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(54) **FORMING MACHINE FOR CARDBOARD BOXES OR THE LIKE**

MASCHINE ZUM FORMEN VON PAPPSCHACHTELN ODER DERGLEICHEN

MACHINE A FORMER DES BOITES EN CARTON OU SIMILAIRES

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(56) References cited:
EP-A- 0 666 167
FR-A- 1 453 183
US-A- 2 429 536
US-A- 2 831 300
US-A- 3 476 024
US-A- 4 678 456

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Description

Technical Field

[0001] The present invention relates to a forming machine for cardboard boxes or the like.

Background Art

[0002] Present-day packaging technology uses cardboard boxes which are pre-finished and pre-glued, but still folded, and which are unfolded from a rhomboid shape, i.e. are opened and glued, only at the time when they are to be filled. In this way unnecessary transportation and storage costs, due to the unused volume present inside the empty boxes, are avoided.

[0003] The boxes have a square-shaped central body which is closed at the top by four upper flaps - the lid - and at the bottom by four lower flaps - the base. Since the boxes used have a rectangular cross-section, the flaps are not all the same; both the lid and the base each consist of two small flaps onto which the two larger side flaps are closed and fixed.

[0004] In this technical sector, it is known that there exist automatic forming machines able to remove the pre-glued cardboard boxes, which are still folded in a closed flat condition and stacked on top of one another inside a special store, and open them in sequence forming and gluing the bases thereof. These machines consist essentially of:

- a store in which the pre-glued cardboard boxes to be opened are stacked;
- a feeding device designed to remove individually the boxes from the store and convey them to an opening device provided with suction-cup gripping members which open the cardboard box;
- a flap-folding device;
- a hot glue sprayer for spreading the glue on the flaps of the cardboard base;
- a press designed to press the base for correct gluing thereof.

[0005] Opening of the cardboard boxes is performed by suction cups and guides which act on the external surfaces of the cardboard box. The suction cups may be divided up into several groups which are in turn mounted on arms or mechanisms in general which during their movement draw along part of the cardboard box or with the aid of the guides perform the expansion or unfolding from a rhomboid shape thereof. The cardboard box is completed by folding over the flaps of the base, after application of a layer of glue, and then compressing them together by means of the press. This solution of the known type, although functioning in a satisfactory manner, however is unable to achieve a cardboard-box forming speed greater than about 30 units per minute since it does not operate continuously.

[0006] Moreover the operation of the suction cups of these machines requires the use of costly and complex pumps for generating the vacuum.

[0007] The use of the suction cups and the presence of extraneous solid particles - such as, for example, residue from the processing of the cardboard box or cardboard dust - greatly affect the action of the suction cups, reducing the operating capacity thereof. This causes malfunctions such as jamming or the like and therefore requires continuous monitoring of the state of wear and cleanliness of the suction cups so as to avoid costly machine stoppages. The presence of the suction cups is therefore a source of both direct and indirect costs which have a negative effect on the use of the machine.

[0008] Similar machines are also known, in which opening of the cardboard box is performed not by the suction cups but by strong jets of air which are blown laterally into the flattened cardboard box and force it to open owing to the force of the air pressure. These machines require, however, the presence of powerful blowers and require particularly careful screening to prevent any solid particles, which are propelled at great speed by the action of the air jet, from causing damage to other nearby machines or injury to the production personnel.

[0009] It therefore consists of a solution which has serious drawbacks due mainly to the secondary effects caused by the strong air jets of the blowers.

[0010] US 2,831,300 discloses a forming machine for cardboard boxes or the like comprising a store containing a plurality of flattened cardboard boxes, a device for extracting one cardboard box at a time from the store, means for opening the cardboard box, means for completing opening of the box, a flap-folding device and means for fixing the base of the box. The opening means comprise at least a displacement member designed to bend slightly, with respect to one another, at least two flaps so as to create an opening towards the inside of the cardboard box, and a member for opening the cardboard box, movable between a first closed position where it is inserted inside the opening between the flaps and a second open position where it opens at least partially the cardboard box acting from the inside of the cardboard box itself. The completing opening means comprise a tong mechanism formed by spaced bars pivotally mounted on transverse pivots. When the forward edge of the carton engages two laterally spaced feet of the tong mechanism, the carton will expand to a rectangular shape in erected position. This machine and also the operations for setting-up thereof when it must be adapted to the different dimensions of the cardboard boxes to be opened are susceptible to be considerably simplified.

[0011] The object of the present invention is therefore that of overcoming the said drawbacks of the devices of the known type by providing a machine for forming cardboard boxes which is able to open the cardboard boxes continuously and at higher speeds than those which are currently achieved, without this thereby resulting in ex-

cessively complex or difficult operation thereof.

[0012] A further object is that of providing a machine which is extremely simple from a constructional and functional point of view and is able to manipulate cardboard boxes without altering or damaging the surface thereof.

[0013] These and other objects as well are all achieved by a machine for the formation of cardboard boxes or the like as described in the claims which follow.

[0014] According to the present invention, continuous operation is obtained by performing opening of the cardboard boxes in an exclusively mechanical manner by means of introduction of a suitable opening member inside the cardboard box, causing it to pass through an opening obtained by bending slightly the two small flaps of the same side of the flattened cardboard box, i.e. one of the lid and one of the base.

[0015] The two small flaps bend during their rotational movement also the two larger flaps of the opposite side (which are situated directly underneath the small flaps), thus separating the two pairs of opposite flaps, i.e. the two small flaps from the two large flaps, respectively.

[0016] The rotation of the flaps is performed making use of the pre-formed folding lines so as not to damage the cardboard box in any way (the step involving formation of the base nevertheless envisages bending the flaps along these folding lines; rotation therefore does not produce any visible deformation).

[0017] In a preferred embodiment the machine comprises on each side of the box a cam which is arranged along the rectlinear trajectory followed by the flaps and which acts on the smaller of the two flaps, rotating it slightly together with the larger of the two flaps on the opposite side, which is forced to follow the rotation thereof. In this way a V-shaped opening is formed between the short superimposed portions of the two larger flaps, which allows easy introduction of any member inside the box so as to force opening thereof.

[0018] According to a preferred embodiment, insertion of the opening member between the flaps is performed - on each side - by inserting said member in a direction of introduction parallel to the direction of fowards movement of the flaps. In this way, by causing the cardboard boxes to move forwards along a rectilinear trajectory, it is sufficient to position the opening member a small amount underneath the surface of the cardboard box such that the opening between the flaps, caused by the action of the cam, is automatically intercepted by this member.

[0019] According to a preferred embodiment, the opening member comprises a flat lever mechanism which is opened in the manner of a compass as soon as the action of the cams ceases, namely as soon as the opening member is located underneath the two larger flaps of the base and the lid of the cardboard box.

[0020] In order to ensure opening of the cardboard box under any conditions of use it is possible to operate on both sides of the cardboard box, therefore acting both on the lid side and on the base side.

[0021] It is also possible to operate with a single cam and a single opening member on one side of the cardboard- box, if necessary displacing the opening member slightly towards the inside of the cardboard box after it has been inserted between the flaps, so that this member acts not only on the flaps (which could bend as a result of its action) but also directly on the central body of the cardboard box which is sufficiently rigid to ensure correct opening.

[0022] According to a preferred embodiment, the feeding movement of the boxes is obtained by means of a pushing tooth which also performs the function of extracting the boxes from the store. It is able to assume two positions: a first flat position for removing one cardboard box at a time from the stacking store and a second raised position for pushing the cardboard box, acting on a larger surface so as not to damage the edge thereof.

[0023] The tooth may also be provided with a small wheel or the like which is located on its upper rear surface and is designed to prevent the rear surface of said tooth, during the step of removal of the boxes from the store, from scratching or in any case damaging the cardboard box located immediately above the one which is being extracted.

[0024] Closing of the flaps may be performed by a fixed front flap-closing device which closes the front side flap, the bottom flap and the upper flap, while the rear side flap may be closed by a rotating rear flap-closing device provided with a pusher arm and a flat half-piece in the form of a helix. The pusher arm causes closing of the small rear flap, while the helix keeps the large flap slightly raised so that it is unable to interfere with the small flap.

[0025] The front flap-folding device may also be constructed in the form of a fixed contact element which intercepts and closes the front flap, making use exclusively of the feeding movement of the cardboard box. The large flap on the opposite side may be guided, in a similar manner, by a fixed guide which keeps it always folded towards the outside of the travel surface of the central body of the cardboard boxes. This solution allows closing of the flaps on the moving boxes in an extremely simple and low-cost manner.

[0026] Pressing of the base may be obtained by means of the association of a conveyor belt, the feeding surface of which is arranged parallel to the base of the box and cooperates with a thrusting piston which presses against the inner base of the box. Said piston moves forwards, parallel to the box, at the same speed as the latter and the supporting conveyor belt, so as not to interfere with the feeding movement of the cardboard box. The presser piston may be mounted on a slide moved along a closed-path guiding rail formed with a U-shaped recess in the section where the action on the base of the box is envisaged. In this way the piston travels parallel to the box and enters into the box only in the space intended for pressing of the base.

