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(11)

EP 1 149 767 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.10.2001 Bulletin 2001/44

(51) Int Cl.7: **B65B 11/02, B65B 11/58**

(21) Application number: **01660067.8**

(22) Date of filing: **11.04.2001**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **11.04.2000 FI 20000865**

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(54) Wrapping method and machine for providing a package with a top film

(57) A method for providing a package with a top film in a wrapping machine (10), whereby an object (12) to be wrapped is wrapped with thin plastic film band (22). With the wrapping action stopped, a top film is brought over the object by pulling from a roll (31) placed outside the wrapping station (11) a length of top film band (32) into the wrapping station and severing the band to form a top film sheet of a desired length, which is brought to a position above the object. The top film sheet is placed

onto the object during the wrapping operation without stopping the wrapping action. The wrapping machine (10) comprises a film fetching apparatus (30) placed in the middle of a wrapping station and having a motion mechanism (35) which can move in a horizontal direction outside the wrapping station and which, being provided with a guide rail (36) and slide (37) mechanism, pulls a top film sheet (33) from a roll to a position above the object.

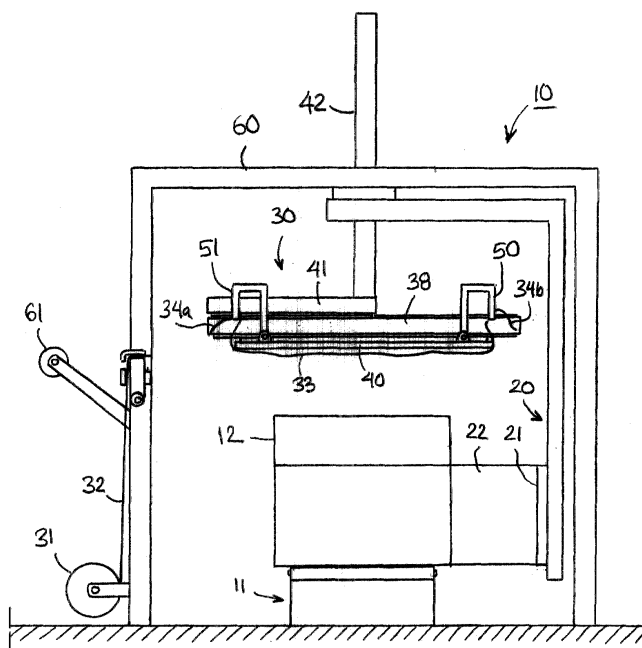


FIG. 7

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Description**SUBJECT OF THE INVENTION**

[0001] The present invention relates to a method for providing a package with a top film in a wrapping machine. According to the method,

- with the wrapping action of the wrapping machine stopped, an object to be wrapped is brought to a wrapping station comprised in the wrapping machine and at the same time an object already wrapped that may be present in the wrapping station is removed from the wrapping station,
- in the wrapping station, the object to be wrapped is wrapped with thin plastic film band used as wrapping material and supplied from a roll,
- a top film sheet is brought onto the object to be wrapped, said sheet being so placed over the object to be wrapped that the downward pointing edges of the top film sheet remain between layers of plastic film band to be wrapped around the object,
- the top film sheet is fetched by means of a film fetching apparatus by gripping the edge of a top film band supplied from a roll by means of the gripping elements of said apparatus,
- a length of top film band is pulled from the roll and the band is severed to form a sheet of a desired length, which is brought into the wrapping station to a position above the object to be wrapped.

A METHOD ACCORDING TO THE STATE OF THE ART

[0002] A wrapping method for wrapping an object tightly usually comprises the following steps, the order of which may vary:

- from a roll containing top film material, a length of top film band to be placed on a package is pulled and a top film sheet of a desired length is cut from said band and brought into a wrapping station, to a position above the object to be wrapped,
- the object to be wrapped is wrapped with thin plastic film band used as wrapping material so that the plastic film band being wrapped around the object at least partially overlaps the previous lap of plastic film band,
- at least one layer of plastic film band is wrapped around the object by moving the roll containing plastic film band from below upward, so that the topmost plastic film band covers at least the upper edge of the previous lap of plastic film band,
- a top film sheet is brought onto the object to be wrapped and the edges of the sheet are bent downward onto the layers of plastic film band already wrapped around it,
- the wrapping operation is continued so that the

downward bent edges of the top film band remain between the previously wrapped layers of plastic film band and the layers of plastic film band to be wrapped next.

[0003] The object to be wrapped may consist of a single piece or several pieces to be wrapped in the same package. If necessary, the object to be wrapped can be held in place in the wrapping station by pressing the object from above by means of a pressing element, causing the object to be squeezed between its support and the pressing element. In this case, the top film sheet to be placed over the object has to be brought between the pressing element and the object to be wrapped.

[0004] In known wrapping methods, a problem is that the wrapping operation has to be interrupted to allow a top film sheet to be brought onto the object to be wrapped. At least one layer of wrapping film has to be first wound about the object so that the roll of wrapping film band moves from below upwards. It is only after a top film sheet has been brought over the object to be wrapped and the edges of the sheet have been bent downward onto the layers of plastic film band already wrapped around it that the wrapping operation can be continued.

[0005] However, stopping the wrapping operation to allow a top film sheet to be brought onto the object leads to substantially slower wrapping. For this reason, efforts have been made to develop methods that would allow a top film sheet to be already brought into the wrapping station while the object just wrapped is being removed and a new object is being moved into the wrapping station. However, such methods and the equipment needed to implement them have proved to be very complicated and awkward in operation.

OBJECT OF THE INVENTION

[0006] The object of the present invention is to achieve a new method for bringing a top film sheet onto an object to be wrapped which does not have any of the disadvantages described above.

FEATURES CHARACTERISTIC OF THE METHOD OF THE INVENTION

[0007] The wrapping method of the invention is characterized in that the package is provided with a top film in a wrapping machine by applying the following steps comprised in the method:

- during the pause in the wrapping action needed for an exchange of objects to be wrapped, a gripper unit comprised in a film fetching apparatus located in the middle of the wrapping station of the wrapping machine is moved horizontally in a lateral direction so that it goes at least partially outside the wrapping station,

- the edge of a top film band coming from a roll placed outside the wrapping station is caught by the grippers of a gripper unit moved to one side
- the gripper unit is moved horizontally back into the wrapping station, with the grippers pulling the top film band from the roll,
- the top film band is severed to form a top film sheet, which, supported by the grippers of the gripper unit, is taken to the center of the wrapping station and placed over or above the object to be wrapped,
- the wrapping action for wrapping the object is started and, after a desired length of time and without stopping the wrapping action, the grippers of the gripper unit are caused to release their grip on the edge of the top film sheet, whereupon the edges of the top film sheet placed over the object to be wrapped will bend downward, being thus left under the next wrapping plastic layers.

