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(54) Machine for automatically packaging items, particularly hosiery items, in a bag

(57) A machine for automatically packaging one or more items, particularly hosiery items, in a bag including: a conveyor (2) for conveying the items (3) to be packaged to a packaging station (4); a frame (28) for retaining at least one bag (5), with its mouth open, at the packaging station (4) and at least one pusher (6) which is arranged at the packaging station and faces the open mouth of the bag retained in the packaging station. The conveyor (2) has a plurality of receptacles (7) for the items (3) to be packaged and can move intermittently in order to position, in each instance, at least one receptacle (7) at the packaging station (4) between at least one pusher (6) and the open mouth of at least one bag (5) retained in the packaging station (4). The pusher (6) can be actuated so as to pass in each instance through the receptacle (7) that is located between the pusher (6) and the mouth of the bag (5), in order to push the item (3) to be packaged, arranged in the receptacle (7) of the conveyor (2), into the bag (5).

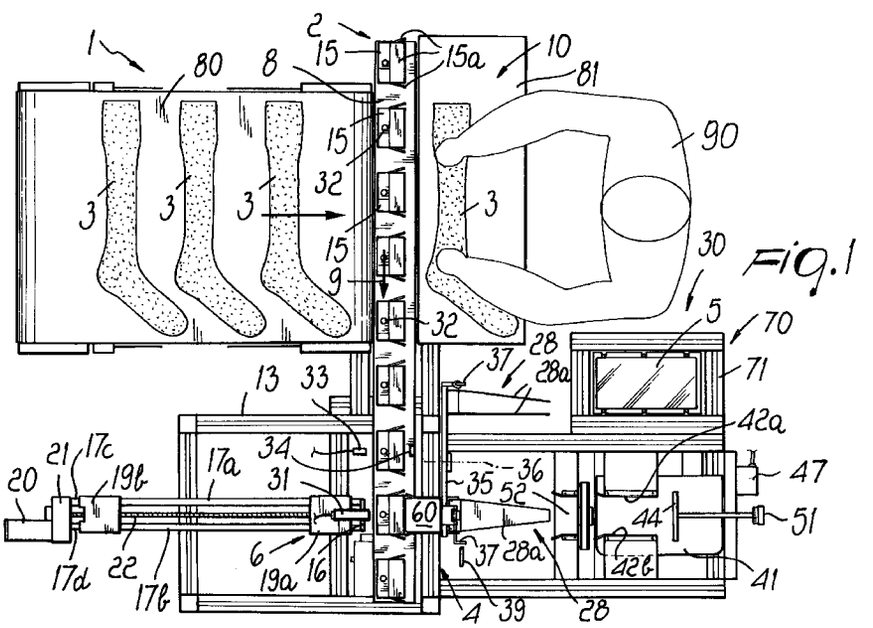

Fig.1

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Description

[0001] The present invention relates to a machine for automatically packaging one or more items, particularly hosiery items, in a bag.

[0002] It is known that hosiery items are generally packaged in adapted bags after production and before being marketed.

[0003] For some types of hosiery item, such as for example knee-length sports hosiery, it is required to package a plurality of pairs of items in a same bag.

[0004] This packaging operation is usually performed manually by an operator, who folds the pairs of hosiery items with a folding operation which causes the pairs of socks to be partially rolled up and then inserts them in sequence in a same bag.

[0005] The manual execution of this operation requires a relatively long time and accordingly affects the overall production costs, since the operator must insert the hosiery items in the bag while taking care to position them correctly and without altering their folding.

[0006] The aim of the present invention is to solve the above problem by providing a machine which allows to automatically package one or more items, particularly hosiery items, in a bag.

[0007] Within the scope of this aim, an object of the invention is to provide a machine which significantly reduces the time required for the insertion of one or more items, particularly hosiery items, in a packaging bag.

[0008] Another object of the invention is to provide a machine which achieves high productivity despite requiring a very small number of operators.

[0009] Another object of the invention is to provide a machine which is also capable, when required, of closing the bags after filling them.

[0010] Another object of the invention is to provide a machine which allows to insert one or more items, particularly hosiery items, in a same bag so that they are correctly positioned and without altering their previously performed folding.

[0011] This aim, these objects and others which will become apparent hereinafter are achieved by a machine for automatically packaging one or more items, particularly hosiery items, in a bag, characterized in that it comprises: means for conveying the items to be packaged to a packaging station; means for retaining at least one bag, with its mouth open, at said packaging station; at least one pusher which is arranged at said packaging station and faces the open mouth of said at least one bag retained in said packaging station; said conveyance means having a plurality of receptacles for the items to be packaged and being intermittently movable in order to position, in each instance, at least one of said receptacles at said packaging station between said at least one pusher and the open mouth of said at least one bag retained in said packaging station; said at least one pusher being actuatable so as to pass in each instance through the receptacle of the conveyance means that is located between said at least one pusher and the open mouth of said at least one bag, in order to push the item to be packaged, arranged in said receptacle, into said at least one bag.

[0012] Further characteristics and advantages of the invention will become apparent from the description of a preferred but not exclusive embodiment of the machine according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic top plan view of the machine according to the invention;

Figure 2 is a schematic and partially sectional lateral elevation view of the machine according to the invention;

Figure 3 is a view of part of the machine, taken from the side of the packaging station designated by the arrow A in Figure 2;

Figure 4 is an enlarged-scale view of a detail of Figure 1;

Figures 5 to 8 are schematic views of the packaging sequence, showing the machine in a partially sectional lateral elevation view;

Figure 9 is a top plan view of the machine according to the invention, with means mounted thereon for supporting the bags after filling which are different from the supporting means shown in the preceding figures;

Figures 10 to 13 are schematic views, similar to Figures 5 to 8, of the packaging sequence of the machine with the bag supporting means shown in Figure 9.

[0013] With reference to the above figures, the machine according to the invention, generally designated by the reference numeral 1, comprises: means 2 for conveying the items 3 to be packaged to a packaging station 4; means for retaining at least one bag 5 with its mouth open at the packaging station 4; at least one pusher 6, which is arranged at the packaging station 4 and faces the open mouth of the bag 5 retained in the packaging station 4. The conveyance means 2 have a plurality of receptacles 7 for the items 3 to be packaged and can move on command intermittently so as to position, in each instance, a receptacle 7 at the packaging station 4 between the pusher 6 and the open mouth of the bag 5 retained in the packaging station 4. The pusher 6 can be actuated so as to pass in each instance through the receptacle 7 arranged between the pusher 6 and the mouth of the bag 5 so as to push the item 3 to be packaged, arranged in the receptacle 7, into the bag 5.

[0014] The machine according to the invention also comprises means for cyclically moving the means for retaining the bag 5 from a station 30 for loading the bag 5 to the packaging station 4.

[0015] More particularly, the conveyance means conveniently comprise a conveyor belt 8 to which a plurality of frame-like enclosures 15 are applied; said enclosures form the receptacles 7 and are uniformly mutually spaced. The conveyor belt 8 is arranged so that an upper portion lies along a substantially horizontal advancement direction, indicated by the arrow 9, so as to convey sequentially the items 3 arranged inside the receptacles 7 from a loading station 10 to the packaging station 4.

[0016] The path of the conveyor belt 8 is defined by two pulleys 11 and 12 around which the conveyor belt 8 winds; said pulleys are arranged respectively upstream and downstream of the packaging station 4 in the advancement direction 9.

[0017] The pulleys 11 and 12 are supported, so that they can rotate about the respective axes, which are horizontal and perpendicular to the advancement direction 9, by the supporting structure 13 of the machine.

[0018] At least one of the pulleys 11 and 12 is connected to an electric motor, not shown for the sake of simplicity, which is supported by the supporting structure 13 and can be actuated on command to produce an intermittent rotation of the pulleys 11 and 12 and therefore an intermittent advancement of the frame-like enclosures 15 in the advancement direction 9 in order to position, in each instance, a receptacle 7 at the packaging station 4.

[0019] Each frame-like enclosure 15 is open in a direction which is perpendicular to the advancement direction 9, so that the pusher 6 can pass through it, and is adapted to contain at least one appropriately prefolded item 3 to be packaged.

[0020] The side of the frame-like enclosures 15 that is directed away from the pusher 6 is conveniently provided with flaps 15a which, except for the side of the enclosures 15 that is applied to the conveyor belt 8, lie gradually further away from the center of the receptacle 7 in the opposite direction with respect to the pusher 6, so as to facilitate the insertion of the items 3 inside the receptacles 7 at the loading station 10.

[0021] The pusher 6 comprises a head 16 which is fixed to the end of two guiding bars 17a and 17b, which are arranged at right angles to the advancement direction 9 and are supported, so that they can slide along their axis, by a supporting block 19a which is fixed to the supporting structure 13 of the machine.

[0022] The other end of the guiding bars 17a and 17b is fixed to a sliding block 19b in which there is a female thread which couples to a threaded shaft 22 which is parallel to the guiding bars 17a and 17b and is supported, so that it can rotate about its own axis, by the supporting structure 13. The sliding block 19b is slideably mounted on two other guiding bars 17c and 17d which are parallel to the guiding bars 17a and 17b and are fixed to the supporting structure 13. The threaded shaft 22 is connected to the output of a reduction unit 21 which is actuated by an electric motor 20. The motor 20 and the reduction unit 21 are supported by the supporting structure 13. The actuation of the motor 20, as a consequence of the screw-and-nut coupling provided between the threaded shaft 22 and the sliding block 19b, produces the translatory motion of the sliding block 19b and therefore of the head 16 in a direction which is perpendicular to the advancement direction 9.

[0023] The head 16 has dimensions which allow it to pass, with a slight clearance, through the receptacle 7 that is positioned in each instance by the conveyance means 2 at the packaging station 4.

[0024] Advantageously, the actuation of the motor 20 can be controlled so as to vary the stroke of the head 16 as a function of the number and order of insertion of the items 3 inside the bag 5, as will become apparent hereinafter.