[0027] Further characteristic features and advantages of the present invention will emerge more clearly from the detailed description which follows of a preferred embodiment illustrated solely by way of a non-limiting example, in the accompanying drawings, in which:

- Figure 1 shows a schematic side view of the forming machine for cardboard boxes or the like according to the present invention, with some details removed so that others may be more clearly visible;
- Figure 2 shows a schematic view from above of the machine according to Figure 1, with some details removed so that others may be more clearly visible;
- Figures 3 to 9 show in sequence the steps of opening of a box;
- Figures 10 to 12 show schematically the stages of insertion of the opening member inside the flattened box;
- Figure 13 shows a constructional variant of the device which pushes the cardboard boxes;
- Figure 14 shows the separating member operating in the store;
- Figure 15 shows the upper member for opening the cardboard boxes.

Disclosure of the invention

[0028] With particular reference to Figure 1, 1 denotes in its entirety the forming machine according to the present invention.

[0029] The forming machine 1 comprises essentially:

- a vertically extending store 2 containing a plurality of cardboard boxes pre-glued and folded in a closed flat condition;
- a device 4 for extracting one cardboard box 3 at a time from the said store 2 and pushing it along a support surface 11;
- a displacement member 15 which is designed to move at least two opposite flaps 8 away from one another slightly, so as to disclose an opening 18 between two flaps 8, 9, substantially perpendicular with respect to the plane of the flattened cardboard box 3, thus creating a wide opening providing access to the inside of the box 3;
- a member 16 for opening the cardboard box 3, movable between a first closed condition C where it is inserted inside said opening 18 and a second open position D where it at least partially opens the cardboard box 3 from the inside;
- a flap-folding device 6 which is designed to rotate and close the four flaps 8, 9 so as to create a base 14 of the cardboard box 3;
- a device for applying glue or the like 7 onto the flaps 8, 9 of the base 14;
- a press 12 for the base 14 of the open box 3.

[0030] The device 4 for extracting and pushing the cardboard boxes 3 comprises a pushing tooth 10 movable between a first lowered position A, where it projects with respect to the surface 11 supporting the cardboard boxes 3 by a thickness S equal to the thickness of the flattened cardboard boxes 3 and a second position B for pushing the cardboard boxes 3 during the following opening steps, where it projects by a greater amount with respect to the surface 11 and has a pushing surface 19 sufficient not to damage the boxes 3. The tooth 10 is formed substantially in the manner of an "L" and its movement from the first lowered position into the second pushing position is performed by suitable actuating members not shown. The tooth 10 also has on its rear surface 20 a small wheel 21, the function of which is to keep the rear surface 20 inside store 2 at a distance from the cardboard box 3' which is stacked immediately on top of the one being extracted. In this way scratching and damaging the cardboard boxes 3' with the rear surface 20 of the pushing tooth 10 is avoided.

[0031] The tooth 10 is moved along a closed trajectory which extends from store 2 to the press 12, by means not described since they form part of the known art.

[0032] A displacement member 15 is arranged at the exit from the store 2, said member being composed of a rotating shaft 22 which has a horizontal axis perpendicular to the feeding movement of the cardboard boxes 3 and on which two cams 23 are keyed. Each of the two cams 23 acts, upon actuation, causing rotation of the smaller of the two upper flaps 8' downwards. Basically, the action of the cam 23 bends the flap 8' downwards slightly, causing it to rotate about a pre-formed folding line 24 connecting it to the central body 27 of the cardboard box 3. This latter central body 27 is supported by the supporting surface 11 with respect to which the flaps 8, 9 protrude. As can be seen clearly in Figure 11, the flap 8', rotating downwards, pushes with it also the larger of the two lower flaps 8" so that the flaps 8' and 8" are displaced with respect to the larger of the upper flaps 9" and the smaller of the lower flaps 9'. The opening 18 is therefore located in the cardboard box section where the two large separated flaps 8" and 9" are partially superimposed.

[0033] The member 16 for opening the cardboard box 3 comprises, on each side, at least one thin blade 25 which is arranged slightly below the surface 11 and parallel to the latter and which has, hinged with it, an arm 26 which can be actuated so as to rotate about an axis substantially parallel to the surface 11. The two blades 25 are arranged downstream of the cams 23, in alignment with the opening 18 between the flaps 8,9, so that the cardboard boxes, moving forwards, cause the flaps 8', 9' and 9" to pass above and the flap 8" to pass below the blades 25.

[0034] The relative movement of the blades 25 and the arms 26, which can be clearly seen from the sequence shown in Figures 3 to 9, is of the compass type.

[0035] The blade 25 may also be inclined slightly so as to be arranged parallel with respect to the lowered

flaps 8' and 8". In this way it is easier to intercept the opening 18.

[0036] To prevent the boxes 3 from being able to close again owing to the resilience of their folds and owing to the their weight an upper friction guide 30 is provided, said guide being suspended from a plurality of springs 31 so as to rest lightly on the upper side 32 of the open box. The frictional force generated by sliding of the cardboard boxes along the guide 30 is sufficient to keep them open.

[0037] The upper rear edge of the open boxes is able to be pushed by a pushing serration 56 which moves forwards at the same speed as the tooth 10.

[0038] A flap-folding arrangement 6 is located downstream of the opening member 16 and comprises a rotating flap-folding device 6' and a fixed flap-folding device 6".

[0039] The fixed flap-folding device 6" consists of a plurality of fixed contact guides 33 which force the flaps 8,9 passing through them to follow the preset closing trajectories.

[0040] The rotating flap-folding device 6' comprises an arm 34 which rotates about an axis perpendicular with respect to the support surface 11 and which has, integrally associated with it, a helically inclined segment 25 which precedes it angularly and is designed to move the upper flap 9" away before the rotating arm 34 pushes and closes the rear side flap 8'. This device, which is extremely simple from a constructional point of view, prevents the rear flap 8' from being able to interfere with the upper flap 9" during the step involving closing of the base.

[0041] The lower flap 8" may also be moved away by a second helix 35 but, more simply, it may be kept constantly inclined downwards by a suitable guide which prolongs the action of the blade 25. In this way the lower flaps 8" which remain bent downwards and which pass underneath a suitable guide also help confer stability on the box moving forwards at a fast speed.

[0042] The application of the glue in the hot state is performed with the means and methods which are already known and which are therefore not discussed and described here.

[0043] The press 12 presses the outer flaps 8" and 9" against the inner flaps 8' and 9' so as to ensure the correct distribution of the glue and perfect gluing of the base. Said press essentially consists of:

- a thrusting piston 36 slidably associated with a support 37 moved by a chain 38 which extends along a closed path;
- a U-shaped rail 39 along which a slide 40 travels, the latter having integrally fixed to it a free end 41 of the piston 36, designed to displace the piston 36 transversely to-and-fro with respect to the direction of feeding of the cardboard boxes 3;
- a conveyor belt 42 arranged with its support surface 43 parallel to the base of the cardboard box 3.

[0044] The piston 36 therefore follows a closed path and comprises a U-shaped section which causes it to be inserted inside the formed boxes 3 and to press the inner flaps 8' and 9' against the outer flaps 8" and 9" which rest on the conveyor belt 42.

[0045] After the mainly structural description, let us now consider operation of the present invention, as illustrated in particular in the sequence from Figures 3 to 9 and 10 to 12.

[0046] Initially (Figure 3) the pushing tooth 10, arranged in the lowered position A, intercepts the store 2 and introduces itself into the bottom thereof, extracting a box 3. With its front portion, preferably shaped so as to match the edge of the boxes to be extracted, it pushes a box 3 along the support surface 11 out of the store. When the rear surface 20 of the tooth 10 is extracted from the store 2, the tooth is raised, bringing itself into the position B illustrated in Figure 4 so as to push the cardboard box 3 with the whole of its pushing surface 19.

[0047] When the two small rear flaps 8' are located exactly underneath the two cams 23, the latter, rotating, push them downwards, bending downwards also the larger flaps 8" situated underneath.

[0048] In this way the front flaps 9 are displaced with respect to the rear flaps 8 and the opening 18 is created. The opening member 16, which is closed in its position C, is arranged underneath the surface 11 exactly so as to be located with its thin blade 25 in front of the opening 18. The box 3, moving forwards, is therefore arranged with its front flaps 9 above the blade 25 and with the rear flaps 8 underneath the blade 25. The action of the cams 23 ceases when the blade 25 is arranged at least partially into the opening 18. The small upper flap 8', freed from the pressure exerted by the cam, reassumes, as a result of the resilience of the cardboard box, its initial horizontal position, therefore being realigned again with the front flaps 9 which are located above the blade 25.

[0049] In this situation, therefore, the blade 25 presses the larger of the two lower flaps 8" downwards, while the remaining flaps 8', 9', 9" remain higher than the blade 25.

[0050] At this stage, opening of the opening member 16 is activated and the latter rapidly assumes its open position D (Figures 5 and 6). Shortly before it reaches the completely open position, the cardboard box 3, or its upper front edge, comes into contact with an upper member (shown in figure 15) which is responsible for completing opening of the cardboard boxes 3. The opening member closes again, reassuming its initial position C, and inserts itself between the lower flap 8" and the rear flap 8'.

[0051] Owing to the relative speed which is thus created between the two opposite sides, the upper side relative to the bottom side, the cardboard box 3 is fully opened, bringing its upper side into contact with the friction guide 30 which keeps the cardboard box 3 open.

[0052] The cardboard box 3 moves forwards further, as illustrated in Figure 9, and continues its travel to-

wards the flap-folding device 6. Here application of the glue in the hot state onto the flaps is performed. The fixed flap-folding device 6" acts on the front flap 9', closing it, while the rotating flap-folding device 6', after lifting the upper flap 9", also closes the rear flap 8'.