[0008] By the method of the invention, a top film sheet can be fetched while the wrapped object in the wrapping station is being removed and another object to be wrapped is being brought in. Thus, a new top film sheet is always ready in place above the object to be wrapped in the wrapping station before the wrapping operation is started. From this it follows that there is no need at all to interrupt the wrapping action for wrapping the object because the top film sheet can be brought onto the object during the wrapping operation. This is important because any interruptions in the wrapping operation substantially reduce its speed and efficiency.

EMBODIMENTS OF THE METHOD OF THE INVENTION

[0009] According to a preferred embodiment of the wrapping method of the invention,

- during the wrapping operation, a top film band supplied from a roll is seized at a first point near the end of the film by means of a film fetching apparatus,
- a length of top film band is pulled from the roll and the band is additionally seized at a second point, whereupon the top film band is severed between the said second point and the roll of top film band,
- and the top film sheet held in the film fetching apparatus between the aforesaid first and second points is brought into the wrapping station, to a position above the object to be wrapped.

[0010] According to a second preferred embodiment of the wrapping method of the invention,

- during the wrapping operation, the top film band supplied from a roll is first seized by both edges near the end of the band and then by both edges at a second point along the band, whereupon the top film band is severed between the said second point

and the roll of top film band,

- whereupon the top film sheet, being held fast by four points at its edges, is brought into the wrapping station, to a position above the object to be wrapped.

[0011] According to a third preferred embodiment of the wrapping method of the invention, the top film band is seized by four points at its edges by means of the gripper unit of a top film fetching apparatus placed inside the wrapping machine, whereupon the band is severed to form a top film sheet of a suitable size, which is brought into the wrapping station to a position above the object to be wrapped, and the top film sheet is pressed by means of the gripper unit onto the object to be wrapped.

THE APPARATUS OF THE INVENTION

[0012] The invention also relates to a wrapping machine comprising a wrapping device for wrapping a thin plastic film band from a roll around an object placed in a wrapping station in order to be wrapped and a film fetching apparatus for bringing a top film sheet into the wrapping station to a position over the object to be wrapped, said film fetching apparatus comprising:

- a gripper unit and grippers for seizing the top film band and pulling it off the roll,
- a cutting device for severing the top film band so as to form a top film sheet,
- and a motion mechanism for bringing the top film sheet into the wrapping station to a position over the object to be wrapped.

FEATURES CHARACTERISTIC OF THE APPARATUS OF THE INVENTION

[0013] The wrapping machine of the invention is characterized in that

- the film fetching apparatus of the wrapping machine is located in the middle of the wrapping station (11), above the object to be wrapped,
- the film fetching apparatus is provided with a motion mechanism comprising a mechanism, such as a guide rail and a slide, allowing horizontal movement,
- the motion mechanism is provided with a gripper unit which can be moved by the motion mechanism in a horizontal direction to a position at least partially outside the wrapping station,
- and that the gripper unit comprises grippers by means of which the top film band and the top film sheet to be cut from it can be pulled horizontally from outside the wrapping station to a position over the object to be wrapped.

[0014] As the film fetching apparatus in the wrapping

machine of the invention is mainly disposed above the object to be wrapped and as it can be moved in a vertical direction, the top film sheet can be fetched while the wrapped object in the wrapping station is being removed and another object to be wrapped is being brought in. Thus, there is no need to interrupt the wrapping action in order to allow a top film sheet to be fetched.

EMBODIMENTS OF THE APPARATUS OF THE INVENTION

[0015] According to a preferred embodiment of the wrapping machine of the invention,

- the film fetching apparatus of the wrapping machine comprises at least one gripping element that seizes the top film band by a first point near the end of the top film band and pulls a length of band from the roll,
- the film fetching apparatus comprises at least one gripping element that seizes the top film band by a second point farther away from the end of the band,
- and the film fetching apparatus also comprises a motion mechanism for taking the top film sheet cut off from the band between the gripping elements and the roll into the wrapping station to a position above the object to be wrapped.

[0016] According to a second preferred embodiment of the wrapping machine of the invention,

- the film fetching apparatus of the wrapping machine comprises two gripping elements which seize the top film band by its both edges at a point near the end of the band and which pull a length of band from the roll,
- the film fetching apparatus comprises another two gripping elements which seize the top film band by its both edges at a second point,
- and the film fetching apparatus comprises a motion mechanism movable in a lateral direction for bringing the severed top film sheet supported by the four gripping elements into the wrapping station to a position above the object to be wrapped.

[0017] According to a third preferred embodiment of the wrapping machine of the invention, the top film fetching apparatus disposed inside the wrapping machine comprises a gripper unit having four grippers for seizing the edges of the top film band, and that the gripper unit together with the top film sheet held fast by the grippers can be pressed onto the object to be wrapped in the wrapping station.

[0018] According to a fourth preferred embodiment of the wrapping machine of the invention, the top film fetching apparatus is a separate assembly which can be added to a crank-type wrapping machine, to a ring-type wrapping machine or to a wrapping machine of any other type.

[0019] According to a fifth preferred embodiment of the wrapping machine of the invention, the top film fetching apparatus is mainly located inside the wrapping machine, above the wrapping station where the object to be wrapped is wrapped.

EXAMPLES OF EMBODIMENTS

[0020] In the following, the invention will be described by the aid of an example with reference to the attached drawings, wherein

LIST OF DRAWINGS

[0021]

- | | |
|-----------|---|
| Fig. 1 | presents a wrapping machine according to the invention, with an object ready wrapped in its wrapping station. |
| Fig. 2 | corresponds to Fig. 1, presenting the wrapping machine at a phase when the object to be wrapped is being replaced with a new one, and a top film fetching apparatus at a first phase of the operation of fetching a top film sheet. |
| Fig. 3 | corresponds to Fig. 1, presenting the wrapping machine and a second phase of the operation of fetching a top film sheet. |
| Figs. 4-6 | correspond to Fig. 1, presenting the wrapping machine and the next phases in the operation of fetching a top film sheet. |
| Fig. 7 | corresponds to Fig. 1, presenting the wrapping machine at the start of a wrapping operation. |
| Fig. 8 | corresponds to Fig. 1, presenting the wrapping machine and a second phase in the wrapping operation. |

DESCRIPTION OF FIGURES

[0022] Fig. 1 presents a wrapping machine 10 according to the invention, which in this example is a crank-type wrapping machine. In the situation presented in Fig. 1, the wrapping station 11 of the wrapping machine 10 contains an object 12 already wrapped, and the cranking wrapping system 20 has been stopped to allow an exchange of object 12. From Fig. 1 it can be seen that the object 12 has been wrapped with wrapping film band 22 from a roll 21 of wrapping film band comprised in the cranking wrapping system 20. A top film sheet 33 has been placed upon the wrapped object 12, and the downward bent edge portions 34 of the top film sheet have been left between the layers 22 of wrapping film band.

