure sensor at the corresponding tire position on the basis of the tire position information received in the step **P6230** (**P6810**), and a reply is carried out which is representative of the ID registration completion (**P6820**). Then, a decision is made on the reception of an ID (**P6830**). In the case of the reception of the ID (**P6830**: YES), this ID, together with the tire position information, is temporarily stored in the RAM (**P6840**), and a decision is made on the reception of an ID re-registration instruction at the tire replacement (**P6850**). In the case of the reception of the ID re-registration instruction at the tire replacement (**P6850**: YES), the operational flow returns to the step **P6810**. On the other hand, in the case of no reception of an ID (**P6830**: NO), a decision is made as to the reception of a trigger signal to the effect that the mode is switched into a normal mode (**P6860**). In the case of the reception of the trigger signal calling for the switching into the normal mode (**P6860**: YES), the switching into the normal mode is done (**P6870**), and the processing comes to an end.

The contents of the control processing to be implemented in the air pressure sensor is similar to those in the tenth embodiment.

Also in the eleventh embodiment, the re-registration stemming from the tire replacement can be done with respect to only the sensor of a tire to be newly mounted, thus reducing the number of steps for the ID registration operation at the time of the tire replacement. Moreover, since a sensor ID is set through the use of a random-number generating function of the tool, for both the initial registration and re-registration, it is possible to lessen the burden imposed in the operator.

It should be understood that the present invention is not limited to the above-described embodiments, and that it is intended to cover all changes and modifications of the embodiments of the invention herein which do not constitute departures from the spirit and scope of the invention.

In the description of the fourth to eleventh embodiments, although an ID transmitted from the tool **60** through wires to the sensors **10**, **20**, **30** and **40** and to the tire pressure monitoring apparatus **50** to be registered therein, it is also acceptable that a set ID is transmitted from the tool **60** through radio using electric wave thereto. In this case, for example, it is also acceptable that a specific band-pass filter can be placed to function so that the receiving circuit in the sensors **10**, **20**, **30** and **40** and the tire pressure monitoring apparatus **50** is capable of receiving only a specific frequency-band signal different from a common pressure detection signal when receiving a trigger signal for setting an ID registration mode, and an ID set value is transmitted as this specific frequency-band from the tool **60**, that the electric wave directivity from the tool **60** is enhanced to prevent the radio interference, or that an information transmission medium (for example, ultrasonic wave) with a high directivity is employed for the ID registration.

In addition, for example, in a case in which an ID is set using a random number, it is also appropriate that an ID is produced on the basis of a combination of the random number and date and time, information on a factory or the like in order to avoid the coincidence. Also in a case in which an ID is manually set in a tool, if the ID is produced on the basis of a combination of an input value and the date and time, an ID registration place, an operator code or the like, it is possible to avoid the coincidence.

In the eleventh embodiment, although an ID is re-registered in the tire pressure monitoring apparatus **50** by means of the overwriting at the time of the re-registration stemming from the rotation or the tire replacement, it is also appropriate that, instead of the overwriting, a new ID is registered while the previous ID is left in a registered condition. This is because the sensor side ID is altered with respect to the initial registration and a pressure detection signal is transmitted only together with the ID after the re-registration and, hence, there arises no problem even if the ID at the time of the initial registration remains in the interior of the monitoring apparatus **50**.

Still additionally, if information in which the fact of re-registration or the number of times of re-registration is attached to an ID is stored in the tire pressure monitoring apparatus **50** at the time of the re-registration stemming from the tire rotation or the tire replacement, it is possible to seize the rotation history or tire replacement history from the ID registration information of the monitoring apparatus **50**.

What is claimed is:

1. A method of registering a tire air pressure sensor ID in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a step of reading said ID offered as readable information, said readable information being optically readable information and being configured to facilitate being read through the use of an optical information reader; and

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a step of writing the read ID in an ID storage unit of each of said air pressure sensors and in an ID storage unit of said tire pressure monitoring apparatus.

2. A method of registering a tire air pressure sensor ID in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a step of indicating a sensor ID as readable information on each of said air pressure sensors, each of said tires, a wheel of each of said tires wheel cover of each of said tires, said readable information being optically readable information and being configured to facilitate being read through the use of an optical information reader;

a step of reading said ID from said readable information; and

a step of writing the read ID in an ID storage unit of said tire pressure monitoring apparatus.

3. The method according to claim 1, further comprising a step of, when an ID is read out from said readable information is inputted in said tire pressure monitoring apparatus, clearing, of IDs already written in said ID storage unit of said tire pressure monitoring apparatus, a previously stored ID corresponding to said ID inputted this time, such that a new ID can be stored.

4. The method according claim 2, further comprising a step of, when an ID is read out from said readable information and is inputted in said tire pressure monitoring apparatus, clearing, of IDs already written in a ID storage unit of said tire pressure monitoring apparatus, a previously stored ID corresponding to said ID inputted this time, such that a new ID can be stored.

5. A method of registering a tire air pressure sensor ID in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a step of reading said ID offered as readable information; and

a step of writing the read ID in an ID storage unit each of said air pressure sensors and in an ID storage unit of said tire pressure monitoring apparatus,

wherein, as said readable information, are used optically-readable information including bar code, data code, QR code, maxi code, CP code, PDF417, code 49, code 16K and coder block, and said ID is read out through the use of an optical information reading unit and said ID read by said optical information reading unit is written in said ID storage unit through the use of a predetermined unit.

6. A method of registering a tire air pressure sensor ID in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a step of indicating a sensor ID as readable information on each of said air pressure sensors, each of said tires, a wheel of each of said tires or a wheel cover of each of said tires;

a step of reading said ID from said readable information; and

a step of writing the read ID in an ID storage unit of said tire pressure monitoring apparatus,

wherein, as said readable information, are used optically-readable information including bar code, data code, QR code, maxi code, CP code, PDF417, code 49, code 16K and coder block, and said ID is read out through the use of an optical information reading unit and said ID read by said optical information reading unit is written in said ID storage unit through the use of a predetermined unit.

7. The method according to claim 5, wherein said optical information reading unit and said tire pressure monitoring apparatus are connected to each other through a signal line so that the read ID is transmitted from said optical information reading unit through said signal line to said tire pressure monitoring apparatus.

8. The method according to claim 6, wherein said optical information reading unit and said tire pressure monitoring apparatus are connected to each other through a signal line so that the read ID is transmitted from said optical information reading unit through said signal line to said tire pressure monitoring apparatus.

9. A tire air pressure sensor ID registration apparatus for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air a tire sensor to monitor an air press of each of said tires mounted on said vehicle, comprising:

an ID indicating unit for indicating readable information including an ID, said readable information being optically readable information and being configured to facilitate being read through the use of an optical information reader;

a reading unit for reading out said ID from said readable information indicated by ID indicating unit; and

ID writing unit for writing said ID, read by said reading unit, in an ID storage unit of each of said air pressure sensors and in an ID storage unit of said tire pressure monitoring apparatus.

10. A tire air pressure sensor ID registration apparatus for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a readable information indication label including a sensor ID for indicating readable information and adhered onto each of said air pressure sensors, each of said tires, a wheel of each of said tires or a wheel cover of each of said tires, said readable information being optically readable information and being configured to facilitate being read through the use of an optically information reader;

a reading unit for reading out said ID from said readable information indication label; and

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an ID writing unit for writing said ID, read out by the reading unit, in an ID storage unit of said tire pressure monitoring apparatus.

11. The apparatus according claim **9**, further comprising an ID deletion unit for, when said ID read out by said reading unit is inputted in said tire pressure monitoring apparatus, clearing, of IDs already written in said ID storage unit of said tire pressure monitoring apparatus, a previously stored ID corresponding to said ID inputted this time, such that a new ID can be stored.

12. The apparatus according to claim **10**, further comprising an ID deletion unit for, when said ID read out by said reading unit is inputted in said tire pressure monitoring apparatus, clearing, of IDs already written in said ID storage unit of said tire pressure monitoring apparatus, a previously stored ID corresponding to said ID inputted this time, such that a new ID can be stored.

13. The apparatus according to claim **9**, wherein, as said readable information, are used optically-readable information including bar code, data code, QR code, maxi code, CP code, PDF417, code 49, code 16K and coder block, and said ID read out through the use of an optical information reading unit and said ID read by said optical information reading unit is written in said ID storage unit through the use of said ID writing unit.

14. The apparatus according to claim **9**, wherein, as said readable information, are used optically-readable information including bar code, data code, QR code, mini code, CP code, PDF417, code 49, code 16K and coder block, and said ID is read out through the use of an optical information reading unit and said ID read by said optical information reading unit is written in said ID storage unit through the use of said ID writing unit.

15. The apparatus according to claim **13**, wherein said optical information reading unit and said tire pressure monitoring apparatus are connected to each other through a signal line so that the ID to be stored in said tire pressure monitoring apparatus is transmitted through said signal.

16. The apparatus according to claim **14**, wherein said optical information reading wih and said tire pressure monitoring apparatus an connected to each other through a signal line so that the ID to be stored in said tire pressure monitoring apparatus is transmitted through said signal.

17. An ID registration tool for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a reading unit for reading out a sensor ID from a readable information indication label including said sensor ID for indicating readable information and adhered onto each of said air pressure sensors, each of said tires, a wheel of each of said tires or a wheel cover of each of said tires, said readable information being optically readable information and being configured to facilitate being read through the use of an optical information reader;

ID transmitting unit for transmitting said ID, read out by said reading unit, to said tire pressure monitoring apparatus; and

a storage state instruction unit for giving an instruction on registration or deletion of said ID transmitted from said ID transmitting unit.

18. An ID registration tool for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with an ID of an air pressure sensor of each of tires mounted on said vehicle from said air pressure sensor to monitor an air pressure of each of said tires mounted on said vehicle, comprising:

a reading unit for reading out a sensor ID from a readable information indication label including said sensor ID and adhered onto each of said air pressure sensors, each of said tires, a wheel of each of said tires or a wheel cover of each of said tires;

ID transmitting unit for transmitting said ID, read out by said reading unit, to said tire pressure monitoring apparatus; and

a storage state instruction unit for giving an instruction on registration or deletion of said ID transmitted from said ID transmitting unit,

wherein said reading unit is an optical information reading unit for optically reading optically-readable information including bar code, data code, QR code, maxi code, CP code, PDF417, code 49, cock 16K and coder block.

19. The tool according to claim **17**, further comprising a signal line for making connection with respect to said tire pressure monitoring apparatus or a connector for connection of said signal line.

20. The tool according to claim **17**, further a trigger signal transmitting unit for transmitting a trigger signal for setting an ID registration mode to said tire pressure monitoring apparatus.

21. A tire with an air pressure sensor in which an optically-readable information label indicating information including an ID of said air pressure sensor is adhered onto said air pressure sensor, said tire itself, a tire wheel or a tire wheel cover, and said optically-readable information label is one of a data code label, a QR code label, a maxi code label, and a CP code label.

22. A method of registering an ID of each of tire air pressure sensors for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with said ID from said air pressure sensor of each of tires mounted on said vehicle to monitor an air pressure of each of said tires, comprising:

placing each of said sensors and said tire pressure monitoring apparatus into an ID registration mode,

transmitting said ID to each of said sensors stored therein, and

while said ID is transmitted, transmitting the same ID, which is identical in content to said ID transmitted to each of said sensors, to said tire pressure monitoring apparatus to be stored therein.

23. A method of registering an ID of each of tire air pressure sensors for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with said ID from said air pressure sensor of each of tires mounted on said vehicle to monitor an air pressure of each of said tires, comprising:

placing each of said sensors and said tire pressure monitoring apparatus into an ID registration mode,

transmitting said ID to each of said sensors through the use of an ID registration tool to be stored in each of said sensors, and

while said ID is transmitted, transmitting the same ID, which is identical in content to said ID transmitted to each of said sensors, to said tire pressure monitoring

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apparatus through said ID registration tool to be stored in said tire pressure monitoring apparatus.

24. The method according to claim **23**, wherein, when said ID is stored in each of said air pressure sensors and said tire pressure monitoring apparatus, connections between each of said sensors and said ID registration tool and between said tire pressure monitoring apparatus and said ID registration tool are made through signal lines so that said ID is transmitted from said ID registration tool through said signal lines to each of said sensors and said tire pressure monitoring apparatus.

25. The method according to claim **22**, wherein said ID is set on the basis of peculiar vehicle information on production management, including a vehicle production number, and is stored in each of said sensors and said tire pressure monitoring apparatus.

26. The method according to claim **23**, wherein said ID is set on the basis of peculiar vehicle information on production management, including a vehicle production number, and is stored in each of said sensors and said tire pressure monitoring apparatus.

27. The method according to claim **22**, wherein said ID is set on the basis of a random number, and is stored in each of said sensors and said tire pressure monitoring apparatus.

28. The method according to claim **23**, wherein said ID is set on the basis of a random number, and is stored in each of said sensors and said tire pressure monitoring apparatus.

29. The method according to claim **22**, wherein said ID is a peculiar ID for each tire position.

30. The method according to claim **23**, wherein said ID is a peculiar ID for each tire position.

31. A tire air pressure sensor ID registration apparatus for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with a registration ID from an air pressure sensor of each of tires mounted on said vehicle to monitor an air pressure of each of said tires, said ID registration apparatus comprising:

a receiver mode switching unit for switching said tire pressure monitoring apparatus into an ID registration mode;

a transmitter mode switching unit for switching said air pressure sensor of each of said tires into an ID registration mode;

an ID setting unit for setting said registration ID to be stored in said air pressure sensor; and

an ID registration tool including an ID transmitting unit for transmitting the set registration ID to said air pressure sensor switched into said ID registration mode by said transmitter mode switching unit and further for transmitting the same set registration ID, which is identical in content to said set registration ID transmitted to said air pressure sensor, to said tire pressure monitoring apparatus switched into said ID registration mode by said receiver mode switching unit.

32. The apparatus according to claim **31**, wherein said ID registration tool is connected through signal lines to said air pressure sensor and said tire pressure monitoring apparatus so that said registration ID is transmitted through said signal lines to said air pressure sensor and said tire pressure monitoring apparatus to be stored in said air pressure sensor and said tire pressure monitoring apparatus.

33. The apparatus according to claim **31**, wherein said ID registration tool is made to be connectable to a production management computer, and said ID setting unit is made to set said registration ID on the basis of production management information peculiar to each vehicle, including a vehicle body number or a vehicle production number, given from said production management computer.

34. An ID registration tool for use in a tire pressure monitoring system in which a tire pressure monitoring apparatus mounted on a body of a vehicle receives an air pressure signal transmitted together with a registration ID from an air pressure sensor of each of tires mounted on said vehicle to monitor an air pressure of each of said tires, and made to register said registration ID in said tire pressure monitoring apparatus, said tool comprising:

an ID setting unit for setting said registration ID to be stored in said air pressure sensor to be mounted on said vehicle, and

an ID transmitting unit for transmitting said registration ID, set in said ID setting unit, to said air pressure sensor and further for transmitting the same set registration ID, which is identical in content to said set registration ID transmitted to said air pressure sensor, to said tire pressure monitoring apparatus.

35. The tool according to claim **34**, further comprising:

signal lines for making connections with respect to said air pressure sensor and said tire pressure monitoring apparatus or connectors for establishing connections with respect to said signal lines.

36. The tool according to claim **34**, further comprising:

a trigger signal transmitting unit for transmitting a trigger signal to said air pressure sensor and said tire pressure monitoring apparatus for placing said air pressure sensor and said tire pressure monitoring apparatus into an ID registration mode.

37. The tool according to claim **34**, wherein said ID setting unit comprises a sensor-peculiar ID producing unit for producing an registration ID peculiar to each of said sensors on the basis of peculiar vehicle information on production management, including a vehicle body number or a vehicle production number.

38. The tool according to claim **34**, wherein said ID setting unit comprises a random-number producing unit for producing a random number and a sensor-peculiar ID producing unit for producing an ID peculiar to each of said sensors on the basis of said random number produced by said random-number producing unit.

39. The tool according to claim **34**, wherein said tool is made to be connectable to production management computer, and said ID setting unit is made to set an ID including a portion of or all of production management information peculiar to each vehicle, including a vehicle body number or a vehicle production number, given by said production management computer.

40. A tire pressure monitoring apparatus which registers an ID of an air pressure sensor of each of tires mounted on a vehicle and receives, through an antenna, an air pressure signal transmitted together with said ID from said sensor to monitor an air pressure of each of said tires on the basis of a result of the reception, said apparatus comprising:

a signal line connecting unit for making a connection through a signal line to a predetermined ID registration tool;

an ID registration mode activating unit for activating an ID registration mode;

a tire position judging unit for making a judgment on a tire position on the basis of registration ID data received

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through said signal line in a state where said ID registration mode is activated;

an ID registration unit for registering said ID of said air pressure sensors in the form of specifying a tire position on the basis of a result of judgment in said tire position judging unit;

a re-registration judging unit for making a judgment on the basis of a command received from said ID registration tool as to whether or not the present registration is re-registration; and

a re-registration unit for, when the judgment in said re-registration judging unit indicates the re-registration, re-registering an air pressure sensor ID in a memory on to basis of a result of the judgment in said tire position judging unit so that an ID already registered with respect to an air pressure sensor existing at a tire position undergoing the tire position judgment is actually replaced with said air pressure sensor ID.

* * * * *

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	Hung-Chih Yu
Filer:	David Alan Reed/Lesley Andrew
Attorney Docket Number:	
Filed as Large Entity	
Filing Fees for ex parte reexam	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
EX PARTE REEXAMINATION (1.510(A)) NON-STREAMLINED	1812	1	12000	12000
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**12000**

Electronic Acknowledgement Receipt	
EFS ID:	36835510
Application Number:	90014362
International Application Number:	
Confirmation Number:	2272
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	Hung-Chih Yu
Customer Number:	23370
Filer:	David Alan Reed/Lesley Andrew
Filer Authorized By:	David Alan Reed
Attorney Docket Number:	
Receipt Date:	09-AUG-2019
Filing Date:	
Time Stamp:	15:22:07
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$12000
RAM confirmation Number	E201989F24505588
Deposit Account	201430
Authorized User	Lesley Andrew
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37 CFR 1.19 (Document supply fees)

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37 CFR 1.21 (Miscellaneous fees and charges)

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Information:					
2		Request_for_Ex_Parte_Reexamination.pdf	560379 36815c9f91452e3a651ab137cceb3b9b3e2c4733	yes	92

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	Reexam Certificate of Service	92	92

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3	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PAT-A-US_8_031_064.pdf	15644261 5d7d62cc56ebd17ad37943202715ead8c2b30451	no	14
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4	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PAT-B-US_8_031_064_prosecution_history_.pdf	16857860 4312a35a573db7dbca1d4863cc8cafeb6c3b6918	no	241
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5	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PAT-C-First_reexam_file_history_No_90-012_430_Part1.pdf	10424535 d8be05b97e8c9c7bab46b883fe23cc66b82cacb7	no	175
Warnings:					
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Warnings:					
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15	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PA-A-US_6_927_679_Taguchi.pdf	6499725 ff8a116498ee97f605fdb44161ea033bd059a0ea	no	36
Warnings:					
Information:					
16	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PA-B-US_6_920_785_Toyofuku.pdf	9294973 31e6968457b5f885a76218daa006e9680c5c7b6c	no	11
Warnings:					
Information:					
17	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PA-C-US_2006-0208864A1_Nantz.pdf	12524327 14cecfca4e3e0de69894b0855cc38aaf82a53ecc	no	9
Warnings:					
Information:					
18	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PA-D_US_6_941_801_Lemense.pdf	7515387 22607e6789283b74e3c3bf8043fcb763b0b1222c	no	7
Warnings:					
Information:					
19	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	PA-E-US_7_079_033_Itou.pdf	20353659 004d973335f321584eda0b8d818fc7886348cc15	no	116
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20	Fee Worksheet (SB06)	fee-info.pdf	29548 f8f066fb702ebdc45b325ec837b1a5a62ae602f3	no	2
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IPR2024-00744

Litigation Search Report CRU 3999

Reexam Control No. 90/014,362

To: Examiner **Location: CRU** **Art Unit: 3992** **Date: 08/09/2019**	**From: Renee Preston** **Location: CRU 3999** **REM 4C75** **Phone: (571) 272-1607** **Renee.preston@uspto.gov**

Search Notes

U.S. Patent No. 8,031,064

1) I performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.

2) I performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.

3) I performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.

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5) I performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.

Litigation – No cases found

Orange Exhibit No. 2004
IPR2024-00744

References Cited Items (3)

Title	Date	Type
1. ID REGISTRATION METHOD, ID COLLATION SYSTEM INCORPORATED IN A VEHICLE CONTROL SYSTEM, EMBODIED AS A PNEUMATIC TIRE PRESSURE MONITORING APPARATUS ASSOC... Out Of Plan US PAT 6927679	Jun 25, 2003	Patents
2. TIRE AIR PRESSURE MONITORING SYSTEM Out Of Plan US PAT 7137296	Jul 01, 2005	Patents
3. TIRE PRESSURE SENSOR UNIT, TIRE PRESSURE MONITORING SYSTEM, AND METHOD OF REGISTERING IDENTIFICATION CODE OF TIRE PRESSURE SENSOR UNIT Out Of Plan US PAT 6920785	May 01, 2002	Patents

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Citing References (7)

Treatment	Title	Date	Type	Depth	Headnote(s)
—	1. **TIRE CONDITION ACQUISITION DEVICE AND TIRE CONDITION MONITORING SYSTEM** Out Of Plan US PAT 8471694 , U.S. PTO Utility	June 25, 2013	Patents	—	—
—	2. **TIRE PRESSURE DETECTING APPARATUS FOR DETECTING AIR PRESSURE INSIDE TIRE OF CAR, HAS POWER SOURCE ELECTRONICALLY CONNECTED TO CONTROL MODULE AND PROVIDING ELECTRICAL POWER TO SETTING APPARATUS** Out Of Plan DWPI 2010-D01202+	Sep. 17, 2008	DWPI	—	—
—	3. **RF 021898/0710** Out Of Plan	Sep. 17, 2008	Assignments	—	—
—	4. **PatStat 8031064**	Dec. 16, 2014	Patent Status Files	—	—
—	5. **PatStat 8031064**	Apr. 29, 2014	Patent Status Files	—	—
—	6. **PatStat 8031064**	Nov. 12, 2013	Patent Status Files	—	—
—	7. **PatStat 8031064**	2012	Patent Status Files	—	—

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Documents (3)

1. *US Patent Issued to Orange Electronic on Oct. 4 for "Tire Pressure Detecting Apparatus and Tire Pressure Detector Identification Copying Method for the Same" (Taiwanese Inventor)*
Client/Matter: -None-
Search Terms: 8031064 or 8,031,064
Search Type: Terms and Connectors
Narrowed by:

Content Type	Narrowed by
News	-None-

2. *Orange Electronic Assigned Patent*
Client/Matter: -None-
Search Terms: 8031064 or 8,031,064
Search Type: Terms and Connectors
Narrowed by:

Content Type	Narrowed by
News	-None-

3. *PTO Litigation Center Report - March 4, 2014*
Client/Matter: -None-
Search Terms: 8031064 or 8,031,064
Search Type: Terms and Connectors
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Content Type	Narrowed by
News	-None-

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US Patent Issued to Orange Electronic on Oct. 4 for "Tire Pressure Detecting Apparatus and Tire Pressure Detector Identification Copying Method for the Same" (Taiwanese Inventor)

US Fed News

October 8, 2011 Saturday 1:28 PM EST

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Length: 236 words

Dateline: ALEXANDRIA, Va.

