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(54) Title: METHOD FOR WRAPPING PLASTIC FILM ON A LOAD AND WRAPPING MACHINE

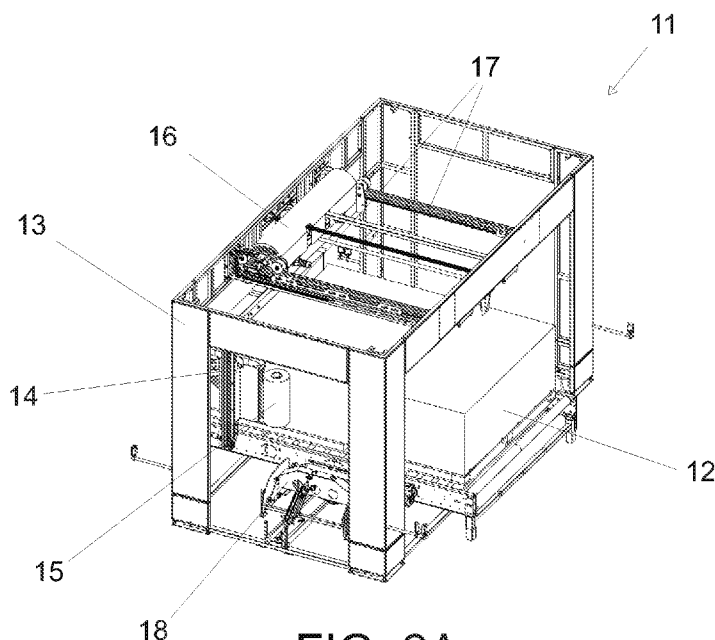


FIG. 2A

(57) Abstract: A method for wrapping plastic film on a load (12, 22), in which method at least one roll of plastic film web (2, 15) is rotated horizontally around the load to be wrapped, wherein in addition to the horizontal rotational movement of the at least one roll of plastic film web (2, 15) in relation to the load (12, 22) to be wrapped, the at least one roll of plastic film web is moved horizontally linearly in relation to the load to be wrapped during wrapping. The invention also relates to such a wrapping machine (11, 21).



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KM, ML, MR, NE, SN, TD, TG).

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Method for wrapping plastic film on a load and wrapping machine

Priority Claim

This international patent application claims priority to and the benefit of Finland Patent Application No. 20165415, which was filed on May 18, 2016, the
5 entire contents of which are incorporated herein by reference.

Field

The present invention relates to wrapping of a plastic film web on a load.

Background

Various types of wrapping machines for wrapping a web type plastic film
10 around an article being packaged are previously known. The article to be packaged is typically a pallet-mounted load, said load being usually an entity in the form of a rectangular parallelepiped.

The plastic film web is wrapped around a load either by rotating roll or rolls of plastic film web around a pallet or by rotating a pallet with respect to rolls of
15 plastic film web, or by conducting both at the same time, whereby the rolls of plastic film web are also simultaneously shifted in vertical direction. Wrapping machines are also typically fitted with elements for providing a piece of film web for covering a top surface of the load to be wrapped.

During the wrapping process the film is usually also pre-stretched to a
20 certain degree prior to wrapping the film around the load. The stretched film provides secure protection of the wrapped load and helps to keep the wrapped products at their places on the pallet. The stretching of the film also decreases the thickness of the film and thus less film material is used in the wrapping of the load.

One way of moving rolls of film web around a stationary pallet and a load
25 thereon is to provide the wrapping machine with a horizontally placed, ring-shaped circular guide, said circular guide being fitted with one or more film supply carriages comprising a roll of film web. Such a circular guide structure can be formed for example from a circular guide ring mounted on a frame of the wrapping machine in a vertically movable manner, and from a circular guide ring capable of
30 rotating relative to the stationary circular guide ring, said rotating circular guide

ring being fitted with film supply carriages. Alternatively, the circular guide structure of a wrapping machine may consist of just one circular guide ring, which is mounted on a frame of the wrapping machine either rotatably or non-rotatably, as well as to be movable in vertical direction. One wrapping machine solution based
5 on the use of circular guides is known from patent publication US 4,587,796.

Another way for moving a roll of film web around a stationary pallet and a load thereon is to provide the wrapping machine with a rotating arm at which outer end a film supply carriage is fixed vertically adjustably.

The size of the load to be wrapped is restricted in these types of wrapping
10 machines either by the size of the circular guide or the length of the rotating arm.

Summary

The present invention provides a novel wrapping method and wrapping machine, where the wrapping area is extended to be larger than the horizontal circular wrapping area of the prior art wrapping machines.

