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(54) **Title**: ARRANGEMENT AND APPARATUS FOR BLANK FEEDING

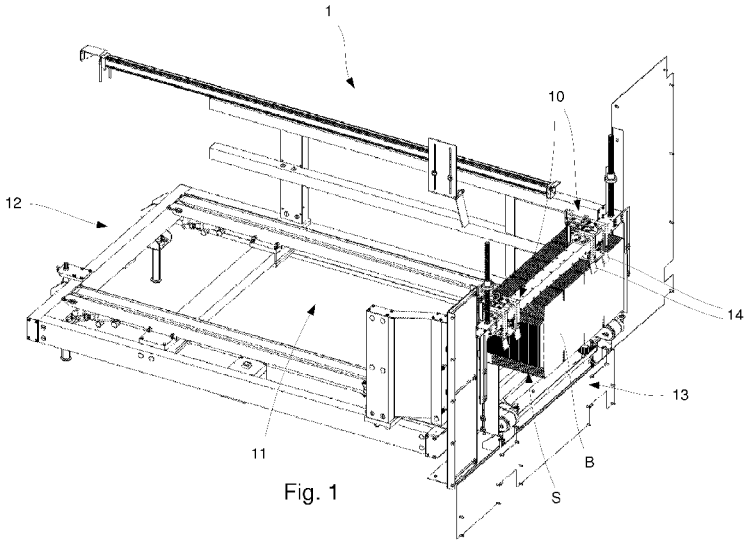


Fig. 1

(57) **Abstract**: A packaging blank feeding unit (1) is provided. The packaging blank feeding unit (1) comprises a packaging blank magazine (11) with an input end (12) and an output end (13), wherein a stop means (14, 34) is arranged at the output end (13), for holding the stack of packaging blanks (S) in place. The stop means (14,34) may be arranged to stop an edge of said packaging blanks. The packaging blank feeding unit (1) further comprises a push plate (15), said push plate (15) being arranged above packaging blank magazine (11) and being vertically movable, such that it may apply a pressure onto the packaging blank stack.A method of feeding packaging blanks in a packaging blank folding machine, and a use of a packaging blank feeding unit is also provided.

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ARRANGEMENT AND APPARATUS FOR BLANK FEEDING

TECHNICAL FIELD

The present invention pertains in general to the field of an arrangement for feeding packaging blanks in a box folding machine. More particularly, the present invention pertains to blank feeding for feeding packaging blanks one by one to a packaging machine for filling.

TECHNICAL BACKGROUND

Devices for automatically feeding packaging blanks, for example for cartons, to a packaging machine for filling are previously known. Such a device has usually a magazine with a bottom, made for example with a sliding surface, the blanks being supported on the bottom of the magazine.

However, a serious problem with these currently used devices is the uneven feeding of blanks due to the static friction at moving the blanks along the bottom of the magazine. The effect of slip-stick, arising when the coefficient of friction generates a force that is higher than the feeding force, will result in missing blanks or more than one blank at feeding instead of desirably one blank. This is mainly due to built up pressure in the blank stack in the magazine, caused by operator influence when correcting and filling the stack on the magazine.

Another problem is that a higher force is needed for moving the blanks in a recently loaded magazine than in an almost empty one, causing uneven loading pressure on the picking unit, picking the blank and transporting it into further treatment in the folding apparatus.

Yet another problem is the spring-back effect arising when the folded blanks tend to spring back to their original position, which occurs more frequently when static friction is present and which contributes to an uncontrolled feeding force.

Attempts have been made to overcome those problems by implementing different types of release systems for built up pressure, such as vibrators as well as moving guides to decrease the effect of static friction and built up pressure. These solutions do however not adjust for varying stack lengths, unavoidably creating variable pressure at the picking arm.

Hence, a new arrangement for feeding packaging blanks in a box folding machine would be advantageous, and especially an arrangement allowing for adaptation to different stack lengths, and an arrangement for feeding packaging blanks in a box

folding machine providing active interaction with the blank stack to eliminate influence from built up pressure in the blank stack on the picking unit at the end of the blank stack, said picking unit delivering the blanks from the stack into folding stations in the folding machine.

SUMMARY OF THE INVENTION

Accordingly, the present invention preferably seeks to mitigate, alleviate or eliminate one or more of the above-identified deficiencies in the art and disadvantages singly or in any combination and solves at least the above mentioned problems e.g. by providing a packaging blank feeding unit, comprising packaging blank magazine with an input end and an output end, wherein a stop means is arranged at the output end, for holding the stack of packaging blanks in place, said stop means being arranged to stop an edge of said packaging blanks, said packaging blank feeding unit further comprising a push plate, said push plate being arranged above packaging blank magazine and being vertically movable, such that it may apply a pressure onto the packaging blank stack; a method of feeding packaging blanks in a packaging blank folding machine, comprising the steps of: arranging a stack of packaging blanks on a packaging blank magazine, with an input end and an output end, such that the stack has a longitudinal horizontal extension, pushing the stack towards the output end, applying a downward vertical pressure onto the stack close to the output end, and picking at least one blank from the stack, after the downward vertical pressure onto the stack has been applied; and a packaging blank folding machine comprising a packaging blank feeding unit according to above.

Further advantages and preferred embodiments will be apparent from the dependent claims.

BRIEF DESCRIPTION OF DRAWINGS

These and other aspects, features and advantages of which the invention is capable of will be apparent and elucidated from the following description of embodiments of the present invention, reference being made to the accompanying drawings, in which

Fig. 1 is a perspective view of one embodiment of the present invention;

Fig. 2 is a side view of the same embodiment of the present invention in the stopping position;

Fig. 3 is an isometric view of a portion of the first embodiment in the stopping position;

Fig. 4 is a view similar to that of Fig. 2 showing the releasing position;

Fig. 5 is a view similar to that of Fig. 3 showing the releasing position;

Fig. 6 is an isometric view of a second embodiment of a unit of the present invention;

Fig. 7 is a schematic side view of the embodiment shown in Fig. 6;

Fig. 8 is an enlarged isometric view of the outfeed of the present invention; and

Fig. 9 is a schematic, enlarged side view of a sensor of an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

An embodiment of the present invention will be described in more detail below with reference to the accompanying drawings, in order for those skilled in the art to be able to carry out the invention. This embodiment is provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