Body

ALEXANDRIA, Va., Oct. 8 -- United States Patent no. ***8,031,064***, issued on Oct. 4, was assigned to Orange Electronic Co. Ltd. (Tanzih Hsiang Taichung Hsien, Taiwan).

"Tire Pressure Detecting Apparatus and Tire Pressure Detector Identification Copying Method for the Same" was invented by Hung-Chih Yu (Taichung, Taiwan).

According to the abstract released by the U.S. Patent & Trademark Office: "A tire pressure detecting apparatus has an identification rewriteable tire pressure detector and a setting apparatus. The tire pressure detector is securely mounted on a valve stem inside a tire of a vehicle and has a micro-processing module, a sensing module, a transmitting module and a receiving interface, where the micro-processing module has a memory unit. The setting apparatus is capable of reading or inputting an identification from a failure tire pressure detector, transmits the identification to the identification rewriteable tire pressure detector and writes the identification into the memory unit."

The patent was filed on Sept. 17, 2008, under Application No. 12/283,979.

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=**8031064**&OS=**8031064**&RS=**8031064***

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Orange Electronic Assigned Patent

Targeted News Service

October 6, 2011 Thursday 11:00 PM EST

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Length: 252 words

Byline: Targeted News Service

Dateline: Alexandria, Va.

Body

ALEXANDRIA, Va., Oct. 6 -- Orange Electronic, Tanzih Hsiang Taichung Hsien, Taiwan, has been assigned a patent (***8,031,064***) developed by Hung-Chih Yu, Taichung, Taiwan, for a "tire pressure detecting apparatus and tire pressure detector identification copying method for the same."

The abstract of the patent published by the U.S. Patent and Trademark Office states: "A tire pressure detecting apparatus has an identification rewriteable tire pressure detector and a setting apparatus. The tire pressure detector is securely mounted on a valve stem inside a tire of a vehicle and has a micro-processing module, a sensing module, a transmitting module and a receiving interface, where the micro-processing module has a memory unit. The setting apparatus is capable of reading or inputting an identification from a failure tire pressure detector, transmits the identification to the identification rewriteable tire pressure detector and writes the identification into the memory unit."

The patent application was filed on Sept. 17, 2008 (12/283,979). 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=80,31,064.PN.&OS=PN/80,31,064&RS=PN/80,31,064*

Written by Ruby Maibam; edited by Jaya Anand.

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PTO Litigation Center Report - March 4, 2014

National Law Review

March 4, 2014 Tuesday 11:10 PM EST

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Length: 338 words

Byline: Sterne, Kessler, Goldstein Fox P.L.L.C.

Body

Mar 04, 2014 (National Law Review:*http://www.natlawreview.com* Delivered by Newstex)

PTO Litigation Center[1]

Listed below are all new filings before PTAB of requests for inter partes review (IPR) and covered business methods review (CBM). Also listed are any newly-posted requests for ex parte reexamination at the USPTO. This listing is current as of 11 AM on Tuesday, March 4, 2014.

New IPR Requests
Trial Number - IPR2014-00468
Filing Date - 2/28/2014
Patent # - 7,811,421
Title - HIGH DEPOSITION RATE SPUTTERING
Assignee - ZOND, INC.
Petitioner - INTEL CORPORATION
Status - Pending
Tech Center - 1700
Trial Number - IPR2014-00472
Filing Date - 3/3/2014
Patent # - 7,096,358
Title - ENCRYPTING FILE SYSTEM
Assignee - MAZ ENCRYPTION TECHNOLOGIES LLC
Petitioner - ORACLE CORPORATION AND APPLE INC.
Status - Pending
Tech Center - 2100
New CBM Review Requests
Trial Number - CBM2014-00079
Filing Date - 3/3/2014
Patent # - 7,698,196
Title - METHOD AND SYSTEM FOR MODELING AND BENCHMARKING PRIVATE EQUITY AND APPLICATIONS OF SAME
Assignee - CAPITAL DYNAMICS
Petitioner - Cambridge Associates, LLC
Status - Pending
Tech Center - 3600
Newly-Posted Reexam Requests
Control # - 90/013,166
Date - 2/26/2014
Patent # - 7,536,723

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PTO Litigation Center Report - March 4, 2014

Inventor - BHAGWAT, Pravin et al.
Assignee - AIRTIGHT NETWORKS, INC. (F/K/A WIBHU TECHNOLOGIES, INC.)
Title - AUTOMATED METHOD AND SYSTEM FOR MONITORING LOCAL AREA COMPUTER NETWORKS FOR UNAUTHORIZED WIRELESS ACCESS
Co-pending Litigation - Aerohive Networks, Inc. v. Airtight Networks, Inc., U.S. Dist. Ct. N.D. Cal., 3:13-cv-00329-JSW; Airtight Networks, Inc. v. Aerohive Networks, Inc., U.S. Dist. Ct. N.D. Cal., 3:13-cv-00383-JSW
Control # - 90/013,169
Date - 2/28/2014

Patent # - ***8,031,064***
Inventor - YU, Hung-Chih
Assignee - ORANGE ELECTRONIC CO., LTD.
Title - TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
Co-pending Litigation - No documents posted on USPTO site.
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90/014,362	08/09/2019	8031064

CONFIRMATION NO. 2272

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ATLANTA, GA 30326

OC000000110461415

Date Mailed: 08/16/2019

NOTICE OF ASSIGNMENT OF REEXAMINATION REQUEST

The above-identified request for reexamination has been assigned to Art Unit 3992. 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)
KILPATRICK TOWNSEND & STOCKTON LLP
MAILSTOP : IP DOCKETING - 22
1100 PEACHTREE STREET SUITE2800
ATLANTA, GA 30309

/pflewis/

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
P.O. Box 1450
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REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/014,362	08/09/2019	8031064

CONFIRMATION NO. 2272

REEXAMINATION REQUEST NOTICE

KILPATRICK TOWNSEND & STOCKTON LLP
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OC000000110461413

Date Mailed: 08/16/2019

NOTICE OF REEXAMINATION REQUEST FILING DATE

(Third Party Requester)

Requester is hereby notified that the filing date of the request for reexamination is 08/09/2019, 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
24728
MORRIS, MANNING & MARTIN, LLP
IP Department
3343 PEACHTREE ROAD, NE
1600 ATLANTA FINANCIAL CENTER
ATLANTA, GA 30326

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Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,362	08/09/2019	8031064		2272

24728 7590 09/09/2019

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EXAMINER	
ESCALANTE, OVIDIO	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
09/09/2019	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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(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

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EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,362* .

PATENT UNDER REEXAMINATION *8031064* .

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)).

PTOL-465 (Rev.07-04)

Orange Exhibit No. 2004
IPR2024-00744

Order Granting Request For Ex Parte Reexamination	Control No. 90/014,362	Patent Under Reexamination 8031064	
	Examiner OVIDIO ESCALANTE	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 08/09/2019 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: Reexam Order

1. ☑ The request for *ex parte* reexamination is GRANTED.

RESPONSE TIMES ARE SET AS FOLLOWS:

For Patent Owner's Statement (Optional): TWO MONTHS from the mailing date of this communication (37 CFR 1.530 (b)). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).**

For Requester's Reply (optional): TWO MONTHS from the **date of service** of any timely filed Patent Owner's Statement (37 CFR 1.535). **NO EXTENSION OF THIS TIME PERIOD IS PERMITTED.** If Patent Owner does not file a timely statement under 37 CFR 1.530(b), then no reply by requester is permitted.

/OVIDIO ESCALANTE/ Primary Examiner, Art Unit 3992	/MAJID A. BANANKHAH/ Primary Examiner, Art Unit 3992	

cc:Requester (if third party requester)

DECISION GRANTING *EX PARTE* REEXAMINATION

1. A substantial new question of patentability (SNQ) is raised affecting claims 16-25 of US Pat 8,031,064 ("the '064 Patent") by the request for *ex parte* reexamination filed August 9, 2019.

2. The '064 Patent was previously subject to reexaminations 90/012,430 ("the '12,430 proceeding") and 90/013,169 (the '13,169 proceeding) and claims are as presented in the reexamination certificate from the '13,169 proceeding.

Prior Art Relied on in the Request

Taguchi (U.S. Patent No. 6,927,679)

Toyofuku (U.S. Patent No. 6,920,785)

Nantz (U.S. Patent Pub. No. 2006/0208864)

Lemense (U.S. Patent No. 6,941,801)

Itou (U.S. Patent No. 7,079,033)

Applying "Old Art" for a New Request for Reexamination

Of the above-mentioned references, Taguchi and Toyofuku (relied upon during the original prosecution of the '064 Patent (U.S. Patent Appl. 12/283,979) and the '12,430 proceeding and the '13,169 proceeding) and Lemense and Itou (relied upon in the '13,169 proceeding) have been relied upon by the Requester.

As stated above, Taguchi, Toyofuku, Lemense and Itou are considered "old art" for the determination of whether a new substantial question of patentability exists in the instant request for reexamination.

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35 U.S.C. 303(a) provides for *ex parte* reexamination (emphasis added):

> "Within three months following the filing of a request for reexamination under the provisions of section 302 of this title, the Director will determine whether a substantial new question of patentability affecting any claim of the patent concerned is raised by the request, with or without consideration of other patents or printed publications **.... 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."**

The reexamination statute makes it clear that a SNQ can be raised by patents and printed publications "previously cited by or to the Office or considered by the Office." This provision was added for both *ex parte* and *inter partes* reexamination via the Patent and Trademark Office Authorization Act of 2002 (Act of 2002).

Therefore, for any reexamination ordered on or after November 2, 2002, the effective date of the statutory revision, reliance on previously cited/considered art, i.e., "old art," does not necessarily preclude the existence of a substantial new question of patentability (SNQ) that is based exclusively on that old art. Rather, determinations on whether a SNQ exists in such an instance shall be based upon a fact-specific inquiry done on a case-by-case basis.

Prosecution History

The '064 patent is drawn to a tire pressure detecting apparatus, and more particularly to an identification rewriteable tire pressure detecting apparatus.

U.S. Patent Application 12/283,979

In response to the Non-Final Office Action, the Applicant stated with respect to Taguchi, claim 1 only comprises a setting apparatus (20) and a rewritable tire pressure detector (10) without connecting any tool therebetween. The input module (27) of the referenced application is a part of the setting apparatus (20) and integrated in the setting apparatus (20). Taguchi thus does not suggest the present invention.

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In addition, the Applicant stated that the input module (27) of the present invention receives an identification captured from a source tire pressure. Since the input module (27) performs a different operation from Taguchi's disclosure, interpreting the ID registration tool (60) and the ID receiving section (61) as the input module (27) of the referenced application is unreasonable.

A notice of Allowability was mailed on June 9, 2011, in response to Applicant's Amendment filed March 29, 2011, without a statement of reasons for allowance.

The '12430 proceeding

In the '12430 proceeding, substantial new questions of patentability were raised by the combination of Taguchi, PUR-TPMS publication, Ghabra, Shida and Toyofuku.

In response to the Non-Final Office Action of January 25, 2013, the Applicant argued that the transmit/receive circuit 51 and the antenna 52 of Taguchi '679 cannot be used to read on both (1) the receiving module and (2) the setting output module of base claim 1. The Applicant further states nowhere is there any disclosure that the transmit/receive circuit 5 and the antenna 52 of Taguchi '679 perform the recited functions of (1) the receiving module and (2) the setting output module of base claim 1. The Applicant notes that the transmit/receive circuit 51 and the antenna 52 of Taguchi are included in a tire pressure monitor apparatus 50 equipped in a vehicle body to monitor the air pressure of a corresponding tire, via respective pressure sensors 10, 20, 30 and 40. In contrast to the tire pressure monitor apparatus 50 of Taguchi, (1) the receiving module and (2) the setting output module of base claim 1 are included in a setting apparatus to read or input an identification to be written into the rewritable tire pressure detector.

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In response to the Applicant's arguments the Applicant rejected new claims 14-17, 19-21 and 23 under 35 U.S.C. 305.

The Examiner also responded to the applicant's arguments and maintained the rejection of the claims over Taguchi.

In response to the Final Rejection, the Applicant amended claims 18 and 22 and canceled claims 1-7, 9, 14-17, 19-21 and 23 (claims 8 and 10-13 were previously confirmed by the examiner).

In response to the Patent Owner's response, the Examiner issued a NIRC and stated the following:

The Requester failed to provide prior art showing the feature/limitation "the input module is a code scanner" as recited in claim 8. The requester, on page 11 of the request, states:

> "Claim 8 recites that the input module is a code scanner. This feature was alleged by the examiner to be illustrated in Fig. 3 of the Toyofuku patent, which characterization was also not disputed by the patent owner." (Request: 1st paragraph of page 11).

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However, nowhere in the Fig. 3 or the specification of the Toyofuku patent, is the code scanner shown, discussed or even mentioned as claimed. Hence, claim 8 is confirmed.

The User Guide only shows the publication year (2008) in the copyright notices at the bottom of each page. Although the requester has provided (i) explanation on pages 8-9 of the request; and (ii) other additional evidence to show an earlier publication date for the User Guide, they all lack the sufficient proof of when in the 2008 year the User Guide was published. Furthermore, it is possible that the User Guide was edited after it initially published. So it is unclear when the manual was made available to the public in its "final" form. While Examiner notes the requester attempted to relate some documents (i.e. (i) an invoice dated 02/26/2008, (ii) an export declaration dated 08/30/2008, and (iii) a certification of TPMS sensor dated 03/07/2008) with the User Guide, it is not evidence of the publication date of the User Guide earlier than 09/17/2008 (the priority/filing date of the '064 patent). Hence, the User Guide is not considered as prior art. None of Toyofuku, Shida, Ghabra, Taguchi and PUR-TPMS teaches at least the "reading" limitation of claims 10, 18 and 22. Hence, claims 10-13, 18 and 22 are also confirmed.

The '13,169 proceeding

In the '13,169 proceeding, substantial new questions of patentability were raised by the combination of Itou, Lemense, Dixit and Taguchi. During reexamination, claims 1-15 were canceled and the Patent Owner added new claims 16-25.

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With respect to new claims 16-17, the Patent Owner stated:

New claim 16 includes the limitation of canceled claim 1, and the new limitations as follows:

> wherein the setting apparatus is configured to:
>
> ***obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving the old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification;***
>
> store the update identification in the setting apparatus; and
>
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector ***such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification***. (Emphasis added.)

Specifically, according to new claim 16, the setting apparatus includes an input module to enable an operator to input an identification to be written into the identification rewriteable tire pressure detector, and a receiving module to receive the RF signal from the identification rewriteable tire pressure detector and to send the RF signal to the control module. The setting apparatus may obtain an ***update identification*** to be recorded into a rewritable memory unit of a new identification rewriteable tire pressure detector, or to be used to ***overwrite a preset identification in the rewritable memory unit by the update identification***. The update identification can be obtained by either one of the following two ways:

(1) ***receiving, by the receiving module, the RF signal from an old tire pressure detector, retrieving the old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification***, or

(2) ***receiving, from the input module, a manual input of the identification, and using the identification as the update identification***.

In other words, the setting apparatus may receive the update identification either from the receiving module (old ID from an old tire pressure detector), or from the input module (manually input ID).

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The Patent Owner noted that the Examiner relied upon Taguchi, Dixit, Lemense and Itou as the basis of rejecting canceled claims 8 and 10-15 and that the Examiner acknowledged that Taguchi discloses a tire pressure detector with the exception of the input module.

The Patent Owner states, "none of the references teaches the action of the input module…" "Specifically, there is no description in any of the cited references that ***the setting apparatus receives from an input module a manually input identification as the update identification."***

The Patent Owner states: "In Dixit, the manual input arrangements 42A-42D are ***directly connected*** to the respective tire condition sensor units 18A-18D (Dixit, FIG. 1 and column 3, lines 43-45), and the transmitter device 44 is a part of the manual input arrangement 42 (Dixit, column 4, lines 16-17). Nowhere in Dixit discloses or teaches an input device connected to a ***setting apparatus,*** which is used to obtain ***an update identification*** for the sensor."

"In Lemense, the service tool 24 is used "to replicate or clone the ID code of a broken sensor unit into a replacement sensor unit over a LF communication link between the service tool and the replacement sensor unit." (Lemense, column 3, lines 56-60.) In other words, Lemense at best teaches ***the receiving module,*** but not the input module, as recited in new claim 16. Although Lemense teaches a keypad 26 (column 3, line 13), nowhere in Lemense describes the data that can be input by the keypad 26 or how the microcontroller 30 processes the data input by the keypad 26."

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"In Itou, the ID registration tool 60 is used to read the IDs from bar codes 5/6/7/8 for wiring the bar codes in the tire pressure monitoring apparatus 50. In other words, Itou at best teaches ***the receiving module,*** but not the input module, as recited in new claim 16."

With respect to new claims 18-19, the Patent Owner stated:

New claim 18 includes the limitation of canceled claim 1, and the new limitations as follows:

> wherein the setting apparatus is configured to:
> ***obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification received from the input module;*** and
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector;
> wherein the new identification rewriteable tire pressure detector is configured to:
> acquire the update identification from the external signal;
> ***when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and***
> ***when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.*** (Emphasis added.)

Specifically, according to new claim 18, the setting apparatus includes an input module to enable an operator to input an identification to be written into the identification rewriteable tire pressure detector, and a receiving module to receive the RF signal from the identification rewriteable tire pressure detector and to send the RF signal to the control module. The setting apparatus may obtain an ***update identification*** to be recorded into a rewritable memory unit of a new identification rewriteable tire pressure detector, or to be used to ***overwrite a preset identification in the rewritable memory unit by the update identification***. The update identification can be one of the following two types of identifications:

(1) ***an old identification of an old tire pressure detector***, obtained by ***receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal***, or

(2) ***an identification manually inputted and*** received from ***the input module***.

In other words, the setting apparatus may receive the update identification either from the

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receiving module (old ID from an old tire pressure detector), or from the input module (manually input ID).

Furthermore, according to new claim 18, after the new identification rewriteable tire pressure detector acquires the update identification from the external signal, the new identification rewriteable tire pressure detector will process the update identification determine with two possible conditional options, based on whether the rewritable memory unit has the preset identification stored therein or not:

(a) when the rewritable memory unit ***has the preset identification*** stored therein, the new identification rewriteable tire pressure detector ***overwrites the preset identification in the rewritable memory unit by the update identification***, or

(b) when the rewritable memory unit ***does not have the preset identification*** stored therein, the new identification rewriteable tire pressure detector ***records the update identification in the rewritable memory unit***.

In the Office Action, the Examiner relied upon Taguchi, Dixit, Lemense and Itou as the basis of rejecting canceled claims 8 and 10-15.

However, as discussed above, none of the references teaches the action of the input module as recited in new claim 18. Specifically, there is no description in any of the cited references that ***the setting apparatus receives from an input module a manually input identification as the update identification***.

In response, the Examiner rejected new claims 16-19 under 35 U.S.C. 305 as enlarging the scope of the patent claims. Claims 20-25 were indicated as being patentable and the examiner stated:

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The closest prior art fails to disclose or fairly suggest:

A tire pressure detector identification updating method having the step of *obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from an the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification from an input module of the setting apparatus, and using the manually input identification as the update identification"*, as recited in new claim 20 (newly added claims 21-25 depend from independent claim 20).

In response, the Patent Owner amended new claims 16 and 18 to overcome the rejections under 35 U.S.C. 305.

On November 19, 2014, the examiner issued a NIRC which stated:

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The closest prior art fails to disclose or fairly suggest:

A tire pressure detector, in which the setting apparatus is configured to perform the following steps similarly as indicated in the method claims of *obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from an the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification from an input module of the setting apparatus, and using the manually input identification as the update identification"*, as recited in newly added independent claims 16, 18 and 20 ((newly added dependent claim(s) 17, 19, and 21-25 are also patentable due to their dependencies from independent claim 16, 18 and 20, respectively).

Requester's Proposed Rejections/SNQs

The following rejections are proposed by the third party.

1. Claims 16-25 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Taguchi in view of Nantz and Toyofuku

2. Claims 17, 19, and 25 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Taguchi, Nantz, and Toyofuku in further view of Itou.

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3. Claims 16-25 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Taguchi in view of Lemense and Toyofuku.

4. Claims 17, 19 and 25 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Taguchi, Lemense, and Toyofuku and further in view of Itou.

As explained above and in the Request, allowance of claims 16-25 during the Second Reexamination was based on the added requirement that "an update identification to be written into a new identification rewritable tire pressure detector" be obtained "either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification" or substantively similar limitations in each of the independent claims. (2014-11-19 Notice of Intent to Issue Ex Parte Reexamination Certificate, at 2-3.)

Therefore, any teaching directed to the above limitations would be considered important in determining whether a substantial new question of patentability exists.

Discussion of the References Pertaining to the SNQs

SNQs 1 and 2

Taguchi teaches tire pressure sensors with rewritable memories for storing an identification. e.g., Taguchi, 10:32-40, 10:65-11:2 ("ID memory 12 storing a registered sensor ID"). Taguchi further teaches an ID registration process in which a new ID is transmitted to a

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pressure sensor and "registered as a transmitter ID in the ID memories... of respective sensors." Taguchi, 11:61-67. The new ID may "overwrite a previous ID having been already registered in respective ID memories." Taguchi, 1266-13:2.

Nantz teaches a setting apparatus receiving an old sensor ID from an RF signal and using that old ID as the update identification.

As set forth in paragraph [0029], Nantz discloses:

> As stated in the foregoing, immobilizer 102 may generate a LF signal that causes a re-write, alteration or modification of the TPM sensor 104 ID. Re-writing the TPM sensor 104 ID may be required when, for example, TPM sensor 104 is damaged and replacement is recommended. Additionally, re-writing of the TPM sensor 104 ID may be required to properly program or re-program TPM sensor 104 for a particular vehicle or TPM system application.

As set forth in paragraph [0030], Nantz discloses:

> In one embodiment, a bank of TPM sensor IDs is stored in the memory of TPM sensor 104, immobilizer 102 or any other module that interfaces with immobilizer 102. Accordingly, when immobilizer 102 transmits the LF signal, the LF signal contains data pertaining to an ID retrieved from the TPM sensor ID bank. In an alternative embodiment, where TPM sensor 104 is damaged or functioning incorrectly, immobilizer 102 may read the ID of the damaged TPM sensor and transmit an LF signal containing the ID of the damaged sensor to a replacement TPM sensor 104. The ID of the damaged TPM sensor may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. In conventional TPM systems, re-writing the ID of TPM sensor 104 is accomplished by placing the entire TPM system in a "learn mode." In such a case, the operator and/or vehicle technician must take the vehicle through a sequence of events (e.g., place the ignition in the "ON" position, press the vehicle brake twice, and press a "reset" button located on the vehicle) to re-write the ID of TPM sensor 104. Accordingly, re-writing the ID of TPM sensor 104 via the LF signal simplifies the sensor ID write/re-write process.

In addition Nantz discloses in paragraph [0026]:

> The LF command presented by immobilizer 102 may also write information to TPM sensor 104. In some aspects, the LF command may write/re-write the identification code for TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and re-flash the memory of TPM sensor 104.