This is achieved by providing a wrapping machine where the rotating point, about which the at least one roll of plastic wrapping film web is rotated on a horizontal plane, is moved also linearly on a horizontal plane during the wrapping process. The horizontal plane in this context is defined to be the horizontal plane in the operating position of the wrapping machine, and which is substantially
15 perpendicular to the vertical direction in which the roll of the plastic wrapping film web is moved during the wrapping process in order to cover the required portion of the height of the load to be wrapped.
20

With the wrapping machine and method of the invention the wrapping area can be adjusted to be suitable for different shapes and sizes of loads to be wrapped.

In the method of the invention for wrapping plastic film on a load at least one roll of plastic film web is horizontally rotated around the load to be wrapped, and in addition to the horizontal rotational movement of the at least one roll of plastic film web in relation to the load to be wrapped, the at least one roll of plastic film web is also moved linearly on a substantially horizontal plane in relation to the load to be
25 wrapped during wrapping. In the method of the invention the at least one roll of
30

plastic film web is rotated with at least one rotating arm, and the rotating point of the at least one rotating arm is moved linearly during wrapping.

In an embodiment of the method of the invention the rotational movement and linear movement of the at least one roll of plastic film web takes place in
5 alternating consecutive phases.

In an embodiment of the method of the invention the at least one roll of plastic film web is moved in substantially vertical direction in relation to the load to be wrapped, or alternatively the load to be wrapped is moved in substantially vertical direction in relation to the at least one roll of plastic film web, during
10 wrapping.

In an embodiment of the method of the invention the plastic film web is pre-stretched before wrapping it around the load to be wrapped.

The present invention also provides a wrapping machine for wrapping plastic film web on a load comprising at least one roll of plastic film web, and devices for
15 horizontally rotating the at least one roll of plastic film web around a load, and devices for moving the at least one roll of plastic film web linearly on a substantially horizontal plane during wrapping. In the wrapping machine of the invention the devices for rotating the at least one roll of plastic film web comprises at least one rotating arm, and the devices for moving the at least one roll of plastic film web
20 linearly during wrapping comprises devices for moving the rotating point of the rotating arm linearly during wrapping.

In an embodiment of the wrapping machine of the invention the wrapping machine comprises devices for operating the devices for rotating the at least one roll of plastic film web and the devices for moving the at least one roll of plastic film web
25 linearly in alternating consecutive phases.

In an embodiment of the wrapping machine of the invention the wrapping machine comprises devices for moving the at least one roll of plastic film web substantially vertically in relation to the load to be wrapped, or alternatively devices for moving the load to be wrapped substantially vertically in relation to the
30 at least one roll of plastic film web, during wrapping.

In an embodiment of the wrapping machine of the invention the wrapping machine comprises devices for pre-stretching the plastic film web before wrapping it around the load to be wrapped.

The features defining a method of the invention are more precisely disclosed in claims 1, and the features defining a wrapping machine of the invention are more precisely disclosed in claim 5. Dependent claims disclose advantageous embodiments and features of the invention.

Brief Description of the Figures

In the following embodiments of the invention are discussed in greater detail in the sense of example and with reference to accompanying drawings, where

Figure 1 shows schematically an embodiment for the track of a roll of plastic film web in accordance with the invention,

Figures 2A-2E show schematically an embodiment of a wrapping machine of the invention in different phases of the wrapping process,

Figure 3 shows schematically top view of the wrapping machine of the figures 2A-2E,

Figure 4 shows schematically an alternative embodiment of a wrapping machine of the invention, and

Figure 5 shows schematically another alternative embodiment of a wrapping machine of the invention.

Detailed Description

In figure 1 is shown schematically an embodiment for the track 1 of a roll 2 of plastic film web in accordance with the present invention during wrapping as seen from above.

As can be seen from figure 1, the track 1 comprises both curved rotational movement and linear movement of the roll 2 of plastic film web, in alternating consecutive phases. This is advantageously obtained with a rotating arm 3 connected to the roll 2 of plastic film web, the opposite end 4 of which rotating arm in relation to the roll of plastic film web is moved linearly, and at each end of the linear movement of the rotating arm the arm is rotated 180°.

After each round of rotation, or during rounds of rotation, the roll 2 of plastic film web is also moved in substantially vertical direction, so that the height of the load to be wrapped is covered with plurality of wrapping rounds. Further, the plastic film web is preferably pre-stretched prior to wrapping it on the load, in order to decrease the amount of plastic film web required for the wrapping and to provide additional support to the products and articles forming the load to be wrapped.

In relation to the schematic presentation of the track 1 of the roll 2 of plastic film web in is to be noted, that rotational movement of the roll can start before the linear movement has completely ended.

Figures 2A-2E show schematically an embodiment of a wrapping machine 11 of the invention in different phases of the wrapping process of a load 12.