According to a first embodiment, illustrated in Fig. 1, a packaging blank feeding unit 1 is disclosed. The packaging blank feeding unit 1 is a part of a box folding machine (not shown in its entirety). The packaging blank feeding unit 1 comprises a force-limiting device 2, and a packaging blank magazine 11. The packaging blank magazine 11 has an input end 12 and an output end 13. In the force-limiting device 2, at the output end 13 of the packaging blank feeding unit, a stop plate 14 is arranged, for holding the stack of packaging blanks S in place in between feeding of separate blanks B into downstream folding units in the folding machine. The stop plate 14 is arranged in a substantially vertical plane, being substantially perpendicular to the longitudinal extension of the magazine and the packaging blank stack S. A picker arm with one or several suction cups (not shown) or a similar picking unit is arranged at the output end 13, for transferring a packaging blank B into downstream folding units of the packaging blank folding machine. The blanks B are fed by a top feeding unit 10, which is driven by a pneumatic cylinder, and two conveyors 51a, 51b at the bottom of the blank magazine 11. The top feeding unit 10 gives a constant force on the top of the rearmost blank B, and the conveyors 51a, 51b are driven intermittently in response to the picking of blanks. The conveyors 51a, 51b may e.g. be driven by a pneumatic cylinder connected to a one-way ratchet mechanism.

In Fig. 2 it is illustrated that a push plate 15 is arranged upstream the stop plate 14. The push plate 15 is arranged above the packaging blank stack S, and is further arranged in a substantially horizontal plane. The push plate is vertically displaceable, such that it may apply a pressure onto the packaging blank stack S.

Preferably, the push plate 15 is arranged at a relatively short distance from the output end 13. The distance between the stop plate 14 and that end of the push plate 15 being located closest to the stop plate 14 corresponds to the thickness of approximately 1 or 2 blank thicknesses. In this way the pressure built up upstream of the push plate 15 will not be transferred to the one or two blanks being located downstream the push plate 15, whereby the pressure on the picking unit is substantially relieved. The breadth of the pushing plate may correspond to an adequate number of packaging blank thicknesses, to transfer the pushing pressure from the push plate 15 to an enough number of packaging blanks not to risk demolishing the blanks.

The push plate 15 comprises an interaction surface 15a for cooperation with the packaging blank stack. This interaction surface may be corrugated. When the interaction surface is corrugated, the ridges of the corrugated pattern will tend to penetrate between two adjacent packaging blanks. When this is obtained, the push plate will not only increase the contact area with the packaging blank stack, thus increasing friction, but also take up pressure in the direction form the input end 12 to the output end 13. In this way the risk of demolishing the packaging blanks is further diminished.

The push plate 15 is connected to an actuation plate 16 via springs 17. The actuation plate 16 is positioned above the push plate 15 in a substantially horizontal plane. The substantially horizontal plane of the push plate 15 is substantially aligned with the substantially horizontal plane of the actuation plate 16.

The actuation plate 16 is fixed to an actuation means 18, which means may displace the actuation plate 16 in the vertical direction. In this embodiment the actuation means 18 is a cylinder, for example a pneumatic cylinder. The actuation means 18 may of course be of another kind, for example a hydraulic cylinder or a linear motor.

Further, Fig. 3 shows that a first end of an actuation arm 19 is connected to the actuation plate 16 via an axle 20. The second end of said actuation arm 19 is provided with an oblong-shaped slot 21 in which a first end of a stop plate arm 22 is mounted via a bearing 23. The bearing 23 may be freely running in the oblong-shaped slot 21. The stop plate 14 is fixed to the second end of said stop plate arm 22. Further, said stop plate arm 22 is angled having two leg portions being angled in relation to each other. The first leg portion, which is connected to the oblong-shaped slot 21, is mounted such that it

may be pivoted around a pivot point 24. Said pivot point being an axle 24 that is being fixedly mounted to a fixed support 25 of the feeding unit 1.

The stop plate 14 is being movable between a stopping position and a releasing position in respect of said packaging blanks. Figs. 1-3 show the arrangement in the stopping position. In this position the stop plate 14 is held firmly against the outermost blank in the stack S, preventing the blanks from falling out at the output end 13. As can be seen in Fig. 3, the cylinder 18 is in its starting position, the starting position being a retracted position, meaning that the springs 17 are not acted upon by the actuation plate 16. This means that the push plate 15 is being positioned above the stack S having no contact with the blanks (see Fig. 2). The bearing 23 of the stop plate arm 22 is positioned in the lower end of the oblong-shaped slot 21, whereby the first leg portion of the stop plate arm 22 is arranged in a substantially horizontal plane.

Figs. 4-5 show the arrangement in the releasing position. In this position the stop plate 14 is arranged to release the stack S and thereby facilitate picking of the outermost blank by the picker (not shown). The stop plate 14 is being moved to its releasing position in the following way: The cylinder 18 starts extracting, which acts on the actuation plate 16, which in turn moves the push plate 15 to come into contact with the stack S of blanks. Before the cylinder 18 has reached its fully extracted position the springs 17 are compressed so that the push plate 15 is firmly held against the stack S (without damaging the blanks). When the springs 17 are fully compressed the cylinder 18 has yet to be extracted a further short distance until it has reached its fully extracted position. This further short distance will cause the stop plate 14 to move from its stopping position to its releasing position. This will be explained in the following.

The extraction of the cylinder 18 will cause a vertical movement of the actuation plate 16 that forces the actuation arm 19 to be correspondingly moved downwards in the figures. During the vertical movement of the actuation arm 19, the bearing 23 runs in the slot 21. However, the full extraction distance of the cylinder 18 is longer than the possible running distance inside the slot 21. This means that the bearing 23 will reach the uppermost end of the slot 21 before the cylinder 18 has been fully extracted. Thus, the last portion of the cylinder extraction distance will make the upper portion of the actuation arm 19 to instead force the bearing 23 downwards, thereby causing the stop plate arm 22 to slightly pivot around the pivot axle 24. By this movement around the pivot axle 24, the stop plate 14 is moved away from the blanks thereby releasing them. The picker may now pick the outermost blank, which is released from pressure, while the push plate 15 stabilizes the position of the rest of the blanks. In

other words, it may be assured that the push plate 15 overcomes the built up pressure in the packaging blank stack in the direction from the input end 12 to the output end 13 when the stop plate 14 releases the packaging blank stack S.

