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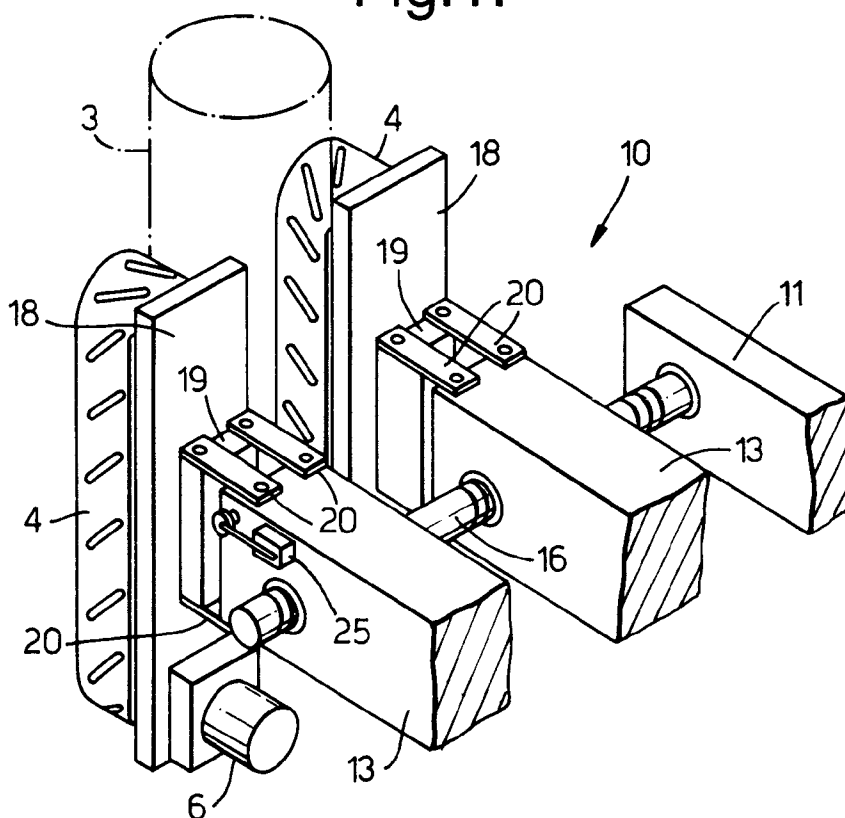
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(54) Apparatus for pulling down cylindrically formed film in a bag maker packaging machine

(57) An apparatus for pulling a cylindrically formed bag-making material along a filling cylinder with a pair of pull-down belts (4) for a bag maker-packaging machine includes a pair of belt-supporting members (18)

adapted to move towards or away from each other, and biasing springs (22) for providing each of the pull-down belts with a biasing force which depends on the relative position between the pull-down belt and the corresponding one of the belt-supporting members.

Fig.1.



Description

This invention relates to an apparatus, generally referred to as a pull-down belt, for pulling a cylindrically formed bag-making material for a bag maker-packaging machine.

A bag maker-packaging machine, for example, of a so-called vertical pillow type, is generally adapted to bend an elongated web of a thermoplastic flexible bag-making material (hereinafter referred to as "the film") into a cylindrical form around a filling cylinder by means of a component known as the former, to simultaneously seal together its mutually overlapping side edge parts and to use a pair of pull-down belts to pull it further down to a transverse sealer for sealing the cylindrically formed film transversely to the direction of its motion. The filling cylinder is for the purpose of dropping articles there-through to be packaged, and a plurality of formers with different sizes are usually made available for handling films with different widths and different ways of sealing. Most pull-down belts which have been used for this purpose are of the type which will forcefully compress the film between the belt and the filling cylinder while the film is being pulled downward. Pull-down belts of this type have the disadvantage that a roller or a slidable plate is required to be buried inside the filling cylinder, thereby narrowing the available passage for the articles dropped therethrough. With pull-down belts of this type, furthermore, it has been difficult to programmatically adjust the contact pressure.

The present inventor has disclosed, in Japanese Patent Publication Tokkai 5-4609, another type of pull-down belt adapted to pull down a film while causing it to be pulled toward the belt surface by creating a negative pressure condition. Pull-down belts of this type are able to overcome the problems of the kind described above, but they have different problems such as not being able to pull the film sufficiently forcefully if the gap between the belt and the film is too large because the suction force by the negative pressure weakens, or causing a zigzag motion of the film if the gaps between the film and the pair of belts on opposite sides thereof are not equal.