[0053] The gluing step continues in the press 12 where the base of the box 3 is compressed between the thrusting piston 36 and the conveyor belt 42.

[0054] The thrusting piston 36, guided by the support 37, is pushed towards the inside of the box 3 by the slide 40 which, causing it to be displaced in the support 37, guides it along a U-shaped trajectory. The trajectory followed by the piston causes it emerge, at the end of the pressing stage, from the cardboard box 3, leaving it free for the manipulating operations which follow.

[0055] The constructional variant, illustrated in Figure 13, shows an alternative embodiment of the device which is responsible for extracting the cardboard boxes 3 from the store 2 and pushing them along their trajectory.

[0056] Basically it consists of a solution in which the pushing surface resting on the cardboard box moves while remaining always perpendicular to the trajectory of the cardboard boxes and, in particular, also along the final section of the trajectory where the pushing surface is extracted downwards so as to free the cardboard boxes. In this way, even if the surface of the cardboard boxes should be particularly delicate, there is no risk of scratching it.

[0057] This alternative device 104 comprises a separating member 50 which lifts slightly the pack of cardboard boxes 3 of the store 2, which are arranged above the cardboard box 3 to be extracted, so as to create a vertical aperture sufficient to allow an upper end of a vertical pushing arm 51 to pass through. The pushing arm 51 is pivotably hinged with an underlying drive chain 53, the trajectory of which extends, underneath the support surface 11, along a substantially vertical plane, and is kept in position by a second arm 54 which is also pivotably hinged with the chain 53. The pushing arm 51 is pivotably hinged in turn with the second arm 54 and forms an acute angle with it.

[0058] The kinematic mechanism thus realized keeps the pushing arm 51 perpendicular with respect to the support surface 11 and causes it to extracted finally downwards, by means of translation, keeping it parallel with itself at least in the section where it is contact with the cardboard box which it pushes, as can be clearly seen from the sequence shown in Figure 13.

[0059] The upper end of the pushing arm 51 has, mounted pivotably rotatably on it, an anti-scratch wheel 121 which has the function of keeping the cardboard box to be extracted separated from the remaining boxes stacked in the store 2, preventing scratching of the bottom surface of the cardboard boxes located above.

[0060] The separating member 50 (Figure 14) may comprise a pair of pushers 52 which are located on the sides of the cardboard box and which are shaped substantially in the form of a wedge. These pusher devices 52 may be made to perform a to-and-fro movement by suitable pusher members (not shown) so as to allow the vertical pushing arm 51 to extract the cardboard boxes, one by one, from the store 2.

[0061] Figure 15 shows the upper member which is responsible for completing opening of the cardboard boxes 3. Basically, it is a curtain-type member 55 consisting of a plurality of strips of resilient material which are suspended in the vicinity of the upper friction guide 30. The dimensions and the characteristics of the material of the strips are chosen so as not to damage the surface of the cardboard boxes, while ensuring correct opening thereof. In practice, excellent results are obtained using strips of plastic material with a width of about 3-7 centimetres.

[0062] This solution simplifies considerably the machine and also simplifies the operations for setting-up thereof when it must be adapted to the different dimensions of the cardboard boxes to be opened. The force necessary for opening the cardboard boxes is produced by the friction which the curtain member develops while rubbing against the upper part of the cardboard boxes. This friction slows down, in fact, the forwards movement of the upper edge of the cardboard box with respect to the lower edge moved by the pushing tooth 10 and completes opening of the cardboard box.

[0063] Obviously the invention thus conceived may be subject to numerous modifications and variations, all of which fall within the scope of the inventive idea which characterizes it.

[0064] In particular, fixing of the bases of the cardboard boxes may be performed using means other than the glue described herein, such as staples, metal fasteners or the like.

[0065] Opening of the cardboard box may be performed by acting simultaneously on both sides of the cardboard box in a symmetrical manner (as illustrated) or by acting exclusively on only one of the sides of the cardboard box, for example the side which will form the base of the cardboard box. Finally, the opening member may act exclusively on the flaps or may, by means of a small additional traslatory movement, act directly on the central body of the cardboard box. The cams may also be replaced by other members which are able to obtain the displacement described. In particular, it is possible to use suitably shaped fixed guides which, guiding the flaps laterally, cause them to rotate with respect to the central part of the cardboard box.

[0066] The invention therefore achieves the objects mentioned.

Claims

1. Forming machine for cardboard boxes or the like comprising:

- a store (2) containing a plurality of flattened cardboard boxes (3);
- a device (4) for extracting one cardboard box (3) at a time from the said store (2);
- means (5) for opening the cardboard box (3) which comprise at least:

  - a displacement member (15) designed to bend slightly, with respect to one another, at least two flaps (8,9) so as to create an opening (18) towards the inside of the cardboard box (3);
  - a member (16) for opening the cardboard box (3), movable between a first closed position (C) where it is inserted inside said opening (18) between the flaps (8,9) and a second open position (D) where it opens at least partially the cardboard box (3) acting from the inside of the cardboard box (3) itself;

- means (55) for completing opening of the box (3);
- a flap-folding device (6);
- means (7; 12) for fixing the base of the box (3);

characterized in that said means (55) for completing opening of the box (3) comprise a curtain member (55) which is designed to collide with the upper part of the half-open cardboard boxes (3) which are moving forwards, so as to complete opening thereof by means of the friction thus produced.

2. Forming machine according to Claim 1, **characterized in that** said curtain member (55) is arranged above a support surface (11) for the cardboard boxes (3).

3. Forming machine according to Claim 1 or 2, **characterized in that** said curtain member (55) comprises a plurality of strips (57) made of resilient material and suspended from above.

4. Forming machine according to one of Claims 1 to 3, **characterized in that** said displacement member (15) comprises pressing means (23) designed to act on at least one of the flaps (8') so as to bend it slightly, causing it to rotate with respect to the remainder of the cardboard box (3) and with respect to the remaining flaps (9).

5. Forming machine according to Claim 4, **characterized in that** said pressing means comprise at least one rotating cam (23) which acts, upon actuation, pressing and inclining downwards the smaller of the two upper flaps (8').

6. Forming machine according to Claim 1, **characterized in that** said member (16) for opening the cardboard box (3) comprises at least one blade (25) with which an arm (26) which can be actuated in the manner of a compass is hinged.

7. Forming machine according to one of Claims 1 to 6, **characterized in that** said member (16) for opening the cardboard box (3) is arranged in alignment with the flaps (8,9) and is inserted inside the opening (18) in a direction parallel to the flaps (8,9) of the flattened cardboard box (3).

8. Forming machine according to Claim 7, **characterized in that** said opening member (16) is arranged underneath the plane of the flattened cardboard box (3).

9. Forming machine according to Claim 1, **characterized in that** the cardboard boxes (3) are extracted from the store (2) and pushed along a support surface (11) by the device (4) comprising a pushing tooth (10) movable between a first lowered position (A), where it projects with respect to the support surface (11) by a thickness (S) not greater than the thickness of the flattened cardboard boxes (3) and a second raised position (B) for pushing the cardboard boxes (3) during the subsequent opening steps, where it projects by a greater amount with respect to the said surface (11) and has a pushing surface (19) sufficient so as not to damage the cardboard boxes (3).

10. Forming machine according to Claim 9, **characterized in that** the flap-folding device (6') comprises an arm (34) which rotates about an axis perpendicular to the support surface (11) for the cardboard boxes (3) and with which a segment in the form of a helix (35) is integrally associated, said segment preceding it angularly and being designed to move away the upper flap before the rotating arm (34) pushes and closes the side flap (8').

11. Forming machine according to one of Claims 1 to 10, **characterized in that** said means (7; 12) for fixing the base of the box (3) comprise:

- a device for applying glue or the like (7) onto the flaps (8',9') of the base;
- a press (12) for pressing the base of the box (3).

12. Forming machine according to Claim 11, **characterized in that** the press (12) comprises:

- a thrusting piston (36) moved by translating means (37,38,39,40) against the inner base of the cardboard box (3), following a trajectory comprising a U-shaped recessed section;
- a conveyor belt (42) arranged with its support

surface (43) parallel to the base of the cardboard box (3); said U-shaped section being located opposite the said conveyor belt (42).

13. Forming machine according to Claim 9, **characterized in that** said pushing tooth has, on its rear surface (20), a small wheel (21) which projects slightly with respect to the said rear surface (20).

14. Forming machine according to one of Claims 1 to 13,
characterized in that it comprises an upper friction guide (30) which is suspended resiliently and is designed to press lightly against the upper side (32) of the open cardboard boxes (3) which, rubbing against it, remain in the open position.

15. Forming machine according to Claim 1, **characterized in that** the device (4) for extracting the cardboard boxes (3) from the store (2) comprises:

- a drive chain (53) located underneath a support surface (11) for the cardboard boxes (3), the trajectory of which extends along a substantially vertical plane;
- a vertical pushing arm (51) which projects from the support surface (11) and is pivotably hinged with the underlying drive chain (53) and which is designed to push the cardboard boxes (3) along the support surface (11);
- a second arm (54) also pivotably hinged with the chain (53);

said vertical pushing arm (51) also being pivotably hinged with the second arm (54) so as to form an acute angle with the latter, so that the pushing arm (51) moves forwards, while remaining always substantially vertical, at least in the zone where it is in contact with the cardboard box (3) which it is pushing.