[0025] The means for retaining the bag 5 at the packaging station 4 comprise at least one perimetric frame 28 which is open in a direction that lies at right angles to the advancement direction 9 and faces the pusher head 16 in alignment therewith. The sides of the perimetric frame 28 are provided with flaps 28a which protrude in the opposite direction with respect to the pusher head 16. The flaps 28a are elastically flexible towards or away from each other to allow the passage of the pusher head 16 and to maintain the folded arrangement of the items 3, and the bag 5 is fitted around said flaps 28a.

[0026] Conveniently, there are stop means for precisely stopping, in each instance, a perimetric frame 15 in alignment with the head 16 of the pusher 6 in the packaging station 4. Said stop means comprise a sensor 31 which is arranged in the packaging station 4 above the pusher 6 and detects an abutment 32 which is arranged on the upper side of the frame-like enclosures 15 when, in each instance, one of said enclosures reaches the packaging station 4. The sensor 31 is operatively connected to the motor 20 so as to interrupt the advancement of the conveyor belt 8 every time one of the frame-like enclosures 15 arrives at the packaging station 4 in alignment with the head 16 of the pusher 6.

[0027] The machine also comprises sensor means for detecting the presence of the items 3 in the frame-like enclosures 15. Said sensor means can be constituted by a photocell 33 arranged between the station 10 for loading the items to be packaged and the packaging station 4. The photocell 33 faces the frame-like enclosures 15 and cooperates with a reflector plate 34 which is applied to the supporting structure 13 of the machine. In practice, if there is no item 3 inside one of the frame-like enclosures 15, the beam emitted by the photocell 33 is reflected by the plate 34 onto the photocell 33, causing the stopping of the motor 20 to allow the operator to deal with the anomaly by arranging an item 3 inside the empty frame-like enclosure 15.

[0028] Advantageously, the machine according to the invention also comprises means for cyclically moving the means for retaining the bag 5 from a station 30 for loading the bag 5 to the packaging station 4.

[0029] Said means for cyclically moving the retention means of the bag 5 from the station 30 for loading the bag 5 to the packaging station 4 comprise a carousel structure 35 which is arranged on a substantially vertical plane and is supported, so that it can rotate about its own horizontally arranged axis 36, by the supporting structure 13. The carousel structure 35 can be actuated with an intermittent rotary motion about its own axis 36 by means of a motor 59 which is supported by the supporting structure 13 of the machine.

[0030] The carousel structure 35 preferably supports four perimetric frames 28 which are uniformly angularly spaced around the axis 36 so that an intermittent rotation of the carousel structure 35 about its own axis 36 with rotation angles of 90° produces, in each instance, the positioning of a perimetric frame 28 in the packaging station 4 in alignment with the head 16 of the pusher 6, while a perimetric frame 28 is arranged at the station 30 for loading the bags 5.

[0031] Each perimetric frame 28 is also provided with a locking lever 37 which can engage one side of the bag 5 fitted on the perimetric frame 28. More particularly, the lever 37 can rotate on command about an axis with respect to the perimetric frame 28 on which it is mounted and has a portion 38 which is eccentric around said axis, so that by means of the rotation of the lever 37 in one direction or in the opposite direction the eccentric portion 38 is engaged with, or disengaged from, the mouth of the bag 5 fitted on the corresponding perimetric frame 28.

[0032] Along the path followed by the perimetric frames 28 in passing from the packaging station 4 to the station 30 for loading the bags 5 as a consequence of the intermittent rotation of the carousel structure 35 about the axis 36 there is an abutment 39 for the locking levers 37, so as to deactivate the locking levers 37 as will become apparent hereinafter.

[0033] The machine also comprises means for supporting the bag 5 after it has been filled and means for closing it after filling.

[0034] Said bag supporting means, in the embodiment illustrated in Figures 1 to 8, comprise a chamber 40 which is arranged in the packaging station 4 in alignment with the head 16 of the pusher 6 on the opposite side with respect to said pusher relative to the carousel structure 35.

[0035] More particularly, the chamber 40 is delimited by an openable bottom 41, by two mutually opposite lateral walls 42a and 42b and by an upper wall 43 which can move on command, in a vertical direction, towards or away from the bottom 41. The side of the chamber 40 that is directed toward the head 16 of the pusher 6 is open, while the opposite side is closed by a wall 44 the position of which in a direction which is parallel to the actuation direction of the head 16 of the pusher 6 can be adjusted according to the length of the bag 5.

[0036] The upper wall 43 is connected to the stem 45 of the piston of a pneumatic cylinder 46 which has a vertical axis, is supported by the supporting structure 13 of the machine and can be actuated to raise or lower the upper wall 43.

[0037] The bottom 41 is hinged, with a side which is parallel to the actuation direction of the head 16 of the pusher 6, to the supporting structure 13 of the machine and is connected to the shaft 47a of an electric motor 47 which can be operated to open or close the bottom 41 by means of its rotation about the axis of the shaft 47a.

[0038] The two lateral walls 42a and 42b can be movable in a horizontal direction at right angles to the actuation direction of the head 16 of the pusher 6 to allow to manually or mechanically adjust the mutual distance of said walls 42a and 42b according to the width of the bag 5.

[0039] The wall 44 that delimits the chamber 40 on the opposite side with respect to the pusher 6 is fixed to the end of two horizontal guiding shafts 48a and 48b which are parallel to the actuation direction of the head 16 of the pusher 6 and are supported, so as to allow sliding along their axes, by the supporting structure 13 of the machine. The wall 44 is connected to the end of a threaded shaft 49 which is parallel to the guiding shafts 48a and 48b and is coupled to a female thread formed in a block 50 which is rigidly coupled to the supporting structure 13. The other end of the threaded shaft 49 is fixed to a knob 51 which can rotate so as to vary, by means of the screw-and-nut coupling between the threaded shaft 49 and the block 50, the position of the wall 44 parallel to the actuation direction of the head 16 of the pusher 6.

[0040] An intermediate supporting plate 52 for the bag 5 is arranged between the chamber 40 and the perimetric frames 28 fitted to the carousel structure 35. Said plate 52 is arranged on a horizontal plane and is conveniently provided with two side walls with guiding folds on their side directed toward the pusher 6.

[0041] The closure means are arranged between the intermediate supporting plate 52 and the chamber 40 and, if the bags 5 are made of heat-sealable synthetic material, comprise a conveniently heated heat-sealing blade 53 which is arranged horizontally and can move on command in a vertical direction towards or away from a complementary blade 54 made of non-stick material which faces the blade 53 on a vertical plane.

[0042] The blade 53 is mounted on a pair of vertical guiding posts 55 which are supported by the supporting structure 13 of the machine so as to allow sliding along their axis. The blade 53 is connected to the stem of a pneumatic cylinder 56 which can be actuated to produce the vertical movement of the blade 53.

[0043] The complementary blade 54 also is mounted on a pair of vertical guiding posts 57 which are supported by the supporting structure 13 of the machine so as to allow sliding along their axis. The complementary blade 54 also is connected to the stem of the piston of a pneumatic cylinder 58 which can be actuated to produce the vertical movement of the complementary

blade 54. The pneumatic cylinders 56 and 58 can be actuated simultaneously to produce the mutual approach or spacing of the blade 53 and of the complementary blade 54 to produce the heat-seal for closing the mouth of the bag 5.

[0044] Instead of the pneumatic cylinders 56 and 58 it is possible to use electric motors whose output shaft is connected, by means of a coupling of the screw-and-nut type, to the blade 53 and to the complementary blade 54.

[0045] An intermediate supporting tunnel 60 is provided between the perimetric frames 28 and the frame-like enclosures 15 in order to support the items 3 to be packaged in their transfer from the corresponding frame-like enclosure 15 to the perimetric frame 28 in the packaging station 4.

[0046] As an alternative, as shown in particular in Figures 9 to 13, the chamber 40, now designated by the reference numeral 61 in such figures, instead of being fixed with respect to the perimetric frame 28 arranged in the packaging station 4, can be movable from a receiving position, in which it lies around the perimetric frame 28 located in the packaging station 4, to an unloading position, in which it is spaced from the perimetric frame 28 in the opposite direction with respect to the frame-like enclosure 15 aligned with the head 16 of the pusher 6.

[0047] In this case, the chamber 61 is formed in a box-like container 62 which is open at the side directed toward the head 16 of the pusher 6 and is closed, at the opposite end, by a wall 63 whose position with respect to the open side can be adjusted as a function of the length of the bag 5.

[0048] More particularly, the box-like container 62 is fixed to a plate 64 which is mounted on two horizontal guides 65 which are parallel to the actuation direction of the head 16 of the pusher 6.

[0049] The plate 64 is rigidly coupled to a block 66 in which there is a female thread with which a threaded shaft 67 is coupled; said shaft is parallel to the guides 65 and is supported, so that it can rotate about its own axis, by the supporting structure 13 of the machine. The threaded shaft 67 can be actuated, by means of an electric step motor which is not shown for the sake of simplicity, so as to produce the translatory motion, in one direction or the other, of the block 66 and therefore of the box-like container 62 along the guides 65.

[0050] The wall 63 also is associated with the plate 64 so as to allow adjustment in a direction which is parallel to the actuation direction of the head 16 of the pusher 6.

[0051] In this embodiment there are also means for expelling the bag 5 from the chamber 61 after said bag has been closed by the blade 53 and by the complementary blade 54. Said expulsion means comprise a fixed expulsion abutment 68 which faces a passage 69 formed in the wall 63.

[0052] By virtue of the actuation of the threaded shaft 67, the box-like container 62 can move from a receiving position, in which the chamber 61 is arranged around the perimetric frame 28 located in the packaging station 4, to a closure position, in which the chamber 61 is spaced from the perimetric frame 28 on the opposite side with respect to the head 16 of the pusher 6 relative to the receiving position, in order to place the mouth of the bag 5 at the blade 53 and at the complementary blade 54, and from the closure position to an unloading position, in which the chamber 61 is further spaced from the perimetric frame 28 with respect to the closure position, so that the expulsion abutment 68, by penetrating through the passage 69 formed in the wall 63, produces the expulsion of the bag 5 through the open side of the box-like container 62.

