

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 11,472,632 B2
APPLICATION NO. : 16/994543
DATED : October 18, 2022
INVENTOR(S) : Alexander Stevens and Joseph Valinsky

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

In Claim 11:

	<u>READS</u>	<u>SHOULD READ</u>
Line 50	“wherein the first horizontal path under the path is spaced apart”	--wherein the first horizontal path under the first rack is spaced apart--
Line 50	“from the first horizontal path a distance greater”	--from the second horizontal path a distance greater--

Signed and Sealed this
Third Day of January, 2023


Katherine Kelly Vidal
Director of the United States Patent and Trademark Office



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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292
156121	7590	12/05/2022	EXAMINER	
Opex Corporation 305 Commerce Dr Moorestown, NJ 08057			LOGAN, KYLE O	
			ART UNIT	PAPER NUMBER
			3655	
			NOTIFICATION DATE	DELIVERY MODE
			12/05/2022	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

juliaschultz@opex.com
seland@opex.com

**Response to the
Request for
Certificate of Correction**

Patent No.

11472632

Applicant(s)

Stevens et al.

Issue Date

10/18/2022

Docket No.

P10808US0

This is in response to the request for a Certificate of Correction filed _____

☒ **Request Approval- In- Part** - Consideration has been given to your request for the issuance of a Certificate of Correction under the provisions of 37 CFR 1.322 and/or 37 CFR 1.323. The Request is improper and approved in part for the reason(s) below:

☐ **Supersede/Vacate** - The Certificate of Correction issued in error, in that error(s) was made in identifying the patent number and/or keying text/corrections. See Other Comments below:

1. ☐ Assignees' names and addresses (assignment data) printed in a patent, are based solely on information supplied in the appropriate space for identifying the assignment data on the Issue Fee Transmittal Form (PTOL-85b). Any request for a patent to be corrected to state the name of the assignee, must state that the assignment was submitted for recordation as set forth in 37 CFR 3.11 before issuance of the patent. Petition under 3.81 is to be filed for consideration of correction to assignee. The petition fee set forth in 37 CFR 1.17(i)(1) (currently \$140, \$70, \$35 for large, small and micro entities, respectively).
2. ☐ The alleged error in _____, is in fact an Amendment and/or Change made by the examiner and considered to be in accordance with the permissible amendments enumerated in the Manual of Patent Examining Procedure (MPEP) Section 1302.04. Applicant did not file objection or amendment under 37 CFR 1.312 prior to payment of the issue fee.
3. ☐ A petition under CFR 1.182 is required to correct the alleged errors in spelling or order of inventor's names, since inventor's names are printed solely in accordance with the type-written names, and in the order of the type-written names on the Application Data Sheet (ADS). The required fee currently under rule 1.17(f) (small entity \$200, large entity \$400, micro entity fee \$100).
4. ☐ With respect to the alleged error in changing the inventor name on the patent due to clerical error in ADS/OATH of related patents. The inventors name is printed in accordance with the OATH/ADS submitted at the time of filing the application. However, your attention is directed to C.F.R. 1.324, wherein a request is being made to change, add or delete inventor(s), after issuance of the patent.
5. ☐ With respect to the alleged error in _____, comparison of the printed patent with the corresponding location in the application file reveals that there is no discrepancy.
6. ☐ With respect to 37 CFR 1.72, the title should be brief but technically accurate and descriptive and should contain fewer than 500 characters. Inasmuch as the words new, improved, improvement of, and improvement in are not considered as part of the title of an invention, these words should not be included at the beginning of the title of the invention and will be deleted when the Office enters the title into the Offices computer records, and when any patent issues.
7. ☐ The fee for correction under 37 CFR 1.323 is set forth in 37 CFR 1.20(a). ☐ Partial fee ☐ No fee was received with your request. Full fee payment is required before further action is taken on this request.
8. ☐ With respect to the request for corrected Letters Patent (Grant), corrections to the original Letters Patent are made under the provisions of Rule 1.322(b), not Rule 1.323, unless a petition is granted.
9. ☒ Other Comments: See Continuation Sheet

Further correspondence concerning this matter should be filed and directed to the Certificates of Correction Branch.

Legal Instrument Examiner: DENICE M CLAGGETT

Phone: (703)756-5743

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov

CoC Central Phone Number: (703)756-1814

If applicable, information regarding a petition under 37 CFR 1.183 should be directed to the attention of the Commissioner for Patents using the FAX number (571) 273-8300

Continuation of Other Comments: Period is being deleted after C (Celsius)/F (Fahrenheit) on pages(s) 1, column(s) 4,8, and 10.

This does not conform to our data capture style rules from the USPTO. A certificate of correction will be issued to correct the remaining errors noted in your request.

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 11472632

APPLICATION NO.: 16/994,543

ISSUE DATE : 10/18/2022

INVENTOR(S) : Alexander Stevens and Joseph Valinsky

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Claim 11:

	<u>READS</u>	<u>SHOULD READ</u>
Line 36	"wherein the first horizontal path under the path is spaced apart"	--wherein the first horizontal path under the first rack is spaced apart--
Line 37	"from the first horizontal path a distance greater"	-- from the second horizontal path a distance greater--

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 hour 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: Attention Certificate of Corrections Branch, 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.

**Petitioners' Exhibit 1002
Exotec v. Opex; No. IPR2024-00850
U.S. Patent No. 11,472,632; Page 5**

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



ELECTRONIC PAYMENT RECEIPT

APPLICATION #
16/994,543

RECEIPT DATE / TIME
11/23/2022 03:19:00 PM ET

ATTORNEY DOCKET #
P10808US0

Title of Invention

Material Handling System

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # 11472632

CONFIRMATION # 4292

FILED BY Julia Schultz

PATENT CENTER # 61216807

AUTHORIZED BY Stephen Eland

CUSTOMER # 156121

FILING DATE 08/14/2020

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Alexander Stevens

Payment Information

PAYMENT METHOD
CARD / 3909

PAYMENT TRANSACTION ID
E2022AMF20072925

PAYMENT AUTHORIZED BY
Julia Schultz

PRE-AUTHORIZED ACCOUNT
603333

PRE-AUTHORIZED CATEGORY

37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1811	CERTIFICATE OF CORRECTION	160.00	1	160.00
TOTAL AMOUNT:				\$160.00

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.

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/994,543

RECEIPT DATE / TIME
11/23/2022 03:19:00 PM ET

ATTORNEY DOCKET #
P10808US0

Title of Invention

Material Handling System

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # 11472632

CONFIRMATION # 4292

FILED BY Julia Schultz

PATENT CENTER # 61216807

FILING DATE 08/14/2020

CUSTOMER # 156121

FIRST NAMED INVENTOR Alexander Stevens

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Stephen Eland

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
P10808US0_Certificate_of_Correction.pdf	2	Request for Certificate of Correction	121 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
P10808US0_Certificate_of_Correction.pdf	81053A72512709CDD329C96575B1549DD6065C7F03D09136FD AF69A88137F78F79826B039F7F6C339F817473EE6570E135103 E18DBD6390B199632B2F355BFB7

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 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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292
156121	7590	11/22/2022	EXAMINER	
Opex Corporation 305 Commerce Dr Moorestown, NJ 08057			LOGAN, KYLE O	
			ART UNIT	PAPER NUMBER
			3655	
			NOTIFICATION DATE	DELIVERY MODE
			11/22/2022	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

juliaschultz@opex.com
seland@opex.com

**Response to the
Request for
Certificate of Correction**

Patent No.

11472632

Applicant(s)

Stevens et al.

Issue Date

10/18/2022

Docket No.

P10808US0

This is in response to the request for a Certificate of Correction filed 01 November 2022

☒ **Request Denied** - Consideration has been given to your request for the issuance of a Certificate of Correction under the provisions of 37 CFR 1.322 and/or 37 CFR 1.323. The Request is improper and denied for the reason(s) below:

1. ☐ Assignees' names and addresses (assignment data) printed in a patent, are based solely on information supplied in the appropriate space for identifying the assignment data on the Issue Fee Transmittal Form (PTOL-85b). Any request for a patent to be corrected to state the name of the assignee, must state that the assignment was submitted for recordation as set forth in 37 CFR 3.11 before issuance of the patent. Petition under 3.81 is to be filed for consideration of correction to assignee. The petition fee set forth in 37 CFR 1.17(i)(1) (currently \$140, \$70, \$35 for large, small and micro entities, respectively).
2. ☐ The alleged error in _____, is in fact an Amendment and/or Change made by the examiner and considered to be in accordance with the permissible amendments enumerated in the Manual of Patent Examining Procedure (MPEP) Section 1302.04. Applicant did not file objection or amendment under 37 CFR 1.312 prior to payment of the issue fee.
3. ☐ A petition under CFR 1.182 is required to correct the alleged errors in spelling or order of inventor's names, since inventor's names are printed solely in accordance with the type-written names, and in the order of the type-written names on the Application Data Sheet (ADS). The required fee currently under rule 1.17(f) (small entity \$200, large entity \$400, micro entity fee \$100).
4. ☐ With respect to the alleged error in changing the inventor name on the patent due to clerical error in ADS/OATH of related patents. The inventors name is printed in accordance with the OATH/ADS submitted at the time of filing the application. However, your attention is directed to C.F.R. 1.324, wherein a request is being made to change, add or delete inventor(s), after issuance of the patent.
5. ☒ With respect to the alleged error in _____, comparison of the printed patent with the corresponding location in the application file reveals that there is no discrepancy.
6. ☐ With respect to 37 CFR 1.72, the title should be brief but technically accurate and descriptive and should contain fewer than 500 characters. Inasmuch as the words "new," "improved," "improvement of," and "improvement in" are not considered as part of the title of an invention, these words should not be included at the beginning of the title of the invention and will be deleted when the Office enters the title into the Offices computer records, and when any patent issues.
7. ☐ The fee for correction under 37 CFR 1.323 is set forth in 37 CFR 1.20(a). ☐ Partial fee ☐ No fee was received with your request. Full fee payment is required before further action is taken on this request.
8. ☐ With respect to the request for corrected Letters Patent (Grant), corrections to the original Letters Patent are made under the provisions of Rule 1.322(b), not Rule 1.323, unless a petition is granted.
9. ☐ Other Comments: Corrections on SB44(1050) do not match text at corresponding location in printed patent.

Further correspondence concerning this matter should be filed and directed to the Certificates of Correction Branch.

Legal Instrument Examiner: DENICE M CLAGGETT

Phone: (703)756-5743

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov

CoC Central Phone Number: (703)756-1814

If applicable, information regarding a petition under 37 CFR 1.183 should be directed to the attention of the Commissioner for Patents using the FAX number (571) 273-8300

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**Page 1 of 1

PATENT NO. : 11472632

APPLICATION NO.: 16/994,543

ISSUE DATE : 10/18/2022

INVENTOR(S) : Alexander Stevens, Joseph Valinsky

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Figure 8 is replaced with the attached replacement sheet.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 hour 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: Attention Certificate of Corrections Branch, 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.

**Petitioners' Exhibit 1002
Exotec v. Opex; No. IPR2024-00850
U.S. Patent No. 11,472,632; Page 13**

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

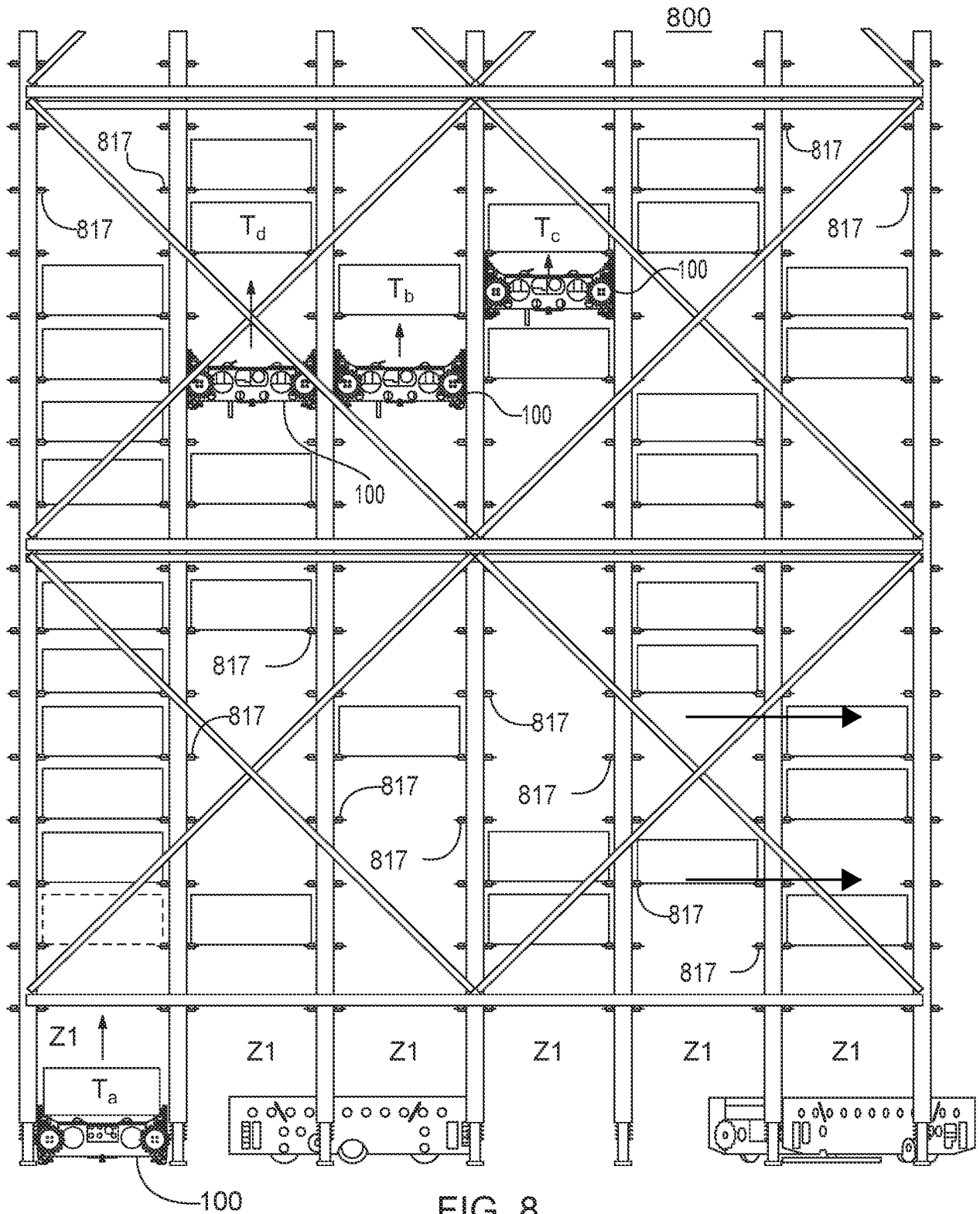


FIG. 8

Electronic Patent Application Fee Transmittal				
Application Number:		16994543		
Filing Date:		14-Aug-2020		
Title of Invention:		Material Handling System		
First Named Inventor/Applicant Name:		Alexander Stevens		
Filer:		Stephen Henry Eland/Julia Schultz		
Attorney Docket Number:		P10808US0		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				
CERTIFICATE OF CORRECTION	1811	1	160	160

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				160

Electronic Acknowledgement Receipt

EFS ID:	46985493
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	Material Handling System
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland/Julia Schultz
Filer Authorized By:	Stephen Henry Eland
Attorney Docket Number:	P10808US0
Receipt Date:	08-NOV-2022
Filing Date:	14-AUG-2020
Time Stamp:	16:52:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 160
RAM confirmation Number	E2022A8G52562518
Deposit Account	603333
Authorized User	Julia Schultz

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

Petitioners' Exhibit 1002
Exotec v. Opex; No. IPR2024-00850
U.S. Patent No. 11,472,632; Page 18

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P10808US0_Cert_of_Corr_Dra wings_Letter.pdf	123567	no	1
			7979425989d9562c1d40e1568030e83f7d90ea9d		
Warnings:					
Information:					
2	Request for Certificate of Correction	P10808US0_Cert_of_Corr_for_ Drawings.pdf	237584	no	2
			b1fd9c029521b39a01d92cf169824b9708fd16c3		
Warnings:					
Information:					
3	Drawings-only black and white line drawings	P10808US0_Cert_of_Correction_Formal_Drawings.pdf	1065562	no	1
			fe2aea4a9da403700b087ebc460d77b9a2e24ddf		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	37894	no	2
			8c388fa1053098c116cb982ee62295a4bf77bdea		
Warnings:					
Information:					
Total Files Size (in bytes):			1464607		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No. 11472632

Application No. 16/994,543

Conf. No.: 4292

Inventors: **Stevens et al**

Attorney Docket No. P10808US0

Filed: August 14, 2020

For: Material Handling System

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 CFR 1.323

A Certificate of Correction under 35 U.S.C. § 255 and 37 CFR 1.323 is respectfully requested for the above-identified patent to correct Applicant's error in Figure 8.

Please replace Figure 8 with the replacement sheet filed herewith to correct Applicant's error of including reference number "1300" in Figure 8 in the formal drawing filed on August 14, 2020. As originally filed, Figure 8 included reference number "800" not reference number "1300". Additionally, the specification includes reference number "800" and not reference number 1300. Therefore, the inclusion of reference number 1300 is an obvious error and replacement Figure 8 does not include any new matter.

Form PTO/SB44 is submitted along with this request, along with the fee in accordance with 37 CFR 1.20(a). The Commissioner is authorized to charge any additional fees due or credit any refund to Deposit Account No. 603333.

Respectfully submitted,

OPEX CORPORATION,

By /Stephen H. Eland/

Stephen H. Eland

PTO Registration No. 41,010

Telephone: (856) 727-1100 x5325

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 11472632
 APPLICATION NO.: 16/994,543
 ISSUE DATE : 10/18/2022
 INVENTOR(S) : Alexander Stevens and Joseph Valinsky

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Claim 11:

	<u>READS</u>	<u>SHOULD READ</u>
Line 11	"wherein the first storage rack is spaced apart"	--wherein the second storage rack is spaced apart—
Line 36	"wherein the first horizontal path under the path is spaced apart"	--wherein the first horizontal path under the first rack is spaced apart--
Line 37	"from the first horizontal path a distance greater"	-- from the second horizontal path a distance greater--

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. 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 1.0 hour 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: Attention Certificate of Corrections Branch, 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.

**Petitioners' Exhibit 1002
 Exotec v. Opex; No. IPR2024-00850
 U.S. Patent No. 11,472,632; Page 22**

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		16994543		
Filing Date:		14-Aug-2020		
Title of Invention:		Material Handling System		
First Named Inventor/Applicant Name:		Alexander Stevens		
Filer:		Stephen Henry Eland/Julia Schultz		
Attorney Docket Number:		P10808US0		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				
CERTIFICATE OF CORRECTION	1811	1	160	160

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				160

Electronic Acknowledgement Receipt

EFS ID:	46937926
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	Material Handling System
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland/Julia Schultz
Filer Authorized By:	Stephen Henry Eland
Attorney Docket Number:	P10808US0
Receipt Date:	01-NOV-2022
Filing Date:	14-AUG-2020
Time Stamp:	16:05:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 160
RAM confirmation Number	E2022A1G07123236
Deposit Account	603333
Authorized User	Julia Schultz

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

Petitioners' Exhibit 1002
Exotec v. Opex; No. IPR2024-00850
U.S. Patent No. 11,472,632; Page 26

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	P10808US0_Certificate_of_Correction.pdf	113839	no	2
			d99d9c92b7edd8f634a3e70a82bac83000ee84dd		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	37894	no	2
			932769c0784ea4652bd9822d7659e5559c15cac9		

Warnings:

Information:

Total Files Size (in bytes):	151733
-------------------------------------	--------

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 NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	10/18/2022	11472632	P10808US0	4292

156121 7590 09/28/2022
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 217 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Alexander Stevens, Moorestown, NJ;
Joseph Valinsky, Moorestown, NJ;

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

OPEX Corporation, Moorestown, NJ

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16994543
Filing Date	2021-08-14
First Named Inventor	Alexander Stevens
Art Unit	
Examiner Name	
Attorney Docket Number	P10808US0

Change(s) applied to document, /J.T./ 6/28/2022	2	20180148259		2018-05-31	~~ATTABOTICS INC.~~ Gravelle et al.
	3	20030185657		2003-10-02	STEFANI
	4	20170267452		2017-09-21	~~COMMONSENSE ROBOTICS LTD.~~ Goren et al.
	5	20180037412		2018-02-08	~~OPEX CORPORATION~~ Lynch et al.

If you wish to add additional U.S. Published Application citation information please click the Add button. [Add](#)

FOREIGN PATENT DOCUMENTS

[Remove](#)

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							

If you wish to add additional Foreign Patent Document citation information please click the Add button. [Add](#)

NON-PATENT LITERATURE DOCUMENTS

[Remove](#)

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	International Search Report and Written Opinion for International application No. PCT/US2020/046562 issued on February 16, 2021.	

If you wish to add additional non-patent literature document citation information please click the Add button. [Add](#)

EXAMINER SIGNATURE

Examiner Signature	/KYLE O LOGAN/	Date Considered	06/15/2022
--------------------	----------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292
156121	7590	09/02/2022	EXAMINER	
Opex Corporation 305 Commerce Dr Moorestown, NJ 08057			LOGAN, KYLE O	
			ART UNIT	PAPER NUMBER
			3655	
			NOTIFICATION DATE	DELIVERY MODE
			09/02/2022	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

juliaschultz@opex.com
seland@opex.com

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of **Alexander Stevens et al**

Application No. 16/994,543

Confirmation No. 4292

Attorney Docket No. P10808US0

Filed: August 14, 2020

For: Material Handling System

CERTIFICATE OF TRANSMISSION

I hereby certify that this Correspondence is being filed on the date identified below with the United States Patent and Trademark Office via the EFS web system.

August 5, 2022
Date of Certificate

/Julia Schultz /
Julia Schultz

1.312 AMENDMENT AFTER ALLOWANCE

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address, and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

156121 7598 06/27/2022
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292

TITLE OF INVENTION: Material Handling System

APPL. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/27/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
LOGAN, KYLE O	3655	700-218000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.362).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents, if no name is listed, no name will be printed.

1. Stephen Eland

2.

3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

OPEX Corporation

Moorestown, New Jersey

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

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.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature

Date 8/9/2022

Typed or printed name Stephen Eland

Registration No. 41010

Electronic Patent Application Fee Transmittal				
Application Number:		16994543		
Filing Date:		14-Aug-2020		
Title of Invention:		Material Handling System		
First Named Inventor/Applicant Name:		Alexander Stevens		
Filer:		Stephen Henry Eland/Julia Schultz		
Attorney Docket Number:		P10808US0		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1200

Electronic Acknowledgement Receipt

EFS ID:	46382097
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	Material Handling System
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland
Filer Authorized By:	
Attorney Docket Number:	P10808US0
Receipt Date:	10-AUG-2022
Filing Date:	14-AUG-2020
Time Stamp:	18:59:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1200
RAM confirmation Number	E202280J00290770
Deposit Account	603333
Authorized User	Stephen Eland

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	P10808US0_Issue_Fee_Form. pdf	115936	no	1
			0876d5c2104892e1a98ae38f8b1ceec14e0143e9		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	37574	no	2
			0f828fa0d94b4a959c2991553a78d2110b5b2d50		

Warnings:

Information:

Total Files Size (in bytes):	153510
-------------------------------------	--------

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Acknowledgement Receipt	
EFS ID:	46353785
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	Material Handling System
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland/Julia Schultz
Filer Authorized By:	Stephen Henry Eland
Attorney Docket Number:	P10808US0
Receipt Date:	05-AUG-2022
Filing Date:	14-AUG-2020
Time Stamp:	16:05:11
Application Type:	Utility under 35 USC 111(a)

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	Amendment after Notice of Allowance (Rule 312)	P10808US0_Response_312.pdf	127632	no	10
			92c64604134d7c237da600591e18990d014372e3		
Warnings:			Petitioners' Exhibit 1002 Exotec v. Opex; No. IPR2024-00850 U.S. Patent No. 11,472,632; Page 38		

Information:	
Total Files Size (in bytes):	127632
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of **Alexander Stevens et al**

Application No. 16/994,543

Confirmation No. 4292

Attorney Docket No. P10808US0

Filed: August 14, 2020

For: Material Handling System

CERTIFICATE OF TRANSMISSION

I hereby certify that this Correspondence is being filed on the date identified below with the United States Patent and Trademark Office via the EFS web system.

August 5, 2022
Date of Certificate

/Julia Schultz /
Julia Schultz

1.312 AMENDMENT AFTER ALLOWANCE

Amendments to the Claims

Please amend the claims as follows:

1. (Original)A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:

providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations;

providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;

driving a first one of the vehicles to drive the first vehicle to the storage racks;

driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart from the first aisle;

turning the first vehicle while the first vehicle is under the first rack;

driving the vehicle into the first aisle;

driving the first vehicle upwardly in the aisle to a first of the storage locations;

transferring an item between the first vehicle and the first storage location;

driving the first vehicle downwardly in the aisle until the vehicle is on a horizontal surface;

driving the first vehicle across the first aisle after the step of driving the first vehicle downwardly; and

driving the vehicle out from under the storage racks after the step of driving the first vehicle across the first aisle.

2. (Original) The method of claim 1 wherein a plurality of vertical posts form a first column of the first storage rack and wherein the first vehicle has a first width extending from a first side of the first vehicle to a second side of the first vehicle and wherein the vertical drive of the first vehicle projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width and wherein the vertical posts of the first column are spaced apart a distance greater than the first width and less than the second width.
3. (Original) The method of claim 1 wherein a plurality of vertical tracks segments are attached to vertical posts of the first column and wherein the step of driving the first vehicle into the first aisle comprises aligning the vertical drive of the first vehicle with the vertical track segments.
4. (Original) The method of claim 3 wherein the step of driving the first vehicle into the aisle comprises driving a first portion of the vertical drive through the vertical track segment and driving a second part of the vertical drive into operative engagement with the vertical track segment.
5. (Original) The method of claim 1 wherein the first storage rack is formed of a plurality of vertical posts and the first vehicle has a length and a width and the length is greater than the width and wherein the step of driving the first vehicle along the first path comprises driving the vehicle along a path spaced apart from the vertical posts by a distance greater than half the length of the vehicle.
6. (Original) The method of claim 1 comprising the step of driving the first vehicle to a workstation to present an item to an operator after the step of driving the first vehicle out from under the storage racks.

7. (Original) The method of claim 1 wherein the step of driving the first vehicle across the aisle comprises driving the first vehicle under a second of the storage racks.
8. (Original) The method of claim 1 wherein the step of turning comprises rotating the first vehicle about a vertical axis that extends through the first vehicle.
9. (Original) The method of claim 8 wherein the vertical axis extends through the first path.
10. (Previously Presented) The method of claim 1 comprising the step of driving a second of the vehicles under the first rack along a second path parallel to the first path so that the second vehicle passes the first vehicle as the first vehicle travels along the first path.
11. (Currently Amended) A material handling system for delivering items to storage locations and retrieving items from storage locations, comprising:
 - a first storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the first storage rack is longitudinally elongated;
 - a second storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the second storage rack is longitudinally elongated, wherein the ~~second~~first storage rack is spaced apart from the first storage rack to provide an aisle between the first and second storage racks;
 - a plurality of delivery vehicles wherein each vehicle has a length and a width and each vehicle comprises:
 - a horizontal drive system operable to drive the vehicle along a horizontal surface;
 - a vertical drive operable to drive the vehicle vertically; and

a transfer mechanism operable to transfer an item between the vehicle
and one of the storage locations;

a track positioned in the aisle wherein the vertical drive is configured to
cooperate with the track to drive the vehicle vertically upwardly;

a first horizontal path that extends under the first rack in a direction parallel to the
aisle;

a second horizontal path that extends under the first rack in a direction parallel to
the aisle;

wherein the horizontal drive is configured to turn the vehicle under the first rack
by rotating the vehicle about a vertical axis that extends through the
vehicle;

wherein the storage rack comprises a plurality of vertical posts and the first and
second horizontal paths are each spaced apart from the vertical posts a
distance greater than one half the length of the vehicles;

wherein the first horizontal path under the path is spaced apart from the first
horizontal path a distance greater than the width of the vehicles.

12. (Original) The system of claim 11 wherein the vertical drive comprises a plurality of rotatable elements that each rotate about a horizontal axis and wherein the horizontal drive comprises a plurality of rotatable elements that each rotate about a horizontal axis transverse the axes of rotation of the vertical drive elements.
13. (Original) The system of claim 12 wherein the plurality of vertical posts form a first column of the first storage rack and wherein the vehicles have a first width extending from a first side of the vehicle to a second side of the vehicle and wherein the vertical drive of the vehicle projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width and wherein the vertical posts of the first column are

spaced apart a distance greater than the first width and less than the second width.

14. (Original) The system of claim 11 wherein the track comprises drive elements configured to cooperate with the vertical drive so that rotating the vertical drive about a horizontal axis operates to drive the vehicle upwardly along the track.
15. (Original) The system of claim 14 wherein the track comprises a lower section and an upper section wherein the drive elements are spaced apart further in the lower section than the upper section to provide gaps in the lower section.
16. (Original) The system of claim 15 wherein the gaps are configured to facilitate the vertical drive passing through the gaps without contacting the lower section when the vehicle is driven past the lower section.
17. (Currently Amended) A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:

providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element adjacent a front end of the vehicle and a rearward rotatable element adjacent a rear end of the vehicle;

providing a first vertical track on a first side of a first column wherein the first vertical track has drive elements configured to cooperate with the forward rotatable element to drive the vehicle upwardly;

providing a second vertical track on a second side of the first column wherein the second vertical track has drive elements configured to cooperate with rearward rotatable element to drive the vehicle upwardly, wherein the vertical drive and the first and second vertical tracks are configured so that the vertical track impedes displacement of the vehicle along a horizontal path when the vertical drive is rotated into a position of misalignment;

aligning the vertical drive, wherein the step of aligning comprises the steps of:

- rotating the forward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the forward rotatable element with gaps in the first and second vertical tracks; and
- rotating the rearward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the rearward rotatable element with gaps in the first and second vertical tracks;
- after the step of aligning, driving the vehicle along the horizontal path toward the first vertical track, wherein the step of driving comprises driving the vehicle so that the forward rotatable element passes through the gaps in the second vertical track;
- continuing to drive the vehicle along the horizontal path to position the forward rotatable element in operative engagement with first track and the rearward rotatable element in operative engagement with the second track;
- rotating the forward and rearward rotatable elements to drive the vehicle upwardly toward a first storage location;
- transferring a first item from the first storage location to the vehicle;
- driving the vehicle down with the first item;
- driving the vehicle with the first item along the horizontal path so that the rearward rotatable element passes through gaps in the first vertical track.
18. (Original) The method of claim 17 wherein the step of rotating the forward and rearward rotatable elements comprises synchronously driving the forward and rearward rotatable elements to drive the vehicle vertically upwardly while maintaining the orientation of the vehicle relative to the horizon.
19. (Previously Presented) The method of claim 17 comprising the step of driving the vehicle out from under the track after the step of driving the vehicle with the first item along a horizontal path.

20. (Previously Presented) The method of claim 17 comprising the step of turning the vehicle to a path perpendicular to the horizontal path while the vehicle is under one of the racks.
21. (Previously Presented) The method of claim 17 comprising the step of driving the vehicle with the first item to a workstation to present the first item to an operator.
22. (Previously Presented) The method of claim 17 wherein the step of driving the vehicle along the horizontal path comprises driving a plurality of horizontal drive elements about a horizontal axis that is substantially perpendicular to the horizontal path.
23. (Original) A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:
 - providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations;
 - providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;
 - driving a first of the vehicle under one or more of the storage racks along a path that crosses one or more aisle, wherein the step of driving the first vehicle includes driving the first vehicle into a first of the columns in a first of the aisles;
 - driving the first vehicle vertically upwardly within the first aisle until the first vehicle is adjacent a first of the storage locations;
 - transferring an item from the first storage location to the first vehicle;
 - driving the first vehicle vertically downwardly within the first aisle;

driving the vehicle out of the first aisle via a path that extends under at least one of the storage racks.

24. (Original) The method of claim 23 wherein the path includes a portion passing under one of the racks and extending parallel to one of the aisles.
25. (Currently Amended) The method of claim 24 comprising the step of driving a second of the vehicles past the first vehicle under the one rack as the first vehicle is driven along the portion of the path under the one of the racks.
26. (Previously Presented) The method of claim 23 comprising the step of turning the vehicle while the vehicle is under one of the racks, wherein the step of turning comprises turning the vehicle to align the vehicle with a path perpendicular to the first aisle.
27. (Original) The method of claim 26 wherein the step of turning the vehicle comprises rotating the vehicle about a vertical axis passing through the vehicle.

REMARKS

In a Notice of Allowance dated June 27, 2022, the Examiner allowed the claims pending in this application. Applicant requests that the Examiner enter the current amendment to claims 11, 17, and 25 to fix minor typographical errors. Since the amendments do not broaden the claims and do not require further examination, Applicant believes that the amendments are proper. Although the claims as allowed are clear and definite as required by §112, upon review after allowance, Applicant believes that these amendments provide further clarity of the recited structure.

In light of the foregoing, Applicant requests entry of this amendment. The Examiner is encouraged to contact Applicant's undersigned attorney by telephone if the Examiner believes that there are issues that would prevent the entry of this amendment.