[0023] In Fig. 1, the top film sheet 33 and the wrapping film band layers 22 form on the object 12 a water-tight wrapping known in itself. To produce a water-tight wrapping, at least one layer of wrapping film band 22 is

wound about the object 12 while the wrapping film band roll 21 is moving from below upwards before the hems 34 of the top film sheet 33 are turned onto the wrapping film band layers 22 already wrapped about the object. After this, the wrapping operation is continued so that the hems 34 of the top film sheet 33 remain under the film band layers 22 to be wound next.

[0024] The crank-type wrapping machine 10 in Fig. 1 is provided with a film fetching apparatus 30, which fetches a top film sheet 33 fit to be placed over the object 12. The film fetching apparatus 30 comprises a gripper unit 40 provided with grippers 50 and 51 capable of seizing the edges of the top film band, the gripper unit being movable in both vertical and horizontal directions. The vertical motion of the gripper unit 40 has been achieved by providing the frame 41 of the film fetching apparatus with a vertical column 42 movable along vertical guide rails in the frame 60 of the wrapping machine. The horizontal motion of the gripper unit 40 has been implemented using a motion mechanism system 35, by connecting the gripper unit 40 to the frame 41 of the film fetching apparatus via an intermediate element 38 and horizontal guide rails 36a and corresponding slides.

[0025] In Fig. 1, the film fetching apparatus 30 and its gripper unit 40 are in a high position above the wrapping station 11. The grippers 50 and 51 of the gripper unit 40 are also in an upturned position after they have released their grip on the top film sheet 33 placed over the wrapped object 12. Fig. 1 also shows the top film roll 31 containing top film band 32 in the wrapping machine 10, with a cutting device 43 used to cut the top film band into top film sheets 33 of a size suited for the objects to be wrapped. The end 39 of the top film band 32 cut by the cutting device 43 is squeezed in a pressing element 44, in which the grippers 50 and 51 of the gripper unit 40 can seize the edges of the top film band 32.

[0026] Fig. 2 presents a situation where the objects 12 to be wrapped are being exchanged, with the crank-type wrapping apparatus 20 of the wrapping machine 10 still inactive, and the completely wrapped object 12 presented in Fig. 1 has already been removed from the wrapping station 11 of the wrapping machine 10. The object to be wrapped next has not yet been brought into the wrapping station 11. From Fig. 2 it can be seen that the standstill of the wrapping apparatus 20 due to the exchange of objects 12 is utilized so that the film fetching apparatus 30 has already been started and is fetching a new length of top film 32 for the next object 12 to be wrapped.

[0027] Fig. 2 shows that the grippers 50 at one end of the gripper unit 40 have been turned to a low position so that they are ready to seize the edge of the top film 32. After that, the motion mechanism 35 comprised in the film fetching apparatus 30 has moved the gripper unit 40 horizontally to its extreme position on the left. The horizontal movement of the gripper unit 40 has been implemented using a motion mechanism 35 in which the gripper unit 40 is attached to the frame 41 of the film

fetching apparatus via an intermediate element 38 and horizontal guide rails 36a and 36b and slides 37.

[0028] Before the horizontal movement of the motion mechanism 35, the gripper unit 40 has been raised to its high position, to a height where all grippers 50 and 51 of the gripper unit 40 in the downward-turned position are at a suitable height to be able to seize the edge of the top film band 32 being held in the grip of the pressing element 44 of the cutting device 43. As explained hereinafter, the gripper unit with its grippers 50 and 51 forms a pulling device for pulling the top film band 32, actuated by the motion mechanism 35. When at the height specified above, the gripper unit 40 is also at such a height that, as the motion mechanism 35 is moving to its extreme position on the left in Fig. 2, a supporting roller 60 mounted on the frame 60 of the wrapping machine 10 will support the gripper unit 40 from below.

[0029] When the operation reaches the situation presented in Fig. 2, the leading grippers 51 of the gripper unit 40 are in the high position because they have to be passed freely over the cutting device 43 severing the top film band 32, whereas the trailing grippers 50 attached to the gripper unit 40 and moving behind it as seen in the direction of motion are now in the low position with their jaws open, ready to seize the edge of the top film band 32 by a point near the band end 39 held by the cutting device 43.

[0030] The situation presented in Fig. 3 is a continuation to the previous figure. After the grippers 50 and 51 of the gripper unit 40 have seized the edge of the top film band 32 and the pressing element 44 comprised in the cutting device 43 has released its grip, the pulling system formed by the motion mechanism 35 and the gripper unit 40 will pull a length of top film band 32 from the roll 31. The grippers 50 of the gripper unit 40 and, together with them, the end 39 of the top film band 32 have moved to the right, to the position presented in Fig. 3. At this stage, the other gripper pair 51 of the gripper unit 40 has also turned to the low position to be ready to seize the edge of the top film band 32 as soon as the gripper unit 40 has moved far enough so that grippers 51 come to a position aligned with the pressing element 44 of the cutting device 43.

[0031] In Fig. 4, the motion mechanism 35 of the film fetching apparatus 30 has pulled the end 39 of the top film band 32 far enough for the grippers 51 attached to the gripper unit 40 and moving behind it as seen in the direction of motion to reach a position aligned with the pressing element 44 comprised in the cutting device 43. At this point, the pressing element 44 is closed and the grippers 51 aligned with it seize the edge of the top film band 32. In this situation, all grippers 50 and 51 of the gripper unit 40 are holding the top film band 32 by its edges.

[0032] In Fig. 5, the pressing element 44 comprised in the cutting device 43 has again been opened and the motion mechanism 35 of the film fetching apparatus 30 has pulled the top film band 32 somewhat further to the

right in Fig. 5. When grippers 51 are at a suitable distance from the cutting device 43, the top film band 32 can be severed.

[0033] In Fig. 6, the pressing element 44 comprised in the cutting device 43 has again been dosed and the cutting device 43 has severed the top film band 32. The top film sheet 33 is now supported by the four grippers 50 and 51 holding it by its edges. After this, the motion mechanism 35 of the film fetching apparatus 30 centers the gripper unit 40 and together with it the top film sheet 33 over the object 12 to be wrapped in the wrapping station 11.

[0034] In Fig. 7, the grippers 50 and 51 of the film fetching apparatus 30 have been turned to the high position, so the edges 34a and 34b of the top film sheet 33 are up and away from the area where the plastic film band 22 is being wound. In Fig. 7, the wrapping action has already been started from the lower edge of the object 12 to be wrapped. If necessary, the gripper unit 40 can also be used as a press device, in which case the gripper unit 40 is pressed on the object to be wrapped so that the top film sheet 33 will remain between the gripper unit 40 and the object 12 to be wrapped.