[0053] In this embodiment, the blade 53 and the complementary blade 54 face each other on a substantially vertical plate between the side of said chamber 61 that is directed toward the head 16 of the pusher 6, with the box-like container 61 in the unloading position, and the perimetric frame 28 located in the packaging station 4.

[0054] In the station 30 for loading the bags 5 there is conveniently a bag loader or magazine 70 which is substantially constituted by a box-like container 71 which is open at the top and is adapted to accommodate a plurality of stacked bags 5. The bottom of said box-like container can move vertically and is raised every time a bag 5 is taken from the top end of the stack of bags 5, so as to always keep the upper bag 5 of the stack at a same height in order to facilitate the operator 90 in picking it up.

[0055] The side walls of the box-like container 71 can be movable, so as to allow to adjust their mutual distance as a function of the transverse dimensions of the bags 5.

[0056] Furthermore, the station 10 for loading the items 3 can be served by a conveyor belt 80 which conveys the items 3 to be packaged to said loading station 10, where there is a working surface 81 which is arranged laterally to the frame-like enclosures 15 on the opposite side with respect to the pusher 6.

[0057] The operation of the machine according to the invention is as follows.

[0058] The items 3 to be packaged, for example pairs of hosiery items, reach the item loading station 10 by way of the conveyor belt 80. The operator 90, who faces the frame-like enclosures 15 on the opposite side with respect to the pusher 6, picks up the items 3 and folds them on the working surface 81. The operator then inserts the folded items 3 in the receptacles 7 of the frame-like enclosures 15 during one of the pauses of the advancement of the conveyor belt 8.

[0059] The operator removes, in each instance, an empty bag 5 from the magazine 70 and fits it over the flaps 28a of the perimetric frame 28 that is located in the station 30 for loading the bags 5 that is arranged laterally to the working surface 81. The bag 5, once fitted around the flaps 28a of the perimetric frame 28, is locked thereon by means of the locking lever 37.

[0060] The intermittent rotation of the carousel structure 35 about the axis 36 aligns a perimetric frame 28 with the head 16 of the pusher 6.

[0061] When a frame-like enclosure 15 arrives at the packaging station 4 in alignment with the pusher head 16, the advancement of the conveyor belt 8 is interrupted and the head of the pusher 6 is actuated by means of the motor 20, passes through the receptacle 7 of said frame-like enclosure 15 and pushes the item 3 into the bag 5 fitted on the perimetric frame 28 arranged in the packaging station 4 in alignment with the pusher head 16.

[0062] It should be noted that the frame-like enclosures 15 and the perimetric frame 28 with the flexible flaps 28a maintain the folded condition and the correct arrangement of the items 3 during their insertion in the bag 5.

[0063] The motor 20 is then rotated in the opposite direction with respect to the preceding one, so as to return the pusher head 16 outside the bag 5 and the receptacle 7. The conveyor belt 7 advances by one step, placing another receptacle 7 at the packaging station 4. The motor 20 is actuated again to cause the advancement of the pusher head 16, which by passing through the receptacle 7 pushes another item 3 into the bag 5 (Figure 5). The stroke of the pusher head 16 to push the second item into the bag 5 can be adequately smaller than the preceding stroke, so as to avoid causing the separation of the bag 5 from the perimetric frame 28.

[0064] This packaging sequence is repeated for a preset number of items, and during the insertion of the last intended item in the bag 5 the stroke of the pusher head 16 is increased adequately so as to automatically cause the disengagement of the bag 5 from the frame 28 and its insertion in the chamber 40 if said chamber is fixed (Figures 6 and 7). The bag 5 is then retained in said chamber 40 by the descent of the upper wall 43. With the bag 5 thus retained, the blade 53 and the complementary blade 54 are moved mutually closer, closing the mouth of the bag 5 (Figure 8).

[0065] At this point the motor 47 is activated, causing the opening of the bottom 41 and the fall of the filled and closed bag 5 into a container or onto a conveyor belt located below the chamber 40.

[0066] If the chamber 61 is formed inside a movable box-like container 62, said container is kept in the receiving position, i.e., around the perimetric frame 28 in the packaging station 4, until the bag 5 has been filled (Figure 10). During the insertion of the last item 3, while the pusher head 16 is covering the last portion of its increased stroke which causes the separation of the bag 5 from the perimetric frame 28, the box-like container 62 is moved away from the pusher 6 in the closure position, i.e., until the mouth of the bag 5 is placed between the blade 53 and the complementary blade 54 (Figure 11), which are then actuated to close the bag 5 (Figure 12).

[0067] The box-like container 62 is then moved further in the same direction into the unloading position, so that the expulsion abutment 68, by entering the chamber 61, causes the expulsion of the bag 5 from the opposite side.

[0068] In this case also, the filled and closed bag 5 can fall into a container or onto a conveyor belt.

[0069] While the bag 5 is being closed, the carousel structure 35 is rotated so as to place another perimetric frame 28 with a bag 5 to be filled in the packaging station 4 in alignment with the pusher head 16.

[0070] In this transfer, the locking lever 37 located on the perimetric frame 28 from which the full bag 5 has been removed engages the abutment 39, and its eccentric portion 38 is disengaged from the side of the perimetric frame 28 against which it had remained pressed, so as to allow the operator to fit a new bag 5 on said perimetric frame 28 when it is located in the bag loading station 30.

[0071] At this point the operating cycle restarts as already described.

[0072] Of course, although the machine according to the invention has been conceived in particular to package a plurality of items in a same bag, it can also be used to package a single item in a bag. In this case, the bag 5 is removed from the frame 28 after the insertion of each item 3.

[0073] In practice it has been observed that the machine according to the invention fully achieves the intended aim, since it allows to package in rapid sequence one or more items in a bag, maintaining the previously provided folded arrangement.

[0074] Another advantage of the machine according to the invention is that it allows a same operator to load the bags and to load the items to be packaged, thus achieving high productivity with a single operator.

[0075] The machine thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; thus, for example, in the packaging station 4, instead of a single pusher 6 it is possible to provide two or more pushers 6 arranged side by side. In this case, the carousel structure 35 is provided so as to arrange in the packaging station 4, in each instance, two or more perimetric frames 28 arranged side by side, with bags 5 fitted thereon, and aligned with the pushers 6, which can be actuated simultaneously or sequentially. In this case, the means for supporting the bags after their packaging can also be duplicated with respect to the illustrated embodiments. All the details may furthermore be replaced with other technically equivalent elements.

[0076] In practice, the materials used, as well as the dimensions, may be any according to the requirements and the state of the art.

[0077] The disclosures in Italian Patent Applications No. MI98A000085, MI98A001222, MI98A002513 from which this application claims priorities are incorporated herein by reference.

[0078] Where technical features mentioned in any

claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A machine for automatically packaging items, particularly hosiery items (3), in a bag (5), characterized in that it comprises: conveyance means (2) for conveying the items (3) to be packaged to a packaging station (4); bag retention means (28,37,38) for retaining at least one bag (5), with its mouth open, at said packaging station (4); at least one pusher (6) which is arranged at said packaging station (4) and faces the open mouth of said at least one bag (5) retained in said packaging station (4); said conveyance means (2) having a plurality of receptacles (7) for the items (3) to be packaged and being intermittently movable in order to position, in each instance, at least one of said receptacles (7) at said packaging station (4) between said at least one pusher (6) and the open mouth of said at least one bag (5) retained in said packaging station (4); said at least one pusher (6) being actuatable so as to pass in each instance through the receptacle (7) of the conveyance means (2) that is located between said at least one pusher (6) and the open mouth of said at least one bag (5), in order to push the item (3) to be packaged, arranged in said receptacle (7), into said at least one bag (5).

2. A machine according to claim 1, characterized in that said conveyance means (2) comprise a conveyor belt (8) to which a plurality of enclosures (15) are applied, said enclosures (15) forming said uniformly mutually spaced receptacles (7), said conveyor belt (8) being arranged, with its upper portion, along a direction for advancement (9) from a station (10) for loading the items to said packaging station (4).

3. A machine according to claims 1 and 2, characterized in that said conveyor belt (8) lies along a path which is defined by two pulleys (11,12) which have horizontal and mutually parallel axes and are orientated transversely to said advancement direction (9); at least one of said pulleys (11,12) being actuatable with an intermittent rotary motion about its own axis in order to position, in each instance, at least one of said receptacles (7) at said packaging station (4) between said at least one pusher (6) and the open mouth of said at least one bag (5) retained in said packaging station (4).

4. A machine according to one or more of the preceding claims, characterized in that each one of said receptacles (7) is formed by a said enclosure (15) which is frame-shaped and is open at right angles to said advancement direction and is adapted to contain at least one of the pre-folded items (3) to be packaged.

5. A machine according to one or more of the preceding claims, characterized in that said at least one pusher (6) comprises a pusher head (16) and actuation means (20,21,22) which act on command on said pusher head (16) to move it with a reciprocating motion in a direction which is substantially perpendicular to said advancement direction (9).

6. A machine according to one or more of the preceding claims, characterized in that it comprises sensor means (33) for detecting the presence of items (3) to be packaged inside said frame-shaped enclosures (15) proximate to said packaging station (4).

7. A machine according to one or more of the preceding claims, characterized in that it comprises stop means (31,32) for stopping, in each instance, at least one of said frame-shaped enclosures (15) at said packaging station (4) in alignment with the head (16) of said at least one pusher (6).