Respectfully submitted,
OPEX Corporation, Applicant

August 5, 2022
Date

By /Stephen Eland/
Stephen Eland
PTO Registration No. 41,010
Telephone: (856) 727-1100 x5325



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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292
156121	7590	07/22/2022		
Opex Corporation 305 Commerce Dr Moorestown, NJ 08057			EXAMINER LOGAN, KYLE O	
			ART UNIT	PAPER NUMBER
			3655	
			NOTIFICATION DATE	DELIVERY MODE
			07/22/2022	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

seland@opex.com
juliaschultz@opex.com

Response to Rule 312 Communication	Application No. 16994543	Applicant(s)
	Examiner	Art Unit

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

1. ☒ The amendment filed on 07/14/22 under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

Meron Nedy
Publishing Division
Office of Data Management



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/994,543

RECEIPT DATE / TIME
07/14/2022 03:37:35 PM ET

ATTORNEY DOCKET #
P10808US0

Title of Invention

Material Handling System

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4292

FILED BY Julia Schultz

PATENT CENTER # 60784423

FILING DATE 08/14/2020

CUSTOMER # 156121

FIRST NAMED INVENTOR Alexander Stevens

CORRESPONDENCE ADDRESS -

AUTHORIZED BY Stephen Eland

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
P10808US0_Response to Notice to File Corrected Application 7.12.22.pdf	3	Amendment after Notice of Allowance (Rule 312)	79 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
P10808US0_Response to Notice to File Corrected Application 7.12.22.pdf	F3A182441B22BC60B69C623AD27557FEF691F95B211D38F3993F46C7CB9D2879C4192227D3BECBC78EE98BD7F3524F26FD108FB5F9F45CF6004E6864E6265D44

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 filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of **Alexander Stevens et al**

Application No. 16/994,543

Confirmation No. 4292

Attorney Docket No. P06808US0

Filed: August 14, 2020

For: Material Handling System

CERTIFICATE OF TRANSMISSION

I hereby certify that this Correspondence is being filed on the date identified below with the United States Patent and Trademark Office via the EFS web system.

July 14, 2022

Date of Certificate

/Julia Schultz /

Julia Schultz

Response to Notice to File Corrected Application

In the Specification:

Please amend the specification by replacing paragraph [0038] with the following paragraph:

[0038] FIG. 10 is an enlarged fragmentary side elevational view of the aisle illustrated in FIG. 13A;

REMARKS

This amendment is in response to the notice dated July 12, 2022, and the amendment simply corrects the typographical error in the description of Figure 10.

Respectfully submitted,

OPEX CORPORATION, Applicant

By /Stephen H. Eland/

Stephen H. Eland

PTO Registration No. 41,010

Telephone: (856) 727-1100 x5325



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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14 2020	Alexander Stevens	P10808US0	4292
156121	7590	07 12/2022		
Opex Corporation 305 Commerce Dr Moorestown, NJ 08057			EXAMINER LOGAN, KYLE O	
			ART UNIT	PAPER NUMBER
			3655	
			NOTIFICATION DATE	DELIVERY MODE
			07/12/2022	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

seland@opex.com
juliaschultz@opex.com



UNITED STATES PATENT AND TRADEMARK OFFICE

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

Application No. : 16994543
Applicant : Stevens
Filing Date : 08/14/2020
Date Mailed : 07/12/2022

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), “all outstanding requirements” will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

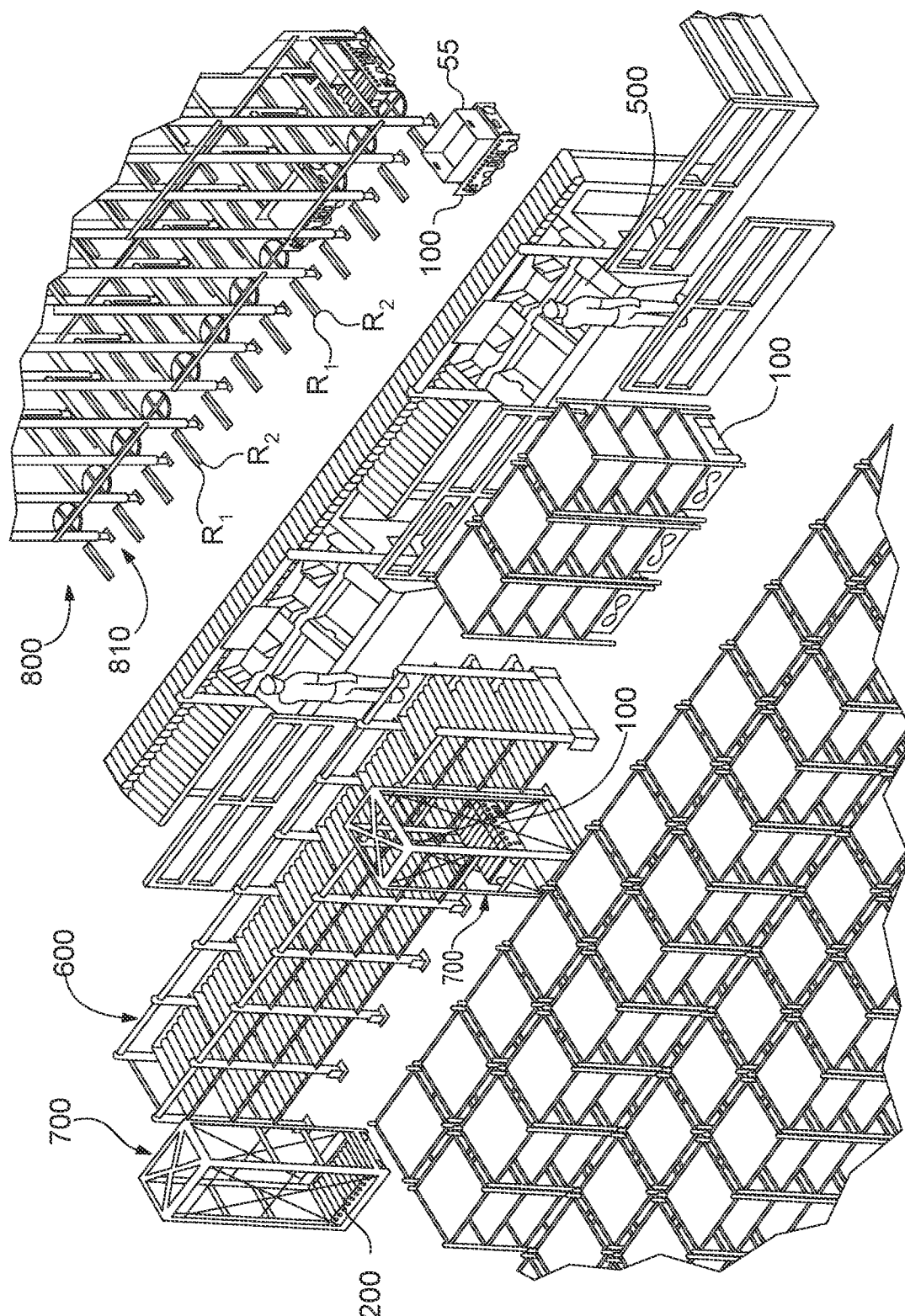
See attachment(s).

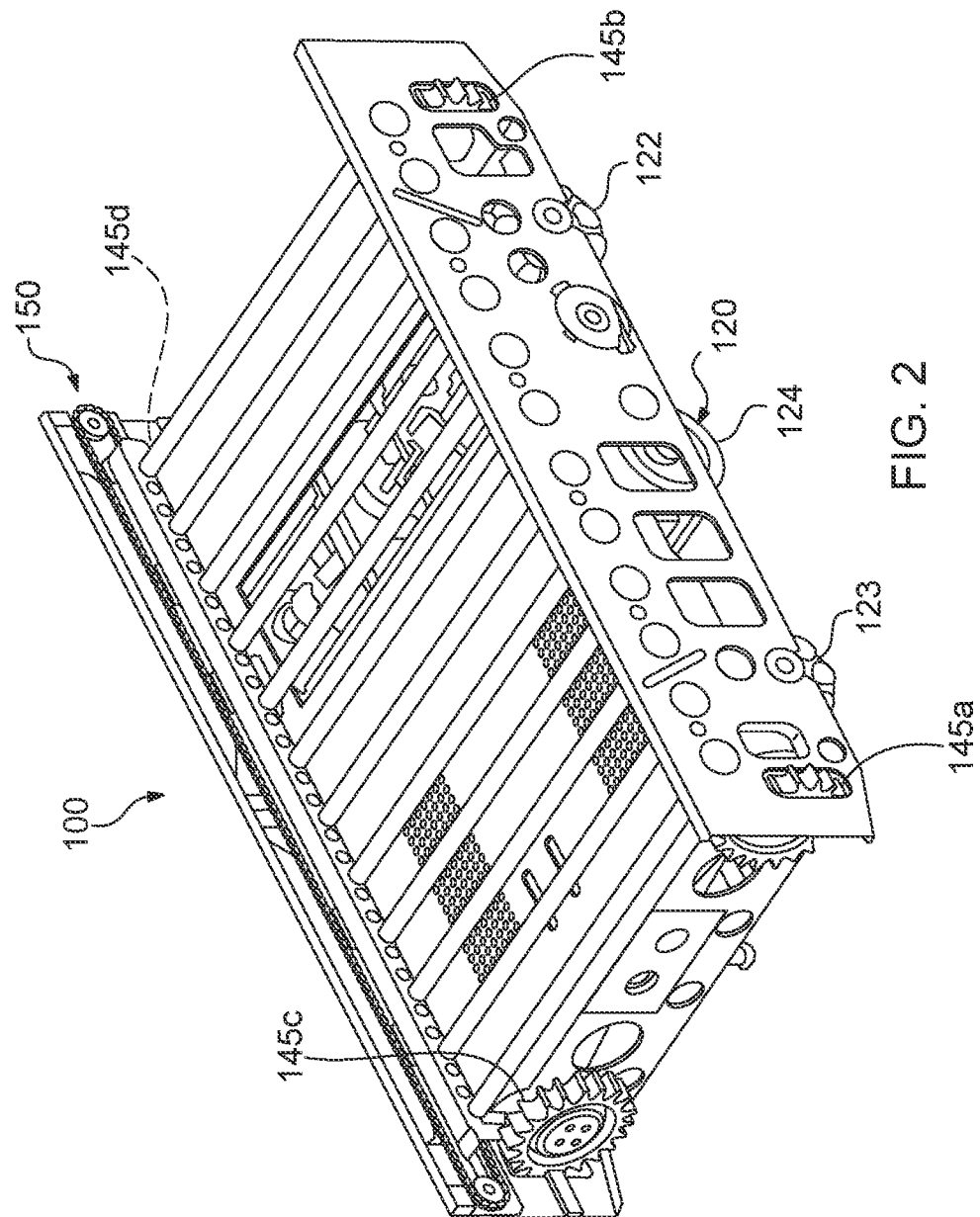
*A copy of this notice **MUST** be returned with the reply. Please address response to
“Mail Stop Issue Fee, Commissioner for Patents,
P.O. Box 1450, Alexandria, VA 22313-1450”.*

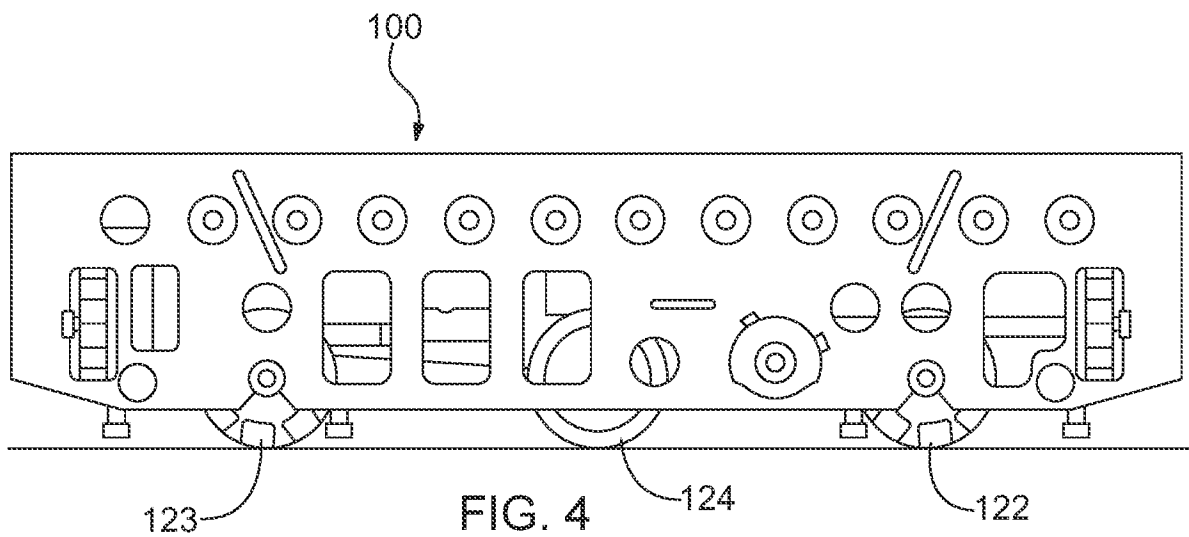
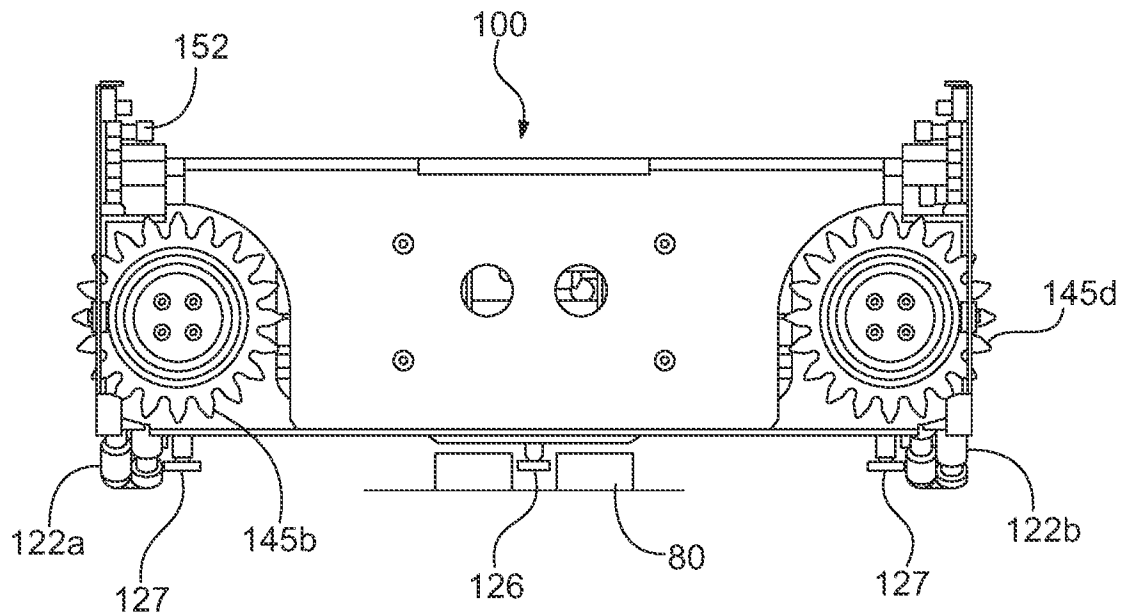
/Midel Geronimo/
Publication Branch
Office of Data Management
(571) 272-4200

IDENTIFICATION OF SPECIFICATION/DRAWING INCONSISTENCIES

- ☒ On Page 7 of the specification there is a brief description of FIG. 13A, but the drawings filed 08/14/2020 do not include a drawing with that designation. Applicant must respond either by supplying the omitted drawing or by amending the specification to remove all references to that drawing.
- ☐ The drawings filed include FIG. , but the specification's brief description of the drawings does not describe a drawing with that designation. Applicant must respond either by amending the specification to add a brief description of that drawing or by correcting the drawings to remove the drawing in question.
- ☐ In the utility application, drawings are present in the application and are referred to in the detailed description of the invention, but the specification does not contain a brief description of the several views as required by 37 CFR 1.74 and 37 CFR 1.77(b)(9).
- ☐ The design application does not contain a description of the figure or figures of the drawing as required by 37 CFR 1.153(a) and 37 CFR 1.154(b)(4).
- ☐ In the plant application, the specification does not contain a brief description of the drawing as required by 37 CFR 1.163(c)(8).
- ☐ Page of the specification refers to FIG. , but no drawing with that designation is described in the brief description of the drawings and no drawing with that designation is present in the application. Applicant must respond either by amending the specification to remove all references to that drawing, or by supplying that drawing and amending the specification to add a brief description of it.
- ☐ In the reissue application, FIG. , is labeled as “New” but is not described in the reissue specification’s brief description of the drawings. Applicant must respond by amending the reissue specification’s brief description of the drawings to add a brief description of the new drawing.
- ☐ OTHER:
- ☐ COMMENTS:







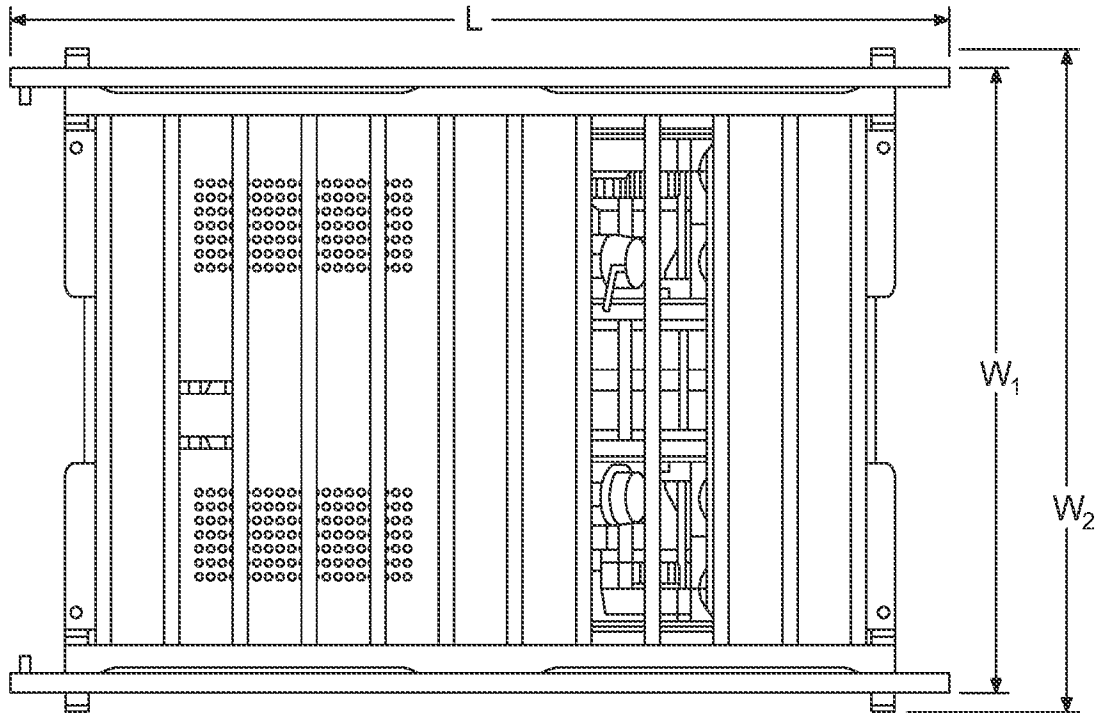


FIG. 5

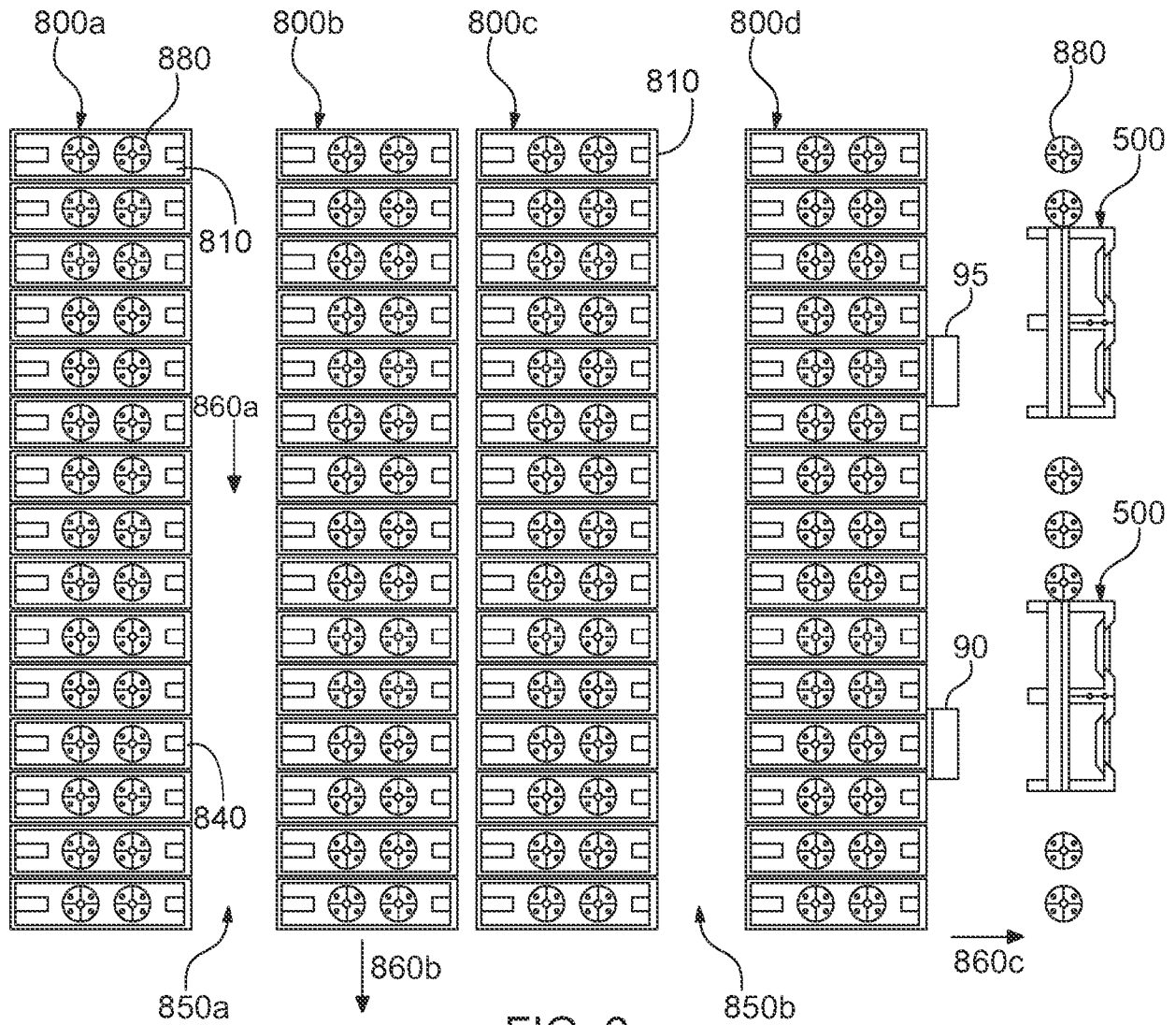


FIG. 6

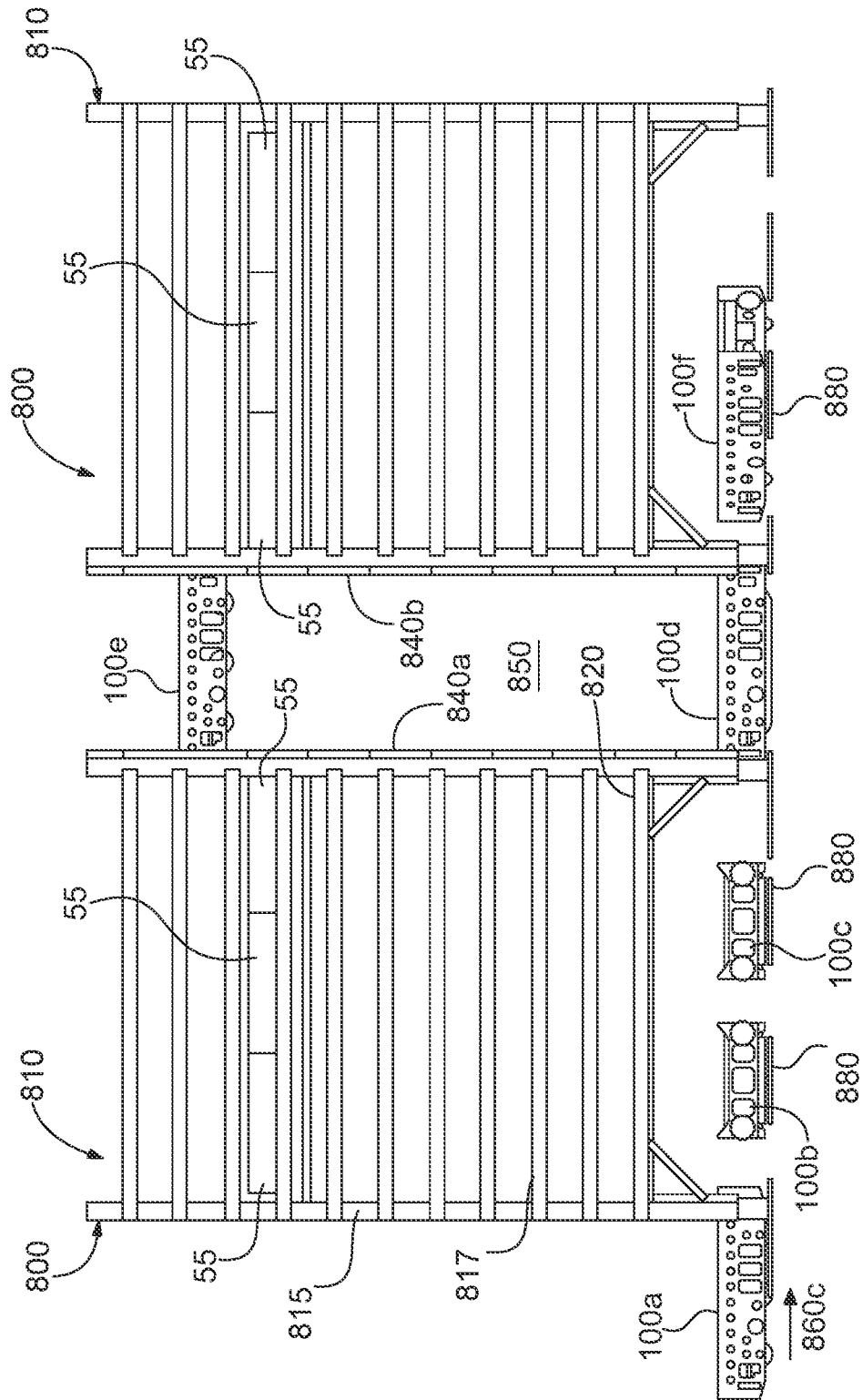


FIG. 7

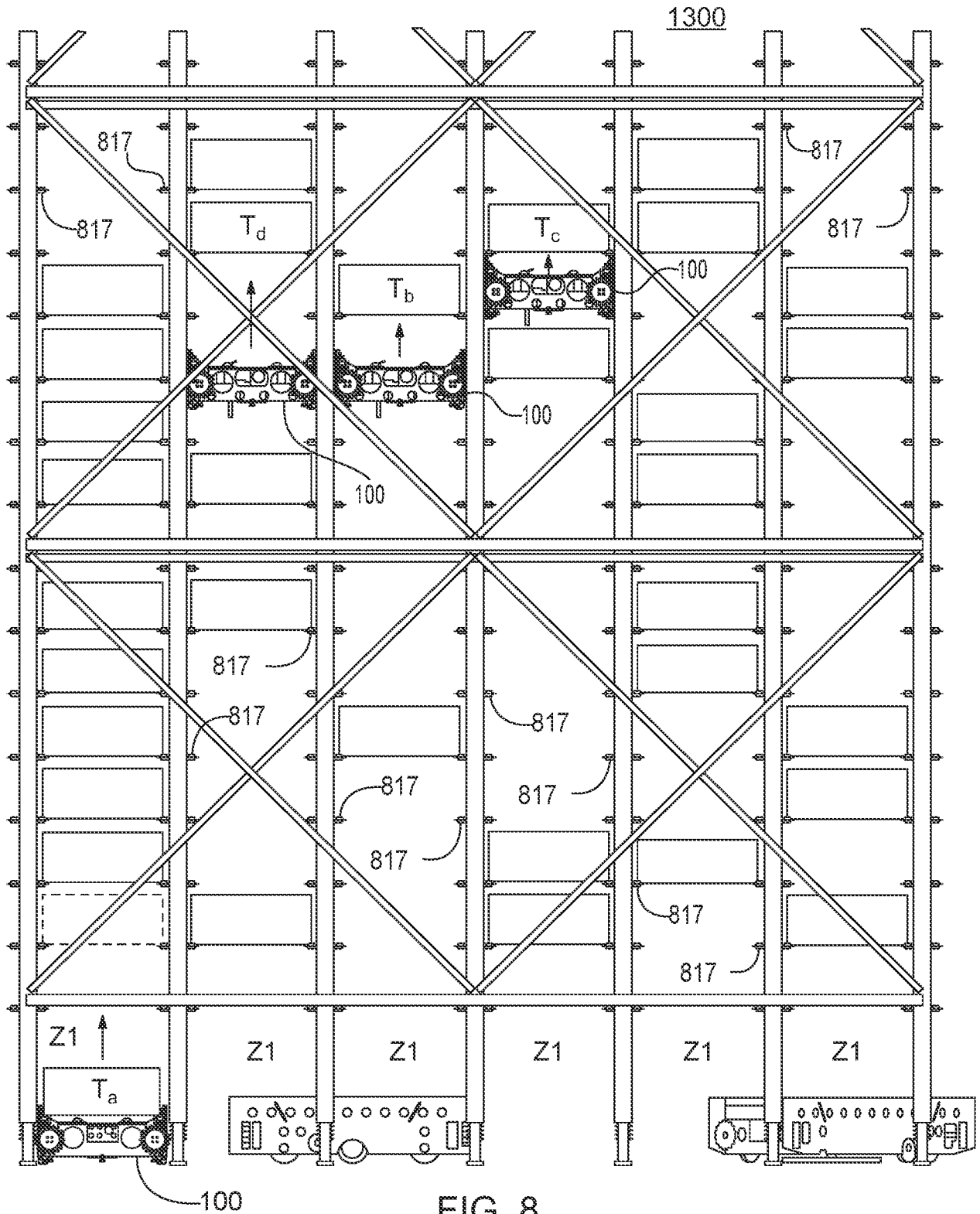
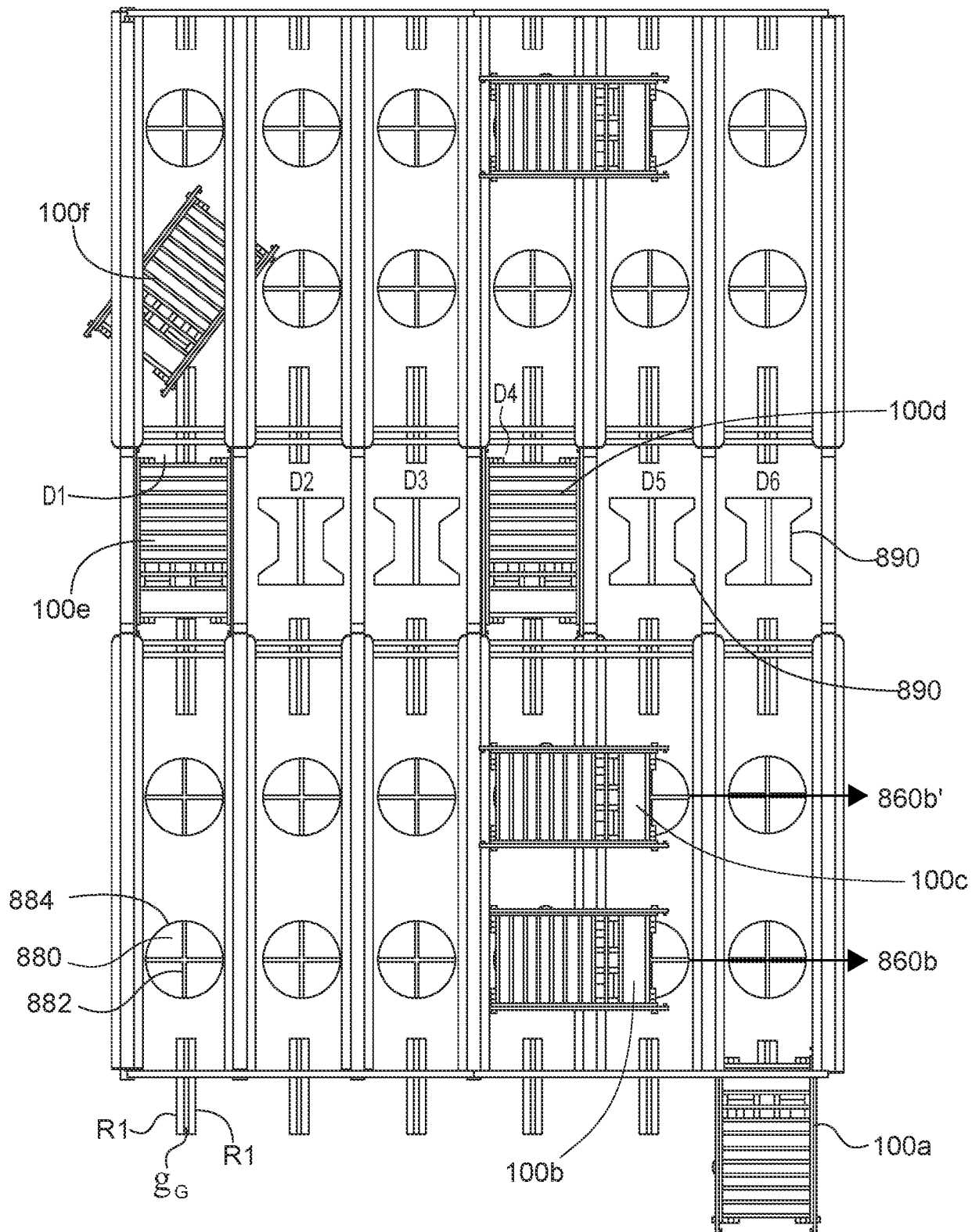