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Toyofuku teaches input devices for manually inputting an update identification.

As disclosed in col. 5, lines 44-57, Toyofuku discloses:

A new self-identification code to be rewritten is input with the data input section 41 of the dedicated writing device 4. After that, the switching lever 43 is switched to the "rewriting mode" side, and then the signal A turns to the high level, so that, in response to the change of the signal A, the external input signal controller 23 performs a control for a preparation of importing the data signal. After a preparation time C has passed since the signal A turns to the high level, the dedicated writing device 4 outputs the self-identification code stored in the data input section 41 as the W part of the signal B to the external input signal controller 23, and, as the external input signal controller 23 is ready for importing the data, the data can be written in the ROM 21.

In addition, Toyofuku discloses:

Since the self-identification code of the broken sensor unit has already been known, a corresponding relation between the self-identification code and the mounting position in the vehicle identical to that before the replacement can be maintained even after the replacement by registering an identification code identical to that of the broken sensor unit to a new sensor unit after the replacement.

See col. 6, lines 23-30

The sensor unit of the present invention is a sensor unit having a pressure sensor installed in a tire wheel of a vehicle to sense tire pressure of the tire wheel, a transmitter transmitting information at least about the tire pressure to a pressure monitor provided on the vehicle and a fixing memory for storing data including data of a self-identification code specific for the sensor unit, which comprises an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface.

See col. 2, lines 27-37

Thus, given the above teachings, there is a substantially likelihood that a reasonable Examiner would consider the teachings of Taguchi, Nantz and Toyofuku important in deciding whether or not the instant claims under reexamination are patentable. Accordingly, it is agreed that the combination of Taguchi, Nantz and Toyofuku raises a SNQ over at least claims 16-25 of the instant patent.

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SNQ 3 and 4

Taguchi teaches tire pressure sensors with rewritable memories for storing an identification. e.g., Taguchi, 10:32-40, 10:65-11:2 ("ID memory 12 storing a registered sensor ID"). Taguchi further teaches an ID registration process in which a new ID is transmitted to a pressure sensor and "registered as a transmitter ID in the ID memories... of respective sensors." Taguchi, 11:61-67. The new ID may "overwrite a previous ID having been already registered in respective ID memories." Taguchi, 1266-13:2.

Lemense discloses:

> "FIG. 3 shows service tool 24 in greater detail. A microcontroller 30 is coupled to an RF receiver 31 and to an LF transmitter 33. RF receiver 31 receives transmissions from a sensor unit via an antenna 32. LF transmitter 33 sends a wake-up signal under control of microcontroller 30 to a sensor unit via an antenna 34."
>
> See col. 3, lines 4-9
>
> "The sensor unit(s) is (are) interrogated in step 41 using the service tool to send a wake-up command and to receive a data signal and ID code from each sensor unit involved in the tire replacement or repair....In step 44, the nominal or faulted results are recorded in memory by the service tool along with the respective ID codes and wheel locations (i.e., left-front, right-front, left-rear, right-rear)"
>
> See 3, lines 21-36
>
> In step 50, any non-working sensor units are replaced. Preferably, the service tool is used to replicate or clone the ID code of a broken sensor unit into a replacement sensor unit over a LF communication link between the service tool and the replacement sensor unit.
>
> See Col. 3, lines 56-60

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Toyofuku teaches input devices for manually inputting an update identification.

As disclosed in col. 5, lines 44-57, Toyofuku discloses:

A new self-identification code to be rewritten is input with the data input section 41 of the dedicated writing device 4. After that, the switching lever 43 is switched to the "rewriting mode" side, and then the signal A turns to the high level, so that, in response to the change of the signal A, the external input signal controller 23 performs a control for a preparation of importing the data signal. After a preparation time C has passed since the signal A turns to the high level, the dedicated writing device 4 outputs the self-identification code stored in the data input section 41 as the W part of the signal B to the external input signal controller 23, and, as the external input signal controller 23 is ready for importing the data, the data can be written in the ROM 21.

In addition, Toyofuku discloses:

Since the self-identification code of the broken sensor unit has already been known, a corresponding relation between the self-identification code and the mounting position in the vehicle identical to that before the replacement can be maintained even after the replacement by registering an identification code identical to that of the broken sensor unit to a new sensor unit after the replacement.

See col. 6, lines 23-30

The sensor unit of the present invention is a sensor unit having a pressure sensor installed in a tire wheel of a vehicle to sense tire pressure of the tire wheel, a transmitter transmitting information at least about the tire pressure to a pressure monitor provided on the vehicle and a fixing memory for storing data including data of a self-identification code specific for the sensor unit, which comprises an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface.

See col. 2, lines 27-37

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Thus, given the above teachings, there is a substantially likelihood that a reasonable Examiner would consider the teachings of Taguchi, Nantz and Toyofuku important in deciding whether or not the instant claims under reexamination are patentable. Accordingly, it is agreed that the combination of Taguchi, Nantz and Toyofuku raises a SNQ over at least claims 16-25 of the instant patent.

Extensions 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 reexamination proceeding. Additionally, 35 U.S.C. 305 requires that reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extension of time in *ex parte* reexamination proceedings are provided for in 37 CFR 1.550(c).

Notification of Other Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985(a), to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the base patent 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 proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Correspondence

All correspondence relating to this *ex parte* reexam proceeding should be directed as follows:

By **U.S. Postal Service Mail** to:

Mail Stop *Ex Parte* Reexam

Orange Exhibit No. 2004
IPR2024-00744

ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Central Reexamination Unit

By hand to: Customer Service Window
Randolph Building
401 Dulany St.
Alexandria, VA 22314

Registered users of EFS-Web may alternatively submit correspondence via the electronic filing system at https://efs.uspto.gov/efile/myportal/efs-registered

Any inquiry concerning this communication or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Ovidio Escalante/
Reexamination Specialist
CRU - 3992

Conferees:

/Majid Banankhah/
Reexamination Specialist
CRU, Art Unit 3992

/M.F/
Supervisory Patent Examiner, Art Unit 3992

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EXHIBIT PA-SB/08

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /O.E/

Orange Exhibit No. 2004
IPR2024-00744

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	Not yet assigned
Filing Date	August 9, 2019
First Named Inventor	Hung-Chih Yu
Art Unit	
Examiner Name	
Attorney Docket Number	

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	US- 6,927,679 B2	08-09-2005	Taguchi et al.	
	2	US- 6,920,785 B2	07-26-2005	Toyofuku	
	3	US- 2006/0208864 A1	09-21-2006	Nantz et al.	
	4	US- 6,941,801 B2	09-13-2005	Lemense et al.	
	5	US- 7,079,033 B2	07-18-2006	Itou	
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document / Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	/OVIDIO ESCALANTE/	Date Considered	08/26/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,362	08/09/2019	8031064		2272

24728 7590 09/19/2019
MORRIS, MANNING & MARTIN, LLP
IP Department
3343 PEACHTREE ROAD, NE
1600 ATLANTA FINANCIAL CENTER
ATLANTA, GA 30326

EXAMINER	
ESCALANTE, OVIDIO	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
09/19/2019	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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(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

KILPATRICK TOWNSEND & STOCKTON LLP

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1100 PEACHTREE STREET, SUITE 2800

ATLANTA, GA 30309

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,362*.

PATENT NO. *8,031,064*.

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)).

PTOL-465 (Rev.07-04)

Orange Exhibit No. 2004
IPR2024-00744

Ex Parte Reexamination Interview Summary – Pilot Program for Waiver of Patent Owner's Statement	Control No. 90/014,362	Patent For Which Reexamination is Requested 8,031,064
	Examiner Escalante, Ovidio	Art Unit 3992

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

All participants (USPTO official and patent owner):

(1) Morris, Manning & Martin, LLP (3)

(2) Renee Preston, CRU Paralegal (4)

Date of Telephonic Interview: 09/19/2019.

The USPTO official requested waiver of the patent owner's statement pursuant to the pilot program for waiver of patent owner's statement in *ex parte* reexamination proceedings.*

☐ The patent owner **agreed** to waive its right to file a patent owner's statement under 35 U.S.C. 304 in the event reexamination is ordered for the above-identified patent.

☐ The patent owner **did not agree** to waive its right to file a patent owner's statement under 35 U.S.C. 304 at this time.

The patent owner is not required to file a written statement of this telephone communication under 37 CFR 1.560(b) or otherwise. However, any disagreement as to this interview summary must be brought to the immediate attention of the USPTO, and no later than one month from the mailing date of this interview summary. Extensions of time are governed by 37 CFR 1.550(c).

*For more information regarding this pilot program, see *Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings*, 75 *Fed. Reg.* 47269 (August 5, 2010), available on the USPTO Web site at http://www.uspto.gov/patents/law/notices/2010.jsp.

☒ USPTO personnel were unable to reach the patent owner.

The patent owner may contact the USPTO personnel at the telephone number provided below if the patent owner decides to waive the right to file a patent owner's statement under 35 U.S.C. 304.

Renee Preston Renee Preston (571) 272-1607
Signature and telephone number of the USPTO official who contacted or attempted to contact the patent owner.

cc: Requester (if third party requester)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,362	08/09/2019	8031064		2272

24728 7590 01/10/2020

MORRIS, MANNING & MARTIN, LLP
IP Department
3343 PEACHTREE ROAD, NE
1600 ATLANTA FINANCIAL CENTER
ATLANTA, GA 30326

EXAMINER	
ESCALANTE, OVIDIO	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
01/10/2020	PAPER

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

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ATLANTA, GA 30309

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,362* .

PATENT UNDER REEXAMINATION *8031064* .

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)).

PTOL-465 (Rev.07-04)

Orange Exhibit No. 2004
IPR2024-00744

Office Action in Ex Parte Reexamination	**Control No.** 90/014,362	**Patent Under Reexamination** 8031064	
	Examiner OVIDIO ESCALANTE	**Art Unit** 3992	**AIA (FITF) Status** No

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

a. ☑ Responsive to the communication(s) filed on 09 August 2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

b. ☐ This action is made FINAL.

c. ☑ A statement under 37 CFR 1.530 has not been received from the patent owner.

A shortened statutory period for response to this action is set to expire 2 month(s) from the mailing date of this letter. Failure to respond within the period for response will result in termination of the proceeding and issuance of an *ex parte* reexamination certificate in accordance with this action. 37 CFR 1.550(d). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).** If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☐ Information Disclosure Statement, PTO/SB/08.
3. ☐ Interview Summary, PTO-474.
4. ☐ _____.

Part II SUMMARY OF ACTION

1a. ☑ Claims 16-25 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been canceled in the present reexamination proceeding.
3. ☑ Claims 23 are patentable and/or confirmed.
4. ☑ Claims 16-22 and 24-25 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ The drawings, filed on _____ are acceptable.
7. ☐ The proposed drawing correction, filed on _____ has been (7a) ☐ approved (7b) ☐ disapproved.
8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the certified copies have
   1 ☐ been received.
   2 ☐ not been received.
   3 ☐ been filed in Application No. _____.
   4 ☐ been filed in reexamination Control No. _____.
   5 ☐ been received by the International Bureau in PCT application No. _____.
   * See the attached detailed Office action for a list of the certified copies not received.
9. ☐ Since the proceeding appears to be in condition for issuance of an *ex parte* reexamination certificate 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.
10. ☐ Other: _____

cc: Requester (if third party requester)

DETAILED ACTION

1. This action is in response to the Requester's Request for Reexamination filed on August 9, 2019 and the Examiner's Order Granting Reexamination filed on September 9, 2019.

Status of the Claims

2. Original claims 16-22, 24 and 25 are rejected.

3. Original claim 23 is confirmed.

Claim Rejections - 35 USC § 103

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of pre-AIA 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, 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.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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5. Claims 16-22, 24 and 25 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Taguchi U.S. Patent 6,927,679 in view of Toyofuku U.S. Patent 6,920,785 and further in view of Nantz U.S. Patent Pub. 2006/0208864.

Regarding claim 16:

A tire pressure detecting system (the combination of pressure sensors 10, 20, 30 and 40 and monitoring apparatus 50 as shown in Figure 2. See also col. 10, lines 32-36)**, comprising:**

an identification rewritable tire pressure detector (The pressure sensors 10, 20, 30, 40; 10 (and similarly other sensors 20, 30, and 40) includes a rewritable ID memory 12, where a transmitter ID is written during a registration process; see abstract and col. 11, lines 49-54) **comprising:**

a micro-processing module (the combination of the control unit 15 and the ID memory 12 in Figure 2) **having a rewritable memory unit to record an identification** (the ID memory 12 is capable of recording/storing ID; see Fig. 2 and col. 10, line 65 – col. 11, line 2)**;**

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit (the pressure sensor 11 and ID memory 12 are electrically connected as shown in Figure 2)**, to detect, a tire pressure and send a detection result to the micro-processing module** (the pressure sensor 11 detects the tire pressure and sends the results to the control unit 15)**;**

a transmitting module (the combination of transmit/receive circuit 13 and the antenna 16 in Fig. 2) **controlled by the micro-processing module to transmit a radio frequency (RF) signal wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector** (see col. 11, lines 16-25, where it discloses about periodically transmitting the combination of detected pressure signal and the sensor ID in a signal with a predetermined frequency. See col. 2, lines 56-59 and col. 18, lines 4-9 where it teaches about radio (or wireless) signal transmit/receive operation)**;**

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a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector (the battery 14 provides the power to the pressure sensor 10 as shown in Fig. 2)**; and**

an interface (the transmit/receive circuit 13 in Fig. 2 and 64a-d in Figure 10) **arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit** (see S140 in Fig. 4)**: and**

a portable setting apparatus (the tire pressure monitor 50 in Figure 2) **arranged to communicate with the identification rewriteable tire pressure detector** (the tire pressure monitor 50 sends the receiver ID to the pressure sensors 10 (and similarly to 20, 30, and 40) for storage in the ID memory unit 12; see S130 in Fig. 4) **, comprising:**

a control module (the control unit 54 in Figure 2)**;**

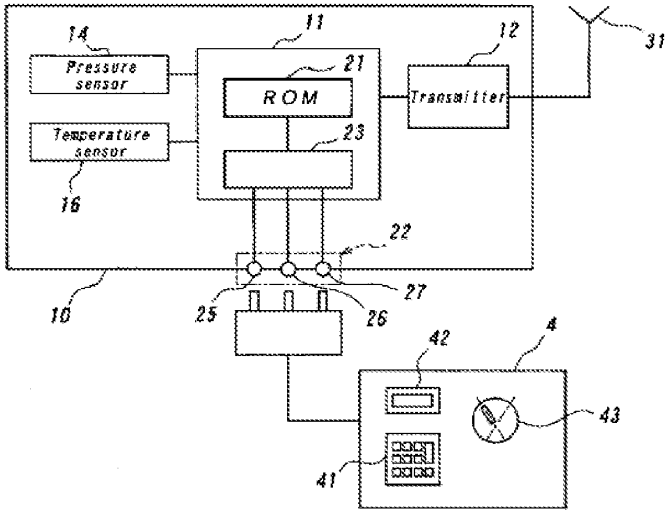
an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector;

Taguchi fails to teach the portable setting apparatus comprising "an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector".

Toyofuku discloses a data input section 41. As disclosed in col. 5, lines 44-51, Toyofuku discloses a new self-identification code can be rewritten with the data input section 41 of the dedicated writing device 4. See below Figure 3 of Toyofuku.

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FIG. 3



a receiving module (the combination of the transmit/receive circuit 51 and the antenna 52 in Fig. 2) **connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module** (see col. 11, lines 25-35 and S21 in Figure 3B, where it teaches about receiving the signal of predetermined frequency from one of the four pressure sensors 10,. 20, 30 and 40)**;**

a setting output module (the combination of the transmit/receive circuit 51 and the antenna 52 in Figure 2; and 64 in Figure 10) **controlled by the control module to send the external signal to the interface of the Identification rewriteable tire pressure detector wherein the external signal is generated by the control module and comprises the identification that is provided by the input module <u>or provided by the RF signal received from the receiving module</u>** (sending a receiver ID from the monitoring apparatus to the pressure sensor 10 (and similarly to 20, 30 and 40); see S130 in Figure 3 and col. 11, lines 60-62)**; and**

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a power source (the power circuit 53 as shown in Figure 2) **connected to the control module** (the control unit 54) **to supply power to the setting apparatus** (the tire pressure monitor 50; see Figure 2)**;**

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by

Taguchi fails to teach the portable setting apparatus is configured to either receive the RF signal from an old tire pressure detector or by receiving a manual input.

(1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification,

Nantz discloses immobilizer 102 may read the ID of the damage TPM sensor and transmit an LF signal containing the ID of the damage sensors to a replacement TPM sensors 104. The ID of the damaged TPM sensors may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. See paragraphs [0029-0030]. See also paragraphs [0014-0015].

or by

(2) receiving a manual input of the identification from the input module, and using the identification as the update identification;

Toyofuku discloses a data input section 41. As disclosed in col. 5, lines 44-51, Toyofuku discloses a new self-identification code can be rewritten with the data input section 41 of the dedicated writing device 4.

store the update identification in the setting apparatus; and

Taguchi discloses:

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"In other words, the present invention brings the transmitter and the receiver into a reversed master/slave relationship so that a collation ID is transmitted from the receiver to the transmitter, not from the transmitter to the receiver. Namely, the collation ID is stored in the receiver (i.e., master) and the collation ID is transmitted from the receiver to the transmitter (i.e., slave) and registered in the transmitter." See col. 3, lines 41-47

"As shown in FIG. 5, the ID transmission mode processing includes transmission of a trigger signal for switching respective sensors 10, 20, 30, and 40 into the ID registration mode (step S210). The frequency of this trigger signal is identical with that used in the pneumatic tire pressure monitoring processing explained with reference to FIG. 3. Next, the receiver ID registered in the memory 55 is read out (step S220), The readout receiver ID is transmitted as a signal having the same frequency as that used in the pneumatic tire pressure monitoring processing (step S230)." See col. 12, lines 19-28

As set forth above, both Toyofuku and Nantz discloses of receiving identification information (either from manual input or from an old tire pressure sensor). Taguchi discloses IDs are stored in memory 55 of the setting apparatus.

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit, by the update identification.

Taguchi discloses:

"Then, the pneumatic tire pressure monitoring apparatus 50 transmits the receiver ID (step S130). The receiver ID having been thus transmitted from the monitoring apparatus 50 is received by respective sensors 10, 20, 30, and 40 (step S140). The received receiver ID is registered as a transmitter ID in the ID memories 12, 22, 32, and 42 of respective sensors 10, 20, 30, and 40, respectively (step S150)." at 11:61-67

"Each of ID memories 12, 22, 32, and 42 is an EEPROM (i.e., Electrically Erasable and Programmable Read Only Memory) or a comparable rewritable memory element which is nonvolatile and has an overwriting function for renewing the data stored therein." at 10:65-11:2

"In the above step S340, the ID registration is executed in such a manner to overwrite a previous ID having been already registered in respective ID memories 12, 22, 32, and 42. Accordingly, in an event that exchange or position rotation of tires is performed, a new ID to be re-registered in respective sensors 10, 20, 30, and 40 as well as in the monitoring apparatus 50 is newly issued by a repair shop or by a dealer." at 12:66-13:6

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As explained above, Tovofuku discloses "an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface." See col. 2, lines 27-37. As further set forth in col. 2, lines 42-45 "[A] self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface." In addition, at col. 3, lines 4-6, Toyofuku discloses "Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added."

Therefore, the identification information that was input, can be sent to the rewritable tire pressure detector of Taguchi.

In addition, Nantz discloses, "[t]he LF command presented by immobilizer 102 may also write information to TPM sensor 104. In some aspects, the LF command may write/re-write the identification code for TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and re-flash the memory of TPM sensor 104". See paragraph [0026]. In addition, See paragraphs [0030, 0032 and 0040] which provide further details with respect to the re-writing of the ID of the TPM sensor.

Like with Toyofuku, the new ID can be sent by the setting unit of Taguchi.

The examiner notes that Taguchi with Toyofuku and Nantz are directed to tire pressure monitoring systems. See Taguchi at col.1, lines 14-23 ("This invention relates to an ID (i.e., identification) registration method.. .More specifically, the present invention relates to a pneumatic tire pressure monitoring system monitoring the pneumatic pressure of a tire..."); Toyofuku at col. 1, lines 9-15 ("The present invention relates to a tire pressure sensor unit for monitoring tire pressure of a vehicle.. .and a method of registering a self-identification code of the tire pressure sensor unit.") and Nantz at col. 1, lines 16-18 ("The present invention relates to a system and a method of tire pressure monitoring sensor diagnosis via a vehicle antitheft and entry system"). Moreover, each of the references is directed to the same problem—systems for registering IDs in tire pressure monitoring sensors.

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Taguchi teaches tire pressure sensors with rewritable memories for storing an identification. E.g., Taguchi at col. 10, lines 32-40, and col. 10, line 65 – col. 11, line 2 ("ID memory 12 storing a registered sensor ID"). Taguchi further teaches an ID registration process in which a new ID is transmitted to a pressure sensor and "registered as a transmitter ID in the ID memories... of respective sensors." See Taguchi at col. 11, lines 61-67. The new ID may "overwrite a previous ID having been already registered in respective ID memories." Taguchi at col. 12, line 66 – col. 13, line 2.

Taguchi does not expressly teach mechanisms to input an ID to be registered in tire pressure sensors. Nantz and Toyofuku supply detailed teachings that a person of ordinary skill in the art would have been motivated to apply to Taguchi. Nantz teaches a setting apparatus receiving an old sensor ID from an RF signal and using that old ID as the update identification. Toyofuku further teaches input devices for manually inputting an update identification. It was known in the art to use these input methods to provide a setting apparatus with an identification to be recorded into the memory of a tire pressure sensor. Combining the known input methods described by Nantz and Toyofuku with the system of Taguchi would have yielded predictable results.

Regarding claim 18:

A tire pressure detecting system (the combination of pressure sensors 10, 20, 30 and 40 and monitoring apparatus 50 as shown in Figure 2. See also col. 10, lines 32-36)**, comprising:**

an identification rewritable tire pressure detector (The pressure sensors 10, 20, 30, 40; 10 (and similarly other sensors 20, 30, and 40) includes a rewritable ID memory 12, where a transmitter ID is written during a registration process; see abstract and col. 11, lines 49-54) **comprising:**

a micro-processing module (the combination of the control unit 15 and the ID memory 12 in Figure 2) **having a rewritable memory unit to record an identification** (the ID memory 12 is capable of recording/storing ID; see Fig. 2 and col. 10, line 65 – col. 11, line 2)**;**

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit (the pressure sensor 11 and ID memory 12 are electrically connected

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as shown in Figure 2 **to detect a tire pressure and send a detection result, to the micro-processing module** (the pressure sensor 11 detects the tire pressure and sends the results to the control unit 15)**;**

a transmitting module (the combination of transmit/receive circuit 13 and the antenna 16 in Fig. 2) **controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector** (see col. 11, lines 16-25, where it discloses about periodically transmitting the combination of detected pressure signal and the sensor ID in a signal with a predetermined frequency. See col. 2, lines 56-59 and col. 18, lines 4-9 where it teaches about radio (or wireless) signal transmit/receive operation**;**

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector (the battery 14 provides the power to the pressure sensor 10 as shown in Fig. 2)**; and**

an interface (the transmit/receive circuit 13 in Fig. 2 and 64a-d in Figure 10) **arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit, or to be used to overwrite a preset identification in the rewriteable memory unit** (see S140 in Fig. 4)**:; and**

a portable setting apparatus (the tire pressure monitor 50 in Figure 2) **arranged to communicate with the identification rewriteable tire pressure detector** (the tire pressure monitor 50 sends the receiver ID to the pressure sensors 10 (and similarly to 20, 30, and 40) for storage in the ID memory unit 12; see S130 in Fig. 4)**, comprising:**

a control module (the control unit 54 in Figure 2)**;**

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector;

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Taguchi fails to teach the portable setting apparatus comprising "an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector".