[0035] In Fig. 8, the object 12 to be wrapped has been wrapped with plastic film band 22 so that the wrapping film band roll 21 has moved once from bottom to top of the object 12 to be wrapped. When the wrapping film band roll 21 is near the upper edge of the object 12 to be wrapped, the gripper unit 40 is lowered onto the object 12 to be wrapped and the top film sheet 33 remains between the gripper unit 40 and the object 12 to be wrapped. When the grippers 50 and 51 of the gripper unit 40 release their grip on the top film sheet 33, the edges 34a and 34b of the top film sheet 33 will be bent downward by the action of gravity, settling against the sides of the object 12 to be wrapped. To accelerate the motion of the hems 34a and 34b of the top film sheet 33, it is possible to apply an intensive downward blast to them via pneumatic jets provided in the gripper unit 40. When the wrapping action is continued further in the manner known in itself, the hems 34a and 34b of the top film sheet 33 will remain under the next wrapping film layers 22, and the result is again a finished, water-tight wrapped package as presented in Fig. 1.

[0036] In the figures described above, the grippers 50 and 51 of the gripper unit 40 of the wrapping machine 10 can also be provided with adjustments to allow a variation of the distance between the grippers 50 and 51. This will enable the wrapping machine 10 to use top film sheets 33 of different sizes if the size of objects 12 to be wrapped varies.

ADDITIONAL REMARKS

[0037] It is obvious to the person skilled in the art that different embodiments of the invention may vary within the scope of the claims presented below. Thus, the essential point about the method and apparatus of the in-

vention is that a top film sheet can be brought by the described method into a wrapping machine of any type. It is not restricted to the crank-type wrapping machine presented in the figures as an example embodiment.

Claims

1. Method for providing a package with a top film in a wrapping machine (10), according to which method

- with the wrapping action of the wrapping machine (10) stopped, an object (12) to be wrapped is brought to a wrapping station (11) comprised in the wrapping machine and at the same time an object already wrapped that may be present in the wrapping station is removed from the wrapping station,
- in the wrapping station (11), the object (12) to be wrapped is wrapped with thin plastic film band (22) used as wrapping material and supplied from a roll (21),
- a top film sheet (33) is brought onto the object (12) to be wrapped, said sheet being so placed over the object to be wrapped that the downward pointing edges (34) of the top film sheet remain between layers (22) of plastic film band to be wrapped around the object,
- the top film sheet (33) is fetched by means of a film fetching apparatus (30) by gripping the edge (39) of a top film band (32) supplied from a roll (31) placed outside the wrapping station (11) by means of gripping elements (50) comprised in said apparatus,
- a length of top film band (32) is pulled from the roll (31) and the band is severed to form a top film sheet (33) of a desired length, which is brought into the wrapping station (11) to a position above the object (12) to be wrapped.

characterized in that the package is provided with a top film in the wrapping machine (10) by applying the following steps comprised in the method:

- during the pause in the wrapping action needed for an exchange of objects to be wrapped, a gripper unit (40) comprised in a film fetching apparatus (30) located in the middle of the wrapping station (11) of the wrapping machine (10) is moved horizontally in a lateral direction so that it goes at least partially outside the wrapping station,
- the edge (39) of the top film band (32) coming from the roll (31) outside the wrapping station (11) is caught by the grippers (50) of the gripper unit (40) moved to one side,
- the gripper unit (40) is moved horizontally back into the wrapping station (11), with the grippers

- (50, 51) pulling the top film band (32) from the roll (31),
- the top film band (32) is severed to form a top film sheet (33), which, supported by the grippers (50, 51) of the gripper unit (40), is taken to the center of the wrapping station (11), to a position over or above the object (12) to be wrapped,
 - the wrapping action for wrapping the object (12) is started and, after a desired length of time and without stopping the wrapping action, the grippers (50, 51) of the gripper unit (40) are caused to release their grip on the edge of the top film sheet (33), whereupon the edges (34) of the top film sheet placed over the object to be wrapped will bend downward, being thus left under the next wrapping plastic layers (22).
2. Method as defined in claim 1, **characterized in that**, during the wrapping operation and without interrupting the wrapping action, the gripper unit (40) of the film fetching apparatus (30) located in the middle of the wrapping station (11) of the wrapping machine (10) is moved vertically so as to move the top film sheet (33) supported by the grippers (50, 51) from the position above the object (12) to be wrapped onto the object to be wrapped.
3. Wrapping machine (10) comprising a wrapping apparatus (20) for wrapping a thin plastic film band (22) from a roll (21) about an object to be wrapped (12) which is placed in the wrapping station (11), and a film fetching apparatus (30) for bringing a top film sheet (33) into the wrapping station (11) to a position above the object to be wrapped, said film fetching apparatus comprising:
- a gripper unit (40) and grippers (50, 51) for seizing the top film band (32) and pulling it from the roll (31)
 - a cutting device (43) for severing the top film band (32),
 - and a motion mechanism (35) for bringing the top film sheet (33) into the wrapping station (11) to a position over the object (12) to be wrapped,
- characterized in that**
- the film fetching apparatus (30) of the wrapping machine (10) is located at the center of the wrapping station (11) above the object (12) to be wrapped,
 - the film fetching apparatus (30) is provided with a motion mechanism (35) comprising a mechanism allowing horizontal motion, such as a guide rail (36) and a slide (37).
 - the motion mechanism (30) is provided with a gripper unit 40 which can be moved horizontally
- by the motion mechanism so that it goes at least partially outside the wrapping station (11),
- and that the gripper unit (40) comprises grippers (50, 51) by means of which the top film band (32) and the top film sheet (33) cut off from it can be pulled horizontally from outside the wrapping station (11) into a position over the object to be wrapped (12).
4. Wrapping machine (10) as defined in claim 3, **characterized in that** the film fetching apparatus (30) is provided with a mechanism permitting vertical motion, such as a vertical guide rail of the frame (60) of the wrapping machine (10) and a vertical column (42) moving along the guide rail.
5. Wrapping machine as defined in claim 3 or 4, **characterized in that** it comprises at least one supporting roller (61) mounted on the frame (60) of the wrapping machine (10) and serving to support the laterally moving motion mechanism (35) when the gripper unit (40) connected to the motion mechanism is at least partially outside the wrapping station (11).
6. Wrapping machine (10) as defined in claim 3, 4 or 5, **characterized in that** the top film fetching apparatus (30) is a separate assembly which can be added to a crank-type wrapping machine (10), to a ring-type wrapping machine or to a wrapping machine of any other type.