FIG. 8



(REPLACEMENT SHEETS)

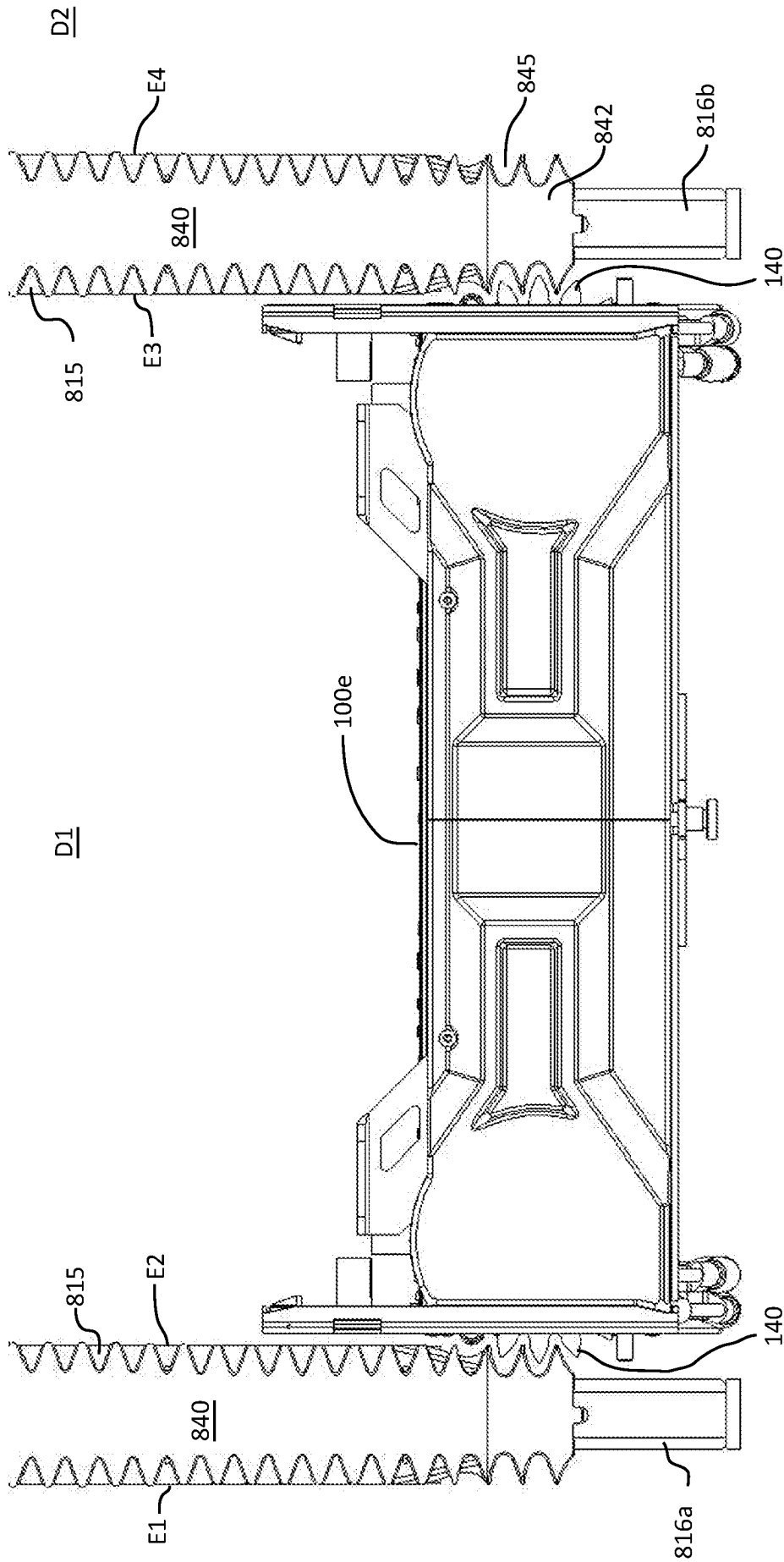


FIG. 10

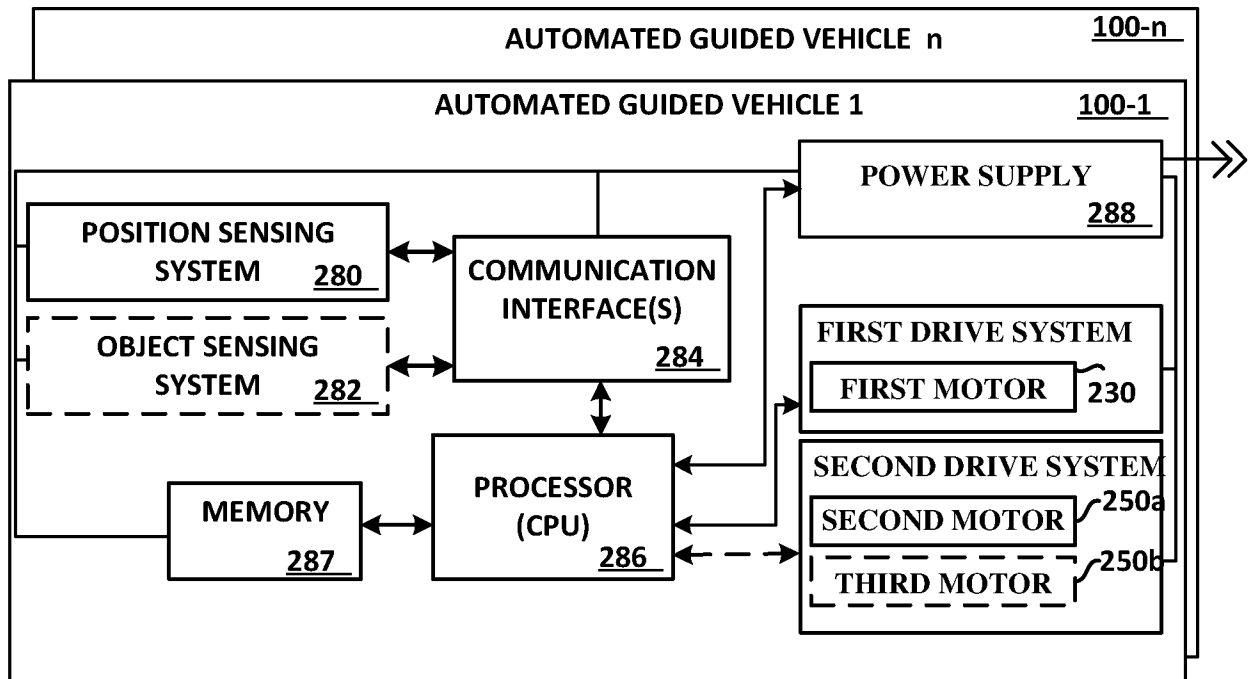


FIG. 11

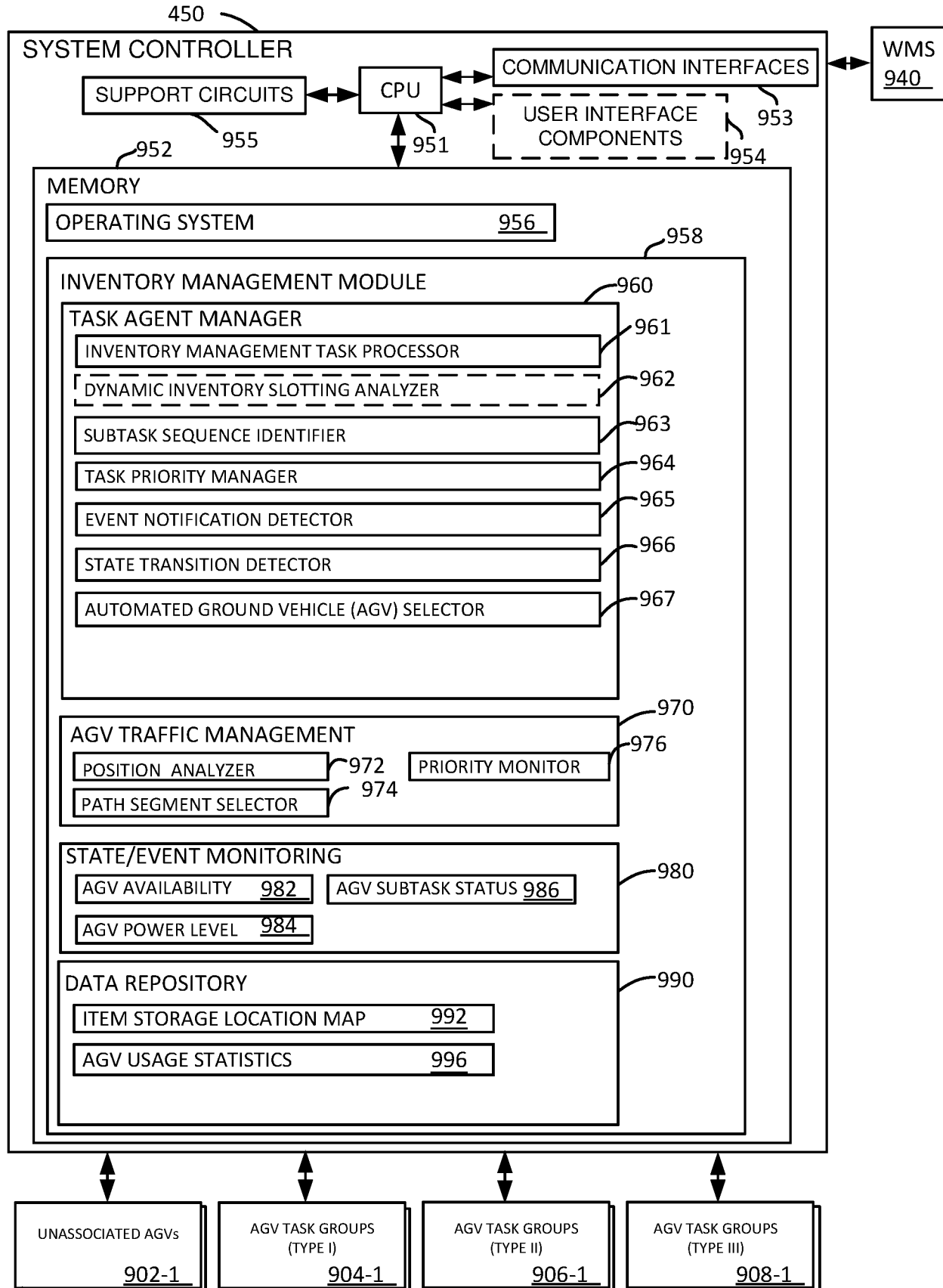


FIG 12

**IN THE UNITED STATES PATENT AND TRADEMARK
OFFICE**

In the Application of **Stevens et**

Application No. 16/994,543

Confirmation No. 429

Attorney Docket No. P10808US0

Filed: August 14, 2020

For: MATERIAL HANDLING SYSTEM

CERTIFICATE OF TRANSMISSION

I hereby certify that this Correspondence is being filed on the date identified below with the United States Patent and Trademark Office via the EFS web system.

June 28, 2022

/Julia Schultz/

Date of Certificate

Julia Schultz

SUBMISSION OF FORMAL DRAWINGS

In The Drawings

Please replace Figures 1-12 with the eleven (11) sheets of formal drawings filed herewith.

REMARKS

Applicant is submitting formal drawings in the form of eleven (11) replacement sheets of drawings. There is no new material in the formal drawings. Accordingly, Applicant requests entry of the amendment to the drawings.

Respectfully submitted,

OPEX CORPORATION, Applicant

By /Stephen Eland/

Stephen H. Eland

PTO Registration No. 41,010

Telephone: (856) 727-1100



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/994,543

RECEIPT DATE / TIME
06/29/2022 09:25:11 AM ET

ATTORNEY DOCKET #
P10808US0

Title of Invention

Material Handling System

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4292

FILED BY Julia Schultz

PATENT CENTER # 60747730

FILING DATE 08/14/2020

CUSTOMER # 156121

FIRST NAMED
INVENTOR Alexander Stevens

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Stephen Eland

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
P10808US0_Formal_drawing s_Response.pdf	3	Drawings-only black and white line drawings	106 KB
P10808US0_Formal_Drawing s.pdf	11	Drawings-only black and white line drawings	1438 KB

Warning: The PDF file contains multiple layers and must be flattened prior to submission.
Documents submitted with multiple layers will be flattened by the USPTO when
converted to an image. Layers marked as "invisible" will be lost during conversion.

Digest

DOCUMENT

MESSAGE DIGEST(SHA-512)

Petitioners' Exhibit 1002
Exotec v. Opex; No. IPR2024-00850
U.S. Patent No. 11,472,632; Page 74

P10808US0_Formal_drawings_ Response.pdf	506CC821B9E1EE9738ACF2B23137A0C88FA2C5CB1835E3103 33544D18917409F2F3D11F4BAD0084EBE6D11D8CDE0A2DD14 D646071BD3750D74422088F4AE4021
--	--

P10808US0_Formal_Drawings. pdf	BD04483DB160E0D9CB166B6751BC524B7061ECB3BFA1CD6D 3EF7A56156E83934E90278463023097934164419461FC02C3B0 E0A501998234D617381CA609C2BAD
-----------------------------------	--

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 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

NOTICE OF ALLOWANCE AND FEE(S) DUE

156121 7590 06/27/2022
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

EXAMINER

LOGAN, KYLE O

ART UNIT

PAPER NUMBER

3655

DATE MAILED: 06/27/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292

TITLE OF INVENTION: Material Handling System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/27/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

156121 7590 06/27/2022
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292

TITLE OF INVENTION: Material Handling System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	09/27/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
LOGAN, KYLE O	3655	700-218000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29☐ Applicant asserting small entity status. See 37 CFR 1.27☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

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.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/994,543	08/14/2020	Alexander Stevens	P10808US0	4292
156121	7590	06/27/2022	EXAMINER	
Opex Corporation 305 Commerce Dr Moorestown, NJ 08057			LOGAN, KYLE O	
			ART UNIT	PAPER NUMBER
			3655	
DATE MAILED: 06/27/2022				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 30 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, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** 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.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or publication, or a patent.
9. A record from this system of records may be disclosed, as a routine use, to the Federal Bureau of Investigation or other law enforcement agency, if the USPTO becomes aware of a violation or potential violation of the Espionage Laws, 18 U.S.C. 793 and 794.

Notice of Allowability	Application No. 16/994,543	Applicant(s) Stevens et al.	
	Examiner KYLE LOGAN	Art Unit 3655	AIA (FITF) Status Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/20/20.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-27. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some* c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>3/15/22</u> . 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
--	--

/KYLE O LOGAN/
Primary Examiner, Art Unit 3655

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the first to file provisions of the AIA.
2. In the event the determination of the status of the application as subject to 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.

Background

3. The claim amendments in the Applicant's Preliminary Amendment, filed on 10/20/20 have been entered.
4. According to the Amendment, claims 1-27 are pending. Claims 10, 19-22, and 26 have been amended.

Allowable Subject Matter

5. Claims 1-27 are allowed.
6. The following is the examiner's statement of reasons for allowance: independent claim 1 is on a method for delivering items to storage locations and retrieving items from storage locations and recites, in part, "driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart

from the first aisle; turning the first vehicle while the first vehicle is under the first rack; driving the vehicle into the first aisle; driving the first vehicle upwardly in the aisle to a first of the storage locations ... driving the first vehicle downwardly in the aisle until the vehicle is on a horizontal surface; driving the first vehicle across the first aisle after the step of driving the first vehicle downwardly; and driving the vehicle out from under the storage racks after the step of driving the first vehicle across the first aisle.”

7. These limitations either individually or in combination when considering the claim as a whole were not found in the prior art. The closest prior art is US Pub. No. 2019/0270588 to *Otto et al.* which discloses an automated warehousing system including storage unit transporters configured to travel path beneath multilevel racking systems in a linear travel path extending along the warehouse floor and configured to transport mobile storage units within, into, and out of multilevel racking system aisles. However, *Otto* does not teach or suggest, for example, the steps of driving transporters upwardly, downwardly, and across storage aisles when storing or retrieving items from storage. Therefore, claim 1 is allowable as well as claims 2-10 depending therefrom.

8. Secondly, independent claims 11, 17, and 23 are allowable as each one recites claim features similar to those above in claim 1. Claims 12-16, 18-22 and 24-27 are allowable as they depend from claims 11, 17, and 23 respectively.

9. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **KYLE LOGAN** whose telephone number is **(571)270-7769**. The examiner can normally be reached **M-F, 9-5P**.

11. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, CHARLES FOX can be reached on (571) 272-6923. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

13. Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KYLE O LOGAN/
Primary Examiner, Art Unit 3655

<i>Notice of References Cited</i>	Application/Control No. 16/994,543		Applicant(s)/Patent Under Reexamination Stevens et al.	
	Examiner KYLE LOGAN		Art Unit 3655	Page 1 of 1

U.S. PATENT DOCUMENTS						
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-10952533-B2	03-2021	Lert, Jr.; John G.	A47B47/0091	1/1
*	B	US-20180037412-A1	02-2018	Lynch; Christopher	B65G1/00	1/1
*	C	US-11142398-B2	10-2021	Lert, Jr.; John G.	B65G1/0478	1/1
*	D	US-20180148259-A1	05-2018	GRAVELLE; Scott	B65G1/0464	1/1
*	E	US-20170267452-A1	09-2017	GOREN; Elram	B65G1/0492	1/1
*	F	US-10435241-B2	10-2019	Lert; John	B65G1/0478	1/1
*	G	US-20210090001-A1	03-2021	Glass; Guy	B65G1/0407	1/1
*	H	US-20190270588-A1	09-2019	Otto; Matthew J.	B65G1/0485	1/1
	I					
	J					
	K					
	L					
	M					

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

NON-PATENT DOCUMENTS		
*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

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

Issue Classification 	Application/Control No. 16/994,543	Applicant(s)/Patent Under Reexamination Stevens et al.	
	Examiner KYLE LOGAN	Art Unit 3655	

CPC						
Symbol					Type	Version
B65G	/	1	/	1375	F	2013-01-01
B65G	/	1	/	0492	I	2013-01-01
B65G	/	1	/	065	I	2013-01-01
B65G	/	1	/	1373	I	2013-01-01
G06Q	/	10	/	087	I	2013-01-01
B65G	/	1	/	0471	I	2013-01-01
B65G	/	1	/	10	I	2013-01-01
B65G	/	1	/	1378	I	2013-01-01
G05D	/	1	/	0027	I	2013-01-01
B25J	/	9	/	1687	I	2013-01-01
B65G	/	1	/	1371	I	2013-01-01
B65G	/	1	/	1376	I	2013-01-01
G05D	/	2201	/	0216	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Set

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	27	
/KYLE O LOGAN/ Primary Examiner, Art Unit 3655	15 June 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification 	Application/Control No. 16/994,543	Applicant(s)/Patent Under Reexamination Stevens et al.
	Examiner KYLE LOGAN	Art Unit 3655

INTERNATIONAL CLASSIFICATION			
CLAIMED			
B65G	/	1	/ 137
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE	Total Claims Allowed:	
(Assistant Examiner)	(Date)	27
/KYLE O LOGAN/ Primary Examiner, Art Unit 3655	15 June 2022	O.G. Print Claim(s)
(Primary Examiner)	(Date)	1
		O.G. Print Figure
		1

Issue Classification 	Application/Control No. 16/994,543	Applicant(s)/Patent Under Reexamination Stevens et al.
	Examiner KYLE LOGAN	Art Unit 3655

☒ 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
	1		10		19										
	2		11		20										
	3		12		21										
	4		13		22										
	5		14		23										
	6		15		24										
	7		16		25										
	8		17		26										
	9		18		27										

NONE	Total Claims Allowed:					
(Assistant Examiner)	(Date)	27				
/KYLE O LOGAN/ Primary Examiner, Art Unit 3655 (Primary Examiner)	15 June 2022 (Date)	<table><tr><td>O.G. Print Claim(s)</td><td>O.G. Print Figure</td></tr><tr><td>1</td><td>1</td></tr></table>	O.G. Print Claim(s)	O.G. Print Figure	1	1
O.G. Print Claim(s)	O.G. Print Figure					
1	1					

<i>Search Notes</i> 	Application/Control No. 16/994,543	Applicant(s)/Patent Under Reexamination Stevens et al.
	Examiner KYLE LOGAN	Art Unit 3655

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner
B65G1/1375 B65G1/0471 B65G1/0492 B65G1/065 B65G1/10 B65G1/1373	06/15/2022	KOL

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
Conducted Inventor and Assignee Search	06/15/2022	KOL
Conducted Combo Class/Text Search	06/15/2022	KOL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	See USPAT Printout	06/15/2022	KOL

--	--

<i>Index of Claims</i> 	Application/Control No. 16/994,543	Applicant(s)/Patent Under Reexamination Stevens et al.
	Examiner KYLE LOGAN	Art Unit 3655

✓	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	06/15/2022								
	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	=								
	26	=								
	27	=								

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	16/994543	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/14 03:16 PM
L2	3195	B65G1/1375 B65G1/0471 B65G1/0492 B65G1/065 B65G1/10 B65G1/1373	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 10:26 AM
L3	2040	700/218	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 10:27 AM
L4	110	(OPEX NEAR1 (CORPORATION CORP)).AS.	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 10:28 AM
L6	56	((("STEVENS") near3 ("Alexander")) OR ((("VALINSKY") near3 ("Joseph")))).INV.	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 10:31 AM
L7	10	("10040632" "10435241" "10435242" "10952533" "11142398" "20030185657" "20070065258" "20170267452" "20180037412" "20180148259").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 10:31 AM
L8	344	(transporter robot\$2 bot rover mobile near1 drive autonomous self\$1driv\$3 driver\$1less unmanned automated near1 guided AGV T3V MDU) near3 ((under underneath below bottom) near3 (storage rack))	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 11:00 AM
L9	73	L8 AND (L1 L2 L3 L4 L5 L6 L7)	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 11:02 AM
L10	101	(transporter robot\$2 bot rover mobile near1 drive autonomous self\$1driv\$3 driver\$1less unmanned automated near1 guided AGV T3V MDU) near3 ((under underneath below bottom) near3 rack)	(US-PGPUB; USPAT)	OR	ON	ON	2022/06/15 11:37 AM
L11	8	((US-10952533-B2 OR US-11142398-B2 OR US-10435241-B2).did. AND USPT.dbnm.) OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2022/06/15 11:44 AM

		((US-20180037412-A1 OR US-20180148259-A1 OR US-20170267452-A1 OR US-20210090001-A1 OR US-20190270588-A1).did. AND PGPB.dbnm.)	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
--	--	---	--	--	--	--	--

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	0	((storage near3 retriev\$3 order near1 fulfillment pick\$3 warehouse) WITH (transporter robot\$2 bot rover mobile near1 drive autonomous self\$1driv\$3 driver\$1less unmanned automated near1 guided AGV T3V MDU) near3 ((under underneath below bottom) near3 (storage rack)) WITH (transfer\$4 pick\$3 plac\$3 stor\$3 retriev\$3) near3 (article item object product case box tote bin container) WITH (vertical\$2 downward\$2) near3 (transporter robot\$2 bot rover mobile near1 drive autonomous self\$1driv\$3 driver\$1less unmanned automated near1 guided AGV T3V MDU) near3 (rack aisle column row)).CLM.	(USPAT)	OR	ON	ON	2022/06/15 11:44 AM

Bibliographic Data

Application No: 16/994,543

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

/KYLE O LOGAN/

Examiner's Signature

Initials

Title:

Material Handling System

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
08/14/2020	700	3655	P10808US0
RULE			

APPLICANTS

OPEX Corporation, Moorestown, NJ,

INVENTORS

Alexander Stevens, Moorestown, NJ, UNITED STATES

Joseph Valinsky, Moorestown, NJ, UNITED STATES

CONTINUING DATA

This application has PRO of 62886602 08/14/2019

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

08/20/2020

STATE OR COUNTRY

UNITED STATES

ADDRESS

Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057
UNITED STATES

FILING FEE RECEIVED

\$3,000

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

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 contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16994543
Filing Date	2021-08-14
First Named Inventor	Alexander Stevens
Art Unit	
Examiner Name	
Attorney Docket Number	P10808US0

U.S.PATENTS

[Remove](#)

Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	10040632		2018-08-07	LERT, JR.	
	2	10435241		2019-10-08	LERT, JR.	
	3	10435242		2019-10-08	LERT, JR.	
	4	10952533		2021-03-23	LERT, JR.	
	5	11142398		2021-10-12	LERT, JR.	

If you wish to add additional U.S. Patent citation information please click the Add button.

[Add](#)

U.S.PATENT APPLICATION PUBLICATIONS

[Remove](#)

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20070065258		2007-03-22	BENEDICT	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16994543
Filing Date	2021-08-14
First Named Inventor	Alexander Stevens
Art Unit	
Examiner Name	
Attorney Docket Number	P10808US0

2	20180148259	2018-05-31	ATTABOTICS INC.
3	20030185657	2003-10-02	STEFANI
4	20170267452	2017-09-21	COMMONSENSE ROBOTICS LTD.
5	20180037412	2018-02-08	OPEX CORPORATION

If you wish to add additional U.S. Published Application citation information please click the Add button. [Add](#)

FOREIGN PATENT DOCUMENTS

[Remove](#)

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							

If you wish to add additional Foreign Patent Document citation information please click the Add button [Add](#)

NON-PATENT LITERATURE DOCUMENTS

[Remove](#)

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	International Search Report and Written Opinion for International application No. PCT/US2020/046562 issued on February 16, 2021.	

If you wish to add additional non-patent literature document citation information please click the Add button [Add](#)

EXAMINER SIGNATURE

Examiner Signature	/KYLE O LOGAN/	Date Considered	06/15/2022
--------------------	----------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		16994543
Filing Date		2021-08-14
First Named Inventor	Alexander Stevens	
Art Unit		
Examiner Name		
Attorney Docket Number		P10808US0

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE
STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number		16994543
Filing Date		2021-08-14
First Named Inventor	Alexander Stevens	
Art Unit		
Examiner Name		
Attorney Docket Number		P10808US0

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.
The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Stephen Eland/	Date (YYYY-MM-DD)	2022-03-15
Name/Print	Stephen H. Eland	Registration Number	41010

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 1 hour 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.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16994543
	Filing Date		2021-08-14
	First Named Inventor	Alexander Stevens	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	P10808US0	

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	10040632		2018-08-07	LERT, JR.	
	2	10435241		2019-10-08	LERT, JR.	
	3	10435242		2019-10-08	LERT, JR.	
	4	10952533		2021-03-23	LERT, JR.	
	5	11142398		2021-10-12	LERT, JR.	

If you wish to add additional U.S. Patent citation information please click the Add button.

[Add](#)

U.S.PATENT APPLICATION PUBLICATIONS						Remove
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20070065258		2007-03-22	BENEDICT	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16994543
Filing Date	2021-08-14
First Named Inventor	Alexander Stevens
Art Unit	
Examiner Name	
Attorney Docket Number	P10808US0

2	20180148259	2018-05-31	ATTABOTICS INC.
3	20030185657	2003-10-02	STEFANI
4	20170267452	2017-09-21	COMMONSENSE ROBOTICS LTD.
5	20180037412	2018-02-08	OPEX CORPORATION

If you wish to add additional U.S. Published Application citation information please click the Add button. [Add](#)

FOREIGN PATENT DOCUMENTS

[Remove](#)

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² i	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							

If you wish to add additional Foreign Patent Document citation information please click the Add button [Add](#)

NON-PATENT LITERATURE DOCUMENTS

[Remove](#)

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	International Search Report and Written Opinion for International application No. PCT/US2020/046562 issued on February 16, 2021.	

If you wish to add additional non-patent literature document citation information please click the Add button [Add](#)

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16994543	
Filing Date	2021-08-14	
First Named Inventor	Alexander Stevens	
Art Unit		
Examiner Name		
Attorney Docket Number	P10808US0	

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16994543
	Filing Date		2021-08-14
	First Named Inventor	Alexander Stevens	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	P10808US0	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Stephen Eland/	Date (YYYY-MM-DD)	2022-03-15
Name/Print	Stephen H. Eland	Registration Number	41010

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 1 hour 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.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: STEPHEN H. ELAND
305 COMMERCE DRIVE
MOORESTOWN, NJ 08057

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing
(day/month/year) **16 FEB 2021**

Applicant's or agent's file reference

P06808WO00

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/US2020/046562

International filing date
(day/month/year)

14 August 2020

Applicant

OPEX CORPORATION

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau preferably through ePCT, or on paper to:
The International Bureau of WIPO, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland
(Facsimile No.: +41 22 338 82 70)

For more detailed instructions, see the *PCT Applicant's Guide*, International Phase, paragraphs 9.004 -- 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
 - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within 22 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenheaver

Telephone No. PCT Helpdesk: 571-272-4300

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P06808WO00		FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2020/046562	International filing date (day/month/year) 14 August 2020	(Earliest) Priority Date (day/month/year) 14 August 2019
Applicant OPEX CORPORATION		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☒ Certain claims were found unsearchable (see Box No. II).

3. ☒ Unity of invention is lacking (see Box No. III).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 1
☒ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
- b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2020/046562

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 20-22
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet(s).

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2020/046562

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B65G 1/04; B65G 1/00; B65G 1/02; B65G 1/06; B65G 1/12; B65G 1/137 (2020.01)

CPC - B65G 1/0492; B65G 1/00; B65G 1/02; B65G 1/04; B65G 1/0407; B65G 1/0414; B65G 1/06; B65G 1/065; B65G 1/12; B65G 1/137 (2020.08)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

see Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

see Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

see Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2007/0065258 A1 (BENEDICT et al) 22 March 2007 (22.03.2007) entire document	1-14, 17-19, 23-27 15, 16
Y	US 2018/0148259 A1 (ATTABOTICS INC.) 31 May 2018 (31.05.2018) entire document	15, 16
A	US 2003/0185657 A1 (STEFANI) 02 October 2003 (02.10.2003) entire document	1-19, 23-27
A	US 2017/0267452 A1 (COMMONSENSE ROBOTICS LTD.) 21 September 2017 (21.09.2017) entire document	1-19, 23-27
A	US 2018/0037412 A1 (OPEX CORPORATION) 08 February 2018 (08.02.2018) entire document	1-19, 23-27

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

16 November 2020

Date of mailing of the international search report

16 FEB 2021

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenhaver

Telephone No. PCT Helpdesk: 571-272-4300

Continued from Box No. III Observations where unity of invention is lacking

Claim 20 is objected under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claim 20 is indefinite for the following reasons: claim 20 is stated to depend from claims 17-19 which appears to be typographical, and thus best understood as depending from claims 17-19.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-16 and 23-27, are drawn to a method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of: providing a plurality of storage racks.

Group II, claims 17-19, are drawn to a method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of: providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations; providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface; a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations; driving a first one of the vehicles to drive the first vehicle to the storage racks; driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart from the first aisle; turning the first vehicle while the first vehicle is under the first rack; driving the vehicle into the first aisle; driving the first vehicle upwardly in the aisle to a first of the storage locations; transferring an item between the first vehicle and the first storage location; driving the first vehicle downwardly in the aisle until the vehicle is on a horizontal surface; driving the first vehicle across the first aisle after the step of driving the first vehicle downwardly; and driving the vehicle out from under the storage racks after the step of driving the first vehicle across the first aisle as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element adjacent a front end of the vehicle and a rearward rotatable element adjacent a rear end of the vehicle; providing a first vertical track on a first side of a first column wherein the first vertical track has drive elements configured to cooperate with the forward rotatable element to drive the vehicle upwardly; providing a second vertical track on second side of the first column wherein the second vertical track has drive elements configured to cooperate with rearward rotatable element to drive the vehicle upwardly, wherein the vertical drive and the first and second vertical tracks are configured so that the vertical track impedes displacement of the vehicle along a horizontal path when the vertical drive is rotated into a position of misalignment; aligning the vertical drive, wherein the step of aligning comprises the steps of: rotating the forward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the forward rotatable element with gaps in the first and second vertical tracks; and rotating the rearward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the rearward rotatable element with gaps in the first and second vertical tracks; after the step of aligning, driving the vehicle along the horizontal path toward the first vertical track, wherein the step of driving comprises driving the vehicle so that the forward rotatable element passes through the gaps in the second vertical track; continuing to drive the vehicle along the horizontal path to position the forward rotatable element in operative engagement with first track and the rearward rotatable element in operative engagement with the second track; rotating the forward and rearward rotatable elements to drive the vehicle upwardly toward a first storage location; transferring a first item from the first storage location to the vehicle; driving the vehicle down with the first item; driving the vehicle with the first item along the horizontal path so that the rearward rotatable element passes through gaps in the first vertical track as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of a method for delivering items to storage locations and retrieving items from storage locations, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 2018/0037412 A1 to Opex Corporation teaches a method for delivering items to storage locations and retrieving items from storage locations (the conveyor network includes a plurality of delivery vehicles or cars 200. The cars 200 are independently movable relative to one another, and each is arranged to deliver items to and/or retrieve items from, any of a plurality of storage locations 100 proximate the conveying path, para. 0040).