16. Forming machine according to Claim 15, **characterized in that** said vertical pushing arm (51) has at the top a small anti-scratch wheel (121) for keeping raised the cardboard boxes (3) stacked in the store (2), separating them from the cardboard box (3) to be extracted, so as not to scratch the bottom surface of the cardboard boxes (3).

Patentansprüche

1. Maschine zum Formen von Pappschachteln oder dergleichen, enthaltend:

- ein Magazin (2) enthaltend eine Anzahl von flach gefalteten Schachteln;
- eine Vorrichtung (4) zum Herausziehen von jeweils einer Schachtel (3) aus dem genannten Magazin (2);
- Mittel (5) zum Öffnen der Schachtel (3),

welche wenigstens enthalten:

- ein Verschiebeelement (15), dazu bestimmt, wenigstens zwei Klappen (8, 9) im Verhältnis zueinander leicht so zu biegen, dass eine Öffnung (18) zum Innenraum der Schachtel (3) hin entsteht;
- ein Element (16) zum Öffnen der Schachtel (3), das zwischen einer ersten, geschlossenen Position (C), in welcher es in das Innere der genannten Öffnung (18) und zwischen den Klappen (8, 9) eingeschoben ist, und einer zweiten, offenen Position (D), in welcher es wenigstens teilweise die Schachtel (3) öffnet und dabei aus dem Inneren der Schachtel (3) her wirkt, beweglich ist;
- Mittel (55) zum Vervollständigen des Öffnens der Schachtel (3);
- Klappen-Faltvorrichtung (6);
- Mittel (7, 12) zum Befestigen des Bodens der Schachtel (3);

dadurch gekennzeichnet, dass die genannten Mittel (55) zum Vervollständigen des Öffnens der Schachtel (3) wenigstens eine Hängeblende (55) enthalten, die dazu bestimmt ist, auf den oberen Teil der halboffenen Schachteln (3) zu treffen, die sich nach vom bewegen, so dass das Öffnen derselben durch die so erzeugte Reibung vervollständigt wird.

2. Formmaschine nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die genannte Hängeblende (55) oberhalbeiner Auflagefläche (11) für die Schachteln (3) angeordnet ist.

3. Formmaschine nach Patentanspruch 1 oder 2, **dadurch gekennzeichnet, dass** die genannte Hängeblende (55) eine Anzahl von Streifen (57) aus elastischem Material enthält, die oben aufgehängt sind.

4. Formmaschine nach einem der Patentansprüche von 1 bis 3, **dadurch gekennzeichnet, dass** das genannte Verschiebeelement (15) Pressmittel (23) enthält, die dazu bestimmt sind, auf wenigstens eine der Klappen (8') zu wirken, so dass diese leicht umgebogen und somit im Verhältnis zu dem Rest der Schachtel (3) und im Verhältnis zu den verbleibenden Klappen (9) gedreht wird.

5. Formmaschine nach Patentanspruch 4, **dadurch gekennzeichnet, dass** die genannten Pressmittel wenigstens eine sich drehende Nocke (23) enthalten, welche auf einen Antrieb hin wirkt, wobei die

kleinere der beiden oberen Klappen (8') drückt und nach unten biegt.

6. Formmaschine nach Patentanspruch 1, **dadurch gekennzeichnet, dass** das genannte Element (16) zum Öffnen der Schachtel (3) wenigstens eine Klinge (25) enthält, an die ein Arm (26) angelenkt ist, welcher in der Art eines Kompasses betätigt werden kann.

7. Formmaschine nach einem der Patentansprüche von 1 bis 6,
dadurch gekennzeichnet, dass das genannte Element (16) zum Öffnen der Schachtel (3) zu den Klappen (8, 9) ausgerichtet angeordnet und in das Innere der Öffnung (18) eingeschoben ist, und zwar in einer Richtung parallel zu den Klappen (8, 9) der gefalteten Schachtel (3).

8. Formmaschine nach Patentanspruch 7, **dadurch gekennzeichnet, dass** das genannte Öffnungselement (16) unterhalb der Ebene der gefalteten Schachtel (3) angeordnet ist.

9. Formmaschine nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Schachteln (3) aus dem Magazin (2) herausgezogen und entlang einer Auflagefläche (11) geschoben werden, und zwar durch die Vorrichtung (4), die einen Schubzahn (10) enthält, der zwischen einer ersten, gesenkten Position (A), in welcher er im Verhältnis zu der Auflagefläche (11) um eine Stärke (S) hervorsteht, die nicht mehr ist als die Stärke der gefalteten Schachtel (3), und einer zweiten, angehobenen Position (B) zum Schieben der Schachteln (3) während der anschliessenden Öffnungsphasen, in welche er um eine grössere Menge im Verhältnis zu der genannten Auflagefläche (11) hervorsteht, beweglich ist und eine Schubfläche (19) aufweist, die ausreichend ist, um die Schachteln nicht zu beschädigen.

10. Formmaschine nach Patentanspruch 9, **dadurch gekennzeichnet, dass** die Klappen-Faltvorrichtung (6') einen Arm (34) enthält, welcher sich um eine Achse rechtwinklig zu der Auflagefläche (11) für die Schachteln (3), und mit welchem ein schnekkenförmiges Segment (35) fest verbunden ist, wobei das genannte Segment diesem winkelmässig vorausgeht und dazu bestimmt ist, die obere Klappe zu entfemen bevor der Dreharm (34) die Seitenklappe (8') schiebt und verschliesst.

11. Formmaschine nach einem der Patentansprüche von 1 bis 10, **dadurch gekennzeichnet, dass** die genannten Mittel (7, 12) zum Befestigen des Bodens der Schachtel (3) wie folgt enthalten:

- eine Vorrichtung zum Anbringen von Klebstoff oder ähnlichem (7) an den Klappen (8', 9') des Bodens;
- einen Presser (12) für den Boden der Schachtel (3).

12. Formmaschine nach Patentanspruch 11, **dadurch gekennzeichnet, dass** der Presser (12) wie folgt enthält:

- einen Druckkolben (36), der durch Verschiebemittel (37, 38, 39, 40) gegen die Innenseite des Bodens der Schachtel (3) bewegt wird, wobei er einer Bahn folgt, die einen Abschnitt in Form einer U-förmigen Vertiefung enthält;
- ein Förderband (42), angeordnet mit seiner oberen Oberfläche (43) parallel zu dem Boden der Schachtel (3); wobei der genannte U-förmige Abschnitt dem genannten Förderband (42) gegenüberliegend angeordnet ist.

13. Formmaschine nach Patentanspruch 9, **dadurch gekennzeichnet, dass** der genannte Schubzahn an seiner rückwärtigen Oberfläche (20) ein kleines Rad (21) aufweist, welches im Verhältnis zu der genannten rückwärtigen Oberfläche (20) leicht hervorsteht.

14. Formmaschine nach einem der Patentansprüche von 1 bis 13, **dadurch gekennzeichnet, dass** sie eine obere Reibführung (30) enthält, welche elastisch aufgehängt und dazu bestimmt ist, leicht gegen die obere Seite (32) der offenen Schachteln (3) zu drücken, welche, dagegen reibend, in offener Position bleiben.

15. Formmaschine nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Vorrichtung (4) zum Herausziehen der Schachteln (3) aus dem Magazin (2) wie folgt enthält:

- eine Antriebskette (53), angeordnet unterhalb einer Auflagefläche (11) für die Schachteln (3), deren Bahn sich entlang einer im wesentlichen vertikalen Ebene erstreckt;
- einen vertikalen Schubarm (51), welcher aus der Auflagefläche (11) hervorsteht und drehbar mit der darunterliegenden Antriebskette (53) verbunden ist, und welcher dazu bestimmt ist, die Schachteln (3) entlang der Auflagefläche (11) zu schieben;
- einen zweiten Arm (54), ebenfalls drehbar mit der Kette (53) verbunden;

wobei der genannte vertikale Schubarm (51) ebenfalls drehbar mit dem zweiten Arm (54) verbunden ist und zusammen mit letzterem einen spitzen Winkel bildet, so dass sich der Schubarm (51) nach vom bewegt, während er stets im wesentlichen vertikal

bleibt, und zwar wenigstens in dem Bereich, in dem er sich mit der Schachtel (3), die er schiebt, in Kontakt befindet.

16. Formmaschine nach Patentanspruch 15, **dadurch gekennzeichnet, dass** der genannte vertikale Schubarm (51) an seinem oberen Ende ein kleines Antikratzrädchen (121) aufweist, um die in dem Magazin (2) gestapelten Schachtel (3) angehoben zu halten und von der herauszuziehenden Schachtel (3) zu trennen, so dass die untere Oberfläche der Schachteln (3) nicht zerkratzt wird.