Toyofuku discloses a data input section 41. As disclosed in col. 5, lines 44-51, Toyofuku discloses a new self-identification code can be rewritten with the data input section 41 of the dedicated writing device 4.

a receiving module (the combination of the transmit/receive circuit 51 and the antenna 52 in Fig. 2) **connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module**(see col. 11, lines 25-35 and S21 in Figure 3B, where it teaches about receiving the signal of predetermined frequency from one of the four pressure sensors 10,. 20, 30 and 40)**;**

a setting output module (the combination of the transmit/receive circuit 51 and the antenna 52 in Figure 2; and 64 in Figure 10) **controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module**(sending a receiver ID from the monitoring apparatus to the pressure sensor 10 (and similarly to 20, 30 and 40); see S130 in Figure 3 and col. 11, lines 60-62)**; and**

a power source (the power circuit 53 as shown in Figure 2) **connected to the control module** (the control unit 54) **to supply power to the setting apparatus** (the tire pressure monitor 50; see Figure 2)**;**

wherein the setting apparatus is configured to:

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obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either

Taguchi fails to teach the portable setting apparatus is configured to either receive the RF signal from an old ire pressure detector or by receiving a manual input.

(1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or

Nantz discloses immobilizer 102 may read the ID of the damage TPM sensor and transmit an LF signal containing the ID of the damage sensors to a replacement TPM sensors 104. The ID of the damaged TPM sensors may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. See paragraph [0030]

(2) the identification manually inputted and received from the input module; and

Toyofuku discloses a data input section 41. As disclosed in col. 5, lines 44-51, Toyofuku discloses a new self-identification code can be rewritten with the data input section 41 of the dedicated writing device 4.

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector;

Taguchi discloses:

"Then, the pneumatic tire pressure monitoring apparatus 50 transmits the receiver ID (step S130). The receiver ID having been thus transmitted from the monitoring apparatus 50 is received by respective sensors 10, 20, 30, and 40 (step S140). The received receiver ID is registered as a transmitter ID in the ID memories 12, 22, 32, and 42 of respective sensors 10, 20, 30, and 40, respectively (step S150)." at 11:61-67

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> "Each of ID memories 12, 22, 32, and 42 is an EEPROM (i.e., Electrically Erasable and Programmable Read Only Memory) or a comparable rewritable memory element which is nonvolatile and has an overwriting function for renewing the data stored therein." at 10:65-11:2

> "In the above step S340, the ID registration is executed in such a manner to overwrite a previous ID having been already registered in respective ID memories 12, 22, 32, and 42. Accordingly, in an event that exchange or position rotation of tires is performed, a new ID to be re-registered in respective sensors 10, 20, 30, and 40 as well as in the monitoring apparatus 50 is newly issued by a repair shop or by a dealer." at 12:66-13:6

As explained above, Tovofuku discloses "an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface." See col. 2, lines 27-37. As further set forth in col. 2, lines 42-45 "[A] self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface." In addition, at col. 3, lines 4-6, Toyofuku discloses "Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added."

Therefore, the identification information that was input, can be sent to the rewritable tire pressure detector of Taguchi.

In addition, Nantz discloses, "[t]he LF command presented by immobilizer 102 may also write information to TPM sensor 104. In some aspects, the LF command may write/re-write the identification code for TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and re-flash the memory of TPM sensor 104". See paragraph [0026]. In addition, See paragraphs [0030, 0032 and 0040] which provide further details with respect to the re-writing of the ID of the TPM sensor.

Like with Toyofuku, the new ID can be sent by the setting unit of Taguchi.

wherein the new identification rewriteable tire pressure detector is configured to:

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acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

Taguchi discloses at col. 10, line 65 –col. 11, line 2, "Each of ID memories 12, 22, 32, and 42 is an EEPROM.. or a comparable rewritable memory element which is nonvolatile and has an overwriting function for renewing the data stored therein"), col. 11, lines 65-67 ("The received receiver ID is registered as a transmitter ID in the ID memories…"), and col 12, line 66 – col. 13, line 6 ("[T]he ID registration is executed in such a manner to overwrite a previous ID having been already registered in respective ID memories..

Toyofuku discloses at col. 2, lines 27-37, "The sensor unit.. .comprises an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface."), col 2, lines 42-45 ("a self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface"), and 3, lines 4-6 ("Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added.).

Nantz.discloses at paragraph [0026] ("The LF command presented by immobilizer 102 may also write information to TPM sensor 104. In some aspects, the LF command may write/re-write the identification code for TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and reflash the memory of TPM sensor 104."), paragraph [0030] ("Accordingly, re-writing the ID of the TPM sensor 104 via the LF signal simplifies the sensor ID write/re-write process."), paragraph [0032] (As described above, TPM sensor 104 may have flash memory. As such, immobilizer 102, via the LF signals, may reconfigure the operating parameters of TPM sensor 104 by "re-flashing" or erasing the

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flash memory of TPM sensor 104. In such an instance, the operating parameters of TPM sensor 104 may be written/re-written for virtually any application."), and paragraph [0040] ("Additionally, the LF command presented at block 204 may also write information to TPM sensor 104. As described above, in some aspects of the invention, the LF command may write/re-write the identification code for the TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and re-flash the memory of TPM sensor 104").

The examiner notes that Taguchi with Toyofuku and Nantz are directed to tire pressure monitoring systems. See Taguchi at col.1, lines 14-23 ("This invention relates to an ID (i.e., identification) registration method.. .More specifically, the present invention relates to a pneumatic tire pressure monitoring system monitoring the pneumatic pressure of a tire..."); Toyofuku at col. 1, lines 9-15 ("The present invention relates to a tire pressure sensor unit for monitoring tire pressure of a vehicle.. .and a method of registering a self-identification code of the tire pressure sensor unit.") and Nantz at col. 1, lines 16-18 ("The present invention relates to a system and a method of tire pressure monitoring sensor diagnosis via a vehicle antitheft and entry system"). Moreover, each of the references is directed to the same problem—systems for registering IDs in tire pressure monitoring sensors.

Taguchi teaches tire pressure sensors with rewritable memories for storing an identification. E.g., Taguchi at col. 10, lines 32-40, and col. 10, line 65 – col. 11, line 2 ("ID memory 12 storing a registered sensor ID"). Taguchi further teaches an ID registration process in which a new ID is transmitted to a pressure sensor and "registered as a transmitter ID in the ID memories... of respective sensors." See Taguchi at col. 11, lines 61-67. The new ID may "overwrite a previous ID having been already registered in respective ID memories." Taguchi at col. 12, line 66 – col. 13, line 2.

Taguchi does not expressly teach mechanisms to input an ID to be registered in tire pressure sensors. Nantz and Toyofuku supply detailed teachings that a person of ordinary skill in the art would have been motivated to apply to Taguchi. Nantz teaches a setting apparatus receiving an old sensor ID from an RF signal and using that old ID as the update identification. Toyofuku further teaches input

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devices for manually inputting an update identification. It was known in the art to use these input methods to provide a setting apparatus with an identification to be recorded into the memory of a tire pressure sensor. Combining the known input methods described by Nantz and Toyofuku with the system of Taguchi would have yielded predictable results.

Regarding claim 20:

A tire pressure detector identification updating method comprising the steps of:

providing a setting apparatus (the tire pressure monitor 50 in Figure 2**, comprising an input module and a receiving module**(the combination of the transmit/receive circuit 51 and the antenna 52 in Fig. 2)**;**

Taguchi fails to teach the portable setting apparatus comprising "an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector".

Toyofuku discloses a data input section 41. As disclosed in col. 5, lines 44-51, Toyofuku discloses a new self-identification code can be rewritten with the data input section 41 of the dedicated writing device 4.

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either

Taguchi fails to teach the portable setting apparatus is configured to either receive the RF signal from an old tire pressure detector or by receiving a manual input.

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(1)reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or

Nantz discloses immobilizer 102 may read the ID of the damage TPM sensor and transmit an LF signal containing the ID of the damage sensors to a replacement TPM sensors 104. The ID of the damaged TPM sensors may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. See paragraph [0030]

Taguchi discloses:

> "In other words, the present invention brings the transmitter and the receiver into a reversed master/slave relationship so that a collation ID is transmitted from the receiver to the transmitter, not from the transmitter to the receiver. Namely, the collation ID is stored in the receiver (i.e., master) and the collation ID is transmitted from the receiver to the transmitter (i.e., slave) and registered in the transmitter." See col. 3, lines 41-47

> "As shown in FIG. 5, the ID transmission mode processing includes transmission of a trigger signal for switching respective sensors 10, 20, 30, and 40 into the ID registration mode (step S210). The frequency of this trigger signal is identical with that used in the pneumatic tire pressure monitoring processing explained with reference to FIG. 3. Next, the receiver ID registered in the memory 55 is read out (step S220), The readout receiver ID is transmitted as a signal having the same frequency as that used in the pneumatic tire pressure monitoring processing (step S230)." See col. 12, lines 19-28

As set forth above, Nantz discloses of receiving identification information from an old tire pressure sensor). Taguchi discloses IDs are stored in memory 55 of the setting apparatus.

(2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification;

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Toyofuku discloses a data input section 41. As disclosed in col. 5, lines 44-51, Toyofuku discloses a new self-identification code can be rewritten with the data input section 41 of the dedicated writing device 4.

when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory' unit by the update identification; and

Taguchi discloses:

> "Then, the pneumatic tire pressure monitoring apparatus 50 transmits the receiver ID (step S130). The receiver ID having been thus transmitted from the monitoring apparatus 50 is received by respective sensors 10, 20, 30, and 40 (step S140). The received receiver ID is registered as a transmitter ID in the ID memories 12, 22, 32, and 42 of respective sensors 10, 20, 30, and 40, respectively (step S150)." at 11:61-67

> "Each of ID memories 12, 22, 32, and 42 is an EEPROM (i.e., Electrically Erasable and Programmable Read Only Memory) or a comparable rewritable memory element which is nonvolatile and has an overwriting function for renewing the data stored therein." at 10:65-11:2

> "In the above step S340, the ID registration is executed in such a manner to overwrite a previous ID having been already registered in respective ID memories 12, 22, 32, and 42. Accordingly, in an event that exchange or position rotation of tires is performed, a new ID to be re-registered in respective sensors 10, 20, 30, and 40 as well as in the monitoring apparatus 50 is newly issued by a repair shop or by a dealer." at 12:66-13:6

As explained above, Tovofuku discloses "an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external

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input imported via the interface." See col. 2, lines 27-37. As further set forth in col. 2, lines 42-45 "[A] self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface." In addition, at col. 3, lines 4-6, Toyofuku discloses "Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added."

Therefore, the identification information that was input, can be sent to the rewritable tire pressure detector of Taguchi.

when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification.

Taguchi discloses at col. 10, line 65 –col. 11, line 2, "Each of ID memories 12, 22, 32, and 42 is an EEPROM.. or a comparable rewritable memory element which is nonvolatile and has an overwriting function for renewing the data stored therein"), col. 11, lines 65-67 ("The received receiver ID is registered as a transmitter ID in the ID memories..."), and col 12, line 66 – col. 13, line 6 ("[T]he ID registration is executed in such a manner to overwrite a previous ID having been already registered in respective ID memories..

Toyofuku discloses at col. 2, lines 27-37, "The sensor unit.. .comprises an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface."), col 2, lines 42-45 ("a self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in

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the sensor unit after the replacement via the interface"), and 3, lines 4-6 ("Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added.).

Nantz.discloses at paragraph [0026] ("The LF command presented by immobilizer 102 may also write information to TPM sensor 104. In some aspects, the LF command may write/re-write the identification code for TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and reflash the memory of TPM sensor 104."), paragraph [0030] ("Accordingly, re-writing the ID of the TPM sensor 104 via the LF signal simplifies the sensor ID write/re-write process."), paragraph [0032] (As described above, TPM sensor 104 may have flash memory. As such, immobilizer 102, via the LF signals, may reconfigure the operating parameters of TPM sensor 104 by "re-flashing" or erasing the flash memory of TPM sensor 104. In such an instance, the operating parameters of TPM sensor 104 may be written/re-written for virtually any application."), and paragraph [0040] ("Additionally, the LF command presented at block 204 may also write information to TPM sensor 104. As described above, in some aspects of the invention, the LF command may write/re-write the identification code for the TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and re-flash the memory of TPM sensor 104").

The examiner notes that Taguchi with Toyofuku and Nantz are directed to tire pressure monitoring systems. See Taguchi at col.1, lines 14-23 ("This invention relates to an ID (i.e., identification) registration method.. .More specifically, the present invention relates to a pneumatic tire pressure monitoring system monitoring the pneumatic pressure of a tire..."); Toyofuku at col. 1, lines 9-15 ("The present invention relates to a tire pressure sensor unit for monitoring tire pressure of a vehicle.. .and a method of registering a self-identification code of the tire pressure sensor unit.") and Nantz at col. 1, lines 16-18 ("The present invention relates to a system and a method of tire pressure monitoring sensor diagnosis via a vehicle antitheft and entry system"). Moreover, each of the references is directed to the same problem—systems for registering IDs in tire pressure monitoring sensors.

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Taguchi teaches tire pressure sensors with rewritable memories for storing an identification. E.g., Taguchi at col. 10, lines 32-40, and col. 10, line 65 – col. 11, line 2 ("ID memory 12 storing a registered sensor ID"). Taguchi further teaches an ID registration process in which a new ID is transmitted to a pressure sensor and "registered as a transmitter ID in the ID memories... of respective sensors." See Taguchi at col. 11, lines 61-67. The new ID may "overwrite a previous ID having been already registered in respective ID memories." Taguchi at col. 12, line 66 – col. 13, line 2.

Taguchi does not expressly teach mechanisms to input an ID to be registered in tire pressure sensors. Nantz and Toyofuku supply detailed teachings that a person of ordinary skill in the art would have been motivated to apply to Taguchi. Nantz teaches a setting apparatus receiving an old sensor ID from an RF signal and using that old ID as the update identification. Toyofuku further teaches input devices for manually inputting an update identification. It was known in the art to use these input methods to provide a setting apparatus with an identification to be recorded into the memory of a tire pressure sensor. Combining the known input methods described by Nantz and Toyofuku with the system of Taguchi would have yielded predictable results.

Regarding claim 21:

The method as claimed in claim 20, wherein the new identification rewriteable tire pressure detector is configured to record the update identification in the rewritable memory unit or overwrite the preset identification in the rewritable memory unit by the update identification by:

acquiring the update identification from the external signal;

Taguchi discloses "The receiver ID having been thus transmitted from the monitoring apparatus 50 is received by respective sensors 10, 20, 30, and 40 (step S140). The received receiver ID is registered as a transmitter ID in the ID memories 12, 22, 32, and 42 of respective sensors 10, 20, 30, and 40, respectively (step S150)." See col. 11, line 61 – col. 12, line 1

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In addition, Tovofuku discloses "FIG. 4 shows a wave form chart during the writing of the self-identification code. A sequence of writing data is described with reference to this figure. In FIG. 4, the signal A designates a data input/output control signal input to the data input/output control signal terminal 27, and the signal B designates a data signal input to/output from the data signal terminal 26." See col. 5, lines 33-57.

Furthermore, Nantz discloses "The LF command presented by immobilizer 102 may also write information to TPM sensor 104. In some aspects, the LF command may write/re-write the identification code for TPM sensor 104, reconfigure the operating parameters of TPM sensor 104, and re-flash the memory of TPM sensor 104." See paragraph [0026]. See also paragraphs [0027, 0029 and 0030].

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

Taguchi discloses "Each of ID memories 12, 22, 32, and 42 is an EEPROM (i.e., Electrically Erasable and Programmable Read Only Memory) or a comparable rewritable memory element which is nonvolatile and has an overwriting function for renewing the data stored therein." See col. 10, line 65 – col. 11, line 2. In addition, Taguchi discloses "In the above step S340, the ID registration is executed in such a manner to overwrite a previous ID having been already registered in respective ID memories 12, 22, 32, and 42. Accordingly, in an event that exchange or position rotation of tires is performed, a new ID to be re-registered in respective sensors 10, 20, 30, and 40 as well as in the monitoring apparatus 50 is newly issued by a repair shop or by a dealer." See col. 12, line 66 – col 13, line 6.

In addition, Toyofuku discloses "[A] self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface." See col. 2, lines 42-45. Toyofuku also discloses "Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added." See col. 3, lines 4-6. See also col. 2, lines 27-37

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Nantz discloses "As described above, TPM sensor 104 may have flash memory. As such, immobilizer 102, via the LF signals, may reconfigure the operating parameters of TPM sensor 104 by "re-flashing" or erasing the flash memory of TPM sensor 104. In such an instance, the operating parameters of TPM sensor 104 may be written/re-written for virtually any application. Conversely, conventional TPM systems having TPM sensors are incapable of on-vehicle re-flashing." See paragraph [0032] See also paragraphs [0026, 0030 and 0040]

Regarding claim 22:

The method as claimed in claim 20, further comprising:

verifying the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector.

Tovofuku, as applied above, further discloses "When the outputting the data to the external input signal controller 23 is finished, the dedicated writing device 4 outputs a signal for turning the signal A to the low level, whereby the external input signal controller 23 confirms a completion of the input, and outputs the imported self-identification code as the R part of the signal B to the dedicated writing device 4 for a verification. The dedicated writing device 4 automatically verity the signal, and if the verification is O.K., a sign of the completion of writing is displayed on the data display 42." See col. 5, lines 58-67

Therefore, the combination of Taguchi and Toyofuku discloses verifying the newly recorded update identification.

Regarding claim 24:

The method as claimed in claim. 20, wherein the setting apparatus is configured to receive the RF signal wirelessly.

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Taguchi discloses "The pneumatic tire pressure monitoring apparatus 50 includes a transmit/receive circuit 51, a transmit/receive antenna 52, a power source circuit 53, a control unit 54, a memory 55, and a communication circuit 56." at col. 11, lines 3-6.

In addition, Taguchi discloses "The pneumatic tire pressure monitoring apparatus 50, as shown in FIG. 3B, checks whether or not the signal of predetermined frequency is received (step S21). When the signal of predetermined frequency is received (i.e., YES in step S21), the pneumatic tire pressure monitoring apparatus 50 extracts the sensor ID from the received signal (step S22)." See col. 11, lines 25-30.

In addition, Nantz discloses "In an alternative embodiment, where TPM sensor 104 is damaged or functioning incorrectly, immobilizer 102 may read the ID of the damaged TPM sensor and transmit an LF signal containing the ID of the damaged sensor to a replacement TPM sensor 104. The ID of the damaged TPM sensor may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. In conventional TPM systems, re-writing the ID of TPM sensor 104 is accomplished by placing the entire TPM system in a "learn mode." In such a case, the operator and/or vehicle technician must take the vehicle through a sequence of events (e.g., place the ignition in the "ON" position, press the vehicle brake twice, and press a "reset" button located on the vehicle) to re-write the ID of TPM sensor 104. Accordingly, re-writing the ID of TPM sensor 104 via the LF signal simplifies the sensor ID write/re-write process." See paragraph [0030]

6. Claims 17, 19 and 25 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Itou.

Regarding claim 17:

The tire pressure detecting apparatus as claimed in claim 16, wherein the input module comprises a code scanner.

Regarding claim 19:

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The tire pressure detecting apparatus as claimed in claim 18, wherein the input module comprises a code scanner.

Regarding claim 25:

The method as claimed in claim 20, wherein the input module comprises a code scanner.

As set forth above, Toyofuku teach or suggest input devices that may include a code scanner to receive an identification to be written into the tire pressure detector.

Moreover, Itou further teaches an ID registration tool that includes a code scanner for reading IDs from bar codes representative of the IDs of the air pressure sensors.

Toyofuku similarly teaches a setting apparatus (dedicated writing device 4) that includes a "data input section 41." Toyofuku, Fig. 3, 5:26-32. "A new self-identification code to be rewritten is input with the data input section 41 of the dedicated writing device 4." Toyofuku, 5:44-46.

A person of ordinary skill in the art would understand that the data input section may include a code scanner.

Itou provides further express teaching of the use of a code scanner in an input module of a setting apparatus. Itou teaches that "ID memories... of the air pressure sensors... store the corresponding IDs." Itou, 17:32-34. Itou further teaches that, "as shown in Fig. 2, bar codes 5, 6, 7, and 8 representative of the IDs of the air pressure sensors 10, 20, 30 and 40 are adhered onto wheels la, 2a, 3a and 4a of tires 1, 2, 3, and 4." Itou, 17:38-41. "[A]n ID registration tool 60 is used in order to read the IDs from these bar codes 5, 6, 7, and 8 for writing them in the tire pressure monitoring apparatus 50." Itou, 17:41-44. "The ID registration tool 60 is composed of a bar-code reading unit 61 and an ID transmitting unit 62 for transmitting the IDs, read by the bar-code reading unit 61, to the tire pressure monitoring apparatus 50." Itou, 17:45-48. Itou thus expressly teaches using a code scanner as an input device for an identification code for a setting apparatus.

Orange Exhibit No. 2004
IPR2024-00744

Allowable Subject Matter

Claim 23 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The examiner notes that claim 23 recites the following:

The method as claimed in claim 22, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit;

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector; and

if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again.