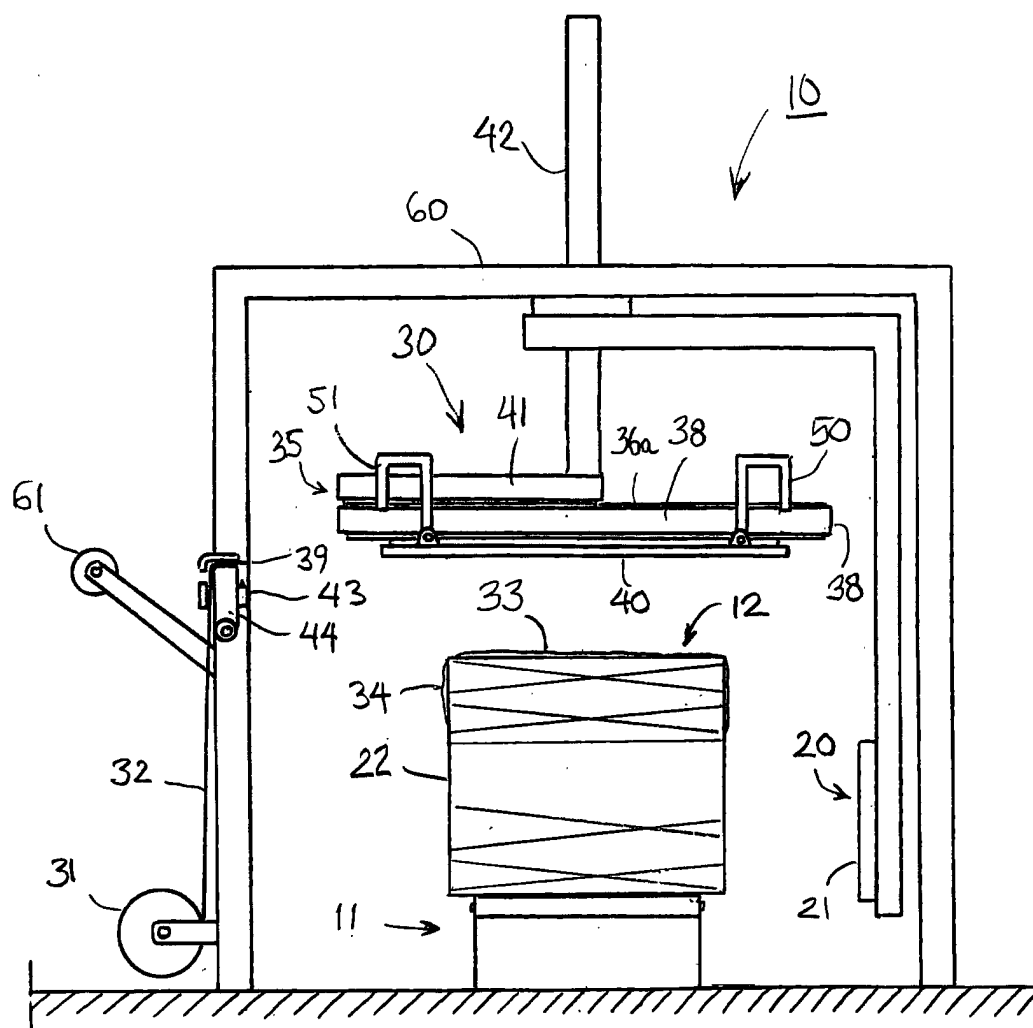


FIG. 1