Revendications

1. Machine à former des boîtes en carton ou similaires comprenant:

- un magasin (2) contenant une pluralité de boîtes en carton aplaties (3);
- un dispositif (4) pour extraire du magasin (2) les boîtes en carton (3) une par une;
- des moyens (5) pour ouvrir la boîte en carton (3) comprenant au moins:

- un organe de poussée (15) conçu pour plier légèrement, par rapport aux autres, deux rabats (8, 9) de manière à créer une ouverture (18) vers l'intérieur de la boîte en carton (3);
- un organe (16) d'ouverture de la boîte en carton (3), mobile entre une première position fermée (C), dans laquelle il est inséré dans ladite ouverture (18) entre les rabats (8, 9), et une seconde position ouverte (D), dans laquelle il ouvre au moins partiellement la boîte en carton (3) en agissant de l'intérieur de cette dernière;
- des moyens (55) pour compléter l'ouverture de la boîte (3);
- un dispositif de pliage des rabats (6);
- des moyens (7; 12) de fixation de la base de la boîte (3);

caractérisée en ce que lesdits moyens (55) pour compléter l'ouverture de la boîte (3) comprennent un organe en rideau (55) conçu pour entrer en collision avec la partie supérieure des boîtes en carton (3) semi-ouvertes se déplaçant vers l'avant, de manière à compléter leur ouverture par l'intermédiaire de la friction ainsi produite.

2. Machine à former selon la revendication 1, **caractérisée en ce que** ledit organe en rideau (55) est disposé au-dessus d'une surface d'appui (11) pour les boîtes en carton (3).

3. Machine à former selon les revendications 1 ou 2, **caractérisée en ce que** ledit organe en rideau (55) comprend une pluralité de bandes (57) en matériau élastique et suspendues depuis le dessus.

4. Machine à former selon les revendications 1 à 3, **caractérisée en ce que** ledit organe de poussée (15) comprend des moyens de pression (23) conçus pour agir sur au moins un des rabats (8') de manière à le plier légèrement en le faisant pivoter par rapport au reste de la boîte en carton (3) et aux autres rabats (9).

5. Machine à former selon la revendication 4, **caractérisée en ce que** lesdits moyens de pression (23) comprennent au moins une came rotative (23) agissant, sur commande, en pressant et inclinant vers le bas le plus petit des deux rabats supérieurs (8').

6. Machine à former selon la revendication 1, **caractérisée en ce que** ledit organe (16) pour ouvrir la boîte en carton (3) comprend au moins une lame (25) sur laquelle est articulé un bras (26) pouvant être actionné comme un compas.

7. Machine à former selon l'une des revendications 1 à 6, **caractérisée en ce que** ledit organe (16) pour ouvrir la boîte en carton (3) est aligné avec les rabats (8, 9) et est inséré à l'intérieur de l'ouverture (18) dans une direction parallèle aux rabats (8, 9) de la boîte en carton (3) aplatie.

8. Machine à former selon la revendication 7, **caractérisée en ce que** ledit organe d'ouverture (16) est disposé au-dessous du plan de la boîte en carton (3) aplatie.

9. Machine à former selon la revendication 1, **caractérisée en ce que** les boîtes en carton (3) sont extraites du magasin (2) et poussées le long d'une surface d'appui (11) par le dispositif (4) comprenant une dent de poussée (10) mobile entre une première position inférieure (A), dans laquelle elle est saillante par rapport à la surface d'appui (11) selon une épaisseur (S) n'excédant pas l'épaisseur de la boîte en carton (3) aplatie, et une seconde position supérieure (B) pour pousser les boîtes en carton (3) pendant les phases suivantes d'ouverture, dans laquelle elle est majeurement saillante par rapport à ladite surface (11) et présente une surface de poussée (19) suffisante pour ne pas endommager les boîtes en carton (3).

10. Machine à former selon la revendication 9, **caractérisée en ce que** le dispositif de pliage des rabats (6') comprend un bras (34) pivotant autour d'un axe perpendiculaire à la surface d'appui (11) des boîtes en carton (3), duquel est solidaire un segment en forme d'hélice (35) le précédant angulairement et étant conçu pour éloigner le rabat supérieur avant

que le bras rotatif (34) ne pousse et ne ferme le rabat latéral (8').

11. Machine à former selon l'une des revendications 1 à 10, **caractérisée en ce que** lesdits moyens (7; 12) de fixation de la base de la boîte (3) comprennent:

- un dispositif d'application de glue ou similaire (7) sur les rabats (8', 9') de la base;
- une presse (12) pour presser la base de la boîte (3).

12. Machine à former selon la revendication 11, **caractérisée en ce que** la presse (12) comprend:

- un piston pousseur (36), mis en mouvement par des moyens translateurs (37, 38, 39, 40) contre la base interne de la boîte en carton (3), suivant une trajectoire comprenant une section rentrante en forme de "U";
- un tapis roulant (42) disposé avec sa surface d'appui (43) parallèle à la base de la boîte en carton (3);

ladite section en forme de "U" étant disposée opposée audit tapis roulant (42).

13. Machine à former selon la revendication 9, **caractérisée en ce que** ladite dent de poussée (10) présente, sur sa surface postérieure (20), une petite roue (21) légèrement saillante par rapport à ladite surface postérieure (20).

14. Machine à former selon l'une des revendications 1 à 13, **caractérisée en ce qu'**elle comprend un guide supérieur à friction (30) suspendu élastiquement et conçu pour presser légèrement contre le côté supérieur (32) des boîtes supérieures (3) ouvertes qui, en frottant contre ce dernier, restent dans une position ouverte.

15. Machine à former selon la revendication 1, **caractérisée en ce que** le dispositif (4) pour extraire les boîtes en carton (3) du magasin (2) comprend:

- une chaîne motrice (53) située au-dessous d'une surface d'appui (11) des boîtes en carton (3), la trajectoire de laquelle s'étend le long d'un plan substantiellement vertical;
- un bras vertical de poussée (51) saillant par rapport à la surface d'appui (11), articulé sur la chaîne motrice (53) située en dessous et conçu pour pousser les boîtes en carton (3) le long de la surface d'appui (11);
- un second bras (54) lui-aussi articulé sur la chaîne (53);

ledit bras vertical de poussée (51) étant également articulé sur le second bras (54) de manière à former un angle aigu avec ce dernier, de manière à ce que le bras de poussée (51) se déplace vers l'avant, tout en restant substantiellement vertical, au moins dans la zone où il est en contact avec la boîte en carton (3) qu'il est en train de pousser.

16. Machine à former selon la revendication 15, **caractérisée en ce que** ledit bras vertical de poussée (51) présente sur son sommet une petite roue antirayures (121) pour maintenir levées les boîtes en carton (3) empilées dans le magasin (2), en les séparant des boîtes en carton (3) devant être extraites, de manière à éviter toute rayure sur de fond des boîtes en carton (3).