In accordance with the present invention, apparatus for pulling a cylindrically formed bag-making material in a longitudinal direction with a pair of pull-down belts for a bag maker-packaging machine comprises a pair of belt-supporting members adapted to move towards or away from each other, each of said pull-down belts being attached to but movable relative to the corresponding one of said belt-supporting members; and force-applying means for applying a force on each of said pull-down belts, said force depending on the relative position between said each pull-down belt and said corresponding one of said belt-supporting members.

This invention overcomes all the problems of prior art pull-down belts, by providing a new apparatus capable of transporting a cylindrically formed film while

pressing the film evenly and lightly such that the friction force generated thereby with the film will not be strong enough to pull it down.

In a preferred embodiment, elastic springs provide each of the pull-down belts with a force which depends on the relative positions of the pull-down belts with respect to the corresponding belt-supporting members.

The accompanying drawings, which are incorporated in and form a part of this specification, illustrate an embodiment of the invention and, together with the description, serve to explain the principles of the invention. In the drawings:

Fig. 1 is a diagonal view of a portion of a film transporting mechanism embodying this invention;
Fig. 2 is a plan view of a portion of the film transporting mechanism of Fig. 1;
Fig. 3 is a diagonal external view of a vertical pillow type packaging machine incorporating the mechanism embodying this invention;
Fig. 4 is a block diagram of the control unit for the packaging machine of Fig. 3; and
Fig. 5 is a plan view of a portion of another film transporting mechanism embodying this invention.

Fig. 3 shows schematically a bag maker-packaging machine of a vertical pillow type, which incorporates the present invention. A flexible, elongated thermoplastic bag-making material (the film S) is originally in the form of a web roll 92 supported around a shaft 95 (serving as web supporting means). The film S is pulled out of the web roll 92 by a pair of pull-down belts 4 and guided by a plurality of guide rolls (including dancer rollers) 105 to a former 2 disposed below a hopper 1. The function of the former 2 is to bend the film S into a tubular shape, and the tubularly shaped film S is then pulled downward along the peripheral surface of a filling cylinder (sometimes also referred to as a former tube) 3 towards a transverse sealer 110. The transverse sealer 110 is for horizontally (that is, transversely to the downward motion of the film S) sealing the film S such that a batch of articles which is dropped simultaneously through the hopper 1 can be sealed inside the bag being formed. Each of the pair of pull-down belts 4 is provided with a suction chamber 5 connected to a negative pressure source (not shown) while longitudinal seal parts of the film S are sealed together by means of a longitudinal sealing jaw 8 (shown somewhat removed from the filling cylinder 3 for clarity). There is also provided an adjustment mechanism 10 for causing the pair of pull-down belts 4 to move towards or away from each other according to the size of the former 2 which is currently installed. The adjustment mechanism 10 comprises a pair of elongated mutually parallel belt-supporting members 13, disposed in a side-by-side relationship, each supporting a corresponding one of the pull-down belts 4 and being supported so as to be horizontally slidable along a guide rod 12 having both its ends supported by main

frames 11 (only one of them shown) of the apparatus. This pair of belt-supporting members 13 can be moved towards or away from each other by means of a turn-buckle 16 adapted to be driven by an adjustment motor 15 disposed on one side of the main frames 11.

As shown in Figs. 1 and 2 in detail, there is a fine-adjustment mechanism at one end of the supporting members 13. Each pull-down belt 4 and a belt-driving motor 6 therefor are both supported by a belt-supporting plate 18, and an L-shaped (when seen from above, as shown in Fig. 2) block 19 is attached to its back surface (away from the belt 4). This L-shaped block 19 and one end part of a corresponding one of the pair of belt-supporting members 13 are connected to each other by means of a parallelogram linkage mechanism formed with a pair of elongated connectors 20 connected so as to remain parallel. A forward protrusion 21 is formed from each belt-supporting member 13, and a weak elastic spring 22 is inserted between this protrusion 21 and the L-shaped block 19 such that the pull-down belt 4 is normally supported at its neutral (unloaded) position.

There is a position-indicating rod 23 attached to the L-shaped block 19, penetrating through and protruding to one side of the belt-supporting member 13. A limit switch 25 is attached to the belt-supporting member 13 for detecting the distance of this protrusion and outputting a stop signal for stopping the adjustment motor 15 according to this distance of protrusion.