8. A machine according to one or more of the preceding claims, characterized in that said bag retention means for retaining the bag (5) comprise at least one perimetric frame (28) which is open in a direction which coincides with the direction of motion of said head (16) of the pusher (6) and is delimited by sides which are provided with flexible flaps (28a) around which it is possible to fit a bag (5) so that its open mouth is directed toward the head (16) of said pusher (6), said flaps (28a) being flexible towards or away from each other in order to allow the passage of said head (16) of the pusher (6) and to maintain the folded condition of said items (3) during their insertion in the bag (5).

9. A machine according to one or more of the preceding claims, characterized in that it comprises means (35) for cyclically moving said means (28) for retaining at least one bag (5) from a station (10) for loading said at least one bag (5) to said packaging station (4).

10. A machine according to one or more of the preceding claims, characterized in that said means for cyclically moving said bag retention means from said station for loading said at least one bag to said packaging station comprise a carousel structure (35) which is arranged on a substantially vertical plane and supports at least two perimetric frames (28), each of which is adapted to support one of

said bags (5); said carousel structure (35) being able to rotate about a substantially horizontal axis (36) with an intermittent motion in order to position, in each instance, at least one of said perimetric frames (28) in said packaging station (4) in alignment with the head (16) of said at least one pusher (6) and at least another one of said perimetric frames (28) in said bag loading station (10).

11. A machine according to one or more of the preceding claims, characterized in that said bag retention means comprise, for each one of said perimetric frames (28), at least one locking lever (37) which is associated with one side of the perimetric frame (28) and can be actuated to clamp one flap of the mouth of the bag (5) fitted over said flexible flaps (28a).

12. A machine according to one or more of the preceding claims, characterized in that it comprises means (39) for deactivating said locking lever (37) when said carousel structure (35) rotates about its own axis (36) when transferring the corresponding perimetric frame (28) from said packaging station (4) to said bag loading station (10).

13. A machine according to one or more of the preceding claims, characterized in that it comprises means (53,54) for closing the mouth of the bags (5).

14. A machine according to one or more of the preceding claims, characterized in that it comprises means (40,61) for supporting the bag (5) after it has been filled in said packaging station (4).

15. A machine according to one or more of the preceding claims, characterized in that said means for supporting the bag (5) after it has been filled comprise at least one chamber (40) which is arranged in said packaging station (4) in alignment with the head (16) of said at least one pusher (6); said chamber (40) being delimited by a bottom (41) which can be opened on command, by a pair of mutually opposite side walls (42a,42b) and by an upper wall (43) which can move on command in a substantially vertical direction towards or away from said bottom (41) in order to retain the bag (5) with the packaged items (3) in said chamber (40); said chamber (40) being open on its side directed toward the head (16) of said at least one pusher (6).

16. A machine according to one or more of the preceding claims, characterized in that said chamber (40) is delimited, on its opposite side with respect to the head (16) of the pusher (6), by a wall (44) whose distance from the side of said chamber (40) that is directed toward the head (16) of the pusher (6) is adjustable.

17. A machine according to one or more of the preceding claims, characterized in that said means for closing the mouth of the bag comprise a heat-sealing blade (53) which is heated and can move on command on a substantially vertical plane towards or away from a complementary blade (54) which faces it; said blade (53) and said complementary blade (54) facing each other on a substantially vertical plane between the side of said chamber (40) that is directed toward the head (16) of the pusher (6) and the perimetric frame (28) of said retention means (28,37,38) arranged in said packaging station (4).

18. A machine according to one or more of the preceding claims, characterized in that the stroke of the head (16) of said pusher (6), in the movement for inserting the items (3) in the bag (5), can be diversified as a function of the number and order of insertion of the items (3) in said bag (5).

19. A machine according to one or more of the preceding claims, characterized in that in said bag loading station (10) there is a bag loader (70) which is adapted to accommodate a plurality of bags (5) stacked on a bottom wall which can move vertically in order to gradually lift the stack of bags (5) every time the bag (5) arranged at the top of the stack of bags is removed.

20. A machine according to one or more of the preceding claims, characterized in that said means for supporting the bag after it has been filled comprise at least one chamber (61) which is formed inside a box-like container (62) which is arranged in said packaging station (4) in alignment with said pusher (6); the side of said chamber that is directed toward said pusher head (16) being open and said box-like container (62) being movable from a receiving position, in which said chamber (61) is arranged around said at least one perimetric frame (28) placed in said packaging station (4), to an unloading position, in which said chamber (61) is spaced from said perimetric frame (28) on the opposite side with respect to said pusher head (16); expulsion means (68) being provided which act on the bag (5) accommodated in said chamber (61), when said box-like container (62) is in said unloading position, in order to expel the bag from said chamber (61).

21. A machine according to claims 13 and 20, characterized in that said means for closing the mouth of the bag comprise a heat-sealing blade (53) which is heated and can move on command on a substantially vertical plane towards or away from a facing complementary blade (54); said blade (53) and said complementary blade (54) facing each other on a substantially vertical plane between the side of said

chamber (61) that is directed toward the head (16) of the pusher (6), when said box-like container (62) is in the unloading position, and the perimetric frame (28) of said retention means is arranged in said packaging station (4).

22. A machine according to claims 20 and 21, characterized in that said box-like container (62) can move from a receiving position, in which said chamber (61) is arranged around said at least one perimetric frame (28) arranged in said packaging station (4), to a closure position, in which said chamber (61) is spaced from said perimetric frame (28) on the opposite side with respect to said pusher head (16) in order to position the open mouth of the bag (5), accommodated in said chamber (61), at said blade (53) and at said complementary blade (54), and from said closure position to an unloading position, in which said chamber (61) is further spaced from said perimetric frame (28) on the opposite side with respect to said pusher head (16); expulsion means (68) being provided which act on the bag (5) accommodated in said chamber (61), when said box-like container (62) is in said unloading position, in order to expel it from said chamber (61).

23. A machine according to one or more of the preceding claims, characterized in that in said item loading station (10) there is a working surface (81) for the operator (90) whereon to fold the items (3) to be packaged, said working surface (81) being served by a conveyor belt (80) for the items (3) to be packaged and being arranged laterally to the frame-shaped enclosures (15), on the opposite side with respect to said pusher (6).