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: STEPHEN H. ELAND
305 COMMERCE DRIVE
MOORESTOWN, NJ 08057

Date of mailing
(day/month/year)

16 FEB 2021

Applicant's or agent's file reference
P06808W000

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2020/046562

International filing date (day/month/year)

14 August 2020

Priority date (day/month/year)

14 August 2019

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - B65G 1/04; B65G 1/00; B65G 1/02; B65G 1/06; B65G 1/12; B65G 1/137 (2020.01)

CPC - B65G 1/0492; B65G 1/00; B65G 1/02; B65G 1/04; B65G 1/0407; B65G 1/0414; B65G 1/06;
B65G 1/065; B65G 1/12; B65G 1/137 (2020.08)

Applicant OPEX CORPORATION

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-6300

Date of completion of this opinion

16 November 2020

Authorized officer

Blaine R. Copenheaver
PCT Helpdesk: 571-272-4300
Telephone No. 571-272-4300

Form PCT/ISA/237 (cover sheet) (revised January 2019)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(b)).
3. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 20-22

because:

☐ the said international application, or the said claims Nos. _____ relate to the following subject matter which does not require an international search (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 20-22 are so unclear that no meaningful opinion could be formed (*specify*):

Claims 20-22 are improper multiple dependent claims not drafted in accordance with the second and third sentences of Rule 6.4(a).

☐ the claims, or said claims Nos. _____ are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

☒ no international search report has been established for said claims Nos. 20-22

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

☐ furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

☐ furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13ter.1(a) or (b).

☐ See Supplemental Box for further details.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/048562

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☒ paid additional fees.
 - ☐ paid additional fees under protest and, where applicable, the protest fee.
 - ☐ paid additional fees under protest but the applicable protest fee was not paid.
 - ☐ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with.
 - ☒ not complied with for the following reasons:

<See Supplemental Box>

4. Consequently, this opinion has been established in respect of the following parts of the international application:

- ☒ all parts.
- ☐ the parts relating to claims Nos. _____

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2020/046562

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	15, 16	YES
	Claims	1-14, 17-19, 23-27	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-19, 23-27	NO
Industrial applicability (IA)	Claims	1-19, 23-27	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-14, 17-19, and 23-27 lack novelty under PCT Article 33(2) as being anticipated by Benedict et al. (hereinafter Benedict).

Regarding Claim 1, Benedict discloses a method for delivering items to storage locations and retrieving items from storage locations (Figs. 1-31; Para. [0056] regarding article handling, storage and distribution systems used in a storage environment), comprising the steps of: providing a plurality of storage racks (at racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) spaced apart from one another forming a plurality of aisles (at aisle spacings 41, Fig. 2, the aisle spacing 41, between adjacent rows 42, Para. [0061]), wherein each storage rack (at racks 43, Fig. 1) comprises a plurality of columns (Fig. 3 showing columns of vertically spaced bins 40; vertically spaced storage bins 40, Para. [0061]) and each column (Fig. 3 showing columns of vertically spaced bins 40) comprises a plurality of storage locations (at storage bins 40); providing a plurality of delivery vehicles (transfer vehicles 32, Fig. 1) wherein each vehicle (transfer vehicles 32) comprises a horizontal drive system (wheels 80, Fig. 6) operable to drive the vehicle (transfer vehicles 32) along a horizontal surface (storage level 35, Fig. 1), a vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) operable to drive the vehicle (transfer vehicles 32) vertically (as shown in Fig. 7) and a transfer mechanism (loading and off-loading assemblies 200, Fig. 6) operable to transfer an item (at pallets 31) between the vehicle (transfer vehicles 32) and one of the storage locations (at storage bins 40, Fig. 5); driving (as shown in Fig. 1) a first one of the vehicles (one of transfer vehicles 32) to drive the first vehicle (one of transfer vehicles 32) to the storage racks (at racks 43); driving the first vehicle (one of transfer vehicles 32) along a first path (Fig. 1 showing a guide channel 38 extending under one of the racks 43; guide channels . . . for guiding the load transfer vehicles . . . the guide channels are shown at 38 as being generally linear channels which intersect perpendicularly with respect to one another, Para. [0114]) under a first one of the racks (one of racks 43) wherein the first rack (one of racks 43) is adjacent a first one of the aisles (one of aisle spacings 41, Fig. 2) and wherein the first path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) extends in a direction parallel to (as shown in Fig. 1) the first aisle (one of aisle spacings 41) and spaced apart from (as shown in Fig. 1) the first aisle (one of aisle spacings 41); turning (omni-directional propelling or drive wheels 80 which are pivotally mounted . . . permit the wheels to be steered, Para. [0082]) the first vehicle (one of transfer vehicles 32) while the first vehicle (one of transfer vehicles 32) is under the first rack (one of racks 43); driving the vehicle (one of transfer vehicles 32) into the first aisle (one of aisle spacings 41); driving the first vehicle (one of transfer vehicles 32) upwardly (as shown in Figs. 3, 4) in the aisle (one of aisle spacings 41, Fig. 4) to a first of the storage locations (one of storage bins 40); transferring (as shown in Fig. 5) an item (at pallets 31) between the first vehicle (one of transfer vehicles 32) and the first storage location (one of storage bins 40); driving the first vehicle (one of transfer vehicles 32, Fig. 3) downwardly (descending, Para. [0018]) in the aisle (one of aisle spacings 41) until the vehicle (one of transfer vehicles 32) is on a horizontal surface (storage level 35, Fig. 1); driving the first vehicle (one of transfer vehicles 32) across the first aisle (one of aisle spacings 41) after the step of driving the first vehicle (one of transfer vehicles 32) downwardly (descending, Para. [0018]); and driving the vehicle (one of transfer vehicles 32) out from under the storage racks (at racks 43) after the step of driving the first vehicle (one of transfer vehicles 32) across the first aisle (one of aisle spacings 41).

Regarding Claim 2, Benedict discloses the method of claim 1 wherein a plurality of vertical posts (racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) form a first column (Fig. 3 showing columns of vertically spaced bins 40) of the first storage rack (one of racks 43, Fig. 1) and wherein the first vehicle (one of transfer vehicles 32, Fig. 7) has a first width (as shown in Fig. 12) extending from a first side (left side of one of transfer vehicles 32, Fig. 7) of the first vehicle (one of transfer vehicles 32) to a second side (right side of one of transfer vehicles 32) of the first vehicle (one of transfer vehicles 32) and wherein the vertical drive (selectively deployable drive gears or pinions 96) of the first vehicle (one of transfer vehicles 32) projects outwardly from the first side (left side of one of transfer vehicles 32) and the second side (right side of one of transfer vehicles 32) so that the vehicle (one of transfer vehicles 32) has a second width (as shown in Fig. 11) corresponding to the distance between outer edges of the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) so that the second width (as shown in Fig. 11) is greater than the first width (as shown in Fig. 12) and wherein the vertical posts (racks 43, Fig. 1) of the first column (Fig. 3 showing columns of vertically spaced bins 40) are spaced apart a distance greater than (as shown in Fig. 7) the first width (as shown in Fig. 12) and less than the second width (as shown in Fig. 11).

Regarding Claim 3, Benedict discloses the method of claim 1 wherein a plurality of vertical tracks segments (teeth 51, Fig. 7, the tracks or racks 43 . . . identical to those which will be described for use on opposite sides or at the corners of the trunks 33 and 34, Para. [0061]) are attached to vertical posts (racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) of the first column (Fig. 3 showing columns of vertically spaced bins 40) and wherein the step of driving the first vehicle (one of transfer vehicles 32, Fig. 1) into the first aisle (one of aisle spacings 41, Fig. 2) comprises aligning the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) of the first vehicle (one of transfer vehicles 32) with the vertical track segments (teeth 51).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 10, 11 and 20 are objected under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because claims 10, 11 and 20 are indefinite for the following reasons:

With regard to claim 10, the claim language says "The method of and of claims" when as best understood it should actually say "The method of any of claims". As it pertains to claim 10 the analyst is interpreting the claim language to actually state "The method of any of claims" and it is treated as such in this Opinion.

With regard to claim 11, the claim language says "spaced apart from the first storage rack" when as best understood it should actually say "spaced apart from the second storage rack". As it pertains to claim 11 the analyst is interpreting the claim language to actually state "spaced apart from the second storage rack" as supported in applicant's specification, Paragraph [0085], and it is treated as such in this Opinion.

With regard to claim 11, the claim language says "spaced apart from the first horizontal path" when as best understood it should actually say "spaced apart from the second horizontal path". As it pertains to claim 11 the analyst is interpreting the claim language to actually state "spaced apart from the second horizontal path" as supported in applicant's specification, Paragraph [0015], and it is treated as such in this Opinion.

Claim 20 is stated to depend from claims 17-10 which appears to be a typo, and is best understood as depending from claims 17-19.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

<Box No. IV Lack of unity of invention>

Claim 20 is objected under PCT Rule 86.2(a)(v) as lacking clarity under PCT Article 6 because claim 20 is indefinite for the following reasons: claim 20 is stated to depend from claims 17-19 which appears to be typographical, and thus best understood as depending from claims 17-19.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-16 and 23-27, are drawn to a method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of: providing a plurality of storage racks.

Group II, claims 17-19, are drawn to a method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of: providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations; providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations; driving a first one of the vehicles to drive the first vehicle to the storage racks; driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart from the first aisle; turning the first vehicle while the first vehicle is under the first rack; driving the vehicle into the first aisle; driving the first vehicle upwardly in the aisle to a first of the storage locations; transferring an item between the first vehicle and the first storage location; driving the first vehicle downwardly in the aisle until the vehicle is on a horizontal surface; driving the first vehicle across the first aisle after the step of driving the first vehicle downwardly; and driving the vehicle out from under the storage racks after the step of driving the first vehicle across the first aisle as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element adjacent a front end of the vehicle and a rearward rotatable element adjacent a rear end of the vehicle; providing a first vertical track on a first side of a first column wherein the first vertical track has drive elements configured to cooperate with the forward rotatable element to drive the vehicle upwardly; providing a second vertical track on second side of the first column wherein the second vertical track has drive elements configured to cooperate with rearward rotatable element to drive the vehicle upwardly, wherein the vertical drive and the first and second vertical tracks are configured so that the vertical track impedes displacement of the vehicle along a horizontal path when the vertical drive is rotated into a position of misalignment; aligning the vertical drive, wherein the step of aligning comprises the steps of: rotating the forward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the forward rotatable element with gaps in the first and second vertical tracks; and rotating the rearward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the rearward rotatable element with gaps in the first and second vertical tracks; after the step of aligning, driving the vehicle along the horizontal path toward the first vertical track, wherein the step of driving comprises driving the vehicle so that the forward rotatable element passes through the gaps in the second vertical track; continuing to drive the vehicle along the horizontal path to position the forward rotatable element in operative engagement with first track and the rearward rotatable element in operative engagement with the second track; rotating the forward and rearward rotatable elements to drive the vehicle upwardly toward a first storage location; transferring a first item from the first storage location to the vehicle; driving the vehicle down with the first item; driving the vehicle with the first item along the horizontal path so that the rearward rotatable element passes through gaps in the first vertical track as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of a method for delivering items to storage locations and retrieving items from storage locations, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 2018/0037412 A1 to Opex Corporation teaches a method for delivering items to storage locations and retrieving items from storage locations (the conveyor network includes a plurality of delivery vehicles or cars 200. The cars 200 are independently movable relative to one another, and each is arranged to deliver items to and/or retrieve items from, any of a plurality of storage locations 100 proximate the conveying path, para. 0040).

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding Claim 4, Benedict discloses the method of claim 3 wherein the step of driving the first vehicle (one of transfer vehicles 32, Fig. 1) into the aisle (at isle spacings 41, Fig. 2) comprises driving a first portion (left selectively deployable drive gears or pinions 96, Fig. 7) of the vertical drive (selectively deployable drive gears or pinions 96) through the vertical track segment (teeth 51) and driving a second part (right selectively deployable drive gears or pinions 96) of the vertical drive (selectively deployable drive gears or pinions 96) into operative engagement with the vertical track segment (teeth 51).

Regarding Claim 5, Benedict discloses the method of claim 1 wherein the first storage rack (one of racks 43, Fig. 1) is formed of a plurality of vertical posts (racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) and the first vehicle (one of transfer vehicles 32) has a length (Fig. 25 showing a length of transfer vehicle 32 from left to right) and a width (Fig. 25 showing a width of transfer vehicle 32 from top to bottom) and the length (Fig. 25 showing a length of transfer vehicle 32 from left to right) is greater than (as shown in Fig. 25) the width (Fig. 25 showing a width of transfer vehicle 32 from top to bottom) and wherein the step of driving (as shown in Fig. 1) the first vehicle (one of transfer vehicles 32) along the first path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) comprises driving the vehicle (one of transfer vehicles 32) along a path spaced apart from the vertical posts (racks 43) by a distance greater the half (as shown in Fig. 1) the length (Fig. 25 showing a length of transfer vehicle 32 from left to right) of the vehicle (one of transfer vehicles 32).

Regarding Claim 6, Benedict discloses the method of claim 1 comprising the step of driving the first vehicle (one of transfer vehicles 32, Fig. 1) to a workstation (forklift F) to present an item (at pallets 31, Fig. 3) to an operator (at forklift F, Fig. 1) after the step of driving the first vehicle (one of transfer vehicles 32) out from under the storage racks (at racks 43).

Regarding Claim 7, Benedict discloses the method of claim 1 wherein the step of driving (as shown in Fig. 1) the first vehicle (one of transfer vehicles 32) across the aisle (at isle spacings 41, Fig. 2) comprises driving (as shown in Fig. 1) the first vehicle (one of transfer vehicles 32) under a second of the storage racks (another one of racks 43).

Regarding Claim 8, Benedict discloses the method of claim 1 wherein the step of turning (omni-directional propelling or drive wheels 80 which are pivotally mounted . . . permit the wheels to be steered, Para. [0082]) comprises rotating (the vehicles may be maneuvered in a 360° manner, Para. [0010]) the first vehicle (one of transfer vehicles 32, Fig. 1) about a vertical axis (at center castor 78, Fig. 13) that extends through the first vehicle (one of transfer vehicles 32).

Regarding Claim 9, Benedict discloses the method of claim 8 wherein the vertical axis (at center castor 78, Fig. 13) extends through the first path (Fig. 1 showing a guide channel 38 extending under one of the racks 43).

Regarding Claim 10, Benedict discloses as best understood the method of claim 1 comprising the step of driving (as shown in Fig. 1) a second of the vehicles (another one of transfer vehicles 32) under the first rack (one of racks 43) along a second path (Fig. 1 showing another guide channel 38 extending under one of the racks 43) parallel (Fig. 2 showing parallel rows of bins 40 between isle spacings 41) to the first path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) so that the second vehicle (another one of transfer vehicles 32) passes the first vehicle (one of transfer vehicles 32) as the first vehicle (one of transfer vehicles 32) travels along the first path (Fig. 1 showing a guide channel 38 extending under one of the racks 43).

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding Claim 11, Benedict discloses as best understood a material handling system for delivering items to storage locations and retrieving items from storage locations (Figs. 1-31; Para. [0056] regarding article handling, storage and distribution systems used in a storage environment), comprising: a first storage rack (one of racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) having a plurality of columns (Fig. 3 showing columns of vertically spaced bins 40; vertically spaced storage bins 40, Para. [0061]) each of which comprises a plurality of storage locations (at storage bins 40) wherein the first storage rack (one of racks 43, Fig. 1) is longitudinally elongated (as shown in Fig. 2); a second storage rack (another one of racks 43, Fig. 1) having a plurality of columns (Fig. 3 showing columns of vertically spaced bins 40) each of which comprises a plurality of storage locations (at storage bins 40) wherein the second storage rack (another one of racks 43, Fig. 1) is longitudinally elongated (as shown in Fig. 2), wherein the first storage rack (one of racks 43, Fig. 1) is spaced apart from the second storage rack (another one of racks 43) to provide an aisle (at aisle spacings 41, Fig. 2, the aisle spacing 41, between adjacent rows 42, Para. [0061]) between the first (one of racks 43, Fig. 1) and second storage racks (another one of racks 43); a plurality of delivery vehicles (transfer vehicles 32, Fig. 1) wherein each vehicle (transfer vehicles 32) has a length (Fig. 25 showing a length of transfer vehicle 32 from left to right) and a width (Fig. 25 showing a width of transfer vehicle 32 from top to bottom) and each vehicle (transfer vehicles 32, Fig. 1) comprises: a horizontal drive system (wheels 80, Fig. 6) operable to drive the vehicle (transfer vehicles 32) along a horizontal surface (storage level 35, Fig. 1); a vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) operable to drive the vehicle (transfer vehicles 32) vertically (as shown in Fig. 7); and a transfer mechanism (loading and off-loading assemblies 200, Fig. 6) operable to transfer an item (at pallets 31) between the vehicle (transfer vehicles 32) and one of the storage locations (at storage bins 40, Fig. 3); a track (at teeth 51, Fig. 7, the tracks or racks 43 . . . identical to those which will be described for use on opposite sides or at the corners of the trunks 33 and 34, Para. [0061]) positioned in the aisle (at aisle spacings 41, Fig. 2) wherein the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) is configured to cooperate with the track (at teeth 51, Fig. 7) to drive the vehicle (transfer vehicles 32, Fig. 1) vertically upwardly (as shown in Figs. 3, 4); a first horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43; guide channels . . . for guiding the load transfer vehicles . . . the guide channels are shown at 38 as being generally linear channels which intersect perpendicularly with respect to one another, Para. [0114]) that extends under the first rack (one of racks 43) in a direction parallel to the aisle (one of aisle spacings 41, Fig. 2); a second horizontal path (Fig. 1 showing another guide channel 38 extending under one of the racks 43) that extends under the first rack (one of racks 43) in a direction parallel to the aisle (one of aisle spacings 41, Fig. 2); wherein the horizontal drive (wheels 80, Fig. 6) is configured to turn (omni-directional propelling or drive wheels 80 which are pivotally mounted . . . permit the wheels to be steered, Para. [0082]) the vehicle (transfer vehicles 32, Fig. 1) under the first rack (one of racks 43) by rotating (the vehicles may be maneuvered in a 360° manner, Para. [0010]) the vehicle (transfer vehicles 32) about a vertical axis (at center castor 78, Fig. 13) that extends through the vehicle (transfer vehicles 32); wherein the storage rack (at racks 43, Fig. 1) comprises a plurality of vertical posts (racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) and the first (Fig. 1 showing a guide channel 38 extending under one of the racks 43) and second horizontal paths (Fig. 1 showing another guide channel 38 extending under one of the racks 43) are each spaced apart from the vertical posts (racks 43) a distance greater than one half (as shown in Fig. 1) the length (Fig. 25 showing a length of transfer vehicle 32 from left to right) of the vehicles (transfer vehicles 32); wherein the first horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) under the path (as shown in Fig. 1) is spaced apart from the second horizontal path (Fig. 1 showing another guide channel 38 extending under one of the racks 43) a distance greater than (as shown in Fig. 2) the width (Fig. 25 showing a width of transfer vehicle 32 from top to bottom) of the vehicles (transfer vehicles 32).

Regarding Claim 12, Benedict discloses the system of claim 11 wherein the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) comprises a plurality of rotatable elements (pinions 96) that each rotate about a horizontal axis (axis through pinions 96) and wherein the horizontal drive (wheels 80, Fig. 6) comprises a plurality of rotatable elements (wheels 80) that each rotate about a horizontal axis (axis through wheels 80) transverse (as shown in Figs. 6, 7) the axes of rotation (axis through pinions 96, Fig. 7) of the vertical drive elements (selectively deployable drive gears or pinions 96).

Regarding Claim 13, Benedict discloses the system of claim 12 wherein the plurality of vertical posts (racks 43, Fig. 1) form a first column (Fig. 3 showing columns of vertically spaced bins 40; vertically spaced storage bins 40, Para. [0061]) of the first storage rack (one of racks 43, Fig. 1) and wherein the vehicles (transfer vehicles 32) have a first width (as shown in Fig. 12) extending from a first side (left side of one of transfer vehicles 32, Fig. 7) of the vehicle (one of transfer vehicles 32) to a second side (right side of one of transfer vehicles 32) of the vehicle (one of transfer vehicles 32) and wherein the vertical drive (selectively deployable drive gears or pinions 96) of the vehicle (one of transfer vehicles 32) projects outwardly from the first side (left side of one of transfer vehicles 32) and the second side (right side of one of transfer vehicles 32) so that the vehicle (one of transfer vehicles 32) has a second width (as shown in Fig. 11) corresponding to the distance between outer edges of the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) so that the second width (as shown in Fig. 11) is greater than the first width (as shown in Fig. 12) and wherein the vertical posts (racks 43, Fig. 1) of the first column (Fig. 3 showing columns of vertically spaced bins 40) are spaced apart a distance greater than (as shown in Fig. 7) the first width (as shown in Fig. 12) and less than the second width (as shown in Fig. 11).

Regarding Claim 14, Benedict discloses the system of claim 11 wherein the track (at teeth 51, Fig. 7) comprises drive elements (teeth 51) configured to cooperate with the vertical drive (selectively deployable drive gears or pinions 96) so that rotating the vertical drive (selectively deployable drive gears or pinions 96) about a horizontal axis (axis through pinions 96) operates to drive the vehicle (one of transfer vehicles 32) upwardly (as shown in Figs. 3, 4) along the track (at teeth 51, Fig. 7).

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Regarding Claim 17, Benedict discloses a method for delivering items to storage locations and retrieving items from storage locations (Figs. 1-31; Para. [0056] regarding article handling, storage and distribution systems used in a storage environment), comprising the steps of: providing a vehicle (one of transfer vehicles 32, Fig. 1) having a horizontal drive (wheels 80, Fig. 6) and a vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) comprising a forward rotatable element (left pinions 96) adjacent a front end (left end of one of transfer vehicles 32) of the vehicle (one of transfer vehicles 32) and a rearward rotatable element (right pinions 96) adjacent a rear end (right end of one of transfer vehicles 32) of the vehicle (one of transfer vehicles 32); providing a first vertical track (at left teeth 51, Fig. 7, the tracks or racks 43 . . . identical to those which will be described for use on opposite sides or at the corners of the trunks 33 and 34, Para. [0061]) on a first side (as shown in Fig. 7) of a first column (Fig. 3 showing columns of vertically spaced bins 40) wherein the first vertical track (at left teeth 51, Fig. 7) has drive elements (left teeth 51) configured to cooperate with the forward rotatable element (left pinions 96) to drive the vehicle (one of transfer vehicles 32) upwardly (as shown in Figs. 3, 4); providing a second vertical track (at right teeth 51, Fig. 7) on second side (as shown in Fig. 7) of the first column (Fig. 3 showing columns of vertically spaced bins 40) wherein the second vertical track (at right teeth 51, Fig. 7) has drive elements (right teeth 51) configured to cooperate with rearward rotatable element (right pinions 96) to drive the vehicle (one of transfer vehicles 32) upwardly (as shown in Figs. 3, 4), wherein the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) and the first (at left teeth 51) and second vertical tracks (at right teeth 51) are configured so that the vertical track (at left and right teeth 51) impedes displacement of the vehicle (one of transfer vehicles 32) along a horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43; guide channels . . . for guiding the load transfer vehicles . . . the guide channels are shown at 38 as being generally linear channels which intersect perpendicularly with respect to one another, Para. [0114]) when the vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) is rotated into a position of misalignment (Fig. 7 showing passing transfer vehicle 32 through only with alignment between pinions 96 and teeth 51; properly align the pinion into meshed engagement with the teeth, Para. [0089]); aligning (properly align the pinion into meshed engagement with the teeth, Para. [0089]) the vertical drive (selectively deployable drive gears or pinions 96), wherein the step of aligning (properly align, Para. [0089]) comprises the steps of: rotating the forward rotatable element (left pinions 96) about a horizontal axis (axis through left pinions 96) substantially parallel with the horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) to align (properly align, Para. [0089]) the forward rotatable element (left pinions 96, Fig. 7) with gaps (between teeth 51) in the first (at left teeth 51) and second vertical tracks (at right teeth 51); and rotating the rearward rotatable element (right pinions 96) about a horizontal axis (axis through right pinions 96) substantially parallel with the horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) to align (properly align, Para. [0089]) the rearward rotatable element (right pinions 96, Fig. 7) with gaps (between teeth 51) in the first (at left teeth 51) and second vertical tracks (at right teeth 51); after the step of aligning (properly align, Para. [0089]), driving the vehicle (one of transfer vehicles 32, Fig. 1) along the horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) toward the first vertical track (at left teeth 51, Fig. 7), wherein the step of driving (as shown in Fig. 1) comprises driving the vehicle (one of transfer vehicles 32) so that the forward rotatable element (left pinions 96, Fig. 7) passes through the gaps (between teeth 51) in the second vertical track (at right teeth 51); continuing to drive the vehicle (one of transfer vehicles 32) along the horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) to position the forward rotatable element (left pinions 96, Fig. 7) in operative engagement with first track (at left teeth 51) and the rearward rotatable element (right pinions 96) in operative engagement with the second track (at right teeth 51); rotating the forward (left pinions 96) and rearward rotatable elements (right pinions 96) to drive the vehicle (one of transfer vehicles 32) upwardly (as shown in Figs. 3, 4) toward a first storage location (one of storage bins 40, Fig. 5); transferring a first item (at pallets 31) from the first storage location (one of storage bins 40) to the vehicle (one of transfer vehicles 32); driving the vehicle (one of transfer vehicles 32) down (descending, Para. [0018]) with the first item (at pallets 31); driving (as shown in Fig. 1) the vehicle (one of transfer vehicles 32) with the first item (at pallets 31, Fig. 3) along the horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) so that the rearward rotatable element (right pinions 96, Fig. 7) passes through gaps (between teeth 51) in the first vertical track (at left teeth 51).

Regarding Claim 18, Benedict discloses the method of claim 17 wherein the step of rotating the forward (left pinions 96, Fig. 7) and rearward rotatable elements (right pinions 96) comprises synchronously driving (the drive pinions 96 are in engagement with the teeth . . . output from the motors 107 is fully synchronized, Para. [0091]) the forward (left pinions 96) and rearward rotatable elements (right pinions 96) to drive the vehicle (one of transfer vehicles 32) vertically upwardly (as shown in Figs. 3, 4) while maintaining the orientation of the vehicle (one of transfer vehicles 32, Fig. 4) relative to the horizon (as shown in Figs. 3, 4).

Regarding Claim 19, Benedict discloses the method of claim 17 comprising the step of driving (as shown in Fig. 1) the vehicle (one of transfer vehicles 32, Fig. 1) out from under the track (at left and right teeth 51, Fig. 7) after the step of driving the vehicle (one of transfer vehicles 32, Fig. 3) with the first item (at pallets 31) along a horizontal path (Fig. 1 showing a guide channel 38 extending under one of the racks 43).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Regarding Claim 23, Benedict discloses a method for delivering items to storage locations and retrieving items from storage locations (Figs. 1-31; Para. [0056] regarding article handling, storage and distribution systems used in a storage environment), comprising the steps of: providing a plurality of storage racks (at racks 43, Fig. 1, the tracks or racks 43 provided along the vertical faces of each side of the bins, Para. [0061]) spaced apart from one another forming a plurality of aisles (at aisle spacings 41, Fig. 2, the aisle spacing 41, between adjacent rows 42, Para. [0061]), wherein each storage rack (at racks 43, Fig. 1) comprises a plurality of columns (Fig. 3 showing columns of vertically spaced bins 40; vertically spaced storage bins 40, Para. [0061]) and each column (Fig. 3 showing columns of vertically spaced bins 40) comprises a plurality of storage locations (at storage bins 40); providing a plurality of delivery vehicles (transfer vehicles 32, Fig. 1) wherein each vehicle (transfer vehicles 32) comprises a horizontal drive system (wheels 80, Fig. 6) operable to drive the vehicle (transfer vehicles 32) along a horizontal surface (storage level 35, Fig. 1), a vertical drive (selectively deployable drive gears or pinions 96, Fig. 7) operable to drive the vehicle (transfer vehicles 32) vertically (as shown in Fig. 7) and a transfer mechanism (loading and off-loading assemblies 200, Fig. 6) operable to transfer an item (at pallets 31) between the vehicle (transfer vehicles 32) and one of the storage locations (at storage bins 40, Fig. 3); driving (as shown in Fig. 1) a first of the vehicle (one of transfer vehicles 32) under one or more of the storage racks (at racks 43) along a path (Fig. 1 showing a guide channel 38 extending under one of the racks 43; guide channels . . . for guiding the load transfer vehicles . . . the guide channels are shown at 38 as being generally linear channels which intersect perpendicularly with respect to one another, Para. [0114]) that crosses one or more aisle (one of aisle spacings 41, Fig. 2), wherein the step of driving the first vehicle (one of transfer vehicles 32, Fig. 1) includes driving the first vehicle (one of transfer vehicles 32) into a first of the columns (Fig. 3 showing columns of vertically spaced bins 40) in a first of the aisles (one of aisle spacings 41, Fig. 2); driving the first vehicle (one of transfer vehicles 32, Fig. 1) vertically upwardly (as shown in Figs. 3, 4) within the first aisle (one of aisle spacings 41, Fig. 4) until the first vehicle (one of transfer vehicles 32, Fig. 1) is adjacent a first of the storage locations (at storage bins 40, Fig. 5); transferring (as shown in Fig. 5) an item (at pallets 31) from the first storage location (one of storage bins 40) to the first vehicle (one of transfer vehicles 32); driving the first vehicle (one of transfer vehicles 32, Fig. 3) vertically downwardly (descending, Para. [0018]) within the first aisle (one of aisle spacings 41); driving the vehicle (one of transfer vehicles 32, Fig. 1) out of the first aisle (one of aisle spacings 41) via a path that extends under at least one of the storage racks (at racks 43).

Regarding Claim 24, Benedict discloses the method of claim 23 wherein the path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) includes a portion passing under one of the racks (one of racks 43) and extending parallel (as shown in Fig. 2) to one of the aisles (one of aisle spacings 41).

Regarding Claim 25, Benedict discloses the method of claim 24 comprising the step of driving (as shown in Fig. 1) a second of the vehicle (another one of transfer vehicles 32) past the first vehicle (one of transfer vehicles 32) under the one rack (one of racks 43) as the first vehicle (one of transfer vehicles 32) is driven along the portion of the path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) under the one of the racks (one of racks 43).

Regarding Claim 26, Benedict discloses the method of claim 23 comprising the step of turning (omni-directional propelling or drive wheels 80 which are pivotally mounted . . . permit the wheels to be steered, Para. [0082]) the vehicle (one of transfer vehicles 32, Fig. 1) while the vehicle (one of transfer vehicles 32) is under one of the racks (at racks 43), wherein the step of turning (omni-directional propelling or drive wheels 80 which are pivotally mounted . . . permit the wheels to be steered, Para. [0082]) comprises turning the vehicle (one of transfer vehicles 32) to align the vehicle (one of transfer vehicles 32) with a path (Fig. 1 showing a guide channel 38 extending under one of the racks 43) perpendicular (as shown in Fig. 2) to the first aisle (one of aisle spacings 41).

Regarding Claim 27, Benedict discloses the method of claim 26 wherein the step of turning (omni-directional propelling or drive wheels 80 which are pivotally mounted . . . permit the wheels to be steered, Para. [0082]) the vehicle (one of transfer vehicles 32, Fig. 1) comprises rotating (the vehicles may be maneuvered in a 360° manner, Para. [0010]) the vehicle (one of transfer vehicles 32) about a vertical axis (at center castor 78, Fig. 13) passing through the vehicle (one of transfer vehicles 32).

Claims 15 and 16 lack an inventive step under PCT Article 33(3) as being obvious over Benedict et al. (hereinafter Benedict) in view of Attabotics Inc. (hereinafter Attabotics).

Regarding Claim 15, Benedict discloses the system of claim 14 wherein the track (at teeth 51, Fig. 7) comprises a lower section (lower portion at teeth 51) and an upper section (upper portion at teeth 51) wherein the drive elements (teeth 51) are spaced apart (as shown in Fig. 7).

Benedict fails to explicitly disclose wherein the spaced apart is spaced apart further in the lower section than the upper section to provide gaps in the lower section.

Attabotics is in the art of storage and retrieval systems (Para. [0002]) and teaches wherein a spaced apart (between frame members 32, Fig. 13) is spaced apart (between frame members 32) further in a lower section (at reduced portions 68') than an upper section (at frame members 32) to provide gaps (along reduced portions 68') in the lower section (at reduced portions 68'). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Benedict with the teaching of Attabotics for the purpose of providing reduced portions of the frame members and thereby ensure that the robotic retrieval vehicle can smoothly roll past the frame members (Attabotics, Para. [0055]).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2020/046562

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Regarding Claim 16, modified Benedict discloses the system of claim 15. Benedict fails to explicitly disclose wherein the gaps are configured to facilitate the vertical drive passing through the gaps without contacting the lower section when the vehicle is driven past the lower section. Attabotics is in the art of storage and retrieval systems (Para. [0002]) and teaches wherein gaps (along reduced portions 68', Fig. 13) are configured to facilitate a vertical drive (pinion wheels 58, Fig. 6) passing through the gaps (along reduced portions 68', Fig. 13) without contacting (enables the wheel units of the robotic retrieval vehicle 36 to roll past the frame member in the space around the reduced portion 68', Para. [0055]) a lower section (at reduced portions 68') when a vehicle (robotic retrieval vehicle 36, Fig. 6) is driven past the lower section (at reduced portions 68', Fig. 13). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Benedict with the teaching of Attabotics for the purpose of providing reduced portions to allow outboard wheels to roll past the frame members and thereby ensure that the robotic retrieval vehicle has good drive traction (Attabotics, Para. [0055]).