Fig. 4 shows a control unit 30 for the adjustment mechanism 10 including a memory device 33, means for comparing 34, means for selecting data 32 and a counting means 35. The counting means 35 is for counting the number of rotations of the adjustment motor 15, on the basis of outputted pulse from an encoder 17 attached to its shaft, until a stop signal is received from the limit switch 25. The memory device 33 is for storing data received from the counting means 35 counted for each type of former. The data selecting means 32 is for receiving signals from an external input means 31 such as a keyboard or a touch panel through which necessary data can be inputted by the user, selectively retrieving data which are stored in the memory device 33 for each former and transmitting them to the comparing means 34. The comparing means 34 is for comparing data received from the data selecting means 32 with the count data from the counting means 35 and outputting a deceleration signal immediately before their coincidence to thereby cause the adjustment motor 15 to decelerate and a stop signal at the time of their coincidence to thereby stop the motion of the adjustment motor 15.

Operations of the apparatus thus structured will be explained next.

First, a former 2 and a film roll appropriate for the packages to be produced are selected and installed on the machine and the film S is pulled out of the roll to the filling cylinder 3. The adjustment motor 15 is then activated to move the pair of belt-supporting members 13 engaged with the turnbuckle 16 towards each other from

their mutually separated positions. As the pull-down belts 4, attached to the belt-supporting members 13 through the aforementioned linkage mechanism and hence movable with respect thereto, come lightly into contact with the film S moving along the outer surface of the filling cylinder 3, they position themselves, each against the elastic force of the associated one of the springs 22, such that the film S can be easily pulled down by the pull-down belts 4 because it is being adsorbed to their inwardly-facing surfaces, not because of friction between the pull-down belts 4 and the film. After the pull-down belts 4 are thus positioned, the limit switch 25 on either of the supporting members 13 will detect the protruding position-indicating rod 23 and output a detection signal to the counting means 35 to stop its counting and to the adjustment motor 15 to stop its rotation.

This routine is repeated for each former 2 with a different size such that the "convenient" position of the pull-down belts 4 corresponding to each former 2 can be preliminarily stored in the memory device 33 in terms of counts counted by the counting means 35. After all these data are stored in the memory device 33, the operator has only to specify the former 2 (or its size), say, on a touch panel serving as the input means 31. The data selecting means 32 thereupon retrieves from the memory device 33 a corresponding data item for the specified former and transmits it to the comparing means 34. Based on this data item and the number counted by the counting means 35, the control unit 30 outputs a signal immediately before their coincidence will occur and another signal at the time of their coincidence, as explained above, to decelerate and stop the adjustment motor 15 without relying on the outputs from the limit switch 25 such that the two pull-down belts 4 are correctly positioned.

The invention has been described above with reference to only one example, but this example is not intended to limit the scope of the invention. Many modifications and variations are possible within the scope of the invention. For example, this invention is applicable also to the type of bag maker-packaging machine having no filling cylinder to keep the tubularly formed film open such that articles dropped from above can easily pass therethrough. The tubularly formed film in such a case is kept open by adsorption onto pull-down belts each provided with a suction chamber connected to a negative pressure source, and a longitudinally elongated backing plate may be provided such that the longitudinal sealing jaw can press the film against it for effecting the longitudinal sealing. Although a linkage mechanism with a weak elastic spring was disclosed above as an example of fine-adjustment mechanism, this may be replaced by a simple structure using a pair of simple plate springs, as shown at 28 in Fig. 5, in which other components which are substantially similar to those shown in Fig. 2 are indicated by the same numerals. Numeral 29 indicates an elongated member adapted to move with

the belt-supporting plate 18 and to activate the limit switch 25 for controlling the deactivation of the adjustment motor 15. The contact pressure between the pull-down belts 4 and the filling cylinder 3 may be adjusted by providing proximity switches where their contacts are to occur and reversing the direction of rotation of the adjustment motor 15 after a detection signal is outputted from them. Moreover, the invention is applicable also to the kind of bag maker-packaging machine having only one pull-down belt (instead of a pair facing each other and at a 90-degree position from the longitudinal sealing jaw 8, as shown in Fig. 2) disposed opposite the longitudinal sealing jaw 8. In summary, all such modifications and variations that may be apparent to a person skilled in the art are intended to be within the scope of this invention.