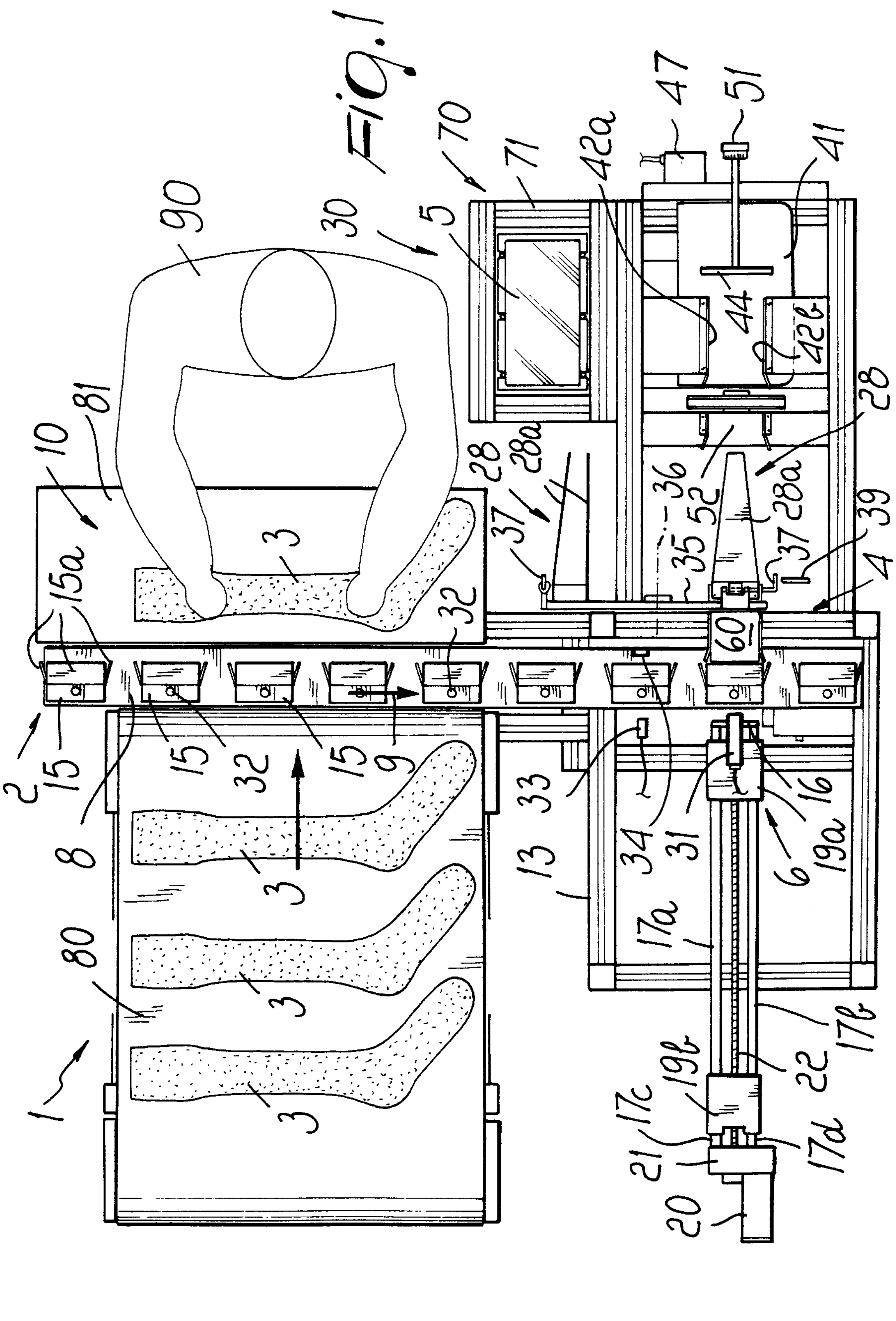

Fig. 1

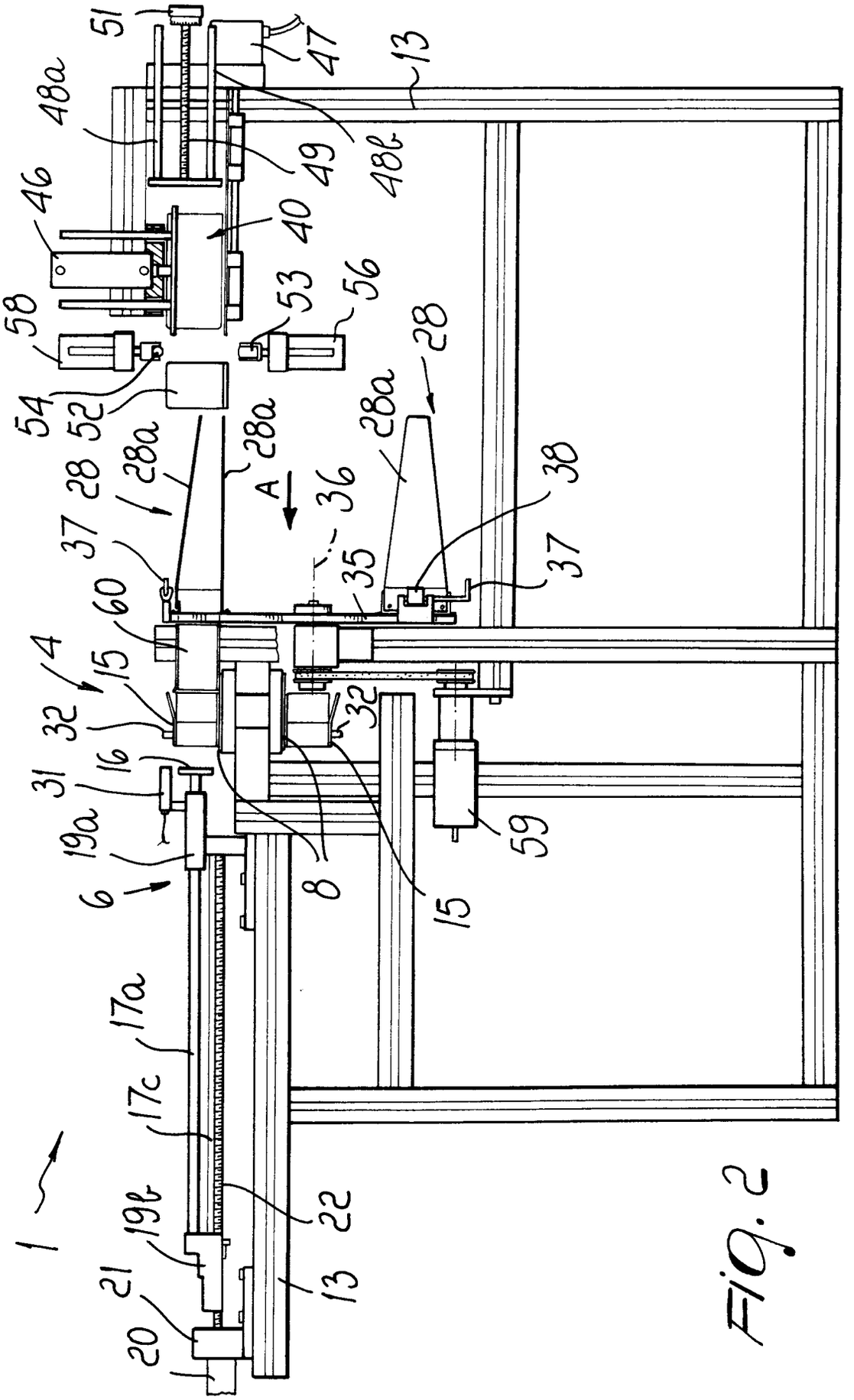
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Fig. 2

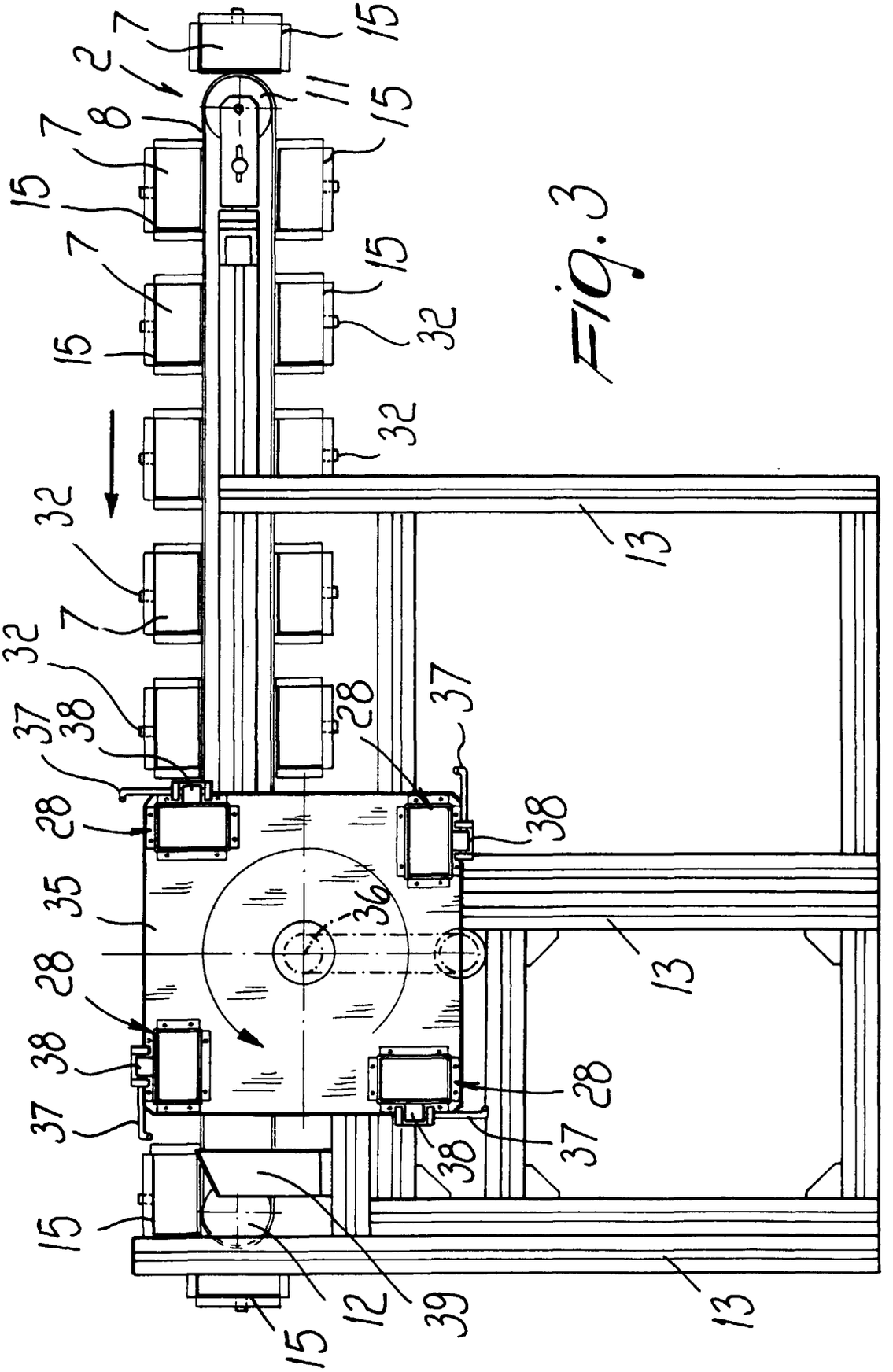
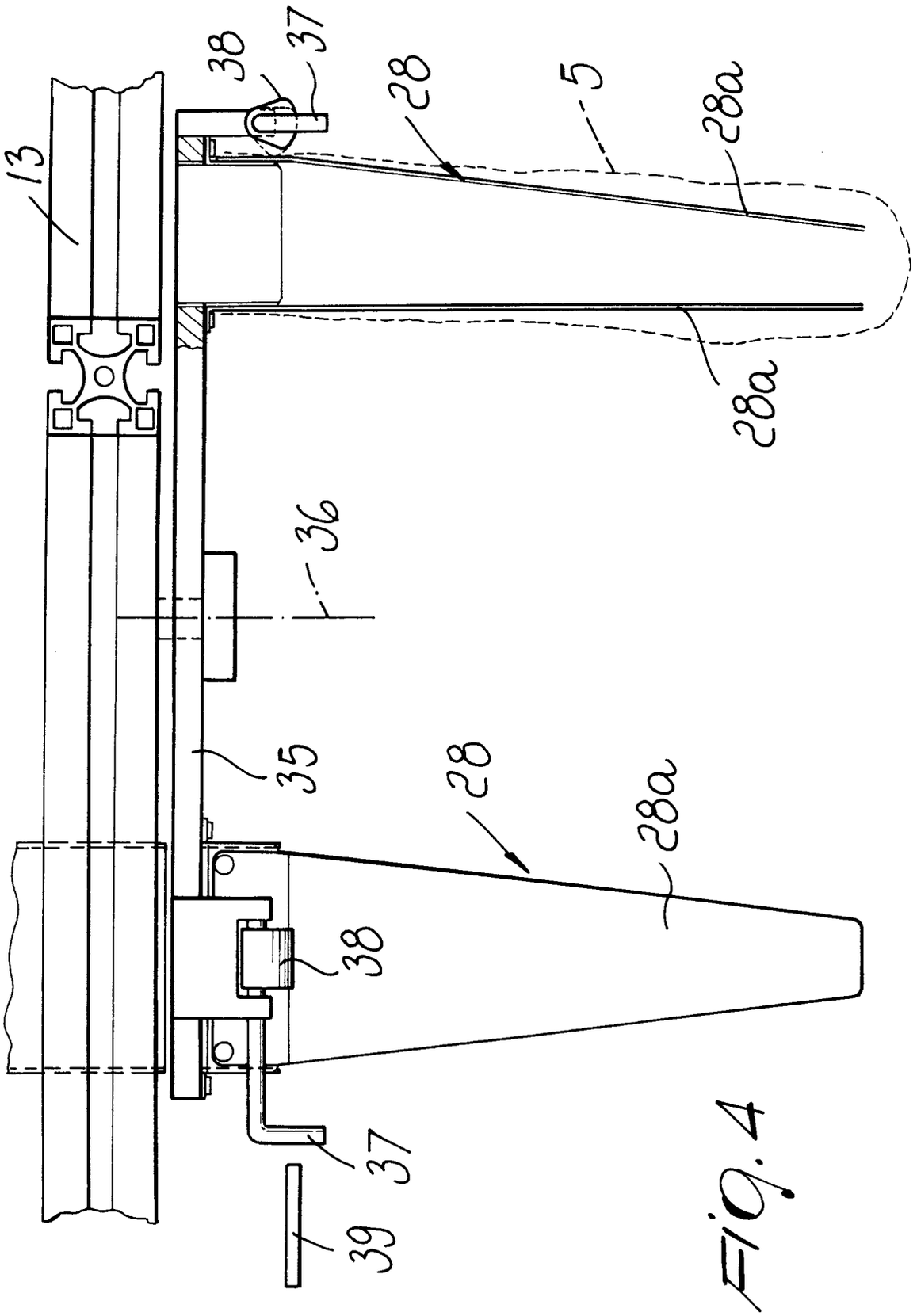