The packaging blank feeding unit 1 comprises a control unit for adapting the downwards vertical pressure of the push plate 15, such that the frictional force between the push plate 15 and the packaging blank stack overcomes the built up pressure in the packaging blank stack in the direction from the input end 12 towards the output end 13.

Another embodiment of the force-limiting device 30 of the present invention can be seen in Figs. 6 and 7. Here, another stop means 34 is provided in the form of a roller that is mounted to contact the top of the foremost cardboard blank B in the cardboard blank stack S. The roller 34 is mounted on a stop means arm 42 via a pivot point 44, such that the roller 34 is freely rotatable. The stop means arm or roller arm 42 is in turn mounted to be pivotable around another pivot point 43, which is connected to the frame of the packaging blank feeding unit 1. A sensor 49 is mounted at a free end of the stop means arm 42, opposite the end of attachment of the roller 34, for sensing movement of said arm 42. The stop means arm 42 is further biased towards a stop 46, which in the shown embodiment is a bracket for attaching the force limiting device 30 to the frame of the packaging blank feeding unit 1, by a spring means 47 acting from a protrusion 48 of the frame, as seen schematically in Fig. 7. The spring-biased pivotable arm 42 with the sensor 49 constitutes a force detection assembly. This may be designed in various different ways, e.g. with a strain gauge mounted on a rigid arm, in a way known to a person skilled in the art, for detecting the force on the roller 34.

The force limiting means 30 further comprises a push plate 35, having an interaction surface 35a, where said push plate is connected to an actuating means 38, such as a pneumatic cylinder. Said interaction surface 35a may be provided with protrusions, such as screws, studs or similar, for improving the grip of the blanks. Said push plate 35 is arranged above the packaging blank magazine 11, and is substantially horizontal. Other orientations are possible, as long as the push plate 35 contacts several blanks B when being activated.

Additionally, the packaging blank feeding unit 1 can be provided with sensors 52a, 52b for detecting when the bottom part of the first blank has arrived at the correct outfeed position, see Figs. 8 and 9. These sensors 52a, 52b give a signal to a control unit (not shown) that stops the feeding of the conveyors 51a, 51b underneath the blank stack S. One sensor 52a, 52b can be arranged in the vicinity of each corresponding conveyor 51a, 51b for controlling said corresponding conveyor independently. This ensures that

the cardboard blanks B in the stack S are perpendicular to the feeding direction for improved alignment of the blanks. This improves the feeding in that it prevents jamming of the blanks.

One embodiment of said sensor 52a, 52b can be seen in more detail in Fig. 9, where an S-shaped metal plate 61 is pivoted about a pivot point 62. The plate is arranged to allow the blanks B to contact the lower part of the S, which is parallel to the bottom of the blank magazine 11. The force from the conveyors 51a, 51b is transferred to the blanks B which in turn press on the upwardly angled part 61a of the plate 61. This plate is then forced to pivot about the pivot point 62 such that a sensor 63, mounted in a frame 64, is depressed. This sensor 63 in turn sends a signal to the control unit (not shown) that deactivates the corresponding conveyor 51a, 51b. The plate 61 is biased by spring 65, shown schematically in Fig. 9, for counteracting the force from the blanks. The force from the spring 65 should be adjusted to give a suitable detection of the bottom part of the blanks B. As mentioned above, one sensor 52a, 52b may be mounted with each conveyor 51a, 51b for independent feeding of each side of the packaging blank stack S.

In operation of the packaging blanks feeding unit 1, a number of blanks are placed in the magazine 11, on top of the conveyors 51a, 51b, and with the top feeding unit 10 in contact with the top of the blanks. The unit 1 is activated and the top feeding unit 10 is activated such that a constant pressure is applied at the top part of the blanks B. The bottom conveyors 51a, 51b are also activated, and drive the bottom part of the blanks towards the outfeed 13 of the unit 1 until the sensors 52a, 52b are trigged. This signals to the control system that the bottom part of the first blank is in position for being picked.

When the force on the stop means 34 reaches a predetermined threshold value, the stop means arm 42 pivots outward, and this movement is detected by the sensor 49. The sensor sends a signal to a control unit of the packaging blank feeding unit 1, which in turn activates the pneumatic cylinder 38, which presses the push plate 35 against the top of the blanks. This limits the force from the top feeding unit 10 onto the stop means 34. The push plate 35 is then depressed for a predetermined time, or until a certain predefined number of blanks B has been picked by the picker arm.

In one embodiment, the conveyors 51a, 51b are driven independently, in response to a corresponding sensor 52a, 52b.

The distance between the push plate 35 and the outfeed may in this embodiment be up to 10 cm. The push plate may be activated during picking of one to

five blanks from the outfeed, depending on the quality of the packaging blanks, thickness thereof etc.

Although the present invention has been described above with reference to specific embodiments, it is not intended to be limited to the specific form set forth herein. Rather, the invention is limited only by the accompanying claims and, other embodiments than the specific above are equally possible within the scope of these appended claims.

In the claims, the term "comprises/comprising" does not exclude the presence of other elements or steps. Furthermore, although individually listed, a plurality of means, elements or method steps may be implemented by e.g. a single unit or processor. Additionally, although individual features may be included in different claims, these may possibly advantageously be combined, and the inclusion in different claims does not imply that a combination of features is not feasible and/or advantageous. In addition, singular references do not exclude a plurality. The terms "a", "an", "first", "second" etc do not preclude a plurality. Reference signs in the claims are provided merely as a clarifying example and shall not be construed as limiting the scope of the claims in any way.

CLAIMS

1. A packaging blank feeding unit (1), comprising a packaging blank magazine (11) with an input end (12) and an output end (13), wherein a stop means (14, 34) is arranged at the output end (13), for holding a stack of packaging blanks (S) in place, said stop means (14, 34) being arranged to stop an edge of said packaging blanks, said packaging blank feeding unit (1) further comprising a push plate (15, 35), said push plate (15, 35) being arranged above the packaging blank magazine (11) and being vertically movable, such that it may apply a pressure onto the packaging blank stack (S) on said packaging blank magazine (11).

2. The packaging blank feeding unit (1) according to claim 1, wherein the stop means (14) is a stop plate being arranged in a substantially vertical plane and substantially perpendicular to a longitudinal extension of the packaging blank magazine (11), said stop plate being movable between a stopping position and a releasing position, in respect of said packaging blanks.

3. The packaging blank feeding unit (1) according to claim 2, wherein the push plate (15) is arranged to apply said pressure onto the packaging blank stack (S) at least when the stop plate (14) is in its releasing position.