The wrapping machine 11 comprises a frame 13, a rotating arm 14, which rotating arm comprises a horizontally extending portion and at first end of the horizontally extending portion a vertically extending portion, to which vertically extending portion is vertically movably connected a roll of plastic wrapping film web 15. The horizontally extending portion of the rotating arm 14 is connected from second end to a rotating arrangement 16 which provides the rotating movement of the rotating arm. The rotating arrangement 16 is connected to the frame 13 of the wrapping machine 11 via a pair of horizontally extending guide rails 17 along which the rotating arrangement 16 is moved linearly in horizontal plane back and forth.

The rotating arrangement 16 comprises a motor for rotating the rotating arm 14 together with the related gear arrangement and a frequency controller for controlling the rotating speed of the motor. The rotating arrangement also comprises a motor for moving the rotating arrangement 16 horizontally in relation to the frame 13 of the wrapping machine 11 along a toothed belt connected to the frame of the wrapping machine, and a related gear arrangement and a frequency controller for controlling the rotating speed of the motor.

The wrapping machine also comprises a cutting and fixing device 18 for cutting the wrapped plastic film web and for attaching the cut end of the wrapped film web onto the wrapped load. The cutting and fixing device 18 also holds the

other end of the cut plastic film web after the film is cut, sets it against a new load to be wrapped when the wrapping process is started and releases the end after the first wrapping round is wrapped so that the end is left between the load and first wrapping round.

5 Before of the wrapping process the load 12 to be wrapped is moved into the wrapping area of the wrapping machine 11, as shown in figure 2A. After the load 12 is moved into the wrapping area the wrapping process is ready to be started.

 When the wrapping is started, the rotating arrangement 16 rotates the rotating arm 14 a half circle, i.e. 180° , on a horizontal plane, starting from the
10 position shown in figure 2A, then through the position shown in figure 2B and to the position shown in figure 2C.

 Once the rotating arm 14 is rotated the half circle to the position shown in figure 2C, the rotating movement is stopped and the rotating arrangement 16 together with the rotating arm 14 is moved horizontally along the guide rails 17 to
15 the other end of the rails, and the rotating movement of the rotating arm 14 is continued, as shown in figure 2D.

 When the second half circle rotation of the rotating arm 14 is completed, the rotating arrangement 16 is again moved horizontally along the guide rails 17, now to the opposite direction than in previous horizontal movement of the rotating
20 arrangement 16, as shown in figure 2E, until the full wrapping circle around the load 12 is completed.

 These wrapping circles are continued until predetermined height of the load 12 is wrapped. After the last wrapping circle the plastic wrapping film web is cut and the end of the web is connected to the load with the cutting and fixing device 18
25 in a manner known from the art.

 Figure 3 shows top view of the wrapping machine 11, further clarifying the movement of the rotating arm 14 and the plastic wrapping film roll 15 during wrapping process. In this figure the dashed line marked with R_i shows the maximum wrapping area and the dashed line marked with R_e shows the required
30 minimum area to be restricted for the operation of the wrapping machine during the

wrapping process. The length L shown in the figure defines the length of the horizontal movement of the rotating arrangement 16.

Figure 4 shows an alternative embodiment of a wrapping machine 11 shown in figures 2A-3, where the frame 13 of the wrapping machine 11 is movable along
5 straight rails 19 extending linearly in the direction of the horizontal linear movement of the rotating arrangement 16. The rails 19 allow further linear horizontal movement for the rotating arrangement 16 of the wrapping machine 11 in relation to the load 12 to be wrapped, which further extends the wrapping area of the wrapping machine significantly in the direction of the rails, i.e. in the linear
10 horizontal direction in which the rotating arrangement 16 is moved.

In this embodiment, the extent of the horizontal movement of the rotating arrangement 16 in relation to the frame 13 is preferably used first before the frame 13 of the wrapping machine 11 is moved along the rails 19 in the wrapping process. This is because the movement of rotating arrangement 16 in relation to the frame
15 13 does not use so much energy than the movement of the frame 13 of the wrapping machine 11, i.e. the whole wrapping machine 11, along the rails 19.

In relation to the embodiment of figure 4 it is to be noted, that the linear movement of the rotating arrangement 16 in relation to frame 13 of the wrapping machine can also be removed, so that the linear movement of the at least one roll of
20 plastic film web is obtained completely by the movement of the frame along the rails 19.

Figure 5 shows another embodiment of a wrapping machine 21 of the invention for wrapping plastic film web on a load 22. In this embodiment the frame 23 of the wrapping machine 21 is formed as a substantially L-shaped structure,
25 which comprises a base at one end and rotating arm 24 at the other end. The rotating arm 24 comprises a horizontally extending portion and at first end of the horizontally extending portion a vertically extending portion, to which vertically extending portion is vertically movably connected a roll of plastic wrapping film web (not shown). The horizontally extending portion of the rotating arm 25 is connected
30 from second end to the end area of the frame 23 rotatably.