Fig. 3



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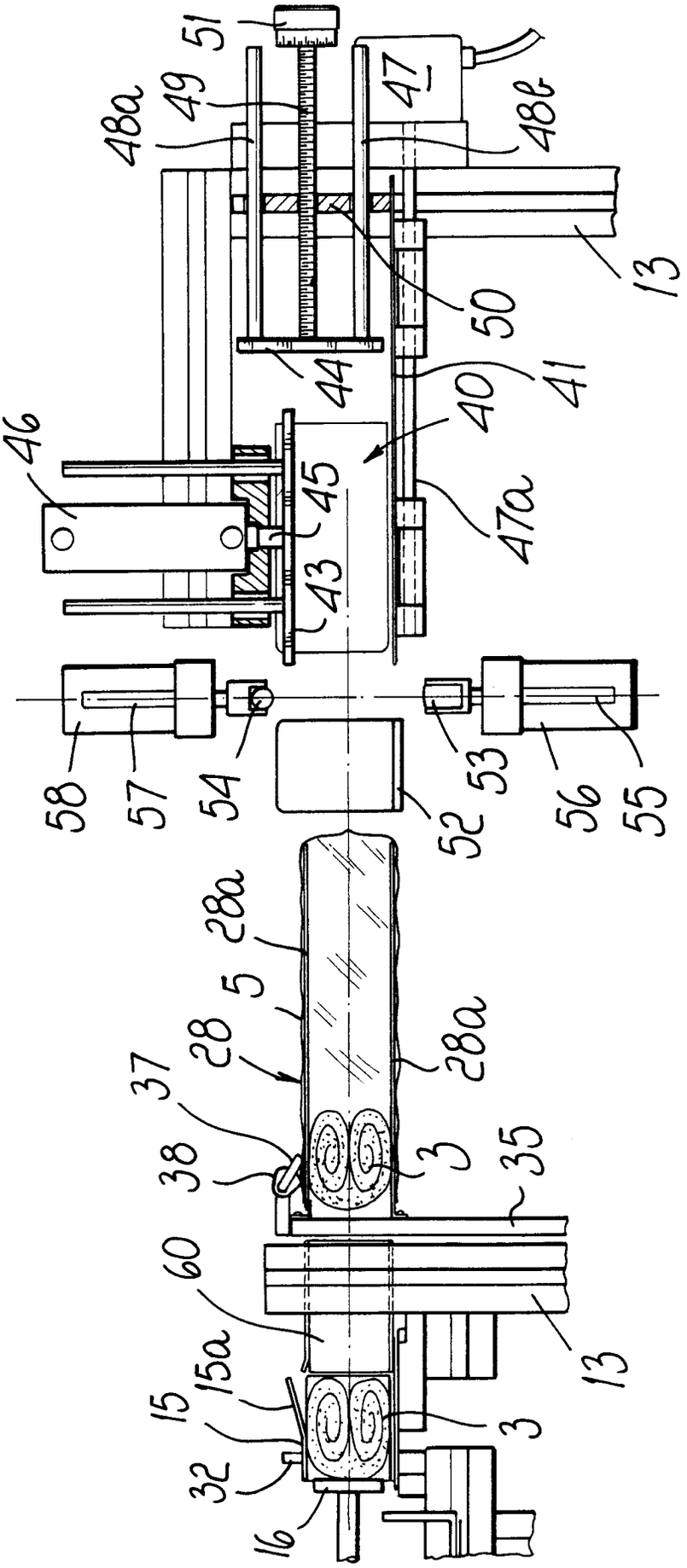
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Fig. 5

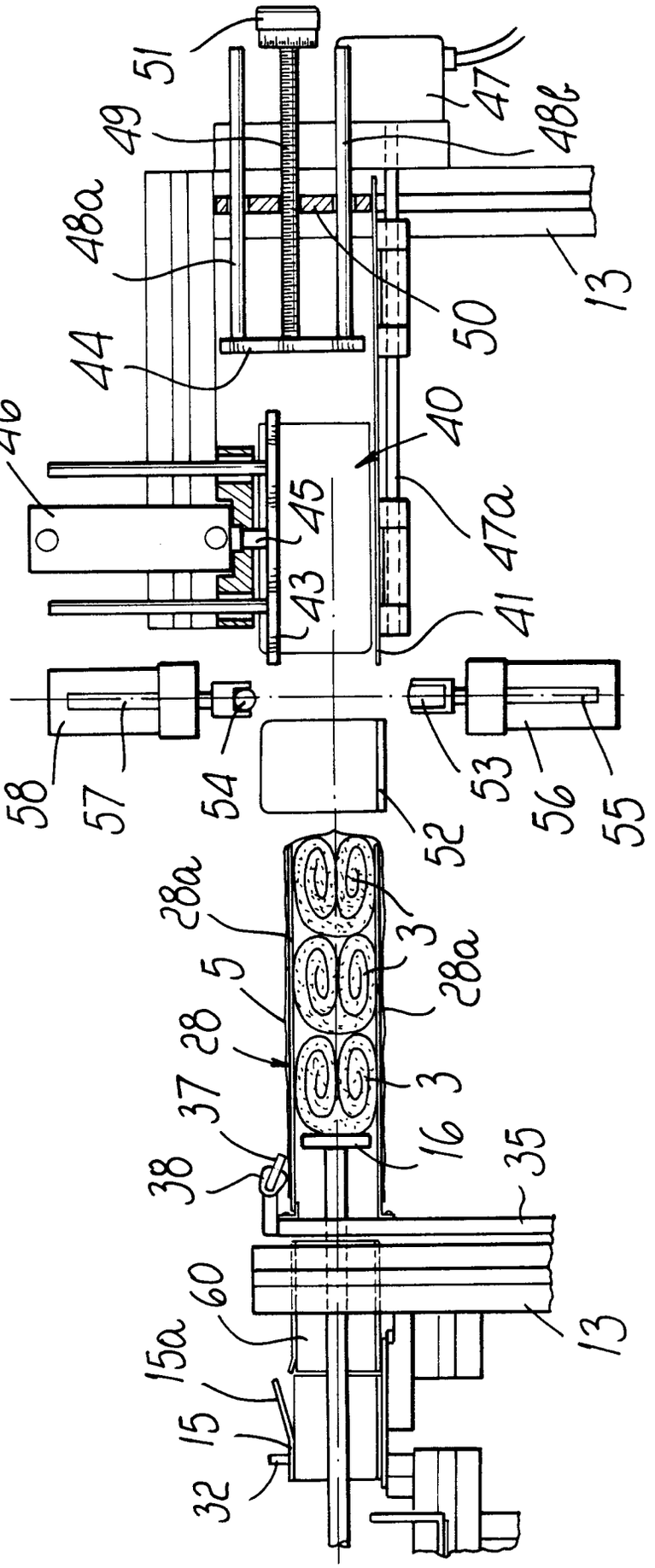
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Fig. 6