Claims 1-19 and 23-27 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Electronic Acknowledgement Receipt

EFS ID:	45229860
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	Material Handling System
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland
Filer Authorized By:	
Attorney Docket Number:	P10808US0
Receipt Date:	15-MAR-2022
Filing Date:	14-AUG-2020
Time Stamp:	13:01:28
Application Type:	Utility under 35 USC 111(a)

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	Information Disclosure Statement (IDS) Form (SB08)	P10808US0_IDS.pdf	612465	no	5
			84cd0635f1eded3a8c5ffaecd169acf80abae ddc		

Warnings:

Information:					
2	Non Patent Literature	ISR_Feb2021.pdf	1355809	no	17
			065265130d14f2dc189a35a81f506b2d674a35ec		
Warnings:					
Information:					
Total Files Size (in bytes):				1968274	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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
16/994,543	08/14/2020	Alexander Stevens	P10808US0

CONFIRMATION NO. 4292

156121
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

PUBLICATION NOTICE



OC000000123476652

Title:Material Handling System

Publication No.US-2021-0047118-A1

Publication Date:02/18/2021

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/994,543	08/14/2020	3659	3160	P06808US0	27	4

156121
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

CONFIRMATION NO. 4292
UPDATED FILING RECEIPT



Date Mailed: 10/22/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Alexander Stevens, Moorestown, NJ;
Joseph Valinsky, Moorestown, NJ;

Applicant(s)

OPEX Corporation, Moorestown, NJ

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/886,602 08/14/2019

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 08/20/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/994,543**

Projected Publication Date: 02/18/2021

Non-Publication Request: No

Early Publication Request: No
Title

Material Handling System

Preliminary Class

477

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/994,543					
APPLICATION AS FILED - PART I											
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY					
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)				
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800				
TOTAL CLAIMS (37 CFR 1.16(j))	27 minus 20 =	*	7			x 100 =	700				
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	*	1			x 480 =	480				
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).						0.00				
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00				
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL	3000				
APPLICATION AS AMENDED - PART II											
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =			OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =			OR	x =	
	Application Size Fee (37 CFR 1.16(s))								OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								OR		
						TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =			OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =			OR	x =	
	Application Size Fee (37 CFR 1.16(s))								OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								OR		
						TOTAL ADD'L FEE			OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** 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 found in the appropriate box in column 1.											



United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

User :C46539

Sale Accounting Date:10/21/2020

Sale Item Reference Number	Effective Date
16994543	10/20/2020

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I20200KE36363317	1051	LATE FILING FEE FOR OATH OR DECLARATION	\$140.00	Salea
I20200KE36363317	1051	LATE FILING FEE FOR OATH OR DECLARATION	\$20.00	Deposit Account

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.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention **MATERIAL HANDLING SYSTEM**

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐

The attached application, or

☒

United States application or PCT international application number 16/994,543

filed on 08/14/2020

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

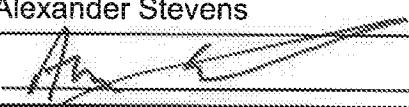
Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Alexander Stevens

Date (Optional)

9/24/20

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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.

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)****Title of
Invention****MATERIAL HANDLING SYSTEM**

As the below named inventor, I hereby declare that:

This declaration
is directed to:☐

The attached application, or

☒United States application or PCT international application number 16/994,543filed on 08/14/2020

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTORInventor: Joseph ValinskyDate (Optional): 10/1/20Signature: [Signature]

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	16994543			
Filing Date:	14-Aug-2020			
Title of Invention:	Material Handling System			
First Named Inventor/Applicant Name:	Alexander Stevens			
Filer:	Stephen Henry Eland			
Attorney Docket Number:	P06808US0			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	7	100	700
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	480	480
Miscellaneous-Filing:				

Petitioners' Exhibit 1002

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
OTHER PUBLICATION PROCESSING FEE	1808	1	140	140
Total in USD (\$)				3140

Electronic Acknowledgement Receipt

EFS ID:	40898547
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	Material Handling System
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland
Filer Authorized By:	
Attorney Docket Number:	P06808US0
Receipt Date:	20-OCT-2020
Filing Date:	14-AUG-2020
Time Stamp:	20:13:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$3140
RAM confirmation Number	E20200JK14493916
Deposit Account	603333
Authorized User	Stephen Eland

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

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)
37 CFR 1.20 (Post Issuance fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	P06808US0_Prelim_Amend.pdf	121776	no	8
			49a58e6567e0dfac3e8c149a06292a3e7c2f98a0		
Warnings:					
Information:					
2	Oath or Declaration filed	P06808US0_signed_declarations.pdf	332453	no	4
			cc87a676d456ab7237f1751847bf4f01ce97d677		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	39913	no	2
			89c23ea6f3007d9a0d43a25671dfd4bb2508be4a		
Warnings:					
Information:					
Total Files Size (in bytes):			494142		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of **Alexander Stevens et al**

Application No. 16/994,543

Confirmation No. 4292

Attorney Docket No. P06808US0

Filed: August 14, 2020

For: Material Handling System

CERTIFICATE OF TRANSMISSION

I hereby certify that this Correspondence is being filed on the date identified below with the United States Patent and Trademark Office via the EFS web system.

October 20, 2020
Date of Certificate

/Stephen Eland /
Stephen Eland

Preliminary Amendment

CLAIMS

Please amend the claims as follows:

1. (Original)A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:

providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations;

providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;

driving a first one of the vehicles to drive the first vehicle to the storage racks;

driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart from the first aisle;

turning the first vehicle while the first vehicle is under the first rack;

driving the vehicle into the first aisle;

driving the first vehicle upwardly in the aisle to a first of the storage locations;

transferring an item between the first vehicle and the first storage location;

driving the first vehicle downwardly in the aisle until the vehicle is on a horizontal surface;

driving the first vehicle across the first aisle after the step of driving the first vehicle downwardly; and

driving the vehicle out from under the storage racks after the step of driving the first vehicle across the first aisle.

2. (Original)The method of claim 1 wherein a plurality of vertical posts form a first column of the first storage rack and wherein the first vehicle has a first width extending from a first side of the first vehicle to a second side of the first vehicle and wherein the vertical drive of the first vehicle projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is

greater than the first width and wherein the vertical posts of the first column are spaced apart a distance greater than the first width and less than the second width.

3. (Original) The method of claim 1 wherein a plurality of vertical tracks segments are attached to vertical posts of the first column and wherein the step of driving the first vehicle into the first aisle comprises aligning the vertical drive of the first vehicle with the vertical track segments.
4. (Original) The method of claim 3 wherein the step of driving the first vehicle into the aisle comprises driving a first portion of the vertical drive through the vertical track segment and driving a second part of the vertical drive into operative engagement with the vertical track segment.
5. (Original) The method of claim 1 wherein the first storage rack is formed of a plurality of vertical posts and the first vehicle has a length and a width and the length is greater than the width and wherein the step of driving the first vehicle along the first path comprises driving the vehicle along a path spaced apart from the vertical posts by a distance greater the half the length of the vehicle.
6. (Original) The method of claim 1 comprising the step of driving the first vehicle to a workstation to present an item to an operator after the step of driving the first vehicle out from under the storage racks.
7. (Original) The method of claim 1 wherein the step of driving the first vehicle across the aisle comprises driving the first vehicle under a second of the storage racks.
8. (Original) The method of claim 1 wherein the step of turning comprises rotating the first vehicle about a vertical axis that extends through the first vehicle.
9. (Original) The method of claim 8 wherein the vertical axis extends through the first path.
10. (Currently Amended) The method of claim 1~~and of claims 1-9~~ comprising the step of driving a second of the vehicles under the first rack along a second path parallel to the first path so that the second vehicle passes the first vehicle as the first vehicle travels along the first path.
11. (Original) A material handling system for delivering items to storage locations and retrieving items from storage locations, comprising:
 - a first storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the first storage rack is longitudinally elongated;
 - a second storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the second storage rack is

longitudinally elongated, wherein the first storage rack is spaced apart from the first storage rack to provide an aisle between the first and second storage racks;

a plurality of delivery vehicles wherein each vehicle has a length and a width and each vehicle comprises:

a horizontal drive system operable to drive the vehicle along a horizontal surface;

a vertical drive operable to drive the vehicle vertically; and

a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;

a track positioned in the aisle wherein the vertical drive is configured to cooperate with the track to drive the vehicle vertically upwardly;

a first horizontal path that extends under the first rack in a direction parallel to the aisle;

a second horizontal path that extends under the first rack in a direction parallel to the aisle;

wherein the horizontal drive is configured to turn the vehicle under the first rack by rotating the vehicle about a vertical axis that extends through the vehicle;

wherein the storage rack comprises a plurality of vertical posts and the first and second horizontal paths are each spaced apart from the vertical posts a distance greater than one half the length of the vehicles;

wherein the first horizontal path under the path is spaced apart from the first horizontal path a distance greater than the width of the vehicles.

12. (Original) The system of claim 11 wherein the vertical drive comprises a plurality of rotatable elements that each rotate about a horizontal axis and wherein the horizontal drive comprises a plurality of rotatable elements that each rotate about a horizontal axis transverse the axes of rotation of the vertical drive elements.
13. (Original) The system of claim 12 wherein the plurality of vertical posts form a first column of the first storage rack and wherein the vehicles have a first width extending from a first side of the vehicle to a second side of the vehicle and wherein the vertical drive of the vehicle projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width and wherein the vertical posts of the first column are

spaced apart a distance greater than the first width and less than the second width.

14. (Original) The system of claim 11 wherein the track comprises drive elements configured to cooperate with the vertical drive so that rotating the vertical drive about a horizontal axis operates to drive the vehicle upwardly along the track.
15. (Original) The system of claim 14 wherein the track comprises a lower section and an upper section wherein the drive elements are spaced apart further in the lower section than the upper section to provide gaps in the lower section.
16. (Original) The system of claim 15 wherein the gaps are configured to facilitate the vertical drive passing through the gaps without contacting the lower section when the vehicle is driven past the lower section.
17. (Original) A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:

providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element adjacent a front end of the vehicle and a rearward rotatable element adjacent a rear end of the vehicle;

providing a first vertical track on a first side of a first column wherein the first vertical track has drive elements configured to cooperate with the forward rotatable element to drive the vehicle upwardly;

providing a second vertical track on second side of the first column wherein the second vertical track has drive elements configured to cooperate with rearward rotatable element to drive the vehicle upwardly, wherein the vertical drive and the first and second vertical tracks are configured so that the vertical track impedes displacement of the vehicle along a horizontal path when the vertical drive is rotated into a position of misalignment;

aligning the vertical drive, wherein the step of aligning comprises the steps of:

rotating the forward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the forward rotatable element with gaps in the first and second vertical tracks; and

rotating the rearward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the rearward rotatable element with gaps in the first and second vertical tracks;

after the step of aligning, driving the vehicle along the horizontal path toward the first vertical track, wherein the step of driving comprises driving the vehicle so that the forward rotatable element passes through the gaps in the second vertical track;

continuing to drive the vehicle along the horizontal path to position the forward rotatable element in operative engagement with first track and the rearward rotatable element in operative engagement with the second track;

rotating the forward and rearward rotatable elements to drive the vehicle upwardly toward a first storage location;

transferring a first item from the first storage location to the vehicle;

driving the vehicle down with the first item;

driving the vehicle with the first item along the horizontal path so that the rearward rotatable element passes through gaps in the first vertical track.

18. (Original) The method of claim 17 wherein the step of rotating the forward and rearward rotatable elements comprises synchronously driving the forward and rearward rotatable elements to drive the vehicle vertically upwardly while maintaining the orientation of the vehicle relative to the horizon.
19. (Currently Amended) The method of claim 17 ~~or 18~~ comprising the step of driving the vehicle out from under the track after the step of driving the vehicle with the first item along a horizontal path.
20. (Currently Amended) The method of claim 17 ~~any of claims 17-10~~ comprising the step of turning the vehicle to a path perpendicular to the horizontal path while the vehicle is under one of the racks.
21. (Currently Amended) The method of claim 17 ~~any of claims 17-20~~ comprising the step of driving the vehicle with the first item to a workstation to present the first item to an operator.
22. (Currently Amended) The method of claim 17 ~~any of claims 17-21~~ wherein the step of driving the vehicle along the horizontal path comprises driving a plurality of horizontal drive elements about a horizontal axis that is substantially perpendicular to the horizontal path.
23. (Original) A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:
 - providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations;
 - providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;

driving a first of the vehicle under one or more of the storage racks along a path that crosses one or more aisle, wherein the step of driving the first vehicle includes driving the first vehicle into a first of the columns in a first of the aisles;

driving the first vehicle vertically upwardly within the first aisle until the first vehicle is adjacent a first of the storage locations;

transferring an item from the first storage location to the first vehicle;

driving the first vehicle vertically downwardly within the first aisle;

driving the vehicle out of the first aisle via a path that extends under at least one of the storage racks.

24. (Original) The method of claim 23 wherein the path includes a portion passing under one of the racks and extending parallel to one of the aisles.
25. (Original) The method of claim 24 comprising the step of driving a second of the vehicle past the first vehicle under the one rack as the first vehicle is driven along the portion of the path under the one of the racks.
26. (Currently Amended) The method of ~~claim 23~~any of claims 23-25 comprising the step of turning the vehicle while the vehicle is under one of the racks, wherein the step of turning comprises turning the vehicle to align the vehicle with a path perpendicular to the first aisle.
27. (Original) The method of claim 26 wherein the step of turning the vehicle comprises rotating the vehicle about a vertical axis passing through the vehicle.

REMARKS

Please amend the claims as set forth above prior to calculating the filing fees.

Respectfully submitted,

OPEX CORPORATION, Applicant

By /Stephen H. Eland/
Stephen H. Eland
PTO Registration No. 41,010
Telephone: (856) 727-1100 x5325

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

PRESORTED
FIRST-CLASS MAIL
U.S. POSTAGE PAID
POSTEDIGITAL
NNNNN

Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057



**Courtesy Reminder for
Application Serial No: 16/994,543**

Attorney Docket No: P06808US0

Customer Number: 156121

Date of Electronic Notification: 08/24/2020

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

kpaul@opex.com

seland@opex.com

To view your correspondence online or update your email addresses, please visit us anytime at **<https://ppair-my.uspto.gov/pair/PrivatePair>**.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET Substitute for Form PTO-1360 (For use with Form PTO/SB/06)							Application Number		Filing Date				
							16994543						
							Applicant(s) Alexander Stevens						
							* May be used for additional claims or amendments						
CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT			*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend		Indep	Depend	Indep	Depend	Indep	Depend
1	1												
2		1											
3		1											
4		1											
5		1											
6		1											
7		1											
8		1											
9		1											
10		9											
11	1												
12		1											
13		1											
14		1											
15		1											
16		1											
17	1												
18		1											
19		2											
20		(1)											
21		(1)											
22		(1)											
23	1												
24		1											
25		1											
26		3											
27		3											
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
Total Indep	4		0		0								
Total Depend	36	↙	0	↙	0	↙							
Total Claims	40		0		0								

51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89							
90							
91							
92							
93							
94							
95							
96							
97							
98							
99							
100							

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/994,543				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	660			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760			
TOTAL CLAIMS (37 CFR 1.16(j))	40 minus 20 =	*	20			x 100 =	2000			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	*	1			x 460 =	460			
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).						0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							820			
				TOTAL		TOTAL	5000			
* If the difference in column 1 is less than zero, enter "0" in column 2.										
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =			x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =			x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE			TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =			x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =			x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE			TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** 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 found in the appropriate box in column 1.										



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
16/994,543	08/14/2020	Alexander Stevens	P06808US0

CONFIRMATION NO. 4292

FORMALITIES LETTER



156121
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057

Date Mailed: 08/24/2020

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Additional claim fees of \$ **3280** as an undiscounted entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.

The surcharge is due for any one of:

- late submission of the basic filing fee, search fee, or examination fee,
- late submission of inventor's oath or declaration,
- filing an application that does not contain at least one claim on filing, or
- submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- \$ **300** basic filing fee.
- \$ **160** surcharge.
- \$ **660** search fee.
- \$ **760** examination fee.
- \$ **460** for **1** independent claims over 3.
- \$ **2000** for **20** total claims over 20.

- \$ 820 for multiple dependent claim surcharge.
- \$(0) previous unapplied payment amount.
- \$ 5160 TOTAL FEE BALANCE DUE.

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Alexander Stevens
Joseph Valinsky

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://portal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

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.

/mtekle michael/



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	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/994,543	08/14/2020	3659	0.00	P06808US0	27	4

CONFIRMATION NO. 4292

FILING RECEIPT

156121
Opex Corporation
305 Commerce Dr
Moorestown, NJ 08057



Date Mailed: 08/24/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Alexander Stevens, Moorestown, NJ;
Joseph Valinsky, Moorestown, NJ;

Applicant(s)

OPEX Corporation, Moorestown, NJ

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/886,602 08/14/2019

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 08/20/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/994,543**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No
Title

Material Handling System

Preliminary Class

477

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1	Remove			
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Alexander		Stevens		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Moorestown	State/Province	NJ	Country of Residence	US

Mailing Address of Inventor:

Address 1	305 Commerce Drive			
Address 2				
City	Moorestown	State/Province	NJ	
Postal Code	08057	Country	US	

Inventor	2	Remove			
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Joseph		Valinsky		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Moorestown	State/Province	NJ	Country of Residence	US

Mailing Address of Inventor:

Address 1	305 Commerce Drive			
Address 2				
City	Moorestown	State/Province	NJ	
Postal Code	08057	Country	US	

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Correspondence Information:Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).Petitioners' Exhibit 1002
Exotec v. Opex; No. IPR2024-00850
U.S. Patent No. 11,472,632; Page 152

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		

☐ An Address is being provided for the correspondence information of this application.

Customer Number	156121		
Email Address	kpaul@opex.com	Add Email	Remove Email
Email Address	seland@opex.com	Add Email	Remove Email

Application Information:

Title of the Invention	Material Handling System		
Attorney Docket Number	P06808US0	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	11	Suggested Figure for Publication (if any)	1

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	156121		

Petitioners' Exhibit 1002

Exotec v. Opex; No. IPR2024-00850

U.S. Patent No. 11,472,632; Page 153

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62886602	2019-08-14
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.					
Applicant	1	Remove			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.					
Clear					
Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor		
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest			
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:					
Name of the Deceased or Legally Incapacitated Inventor:					
If the Applicant is an Organization check here. ☒					
Organization Name	OPEX Corporation				
Mailing Address Information For Applicant:					
Address 1	305 Commerce Drive				
Address 2					
City	Moorestown	State/Province	NJ		
Country	US	Postal Code	08057		
Phone Number		Fax Number			
Email Address					
Additional Applicant Data may be generated within this form by selecting the Add button. Add					

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Stephen Eland/		Date (YYYY-MM-DD)	2020-08-14	
First Name	Stephen	Last Name	Eland	Registration Number	41010
Additional Signature may be generated within this form by selecting the Add button. Add					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P06808US0
		Application Number	
Title of Invention	Material Handling System		

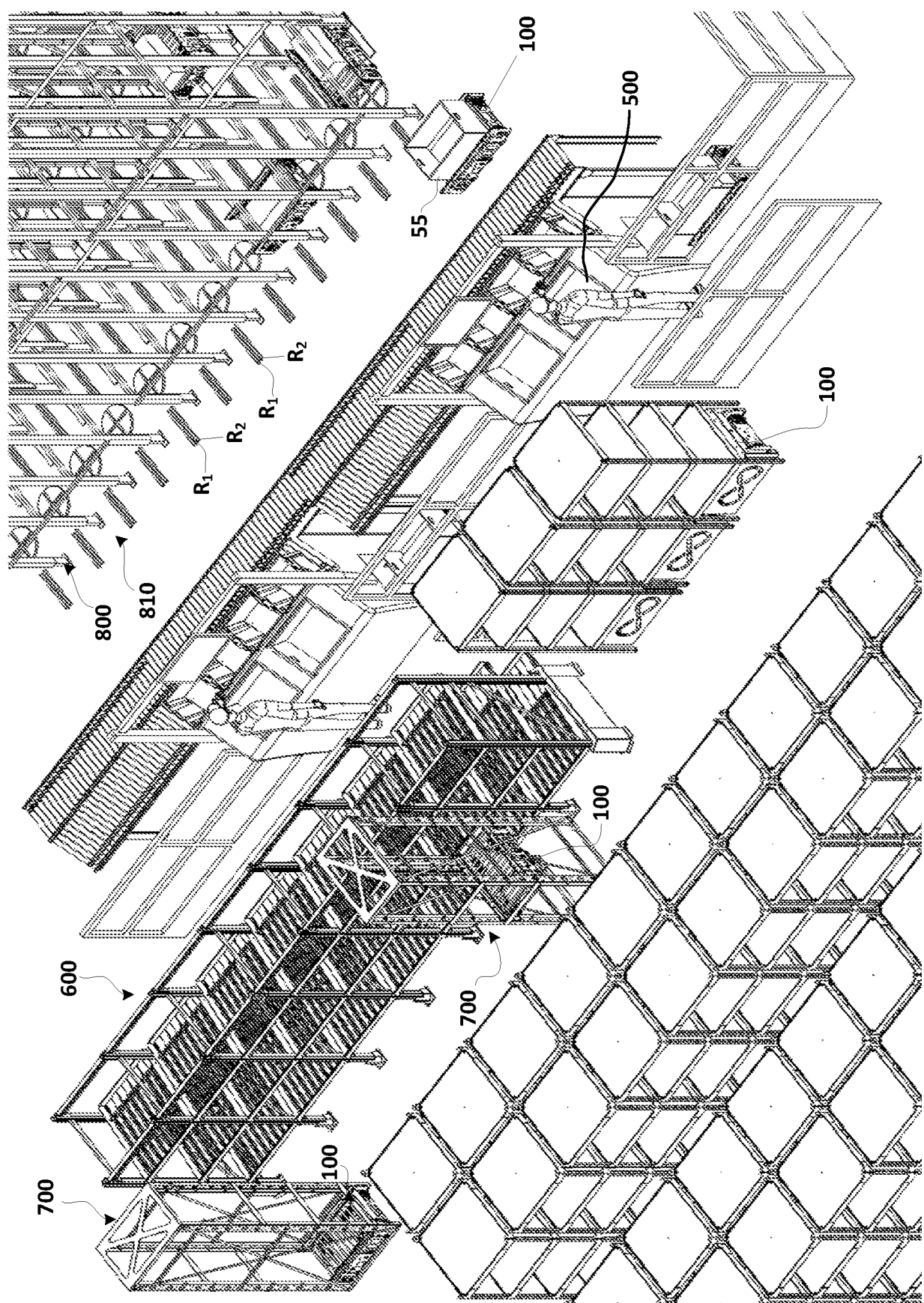
This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