Claims

1. An apparatus for pulling a cylindrically formed bag-making material in a longitudinal direction with a pair of pull-down belts for a bag maker-packaging machine, said apparatus comprising:
 - a pair of belt-supporting members (18) adapted to move towards or away from each other, each of said pull-down belts (4) being attached to but movable relative to the corresponding one of said belt-supporting members; and
 - force-applying means (22) for applying a force on each of said pull-down belts, said force depending on the relative position between said each pull-down belt and said corresponding one of said belt-supporting members.
2. The apparatus of claim 1, further comprising parallelogram linkage mechanisms (20), each of said pull-down belts (4) being attached to a corresponding one of said belt-supporting members through one of said linkage mechanisms.
3. The apparatus of claim 1 or claim 2, further comprising a motor means (15) for moving said pair of belt-supporting members selectably towards or away from each other.
4. Apparatus according to claim 3, wherein said motor means (15) is adapted to be automatically stopped when said pull-down belts are at specified positions relative to said belt-supporting members.
5. The apparatus of claim 4, further comprising a control unit (30) for storing data on the separation between said pair of belt-supporting members for each of a plurality of different formers usable on said bag maker-packaging machine and controlling said motor means according to said stored data.
6. The apparatus of claim 4 or claim 5, wherein the friction force between said bag-making material and said pull-down belts (4) at said specified positions is not strong enough to pull said bag-making material in said longitudinal direction.
7. The apparatus of any of the preceding claims, wherein said pull-down belts (4) are supported at mutually opposite to each other with respect to said longitudinal direction.
8. The apparatus of any of the preceding claims, wherein said belt-supporting members (18) are elongated and parallel to each other in a specified direction which is transverse to said longitudinal direction, each of said pull-down belts (4) being capable of moving transversely to said specified direction selectably towards or away from each other.
9. An apparatus for pulling a cylindrically formed bag-making material in a longitudinal direction with a pull-down belt for a bag maker-packaging machine, said apparatus comprising:
 - a belt-supporting member (18) adapted to move towards or away from said cylindrically formed bag-making material being transported in said longitudinal direction, said pull-down belt (4) being attached to but movable relative to said belt-supporting member; and
 - force-applying means (22) for applying a force on said pull-down belt, said force depending on the relative position between said pull-down belt and said belt-supporting member.
10. The apparatus of claim 9, further comprising a parallelogram linkage mechanism (20), said pull-down belt (4) being attached to said belt-supporting member through said linkage mechanism.
11. The apparatus of claim 9 or claim 10, further comprising a motor means (15) for moving said belt-supporting member (18) selectably towards or away from said cylindrically formed bag-making material being transported in said longitudinal direction.
12. Apparatus according to claim 11, wherein said motor means is adapted to be automatically stopped when said pull-down belt is at a specified position relative to said belt-supporting member.
13. The apparatus of claim 11 or claim 12, further comprising a control unit (30) for storing data on the separation between said belt-supporting member for each of a plurality of different formers usable on said bag maker-packaging machine and controlling said motor means according to said stored data.

14. The apparatus of any of claims 9 to 13, wherein said belt-supporting member (18) is elongated transversely to said longitudinal direction, said pull-down belt (4) being capable of moving transversely to said specified direction selectably towards or away from said bag-making material. 5
15. A bag maker-packaging machine adapted to bend an elongated bag-making film into a tubular shape to form a bag and to simultaneously fill said bag with a batch of articles, said bag maker-packaging machine comprising: 10
- a web supporting means supporting a web roll (92) having a web of said elongated film wound around a core shaft (95); 15
- a former (2) for forming said web into a tubular shape;
- web guiding means (105) for guiding said web from said web roll to said former and said tubularly formed web on a longitudinal downward film path; 20
- a longitudinal sealer (8) for sealing side edges of said tubularly formed web longitudinally;
- a transverse sealer (110) for sealing said longitudinally sealed film in a direction transverse to said film path; and 25
- apparatus according to any of the preceding claims for pulling the film along the downward film path. 30

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Fig.1.