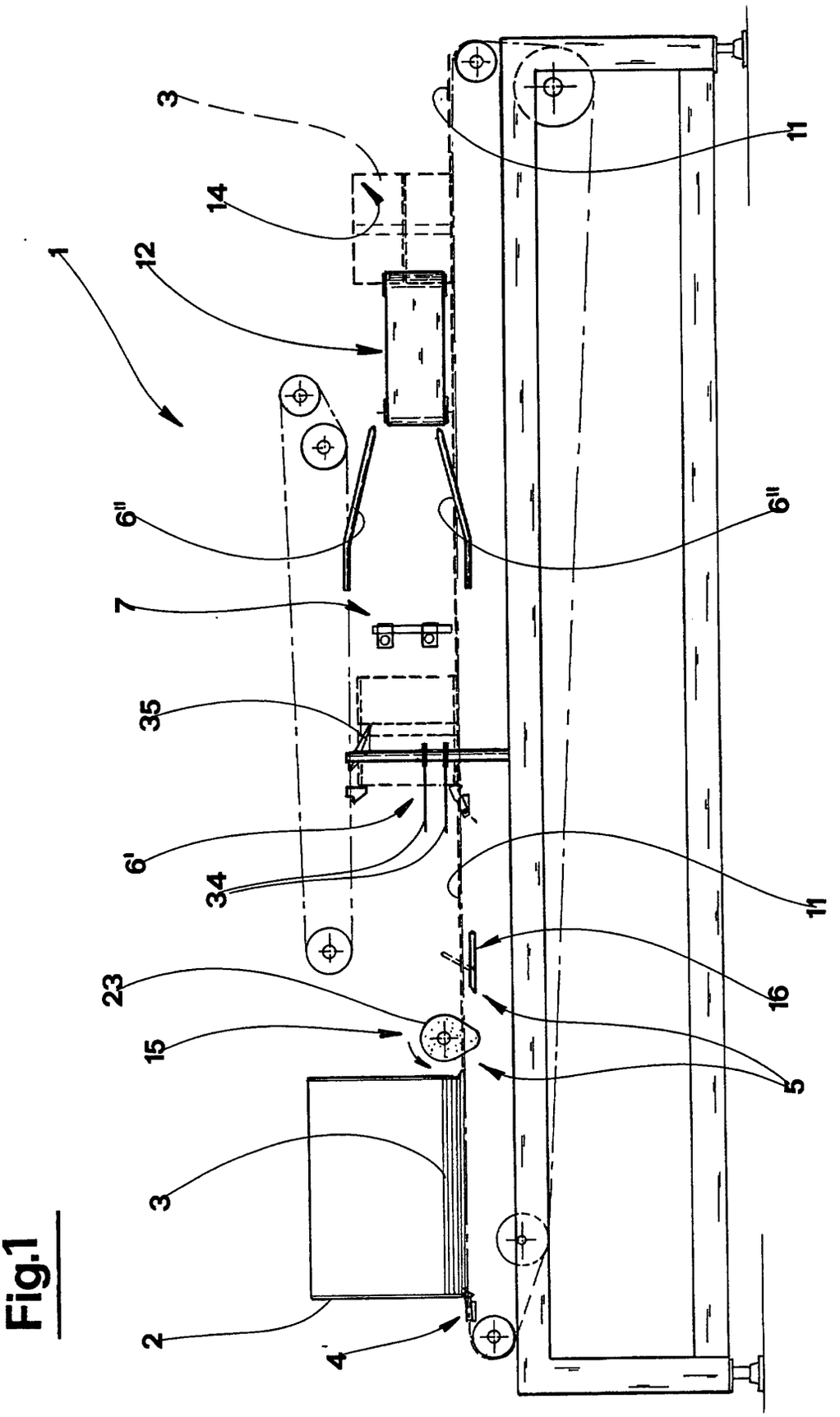


Fig.1

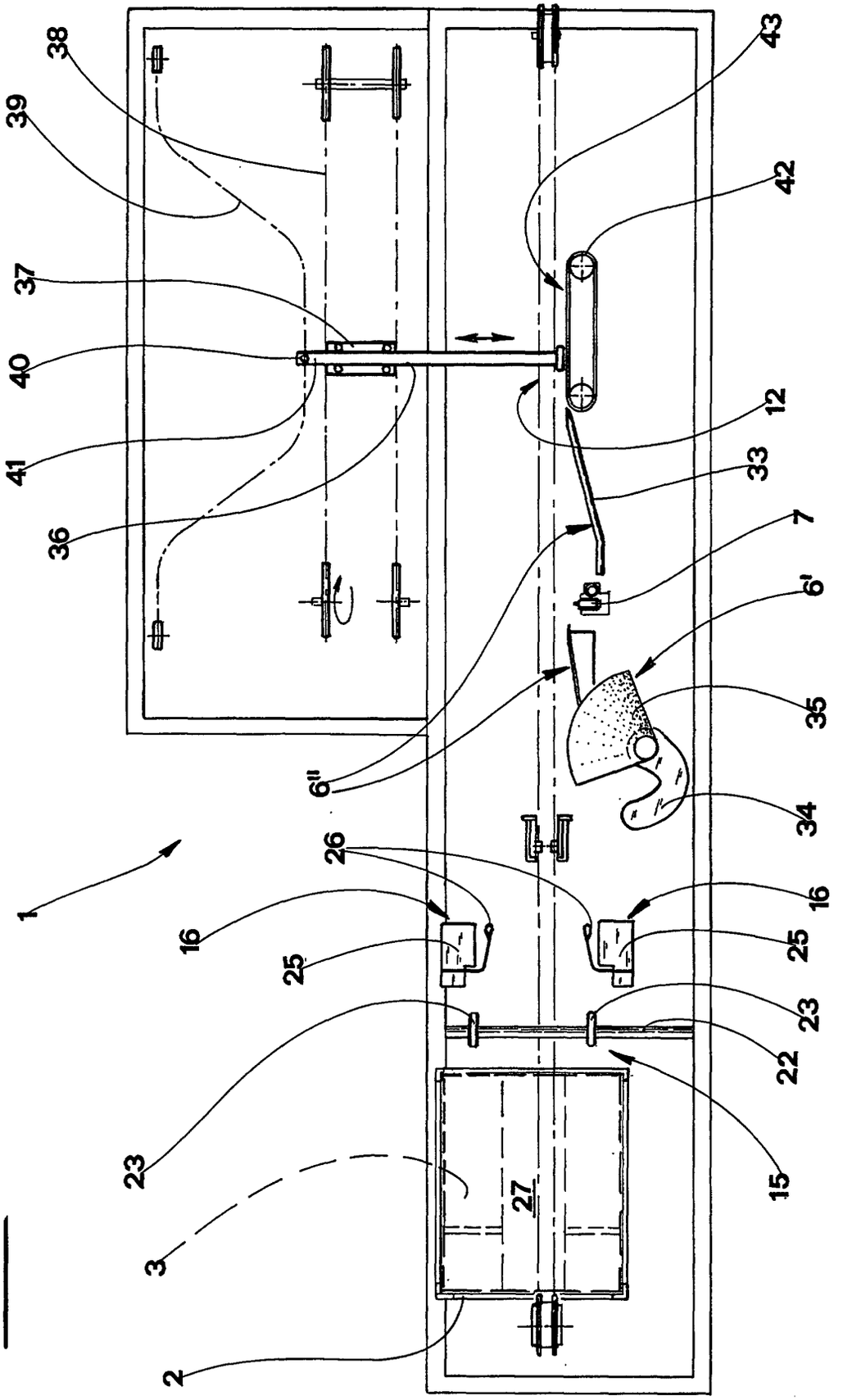


Fig.2

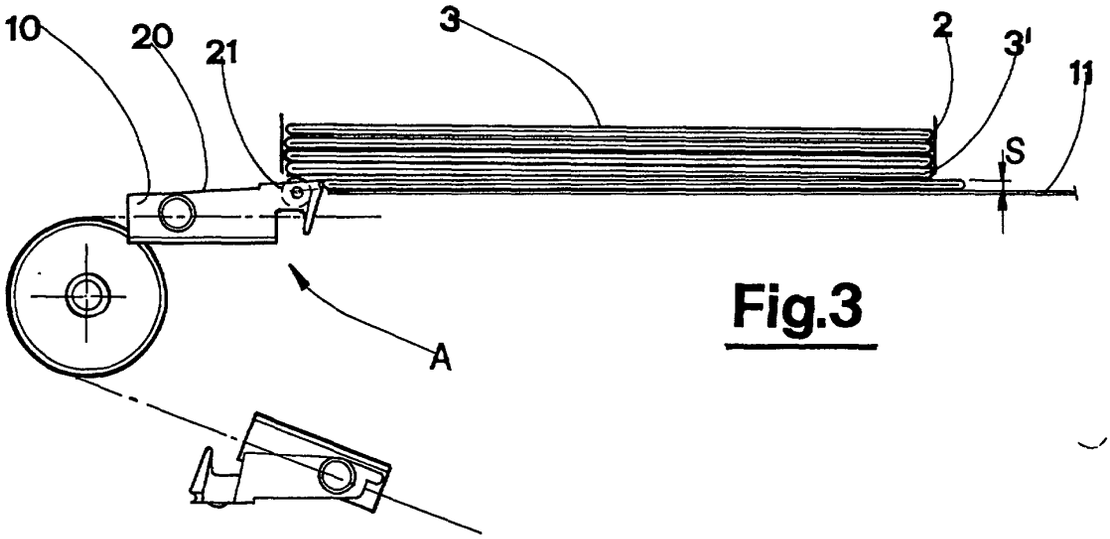


Fig.3

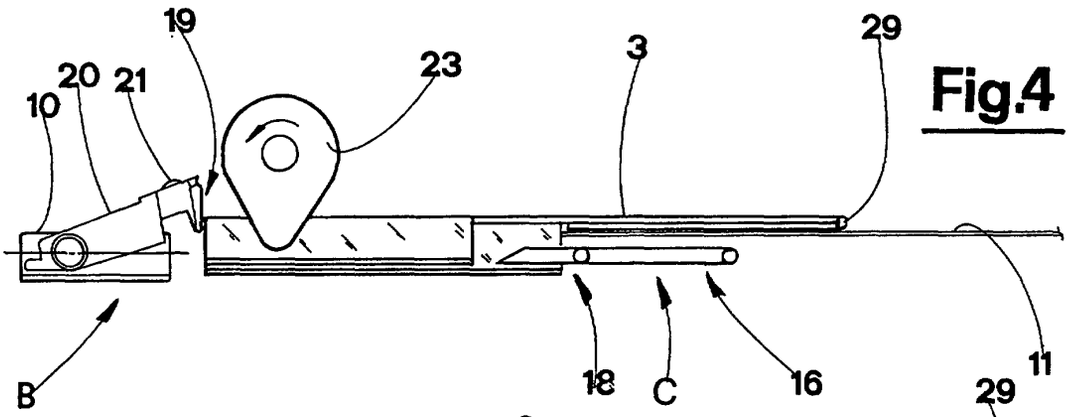


Fig.4

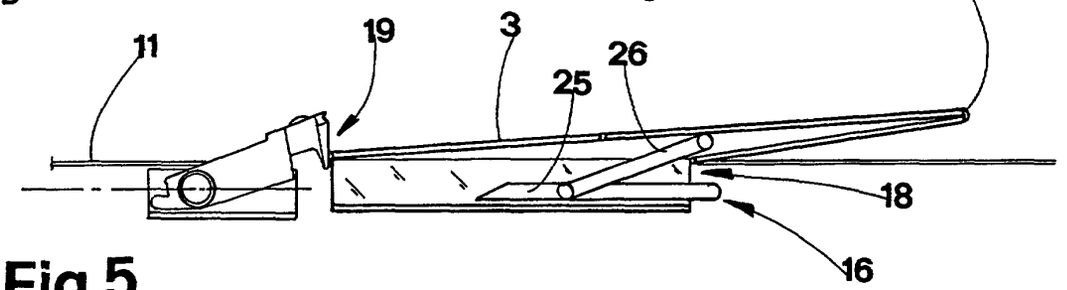