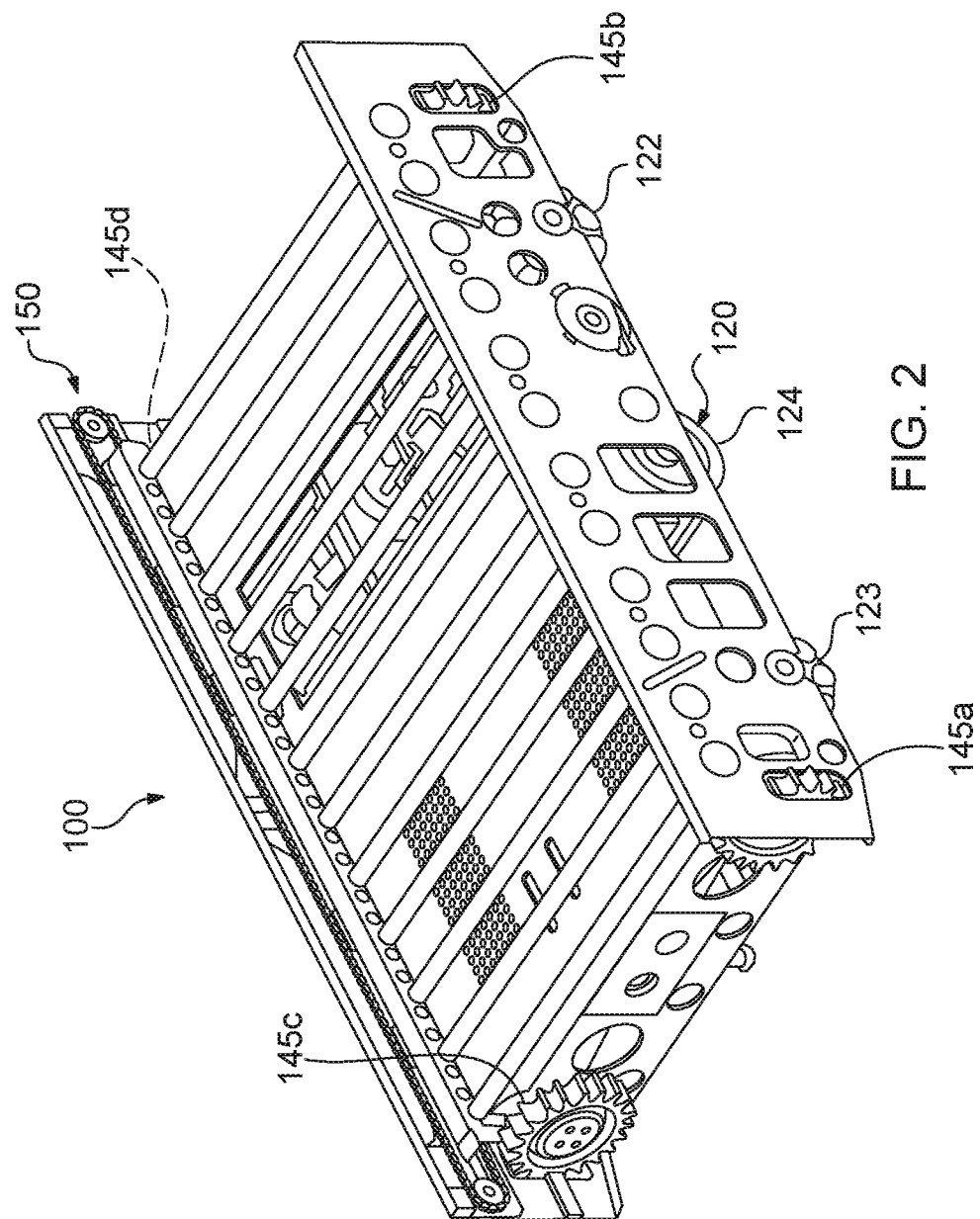


FIG. 2

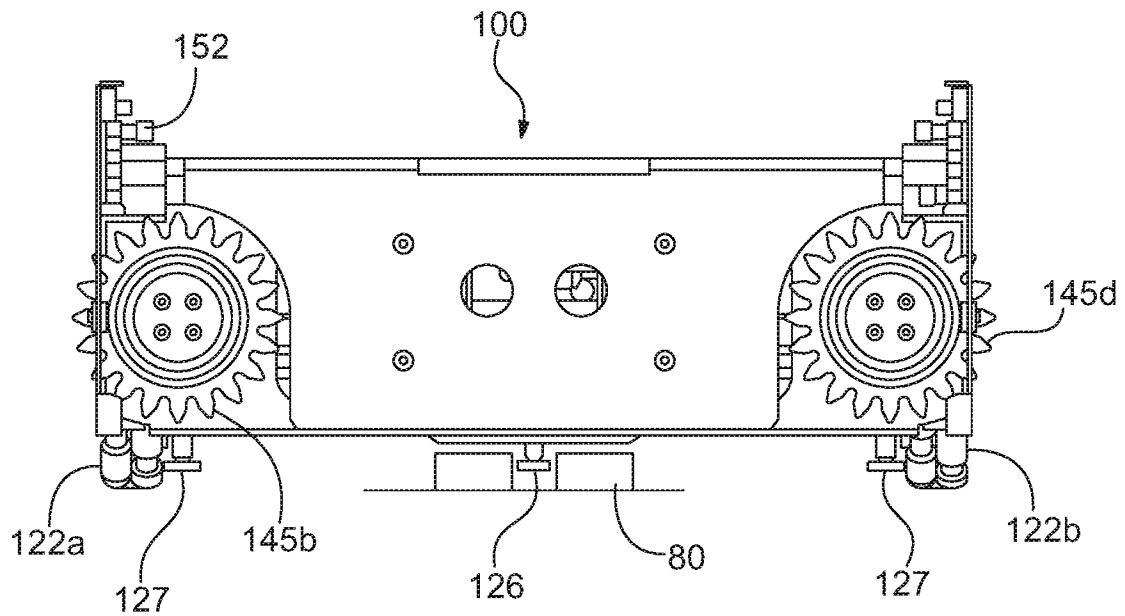


FIG. 3

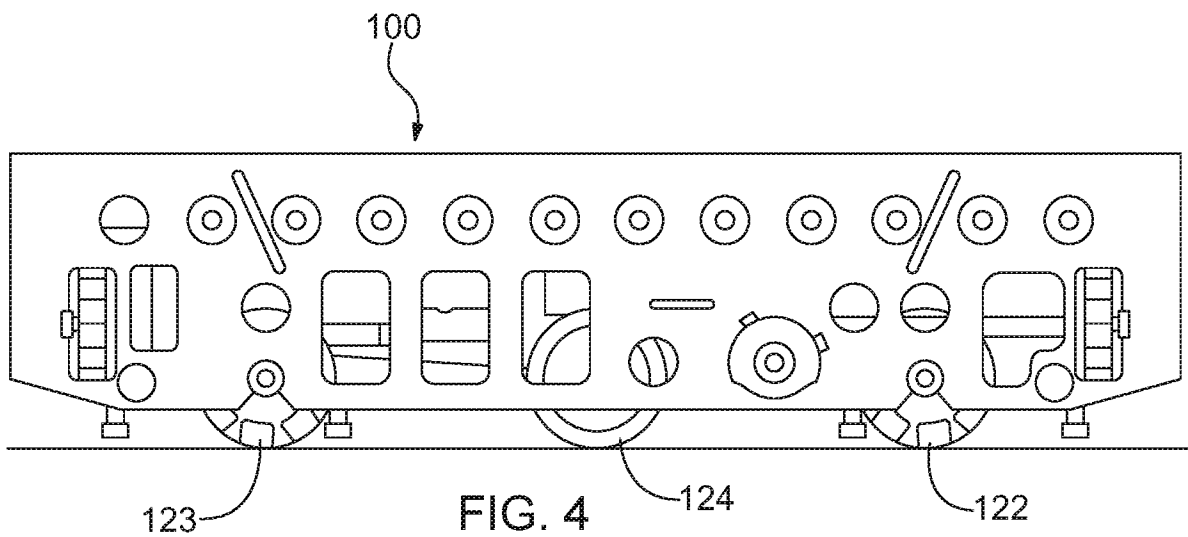


FIG. 4

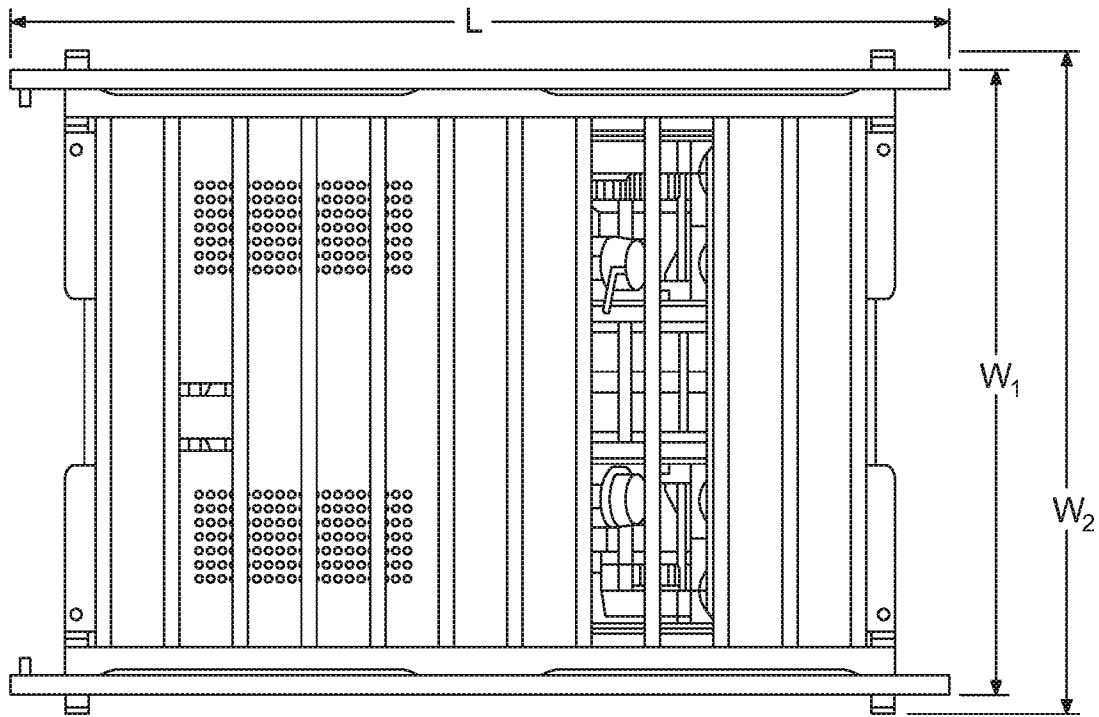


FIG. 5

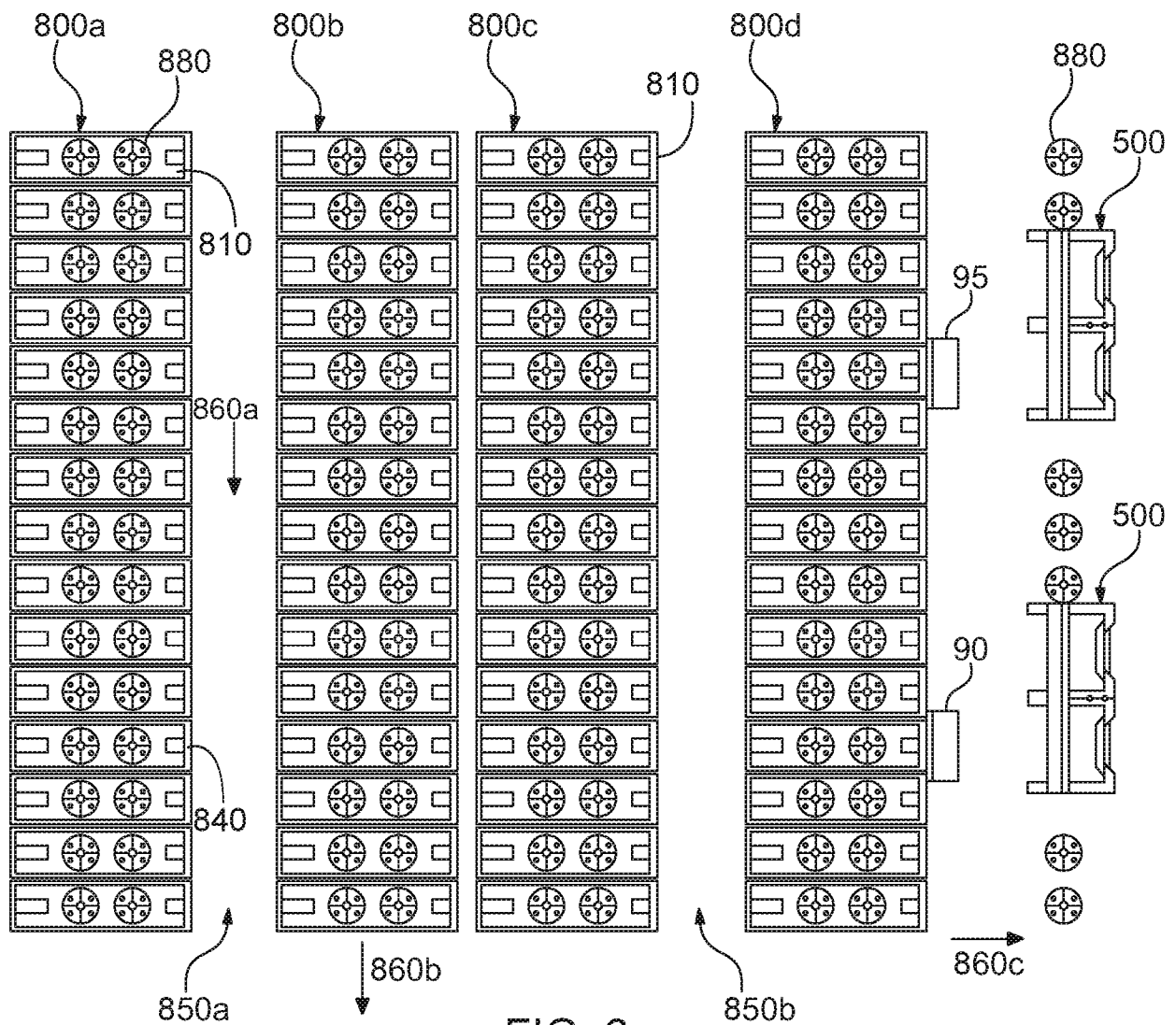


FIG. 6

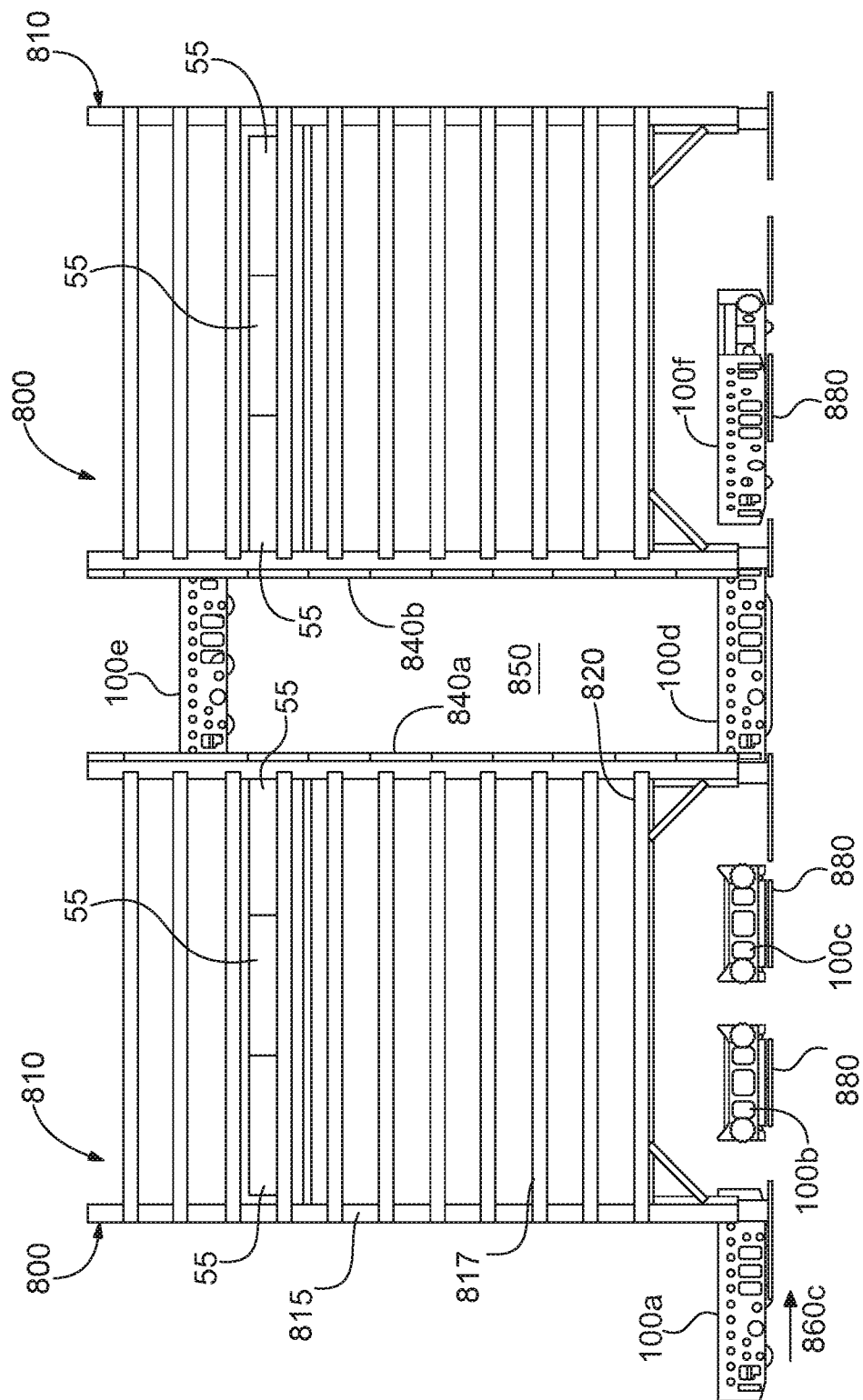


FIG. 7

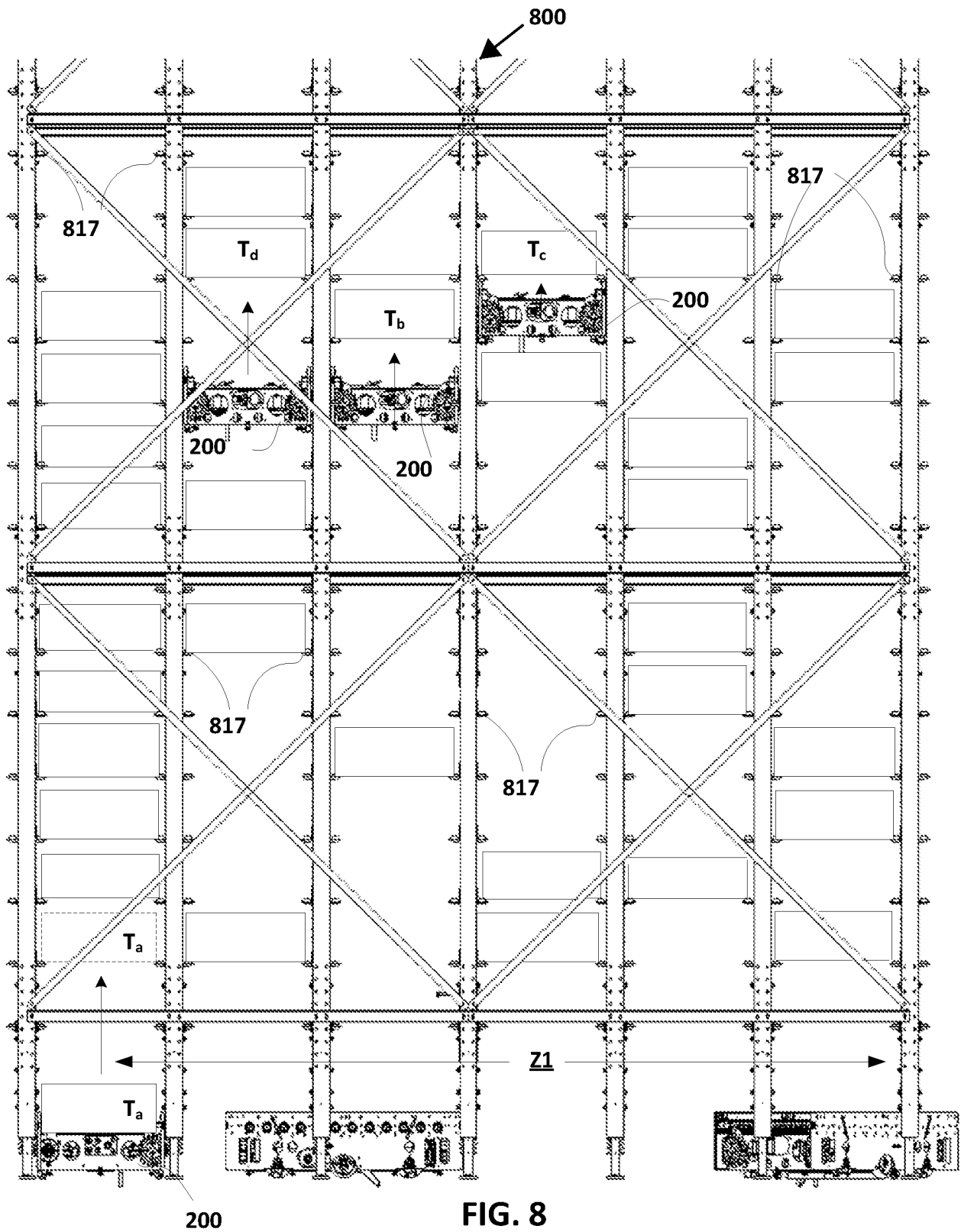
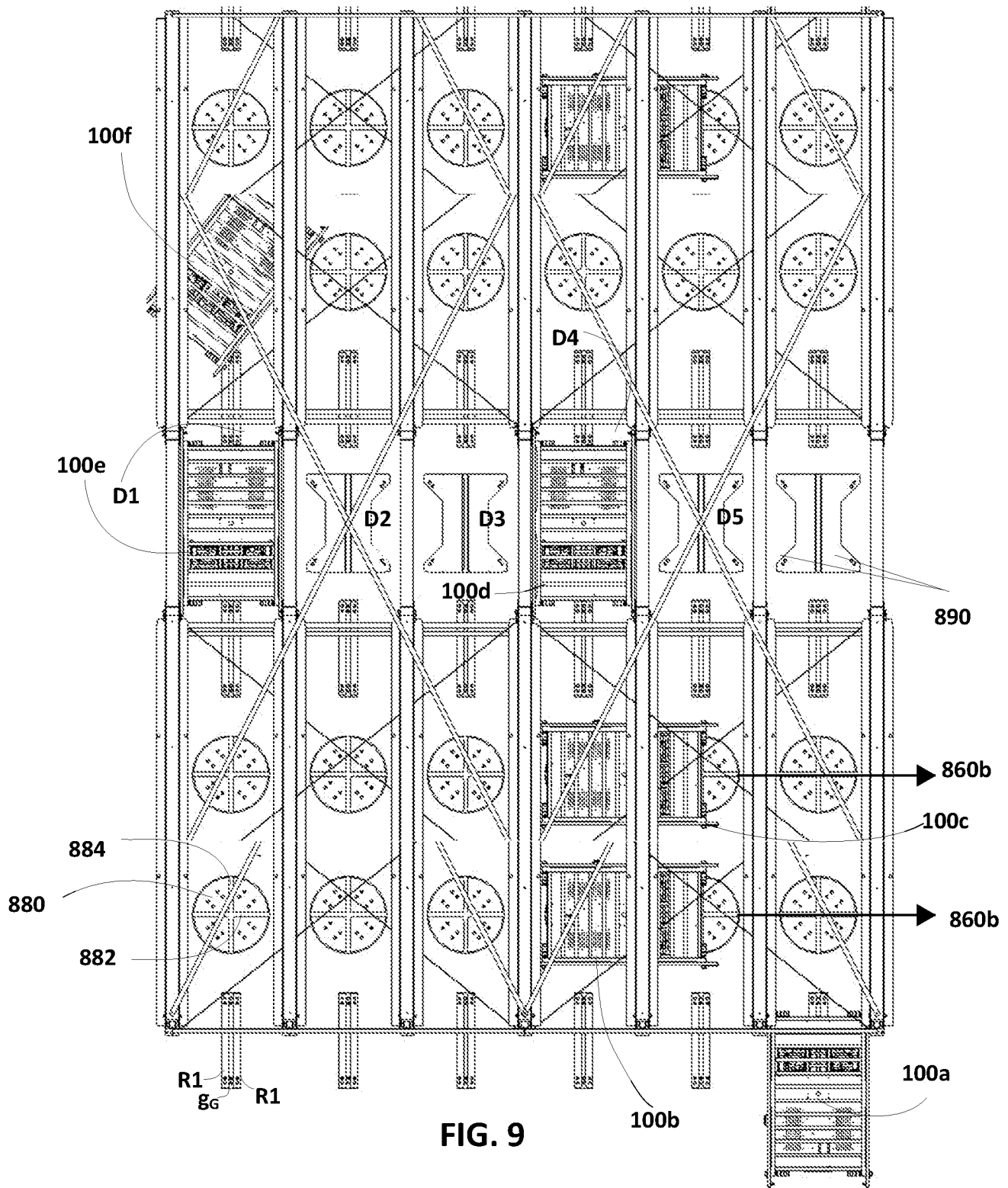


FIG. 8



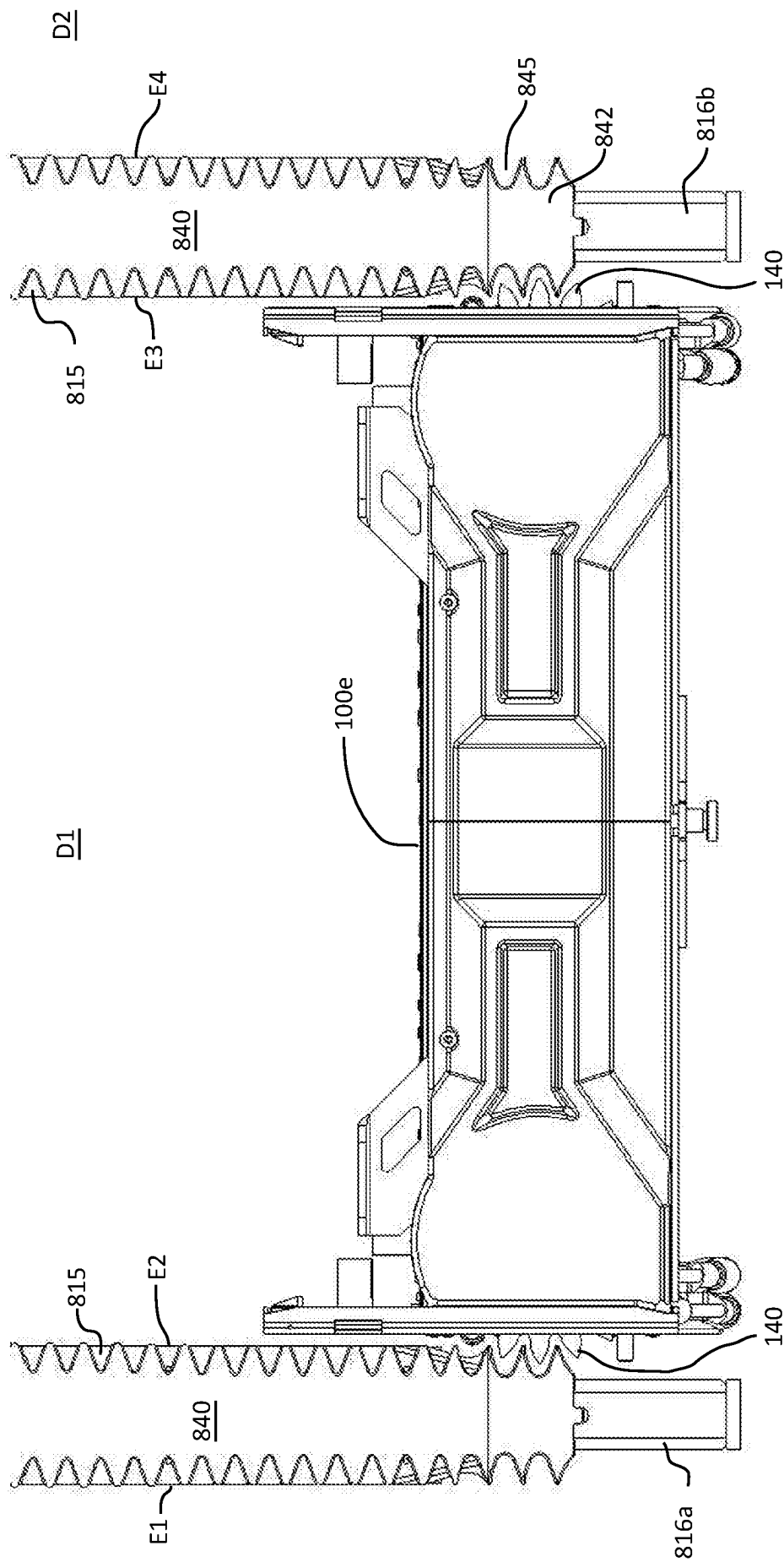


FIG. 10

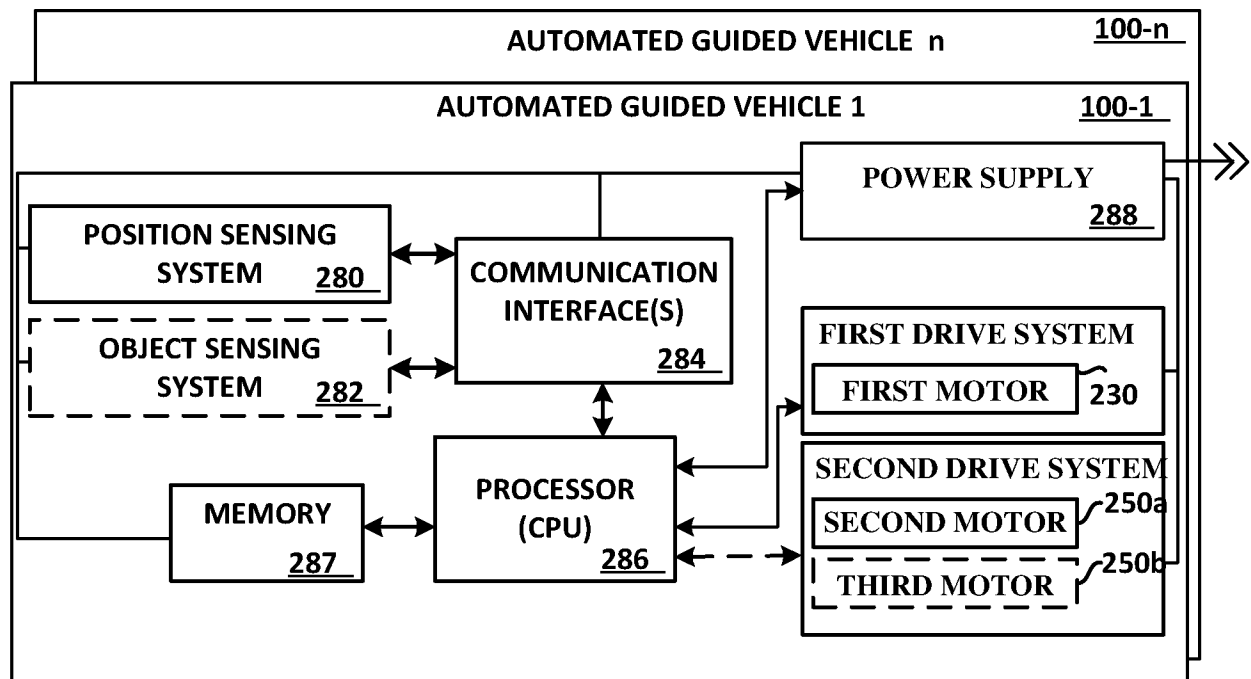


FIG. 11

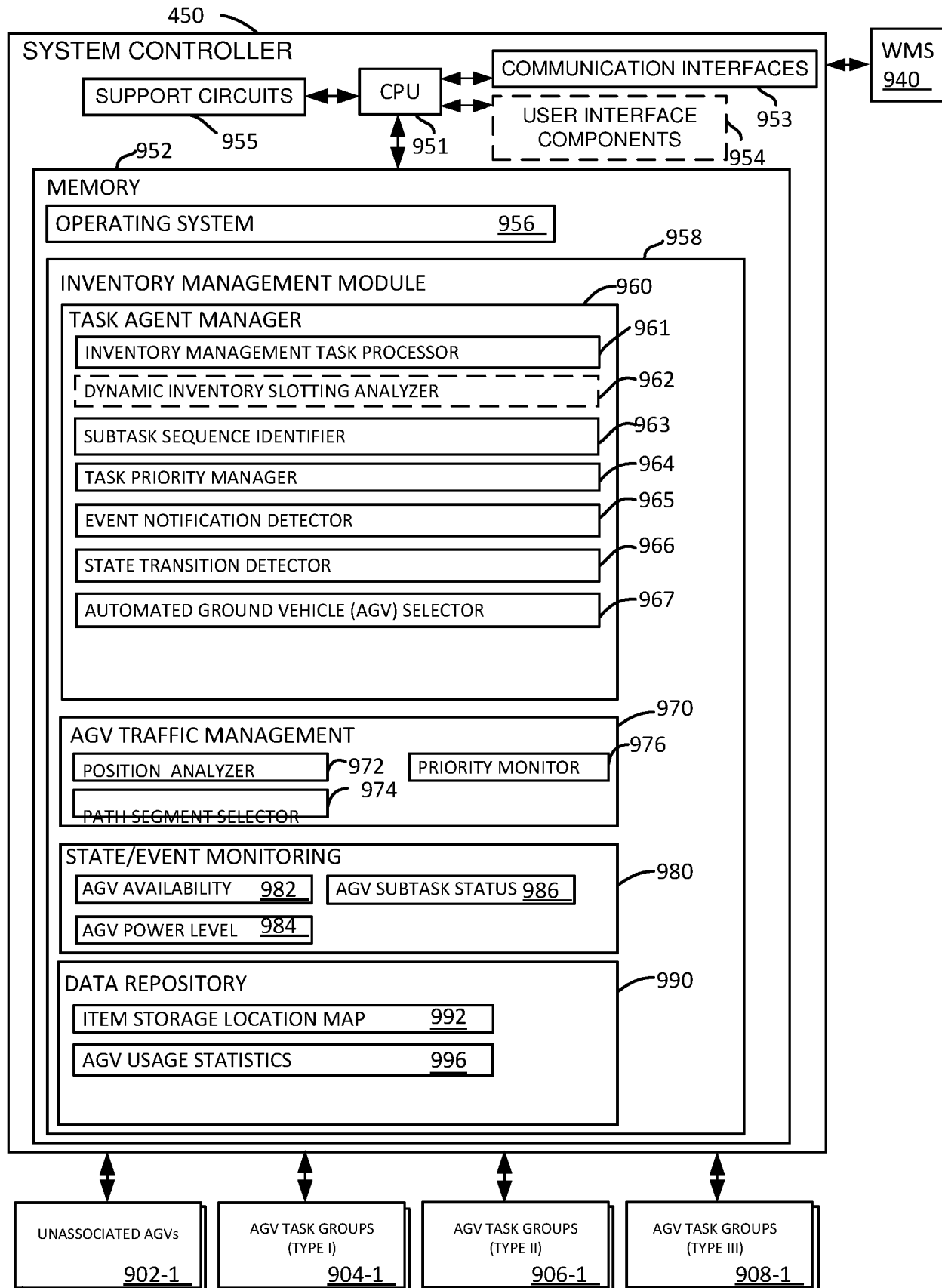


FIG 12

Electronic Acknowledgement Receipt	
EFS ID:	40294223
Application Number:	16994543
International Application Number:	
Confirmation Number:	4292
Title of Invention:	MATERIAL HANDLING SYSTEM
First Named Inventor/Applicant Name:	Alexander Stevens
Customer Number:	156121
Filer:	Stephen Henry Eland
Filer Authorized By:	
Attorney Docket Number:	P06808US0
Receipt Date:	14-AUG-2020
Filing Date:	
Time Stamp:	22:56:23
Application Type:	Utility under 35 USC 111(a)

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	Application Data Sheet	P06808US0_ADS.pdf	1255965	no	8
			7fe4ecc4e696fe6c144dd269e07c84d11135e3b		
Warnings:			Petitioners' Exhibit 1002		

Information:					
2	Drawings-only black and white line drawings	P06808US0_Drawings.pdf	3183575	no	11
			32b1a00adab4472d593efd3221a28daf0ab05f12		
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
3	Specification	P06808US0_Application.pdf	303054	no	40
			8962b27f9e1d8aef0afe6853e3138fc8d885523		
Warnings:					
Information:					
Total Files Size (in bytes):				4742594	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

MATERIAL HANDLING SYSTEM

PRIORITY CLAIM

[0001] This application claims priority under 35 U.S.C. §119 to U.S. Provisional Patent Application No. 62/886,602 filed on August 14, 2019. The entire disclosure of U.S. Appl. No. 62/886,602 is hereby incorporated herein by reference.

FIELD OF THE INVENTION

[0002] Embodiments of the present invention generally relate to automated material and article handling systems which can be used in warehouse, storage and/or distribution environments.

BACKGROUND

[0003] Modern material handling systems, such as those used in mail-order warehouses, supply chain distribution centers, and custom-order manufacturing facilities, face significant challenges in responding to requests for inventory articles. In their incipency, enterprises will generally invest in a level of automation that is at least adequate for current needs. As the scale of an inventory management system expands to accommodate a greater number and variety of articles, however, so too does the cost and complexity of operating it to simultaneously complete the packing, storing, replenishment, and other inventory management tasks for which it is intended.

[0004] Failure to efficiently utilize resources such as space, equipment, and manpower in an inventory management facility results in lower throughput, longer response times, and a growing backlog of unfinished tasks. Greater efficiency may often be achieved, for a time, by incrementally expanding the capacity of the facility's existing automation infrastructure, particularly when that expansion follows a well-conceived plan for growth. Sooner or later, however, a point of diminishing returns is encountered. That is, the achievement of further gains in capacity and/or functionality eventually becomes cost prohibitive as compared to available alternatives, if such gains can be realized at all. When that point of diminishing returns is reached, a facility operator may be forced to abandon pre-existing material handling infrastructure and to replace that infrastructure with a completely new automation platform.

SUMMARY OF THE INVENTION

[0005] The present invention provides a number of inventive aspects that relate to material handling and/or storage and retrieval processes.

[0006] According to one aspect, the present invention provides a method for delivering items to storage locations and retrieving items from storage locations. The method may include the step of providing a plurality of storage racks spaced apart from one another forming a plurality of aisles. Each storage rack may include a plurality of columns and each column may include a plurality of storage locations. The method may also include the step of providing a plurality of delivery vehicles wherein each vehicle includes a horizontal drive system operable to drive the vehicle along a horizontal surface. The vehicles may also include a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations. The method may also include the step of driving a first one of the vehicles to drive the first vehicle to the storage racks. Optionally, the method includes the step of driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart from the first aisle. The method may also include the step of turning the first vehicle while the first vehicle is under the first rack. Additionally, the method includes the step of driving the vehicle into the first aisle and driving the first vehicle upwardly in the aisle to a first of the storage locations. An item may be transferred between the first vehicle and the first storage location. The first vehicle may then be driven downwardly in the aisle until the vehicle is on a horizontal surface. The first vehicle may then be driven across the first aisle and then out from under the storage racks after the step of driving the first vehicle across the first aisle.

[0007] According to another aspect a method for delivering items may include a storage rack having a plurality of vertical posts form a first column of the first storage rack and a first vehicle having a first width extending from a first side of the first vehicle to a second side of the first vehicle. The first vehicle may also include a vertical drive that projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width and wherein the vertical posts of the first column are spaced apart a distance greater than the first width and less than the second width.

[0008] According to yet another aspect, a method for delivering items may include a plurality of vertical tracks segments attached to vertical posts of a first column and the method may include the step of aligning the vertical drive of the first vehicle with the vertical track segments.

[0009] According to another aspect, the present invention may provide a method for delivering items that includes the step of driving a first portion of a vertical drive of a vehicle through a

vertical track segment and driving a second part of the vertical drive into operative engagement with the vertical track segment.

[0010] According to a further aspect, a method for delivering items may include the step of driving a first vehicle along a first path by driving the vehicle along a path spaced apart from the vertical posts by a distance greater than half the length of the vehicle.

[0011] According to yet another aspect, a method for delivering items may include the step of driving a first vehicle to a workstation to present an item to an operator after driving the first vehicle out from under storage racks.

[0012] According to a further aspect, a method for delivering items may include the step of driving the first vehicle across the aisle by driving the first vehicle under a second of the storage racks.

[0013] According to another aspect, a method for delivering items may include the step of turning a vehicle by rotating the vehicle about a vertical axis that extends through the vehicle. Optionally, the vertical axis may extend through the first path.

[0014] According to a further aspect, a method for delivering items may include the step of driving a second vehicle under a first rack along a second path parallel to a first path so that a second vehicle passes the first vehicle as the first vehicle travels along the first path.

[0015] According to a further aspect, a material handling system for delivering items to storage locations and retrieving items from storage locations is provided. The system may include a first storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the first storage rack is longitudinally elongated and a second storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the second storage rack is longitudinally elongated. The first storage rack may be spaced apart from the second storage rack to provide an aisle between the first and second storage racks. Additionally, the system may include a plurality of delivery vehicles. Optionally, each vehicle may have a length and a width and each vehicle include a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically, and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations. The system may also include a track positioned in the aisle. Additionally, the vertical drive may be configured to cooperate with the track to drive the vehicle vertically upwardly. The system may also include a first horizontal path that extends under the first rack in a direction parallel to the aisle and a second horizontal path that extends under the

first rack in a direction parallel to the aisle. Optionally, the horizontal drive is configured to turn the vehicle under the first rack by rotating the vehicle about a vertical axis that extends through the vehicle. Additionally, the storage rack may include a plurality of vertical posts and the first and second horizontal paths may each be spaced apart from the vertical posts a distance greater than one half the length of the vehicles. Further, the first horizontal path under the path may be spaced apart from the first horizontal path a distance greater than the width of the vehicles.

[0016] According to a further aspect a system for delivering items may include a vertical drive having a plurality of rotatable elements that each rotate about a horizontal axis. Additionally, the system may include a horizontal drive that includes a plurality of rotatable elements that each rotate about a horizontal axis transverse the axes of rotation of the vertical drive elements.

[0017] According to yet another aspect, the present invention may provide a system for delivering items that includes a plurality of vertical posts that form a first column of a first storage rack and vehicles that have a first width extending from a first side of the vehicle to a second side of the vehicle. The vertical drive of the vehicle may project outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width. Optionally, the vertical posts of the first column are spaced apart a distance greater than the first width and less than the second width.

[0018] According to a further aspect, a system for delivering items may include a track that includes drive elements configured to cooperate with a vertical drive so that rotating the vertical drive about a horizontal axis operates to drive the vehicle upwardly along the track. Optionally, the track includes a lower section and an upper section wherein the drive elements are spaced apart further in the lower section than the upper section to provide gaps in the lower section.

[0019] The system of claim 15 wherein the gaps are configured to facilitate the vertical drive passing through the gaps without contacting the lower section when the vehicle is driven past the lower section.

[0020] According to an additional aspect, the present invention may provide a method for delivering items to storage locations and retrieving items from storage locations. The method may include the steps of providing a vehicle having a horizontal drive and a vertical drive having a forward rotatable element adjacent a front end of the vehicle and a rearward rotatable element adjacent a rear end of the vehicle and providing a first vertical track on a first side of a first

column. The first vertical track may have drive elements configured to cooperate with the forward rotatable element to drive the vehicle upwardly. The method may also include the step of providing a second vertical track on second side of the first column wherein the second vertical track has drive elements configured to cooperate with rearward rotatable element to drive the vehicle upwardly. The vertical drive and the first and second vertical tracks may be configured so that the vertical track impedes displacement of the vehicle along a horizontal path when the vertical drive is rotated into a position of misalignment. Additionally, the method may aligning the vertical drive that may include the steps of rotating the forward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the forward rotatable element with gaps in the first and second vertical tracks and rotating the rearward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the rearward rotatable element with gaps in the first and second vertical tracks. After the step of aligning, the method may include the step of driving the vehicle along the horizontal path toward the first vertical track. The step of driving may include driving the vehicle so that the forward rotatable element passes through the gaps in the second vertical track. The method may also include the step of continuing to drive the vehicle along the horizontal path to position the forward rotatable element in operative engagement with the first track and the rearward rotatable element in operative engagement with the second track. The forward and rearward rotatable elements may be rotated to drive the vehicle upwardly toward a first storage location. Additionally, a first item may be transferred from the first storage location to the vehicle, the vehicle may be driven downwardly with the item and the vehicle may be driven with the first item along the horizontal path so that the rearward rotatable element passes through gaps in the first vertical track.