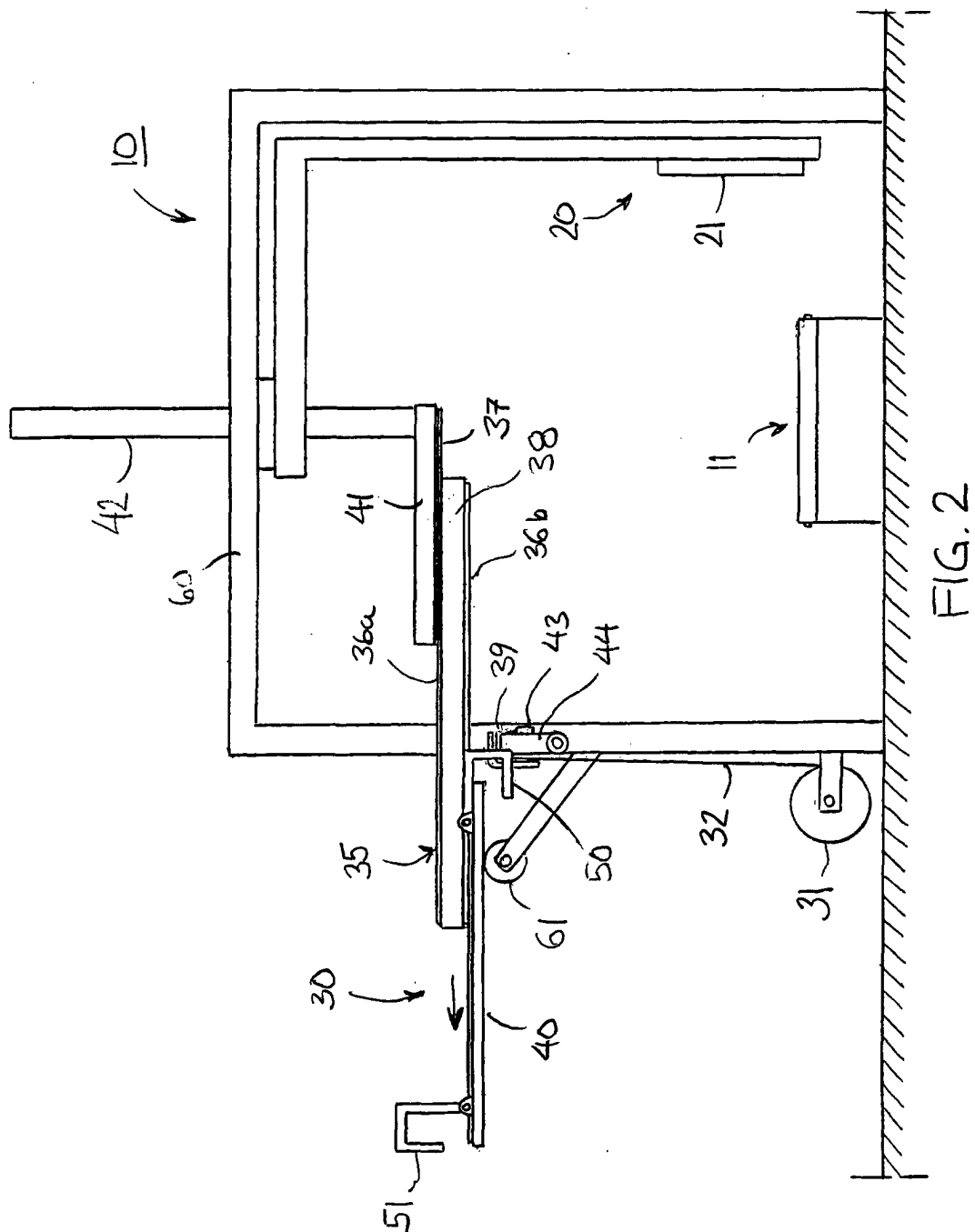
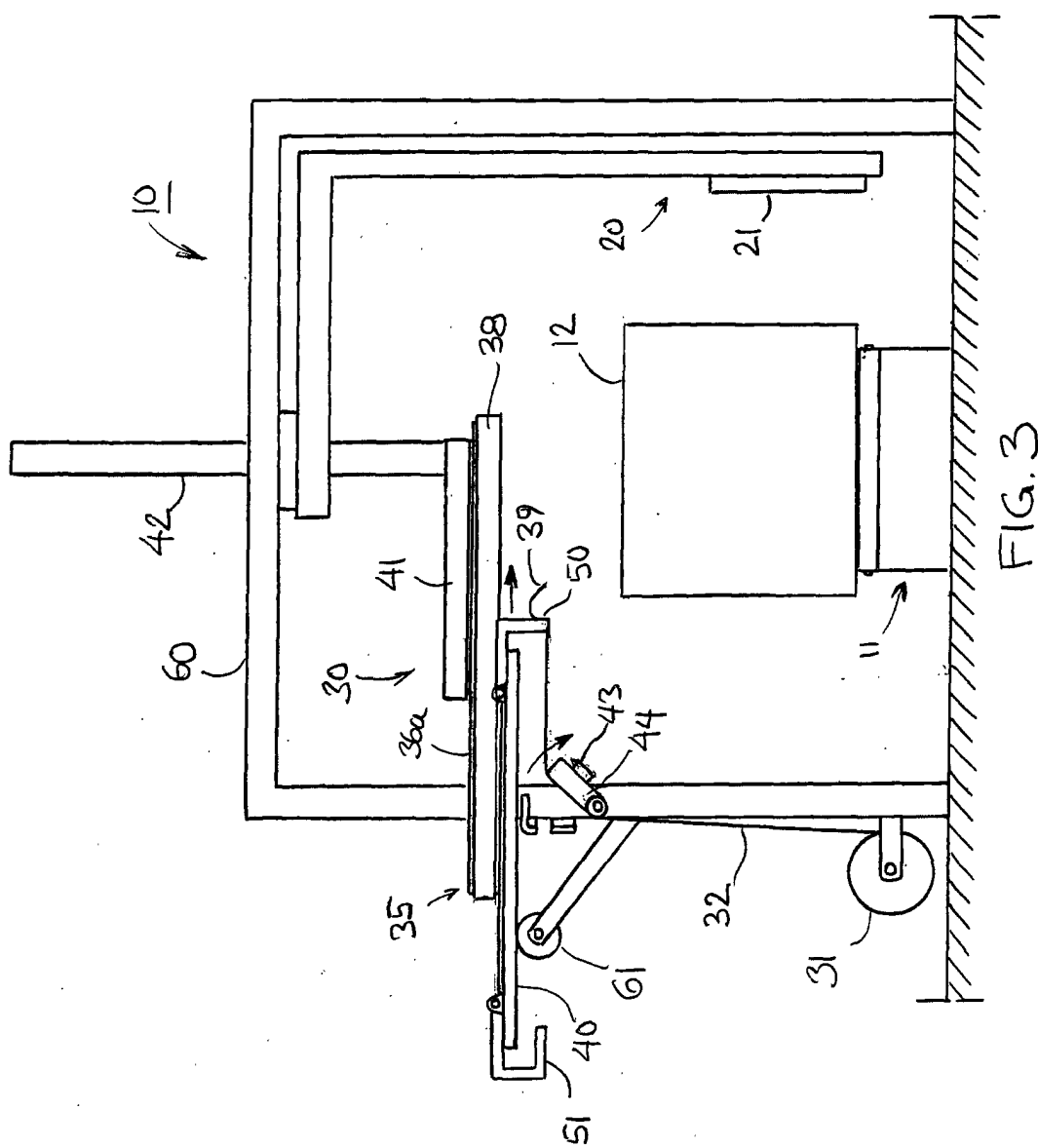