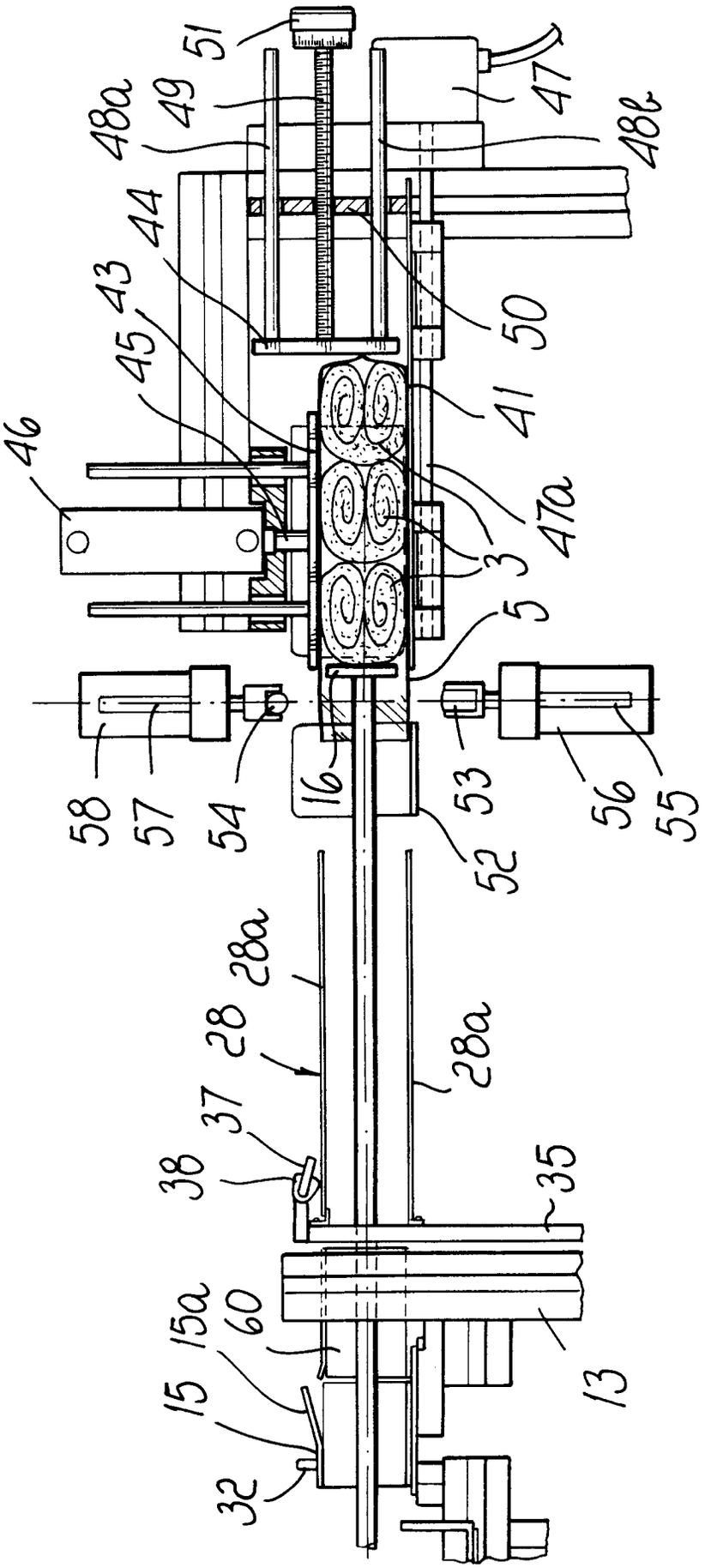
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Fig. 7

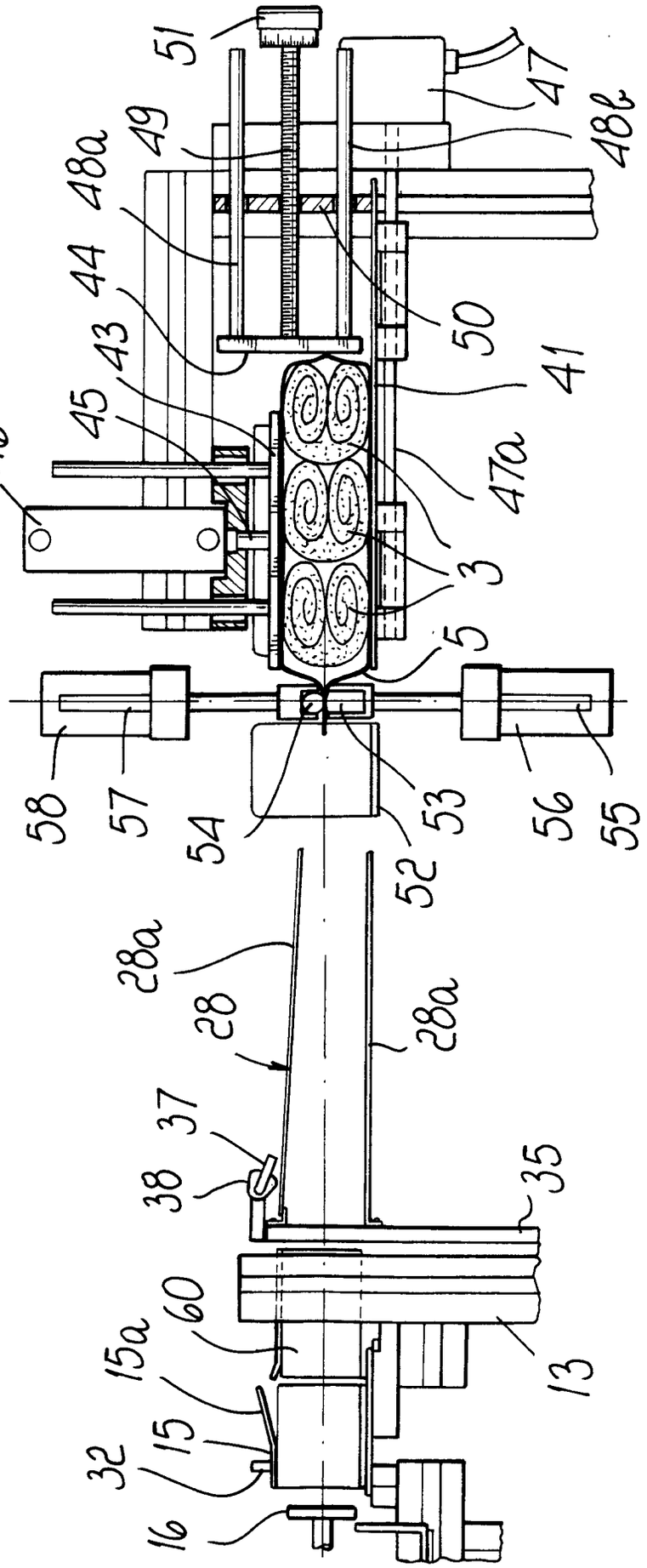
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Fig. 8

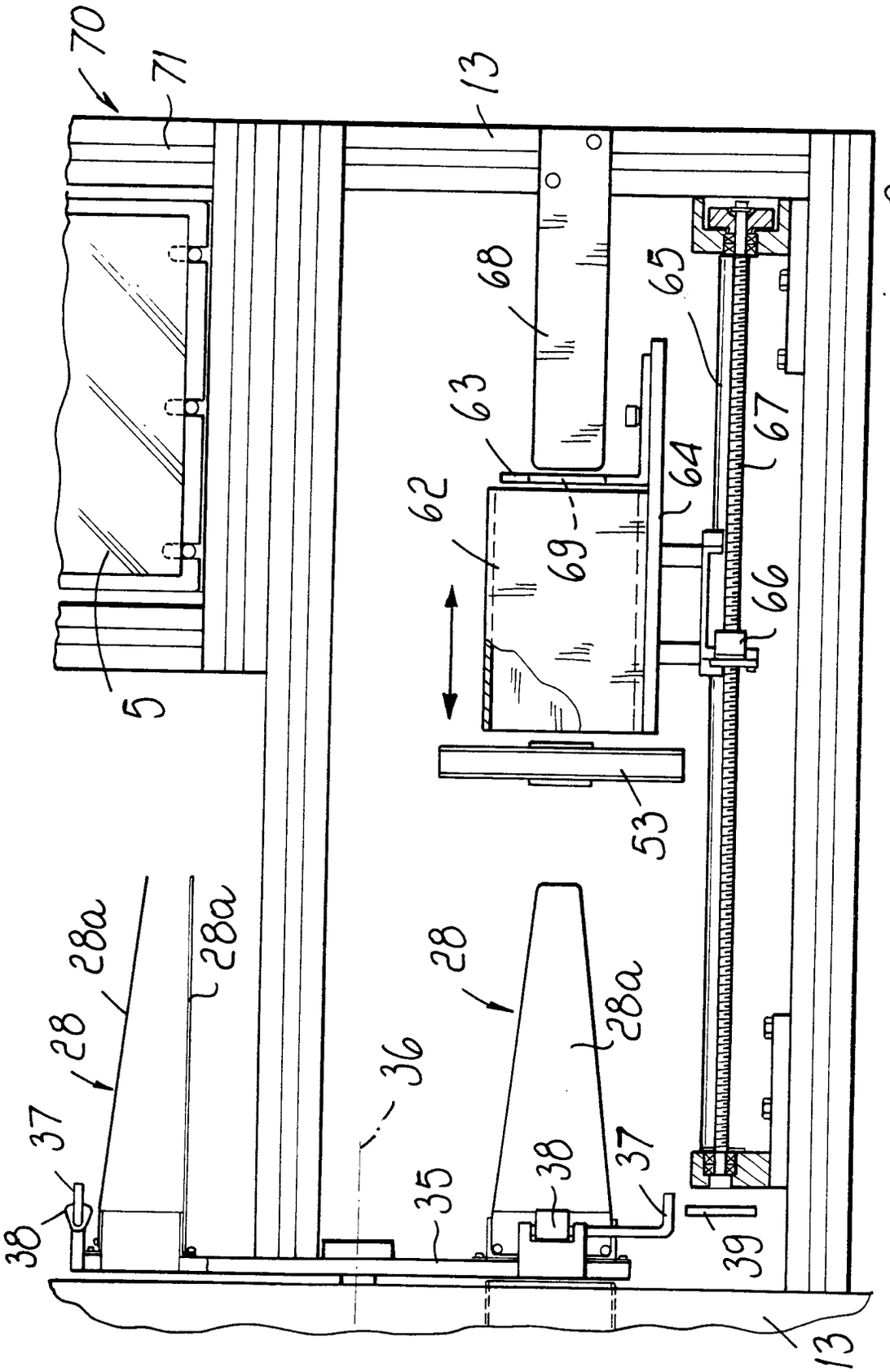
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FIG. 9