4. The packaging blank feeding unit (1) according to claim 2, wherein the push plate (15) is arranged to apply said pressure onto the packaging blank stack (S) by means of an actuation means (18), and wherein the application of said pressure causes the stop plate (14) to be moved from its stopping position to its releasing position.

5. The packaging blank feeding unit (1) according to any of the preceding claims, wherein the push plate (15) is arranged in a substantially horizontal plane and is spring-loaded.

6. The packaging blank feeding unit (1) according to any of the preceding claims, wherein the push plate (15) is arranged close to the output end (13).

7. The packaging blank feeding unit (1) according to any of the preceding claims, wherein the push plate (15) comprises an interaction surface (15a) for

cooperation with the packaging blank stack (S), wherein said interaction surface (15a) is corrugated.

8. The packaging blank feeding unit (1) according to any of claims 2 to 7, wherein:

the push plate (15) is connected to an actuation plate (16), said actuation plate (16) being fixed to the actuation means (18),

an actuation arm (19) is provided which in one end is connected to said actuation plate (16) and in a second end is provided with a slot (21),

the stop plate (14) is being connected to a first end of a stop plate arm (22),

a second end of said stop plate arm (22) is being arranged to be able to run in said slot (21), and

the stop plate arm (22) is being arranged in such a way that it may pivot around a pivot point (24) positioned in between said first and said second end of the stop plate arm (22).

9. The packaging blank feeding unit (1) according to claim 8, wherein the actuation means (18) is arranged to displace the actuation plate (16) towards the packaging blank stack (S), thereby causing the push plate (15) to be pressed against the blanks, and the stop plate arm (22) to be pivoted slightly around the pivot point (24), thereby moving the stop plate (14) from its stopping position to its releasing position, said pivoting of the stop plate arm (22) is being achieved in that the extraction distance of the actuation means (18) is longer than the distance inside the slot 21.

10. The packaging blank feeding unit (1) according to any of the preceding claims, further comprising a control unit for adapting the downwards vertical pressure of the push plate (15), such that the frictional force between the push plate (15) and the packaging blank stack overcomes the built up pressure in the packaging blank stack in the direction from the input end (12) towards the output end (13).

11. The packaging blank feeding unit (1) according to claim 1, wherein the stop means (14, 34) is provided with a force detection assembly, such that the push plate (15, 35) can be pushed down on the packaging magazine blanks (B) if a force on the stop means (14, 34) exceeds a predetermined force.

12. The packaging blank feeding unit (1) according to claim 1 or 10, wherein the stop means (34) is a pivotable roller with an axis of rotation that is parallel to the top edge of the packaging blank (B).

13. The packaging blank feeding unit (1) according to claim 1, wherein a second sensor (52a, 52b) is provided in vicinity of a conveyor (51a, 51b) for feeding the bottom of the packaging blanks (B), said sensor (52a, 52b) being arranged to detect when a bottom of said blanks has reached an outfeed position.

14. The packaging blank feeding unit (1) according to claim 12, wherein two sensors (52a, 52b) each are arranged in vicinity of a corresponding conveyor (51a, 51b) on either side of the bottom of the packaging blanks (B), such that each side of the packaging blank can be fed independently of the other side.

15. A method of feeding packaging blanks in a packaging blank folding machine, comprising the steps of:

arranging a stack (S) of packaging blanks (B) on a packaging blank magazine (11), with an input end (12) and an output end (13), such that the stack has a longitudinal horizontal extension,

pushing the stack towards a stop means (14, 34) at the output end (13),

applying a downward vertical pressure onto the stack close to the output end (13), and

picking at least one blank from the stack, after the downward vertical pressure onto the stack has been applied.

16. A method according to claim 14, wherein the step of applying a downward vertical pressure onto the stack (S) of packaging blanks (B) is triggered by a force on the stop means (14, 34) exceeding a predetermined value.

17. A packaging blank folding machine comprising a packaging blank feeding unit (1) according to any of claims 1 to 9.

18. Use of a packaging blank feeding unit (1) according to any of claims 1 to 9, for feeding a blank into a packaging blank folding machine.