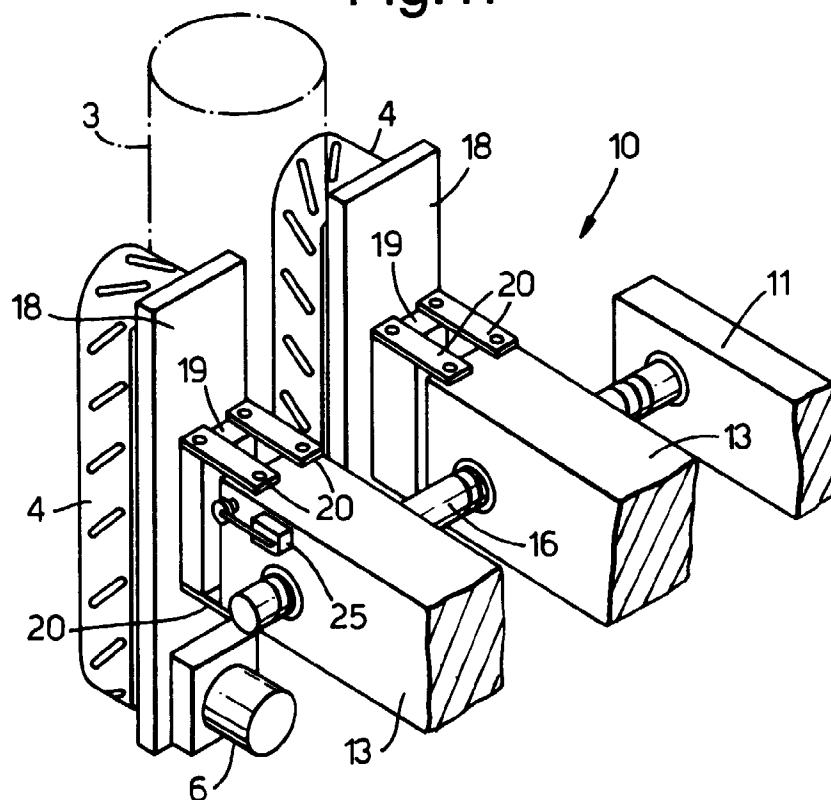
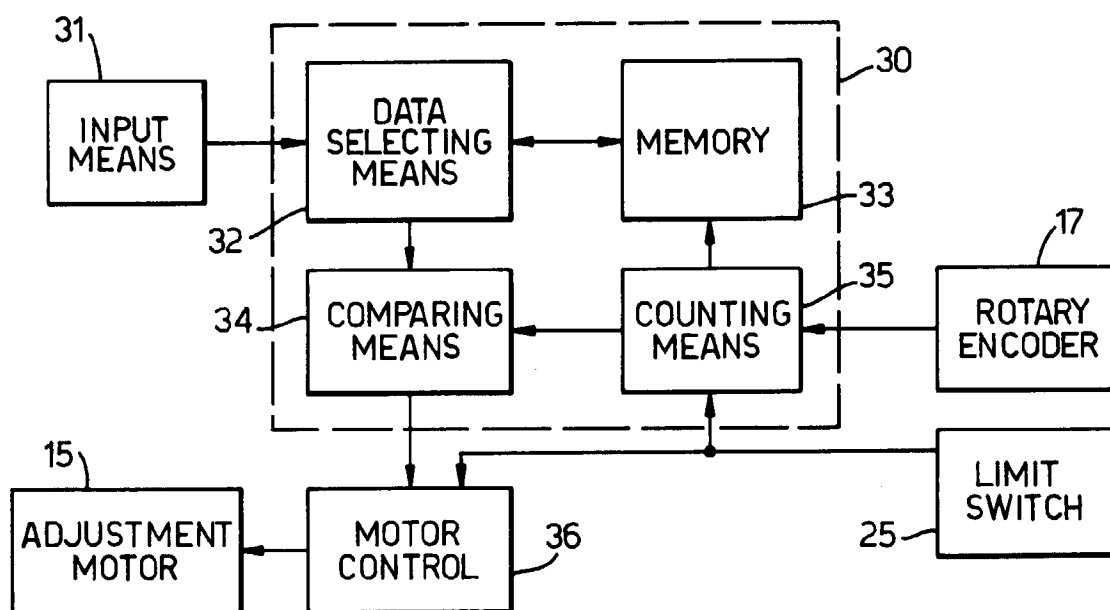


Fig.4.