FIG. 2



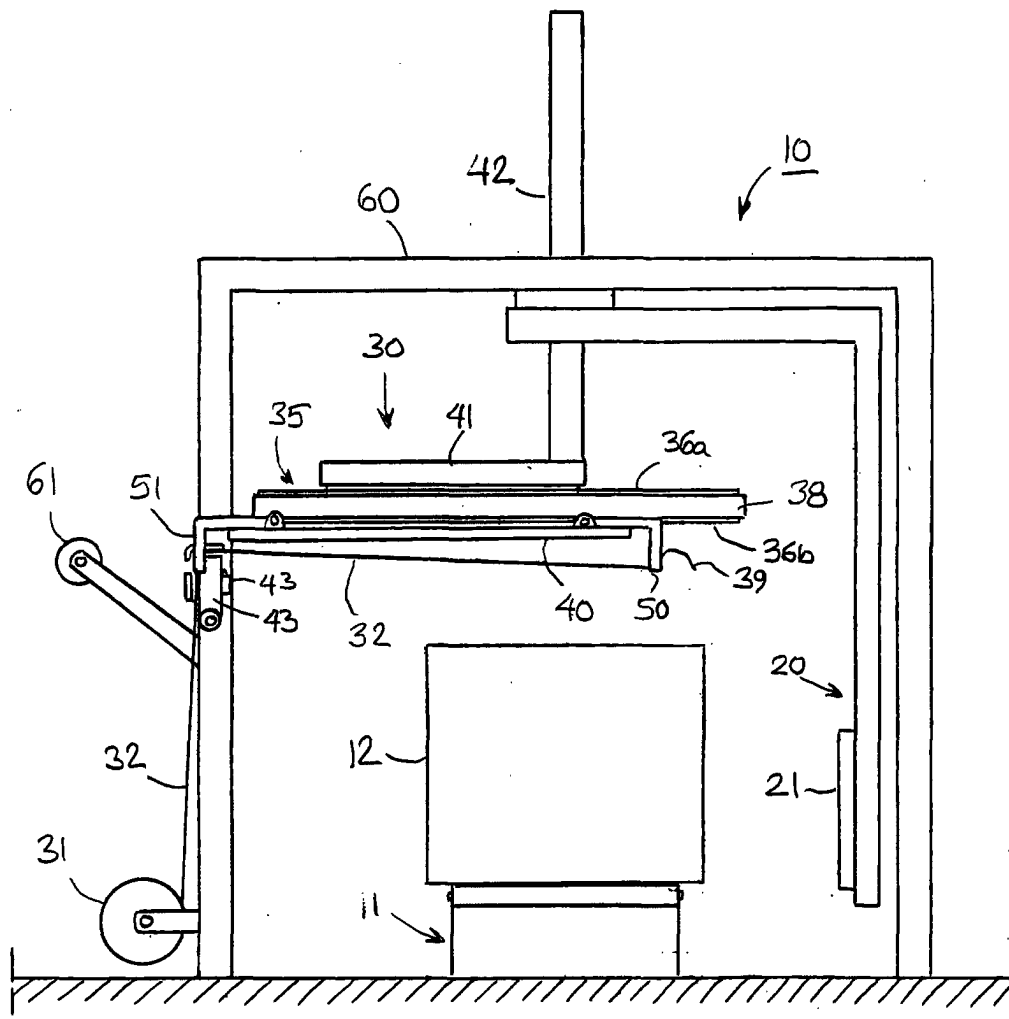


FIG. 4

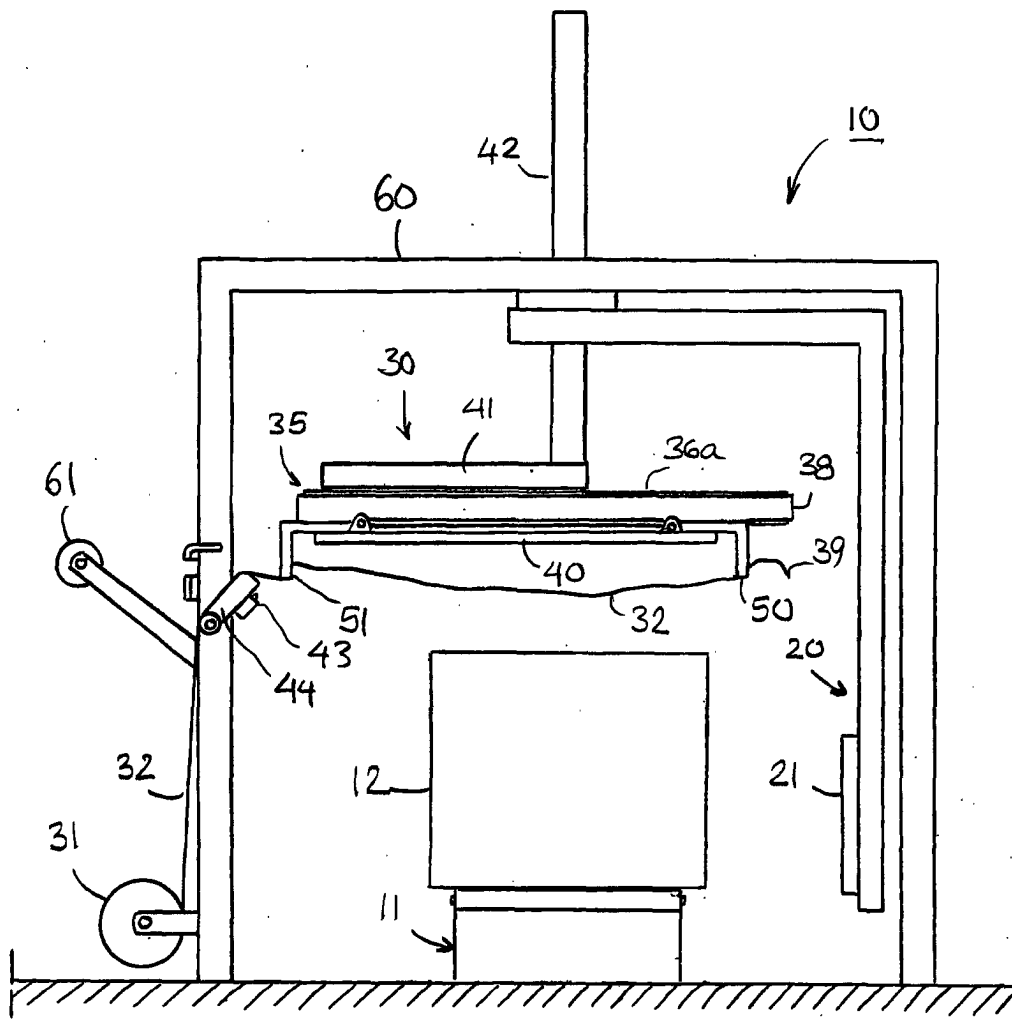


FIG. 5

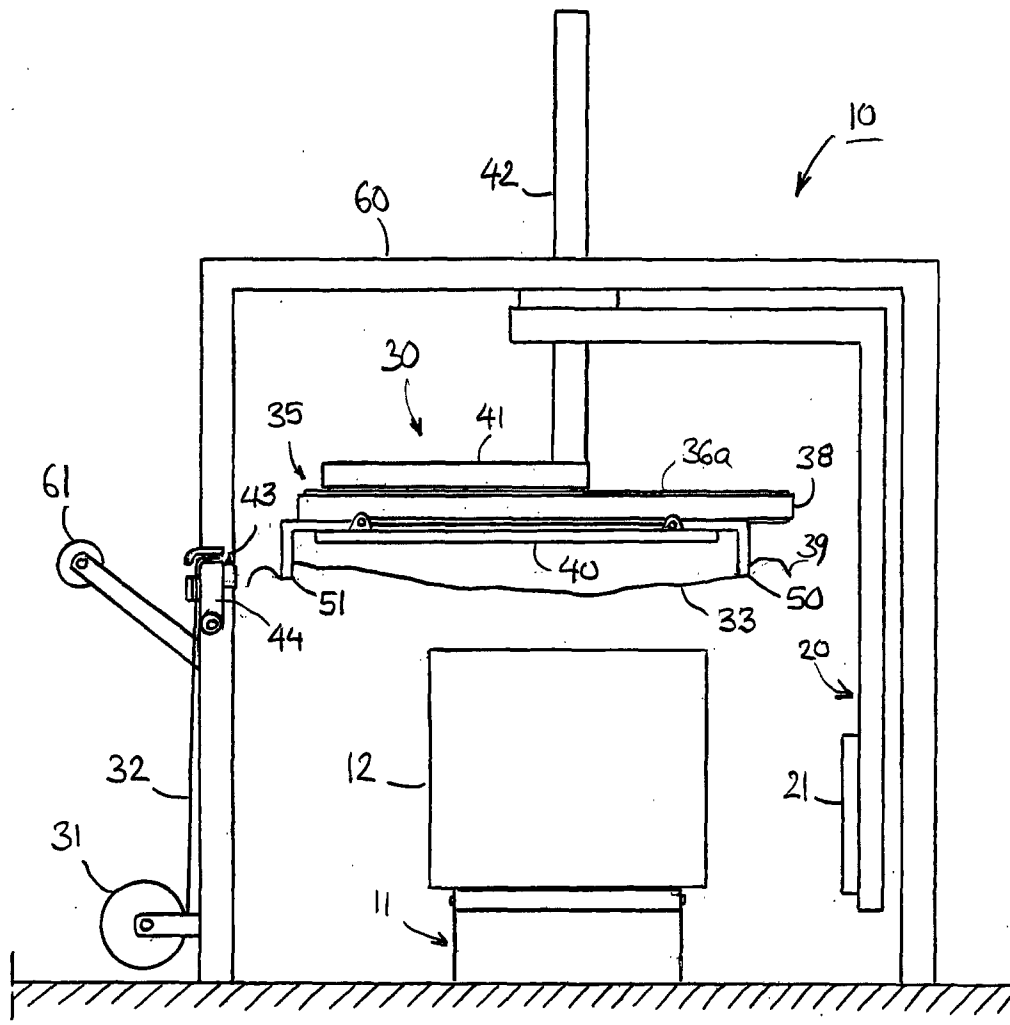


FIG. 6

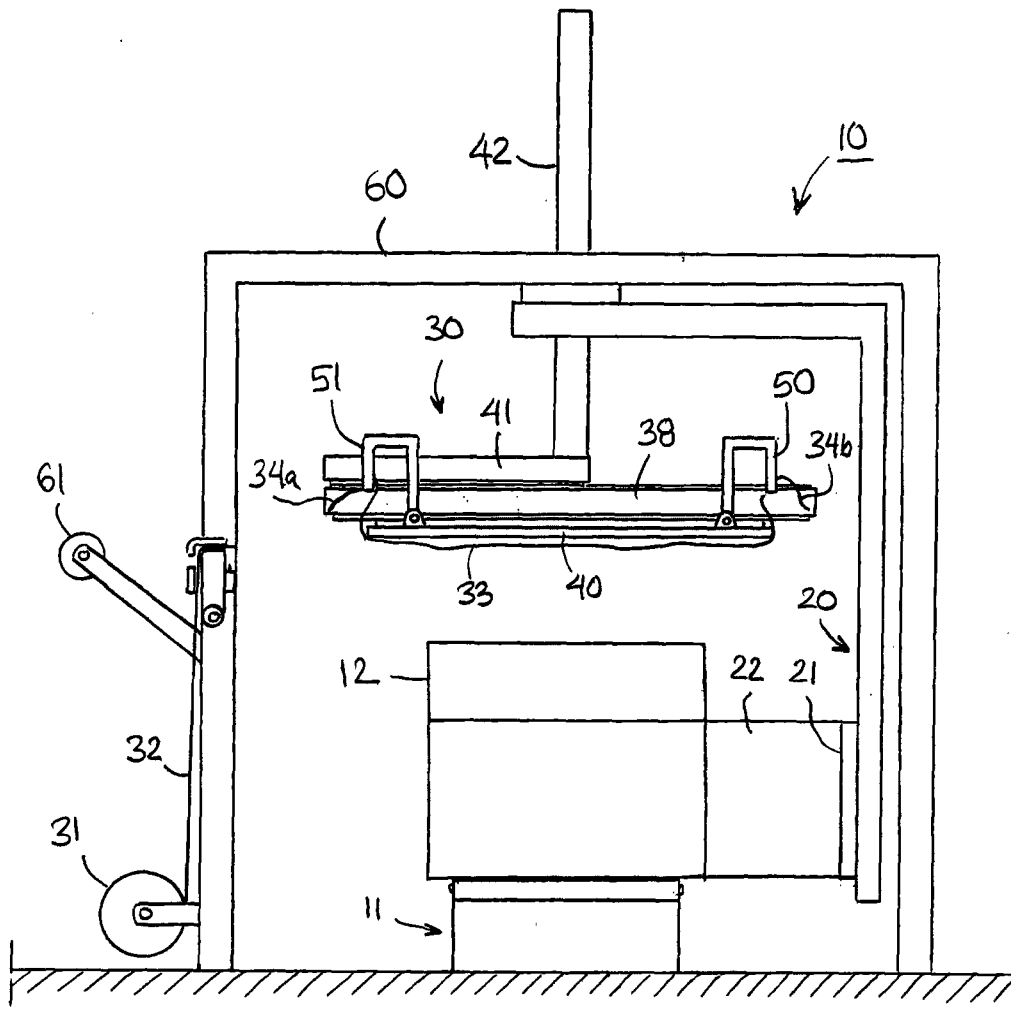


FIG. 7