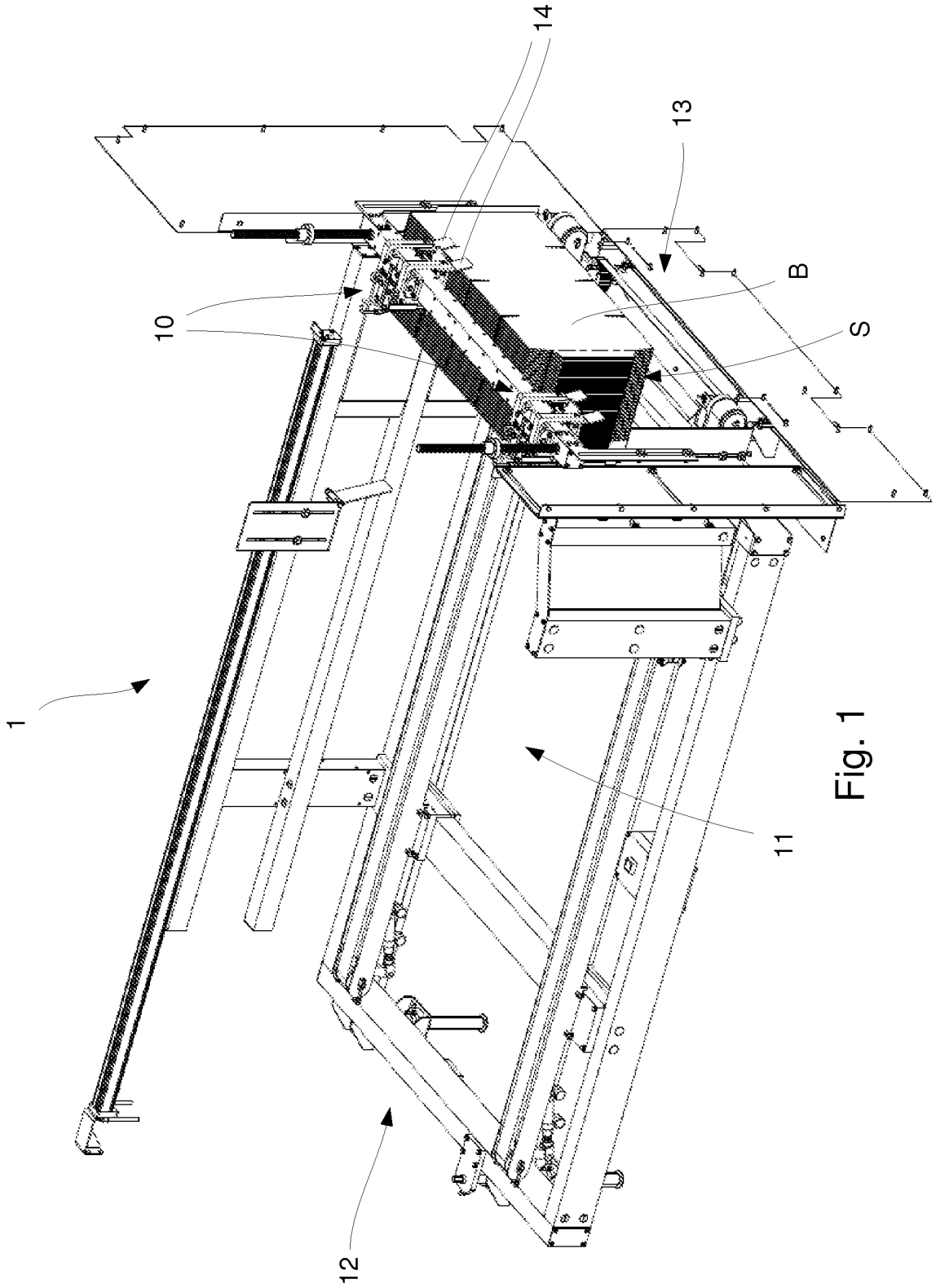


Fig. 1

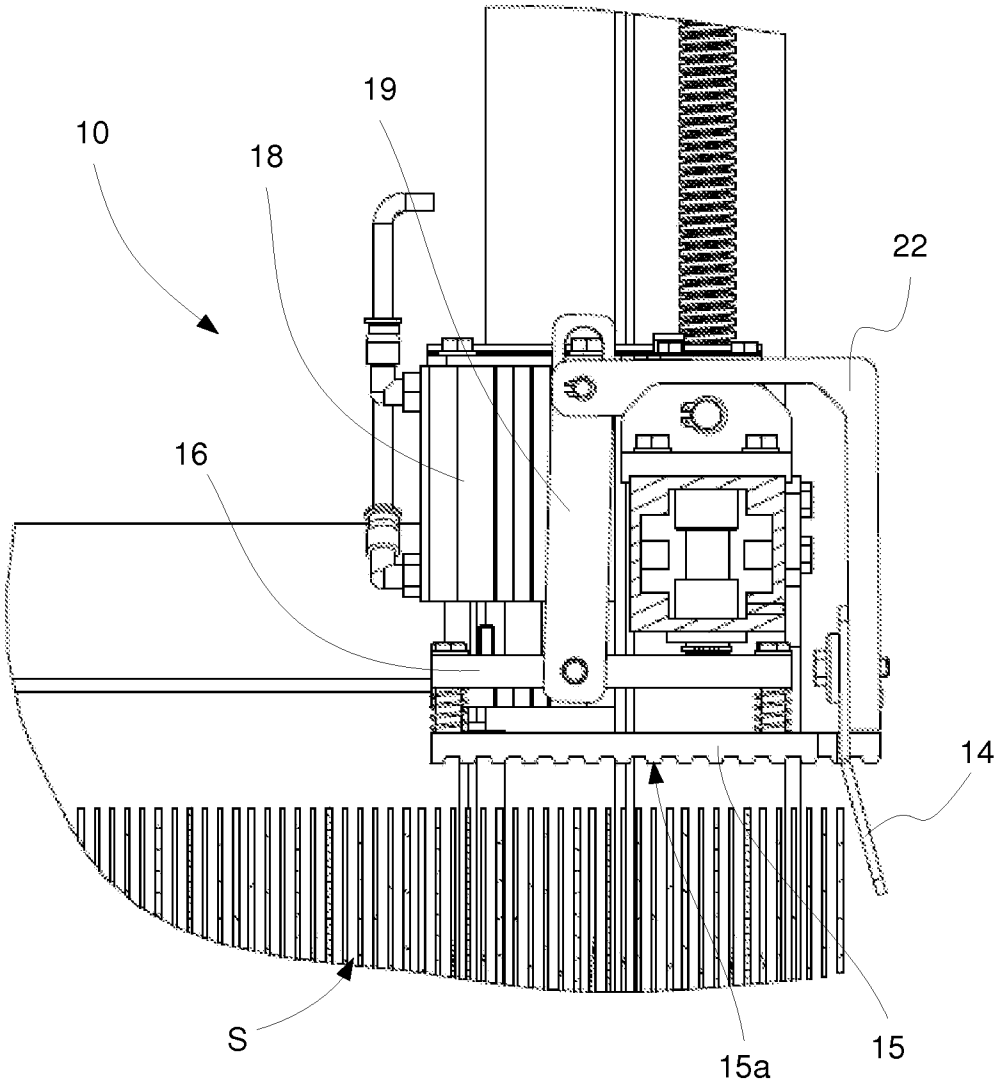


Fig. 2

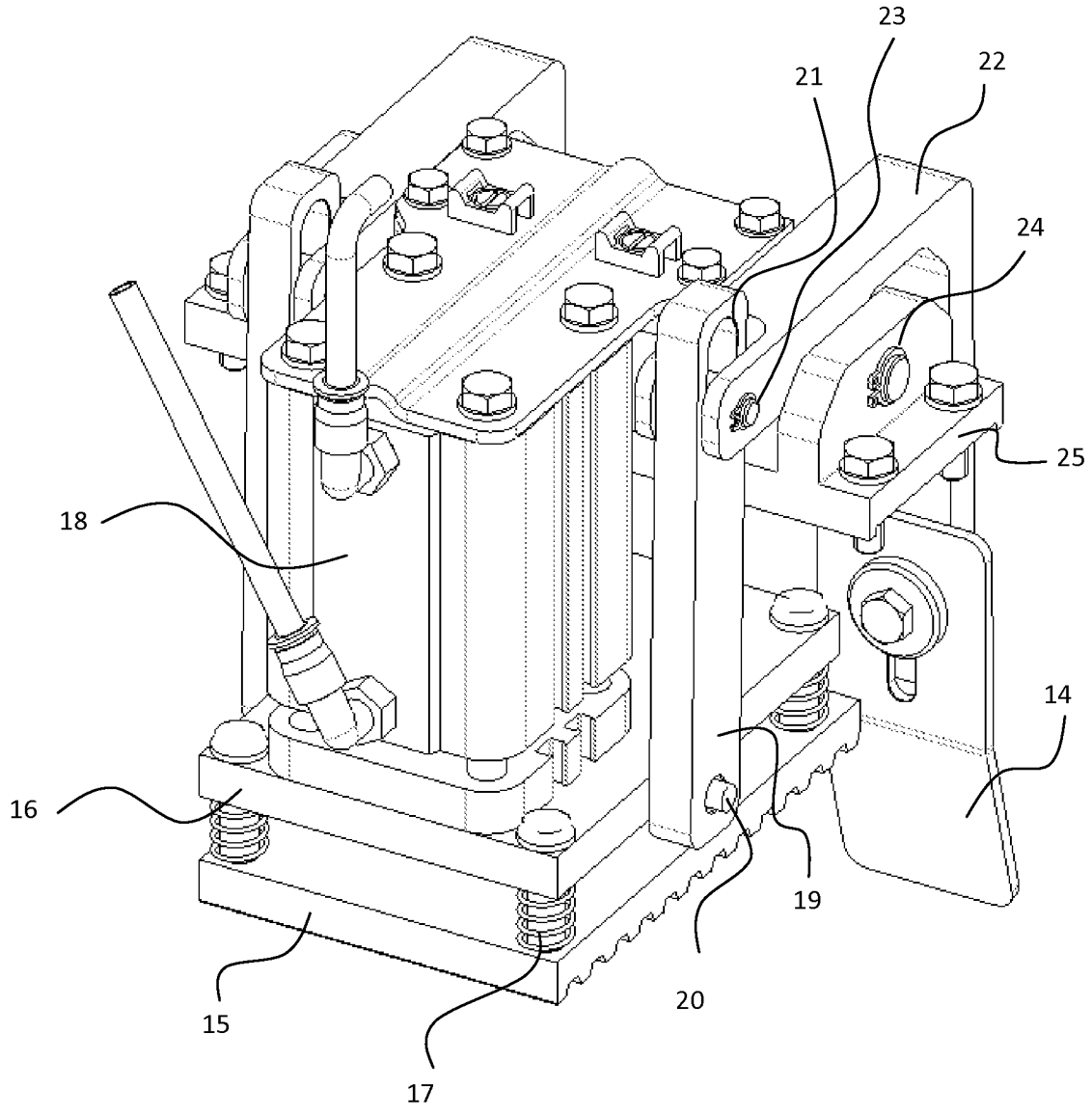


Fig. 3

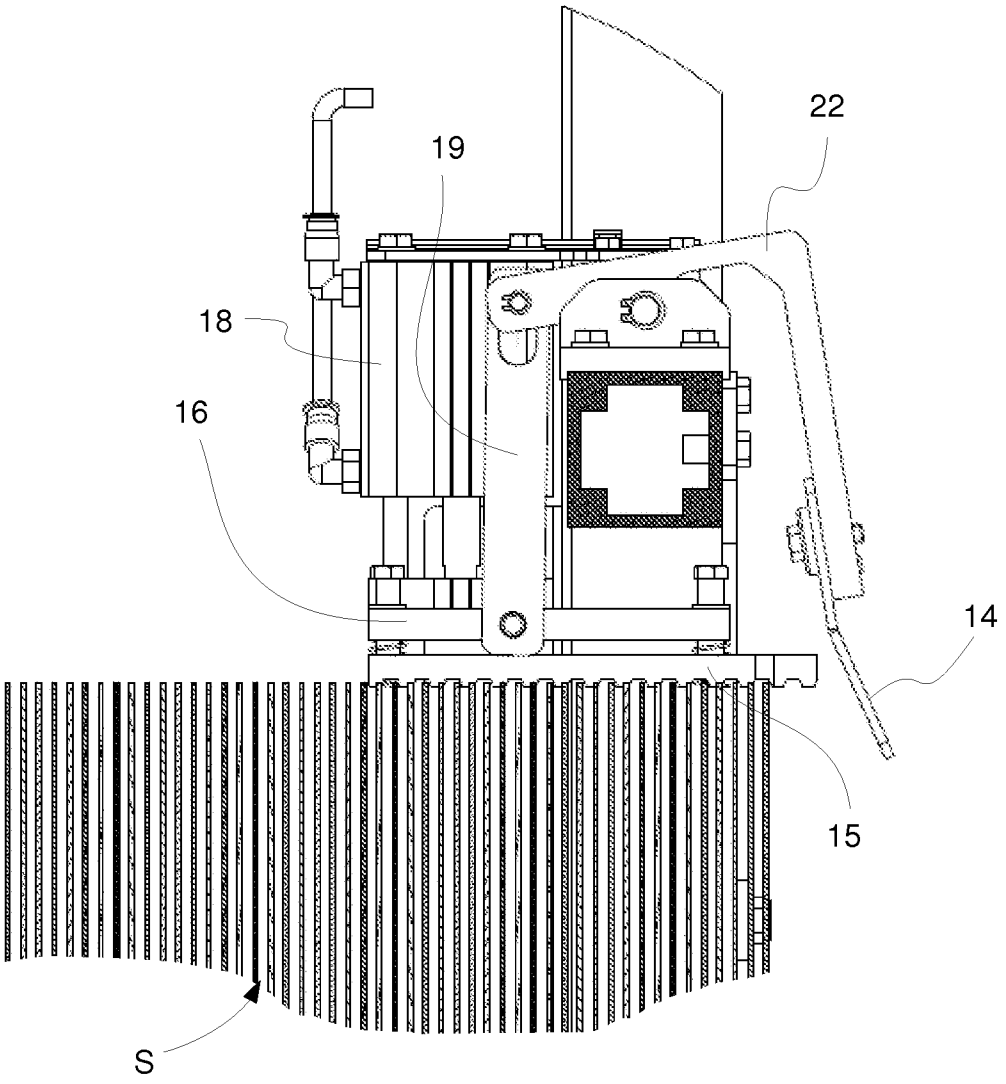


Fig. 4

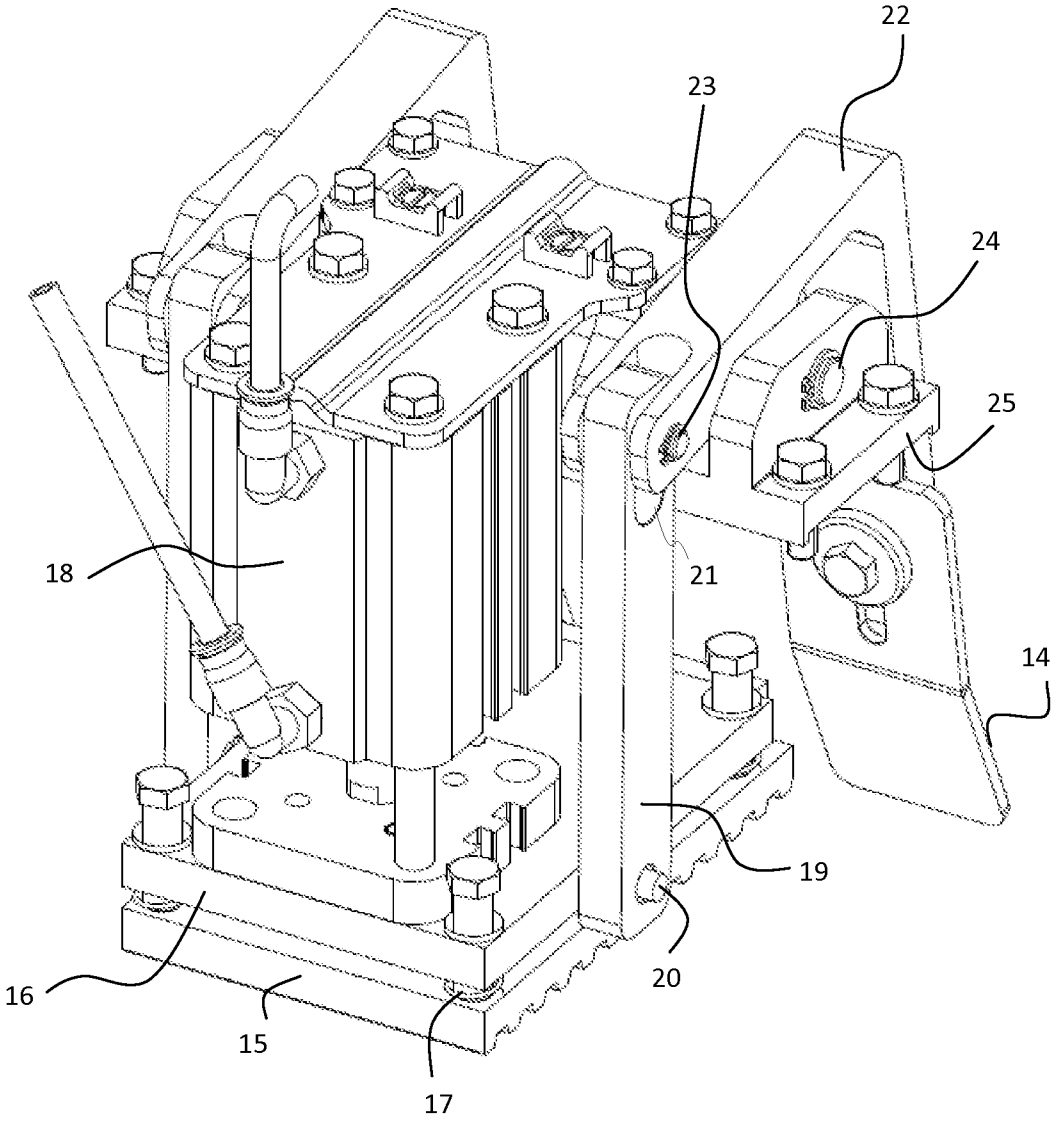


Fig. 5

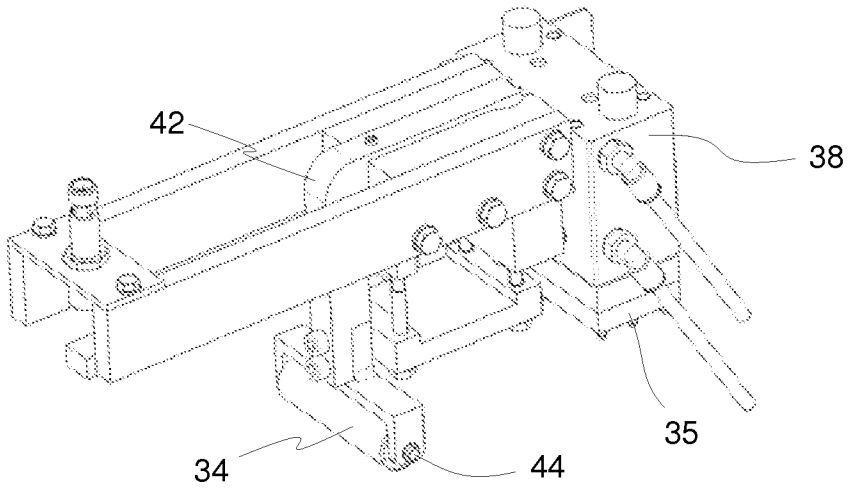


Fig. 6

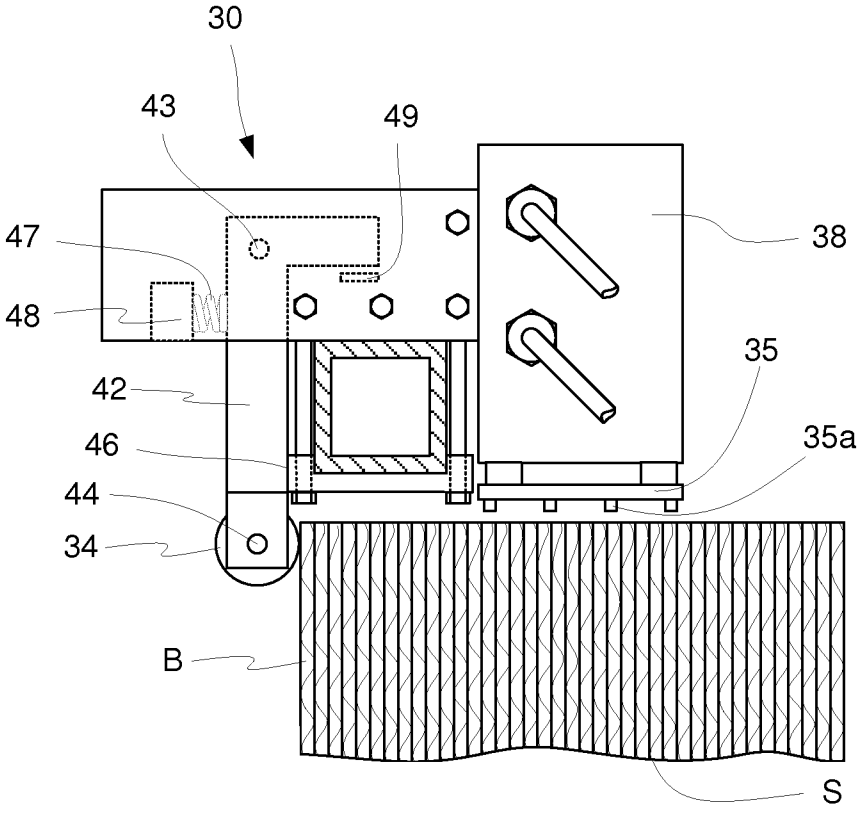


Fig. 7

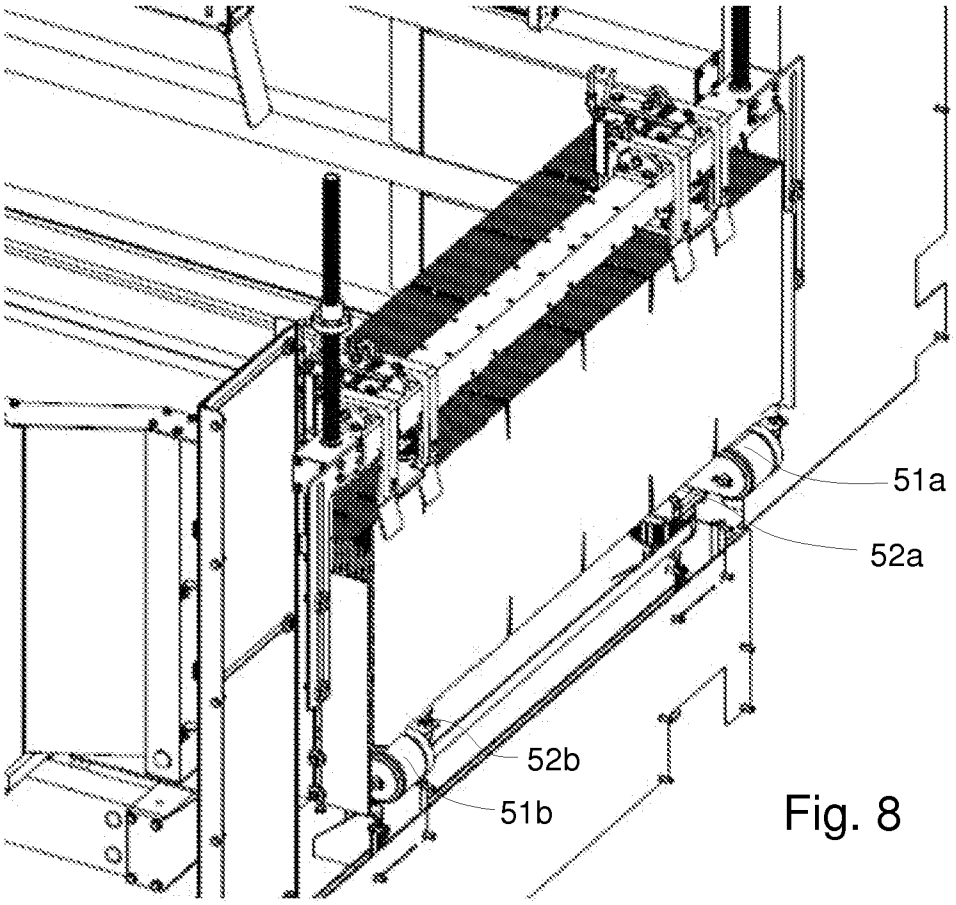


Fig. 8

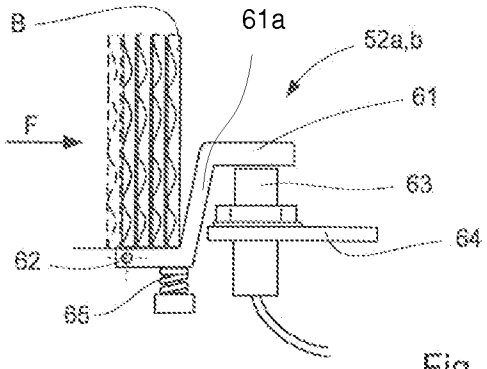


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2011/051234