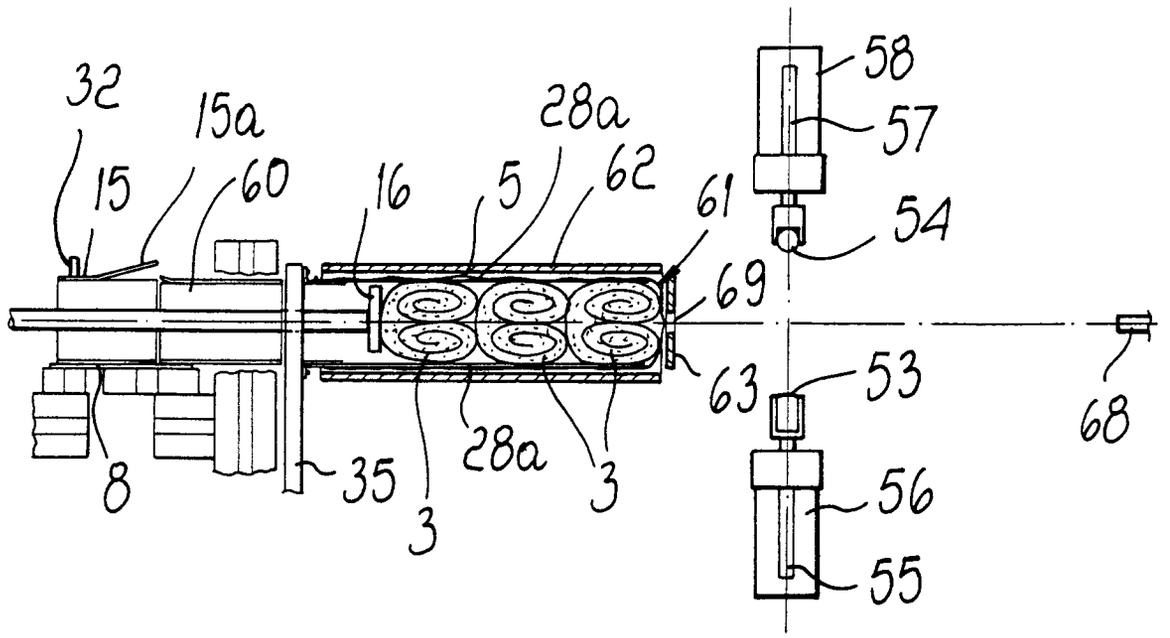
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Fig. 10

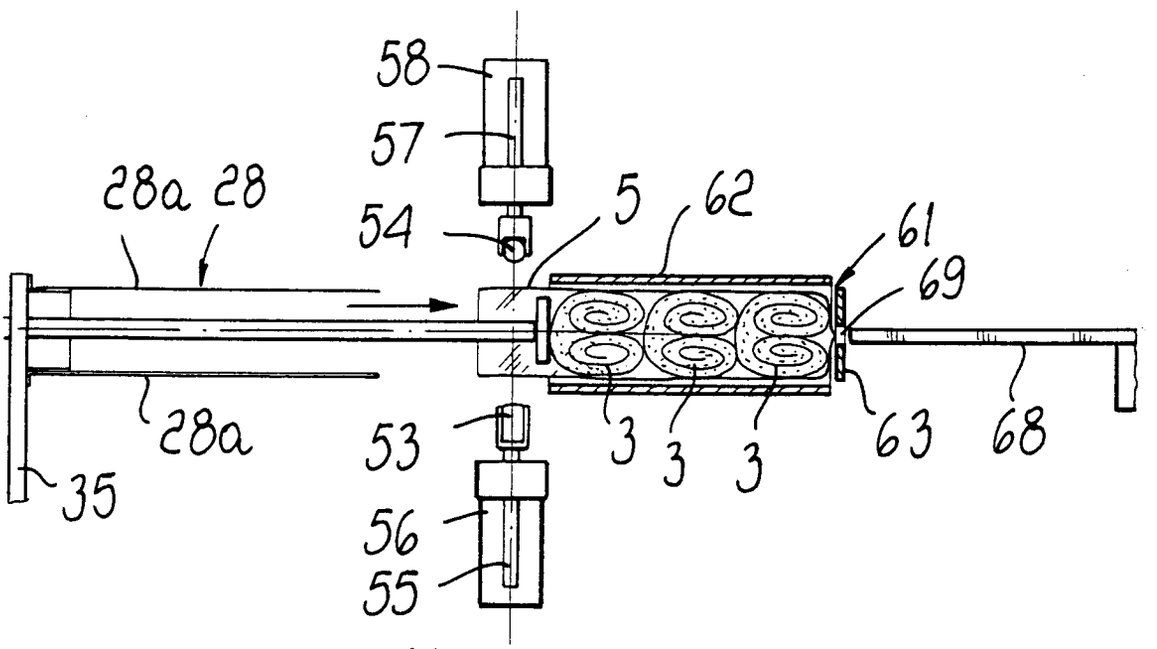
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Fig. 11

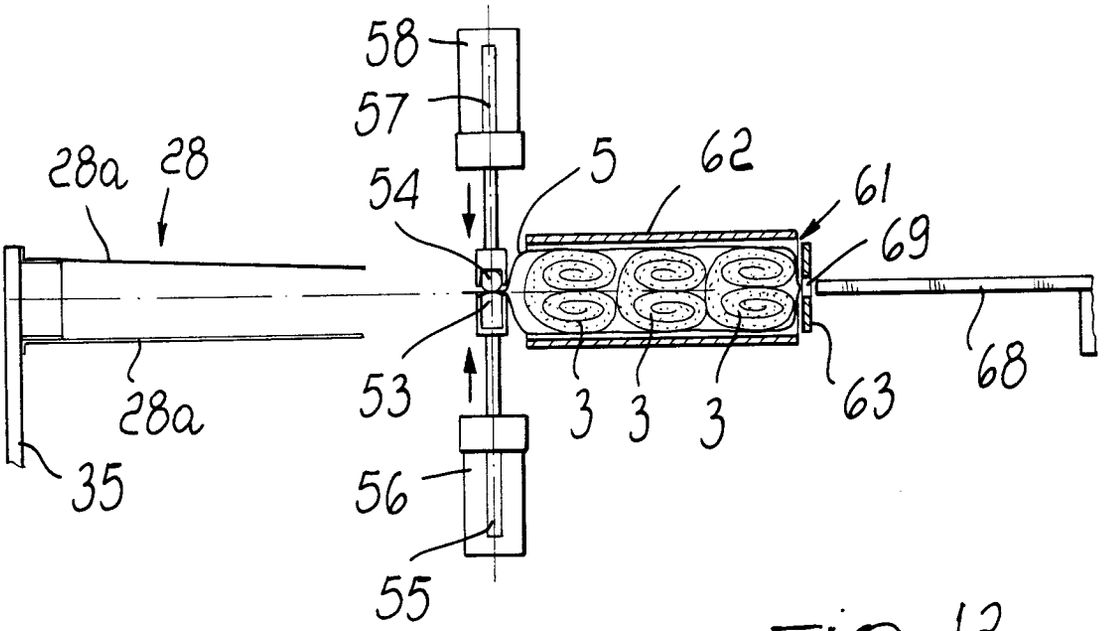
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Fig. 12

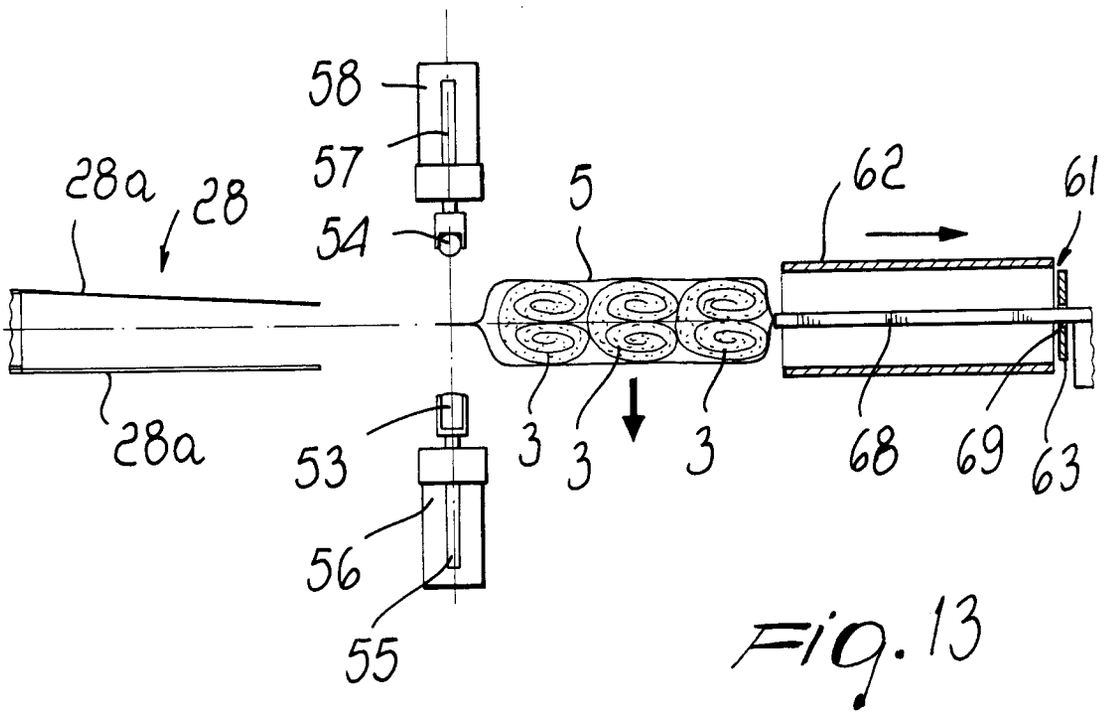
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Fig. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 10 0390

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)
X	CA 929 142 A (CANADIAN INDUSTRIES) 26 June 1973 * claims 1-5; figures 1,3,4 *	1-7,19	B65B25/20 B65B5/04
A	US 3 503 180 A (M.J. MYLES ET AL.) 31 March 1970 * column 3, line 27-54; figures 1-3 *	8	
A	GB 983 903 A (KOUSENFABRIEKEN HIN) 17 February 1965 * page 2, line 21-26 * * page 4, line 17-21; figures 1,2 *	13,14	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	1 April 1999	Grentzius, W

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01-04-1999

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