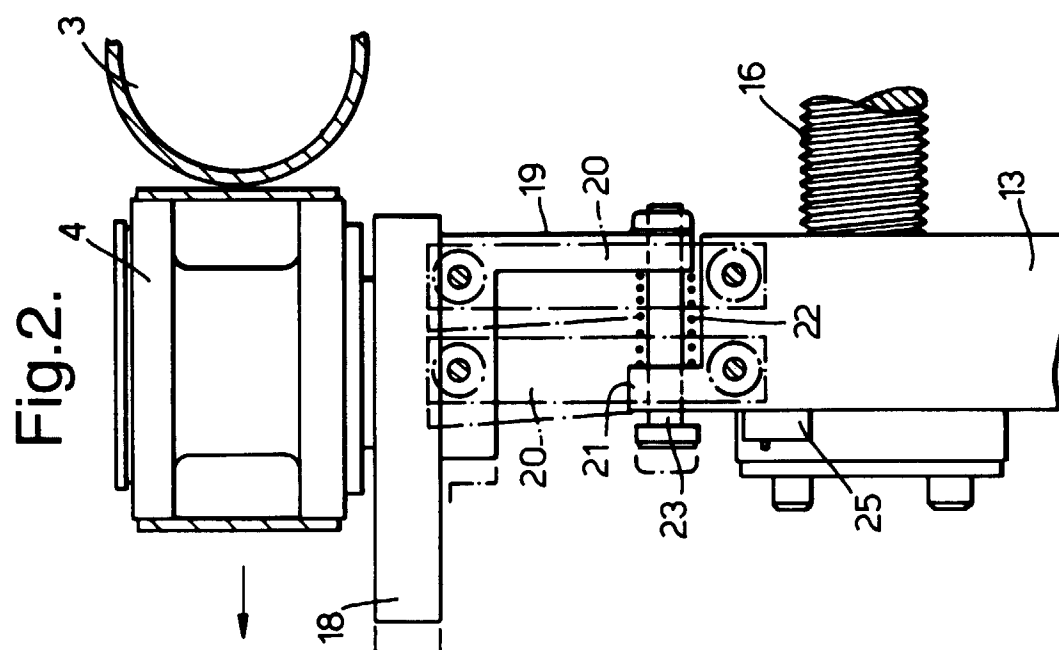
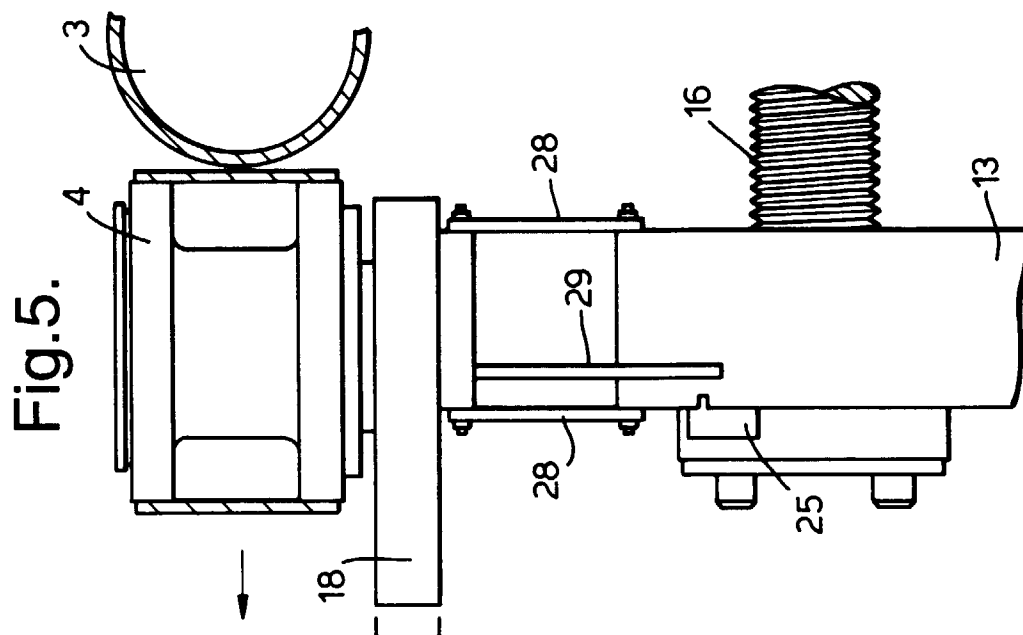
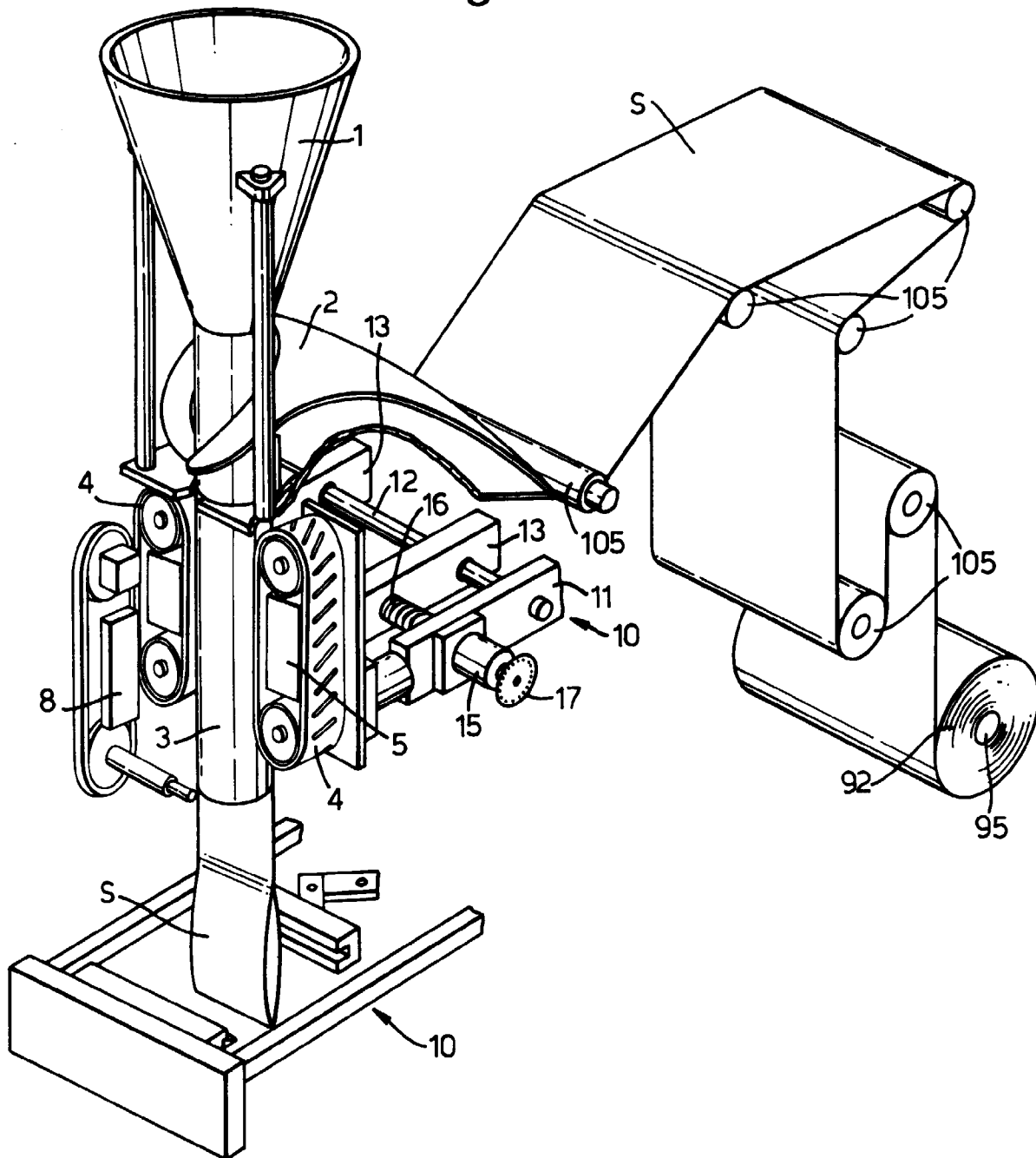


Fig.3.





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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 5876

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.6)
A	EP-A-0 189 264 (KLIKLOK) * abstract; figure 3 * ---	1-3,9,15	B65B9/20 B65B59/00
A	GB-A-2 261 645 (BISHOPBARN) * abstract; figures 1,2 * ---	1,9,15	
A	US-A-5 203 760 (DELAWARE) * the whole document * ---	1,9,15	
A	EP-A-0 180 757 (SIMIONATO) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 November 1996	Examiner Claeys, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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