As set forth above, claim 16 recites both an identification rewritable tire pressure detector and a portable setting apparatus. Claim 23 recites judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

The examiner notes that Toyofuki discloses:

> "When the outputting the data to the external input signal controller 23 is finished, the dedicated writing device 4 outputs a signal for turning the signal A to the low level, whereby the external input signal controller 23 confirms a completion of the input, and outputs the imported self-identification code as the R part of the signal B to the dedicated writing device 4 for a verification. The dedicated writing device 4 automatically verity the signal, and if the verification is O.K., a sign of the completion of writing is displayed on the data display 42." at 5:58-67

The teachings associated with Toyofuku shows that the controller 23 confirms completion of the input and outp8uts a signal to the writing device 4 for a verification. Although the dedicated writing

Orange Exhibit No. 2004
IPR2024-00744

device 4 verifies the signal (which is based upon completion of inputting the data), the teachings do not show that the writing device judges the consistency of the update identification dnwlry record in the rewritable memory unit and the old identification of the old tire pressure detector", rather it just verifies completion of the input of data.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ovidio Escalante whose telephone number is (571)272-7537. The examiner can normally be reached on Monday to Friday - 6:00 AM to 2:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Fuelling can be reached on (571) 270-1367 The fax phone number for the organization where this application or proceeding is assigned is 571-273-9000. 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). If you would like assistance from a

Orange Exhibit No. 2004
IPR2024-00744

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ovidio Escalante/
Ovidio Escalante
Reexamination Specialist
Central Reexamination Unit - Art Unit 3992
(571) 272-7537
Conferees:

/MAJID A BANANKHAH/
Reexamination Specialist, Art Unit 3992

/M.F/
Supervisory Patent Examiner, Art Unit 3992

Orange Exhibit No. 2004
IPR2024-00744

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Examiner	Art Unit
	OVIDIO ESCALANTE	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 Patent File and Prosecution History	12/16/2019	OE
Litigation Search Report	8/9/2019	OE

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

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
KILPATRICK TOWNSEND & STOCKTON LLP MAILSTOP: IP DOCKETING - 22 1100 PEACHTREE STREET SUITE 2800 ATLANTA, GA 30309

LITIGATION REVIEW ☑	OE (examiner initials)	09 August 2019 (date)
Case Name		Director Initials
None		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Examiner	Art Unit
	OVIDIO ESCALANTE	3992

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/16/2019								
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									
	16	✓								
	17	✓								
	18	✓								
	19	✓								
	20	✓								
	21	✓								
	22	✓								
	23	=								
	24	✓								
	25	✓								

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	90/014,362
Filing Date	August 9, 2019
First Named Inventor	Hung-Chih Yu
Title	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
Art Unit	3992
Examiner Name	Ovidio Escalante
Attorney Docket Number	1007383.104US7

SIGNATURE of Applicant or Patent Practitioner

Signature	/Tim Tingkang Xia/	Date (Optional)	January 16, 2020
Name	Tim Tingkang Xia	Registration Number	45242
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Orange Exhibit No. 2004
IPR2024-00744

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), an to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 21874

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transac all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

	Firm or Individual Name				
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

ORANGE ELECTRONIC CO., LTD.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Hsu, Chin-Yao	Date (Optional)	
Name	Hsu, Chin-Yao		
Title	CEO		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	38314953
Application Number:	90014362
International Application Number:	
Confirmation Number:	2272
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	8031064
Customer Number:	24728
Filer:	Tim Tingkang Xia/Danielle Olive
Filer Authorized By:	Tim Tingkang Xia
Attorney Docket Number:	
Receipt Date:	16-JAN-2020
Filing Date:	09-AUG-2019
Time Stamp:	13:39:17
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	Power of Attorney	1007383104US7POA.pdf	334996 becb41fef80e07a220f49c27649fed67fbcf79ea	no	2

Warnings:

Orange Exhibit No. 2004
IPR2024-00744

Information:	
Total Files Size (in bytes):	334996

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.

Orange Exhibit No. 2004
IPR2024-00744

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
90/014,362	08/09/2019	8031064	

CONFIRMATION NO. 2272

21874
LOCKE LORD LLP
P.O. BOX 55874
BOSTON, MA 02205

POA ACCEPTANCE LETTER

OC000000114286102

Date Mailed: 01/29/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/16/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/pflewis/

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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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
90/014,362	08/09/2019	8031064	

CONFIRMATION NO. 2272

POWER OF ATTORNEY NOTICE

24728
MORRIS, MANNING & MARTIN, LLP
IP Department
3343 PEACHTREE ROAD, NE
1600 ATLANTA FINANCIAL CENTER
ATLANTA, GA 30326

OC000000114286040

Date Mailed: 01/29/2020

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/16/2020.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/pflewis/

EX-PARTE **REEXAMINATION** **Attorney Docket No. 1007383.104US7**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Owner:	Orange Electronic Co., Ltd.	Confirmation No.	2272
U.S. Patent No.	8,031,064	Group Art Unit:	3992
Serial No.	90/014,362	Examiner	Ovidio Escalante
Filed:	August 9, 2019		
For:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME		

REQUEST FOR EXTENSION OF TIME IN RESPONSE TO OFFICE ACTION IN *EX PARTE* REEXAMINATION UNDER 37 C.F.R. § 1.550(c)

Mail Stop: *Ex Parte* Re-Examination
Central Reexamination Unit
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 6, 2020

CUSTOMER NO. 21874

Dear Sir/Madam:

In response to the Office Action mailed January 10, 2020, the Patent Owner hereby requests, pursuant to 37 C.F.R. § 1.550(c), that the two-month shortened statutory period for response set forth in the Office Action be extended **ONE (1) MONTH** to expire on **April 10, 2020**.

On January 10, 2020, a non-final Office Action was mailed by the United States Patent and Trademark Office. The Office Action set a two-month shortened statutory period for response to the Office Action, which was set to expire on March 10, 2020, the two-month date from the mailing of the Office Action.

The Patent Owner, Orange Electronic Co., Ltd. (hereinafter "Patent Owner"), located in Taichung, Taiwan, hereby requests an additional **ONE (1) MONTH** extension of time to have sufficient time to complete a response to the Office Action. Specifically, upon receiving the Office Action, Patent Owner has been working with the attorney on the record to prepare a response to the Office Action until the week of March 2, 2020, when one employee of Patent Owner who is responsible in preparing the response reportedly had flu-like symptoms. Taiwan

Orange Exhibit No. 2004
IPR2024-00744

has been confirmed by the Centers for Disease Control and Prevention (hereinafter the "CDC") as one of the locations with confirmed coronavirus disease COVID-19 cases. Although the employee having the flu-like symptoms was not diagnosed with COVID-19 and did not have any direct contact to confirmed COVID-19 patients, Patent Owner has determined to impose a contingency plan to protect employees, due to the recent outbreak of COVID-19 in Asian and European countries as well as the similarity of the flu symptoms to those of COVID-19. In particular, Patent Owner has suggested the employee take precautionary protective measures, such as staying at home and avoiding direct contact with others, including all other employees of the Patent Owner.

In view of the foregoing, Patent Owner respectfully believes that there is sufficient cause to grant to a reasonable extension of time. Therefore, Patent Owner respectfully requests, pursuant to 37 C.F.R. § 1.550(c), that the two-month shortened statutory period for response set forth in the Office Action be extended **ONE (1) MONTH** to expire on **April 10, 2020**, together with a petition fee under 37 C.F.R. § 1.17(g), in the amount of $100.00.

Patent Owner respectfully asserts that all requirements of the request for the extension of time have been met, and consideration and grant of the requested extension of time are earnestly requested.

The Commissioner is hereby authorized to charge any deficiency of fees that may be required and credit of any overpayments to Deposit Account No. 121781.

Respectfully submitted,

Locke Lord LLP

March 6, 2020



Tim Tingkang Xia
Attorney for Patent Owner on the Record
Reg. No. 45,242

Terminus 200, Suite 1200
3333 Piedmont Road NE
Atlanta, Georgia 30305
Phone: 404-870-4698
Customer No. 21874

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Owner:	Orange Electronic Co., Ltd.	Confirmation No.	2272
U.S. Patent No.	8,031,064	Group Art Unit:	3992
Serial No.	90/014,362	Examiner	Ovidio Escalante
Filed:	August 9, 2019		
For:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME		

CERTIFICATE OF SERVICE

Mail Stop: *Ex Parte* Re-Examination
Central Reexamination Unit
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 6, 2020

CUSTOMER NO. 21874

Dear Sir/Madam:

Pursuant to 37 C.F.R. § 1.248, the undersigned, on behalf of the Patent Owner, hereby certifies that a copy of the following document:

REQUEST FOR EXTENSION OF TIME IN RESPONSE TO OFFICE ACTION IN *EX PARTE* REEXAMINATION UNDER 37 C.F.R. § 1.550(c),

submitted in the above-identified application on **March 6, 2020**, was served on the Third Party Requester at the following address:

KILPATRICK TOWNSEND & STOCKTON LLP
MAILSTOP: IP DOCKETING - 22
1100 Peachtree Street, Suite 2800
Atlanta, GA 30309

provided for in 37 C.F.R. § 1.33(c) via first class mail on **March 6, 2020**.

Respectfully submitted,
LOCKE LORD LLP

March 6, 2020

Tim Tingkang Xia
Attorney for Patent Owner on the Record
Reg. No. 45,242

Terminus 200, Suite 1200
3333 Piedmont Rd. NE
Atlanta, GA 30305
T: 404-870-4698
Customer No. 21874

Electronic Patent Application Fee Transmittal	
Application Number:	90014362
Filing Date:	09-Aug-2019
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	8031064
Filer:	Tim Tingkang Xia/Danielle Olive
Attorney Docket Number:	1007383.104US7
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:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PETITION FEE-37CFR 1.17(G)(GROUPII)	2463	1	100	100
Miscellaneous:				
		Total in USD ($)		**100**

Orange Exhibit No. 2004
IPR2024-00744

Electronic Acknowledgement Receipt

EFS ID:	38787118
Application Number:	90014362
International Application Number:	
Confirmation Number:	2272
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	8031064
Customer Number:	21874
Filer:	Tim Tingkang Xia/Danielle Olive
Filer Authorized By:	Tim Tingkang Xia
Attorney Docket Number:	1007383.104US7
Receipt Date:	06-MAR-2020
Filing Date:	09-AUG-2019
Time Stamp:	09:01:38
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$100
RAM confirmation Number	E202036002021306
Deposit Account	121781
Authorized User	Danielle Olive
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.19 (Document supply fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

Orange Exhibit No. 2004
IPR2024-00744

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Request for Extension of Time	1007383104US7RequestforExtensionunder1550c_exparteReexam.pdf	171744 2197a9239d28db05943ec61bd3764588cc5613e4	no	2
Warnings:					
Information:					
2	Reexam Certificate of Service	1007383104US7CertificateofService_EOT.pdf	166119 1200cfd9961858844e6c1190caa3b5d2c73f2c36	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30102 18c91759eaad14ae39f2e81ba4dbbad879ba4858	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	367965		

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.

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
90/014,362	08/09/2019	8031064	1007383.104US7	107105

Acknowledgement of Change to Small Entity Status

The entity status change request below filed through Private PAIR on 03/06/2020 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

X Applicant asserting small entity status. See 37 CFR 1.27.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Tim Tingkang Xia/
Name:	Tim Tingkang Xia
Registration Number:	45242

Orange Exhibit No. 2004
IPR2024-00744

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Owner:	Orange Electronic Co., Ltd.	Confirmation No.	2272
U.S. Patent No.	8,031,064	Group Art Unit:	3992
Serial No.	90/014,362	Examiner	Ovidio Escalante
Filed:	August 9, 2019		
For:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME		

CERTIFICATE OF SERVICE

Mail Stop: *Ex Parte* Re-Examination
Central Reexamination Unit
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 10, 2020

CUSTOMER NO. 21874

Dear Sir/Madam:

Pursuant to 37 C.F.R. § 1.248, the undersigned, on behalf of the Patent Owner, hereby certifies that a copy of the following document:

AMENDMENT AND RESPONSE TO OFFICE ACTION IN *EX PARTE* RE-EXAMINATION,

submitted in the above-identified application on **March 10, 2020**, was served on the Third Party Requester at the following address:

KILPATRICK TOWNSEND & STOCKTON LLP
MAILSTOP: IP DOCKETING - 22
1100 Peachtree Street, Suite 2800
Atlanta, GA 30309

provided for in 37 C.F.R. § 1.33(c) via first class mail on **March 10, 2020**.

Respectfully submitted,
LOCKE LORD LLP

March 10, 2020

Tim Tingkang Xia
Attorney for Patent Owner on the Record
Reg. No. 45,242

Terminus 200, Suite 1200
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Atlanta, GA 30305
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Customer No. 21874

Electronic Patent Application Fee Transmittal

Application Number:	90014362
Filing Date:	09-Aug-2019
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	8031064
Filer:	Tim Tingkang Xia/Danielle Olive
Attorney Docket Number:	1007383.104US7

Filed as Small Entity

Filing Fees for ex parte reexam

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
REEXAMINATION INDEPENDENT CLAIMS	2821	3	230	690
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**690**

Electronic Acknowledgement Receipt	
EFS ID:	38823597
Application Number:	90014362
International Application Number:	
Confirmation Number:	2272
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	8031064
Customer Number:	21874
Filer:	Tim Tingkang Xia/Danielle Olive
Filer Authorized By:	Tim Tingkang Xia
Attorney Docket Number:	1007383.104US7
Receipt Date:	10-MAR-2020
Filing Date:	09-AUG-2019
Time Stamp:	15:59:50
Application Type:	Reexam (Patent Owner)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$690
RAM confirmation Number	E202030G00147737
Deposit Account	121781
Authorized User	Danielle Olive
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.19 (Document supply fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

Orange Exhibit No. 2004
IPR2024-00744

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Response after non-final action-owner timely	1007383104US7ResponseOA_ExParte.pdf	730256 b9151ad0bb55c7dcf5fc01ce7c8fe9cafe841bf7	no	28
Warnings:					
Information:					
2	Reexam Certificate of Service	1007383104US7CertificateofService_ResponseOA_ExParte.pdf	164361 915cf414029ac64c4e4547f03e6ae64b465bbe4d	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30151 b25763a84217bd5ed58331ebdd1c77d940c2e9ce	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	924768		

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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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 90/014,362	Filing Date 08/09/2019	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	03/10/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	*** 3	= 3		x $230 =	690
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	690

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/PATRICIA F LEWIS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Orange Exhibit No. 2004
IPR2024-00744

EX-PARTE **REEXAMINATION** **Attorney Docket No. 1007383.104US7**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Owner:	Orange Electronic Co., Ltd.	Confirmation No.	2272
U.S. Patent No.	8,031,064	Group Art Unit:	3992
Serial No.	90/014,362	Examiner	Ovidio Escalante
Filed:	August 9, 2019		
For:	Tire Pressure Detecting Apparatus and Tire Pressure Detector Identification Copying Method for the Same		

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION IN *EX PARTE* RE-EXAMINATION

Mail Stop: *Ex Parte* Re-Examination
Central Reexamination Unit
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 10, 2020

CUSTOMER NO. 21874

Dear Sir/Madam:

In response to the Office Action mailed January 10, 2020, please amend the above-identified application as follows and consider the following Remarks:

Amendments to the Claims begin on page **2** of this paper.

Claim Status and Support for Amendments (37 CFR 1.530(e)) begin on page **14** of this paper.

Remarks begin on page **15** of this paper.

Orange Exhibit No. 2004
IPR2024-00744

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1-15. (Canceled).

16. (Currently amended): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire

pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification;

store the update identification in the setting apparatus; [[and]]

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification; and

verify the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal

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comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

17. (Previously presented): The tire pressure detecting apparatus as claimed in claim 16, wherein the input module comprises a code scanner.

18. (Currently amended): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to

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manually input an identification to be written into the identification rewriteable tire pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification manually inputted and received from the input module; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector; and

verify the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector;

wherein the new identification rewriteable tire pressure detector is configured to:

acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit, and send the update identification newly recorded in the rewritable memory unit back to the setting apparatus;

wherein the verifying step by the setting apparatus comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

19. (Previously presented): The tire pressure detecting apparatus as claimed in claim 18, wherein the input module comprises a code scanner.

20. (Canceled):

21. (Currently amended): The method as claimed in claim [[20]]23, wherein the new identification rewriteable tire pressure detector is configured to record the update identification in the rewritable memory unit or overwrite the preset identification in the rewritable memory unit by the update identification by:

acquiring the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

22. (Canceled).

23. (Currently amended): ~~The method as claimed in claim 22,~~ A tire pressure detector identification updating method comprising the steps of:

providing a setting apparatus, comprising an input module and a receiving module;

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification;

when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification; [[and]]

when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification; and

verifying, by the setting apparatus, the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.; ~~and~~

~~if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again.~~

24. (Currently amended): The method as claimed in claim [[20]]23, wherein the setting apparatus is configured to receive the RF signal wirelessly.

25. (Currently amended): The method as claimed in claim [[20]]23, wherein the input module comprises a code scanner.

26. (New): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector used for being installed in a vehicle, the identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external

identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector;

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle, and is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification, wherein the old tire pressure detector stores only the old identification;

store the update identification in the setting apparatus; and

generate the external signal comprising the update identification as the external

identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal.

27. (New): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector used for being installed in a vehicle, the identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire

pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle, and is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification manually inputted and received from the input module, wherein the old tire pressure detector stores only the old identification; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal;

wherein the new identification rewriteable tire pressure detector is configured to:

acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored

therein, record the update identification in the rewritable memory unit.

28. (New): A tire pressure detector identification updating method comprising the steps of:

providing a portable setting apparatus, comprising an input module and a receiving module, wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to a vehicle;

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification, wherein the old tire pressure detector stores only the old identification;

when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification; and

when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the

rewritable memory unit by the update identification, wherein the external signal is a low frequency (LF) signal.

29. (New): The method as claimed in claim 23, wherein the verifying step further comprises:

if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again.

CLAIM STATUS AND SUPPORT FOR AMENDMENTS (37 CFR 1.530(e))

Claims 16-25 were under reexamination. Of them, claims 16-25 were new relative to the original patent and previously presented in a prior *ex parte* reexamination certificate, before this amendment as set forth above.

By this amendment, claims 17 and 19 remain unchanged, claims 16, 18, 21 and 23-25 are amended, claims 20 and 22 are canceled, and new claims 26-29 are added.

Support for the amendment can be found throughout the original patent. None of the newly added claims 26-29 broadens the claim scope of the originally issued claims 1-13.

Upon entry of this amendment, claims 16-19, 21 and 23-29 are pending in in this reexamination proceeding. The claim status is listed as follows:

Claims 1-15.	Canceled.
Claim 16.	Pending – amended.
Claim 17.	Pending – unchanged.
Claim 18.	Pending – amended.
Claim 19.	Pending – unchanged.
Claim 20.	Canceled.
Claim 21.	Pending – amended.
Claim 22.	Canceled.
Claim 23-25.	Pending – amended.
Claims 26-29.	Pending - new.

REMARKS

Claims 16-25 were under reexamination. By the amendment, claims 16, 18, 21 and 23-25 are amended, and claims 20 and 22 are canceled. Further, new claims 26-29 are added.

In the Office Action, claims 16-22, 24 and 25 were rejected under pre-AIA 35 U.S.C. 103(a) as being allegedly unpatentable over Taguchi (U.S. Patent No. 6,927,679, hereinafter "Taguchi") in view of Toyofuku (U.S. Patent No. 6,920,785, hereinafter "Toyofuku") and further in view of Nantz (U.S. Patent Pub. No. 2006/0208864, hereinafter "Nantz").

However, the Examiner indicated that claim 23 was objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The Patent Owner appreciates very much the careful review of the patent by the Reexamination Panel, as well as the allowability of claim 23.

In response, as set forth above, without acquiescing to the Examiners' assertion, which the Patent Owner does not agree, and in order to advance the prosecution of the confirmed claims and allowable claims, the Patent Owner has amended and rewritten allowable claim 23 in independent form, incorporating the limitations of claims 20 and 22, which makes amended claim 23 allowable. Further, the Patent Owner has amended previously presented independent claims 16 and 18 to incorporate the limitations from the allowable claim 23 as well as the intervening claim 22, which makes amended claims 16, 18 and 20 allowable. Furthermore, new claims 26-29 have been added. Of the pending claims, claims 16, 18, 23 as well as new claims 26-28 are independent claims. Support for the amendment can be found throughout the original patent. None of the newly added claims 26-29 broadens the claim scope of the originally issued claims 1-13.

Any amendments to the claims not specifically referred to herein as being included for the purpose of distinguishing the claims from cited references are included for the purpose of clarification, consistence and/or grammatical correction only.

In view of the foregoing, the Patent Owner respectfully requests allowance of the presently pending claims in this reexamination proceeding.

The following remarks herein are considered to be responsive thereto.

Amended Claim 23

As set forth above, the Examiner indicated in the Office Action that claim 23 recites allowable features. Specifically, the Examiner stated, among other things, that the teachings of the references do not show that the writing device judges the consistency of the update identification newly record in the rewriteable memory unit and the old identification of the old tire pressure detector.

In response, allowable claim 23 has been amended and rewritten in independent form, incorporating the limitations of claims 20 and 22, which makes amended claim 23 allowable. Dependent claims 21 and 24-25 have been amended to depend upon allowable claim 23, and new claim 29 has been added to depend upon allowable claim 23. Thus, these dependent claims are also allowable as well.

Amended Claims 16 and 18

As set forth above, independent claims 16 and 18 have been respectively amended to incorporate the limitations from the allowable claim 23 as well as the intervening claim 22, which makes amended claims 16 and 18 allowable. Dependent claims 17 and 19, which depend upon amended claims 16 and 18, respectively, are also allowable as well.

New Claim 26

MPEP 2141.02 (VI) states that "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

Further, MPEP 2145 (X)(D)(2) states that "[i]t is improper to combine references where the references teach away from their combination." *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).

New claim 26 includes the limitation of previously present claim 16, and the new limitations as follows:

> ***an identification rewritable tire pressure detector used for being installed in a vehicle***, the identification rewritable tire pressure detector comprising:
>
> . . .
>
> ***wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle***, and is configured to:
>
> obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) ***receiving the RF signal from an old tire pressure detector by the receiving module***, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification, ***wherein the old tire pressure detector stores only the old identification***;
>
> store the update identification in the setting apparatus; and
>
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein ***the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal***.
>
> (Emphasis added.)

Specifically, according to new claim 26, the identification rewritable tire pressure detector is used for being installed in a vehicle. Further, the portable setting apparatus is ***not equipped in the vehicle and is portable relative to the vehicle***. (See FIG. 4 of the drawing, showing the setting apparatus 90 not equipped in the car 80, provided below. See also the paragraph on column 1, lines 25-51 of the specification.) In other words, **the portable setting apparatus is not equipped by the vehicle**.