The wrapping machine 21 also comprises a cutting and fixing device 28 for cutting the wrapped plastic film web and for attaching the cut end of the wrapped film web onto the wrapped load. The cutting and fixing device 28 also holds the other end of the cut plastic film web after the film is cut, sets it against a new load
5 to be wrapped when the wrapping process is started and releases the end after the first wrapping round is wrapped so that the end is left between the load and first wrapping round.

The wrapping machine 21 is mounted on straight rails 29, which allow the wrapping machine to be moved horizontally linearly along the side on the load to 22
10 be wrapped.

In this embodiment, the horizontal linear movement of the roll of the plastic wrapping film is achieved by moving the whole wrapping machine 21 along the rails after each half circle rotation of the rotating arm 24.

The specific exemplifying embodiments of the invention shown in figures and
15 discussed above should not be construed as limiting. A person skilled in the art can amend and modify the embodiments in many evident ways within the scope of the attached claims. Thus the invention is not limited merely to the embodiments described above.

Claims

1. A method for wrapping plastic film on a load (12, 22), in which method at least one roll of plastic film web (2, 15) is rotated horizontally around the load to be wrapped, wherein in addition to the horizontal rotational movement of the at least
5 one roll of plastic film web (2, 15) in relation to the load (12, 22) to be wrapped, the at least one roll of plastic film web is moved horizontally linearly in relation to the load to be wrapped during wrapping, **characterized** in that the at least one roll of plastic film web (2, 15) is rotated with at least one rotating arm (3, 14, 24), and the rotating point of the at least one rotating arm is moved linearly on a substantially
10 horizontal plane during wrapping.
2. A method according to claim 1, wherein the rotational movement and linear movement of the at least one roll of plastic film web (2, 15) takes place in alternating consecutive phases.
3. A method according to claim 1 or 2, wherein the at least one roll of plastic film
15 web (2, 15) is moved in substantially vertical direction in relation to the load (12, 22) to be wrapped, or the load to be wrapped is moved in substantially vertical direction in relation to the at least one roll of plastic film web, during wrapping.
4. A method according to any of claims 1-3, wherein the plastic film web is pre-stretched before wrapping it around the load (12, 22) to be wrapped.
- 20 5. A wrapping machine (11, 21) for wrapping plastic film web on a load (12, 22) comprising at least one roll of plastic film web (2, 15), and devices (3, 14, 24) for horizontally rotating the at least one roll of plastic film web around a load, wherein the wrapping machine (11, 21) comprises devices (16, 17, 19, 29) for moving the at least one roll of plastic film web (2, 15) horizontally linearly during wrapping,
25 **characterized** in that the devices for rotating the at least one roll of plastic film web (2, 15) comprises at least one rotating arm (3, 14, 24), and the devices for moving the at least one roll of plastic film web linearly during wrapping comprises devices (17, 19, 29) for moving the rotating point of the rotating arm linearly on a substantially horizontal plane during wrapping.

6. A wrapping machine (11, 21) according to claim 5, wherein the wrapping machine comprises devices for operating the devices (3, 14, 24) for rotating the at least one roll of plastic film web (2, 15) and the devices (16, 17, 19, 29) for moving the at least one roll of plastic film web linearly in alternating consecutive phases.
- 5 7. A wrapping machine (11, 21) according to claim 5 or 6, wherein the wrapping machine comprises devices for moving the at least one roll of plastic film web (2, 15) substantially vertically in relation to the load (12, 22) to be wrapped, or devices for moving the load to be wrapped substantially vertically in relation to the at least one roll of plastic film web, during wrapping.
- 10 8. A wrapping machine (11, 21) according to any of claims 5-7, wherein the wrapping machine comprises devices for pre-stretching the plastic film web before wrapping it around the load (12, 22) to be wrapped.