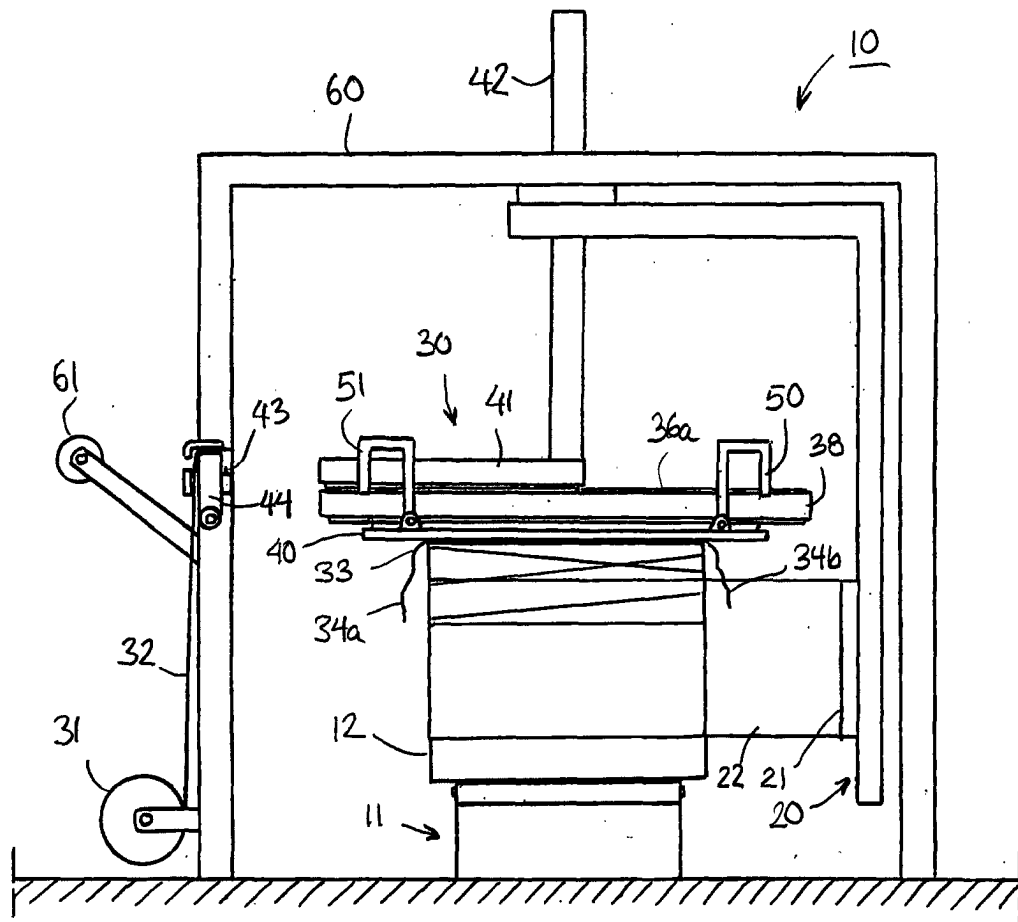


FIG. 8



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 66 0067

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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