Orange Exhibit No. 2004
IPR2024-00744

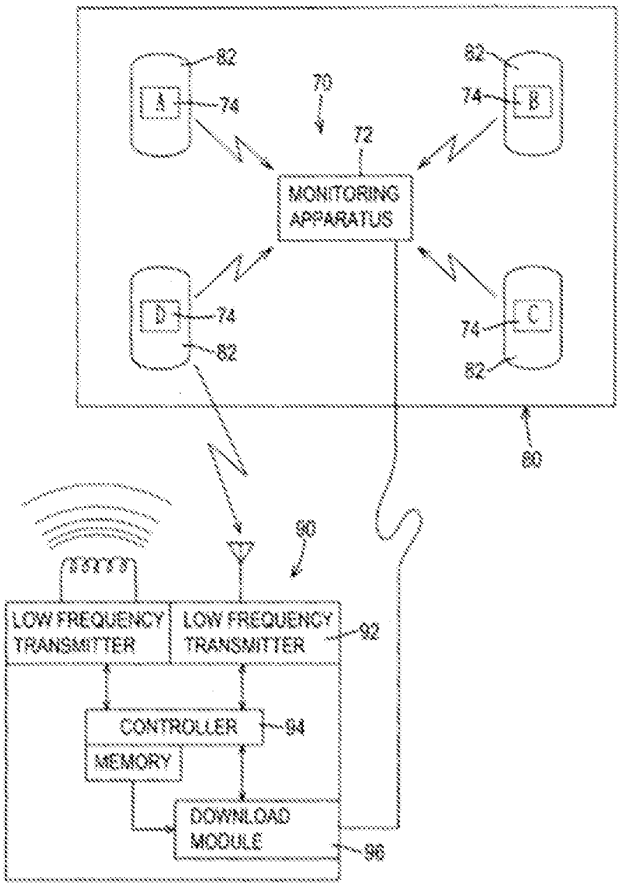
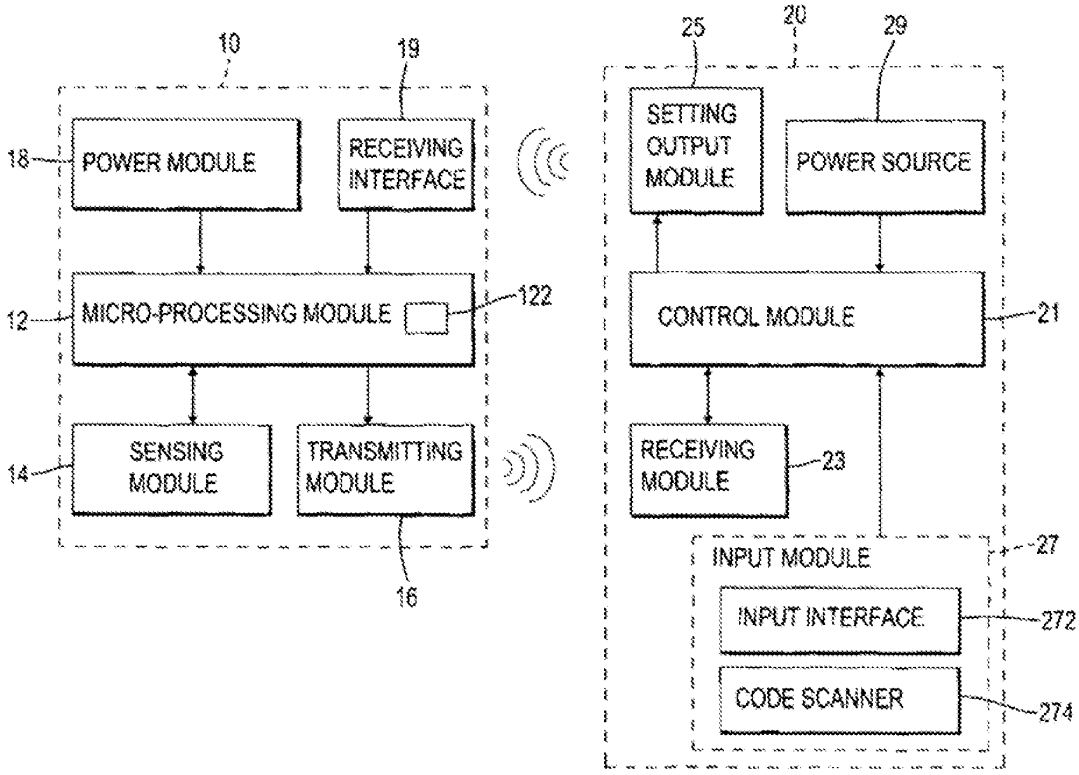


FIG.4

In addition, according to new claim 26, the portable setting apparatus is configured to receive the RF signal from an old tire pressure detector by the receiving module. (See FIG. 1 of the drawings, showing the transmitting module 16 of the tire pressure detector 10 transmitting the RF signal to the receiving module 23 of the portable setting apparatus 20, provided below.) In other words, the RF signal is sent ***from the old tire pressure detector to the portable setting apparatus***. Further, according to new claim 26, the external identification is from the old tire pressure detector. (See FIG. 1, provided below. See also the paragraphs on column 4, lines 15-32 of the specification.)



Further, according to new claim 26, ***the old tire pressure detector stores only the old identification***. In other words, the old identification is the only identification being stored in the old tire pressure detector.

Moreover, according to new claim 26, the portable setting apparatus is configured to generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein ***the external signal is a low frequency (LF) signal***. (See FIG. 1, showing the portable setting apparatus 20 sending the external signal, which is the LF signal, to the receiving interface 19 of a tire pressure detector 10, provided above. See also the paragraph on column 3, lines 6-28 of the specification.)

In the Office Action, the Examiner relied upon Taguchi, Toyofuku and Nantz as the basis of rejecting claim 16. In particular, the Examiner stated, among other things, that Taguchi teaches a portable setting apparatus (the tire pressure monitor 50 in Figure 2).

However, Taguchi not only fails to teach or suggest, but also explicitly ***teaches away*** from the limitation of "***the portable setting apparatus is portable relative to the vehicle***" as recited in new claim 26. Specifically, the paragraph on column 10, lines 29-54 of Taguchi explicitly teaches that the pneumatic tire pressure monitoring apparatus 50 is "***equipped in a vehicle body***." Furthermore, nowhere in Taguchi teaches or suggests that the pneumatic tire pressure monitoring apparatus 50 is ***portable relative to the vehicle***. In other words, the monitoring apparatus 50 of Taguchi is not comparable to the portable setting apparatus, which is ***portable relative to the vehicle***, as recited in new claim 26.

Accordingly, one of ordinary skill in the art, based on the teaching of Taguchi ***in its entirety (i.e., as a whole)***, would understand that the monitoring apparatus 50 of Taguchi and the components thereof are equipped in a vehicle body and thus are not portable, which clearly **teaches away** from the limitation of the portable setting apparatus being portable relative to the vehicle as recited in new claim 26.

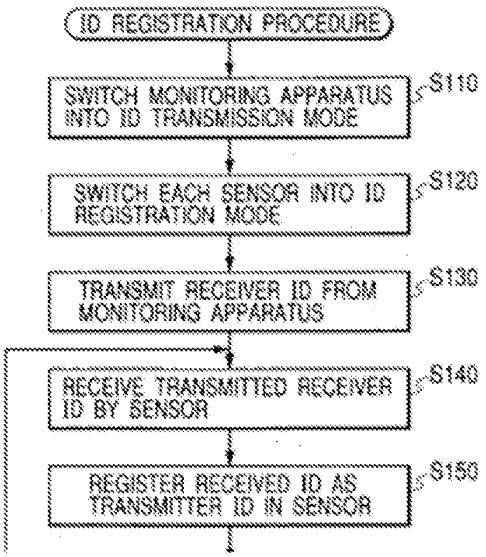
For the foregoing reasons, the Examiner's rejection in reliance of the combination of the cited references, including Taguchi, Toyofuku and Nantz (or any other reference), is improper according to MPEP 2145 (X)(D)(2) because Taguchi teaches features that leads away from the combination.

Further, in the Office Action, the Examiner also stated that Taguchi teaches, among other things, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit. Moreover, in the Office Action, the Examiner also stated that Taguchi teaches, among other things, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module. (See below.)

a setting output module (the combination of the transmit/receive circuit 51 and the antenna 52 in Figure 2; and 64 in Figure 10) **controlled by the control module to send the external signal to the interface of the Identification rewriteable tire pressure detector wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module** (sending a receiver ID from the monitoring apparatus to the pressure sensor 10 (and similarly to 20, 30 and 40); see S130 in Figure 3 and col. 11, lines 60-62); **and**

However, a partial FIG. 4 of Taguchi is provided below. As shown in step 130 in FIG. 4 of Taguchi, the receiver ID (i.e., the alleged external identification) is transmitted ***from the monitoring apparatus (i.e., the alleged setting apparatus)***. In other words, Taguchi teaches the external identification is **not** from the old tire pressure detector. Instead, the ID in Taguchi is transmitted from ***the monitoring apparatus (i.e., the alleged setting apparatus) to the sensor***, not from the sensor to the monitoring apparatus.

FIG. 4



Partial view of FIG. 4 of Taguchi.

Accordingly, Taguchi fails to teach or suggest the limitations of "***receiving the RF signal from an old tire pressure detector by the receiving module***" and "***the external identification is from the old tire pressure detector***" as recited in new claim 26.

In the Office Action, the Examiner further stated that Taguchi fails to teach the portable setting apparatus is configured to either receive the RF signal from an old tire pressure detector or by receiving a manual input. To remedy this deficiency, the Examiner stated that Nantz teaches, among other things, receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification. (See below.)

> **(1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification,**
>
> Nantz discloses immobilizer 102 may read the ID of the damage TPM sensor and transmit an LF signal containing the ID of the damage sensors to a replacement TPM sensors 104. The ID of the damaged TPM sensors may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. See paragraphs [0029-0030]. See also paragraphs [0014-0015].

However, paragraph [0030] of Nantz explicitly teaches that "***a bank of TPM sensor IDs is stored in the memory of TPM sensor 104, immobilizer 102 or any other module that interfaces with immobilizer 102***" (emphasis added). In other words, the TPM sensor 104 stores a bank of ***TMP sensor IDs (in plural form)*** instead of only one identification. Nowhere in Nantz teaches the TMP sensor 104 storing only one ID.

Accordingly, Nantz, in combination with Taguchi, fails to teach or suggest the limitation of "***wherein the old tire pressure detector stores only the old identification***" as recited in new claim 26.

Moreover, in the Office Action, the Examiner relied upon Toyofuku in addressing the limitation to generate the external signal comprising the update identification as the external

identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification.

As explained above, Toyofuku discloses "an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface." See col. 2, lines 27-37. As further set forth in col. 2, lines 42-45 "[A] self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface." In addition, at col. 3, lines 4-6, Toyofuku discloses "Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added."

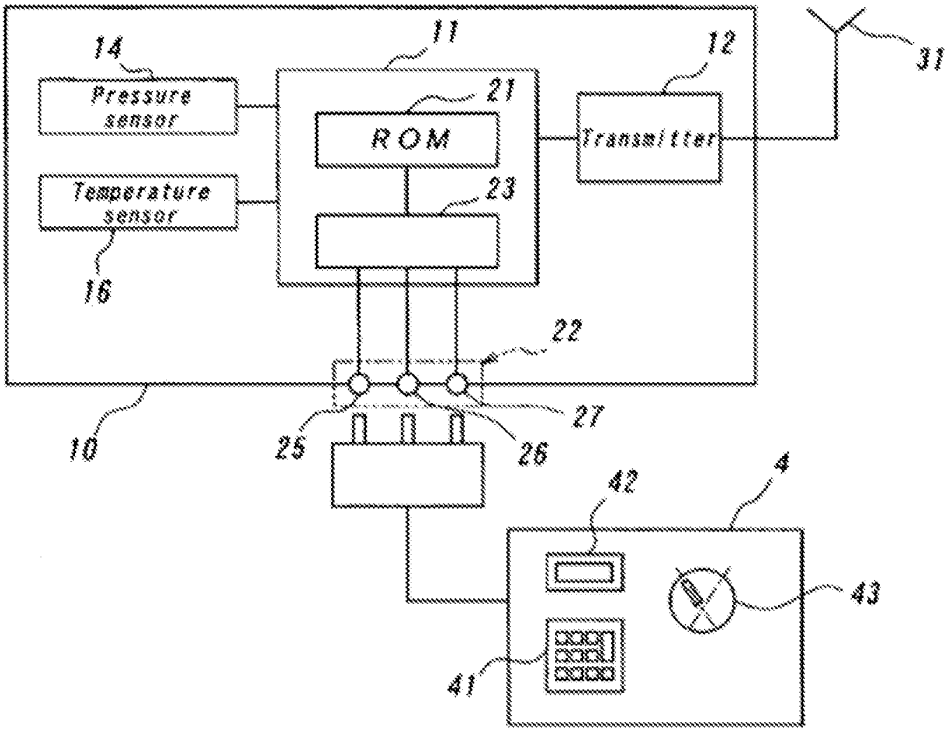
Therefore, the identification information that was input, can be sent to the rewritable tire pressure detector of Taguchi.

However, FIG. 3 of Toyofuku (provided below) shows that the ID being manually input through the data input section 41 is sent to the tire pressure detector **through wire communication**. Nowhere in Toyofuku teaches that the external signal (which is used to transmit the update identification) is a ***low frequency signal***.

Accordingly, Nantz, in combination with Taguchi, fails to teach or suggest the limitation of "***the external signal is a low frequency (LF) signal***" as recited in new claim 26.

In sum, Taguchi, Toyofuku and Nantz, taken alone or in combination, fail to disclose, teach or suggest all of the limitations as recited in new claim 26. Therefore, new claim 26 should be patentable over the cited references under 35 U.S.C. 103(a).

FIG. 3



New Claim 27

New claim 27 includes the limitation of previously present claim 18, and the new limitations as follows:

> ***an identification rewritable tire pressure detector used for being installed in a vehicle***, the identification rewritable tire pressure detector comprising:
>
> . . .
>
> ***wherein the portable setting apparatus is portable relative to the vehicle***, and is configured to:
>
> obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) ***an old identification of an old tire pressure detector, obtained by receiving the***

> ***RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal***, or (2) the identification manually inputted and received from the input module, ***wherein the old tire pressure detector stores only the old identification***; and
>
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, ***wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal***;
>
> . . .

(Emphasis added.)

Specifically, the new limitations as recited in new claim 27 are similar to those as recited in new claim 26. According to new claim 27, the identification rewritable tire pressure detector is used for being installed in a vehicle. Further, the portable setting apparatus is ***not equipped in the vehicle and is portable relative to the vehicle***. In other words, **the portable setting apparatus is not equipped by the vehicle**.

In addition, according to new claim 27, the portable setting apparatus is configured to receive the RF signal from an old tire pressure detector by the receiving module. In other words, the RF signal is sent ***from the old tire pressure detector to the portable setting apparatus***. Further, according to new claim 27, the external identification is from the old tire pressure detector.

Further, according to new claim 27, ***the old tire pressure detector stores only the old identification***. In other words, the old identification is the only identification being stored in the old tire pressure detector.

Moreover, according to new claim 27, the portable setting apparatus is configured to generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein ***the external signal is a low frequency (LF) signal***.

As discussed above, Taguchi, Toyofuku and Nantz, taken alone or in combination, fail to disclose, teach or suggest all of the limitations as recited in new claim 26. For at least the same reasons, Taguchi, Toyofuku and Nantz, taken alone or in combination, also fail to disclose, teach or suggest all of the limitations as recited in new claim 27. Therefore, new claim 27 should be patentable over the cited references under 35 U.S.C. 103(a).

New Claim 28

New claim 28 includes the limitation of previously present claim 20, and the new limitations as follows:

> providing a portable setting apparatus, comprising an input module and a receiving module, wherein ***the portable setting apparatus is not equipped in the vehicle and is portable relative to a vehicle***;
>
> obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by ***receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module*** and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification, wherein ***the old tire pressure detector stores only the old identification***;
>
> when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification; and
>
> when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, ***wherein the external signal is a low frequency (LF) signal***. (Emphasis added.)

Specifically, the new limitations as recited in new claim 28 are similar to those as recited in new claim 26. According to new claim 28, the portable setting apparatus is ***not equipped in the vehicle and is portable relative to a vehicle***. In other words, **the portable setting apparatus is not equipped by the vehicle**.

In addition, according to new claim 28, the portable setting apparatus is configured to receive the RF signal from an old tire pressure detector by the receiving module. In other words,

the RF signal is sent ***from the old tire pressure detector to the portable setting apparatus***. Further, according to new claim 28, the external identification is from the old tire pressure detector.

Further, according to new claim 28, ***the old tire pressure detector stores only the old identification***. In other words, the old identification is the only identification being stored in the old tire pressure detector.

Moreover, according to new claim 28, the portable setting apparatus is configured to generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein ***the external signal is a low frequency (LF) signal***.

As discussed above, Taguchi, Toyofuku and Nantz, taken alone or in combination, fail to disclose, teach or suggest all of the limitations as recited in new claim 26. For at least the same reasons, Taguchi, Toyofuku and Nantz, taken alone or in combination, also fail to disclose, teach or suggest all of the limitations as recited in new claim 28. Therefore, new claim 28 should be patentable over the cited references under 35 U.S.C. 103(a).

CONCLUSION

The Patent Owner respectfully submits that the foregoing Response place this application in condition for allowance. If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, please call the undersigned at 404-870-4698.

It is believed that no fee is due. However, the Commissioner is hereby authorized to charge any deficiency of fees that may be required, and credit of any overpayments to Deposit Account No. 121781.

Respectfully submitted,
LOCKE LORD LLP

March 10, 2020



Tim Tingkang Xia
Attorney for Patent Owner on the Record
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Direct: 404-870-4698
Customer No. 21874

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,362	08/09/2019	8031064	1007383.104US7	2272

21874 7590 03/20/2020

LOCKE LORD LLP
P.O. BOX 55874
BOSTON, MA 02205

EXAMINER	
ESCALANTE, OVIDIO	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
03/20/2020	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.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patents and Trademark Office
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Alexandria, VA 22313-1450
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THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS
KILPATRICK TOWNSEND & STOCKTON LLP
MAILSTOP :IP DOCKETING -22
1100 PEACHTREE STREET SUITE 2800
ATLANTA , GA 30309

Date: March 20, 2020

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. : 90014362
PATENT NO. : 8031064
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)).

Orange Exhibit No. 2004
IPR2024-00744

Decision on Petition for Extension of Time in Reexamination	Application No. 90/014,362	Applicant(s) 8,031,064 B2	
	Examiner Ovidio Escalante	Art Unit 3992	

1. THIS IS A DECISION ON THE PETITION FILED March 6, 2020.

2. THIS DECISION IS ISSUED PURSUANT TO:
   - A. ☒ 37 CFR 1.550(c) – The time for taking any action by a patent owner in a third party requested *ex parte* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified.
   - B. ☐ 37 CFR 1.550(c) – The time for taking action by a patent owner in a patent owner requested *ex parte* reexamination proceeding will only be extended for more than two months for sufficient cause and for a reasonable time specified.
   - C. ☐ 37 CFR 1.956 – The time for taking any action by a patent owner in an *inter partes* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified.

   The petition is before the Central Reexamination Unit for consideration.

3. FORMAL MATTERS
   Patent owner requests that the period for filing a response to the Non-Final Office action mailed January 10, 2020, which set a two (2) month period to file a response (i.e., until March 10, 2020), be extended by an additional one (1) month (i.e., until April 10, 2020).
   - A. Petition fee per 37 CFR §1.17(g)):
     - i. ☐ Petition includes authorization to debit a deposit account.
     - ii. ☒ Petition includes authorization to charge a credit card account.
     - iii. ☐ Other: _____.
   - B. ☒ Proper certificate of service was provided. (Not required in reexamination where patent owner is requester.)
   - C. ☒ Petition was timely filed.
   - D. ☒ Petition properly signed.

4. DECISION (See MPEP 2265 and 2665)
   - A. ☐ Granted or ☐ Granted-in-part for_____. (See 37 CFR 1.550(c) and 37 CFR 1.956).
     - i. ☐ Other/comment: _____.
   - B. ☒ Dismissed because:
     - i. ☐ Formal matters (See unchecked box(es) (A, B, C and/or D) in section 4 above).
     - ii. ☐ Petitioner failed to provide a factual accounting of reasonably diligent behavior by all those responsible for preparing a response to the outstanding Office action within the statutory time period.
     - iii. ☐ Petitioner failed to explain why, in spite of the action taken thus far, the requested additional time is needed.
     - iv. ☐ The statements provided fail to establish sufficient cause to warrant extension of the time for taking action (See attached).
     - v. ☒ The petition is moot.
     - vi. ☒ Other/comment: Patent Owner filed a response on March 10, 2020 to the January 10, 2020 Non-Final Office action, which was within the two (2) month shortened statutory time period.

5. CONCLUSION: **Since Patent Owner filed a response on March 10, 2020 to the January 10, 2020 Non-Final Office action, which was within the two (2) month shortened statutory time period, Patent Owner's petition for extension of time is moot**.

   Telephone inquiries with regard to this decision should be directed to Gay Ann Spahn at 571-272-7731 in the CRU.

	/Gay Ann Spahn/ Supervisory Patent Reexamination Specialist Central Reexamination Unit

Electronic Acknowledgement Receipt

EFS ID:	39093862
Application Number:	90014362
International Application Number:	
Confirmation Number:	2272
Title of Invention:	TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME
First Named Inventor/Applicant Name:	8031064
Customer Number:	21874
Filer:	Tim Tingkang Xia/Danielle Olive
Filer Authorized By:	Tim Tingkang Xia
Attorney Docket Number:	1007383.104US7
Receipt Date:	08-APR-2020
Filing Date:	09-AUG-2019
Time Stamp:	09:50:46
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	Supplemental Response or Supplemental Amendment	1007383104US7SupplementalResponse_ExParte.pdf	730072 32d5fe5db1cac271c4c5142d3c6352c3d9b8984f	no	28

Warnings:

Orange Exhibit No. 2004
IPR2024-00744

Information:	
Total Files Size (in bytes):	730072

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.

Orange Exhibit No. 2004
IPR2024-00744

EX-PARTE **REEXAMINATION** **Attorney Docket No. 1007383.104US7**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Owner:	Orange Electronic Co., Ltd.	Confirmation No.	2272
U.S. Patent No.	8,031,064	Group Art Unit:	3992
Serial No.	90/014,362	Examiner	Ovidio Escalante
Filed:	August 9, 2019		
For:	Tire Pressure Detecting Apparatus and Tire Pressure Detector Identification Copying Method for the Same		

SUPPLEMENTAL AMENDMENT AND RESPONSE TO OFFICE ACTION IN *EX PARTE* RE-EXAMINATION

Mail Stop: *Ex Parte* Re-Examination
Central Reexamination Unit
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

April 8, 2020

CUSTOMER NO. 21874

Dear Sir/Madam:

In response to the Office Action mailed January 10, 2020, please amend the above-identified application as follows and consider the following Remarks:

Amendments to the Claims begin on page **2** of this paper.

Claim Status and Support for Amendments (37 CFR 1.530(e)) begin on page **14** of this paper.

Remarks begin on page **15** of this paper.

Orange Exhibit No. 2004
IPR2024-00744

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1-15. (Canceled).

16. (Currently amended): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire

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pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification;

store the update identification in the setting apparatus; [and]

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification; and

verify the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal

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comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

17. (Previously presented): The tire pressure detecting apparatus as claimed in claim 16, wherein the input module comprises a code scanner.

18. (Currently amended): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to

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manually input an identification to be written into the identification rewriteable tire pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification manually inputted and received from the input module; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector; and

verify the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector;

wherein the new identification rewriteable tire pressure detector is configured to:

acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit, and send the update identification newly recorded in the rewritable memory unit back to the setting apparatus;

wherein the verifying step by the setting apparatus comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

19. (Previously presented): The tire pressure detecting apparatus as claimed in claim 18, wherein the input module comprises a code scanner.

20. (Canceled):

21. (Currently amended): The method as claimed in claim [20]23, wherein the new identification rewriteable tire pressure detector is configured to record the update identification in the rewritable memory unit or overwrite the preset identification in the rewritable memory unit by the update identification by:

acquiring the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

22. (Canceled).

23. (Currently amended): [The method as claimed in claim 22,]A tire pressure detector identification updating method comprising the steps of:

providing a setting apparatus, comprising an input module and a receiving module;

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification;

when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification;

when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification; and

verifying, by the setting apparatus, the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.[; and]

[if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again.]

24. (Currently amended): The method as claimed in claim [20]23, wherein the setting apparatus is configured to receive the RF signal wirelessly.

25. (Currently amended): The method as claimed in claim [20]23, wherein the input module comprises a code scanner.

26. (New): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector used for being installed in a vehicle, the identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to

the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector;

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle, and is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification, wherein the old tire pressure detector stores only the old identification;

store the update identification in the setting apparatus; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal.