Fig.5

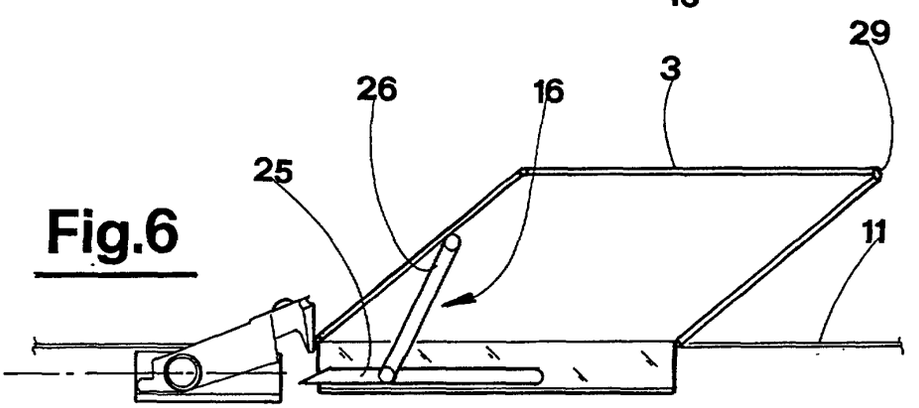


Fig.6

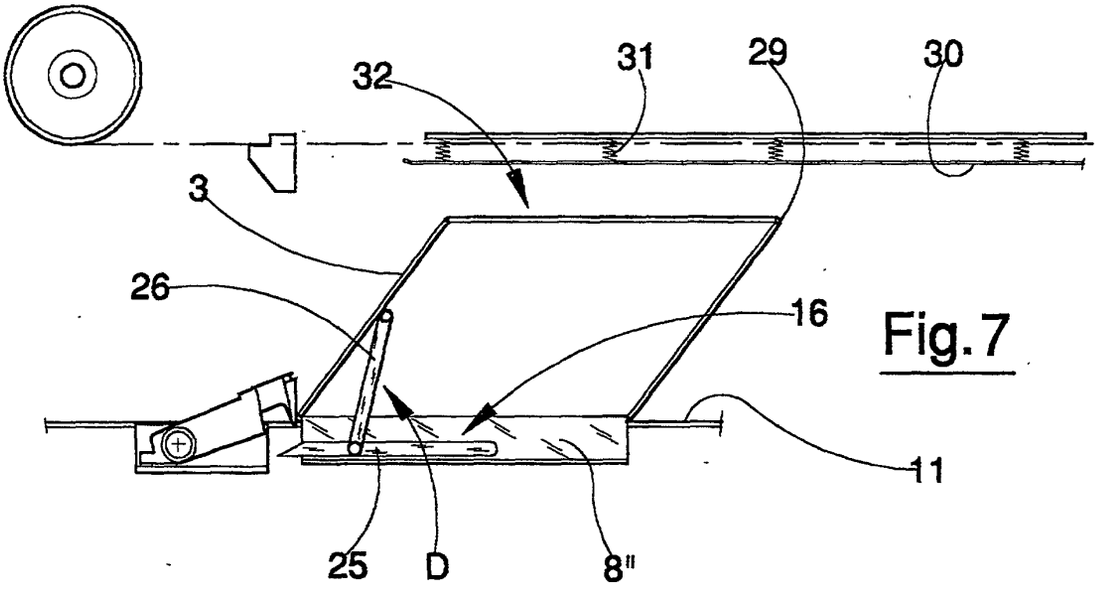


Fig.7

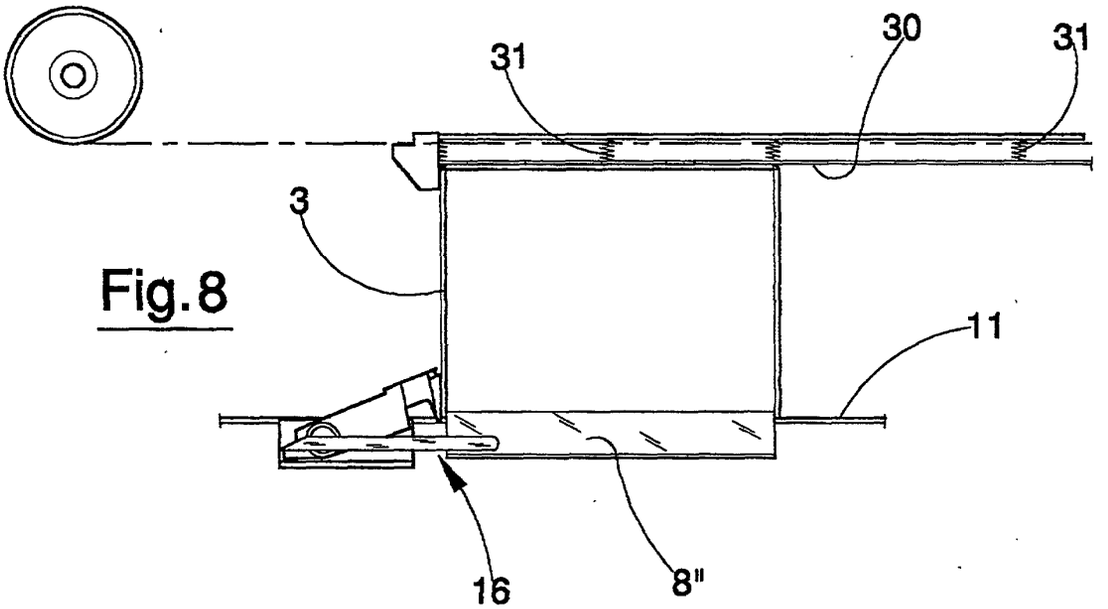


Fig.8

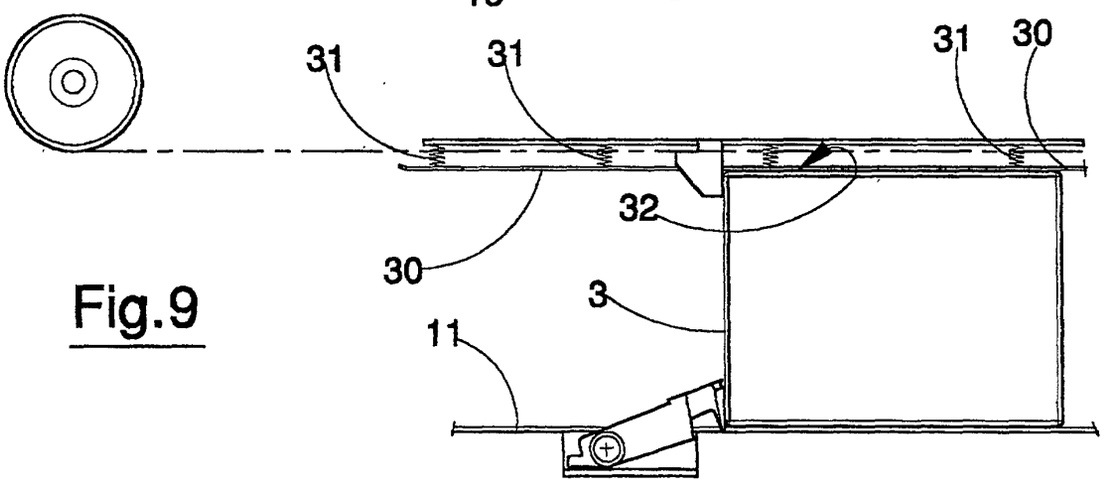


Fig.9