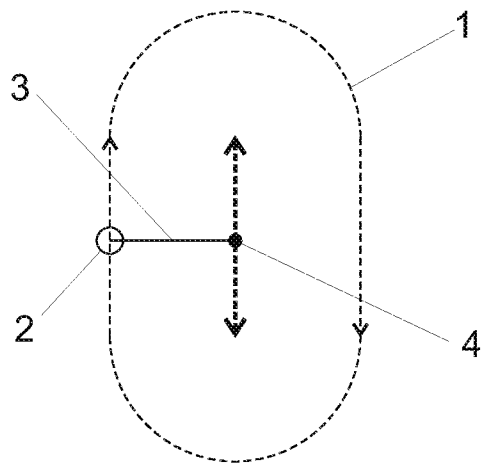


FIG. 1

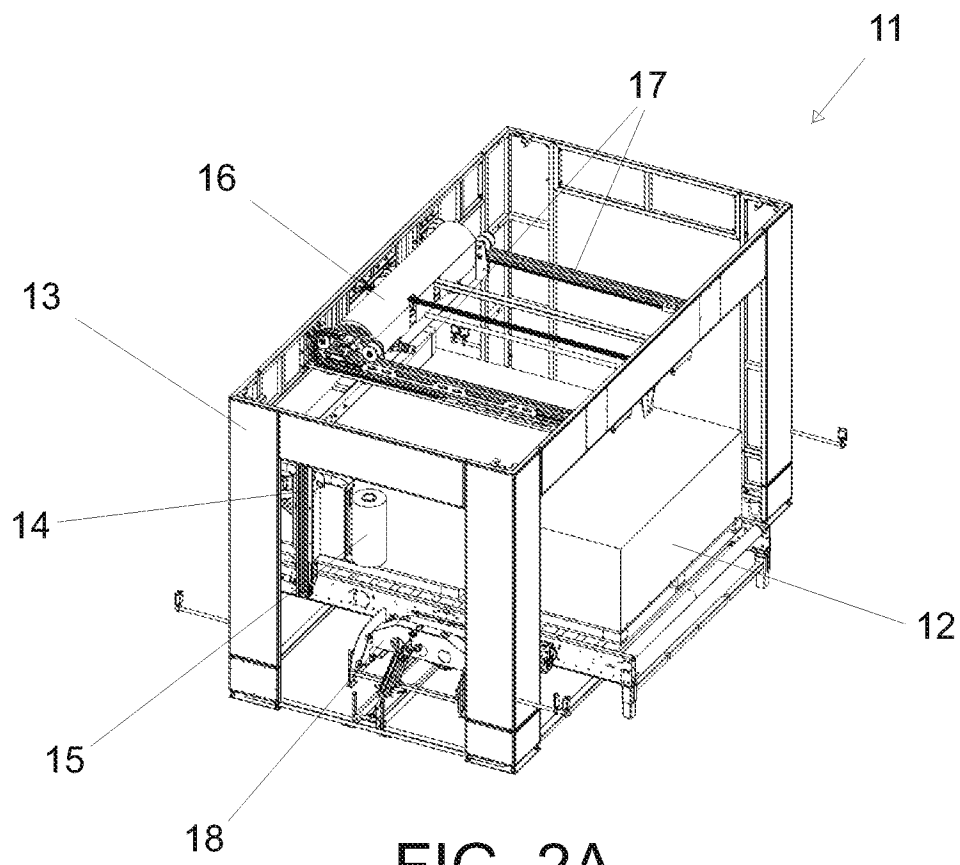


FIG. 2A

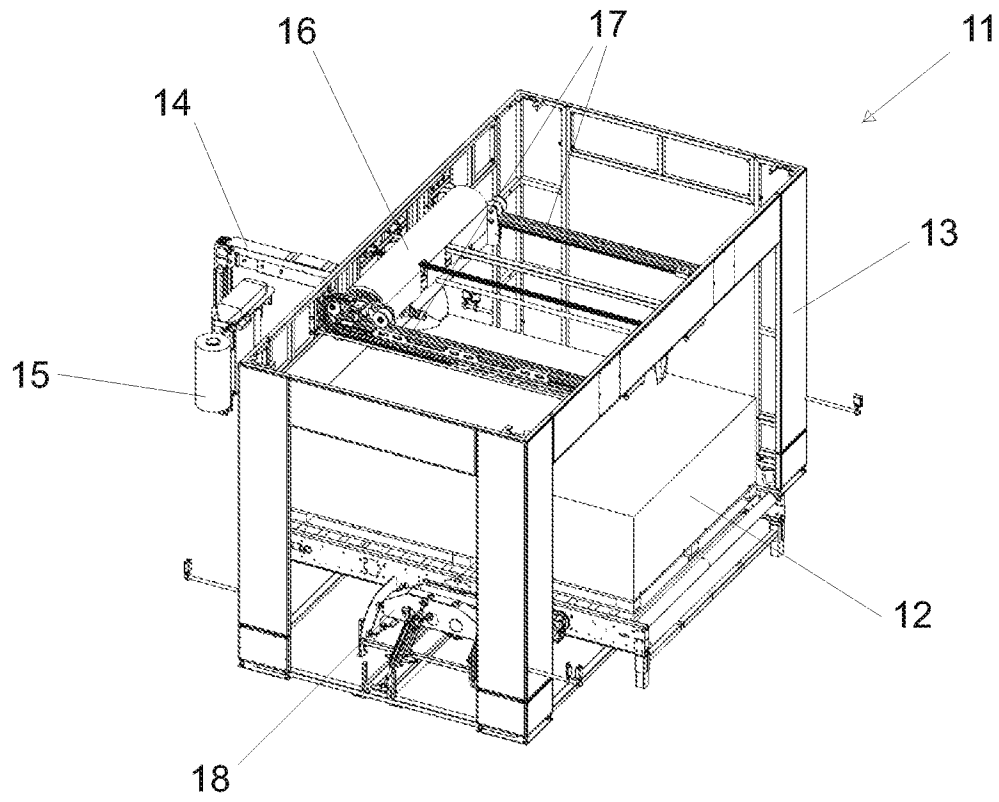


FIG. 2B

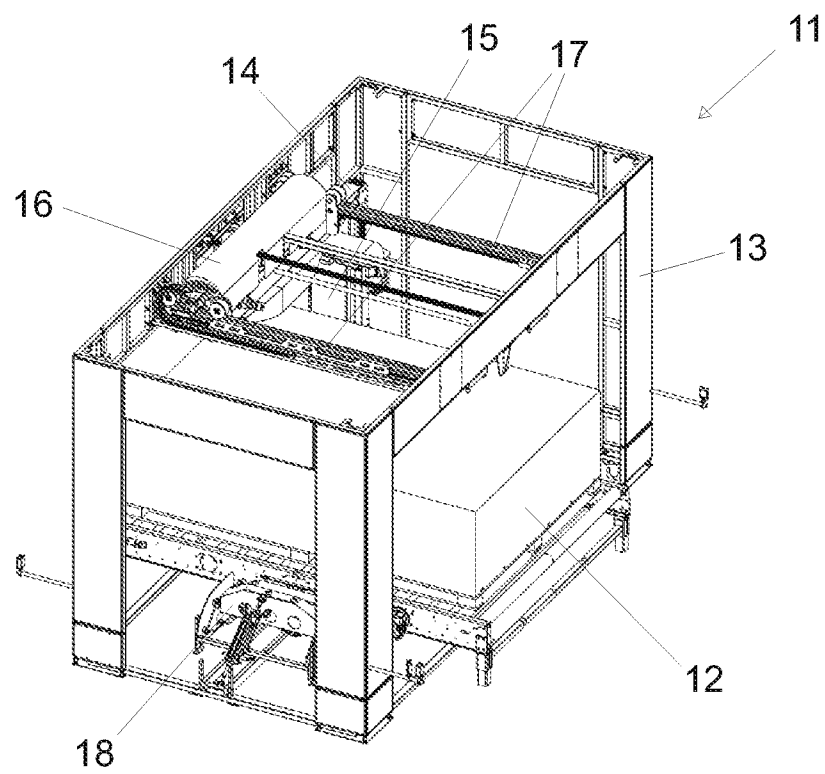


FIG. 2C

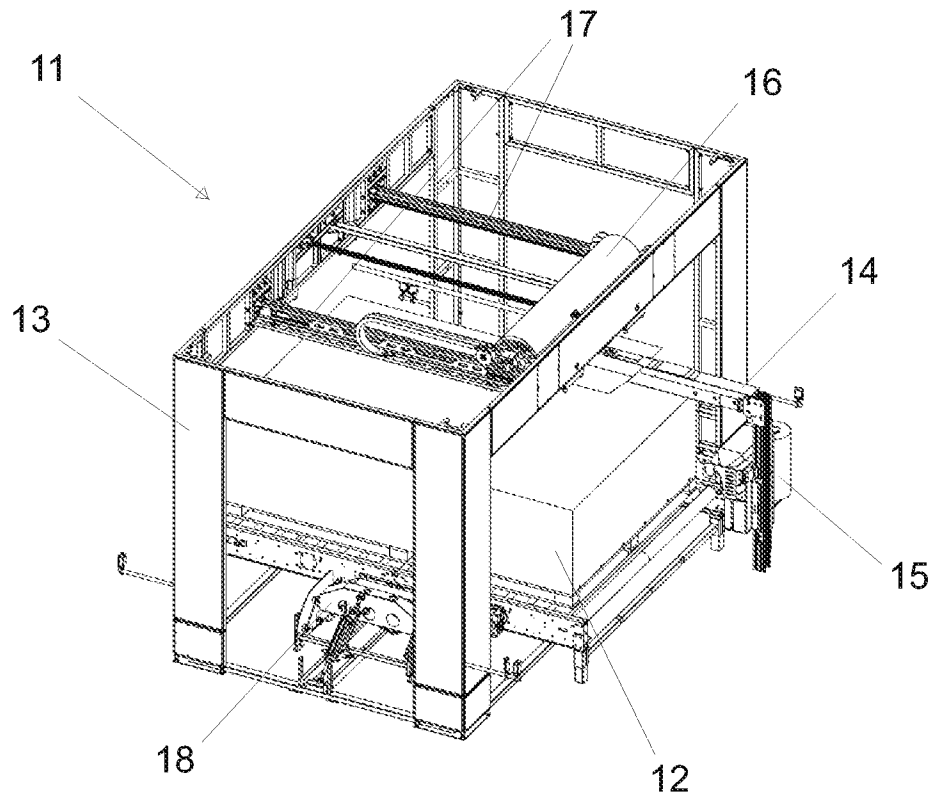


FIG. 2D

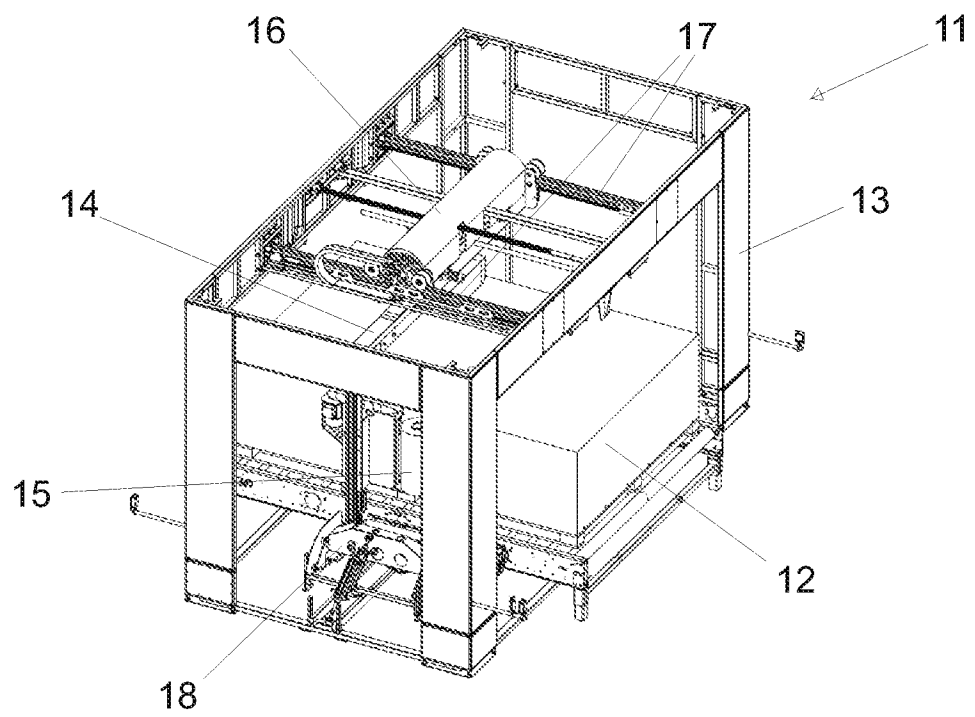


FIG. 2E

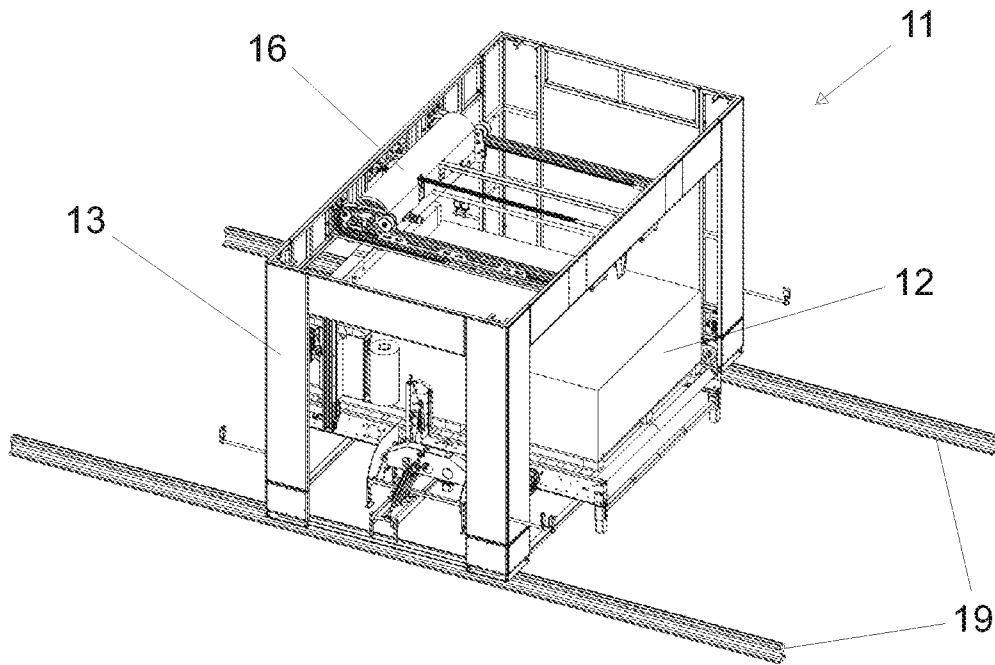


FIG. 4

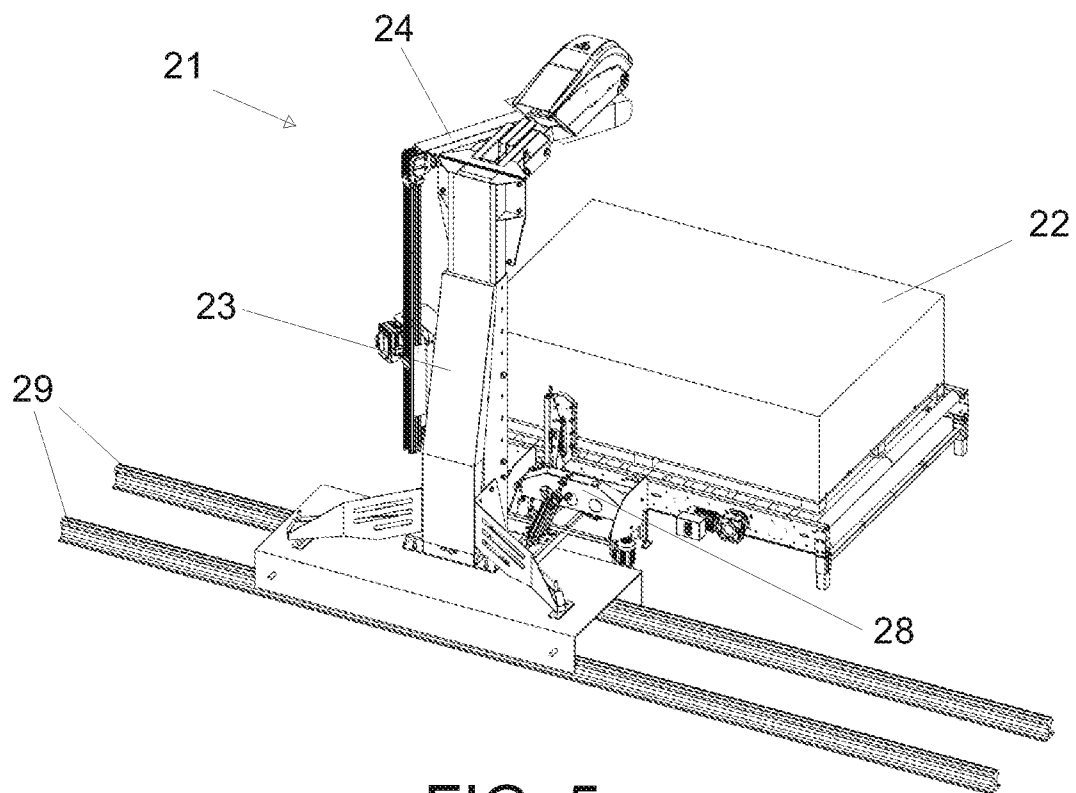


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/029633

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B11/02
ADD.

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)
B65B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	EP 3 144 231 A1 (SCHERMESSE [FR]) 22 March 2017 (2017-03-22) abstract; figures 1,4 column 5, line 51 - column 15, line 35 -----	1-8
Y	EP 2 634 101 A2 (LINDPOINTNER ANDREAS [AT]) 4 September 2013 (2013-09-04) abstract; figures 2,3 paragraph [0018] - paragraph [0022] -----	1-8
Y	DE 102 20 803 A1 (HEIKAUS UNTERNEHMENSBETEILIGUN [DE]) 24 December 2003 (2003-12-24) abstract; claims 1,7; figures 1,2 ----- -/-	1-8



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/029633

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 587 796 A (HALOILA MATTI [FI]) 13 May 1986 (1986-05-13) cited in the application abstract; figures 1,2 column 2, line 30 - column 4, paragraph 1 -----	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 3144231	A1	22-03-2017	EP 3144231 A1	22-03-2017
			WO 2017050678 A1	30-03-2017

EP 2634101	A2	04-09-2013	AT 13149 U1	15-07-2013
			EP 2634101 A2	04-09-2013

DE 10220803	A1	24-12-2003	NONE	

US 4587796	A	13-05-1986	NONE	