27. (New): A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector used for being installed in a vehicle, the identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to

manually input an identification to be written into the identification rewriteable tire pressure detector;

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle, and is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification manually inputted and received from the input module, wherein the old tire pressure detector stores only the old identification; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal;

wherein the new identification rewriteable tire pressure detector is configured to:

acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

28. (New): A tire pressure detector identification updating method comprising the steps of:

providing a portable setting apparatus, comprising an input module and a receiving module, wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to a vehicle;

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification, wherein the old tire pressure detector stores only the old identification;

when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification; and

when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update

identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein the external signal is a low frequency (LF) signal.

29. (New): The method as claimed in claim 23, wherein the verifying step further comprises:

if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again.

CLAIM STATUS AND SUPPORT FOR AMENDMENTS (37 CFR 1.530(e))

Claims 16-25 were under reexamination. Of them, claims 16-25 were new relative to the original patent and previously presented in a prior *ex parte* reexamination certificate, before this amendment as set forth above.

By this amendment, claims 17 and 19 remain unchanged, claims 16, 18, 21 and 23-25 are amended, claims 20 and 22 are canceled, and new claims 26-29 are added.

Support for the amendment can be found throughout the original patent. None of the newly added claims 26-29 broadens the claim scope of the originally issued claims 1-13.

Upon entry of this amendment, claims 16-19, 21 and 23-29 are pending in in this reexamination proceeding. The claim status is listed as follows:

Claims 1-15.	Canceled.
Claim 16.	Pending – amended.
Claim 17.	Pending – unchanged.
Claim 18.	Pending – amended.
Claim 19.	Pending – unchanged.
Claim 20.	Canceled.
Claim 21.	Pending – amended.
Claim 22.	Canceled.
Claim 23-25.	Pending – amended.
Claims 26-29.	Pending - new.

REMARKS

Claims 16-25 were under reexamination. By the amendment, claims 16, 18, 21 and 23-25 are amended, and claims 20 and 22 are canceled. Further, new claims 26-29 are added.

In the Office Action, claims 16-22, 24 and 25 were rejected under pre-AIA 35 U.S.C. 103(a) as being allegedly unpatentable over Taguchi (U.S. Patent No. 6,927,679, hereinafter "Taguchi") in view of Toyofuku (U.S. Patent No. 6,920,785, hereinafter "Toyofuku") and further in view of Nantz (U.S. Patent Pub. No. 2006/0208864, hereinafter "Nantz").

However, the Examiner indicated that claim 23 was objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The Patent Owner appreciates very much the careful review of the patent by the Reexamination Panel, as well as the allowability of claim 23.

In response, as set forth above, without acquiescing to the Examiners' assertion, which the Patent Owner does not agree, and in order to advance the prosecution of the confirmed claims and allowable claims, the Patent Owner has amended and rewritten allowable claim 23 in independent form, incorporating the limitations of claims 20 and 22, which makes amended claim 23 allowable. Further, the Patent Owner has amended previously presented independent claims 16 and 18 to incorporate the limitations from the allowable claim 23 as well as the intervening claim 22, which makes amended claims 16, 18 and 20 allowable. Furthermore, new claims 26-29 have been added. Of the pending claims, claims 16, 18, 23 as well as new claims 26-28 are independent claims. Support for the amendment can be found throughout the original patent. None of the newly added claims 26-29 broadens the claim scope of the originally issued claims 1-13.

Any amendments to the claims not specifically referred to herein as being included for the purpose of distinguishing the claims from cited references are included for the purpose of clarification, consistence and/or grammatical correction only.

In view of the foregoing, the Patent Owner respectfully requests allowance of the presently pending claims in this reexamination proceeding.

The following remarks herein are considered to be responsive thereto.

Amended Claim 23

As set forth above, the Examiner indicated in the Office Action that claim 23 recites allowable features. Specifically, the Examiner stated, among other things, that the teachings of the references do not show that the writing device judges the consistency of the update identification newly record in the rewriteable memory unit and the old identification of the old tire pressure detector.

In response, allowable claim 23 has been amended and rewritten in independent form, incorporating the limitations of claims 20 and 22, which makes amended claim 23 allowable. Dependent claims 21 and 24-25 have been amended to depend upon allowable claim 23, and new claim 29 has been added to depend upon allowable claim 23. Thus, these dependent claims are also allowable as well.

Amended Claims 16 and 18

As set forth above, independent claims 16 and 18 have been respectively amended to incorporate the limitations from the allowable claim 23 as well as the intervening claim 22, which makes amended claims 16 and 18 allowable. Dependent claims 17 and 19, which depend upon amended claims 16 and 18, respectively, are also allowable as well.

New Claim 26

MPEP 2141.02 (VI) states that "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

Further, MPEP 2145 (X)(D)(2) states that "[i]t is improper to combine references where the references teach away from their combination." *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).

New claim 26 includes the limitation of previously present claim 16, and the new limitations as follows:

> ***an identification rewritable tire pressure detector used for being installed in a vehicle***, the identification rewritable tire pressure detector comprising:
>
> . . .
>
> ***wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle***, and is configured to:
>
> obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) ***receiving the RF signal from an old tire pressure detector by the receiving module***, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification, ***wherein the old tire pressure detector stores only the old identification***;
>
> store the update identification in the setting apparatus; and
>
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein ***the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal***.
>
> (Emphasis added.)

Specifically, according to new claim 26, the identification rewritable tire pressure detector is used for being installed in a vehicle. Further, the portable setting apparatus is ***not equipped in the vehicle and is portable relative to the vehicle***. (See FIG. 4 of the drawing, showing the setting apparatus 90 not equipped in the car 80, provided below. See also the paragraph on column 1, lines 25-51 of the specification.) In other words, **the portable setting apparatus is not equipped by the vehicle**.

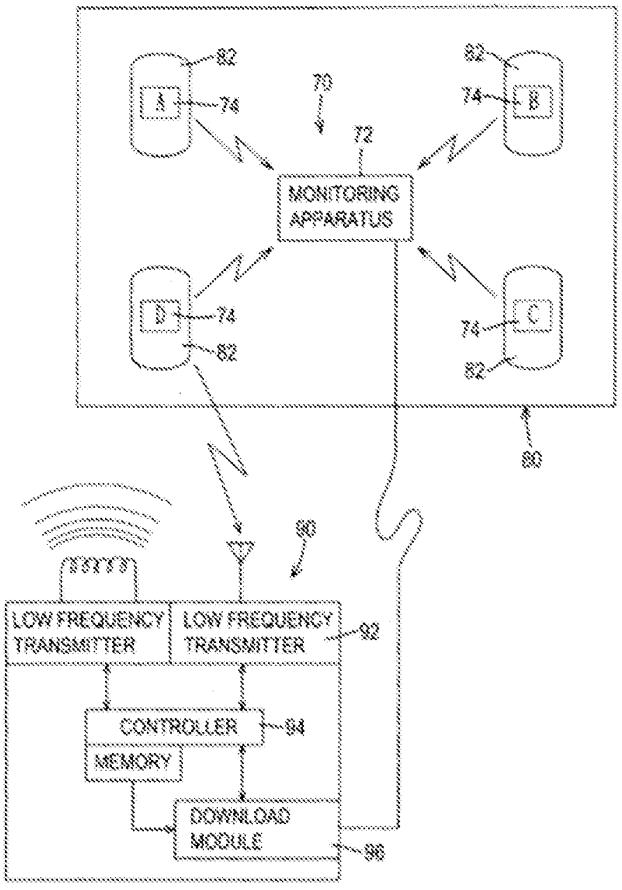
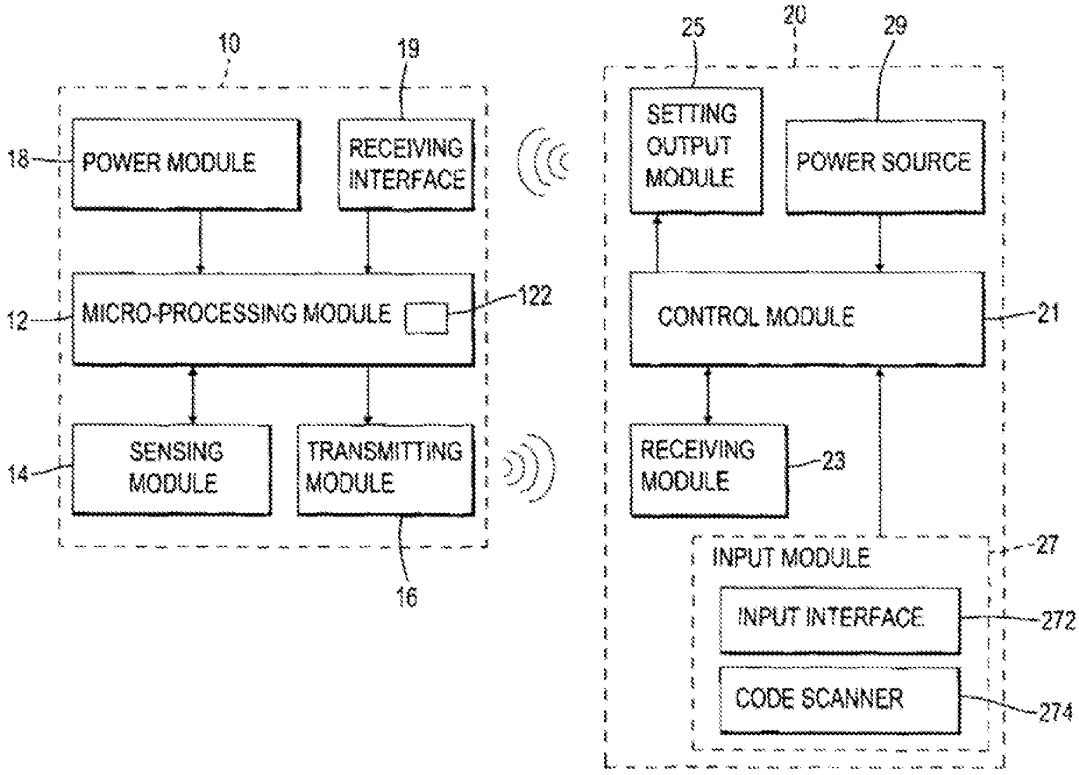


FIG.4

In addition, according to new claim 26, the portable setting apparatus is configured to receive the RF signal from an old tire pressure detector by the receiving module. (See FIG. 1 of the drawings, showing the transmitting module 16 of the tire pressure detector 10 transmitting the RF signal to the receiving module 23 of the portable setting apparatus 20, provided below.) In other words, the RF signal is sent ***from the old tire pressure detector to the portable setting apparatus***. Further, according to new claim 26, the external identification is from the old tire pressure detector. (See FIG. 1, provided below. See also the paragraphs on column 4, lines 15-32 of the specification.)



Further, according to new claim 26, ***the old tire pressure detector stores only the old identification***. In other words, the old identification is the only identification being stored in the old tire pressure detector.

Moreover, according to new claim 26, the portable setting apparatus is configured to generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein ***the external signal is a low frequency (LF) signal***. (See FIG. 1, showing the portable setting apparatus 20 sending the external signal, which is the LF signal, to the receiving interface 19 of a tire pressure detector 10, provided above. See also the paragraph on column 3, lines 6-28 of the specification.)

In the Office Action, the Examiner relied upon Taguchi, Toyofuku and Nantz as the basis of rejecting claim 16. In particular, the Examiner stated, among other things, that Taguchi teaches a portable setting apparatus (the tire pressure monitor 50 in Figure 2).

However, Taguchi not only fails to teach or suggest, but also explicitly ***teaches away*** from the limitation of "***the portable setting apparatus is portable relative to the vehicle***" as recited in new claim 26. Specifically, the paragraph on column 10, lines 29-54 of Taguchi explicitly teaches that the pneumatic tire pressure monitoring apparatus 50 is "***equipped in a vehicle body***." Furthermore, nowhere in Taguchi teaches or suggests that the pneumatic tire pressure monitoring apparatus 50 is ***portable relative to the vehicle***. In other words, the monitoring apparatus 50 of Taguchi is not comparable to the portable setting apparatus, which is ***portable relative to the vehicle***, as recited in new claim 26.

Accordingly, one of ordinary skill in the art, based on the teaching of Taguchi ***in its entirety (i.e., as a whole)***, would understand that the monitoring apparatus 50 of Taguchi and the components thereof are equipped in a vehicle body and thus are not portable, which clearly **teaches away** from the limitation of the portable setting apparatus being portable relative to the vehicle as recited in new claim 26.

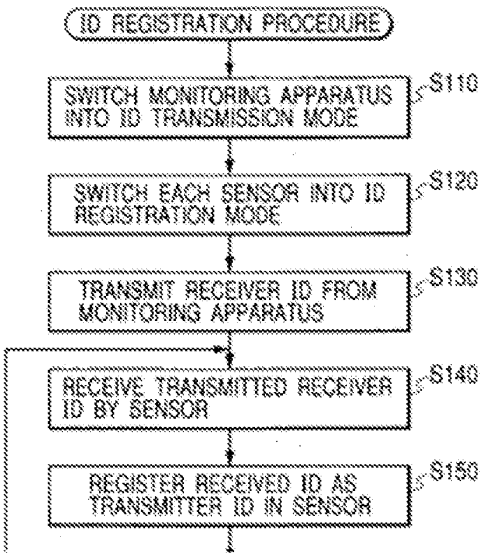
For the foregoing reasons, the Examiner's rejection in reliance of the combination of the cited references, including Taguchi, Toyofuku and Nantz (or any other reference), is improper according to MPEP 2145 (X)(D)(2) because Taguchi teaches features that leads away from the combination.

Further, in the Office Action, the Examiner also stated that Taguchi teaches, among other things, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit. Moreover, in the Office Action, the Examiner also stated that Taguchi teaches, among other things, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module. (See below.)

a setting output module (the combination of the transmit/receive circuit 51 and the antenna 52 in Figure 2; and 64 in Figure 10) **controlled by the control module to send the external signal to the interface of the Identification rewriteable tire pressure detector wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module** (sending a receiver ID from the monitoring apparatus to the pressure sensor 10 (and similarly to 20, 30 and 40); see S130 in Figure 3 and col. 11, lines 60-62); **and**

However, a partial FIG. 4 of Taguchi is provided below. As shown in step 130 in FIG. 4 of Taguchi, the receiver ID (i.e., the alleged external identification) is transmitted ***from the monitoring apparatus (i.e., the alleged setting apparatus)***. In other words, Taguchi teaches the external identification is **not** from the old tire pressure detector. Instead, the ID in Taguchi is transmitted from ***the monitoring apparatus (i.e., the alleged setting apparatus) to the sensor***, not from the sensor to the monitoring apparatus.

FIG. 4



Partial view of FIG. 4 of Taguchi.

Accordingly, Taguchi fails to teach or suggest the limitations of "***receiving the RF signal from an old tire pressure detector by the receiving module***" and "***the external identification is from the old tire pressure detector***" as recited in new claim 26.

In the Office Action, the Examiner further stated that Taguchi fails to teach the portable setting apparatus is configured to either receive the RF signal from an old tire pressure detector or by receiving a manual input. To remedy this deficiency, the Examiner stated that Nantz teaches, among other things, receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification. (See below.)

> **(1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification,**
>
> Nantz discloses immobilizer 102 may read the ID of the damage TPM sensor and transmit an LF signal containing the ID of the damage sensors to a replacement TPM sensors 104. The ID of the damaged TPM sensors may be read as a result of a signal that is transmitted from the damaged TPM sensor to immobilizer 102. See paragraphs [0029-0030]. See also paragraphs [0014-0015].

However, paragraph [0030] of Nantz explicitly teaches that "***a bank of TPM sensor IDs is stored in the memory of TPM sensor 104, immobilizer 102 or any other module that interfaces with immobilizer 102***" (emphasis added). In other words, the TPM sensor 104 stores a bank of ***TMP sensor IDs (in plural form)*** instead of only one identification. Nowhere in Nantz teaches the TMP sensor 104 storing only one ID.

Accordingly, Nantz, in combination with Taguchi, fails to teach or suggest the limitation of "***wherein the old tire pressure detector stores only the old identification***" as recited in new claim 26.

Moreover, in the Office Action, the Examiner relied upon Toyofuku in addressing the limitation to generate the external signal comprising the update identification as the external

identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification.

As explained above, Toyofuku discloses "an interface for importing signals from external sources, wherein the fixing memory is so configured that the data can be rewritten by the external input imported via the interface." See col. 2, lines 27-37. As further set forth in col. 2, lines 42-45 "[A] self-identification code identical to that of the sensor unit attached to the tire wheel before the replacement can be written in the sensor unit after the replacement via the interface." In addition, at col. 3, lines 4-6, Toyofuku discloses "Since the sensor unit can rewrite or add data after the manufacturing of the sensor unit, data other than the self-identification code can be rewritten or added."

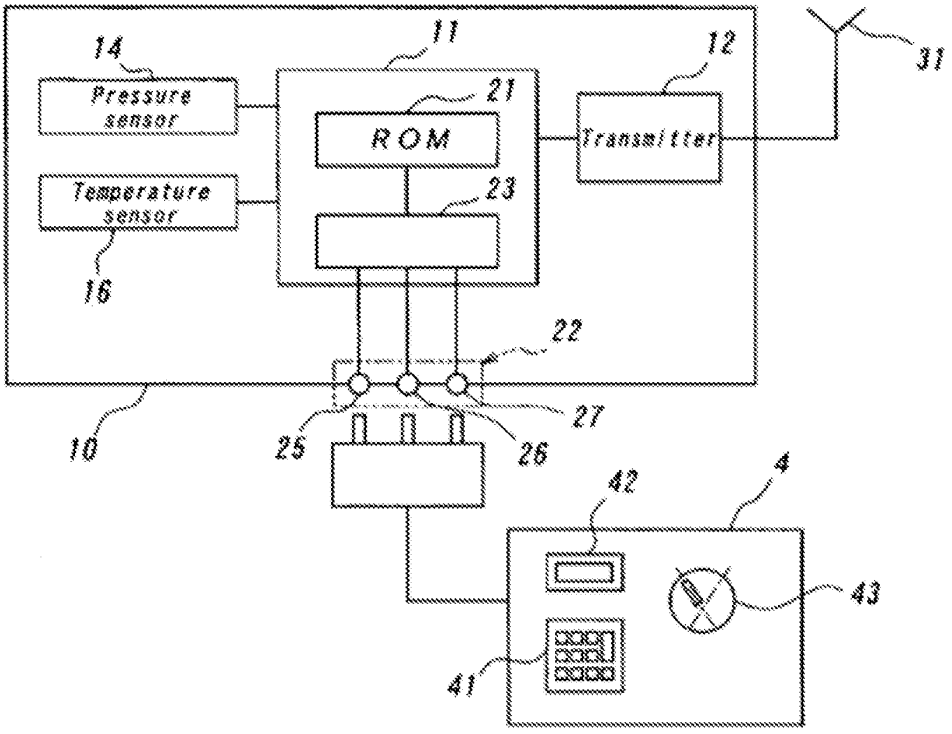
Therefore, the identification information that was input, can be sent to the rewritable tire pressure detector of Taguchi.

However, FIG. 3 of Toyofuku (provided below) shows that the ID being manually input through the data input section 41 is sent to the tire pressure detector **through wire communication**. Nowhere in Toyofuku teaches that the external signal (which is used to transmit the update identification) is a ***low frequency signal***.

Accordingly, Nantz, in combination with Taguchi, fails to teach or suggest the limitation of "***the external signal is a low frequency (LF) signal***" as recited in new claim 26.

In sum, Taguchi, Toyofuku and Nantz, taken alone or in combination, fail to disclose, teach or suggest all of the limitations as recited in new claim 26. Therefore, new claim 26 should be patentable over the cited references under 35 U.S.C. 103(a).

FIG. 3



New Claim 27

New claim 27 includes the limitation of previously present claim 18, and the new limitations as follows:

> ***an identification rewritable tire pressure detector used for being installed in a vehicle***, the identification rewritable tire pressure detector comprising:
>
> . . .
>
> ***wherein the portable setting apparatus is portable relative to the vehicle***, and is configured to:
>
> obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) ***an old identification of an old tire pressure detector, obtained by receiving the***

> ***RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal***, or (2) the identification manually inputted and received from the input module, ***wherein the old tire pressure detector stores only the old identification***; and
>
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, ***wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal***;
>
> . . .

(Emphasis added.)

Specifically, the new limitations as recited in new claim 27 are similar to those as recited in new claim 26. According to new claim 27, the identification rewritable tire pressure detector is used for being installed in a vehicle. Further, the portable setting apparatus is ***not equipped in the vehicle and is portable relative to the vehicle***. In other words, **the portable setting apparatus is not equipped by the vehicle**.

In addition, according to new claim 27, the portable setting apparatus is configured to receive the RF signal from an old tire pressure detector by the receiving module. In other words, the RF signal is sent ***from the old tire pressure detector to the portable setting apparatus***. Further, according to new claim 27, the external identification is from the old tire pressure detector.

Further, according to new claim 27, ***the old tire pressure detector stores only the old identification***. In other words, the old identification is the only identification being stored in the old tire pressure detector.

Moreover, according to new claim 27, the portable setting apparatus is configured to generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein *the external signal is a low frequency (LF) signal*.

As discussed above, Taguchi, Toyofuku and Nantz, taken alone or in combination, fail to disclose, teach or suggest all of the limitations as recited in new claim 26. For at least the same reasons, Taguchi, Toyofuku and Nantz, taken alone or in combination, also fail to disclose, teach or suggest all of the limitations as recited in new claim 27. Therefore, new claim 27 should be patentable over the cited references under 35 U.S.C. 103(a).

New Claim 28

New claim 28 includes the limitation of previously present claim 20, and the new limitations as follows:

> providing a portable setting apparatus, comprising an input module and a receiving module, wherein ***the portable setting apparatus is not equipped in the vehicle and is portable relative to a vehicle***;
>
> obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by ***receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module*** and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification, wherein ***the old tire pressure detector stores only the old identification***;
>
> when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification; and
>
> when the update identification is the manually input identification from the input module, writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, ***wherein the external signal is a low frequency (LF) signal***. (Emphasis added.)

Specifically, the new limitations as recited in new claim 28 are similar to those as recited in new claim 26. According to new claim 28, the portable setting apparatus is ***not equipped in the vehicle and is portable relative to a vehicle***. In other words, **the portable setting apparatus is not equipped by the vehicle**.

In addition, according to new claim 28, the portable setting apparatus is configured to receive the RF signal from an old tire pressure detector by the receiving module. In other words,

the RF signal is sent ***from the old tire pressure detector to the portable setting apparatus***. Further, according to new claim 28, the external identification is from the old tire pressure detector.

Further, according to new claim 28, ***the old tire pressure detector stores only the old identification***. In other words, the old identification is the only identification being stored in the old tire pressure detector.

Moreover, according to new claim 28, the portable setting apparatus is configured to generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein ***the external signal is a low frequency (LF) signal***.

As discussed above, Taguchi, Toyofuku and Nantz, taken alone or in combination, fail to disclose, teach or suggest all of the limitations as recited in new claim 26. For at least the same reasons, Taguchi, Toyofuku and Nantz, taken alone or in combination, also fail to disclose, teach or suggest all of the limitations as recited in new claim 28. Therefore, new claim 28 should be patentable over the cited references under 35 U.S.C. 103(a).