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: B31B, B65B, B65G

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3429570 A (SCULLY JOHN W), 25 February 1969 (1969-02-25); column 4, line 23 - line 34; column 4, line 50 - line 60 --	1-18
A	US 5211529 A (ESALA DAVID A ET AL), 18 May 1993 (1993-05-18); column 5, line 18 - line 23; figure 2 --	1-18
A	US 5970834 A (GAROFANO GARY M ET AL), 26 October 1999 (1999-10-26); column 6, line 20 - line 28; figure 7 --	1-18
A	DE 9310310 U1 (IWK VERPACKUNGSTECHNIK GMBH), 16 September 1993 (1993-09-16); page 7, line 1 - line 28; figures 1,2 --	1-18

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
03-04-2012	04-04-2012

Name and mailing address of the ISA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Kristina Berggren Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2011/051234

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 3614606 A1 (POLYGRAPH LEIPZIG), 4 December 1986 (1986-12-04); abstract; figure 1 --	1-18
A	EP 0510953 A1 (MEAD CORP), 28 October 1992 (1992-10-28); abstract --	1-18
A	US 4348853 A (MORSE HUGH B ET AL), 14 September 1982 (1982-09-14); column 3, line 23 - column 4, line 2; figure 3 --	1-18

International application No.
PCT/SE2011/051234

Continuation of: second sheet

International Patent Classification (IPC)

B65B 43/18 (2006.01)
B65G 59/08 (2006.01)
B31B 1/06 (2006.01)

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Cited literature, if any, will be enclosed in paper form.

US	3429570	A	25/02/1969	NONE		
US	5211529	A	18/05/1993	NONE		
US	5970834	A	26/10/1999	NONE		
DE	9310310	U1	16/09/1993	NONE		
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