[0021] According to yet another aspect, a method of delivery items may include a step of rotating forward and rearward rotatable elements by synchronously driving the forward and rearward rotatable elements to drive the vehicle vertically upwardly while maintaining the orientation of the vehicle relative to the horizon.

[0022] According to yet another aspect, a method of delivery items may include a step of driving a vehicle out from under a track after driving the vehicle with the first item along a horizontal path.

[0023] According to another aspect, a method of delivery items may include a step turning a vehicle to a path perpendicular to the horizontal path that the vehicle was travelling along. Optionally the step of turning may be performed while the vehicle is under one of the racks.

[0024] According to a further aspect, a method of delivery items may include a step of driving the vehicle along the horizontal path. The step of driving may include the step of driving a plurality of horizontal drive elements about a horizontal axis that is substantially perpendicular to the horizontal path.

[0025] According to an additional aspect, a method of delivery items may include the steps of providing a plurality of storage racks and a plurality of delivery vehicles. The storage racks may be spaced apart from one another forming a plurality of aisles and each storage rack may include a plurality of columns and each column may include a plurality of storage locations. Optionally, each vehicle may include a horizontal drive system operable to drive the vehicle along a horizontal surface. Each vehicle may also include a vertical drive operable to drive the vehicle vertically. Optionally, a transfer mechanism may be operable to transfer an item between the vehicle and one of the storage locations. The method may also include the step of driving a first of the vehicle under one or more of the storage racks along a path that crosses one or more aisle. The step of driving the first vehicle may include driving the first vehicle into a first of the columns in a first of the aisles. The first vehicle may be driven vertically upwardly within the first aisle until the first vehicle is adjacent a first of the storage locations. An item may be transferred from the first storage location to the first vehicle. The first vehicle may then be driven vertically downwardly within the first aisle and then driven out of the first aisle via a path that extends under at least one of the storage racks.

[0026] According to yet another aspect, a method of delivery items may include a path that includes a portion passing under one of the racks and extending parallel to one of the aisles. Optionally,, a second vehicle may be driven past the first vehicle under the one rack as the first vehicle is driven along the portion of the path under the one of the racks.

[0027] According to a further aspect, a method of delivery items may include a step of turning the vehicle while the vehicle is under one of the racks. The step of turning may include turning the vehicle to align the vehicle with a path perpendicular to the first aisle. Optionally, the step of turning the vehicle may include rotating the vehicle about a vertical axis passing through the vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] So that the manner in which the above recited features of the present invention can be understood in detail, a more particular description of the invention, briefly summarized above, may be had by reference to embodiments, some of which are illustrated in the appended

drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

[0029] FIG. 1 is a perspective view of a material handling system;

[0030] FIG. 2 is a perspective view of an automated guided of the material handling system illustrated in FIG. 1;

[0031] FIG. 3 is an end view of the vehicle illustrated in FIG. 2;

[0032] FIG. 4 is a side elevational view of the vehicle illustrated in FIG. 2;

[0033] FIG. 5 is a plan view of the vehicle illustrated in FIG. 2;

[0034] FIG. 6 is an enlarged fragmentary perspective view of a rack portion of the material handling system illustrated in FIG. 1;

[0035] FIG. 7 is a front elevational view of an aisle of a rack system of the material handling system illustrated in FIG. 1;

[0036] FIG. 8 is a side elevational view of the aisle illustrated in FIG. 7;

[0037] FIG. 9 is a plan view of the aisle illustrated in FIG. 7;

[0038] FIG. 10 is an enlarged fragmentary side elevational view of the aisle illustrated in FIG. 13A;

[0039] FIG. 11 is a block diagram depicting the subsystems of a plurality of guided vehicles according to one or more embodiments; and

[0040] FIG. 12 is a block schematic diagram of a controller of the system illustrated in FIG. 1.

[0041] While the systems and methods are described herein by way of example for several embodiments and illustrative drawings, those skilled in the art will recognize that systems and methods for performing respective subsets of inventory management tasks using corresponding functional accessory modules are not limited to the embodiments or drawings described. It should be understood that the drawings and detailed description thereto are not intended to limit embodiments to the particular form disclosed. Rather, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the systems and methods for performing respective subsets of inventory management tasks using corresponding functional accessory modules defined by the appended claims. Any headings used herein are for

organizational purposes only and are not meant to limit the scope of the description or the claims. As used herein, the word “may” is used in a permissive sense (i.e., meaning having the potential to), rather than the mandatory sense (i.e., meaning must). Similarly, the words “include”, “including”, and “includes” mean including, but not limited to.

DETAILED DESCRIPTION OF EMBODIMENTS

[0042] Various embodiments of a method and apparatus for performing inventory management tasks in an inventory management system are described. In the following detailed description, numerous specific details are set forth to provide a thorough understanding of claimed subject matter. However, it will be understood by those skilled in the art that claimed subject matter may be practiced without these specific details. In other instances, methods, apparatuses or systems that would be known by one of ordinary skill have not been described in detail so as not to obscure claimed subject matter.

[0043] Some portions of the detailed description that follow are presented in terms of algorithms or symbolic representations of operations on binary digital signals stored within a memory of a specific apparatus or special purpose computing device or platform. In the context of this particular specification, the term specific apparatus or the like may include a general-purpose computer once it is programmed to perform particular functions pursuant to instructions from program software. Algorithmic descriptions or symbolic representations are examples of techniques used by those of ordinary skill in the signal processing or related arts to convey the substance of their work to others skilled in the art. An algorithm is here, and is generally, considered to be a self-consistent sequence of operations or similar signal processing leading to a desired result. In this context, operations or processing involve physical manipulation of physical quantities. Typically, although not necessarily, such quantities may take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared or otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to such signals as bits, data, values, elements, symbols, characters, terms, numbers, numerals or the like. It should be understood, however, that all of these or similar terms are to be associated with appropriate physical quantities and are merely convenient labels.

[0044] Unless specifically stated otherwise, as apparent from the following discussion, it is appreciated that throughout this specification discussions utilizing terms such as “processing,” “computing,” “calculating,” “determining” or the like refer to actions or processes of a specific

apparatus, such as a special purpose computer or a similar special purpose electronic computing device. In the context of this specification, therefore, a special purpose computer or a similar special purpose electronic computing device is capable of manipulating or transforming signals, typically represented as physical electronic or magnetic quantities within memories, registers, or other information storage devices, transmission devices, or display devices of the special purpose computer or similar special purpose electronic computing device.

[0045] Reference will now be made in detail to exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0046] Referring now to the figures in general and to FIG. 1 specifically, an apparatus for sorting or retrieving items is designated generally 10. The apparatus 10 includes one or more mechanisms for delivering items to and/or retrieving items from one of a plurality of locations, such as storage areas located in racks 800 or flow racks 600. The delivery mechanism may include one or more vehicles 100 that transport items. For instance, optionally, the vehicles may retrieve items from storage locations 820 in the racks 800 and deliver the items to a workstation 500 where an operator can retrieve the item from the vehicle. The vehicle may optionally return to a storage area in the rack to store any remaining items that were not retrieved by the operator. The vehicle can then advance to another storage area to obtain the next item to be retrieved. In this way, the system may include a mechanism for continuously storing and retrieving items to/from the various storage areas so that the items can be presented to an operator. Optionally, a guide, such as a track, may be positioned adjacent the rack so that the vehicle may climb the rack vertically to retrieve an item from the rack. Optionally, the system may include a moveable rack 700 that is configured to be transported by the vehicles. The vehicles may transport the moveable rack into position adjacent a storage rack. The vehicle may then climb the rack vertically to transfer items between the vehicle and a storage location in the storage rack.

[0047] It should be understood that various items and subassemblies of the overall system can be used alone or in combination with material handling systems having different structure or operation to the system illustrated in the Figures and described below.

[0048] As illustrated in FIGS. 1 and 7, the material handling system may optionally incorporate one or more storage racks 800. Each storage rack may include a plurality of storage locations

820. Optionally, the storage locations may be arranged into one or more vertical columns 810. For instance, FIG. 1 illustrates a plurality of racks 800 and each rack may include a plurality of columns 810, each of which includes a plurality of storage locations. The items that are handled by the system may be stored directly in the storage locations. Alternatively, the items may be stored in bins or totes 55 and the storage locations 820 may be configured to store the totes 55 as shown in FIG. 1 and 6-9. Accordingly, it should be understood that unless stated otherwise in the following description, when a tote is mentioned, the term tote is broad enough to include a container for containing one or more items as well as simply being an item that is not necessarily contained in a container. Although the present system is described as using totes, it should be understood that any of a variety of storage mechanisms can be used, such as pallets or similar platforms.

Vehicles

[0049] Figure 2 illustrates details of one of the vehicles 100 that are shown in FIG. 1. As noted above, if the system incorporates vehicles, the structure of the vehicle may vary. Accordingly, it should be understood that each of the vehicle's features discussed below are optional features that may be varied or eliminated depending on the application.

[0050] The vehicles 100 may be autonomous systems that include an onboard power supply for driving the vehicle. The vehicles may also include a communication system for wirelessly receiving and transmitting control signals between each vehicle and a control element, such as the central controller 450. In this way, the vehicle may receive control signals regarding the location for retrieving an item and the location to which the vehicle is to deliver the item.

[0051] The vehicle illustrated in Figure 2 includes a horizontal drive assembly 120 for driving the vehicle 100 in a horizontal direction. The horizontal drive 120 may be configured to drive the vehicle along a track or along an open horizontal surface, such as a floor. For instance, one option for a horizontal drive includes a plurality of rotatable elements, such as wheels or rollers. One or more drive mechanisms may be provided for turning the rotatable elements. Additionally, the rotatable elements may turn from side to side to steer the vehicle.

[0052] Alternatively, as illustrated in Figures 3-5, the vehicle may have a horizontal drive 120 formed of a plurality of rollers 122, 123, 124 that are rotatable around a first axis, such as around an axle. Additionally, the rollers 122, 123, 124 may be constrained to rotation about a single axis. For example, in the embodiment illustrated in FIGS. 3-5, the horizontal drive 120 includes a pair of central rollers 124 and first and second sets of outer rollers 122, 123. The first

set 122 is positioned forwardly of the central rollers while the second set of rollers 123 is positioned rearwardly of the central rollers 124. The outer rollers 122, 123 may include rollers spaced apart along the length of a horizontal axle so that each set of outer rollers includes a first roller 122a on one side of the vehicle and a second roller 122b on an opposite side of the vehicle as shown in FIG. 3. Additionally, as shown in FIG. 3, each set of outer rollers may include a pair of rollers 122b on each side of the vehicle.

[0053] As noted above, the vehicle 100 may have any of a variety of steering mechanisms for controlling the direction of travel of the vehicle. For example, an optional steering mechanism is a zero-turn mechanism that can turn the vehicle without substantially moving forwardly. Optionally, the zero-turn mechanism provides a means for turning the vehicle about a vertical axis extending through the vehicle.

[0054] The zero-turn mechanism comprises a linkage that allows the wheels or rollers on one side of the vehicle to rotate at a different speed than the wheels or rollers on the opposing side of the vehicle. Optionally, the linkage allows the wheels or rollers on one side of the vehicle to rotate in different directions than the wheels or rollers on the opposing side of the vehicle. In this way, by varying the speed and/or rotational direction of the wheels on one side of the vehicle relative to the speed and/or rotational direction of the wheels on the opposing side of the vehicle, the zero-turn mechanism changes the direction of travel to steer the vehicle.

[0055] Optionally, the system may also include one or more guides 880 to guide or align the vehicles as they travel. For instance, referring to FIG. 9, the guide 880 may include a channel or groove and the vehicle may include a corresponding guide element that cooperates with the guide 880 to control movement of the vehicle 100. One example of a guide element is a follower 126. The follower may be any element configured to engage with or cooperate with the guide 880. In the present instance, the vehicle 100 includes a central follower 126 that includes a rotatable element such as a bearing that rotates about a vertical axis. The central follower 126 engages the channel in the guide 880 to constrain horizontal movement of the vehicle.

[0056] Optionally, the vehicle may also include one or more lateral guide member 127. The lateral guide members 127 may cooperate with an outer surface of the guide 880 to constrain movement of the vehicle. For instance, guides 880 may comprises circular guides having a circumferential surface for guiding the rotation of the vehicles. The vehicle may have a pair of lateral guide members 127 spaced apart from one another a distance equal to the diameter of the circumferential surface of the guide. In this way, the lateral guides 127 engage the

circumferential surface of the guide to constrain the vehicle to rotational motion.

[0057] In addition to the horizontal drive mechanism 120 the vehicle may also include a vertical drive mechanism 140 for driving the vehicle 100 vertically within the rack 20. In particular, as noted above, the system may include a guide mechanism such as a track 840 that is disposed adjacent the rack 20. The vertical drive mechanism 140 may be configured to cooperate with the vertical guide mechanism 840 to drive the vehicle 100 vertically.

[0058] Figures. 2-3 illustrate an exemplary vertical drive 140 that includes a plurality of rotatable gears 145, however, it should be understood that the vertical drive 140 may include any of a number of drive mechanisms for driving the vehicle vertically. Referring to FIG. 3, the vertical drive may include drive gear 145 that rotates about a horizontal axis that is transverse the horizontal axis of rotation of the horizontal drive mechanism 120. In particular, optionally, the vehicle includes a pair of drive gears 145 that are spaced apart from one another so that teeth of a first one of the gears 145b project outwardly from a first side of the vehicle and teeth of a second one of the gears 145d project outwardly from a second side of the vehicle as shown in FIG. 3. These first and second gears 145b,d may be synchronously driven. Additionally, as shown in FIG. 2, the vehicle may include two pairs of vertical drive elements that are spaced apart from one another along the length of the vehicle. In particular, optionally, the vehicle includes a first pair of vertical drive elements 145a,c at a first end of the vehicle and a second pair of vertical drive elements 145b,d at a second end of the vehicle.

[0059] Referring to FIGS. 1 and 6-7, the rack 20 may be configured so that the track 40a on one rack is spaced apart from the track 40b on a second rack a distance corresponding to the spacing between the first set of vertical drive elements 145a and the second set of drive elements 145b. In this way, the first vertical drive element 145a may cooperate with the first track 40a to drive the vehicle up the first track 40a, while the second vertical drive element 145b may cooperate with the second track 40b to drive the vehicle up the second track 40b. Optionally, the two vertical drive elements 145a,b are synchronously driven so that the vehicle maintains a horizontal orientation as the vehicle moves from horizontal movement to vertical movement.

[0060] As described in U.S. Provisional Patent application no. 62/886,602, the entire disclosure of which is hereby incorporated by reference, the vertical drive 140 may optionally be configured so that vertical drive has a width that remains substantially constant as the vehicle transitions from horizontal movement to vertical movement. In this way, the vertical drive 140

need not telescope or extend outwardly to transition from horizontal driving to vertical driving. For example, referring to FIGS. 2-3 forward climbing gears 145b and 145d each have a horizontal axis of rotation and the spacing between the horizontal axis of rotation of drive member 145b is fixed relative to the horizontal axis of rotation of drive member 145d while the vehicle is moving horizontally and while the vehicle is climbing.

[0061] The vehicle may also include an optional transfer mechanism for transferring items between the vehicle and a destination, such as a storage location.

[0062] For instance, the transfer mechanism 150 may be operative to transfer an item between a platform surface of the vehicle and one of the plurality of destination areas 820. As shown in FIG. 2, the platform surface is optionally defined by the exterior surfaces of a plurality of rollers.

[0063] The transfer mechanism 150 may be any of a variety of mechanisms for loading items onto the vehicle and for unloading items from the vehicle into one of the storage areas. Additionally, the transfer mechanism 150 may be specifically tailored for a particular application. In the present instance, the transfer mechanism 150 comprises one or more displaceable element(s) configured to engage an item stored at a storage location and pull the item onto the vehicle. More specifically, in the present instance, the vehicle includes one or more displaceable element(s) configured to move toward a tote in a storage location and releasably engage the tote. After the displaceable element(s) engage the tote, each displaceable element is displaced away from the storage location, thereby pulling the tote onto the vehicle 100.

[0064] The displaceable element of the transfer mechanism may any of a variety of items, such as a bar, rod, or another element configured to engage an item, for example, a tote. For example, referring to FIGS. 2-3, the transfer mechanism 150 may include one or more displaceable pins 152. Additionally, the transfer mechanism may include a drive element for displacing the pins 152. For instance, optionally, the transfer mechanism 150 includes two drive elements in the form of endless carriers such as a drive belt or as shown drive chains 154. Optionally, each pin 152 projects or extends inwardly toward the longitudinal center line of the vehicle. The transfer mechanism is preferable configured to cooperate one of the totes to releasably engage the tote. For example, in the present instance, the pins 152 are configured to mate with a recess on the tote so that the transfer mechanism can engage the tote. However, it should be recognized that the transfer mechanism may include any of a variety of elements for engaging items to be transferred onto or off of the vehicle.

[0065] The vehicle includes one or more drive elements for driving the transfer mechanism.

Optionally, the vehicle includes one or more motors that drive the transfer mechanism 150. For instance, one or more motors of the vehicle drive system may drive the chains 154 to selectively move the chains and pins 152 toward or away from storage locations.

[0066] As the vehicle approaches a storage location to retrieve a tote, the chains may drive the displaceable pins 152 toward the storage location so that the pins underlie a groove or notch in the bottom of the tote. The vehicle travels a small distance upward until the pins 152 are disposed with the groove or notch of the tote. The chain 154 then reverses so that the pins 152 move away from the storage location. Since the pins engage the tote within the notch, when the pins move away from the storage location, the pins pull the tote onto a surface of the vehicle. In this way, the transfer mechanism 150 is operable to retrieve items from a storage location. Similarly, to store an item in a storage location 820, the chains 154 of the transfer mechanism 150 drives the pins 152 toward the storage location until the item is in the storage location. The vehicle then moves downwardly to disengage the pins from the tote, thereby releasing the tote.

[0067] In this instance, as seen in FIG. 7, two or more totes, such as totes 55, may be coupled and decoupled from one another using mating connectors. Optionally, totes 55 may be coupled and decoupled from one another through a series of lifting and separating movements implemented by movement of the vehicle 100. Optionally, the transfer mechanism 150 may be actuated to pull a forward facing ("lead") tote onto a surface of the vehicle so as to be fully supported by vehicle 100. If the totes are releasably connected, this pulling motion advances the trailing tote (i.e., the one that is immediately behind the lead tote) into the aisle facing location. Optionally, the vertical drive mechanism of vehicle 100 is then operated to drive the vehicle 100 vertically to uncouple the lead tote from the trailing tote(s). Once decoupling is completed, the drive system may be actuated again to center the tote upon the vehicle 100.

[0068] The vehicle 100 may include a separate drive element for driving the transfer mechanism 150. Alternatively, the transfer mechanism may be interconnected with one of the horizontal or drive elements of the vehicle. Specifically, the transfer mechanism may be connected with one of the drive systems so that the drive system is selectively operable between driving the vehicle and driving the transfer mechanism.

[0069] For instance, the transfer mechanism may optionally be connected with one of the horizontal drive systems with a selectable connection so that in a first orientation the drive system drives the vehicle horizontally and in the second orientation the drive system drives the transfer mechanism. The optional clutch mechanism may be selectively engaged and disengaged to

initiate and terminate transmission of power, respectively, from the motor(s) of the horizontal drive system to the transfer mechanism, whereby the second drive system may be operated independently of the transfer mechanism. In this instance, the clutch mechanism may be configured as two clutch sub-assemblies which are symmetrically arranged relative to a longitudinal centerline of vehicle 100.

[0070] The vehicle 100 may be semi-autonomous or, alternatively, fully autonomous. In the latter regard, a multitude of non-contact systems have been proposed for the purpose of continuously determining the actual position of an automated guided vehicle in absolute coordinates, and resetting navigational parameters (i.e., X, Y, and heading) to null out accumulated errors, thereby re-referencing the vehicle. Any of these may be utilized in the implementation of position referencing for automated guided vehicles in an inventory management system consistent with embodiments of the present disclosure. Such referencing systems can be ultrasonic, RF, or optical in nature, with ultrasonic and optical being especially suited to indoor scenarios. Of these latter two categories, optical systems are generally more accurate and therefore more widely employed in commercial practice.

[0071] Exemplary position sensing systems utilize a scanning mechanism that operates in conjunction with fixed-location references strategically placed at pre-defined surveyed sites. Such scanning mechanisms may include scanning detectors with fixed active-beacon emitters, scanning emitter/detectors with passive retroreflective targets, scanning emitter/detectors with active transponder targets, and rotating emitters with fixed detector targets.

[0072] In one or more illustrative embodiments consistent with the present disclosure, the vehicles may optionally rely on a scanning laser triangulation scheme (SLTS) to provide positional updates to an onboard dead-reckoning system of the vehicle. A laser emitter rotating at, for example, two rpm illuminates passive retroreflective barcode targets affixed to walls or support columns at known locations on the order of fifteen meters away from the vehicle. The barcodes are used to positively identify the reference target and eliminate ambiguities due to false returns from other specular surfaces within the operating area. An onboard computer of each vehicle calculates X-Y positional updates through simple triangulation to null out accumulated dead-reckoning errors.

[0073] Alternatively, each vehicle 100 may optionally utilize retroreflective targets, distributed throughout the operating area, in a manner which allows both range and angular orientation to be determined by each vehicle. For example, a servo-controlled rotating mirror on the vehicle

may optionally pans a near-infrared laser beam through a horizontal arc of 90 degrees at, for example, a 20-Hz update rate. When the beam sweeps across a target of known dimensions, a return signal of finite duration is sensed by the detector. Where the retroreflective targets are all the same size, the signal generated by a close target will be of longer duration than that from a distant one. Angle measurement is initiated when the scanner begins its sweep from right to left, where detection of the reflected signal terminates the timing sequence.

[0074] As yet another position reference technique which may be employed in the vehicle is a laser-based scanning beacon system computes vehicle position and heading using cooperative electronic transponders with passive reflectors. Such a scanner mechanism includes a rotating mirror attached at, for example, a 45-degree angle to the vertical shaft of an incremental optical encoder. To improve azimuthal accuracy, optionally a timer interpolates between encoder counts. The fan-shaped beam diverges vertically at, for example, a four-degree spread angle, to ensure target detection at long range while traversing irregular floor surfaces. Each target is uniquely coded, and many (e.g., 32) targets can be processed in a single Scan, with vehicle X-Y position calculated every 100 milliseconds.

[0075] In one or more embodiment, each vehicle may maintain, in memory, an internally stored map of its own position within a facility. In addition, each vehicle provides signals to the central controller that may include data such as position, speed, angular orientation in the plane of travel, and a selected path of travel data to other vehicles in the facility. The vehicle may also include a receiver so that the vehicle can receive such data regarding other vehicles. The vehicle may receive such data regarding other vehicle either directly from other vehicles or from a central controller. Using the vehicle data, each vehicle may maintain a dynamically updated map which reflects the position of all vehicles in the particular zone(s) of an inventory management facility to which that vehicle has been assigned. When dynamically updated position data is available locally at each vehicle, a task may be assigned to a vehicle by a central controller 450, including the path segments taken by a vehicle to reach the location(s) where elements of the assigned task are to be performed may be selected by the vehicle.

[0076] Each vehicle may include a processor configured to execute steps of a navigation process stored in memory which cause the vehicle to follow a shortest path from a current location of the vehicle to a destination where the next subtask(s) of an assigned task are to be performed. In such embodiments, the central controller 450 need not be configured to execute traffic control and collision avoidance functions (unless a backup control scheme is desired) but, instead, the central controller 450 may be configured to transmit signals representative of

instructions which identify the next task(s) to be assigned to each vehicle and which specify the various locations within the facility where those tasks are to be performed. The vehicles, on the other hand, may be configured to transmit signals to the controller which are representative of task assignment acknowledgements, position updates, status updates (e.g., sub-task completed or in process, current power status, etc.), and other information which the controller may require to assess the relative ability of the vehicles to perform tasks awaiting assignment.

[0077] In a fully autonomous scheme according to one or more embodiments, each vehicle may alternatively utilize a local processor to determine speed and direction of movement from sensed indicia placed on an underlying support surface in one or more zones of an inventory management facility, to exchange that positional data with other vehicles within the facility, and to maintain a dynamically updated, local map to achieve a form of decentralized traffic control in manner similar to that described above using other positional sensing approaches..

[0078] In semi-autonomous configurations of vehicles 100, also referred to as automatic guided vehicles (AGVs), a central controller, such as controller 450, provides traffic control functions needed, for example, to prevent collisions of the vehicles with one another and/or with any potential obstructions to vehicle movement which may be present in the one or more zone(s) of a facility to which a subset of vehicles are assigned. In such embodiments, the controller 450 receives current position and bearing data in the form of update signals transmitted from the vehicles 100. The received position and bearing data are compared with estimates that the controller has derived from prior speed and heading instructions transmitted by the controller to the vehicle. Based on the comparison, the controller 450 may determine that corrections to one or more of the velocity and the direction of one or more vehicles that is needed to prevent a collision and, if so, transmit those instructions to the vehicle(s).

[0079] In one or more semi-autonomous embodiments, each vehicle 100 may include a reader for reading indicia placed on a surface upon which the vehicle is traveling and/or in positions within access columns aligned with the array of storage areas 820 (see FIG. 1). In some embodiments, each indicium of a first group of indicia corresponds to a unique location to form a grid of locations. These locations may be stored in a data table in a memory accessible to a processor of the vehicle, of the central controller 450, or a both. By following a path designed to intersect with a particular sequence of these indicia, each vehicle may transmit an identifier of an indicium as it passes over it and confirm it to controller 450 whereupon a semi-autonomous guiding of the vehicle is achieved via instructions transmitted by the controller to the vehicle. From this information and other data reported by each vehicle, controller 450 can confirm the

speed, direction, and path of movement for each vehicle. In one or more embodiments, controller 450 utilizes speed and directional data to enforce collision avoidance policies, to assign inventory management tasks according to the location and power reserve status of each vehicle and, in the interest of safety, to maintain an appropriate distance from any personnel permitted in the area.

[0080] Additional indicia may be affixed, within the access columns or to stored totes themselves, at positions adjacent to each storage locations. Here, each indicium may bear include a unique bar code, and the reader on each vehicle 100 may scan the area around the storage location at which an item is to be delivered or retrieved. The data that the central processor 450 has regarding the path that a vehicle 100 has to follow and the data regarding the distance the vehicle has traveled based on the data regarding the rotation of the drive motor may be sufficient to determine whether the vehicle 100 is positioned at the appropriate storage location within the storage areas. Nonetheless, indicia adjacent the storage areas permits a redundancy check of the location of the vehicle before an item is discharged into or received from the appropriate storage location. Therefore, the scanner may operate to scan and read information regarding the storage location at which the vehicle is stopped. If the scanned data indicates that the storage location is the appropriate storage location, then the vehicle discharges its item into the storage location. Similarly, the vehicle may have a second reader for reading indicia adjacent the rearward edge of the vehicle. The second reader may be used in applications in which the system is set up to utilize a first series of storage locations along the forward side of an access column and a second series of storage locations along the rearward side of an access column, as shown in FIG. 1.

[0081] In some embodiments, functionality for autonomous or semi-autonomous guidance of the vehicles 100 may be integrated into one or more functional accessory. Such an approach may be beneficial where precise position sensing is required in some zones within an inventory management facility, but a less precise position sensing approach may be acceptable in other zones. For example, in embodiments such as that depicted in FIG. 1, functional accessories 700 are depicted as serving a supporting role to maintain a necessary supply of items to operators at a workstation.

[0082] In the foregoing description, the vehicles have a vertical drive 140 that is dimensioned and arranged to interact with tracks disposed adjacent storage areas 820 of racks 800 as discussed further below. The drive gears effect the raising or lowering of a vehicle, depending upon the direct of rotation of motor 230. As well, the functional accessories may incorporate

tracks that cooperate with the vertical drive so as to permit a vehicle to raise and lower a functional accessory with which it is associated.

[0083] In some embodiments, the processor of each vehicle controls the operation of the vehicle in response to signals received from the central processor 450. Additionally, the vehicle includes a wireless transceiver so that the vehicle can continuously communicate with the central processor as it travels along the track. Alternatively, in some applications, it may be desirable to incorporate a plurality of sensors or indicators along paths which the vehicles may traverse. The vehicle may include a reader for sensing the sensor signals and/or the indicators, as well as a central processor for controlling the operation of the vehicle in response to the sensors or indicators.

[0084] As shown in FIG. 1, a material handling system 10 may include a number of different stations or areas. For instance, the system 10 may include a large number of storage locations arranged in numerous racks 800. The racks may accommodate thousands or tens of thousands of storage locations 820.

AUTONOMOUS STORAGE

[0085] Referring again to FIGS. 1 and 6, the system may include a plurality of racks 800 that optionally may be positioned to form rows or aisles 850. For instance, a first rack 800a may be spaced apart from a second rack 820b so that an aisle 850a is formed between the two racks. In particular, the first rack 820a may be substantially parallel to the second rack to form an aisle having a substantially uniform width. Additionally, the system may include a plurality of racks forming a plurality of aisles 850. Although the aisles 850 are illustrated in FIG. 6 as being parallel, it should be understood that if the system incorporates a plurality of racks 800, the racks may be arranged in a variety of configurations and if the system includes a plurality of aisles 850, the aisles need not be parallel.

One of the inventory management tasks assigned to a vehicle 100 may be to retrieve items from the storage locations 800. This task can be viewed as a series of sub-tasks which include exiting the current or starting location of the vehicle, traversing a path which takes the vehicle between the starting location to an intermediate destination adjacent a point of entry into the array of storage locations and, at the intermediate destination, aligning the vehicle 100 with the point of entry. As a further sub-task of the retrieval task, the aligned vehicle enters the array and maintains its alignment until it reaches the column within which the vehicle is positioned, is operated to climb, according to yet another sub-task, until it reaches a target one of the storage

areas 820. As further sub-tasks of the retrieval process, a transfer mechanism of the vehicle is operated to retrieve an item, descend within the column until the vehicle rests upon a support surface, and then exit the array of storage location. As a final sub-task of the retrieval operation, the vehicle 100 proceeds along a path to an output station 500, where an operator can retrieve the item from the vehicle.

[0086] Optionally, the system includes an automated element for storing and retrieving totes from the storage locations. One such automated element is an autonomous vehicle. For example, as discussed further below, the automated element may include a plurality of autonomous vehicles 100. Additionally, the automated vehicles 100 may be configured to transport the totes 55 to workstations 500. At the workstation 500, one or more items may be removed from a tote on one of the vehicles 100. In one embodiment, a human operator may remove an item from the vehicle. However, it should be understood that an automated mechanism may remove the item from the vehicle. Accordingly, it should be understood that the operator that handles items at the workstation(s) 500 may be a human operator or an automated mechanism or a combination of the two.

[0087] The system 10 and/or various components of the system may be controller by a central controller 450, such as a microcomputer. The central computer may receive signals from various elements, such as sensors and control various aspects of the system based on signals received from the various components. The central controller may also store data regarding the location of various items to be retrieved from the system. Additionally, the central controller may include data regarding the identification of items to be retrieved, such as a number of items to fill customer orders, as well as the quantify of such items. In this way, the central controller may control and coordinate the operation of various elements to schedule the retrieval and processing of a variety of items from the storage locations.

[0088] Figure 6 is a plan view depicting a part of an inventory management system 800, which may form part of the system shown in FIG. 1 and utilizes autonomous vehicles 100 to transfer containers 55 of inventory items back and forth between a picking area and a vertical array of storage locations 820. The system may incorporate a plurality of vehicles 100 and the array of storage locations 820 as elements of an automated storage and retrieval system (AS/RS). The vehicles 100 may be configured in the same manner as the vehicles 100 described above. However, it should be understood that the vehicles may have modifications for different tasks within the system if desired.

[0089] In any event, and turning now to FIGS. 1 and 6-10, a system for storage and retrieval of items within an array of storage locations 820 will now be described in detail. Turning first to FIGS. 1 and 6, a plurality of automated guided vehicles 100a to 100f are depicted being operated within or about a rack structure 800. As in previously described embodiments, the vehicles perform various item replenishment and/or item retrieval tasks and in this instance, some of those tasks involve retrieving containers from or returning the containers (or totes) to storage locations 820.

[0090] As discussed above, the system may include a plurality of racks that are spaced apart to form one or more aisles 850. Optionally, a track 840 may be positioned along one or more of the racks. For instance, the track may be fixedly connected to the racks 800. Additionally, the track may be configured to guide vehicles vertically so that the vehicles may be conveyed up and down the column to the storage locations in the column. Additionally, it may be desirable to position a first track along a rack on one side of the aisle, such as along rack 800a and a second track along a rack on the opposite side of the aisle, such as along rack 800b. The vehicles 100 may be configured so that the vehicle travels in the aisle 850a traveling with one side of the vehicle travelling vertically along a track on rack 800a while simultaneously a second side of the vehicle travels vertically along a track on rack 800b.

[0091] Each column may be formed by a plurality of vertical posts 815. The posts may be arranged so that a plurality of vertical posts are aligned in a parallel relation on one side of the column and a plurality of posts may be arranged in parallel relation on a second side of the column opposing the posts on the first side, as shown in FIGS. 7-10. As shown in FIG. 7, the posts 815 on each side may be interconnected by a plurality of horizontal members 817 that extend along the depth of the column.

[0092] The horizontal members 817 may be separate elements solely providing structural support for the column. Alternatively, the horizontal members may also support items stored in the storage locations 820. For instance, the horizontal supports may be planar elements forming shelves so that the shelves form storage locations. However, it should be understood that the horizontal supports may be any of a variety of configurations. For instance, in the embodiment illustrated in FIG. 8, the horizontal members are L-shaped brackets 817 that form elongated horizontal ledges to support edges of the totes 55 along the depth of the storage location. The horizontal brackets may be spaced apart from one another up the height of the vertical legs 815 to form a column of vertically spaced apart storage locations 820.