CONCLUSION

The Patent Owner respectfully submits that the foregoing Response place this application in condition for allowance. If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, please call the undersigned at 404-870-4698.

It is believed that no fee is due. However, the Commissioner is hereby authorized to charge any deficiency of fees that may be required, and credit of any overpayments to Deposit Account No. 121781.

Respectfully submitted,
LOCKE LORD LLP

April 8, 2020



Tim Tingkang Xia
Attorney for Patent Owner on the Record
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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 90/014,362	Filing Date 08/09/2019	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/08/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 6	Minus	*** 6	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/PATRICIA F LEWIS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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IPR2024-00744

Patent Assignment Abstract of Title

Total Assignments: 1

Application #: 12283979 **Filing Dt:** 09/17/2008 **Patent #:** 8031064 **Issue Dt:** 10/04/2011

PCT #: NONE **Intl Reg #:** **Publication #:** US20100066524 **Pub Dt:** 03/18/2010

Inventor: Hung-Chih Yu

Title: TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME

Assignment: 1

Reel/Frame: 021898 / 0710 **Received:** 10/06/2008 **Recorded:** 09/17/2008 **Mailed:** 11/28/2008 **Pages:** 2

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignor: YU, HUNG-CHIH **Exec Dt:** 09/15/2008

Assignee: ORANGE ELECTRONIC CO., LTD.
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TAICHUNG HSIEN, TAIWAN R.O.C.

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Search Results as of: 04/20/2020 12:36 PM

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,362	08/09/2019	8031064	1007383.104US7	2272

21874 7590 04/30/2020

LOCKE LORD LLP
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BOSTON, MA 02205

EXAMINER	
ESCALANTE, OVIDIO	

ART UNIT	PAPER NUMBER
3992	

MAIL DATE	DELIVERY MODE
04/30/2020	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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1100 PEACHTREE STREET
SUITE 2800
ATLANTA, GA 30309

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,362* .

PATENT UNDER REEXAMINATION *8031064* .

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)).

PTOL-465 (Rev.07-04)

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IPR2024-00744

Notice of Intent to Issue Ex Parte Reexamination Certificate	**Control No.** 90/014,362	**Patent Under Reexamination** 8031064	
	Examiner OVIDIO ESCALANTE	**Art Unit** 3992	**AIA Status** No

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

1. ☑ Prosecution on the merits is (or remains) closed in this *ex parte* reexamination proceeding. This proceeding is subject to reopening at the initiative of the Office or upon petition. *Cf.* 37 CFR 1.313(a). A Certificate will be issued in view of
   (a) ☑ Patent owner's communication(s) filed: 4/8/2020.
   (b) ☐ Patent owner's failure to file an appropriate timely response to the Office action mailed: _____.
   (c) ☐ Patent owner's failure to timely file an Appeal Brief (37 CFR 41.31).
   (d) ☐ The decision on appeal by the ☐ Board of Patent Appeals and Interferences ☐ Court dated _____
   (e) ☐ Other: _____.
2. The Reexamination Certificate will indicate the following:
   (a) Change in the Specification: ☐ Yes ☑ No
   (b) Change in the Drawing(s): ☐ Yes ☑ No
   (c) Status of the Claim(s):
      (1) Patent claim(s) confirmed: _____.
      (2) Patent claim(s) amended (including dependent on amended claim(s)): 16-19,21 and 23-25
      (3) Patent claim(s) canceled: 20 and 22.
      (4) Newly presented claim(s) patentable: 26-29.
      (5) Newly presented canceled claims: _____.
      (6) Patent claim(s) ☐ previously ☐ currently disclaimed: _____
      (7) Patent claim(s) not subject to reexamination: _____.
3. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
4. ☑ Note the attached statement of reasons for patentability and/or confirmation. Any comments considered necessary by patent owner regarding reasons for patentability and/or confirmation must be submitted promptly to avoid processing delays. Such submission(s) should be labeled: "Comments On Statement of Reasons for Patentability and/or Confirmation."
5. ☐ Note attached NOTICE OF REFERENCES CITED (PTO-892).
6. ☐ Note attached LIST OF REFERENCES CITED (PTO/SB/08 or PTO/SB/08 substitute).
7. ☐ The drawing correction request filed on _____ is: ☐approved ☐disapproved.
8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐None of the certified copies have
   ☐been received.
   ☐not been received.
   ☐been filed in Application No. _____.
   ☐been filed in reexamination Control No. _____.
   ☐been received by the International Bureau in PCT Application No. _____.
   * Certified copies not received: _____.
9. ☐ Note attached Examiner's Amendment.
10. ☐ Note attached Interview Summary (PTO-474).
11. ☐ Other: _____.

All correspondence relating to this reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

/OVIDIO ESCALANTE/ Primary Examiner, Art Unit 3992	/MAJID A BANANKHAH/ Reexamination Specialist, Art Unit 3992

cc: Requester (if third party requester)

NOTICE OF INTENT TO ISSUE REEXAMINATION CERTIFICATE

1. This action is in response to the Patent Owner's response filed on March 10, 2020 and the supplemental response filed on April 8, 2020.

Status of the Claims

2. Original claims 16- 19,21, and 23-25 are patentable

3. New claims 26-29 are allowed.

Response to Arguments

As per Claims 16-19, 21, 23-25

The Examiner acknowledges the Patent Owners amendment to claim 23 which places the claim in independent form by incorporating the limitations of claims 20 and 22. The Examiner also acknowledges the amendment to claims 16, 18 and 23 which incorporates the limitations of allowable claim 23 and intervening claim 22.

The examine notes that the Patent Owner did not incorporate the entirety of dependent claim 23. Specifically, the Patent Owner did not incorporate "if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again" into the independent claim. However, the examiner notes that this limitation is a contingent limitation and therefore, allowability of claim 23 did not pertain to this limitation.

Thus, in light of the amendment, as well as the examiner reasons for finding the limitations allowable as set forth in the previous office action, the examiner agrees to withdrawn the rejection of claims 16, 18, and 23 as well as its dependencies.

As per claims 26-29

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New claim 26 includes the limitation of previously present claim 16, and the new limitations as follows:

> ***an identification rewritable tire pressure detector used for being installed in a vehicle***, the identification rewritable tire pressure detector comprising:
>
> . . .
>
> ***wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle***, and is configured to:
>
> obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) ***receiving the RF signal from an old tire pressure detector by the receiving module***, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification, ***wherein the old tire pressure detector stores only the old identification***;
>
> store the update identification in the setting apparatus; and
>
> generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein ***the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal***.

(Emphasis added.)

The Patent Owner argues Taguchi fails to teach and teaches away from the limitation of "the portable setting apparatus is portable relative to the vehicle. The Patent Owner states that Taguchi explicitly teaches that the pneumatic tire pressure monitoring apparatus 50 is "equipped in a vehicle body".

The examiner agrees in part. Although the Patent Owner is correct that Taguchi does not teach that the portable setting apparatus is portable relative to the vehicle and that the pneumatic tire pressure apparatus is "equipped in a vehicle body", the examiner disagrees that Taguchi "teaches away" from using a portable setting apparatus.

The examiner notes that "the prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize,

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discredit, or otherwise discourage the solution claimed…." In re Fulton, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004).

The Patent Owner also argues that in the Office Action, the Examiner states that Taguchi teaches wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module. The Patent Owner states that as shown in step 130 in Fig. 4 of Taguchi, the receiver ID is transmitted from the monitoring apparatus (i.e. the alleged setting apparatus) and that Taguchi teaches the external identification is not from the old tire pressure detector, instead, the ID in Taguchi is transmitted from the monitoring apparatus to the sensor, not from the sensor to the monitoring apparatus.

With respect to Nantz, the Patent Owner states that in paragraph [0030], Nantz explicitly teaches that "a bank of TPM sensor IDs is stored in the memory of TPM sensor 104, immobilizer 102 or another module that int3erfaces with immobilizer 102". The Patent Owner argues that none were in Nantz does it disclose the TMP sensor 04 storing only one ID.

With respect to Toyofuku, the Patent Owner argues that the ID is manually input through wire communication and thus Toyofuku does not disclose that the external signal (which is used to transmit the update identification) is a low frequency signal..

The examiner notes that although Toyofuku discloses a wire communication, low frequency signals are disclosed by Nantz, Nonetheless, in view of the above comments, upon review of all of the arguments presented by the Patent Owner, the examiner finds the arguments persuasive. The examiner notes that the Patent Owner provides the same arguments with respect to new claims 27 and 28.

STATEMENT OF REASONS FOR PATENTABILITY AND/OR CONFIRMATION

The following is an examiner's statement of reasons for patentability and/or confirmation of the claims found patentable in this reexamination proceeding:

As per Claims 16-19, 21, 23-25

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The examiner notes that previous claim 23 recited "judging, by the setting apparatus, consistency of the update identification newly record3ed in the rewritable memory unit and the old identification of the old tire pressure detector."

The examiner notes that Toyofuki discloses:

> "When the outputting the data to the external input signal controller 23 is finished, the dedicated writing device 4 outputs a signal for turning the signal A to the low level, whereby the external input signal controller 23 confirms a completion of the input, and outputs the imported self-identification code as the R part of the signal B to the dedicated writing device 4 for a verification. The dedicated writing device 4 automatically verity the signal, and if the verification is O.K., a sign of the completion of writing is displayed on the data display 42." at 5:58-67

The Examiner determines that the teachings associated with Toyofuku show that the controller 23 confirms completion of the input and outputs a signal to the writing device 4 for a verification. Although the dedicated writing device 4 verifies the signal (which is based upon completion of inputting the data),. The teachings do not sow that the writing device judges the consistency of the update ind3efnicaiton newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector, rather it just verifies completion of the input of data.

As per ***claims 26-29***, see the above discussion in the response to arguments section.

Any comments considered necessary by PATENT OWNER regarding the above statement must be submitted promptly to avoid processing delays. Such submission by the patent owner should be labeled: "Comments on Statement of Reasons for Patentability and/or Confirmation" and will be placed in the reexamination file.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ovidio Escalante whose telephone number is (571)272-7537. The examiner can normally be reached on Monday to Friday - 6:00 AM to 2:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Fuelling can be reached on (571) 270-1367 The fax phone number for the organization where

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this application or proceeding is assigned is 571-273-9000. 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). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ovidio Escalante/
Ovidio Escalante
Reexamination Specialist
Central Reexamination Unit - Art Unit 3992
(571) 272-7537

Conferees:
/MAJID A BANANKHAH/
Reexamination Specialist, Art Unit 3992
/M.F/
Supervisory Patent Examiner, Art Unit 3992

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Examiner	Art Unit
	OVIDIO ESCALANTE	3992

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/16/2019	04/15/2020							
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
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	10									
	11									
	12									
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	15									
	16	✓	=							
	17	✓	=							
	18	✓	=							
	19	✓	=							
	20	✓	-							
	21	✓	=							
	22	✓	-							
	23	=	=							
	24	✓	=							
	25	✓	=							
	26		=							
	27		=							
	28		=							
	29		=							

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Certificate Date	Certificate Number
		C3

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
KILPATRICK TOWNSEND & STOCKTON LLP MAILSTOP: IP DOCKETING - 22 1100 PEACHTREE STREET SUITE 2800 ATLANTA, GA 30309

LITIGATION REVIEW ☑	OE (examiner initials)	09 August 2019 (date)
Case Name		Director Initials
None		/MF/for JC

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Examiner	**Art Unit**
	OVIDIO ESCALANTE	3992

CPC							
Symbol						**Type**	**Version**
B60C	/	23	/	0408		F	2013-01-01
B60C	/	23	/	0472		I	2013-01-01
B60C	/	23	/	0479		I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/OVIDIO ESCALANTE/ Primary Examiner, Art Unit 3992	15 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	16	1

U.S. Patent and Trademark Office — Part of Paper No.: 20200413

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IPR2024-00744

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Examiner	Art Unit
	OVIDIO ESCALANTE	3992

INTERNATIONAL CLASSIFICATION					
CLAIMED					
B60C	/	23	/	00	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
340	447

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
340	445	442				
73	146.5	146				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/OVIDIO ESCALANTE/ Primary Examiner, Art Unit 3992	15 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	16	1

U.S. Patent and Trademark Office — Part of Paper No.: 20200413

Orange Exhibit No. 2004
IPR2024-00744

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,362	8031064
	Examiner	Art Unit
	OVIDIO ESCALANTE	3992

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/OVIDIO ESCALANTE/ Primary Examiner, Art Unit 3992	15 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	16	1

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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CPC - Searched*		
Symbol	**Date**	**Examiner**
None	04/15/2020	OE

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
None	None	04/15/2020	OE

* 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 Patent File and Prosecution History	12/16/2019	OE
Litigation Search Report	8/9/2019	OE
Reviewed Patent File	04/15/2020	OE

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
None	None	04/15/2020	OE

/OVIDIO ESCALANTE/ Primary Examiner, Art Unit 3992	

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35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /OVIDIO ESCALANTE/ (Examiner's Signature) | (Initials)

Title: TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
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8031064

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CONTINUING DATA

This application is a REX of 12283979 09/17/2008 PAT 8031064

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

** SMALL ENTITY **

STATE OR COUNTRY

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(12) EX PARTE REEXAMINATION CERTIFICATE (11679th)

United States Patent
Yu

(10) Number: US 8,031,064 C3
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(54) **TIRE PRESSURE DETECTING APPARATUS AND TIRE PRESSURE DETECTOR IDENTIFICATION COPYING METHOD FOR THE SAME**

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B60C 23/04 (2006.01)

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CPC ***B60C 23/0408*** (2013.01); ***B60C 23/0472*** (2013.01); ***B60C 23/0479*** (2013.01)

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None
See application file for complete search history.

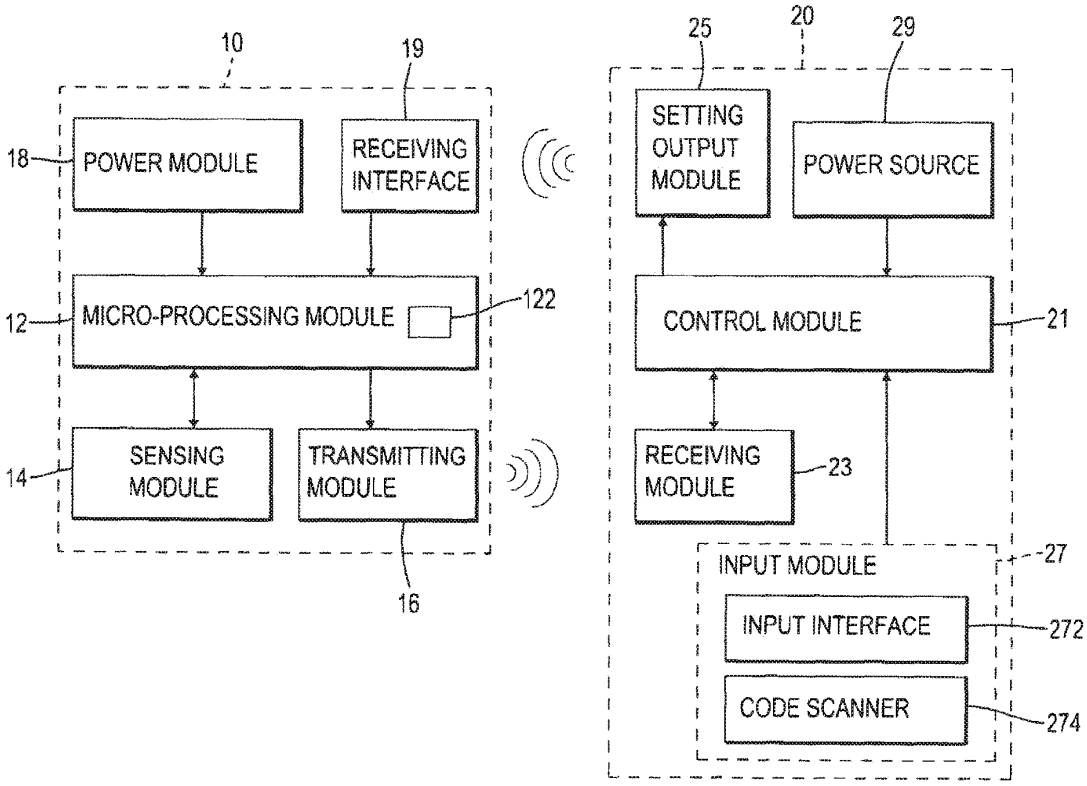
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,362, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Ovidio Escalante

(57) **ABSTRACT**

A tire pressure detecting apparatus has an identification rewriteable tire pressure detector and a setting apparatus. The tire pressure detector is securely mounted on a valve stem inside a tire of a vehicle and has a micro-processing module, a sensing module, a transmitting module and a receiving interface, where the micro-processing module has a memory unit. The setting apparatus is capable of reading or inputting an identification from a failure tire pressure detector, transmits the identification to the identification rewriteable tire pressure detector and writes the identification into the memory unit.



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EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims **1-15** were previously cancelled.

Claims **20** and **22** are cancelled.

Claims **16**, **18**, **21**, **23**, **24** and **25** are determined to be patentable as amended.

Claims **17** and **19**, dependent on an amended claim, are determined to be patentable.

New claims **26-29** are added and determined to be patentable.

16. A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification;

store the update identification in the setting apparatus; **[**and**]**

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification*; and*

verify the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit: and

judging by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

18. A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the setting apparatus is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification manually inputted and received from the input module; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector*; and*

verify the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector;

wherein the new identification rewriteable tire pressure detector is configured to:

acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit*, and send the update identification newly recorded in the rewritable memory unit back to the setting apparatus;*

wherein the verifying step by the setting apparatus comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit; and

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector.

21. The method as claimed in claim **[20]** *23*, wherein the new identification rewriteable tire pressure detector is configured to record the update identification in the rewritable memory unit or overwrite the preset identification in the rewritable memory unit by the update identification by:

acquiring the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

23. **[**The method as claimed in claim **22**,**]** *A tire pressure detector identification updating method comprising the steps of:*

providing a setting apparatus, comprising an input module and a receiving module:

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RF) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification;

when the update identification is the old identification from the old tire pressure detector, wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification;

when the update identification is the manually input identification from the input module. writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification; and

verifying, by the setting apparatus. the update identification newly recorded in the rewritable memory unit of the new identification rewriteable tire pressure detector, wherein the verifying step comprises:

receiving, by the setting apparatus, a wireless signal from the new identification rewriteable tire pressure detector, wherein the wireless signal comprises the update identification newly recorded in the rewritable memory unit; *and*

judging, by the setting apparatus, consistency of the update identification newly recorded in the rewritable memory unit and the old identification of the old tire pressure detector**[**; and

if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again**]**.

24. The method as claimed in claim **[20]** *23*, wherein the setting apparatus is configured to receive the RF signal wirelessly.

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25. The method as claimed in claim [20] 23, wherein the input module comprises a code scanner.

26. A tire pressure detecting system, comprising:

an identification rewritable tire pressure detector used for being installed in a vehicle, the identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification:

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module:

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle, and is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector either by (1) receiving the RF signal from an old tire pressure detector by the receiving module, retrieving an old identification of the old tire pressure detector from the RF signal, and using the old identification as the update identification, or by (2) receiving a manual input of the identification from the input module, and using the identification as the update identification, wherein the old tire pressure detector stores only the old identification;

store the update identification in the setting apparatus; and

generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein the external identification is from the old tire pressure detector, and the external signal is a low frequency (LF) signal.

27. A tire pressure detecting system. comprising:

an identification rewritable tire pressure detector used for being installed in a vehicle, the identification rewritable tire pressure detector comprising:

a micro-processing module having a rewritable memory unit to record an identification;

a sensing module electrically connected to the micro-processing module and having a pressure-detecting unit to detect a tire pressure and send a detection result to the micro-processing module;

a transmitting module controlled by the micro-processing module to transmit a radio frequency (RF) signal, wherein the RF signal comprises the detection result and the identification of the identification rewritable tire pressure detector;

a power module electronically connected to the micro-processing module to supply power to the identification rewriteable tire pressure detector; and

an interface arranged to receive an external signal and send the external signal to the micro-processing module, wherein the external signal comprises an external identification to be written into the rewriteable memory unit or to be used to overwrite a preset identification in the rewriteable memory unit; and

a portable setting apparatus arranged to communicate with the identification rewriteable tire pressure detector, comprising:

a control module;

an input module connected to the control module to enable an operator to manually input an identification to be written into the identification rewriteable tire pressure detector:

a receiving module connected to the control module to receive the RF signal from the identification rewriteable tire pressure detector or a tire pressure detector and to send the RF signal to the control module;

a setting output module controlled by the control module to send the external signal to the interface of the identification rewriteable tire pressure detector, wherein the external signal is generated by the control module and comprises the identification that is provided by the input module or provided by the RF signal received from the receiving module; and

a power source connected to the control module to supply power to the setting apparatus;

wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to the vehicle and is configured to:

obtain an update identification to be written into a new identification rewriteable tire pressure detector, wherein the update identification is either (1) an old identification of an old tire pressure detector, obtained by receiving the RF signal from the old tire pressure detector by the receiving module and retrieving the old identification from the RF signal, or (2) the identification manually inputted and received from the input module, wherein the old tire pressure detector stores only the old identification; and

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generate the external signal comprising the update identification as the external identification, and send the external signal to the new identification rewriteable tire pressure detector, wherein the external identification is from the old tire pressure detector and the external signal is a low frequency (LF) signal;

wherein the new identification rewriteable tire pressure detector is configured to:

acquire the update identification from the external signal;

when the rewritable memory unit has the preset identification stored therein, overwrite the preset identification in the rewritable memory unit by the update identification; and

when the rewritable memory unit does not have the preset identification stored therein, record the update identification in the rewritable memory unit.

28. A tire pressure detector identification updating method comprising the steps of:

providing a portable setting apparatus, comprising an input module and a receiving module, wherein the portable setting apparatus is not equipped in the vehicle and is portable relative to a vehicle;

obtaining, by the setting apparatus, an update identification to be written into a new identification rewriteable tire pressure detector by either (1) reading an old identification from an old tire pressure detector by the receiving module of the setting apparatus by receiving radio frequency (RI) signal from the old tire pressure detector by the receiving module and retrieving the old identification of the old tire pressure detector from the RF signal, and storing the old identification in the setting apparatus for using the old identification as the update identification, or (2) receiving an input of a manually input identification from an input module of the setting apparatus, and using the manually input identification as the update identification, wherein the old tire pressure detector stores only the old identification;

when the update identification is the old identification from the old tire pressure detector wirelessly writing the old identification into a new identification rewritable tire pressure detector by the setting apparatus by generating an external signal comprising the old identification, and sending the external signal to the new identification rewritable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in a rewritable memory unit or overwrites a preset identification in the rewritable memory unit by the update identification; and

when the update identification is the manually input identification from the input module. writing the manually input identification into the new identification rewritable tire pressure detector by the setting apparatus by generating the external signal comprising the manually input identification, and sending the external signal to a new identification rewriteable tire pressure detector, such that the new identification rewriteable tire pressure detector records the update identification in the rewritable memory unit or overwrites the preset identification in the rewritable memory unit by the update identification, wherein the external signal is a low frequency (LF) signal.

29. The method as claimed in claim 23, wherein the verifying step further comprises:

if the update identification newly recorded in the rewritable memory unit is not consistent with the old identification of the old tire pressure detector, performing the generating step again.

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