[0093] The column 810 of rack 800 has a depth, which from the perspective of FIG. 7 is similar to the length of horizontal bracket 817. The column 810 have a depth that is at similar to the length of a tote 55 or greater. For instance, the column may have a depth sufficient to accommodate at least one tote. However, the tote may overhang into the aisle 850, so the column may have a depth that is slightly less than the length of a tote. Alternatively, the column may have a depth sufficient to accommodate a plurality of totes arranged end to end as shown in FIG. 7. In the example illustrated in FIG. 7, the racks are sufficiently deep so that each storage location 820 can accommodate three totes 55 aligned end to end, wherein each tote is approximately similar of the length of the vehicles 100.

[0094] As described above, the vehicle has a length and a width. As shown in FIG. 5, optionally the vehicle has a length "L" that is sufficiently greater than its width "W2". Referring to FIGS. 6-10, the rack 800 is configured so that each column 810 has a width that is significantly less than its depth. Specifically, the width of each column is similar to the width of the vehicle and the depth of the column is substantially greater than the length of the vehicle. Optionally, the column has a depth that is more than twice the width of the vehicle as shown in FIGS. 7 and 10. Additionally, the depth of the column may optionally be greater than the length of the vehicle.

[0095] Figure 7 illustrates a plurality of vehicles in different orientations relative to the racks 800 and the storage locations 820. For instance, a first vehicle 100a is oriented for horizontal movement along path 860c, transverse the length of aisle 850. A second vehicle 100b is oriented for horizontal movement under the rack along path 860b that is parallel to the length of the aisle 850. Additionally, a third vehicle 100c is positioned within the aisle 850 to climb vertical tracks along the racks 800 on either side of the aisle. A fourth vehicle 100d is also positioned within the aisle and has climbed up the track 840a,b to a storage location 820 in an upper portion of the column 810. Finally, a fifth vehicle 100f is positioned under the rack 800 and is oriented at an intermediate position between the orientation of vehicle 100a and the orientation of vehicle 100b. In particular, the racks may be configured to facilitate the vehicles turning horizontally underneath the racks. The fifth vehicle 100f illustrates the vehicle in the process of turning under the rack from a first path to a second path.

[0096] As mentioned above, structure 800 is dimensioned and arranged such that the vehicles may enter and exit from various locations beneath the storage locations, allowing for flexibility in the installation of picking and/or replenishing stations. If the system utilizes one or more vehicles and one or more racks, the racks may be configured to allow the vehicles to travel

under the racks 800 as well as being able to travel across or along one or more aisles that may be incorporated into the system. For instance, referring to FIG. 6, the vehicles may follow a path that moves along one or more path segments that may be parallel or transverse to the aisle. A first such path is designated as path 860a. Path 860a is within and parallel to the length of aisle 850a. A second such path is designated path 860b, which is parallel to the length of aisle 850a, but spaced apart from the aisle. Specifically, path 860b is located under rack 800b. Rack 800b may be configured to provide clearance for movement of the vehicle under the lowermost storage location 820 so that the vehicle may travel under the rack 800b along a path 860b that is parallel to the length of the aisle. A third path is designated 860c, which is transverse 860a and 860b. As shown in FIG. 6, path 860c is parallel to the depth of the column 810.

[0097] Referring to FIGS. 7 and 9, the rack is optionally configured so that the columns of the rack have a depth sufficient to provide multiple paths under each column that are substantially parallel to the length of the aisle 850. Specifically, as shown in FIG. 7, the posts 815 adjacent the aisle 850 may be spaced apart from the posts 815 remote from the aisle to form an opening having a width that is greater than twice the width of the vehicle.

[0098] Figure 9 illustrates vehicle 100b moving along path 860 that is parallel to the aisle and vehicle 100c moving along path 860' that is parallel to path 860. Preferably path 860' has a centerline that is spaced apart from the posts 815 adjacent the aisle that is greater than half the length "L" of the vehicle 100 (see FIG. 5). Similarly, preferably path 860 has a centerline that is spaced apart from the posts at the rearward edge of the column remote from the aisle 850 by a distance that is greater than half the length of the vehicle.

[0099] Optionally, the paths 860, 860' under the rack that are parallel to the aisle may be spaced apart to provide a gap to allow a first vehicle travelling along path 860 to pass a second vehicle positioned along path 860', such as a vehicle travelling in an opposite direction along path 860'. For instance, path 860 may be spaced apart from path 860' by a distance greater than the width "W2" of vehicle 100 (see FIG. 5).

[00100] Additionally, as discussed above, the vehicles may change direction by rotating about a vertical axis of rotation that passes through the vehicle. In particular, the axis of rotation may pass through the center of the vehicle. The columns 810 preferably have a depth sufficient to facilitate the vehicle rotating about the axis of rotation while the vehicle is positioned in the column under the rack. Specifically, each of path 860, 860' is preferably spaced apart from the

posts 815 a distance greater than the distance from the axis of rotation to each of the corners of the vehicle.

[00101] When the vehicle turns under the rack 800, the vehicle may turn in any of a variety of angles. Optionally, the vehicle may turn in increments of 90 degrees. In particular, optionally, the vehicle turns either 90 degrees or 270 degrees after exiting the aisle so that the vehicle travels parallel to the aisle under the rack after climbing the track in the aisle.

[00102] Figure 8 is a side elevation view depicting the rack structure 800 that includes a plurality of columns 810a-810f populated within a number of containers or totes, including totes T_a , T_b , T_c and T_d . A plurality of vehicles operating to perform various item replenishment and/or item retrieval tasks as part of the inventory management system. Vehicle 100a is shown having entered the leftward most drive column 810a. In this regard, and with reference now to FIG. 9, it will be seen that the structure 800 may incorporate an array of parallel guide rails, as rails R1 and R2, which define a gap g_G between them. The gap is dimensioned and arranged to receive corresponding alignment structures on the vehicles to enable entry, exit and reorientation of the vehicles without damage to each other and the rack structure as discussed further below.

[00103] Optionally, the system may also include one or more guides 880 to guide or align the vehicles as they travel. For instance, referring to FIG. 10, the guide 880 may include a channel or groove and the vehicle may include a corresponding guide element 127 that cooperates with the guide 880 to control movement of the vehicle 100. One example of a guide element is a follower 127. The follower may be any element configured to engage with or cooperate with the guide 880. In the present instance, the vehicle 100 includes a central follower 126 that includes a rotatable element such as a bearing that rotates about a vertical axis. Optionally, the follower 126 includes a shaft so that the follower projects away from a surface of the vehicle, such as downwardly from a lower surface of the vehicle. The central follower 126 engages the channel in the guide 880 to constrain horizontal movement of the vehicle.

[00104] Optionally, the vehicle may also include one or more lateral guide member 127. The lateral guide members 127 may cooperate with an outer surface of the guide 880 to constrain movement of the vehicle. For instance, guides 880 may comprises circular guides having a circumferential surface for guiding the rotation of the vehicles. The vehicle may have a pair of lateral guide members 127 spaced apart from one another a distance equal to the

diameter of the circumferential surface of the guide. In this way, the lateral guides 127 engage the circumferential surface of the guide to constrain the vehicle to rotational motion.

[00105] Referring to FIG. 8, optionally the guide 880 includes a plurality of intersecting guideways. For instance, guide 880 may include a first guideway 882 in the form of a groove or channel having walls spaced apart a distance substantially similarly to the width of central follower 126 of the vehicle. The first guideway 882 may be oriented so that it extends parallel to pathway 860. Additionally, guide 880 may have a second guideway 884 in the form of a groove or channel have walls spaced apart a distance substantially similar to the width of the follower 126 of vehicle 100. The second guideway 884 may be oriented so that it extends transverse pathway 860. In the present instance, guideway 884 extends substantially perpendicular to pathway 860. In this way, the first and second guideways 882, 884 of guide 880 extend in a linear direction that is preferably parallel or perpendicular to the aisle 850.

[00106] Guide 880 may optionally include a non-linear guideway. For instance, the perimeter of the guide may form a non-linear guide surface identified as 886 in FIG. 9. Specifically, the guide may have a substantially circular profile forming a circumferential bearing surface. The diameter of the circular profile may have a diameter corresponding to the distance between lateral guides 127 of the vehicle 100 (see FIG. 3).

[00107] The guideways of the guide 880 optionally intersect to facilitate changing the direction of travel for the vehicle. For instance, guideway 882 may intersect guideway 884 to facilitate the vehicle changing direction from parallel to the aisle to perpendicular to the aisle or vice versa. The guideways 882, 884 may intersect at a center point of the guide. In this way, the guide may facilitate rotation of the vehicle about a vertical axis to turn the vehicle from one direction of travel along guideway 882 to a second direction of travel along guideway 884.

[00108] The guide 880 may guide the vehicle 100 to change direction as follows. The vehicle may move along a linear path with central follower 884 engaging guideway 882 or 884 to impede lateral displacement away from the linear path. The vehicle travels in a horizontal direction along the linear path until the central follower is positioned at the center point of the guide with the lateral guides 127 of the vehicle engaging the circumferential guideway 886. The vehicle 100 is rotated about a vertical axis to change the direction of travel. For instance, drive wheel 124 on one side of the vehicle may be rotated in a first direction while drive wheel 124 on the opposite side of the vehicle is rotated in a second direction that is reverse of the first direction to perform a zero radius turn. While the drive wheels 124 rotate the vehicle about the

axis of rotation, the lateral guides 127 impede lateral displacement of the vehicle away from the rotational path.

[00109] Optionally, the guides 880 are aligned with the columns to facilitate rotation of the vehicle within the column while aligning the width of the vehicle with the opening between posts 815 at the front of the column (adjacent the aisle 850) or at the back of the column (remote from aisle 850).

[00110] Optionally, as shown in FIG. 9, the system may include a floor mounted lateral alignment system 890 which consists of a pair of plate members separated by gap g_G . In this instance, the gap defined by alignment system 890 is oriented with those defined by alignment system 895 so as to permit a vehicle to quickly and easily traverse the entire width of the structure while maintaining a generally constant angular orientation within the drive columns D1 to D6.

[00111] As described above, a plurality of guide elements, such as track elements 840 may be attached to the rack 800 to guide the vehicles into alignment with storage locations positioned above the floor. For instance, the track 840 may comprises a plurality of vertical sections. Specifically, a vertical track section may be attached to each post within the aisle 850. Referring to FIG. 10, the vertical track section may have a profile for engaging the vertical drive system 140 of the vehicle. For instance, the track may include a plurality of teeth forming a rack extending up the height of the post 815.

[00112] As shown in FIG. 10, the track 840 may straddle the aisle so that a first track extends vertically upwardly along a first side of the column and a second track extends upwardly along a second side of the column. For instance, column D1 and vehicle 100e of FIG. 10 are illustrated in FIG. 10. Column D1 includes two spaced apart vertical posts 815 forming an opening having a width. Specifically, a first post has a first vertical edge E1 and a second vertical edge E2; and a second post has a first vertical edge E3 and a second vertical edge E4. The distance between vertical edges E2 and E3 is greater than the width W1 of the vehicle (see FIG. 5). Optionally, the distance between vertical edges E2 and E3 is less than the width W2 of the vehicle (see FIG. 5). In this way, the column width may be less than the distance between the outer tips of the gears of the vertical drive 140 of vehicle 100. Accordingly, the majority of the column may be narrower than the width of the vehicle at its widest point.

[00113] Optionally, the track 840 may be configured so that a first edge of the track projects toward a first column to provide a guide surface for the first column and a second edge of the

track projects toward a second column to provide a guide surface for an adjacent column. For instance, track 840 may provide a first set of teeth projecting toward column D1 and a second set of teeth projecting toward column D2.

[00114] Additionally, the vertical posts 815 may optionally be configured to provide a stop to impede lateral displacement of the vehicle as the vehicle climbs the track 840. For instance, referring to FIG. 10 the post 815 overlaps with the teeth of track 840 so that edge E3 of post 815 extends beyond the root of the teeth of the track and preferably toward the crests of the track. In this way, the teeth of the vertical drive 140 mesh with the track while the post impedes the vertical drive from displacing laterally parallel to the depth of the column.

[00115] The vertical drive 140 of the vehicle 100 may be configured so that the vertical drive gears 145 are displaceable inwardly to reduce the distance between the vertical drive gears. In this way, the drive gears can be moved inwardly to provide clearance between the tracks 840 and the vertical drive gears as the vehicle drives into the column. Alternatively, as described above, the vertical drive gears may be mounted on shafts so that the axis of rotation of each vertical gear is substantially parallel to the horizontal direction of travel. Additionally, the axes of rotation of the vertical drive gears may be substantially fixed so that the lateral distance between each pair of vertical drive gears is substantially fixed. To enter the column, the teeth of the vertical drive teeth are aligned with the teeth in the track 840 so that the teeth of the vertical drive gears pass through the teeth in the track.

[00116] Referring to FIG. 10, the track 840 and the vertical drive gear 145 may be aligned so that the vertical drive gears do not impinge upon or contact the track when the vertical gear is translated relative to the track. For instance, the spacing between the teeth of track 840 provides sufficient clearance for the teeth of the vertical drive gear 145 to pass between the gaps between the teeth of track 840 when the vertical drive gear translates horizontally along a line that is parallel to the axis of rotation of the vertical drive gear 145. More specifically, the vertical drive gear and the track may be configured and positioned so that the addendum circle of the vertical drive gear 145 overlaps with the addendum line of the teeth in the track 840. While the addendum circle of the drive gear overlaps the addendum line of the track, the teeth of the gear are configured and oriented so that the vertical drive gear passes through the gaps between teeth in the track 840.

[00117] Referring again to FIG. 10, optionally, the vertical drive gear 145 and the track 840 may be configured and oriented to increase the clearance for the vertical drive gear to pass

through the track when the vehicle drives the opening between the vertical posts 815 forming the width of the column (i.e. when the vertical drive gear translates so that the axis of rotation of the vertical drive gear translates in a horizontal direction perpendicular to the aisle). For instance, the track 840 may have an upper portion and a lower portion 842. The upper portion may have a tooth pitch and configuration to mate with the teeth of the vertical drive gear 145. The lower portion 842 may have a tooth pitch that is substantially similar to the tooth pitch of the upper section, but the tooth profile of the lower section may be substantially different than the upper section. For instance, the teeth of the lower section may be substantially narrower than the teeth of the upper section. For instance, the teeth may be at least 10% narrower and preferably at least 20% narrower. Optionally or additionally, the teeth of the lower section 842 may have dedendum that is substantially greater than the dedendum of the upper section. For instance, the dedendum of the lower section may be greater than the upper section so that the root of the teeth extends inwardly away from the drive gears a greater distance than the root of the teeth of the upper section. For instance, the dedendum of the teeth of the lower section may be 10% greater and preferably is 20% greater.

[00118] Additionally, the lower section 842 may optionally have a tapered pitch line so that the clearance between adjacent teeth gradually diminishes as the teeth progress up the height of the lower section. In other words, the clearance 845 between adjacent teeth at the bottom of the lower section is greatest and the spacing between adjacent teeth at the upper part of the lower section is at a minimum and the clearance gradually decreases from the maximum to the minimum.

[00119] Optionally, the posts 815 may have a variable width to facilitate the vertical drive passing through the opening between the posts 815. For instance, as described above, posts 815 may have a first width so that the edge E3 of the post extends beyond the root of the teeth of the track. Additionally, the lower portion 816a,b of the post 815 may have a reduced width relative to the upper portion of the post. Specifically, the post may have a reduced width so that the edge of the post terminates below the root of the tooth. In this way, the lower portion of the post has a width that is narrower than the upper portion of the post. Similarly, the distance between lower post 816a and lower post 816b is greater than the distance between edge E2 and edge E3. Additionally, the opening to the column between lower portion 816a and 816b is greater than the widest width W2 of the vehicle.

[00120] Configured as described above, the vertical drive 140 may optionally be configured to pass through openings in the track so that the vertical drive is aligned with the track. After the

vertical drive is aligned with the track, the vertical drive is positioned to cooperate with the track to raise the track and/or to climb the track as described further above.

[00121] As noted above, a central controller 450 may provide control signals for controlling the vehicles 100. For instance, the central controller may control the operation of a vehicle to follow a path through the rack to retrieve a tote 55 from a storage location 820 in one of the columns 810 in the rack 800. The vehicle may follow a path along the ground to align the width of the vehicle with a path that extends through an opening between two vertical posts 815 of the rack 800. The vehicle may travel along the path crossing through a plurality of columns in the rack. Optionally, the central controller may provide signals to control a second vehicle so that the second vehicle travels along a second path parallel to the first path and under the same rack as the first vehicle so that the second vehicle passes the first vehicle under the rack.

[00122] After the vehicle passes through a plurality of columns under the rack, the vehicle reaches the column in the rack the select storage location is located. The central controller provides signals to stop the forward progress of the vehicle along the path. The central controller provides signals to turn the vehicle under the rack to align the vehicle with an opening in the column. After turning, the vehicle advances along a path parallel to the depth of the column so that the vehicle passes through the opening in the column and into the aisle. Optionally, the step of advancing the vehicle into the aisle includes the step of aligning a vertical drive element with gaps in the opening in the column. Once in the aisle, the vehicle is driven vertically upwardly until the vehicle is aligned with the desired storage location. The vehicle actuates a transfer mechanism to transfer an item from the storage location on the vehicle. Optionally, the storage location may include an item at the front edge of the storage location separating the vehicle from the desired item in the storage location. Accordingly, the vehicle may transfer the item at the front edge onto the vehicle, which in turn pulls the desired item to the front edge of the storage location. The vehicle is then driven vertically to a storage location having an open location for receiving an item. The vehicle then transfers the item toward the open location. The vehicle then moves vertically to the storage location having the desired item and drives the transfer mechanism to transfer the desired item onto the vehicle. After retrieving the desired item, the vehicle actuates the vertical drive mechanism to drive down the column until the vehicle engages a horizontal drive surface, such as the floor. The horizontal drive of the vehicle is engaged to drive the vehicle through the opening in the column in a direction transverse the aisle. After driving out of the aisle, the vehicle continues to drive in a horizontal direction to exit the rack 800. For instance, the vehicle may continue along a path transverse

the aisle 850 and pass under one or more additional racks 800 and cross one or more additional aisles 850. Following such a path, the path of the vehicle is controlled so that the width of the vehicle is aligned with the opening in each column that the vehicle passes through.

Alternatively, the vehicle is rotated around a vertical axis to turn the vehicle into alignment with a path parallel with the aisle while the vehicle remains under the rack. The vehicle then crosses under one or more columns of the rack 800 until the vehicle exits from under the rack.

[00123] After the vehicle exits the rack 800, the central controller 450 may control the vehicle to direct the vehicle to one of a plurality of workstations 500. At the workstation the vehicle is presented to an operator to remove one or more items from the vehicle. The central controller may then control the vehicle to direct the vehicle along a path to store the item it is carrying in an open storage place in the rack and retrieve a subsequent item at a different storage location. In this way, the central controller provides control signals to a plurality of vehicles to direct the vehicles along one of a plurality of paths to retrieve a plurality of items from the storage locations and deliver items to the workstation 500.

CONTROL PROCESS

[00124] Figure 11 is a block diagram depicting the subsystems of a plurality of guided vehicles 100-1 to 100-n, according to one or more embodiments. Each vehicle, as vehicle 100-1 may comprise a Central Processing Unit (CPU) 103, a memory 105, and communication interfaces. In some embodiments, the communication interfaces comprise one or more wireless transceivers compliant with corresponding wireless transmission protocol(s) such as IEEE 802.11, with the interfaces of a vehicle being used to communicate with other vehicles, as in a peer-to-peer topology, or with a central controller. In the latter regard, vehicles 100-1 to 100-n may include position sensors 280 and object sensors 282 and use the interfaces to communicate sensed information with a master controller, such as central controller 450. The position sensors, in one or more embodiments, include onboard imaging sensors for determining when the vehicle has passed over a fiducial marking positioned on an underlying support surface. Alternatively, however, the vehicles 100-1 to 100-n may utilize signal triangulation and/or any other conventional technique for determining their respective locations relative to one another or enabling the controller to do so.

[00125] Each vehicle 100-1 includes a power supply 288 which may, for example, be a rechargeable power supply comprising ultracapacitors, one or more batteries, or a combination of these. In one or more embodiments, the power supply drives a first motor 230 of first drive

system. First drive system may further include gear wheels driven by the first motor and used, for example, to drive the vehicle vertically. In the present instance, the power supply 288 also supplies power to a second drive system, which includes a second motor 250a and, optionally, a third motor 250b.

[00126] The CPU 286 may comprise one or more commercially available microprocessors or microcontrollers that facilitate data processing and storage. Various support circuits facilitate the operation of the CPU 286 and include one or more clock circuits, power supplies, cache, input/output circuits, and the like. The memory 287 comprises at least one of Read Only Memory (ROM), Random Access Memory (RAM), disk drive storage, optical storage, removable storage and/or the like.

[00127] Figure 12 is a block schematic diagram of a controller 450 which may be responsive to instructions received from a warehouse automation system (WMS) 1440 to coordinate the assignment and performance of inventory management task activities by a plurality of vehicles and subassemblies (e.g. moveable track 700 or flow rack 600), such as those assigned to AGV task groups 902-1, 904-1, 906-1 and 908-1. The controller 450 comprises a Central Processing Unit (CPU) 951, support circuits 955, a memory 952, user interface components 954 (which may include, for example, a display with touch sensitive screen or a separate keyboard), and communication interfaces 953. In some embodiments server 450 comprise one or more wireless transceivers compliant with corresponding wireless transmission protocol(s) such as IEEE 802.11.

[00128] The CPU 951 may comprise one or more commercially available microprocessors or microcontrollers that facilitate data processing and storage. The various support circuits 955 facilitate the operation of the CPU 951 and include one or more clock circuits, power supplies, cache, input/output circuits, and the like. The memory 952 comprises at least one of Read Only Memory (ROM), Random Access Memory (RAM), disk drive storage, optical storage, removable storage and/or the like. In some embodiments, the memory 952 comprises an operating system 956 and one or more inventory management applications. In some embodiments, the inventory management applications include a task agent manager module 960, an AGV traffic management module 970, a state/event monitoring module 980, and a data repository 990.

[00129] In one or more embodiments, the task agent manager 960 is configured with an inventory management task processor 961, a dynamic inventory slotting analyzer 962, a

subtask sequence identifier 963, a task priority manager 964, an event notification detector 965, a state transition detector 966, and an AGV selector 967. The inventory management task processor 961, through execution of instructions by CPU 951, processes inventory management task requests received from the WMS 940.

[00130] In some embodiments, traffic management of the AGVs is performed by a traffic management module 470 of controller 450. In such cases, position, speed and direction data is collected from the vehicles at regular intervals by the controller. The position data is analyzed, and path segment selector 474 selects paths for each vehicle over the next control interval to ensure that there are no collisions with other vehicles, with personnel, or with fixed structures. The updated instructions corresponding to the path selections, inclusive of heading and direction, are transmitted by the controller back to the vehicles. In other embodiments, however, the vehicles do not rely on the controller for relative positioning instructions, but rather solely for destination and task assignments, with the vehicles instead relying on internal data gathering and spatial analysis capabilities.

[00131] To facilitate the aforementioned operations, the controller 450 of FIG. 12 includes a data repository which reflects an up to date location of all inventory items for which management and allocation responsibility has been assigned by the WMS, as well as a map of the vehicle locations within the facility. In addition, to facilitate the scheduling of preventive maintenance procedures, usage statistics are collected for all AGVs having moving parts, so that at regular intervals, parts can be inspected, lubricated, and/or replaced.

[00132] The order of methods described herein may be changed, and various elements may be added, reordered, combined, omitted, modified, etc. All examples described herein are presented in a non-limiting manner. Various modifications and changes may be made as would be obvious to a person skilled in the art having benefit of this disclosure. Realizations in accordance with embodiments have been described in the context of particular embodiments. These embodiments are meant to be illustrative and not limiting. Many variations, modifications, additions, and improvements are possible. Accordingly, plural instances may be provided for components described herein as a single instance. Boundaries between various components, operations and data stores are somewhat arbitrary, and particular operations are illustrated in the context of specific illustrative configurations. Other allocations of functionality are envisioned and may fall within the scope of claims that follow. Finally, structures and functionality presented as discrete components in the example configurations may be

implemented as a combined structure or component. These and other variations, modifications, additions, and improvements may fall within the scope of embodiments as defined in the claims that follow.

[00133] Accordingly, while the foregoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

CLAIMS

We claim:

1. A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:
 - providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations;
 - providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;
 - driving a first one of the vehicles to drive the first vehicle to the storage racks;
 - driving the first vehicle along a first path under a first one of the racks wherein the first rack is adjacent a first one of the aisles and wherein the first path extends in a direction parallel to the first aisle and spaced apart from the first aisle;
 - turning the first vehicle while the first vehicle is under the first rack;
 - driving the vehicle into the first aisle;
 - driving the first vehicle upwardly in the aisle to a first of the storage locations;
 - transferring an item between the first vehicle and the first storage location;
 - driving the first vehicle downwardly in the aisle until the vehicle is on a horizontal surface;
 - driving the first vehicle across the first aisle after the step of driving the first vehicle downwardly; and
 - driving the vehicle out from under the storage racks after the step of driving the first vehicle across the first aisle.
2. The method of claim 1 wherein a plurality of vertical posts form a first column of the first storage rack and wherein the first vehicle has a first width extending from a first side of the first vehicle to a second side of the first vehicle and wherein the vertical drive of the first vehicle projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width and wherein the vertical

- posts of the first column are spaced apart a distance greater than the first width and less than the second width.
3. The method of claim 1 wherein a plurality of vertical tracks segments are attached to vertical posts of the first column and wherein the step of driving the first vehicle into the first aisle comprises aligning the vertical drive of the first vehicle with the vertical track segments.
 4. The method of claim 3 wherein the step of driving the first vehicle into the aisle comprises driving a first portion of the vertical drive through the vertical track segment and driving a second part of the vertical drive into operative engagement with the vertical track segment.
 5. The method of claim 1 wherein the first storage rack is formed of a plurality of vertical posts and the first vehicle has a length and a width and the length is greater than the width and wherein the step of driving the first vehicle along the first path comprises driving the vehicle along a path spaced apart from the vertical posts by a distance greater the half the length of the vehicle.
 6. The method of claim 1 comprising the step of driving the first vehicle to a workstation to present an item to an operator after the step of driving the first vehicle out from under the storage racks.
 7. The method of claim 1 wherein the step of driving the first vehicle across the aisle comprises driving the first vehicle under a second of the storage racks.
 8. The method of claim 1 wherein the step of turning comprises rotating the first vehicle about a vertical axis that extends through the first vehicle.
 9. The method of claim 8 wherein the vertical axis extends through the first path.
 10. The method of and of claims 1-9 comprising the step of driving a second of the vehicles under the first rack along a second path parallel to the first path so that the second vehicle passes the first vehicle as the first vehicle travels along the first path.
 11. A material handling system for delivering items to storage locations and retrieving items from storage locations, comprising:
 - a first storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the first storage rack is longitudinally elongated;
 - a second storage rack having a plurality of columns each of which comprises a plurality of storage locations wherein the second storage rack is longitudinally elongated, wherein the first storage rack is spaced apart from the first storage rack to provide an aisle between the first and second storage racks;

a plurality of delivery vehicles wherein each vehicle has a length and a width and each vehicle comprises:

- a horizontal drive system operable to drive the vehicle along a horizontal surface;
- a vertical drive operable to drive the vehicle vertically; and
- a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;

a track positioned in the aisle wherein the vertical drive is configured to cooperate with the track to drive the vehicle vertically upwardly;

a first horizontal path that extends under the first rack in a direction parallel to the aisle;

a second horizontal path that extends under the first rack in a direction parallel to the aisle;

wherein the horizontal drive is configured to turn the vehicle under the first rack by rotating the vehicle about a vertical axis that extends through the vehicle;

wherein the storage rack comprises a plurality of vertical posts and the first and second horizontal paths are each spaced apart from the vertical posts a distance greater than one half the length of the vehicles;

wherein the first horizontal path under the path is spaced apart from the first horizontal path a distance greater than the width of the vehicles.

12. The system of claim 11 wherein the vertical drive comprises a plurality of rotatable elements that each rotate about a horizontal axis and wherein the horizontal drive comprises a plurality of rotatable elements that each rotate about a horizontal axis transverse the axes of rotation of the vertical drive elements.
13. The system of claim 12 wherein the plurality of vertical posts form a first column of the first storage rack and wherein the vehicles have a first width extending from a first side of the vehicle to a second side of the vehicle and wherein the vertical drive of the vehicle projects outwardly from the first side and the second side so that the vehicle has a second width corresponding to the distance between outer edges of the vertical drive so that the second width is greater than the first width and wherein the vertical posts of the first column are spaced apart a distance greater than the first width and less than the second width.
14. The system of claim 11 wherein the track comprises drive elements configured to cooperate with the vertical drive so that rotating the vertical drive about a horizontal axis operates to drive the vehicle upwardly along the track.

15. The system of claim 14 wherein the track comprises a lower section and an upper section wherein the drive elements are spaced apart further in the lower section than the upper section to provide gaps in the lower section.
16. The system of claim 15 wherein the gaps are configured to facilitate the vertical drive passing through the gaps without contacting the lower section when the vehicle is driven past the lower section.
17. A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:
 - providing a vehicle having a horizontal drive and a vertical drive comprising a forward rotatable element adjacent a front end of the vehicle and a rearward rotatable element adjacent a rear end of the vehicle;
 - providing a first vertical track on a first side of a first column wherein the first vertical track has drive elements configured to cooperate with the forward rotatable element to drive the vehicle upwardly;
 - providing a second vertical track on second side of the first column wherein the second vertical track has drive elements configured to cooperate with rearward rotatable element to drive the vehicle upwardly, wherein the vertical drive and the first and second vertical tracks are configured so that the vertical track impedes displacement of the vehicle along a horizontal path when the vertical drive is rotated into a position of misalignment;
 - aligning the vertical drive, wherein the step of aligning comprises the steps of:
 - rotating the forward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the forward rotatable element with gaps in the first and second vertical tracks; and
 - rotating the rearward rotatable element about a horizontal axis substantially parallel with the horizontal path to align the rearward rotatable element with gaps in the first and second vertical tracks;
 - after the step of aligning, driving the vehicle along the horizontal path toward the first vertical track, wherein the step of driving comprises driving the vehicle so that the forward rotatable element passes through the gaps in the second vertical track;
 - continuing to drive the vehicle along the horizontal path to position the forward rotatable element in operative engagement with first track and the rearward rotatable element in operative engagement with the second track;

- rotating the forward and rearward rotatable elements to drive the vehicle upwardly toward a first storage location;
- transferring a first item from the first storage location to the vehicle;
- driving the vehicle down with the first item;
- driving the vehicle with the first item along the horizontal path so that the rearward rotatable element passes through gaps in the first vertical track.
18. The method of claim 17 wherein the step of rotating the forward and rearward rotatable elements comprises synchronously driving the forward and rearward rotatable elements to drive the vehicle vertically upwardly while maintaining the orientation of the vehicle relative to the horizon.
19. The method of claim 17 or 18 comprising the step of driving the vehicle out from under the track after the step of driving the vehicle with the first item along a horizontal path.
20. The method of any of claims 17-10 comprising the step of turning the vehicle to a path perpendicular to the horizontal path while the vehicle is under one of the racks.
21. The method of any of claims 17-20 comprising the step of driving the vehicle with the first item to a workstation to present the first item to an operator.
22. The method of any of claims 17-21 wherein the step of driving the vehicle along the horizontal path comprises driving a plurality of horizontal drive elements about a horizontal axis that is substantially perpendicular to the horizontal path.
23. A method for delivering items to storage locations and retrieving items from storage locations, comprising the steps of:
- providing a plurality of storage racks spaced apart from one another forming a plurality of aisles, wherein each storage rack comprises a plurality of columns and each column comprises a plurality of storage locations;
- providing a plurality of delivery vehicles wherein each vehicle comprises a horizontal drive system operable to drive the vehicle along a horizontal surface, a vertical drive operable to drive the vehicle vertically and a transfer mechanism operable to transfer an item between the vehicle and one of the storage locations;
- driving a first of the vehicle under one or more of the storage racks along a path that crosses one or more aisle, wherein the step of driving the first vehicle includes driving the first vehicle into a first of the columns in a first of the aisles;
- driving the first vehicle vertically upwardly within the first aisle until the first vehicle is adjacent a first of the storage locations;
- transferring an item from the first storage location to the first vehicle;

driving the first vehicle vertically downwardly within the first aisle;
driving the vehicle out of the first aisle via a path that extends under at least one of the storage racks.

24. The method of claim 23 wherein the path includes a portion passing under one of the racks and extending parallel to one of the aisles.
25. The method of claim 24 comprising the step of driving a second of the vehicle past the first vehicle under the one rack as the first vehicle is driven along the portion of the path under the one of the racks.
26. The method of any of claims 23-25 comprising the step of turning the vehicle while the vehicle is under one of the racks, wherein the step of turning comprises turning the vehicle to align the vehicle with a path perpendicular to the first aisle.
27. The method of claim 26 wherein the step of turning the vehicle comprises rotating the vehicle about a vertical axis passing through the vehicle.

ABSTRACT

A system may include a vehicle for delivering items and a plurality of racks having a plurality of storage locations. The racks may be arranged to form one or more aisles. The vehicles are configured to drive horizontally along a path that may extend along a path under the racks that is parallel to the aisles. Additionally, the vehicles may be operated to turn while the vehicle is positioned under one of the racks. The vehicles may travel under the racks and cross one or more aisles to reach a particular column in one of the aisles. The vehicle climbs upwardly within the particular column to retrieve an item from a storage location in the column.