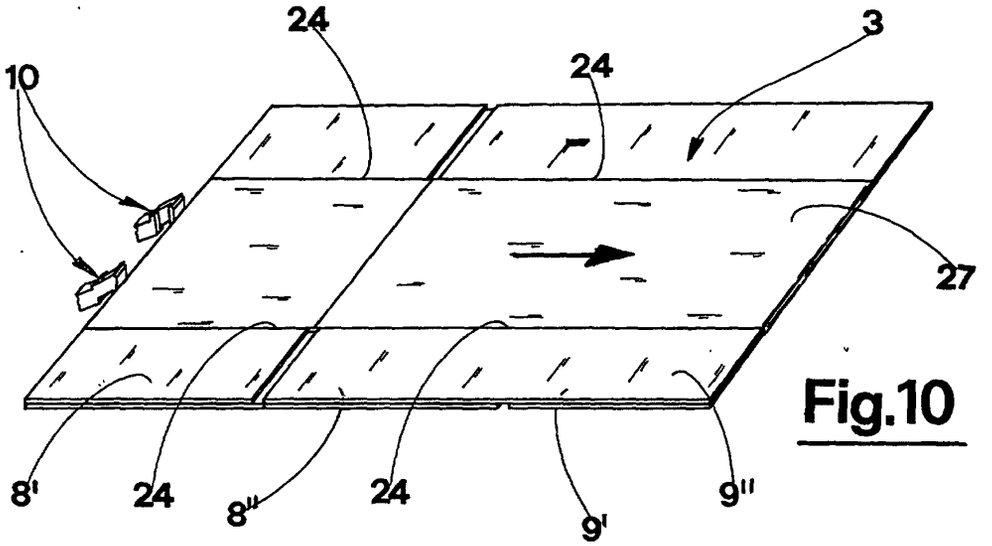


Fig.10

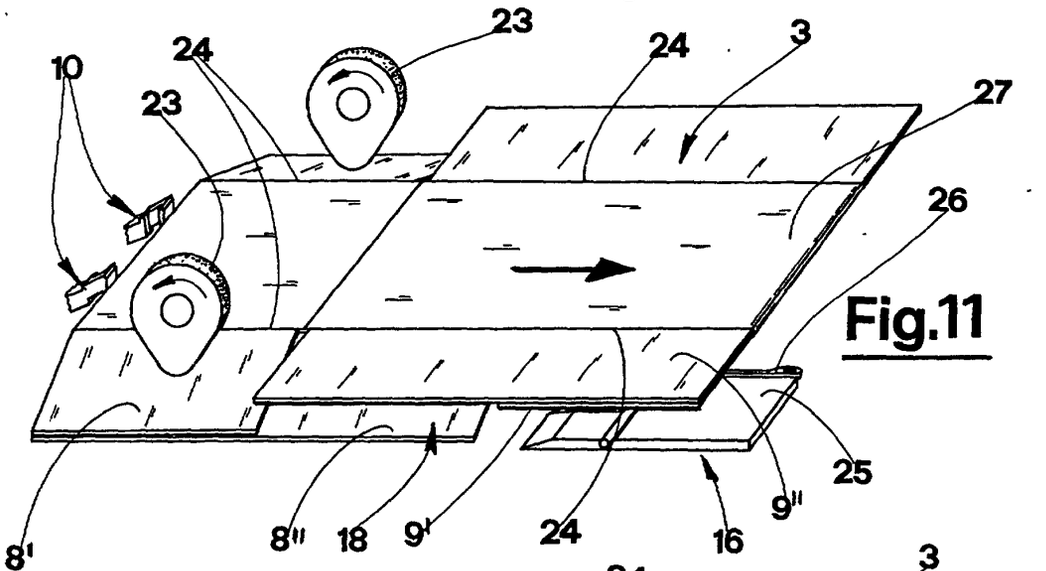


Fig.11

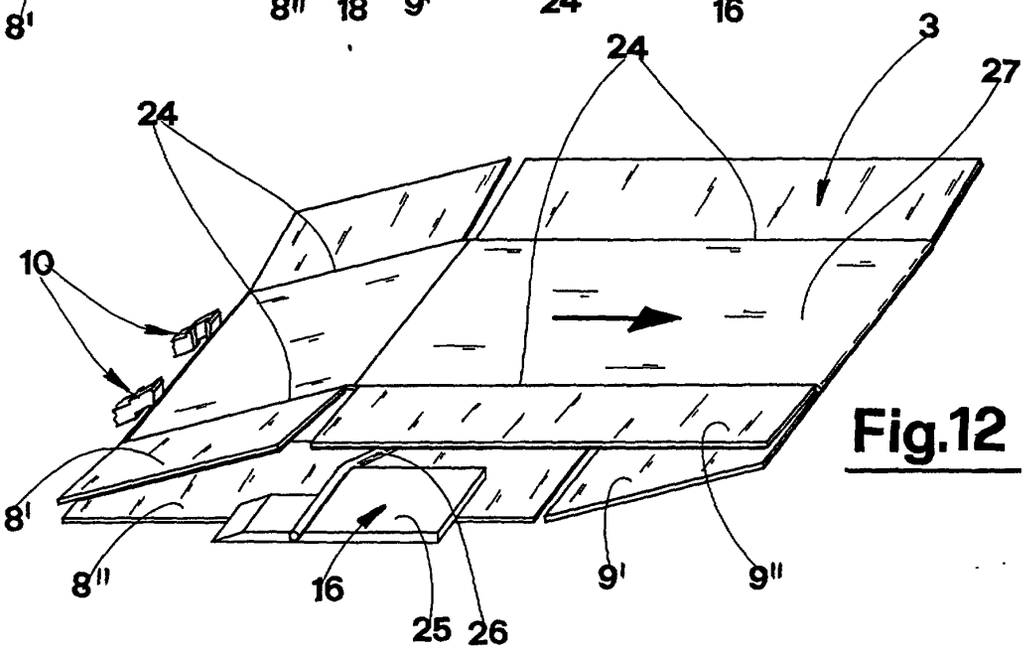


Fig.12

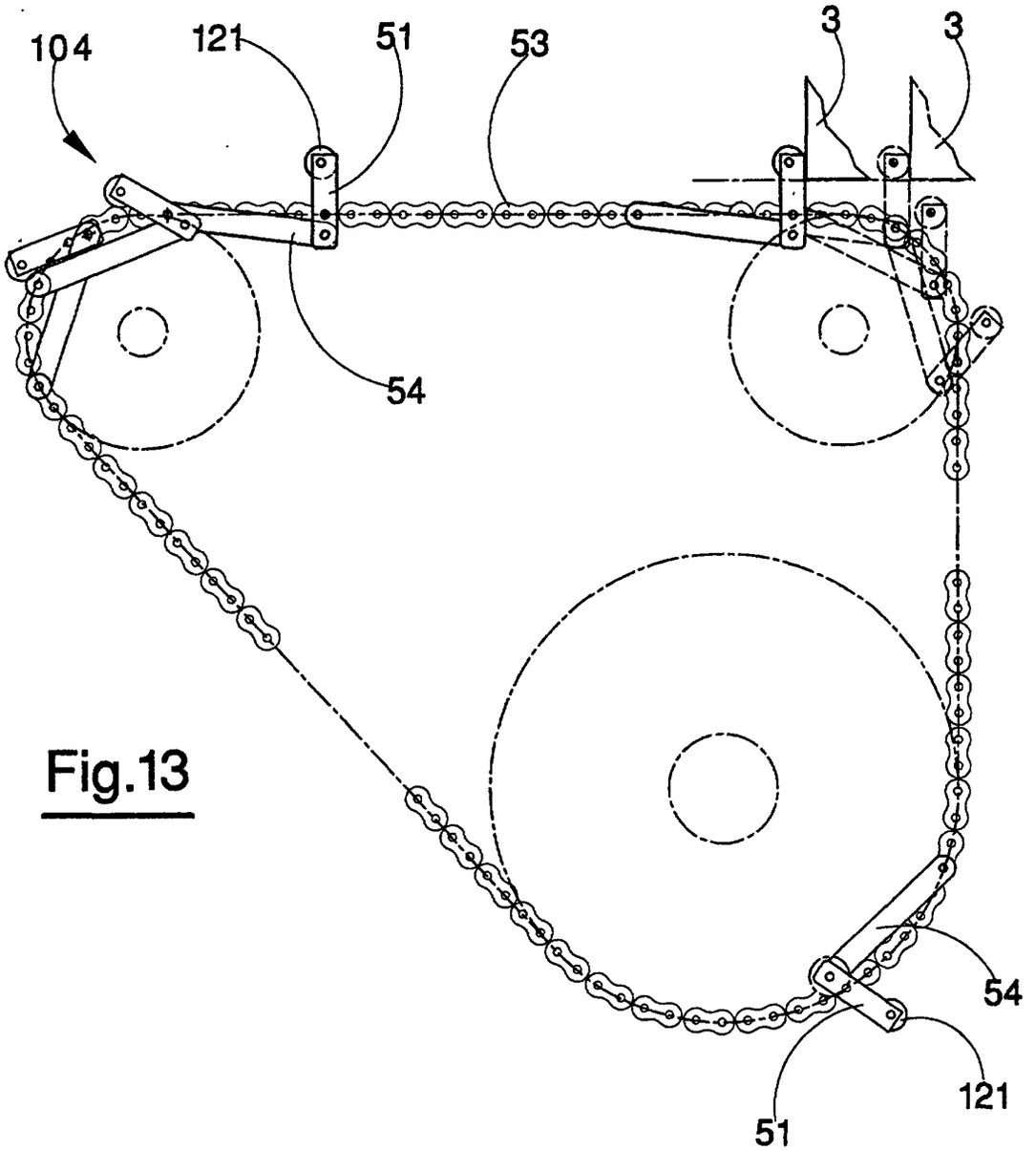
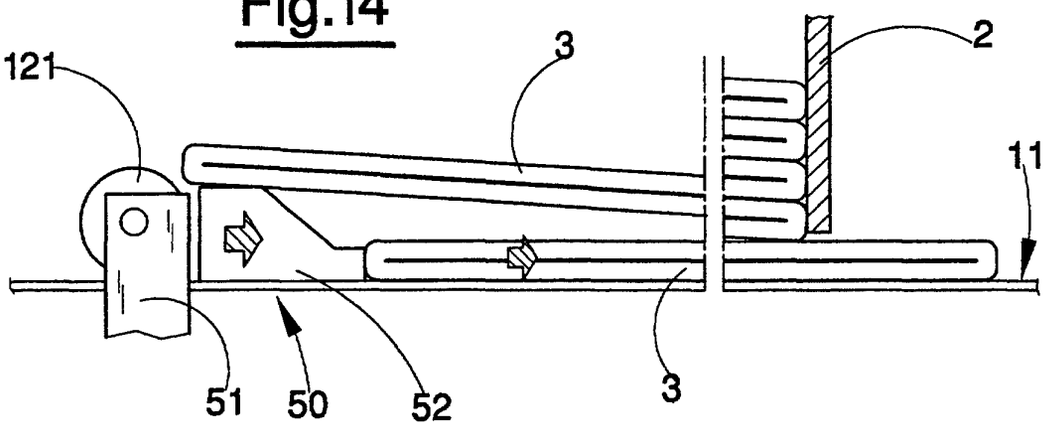


Fig.13

Fig.14



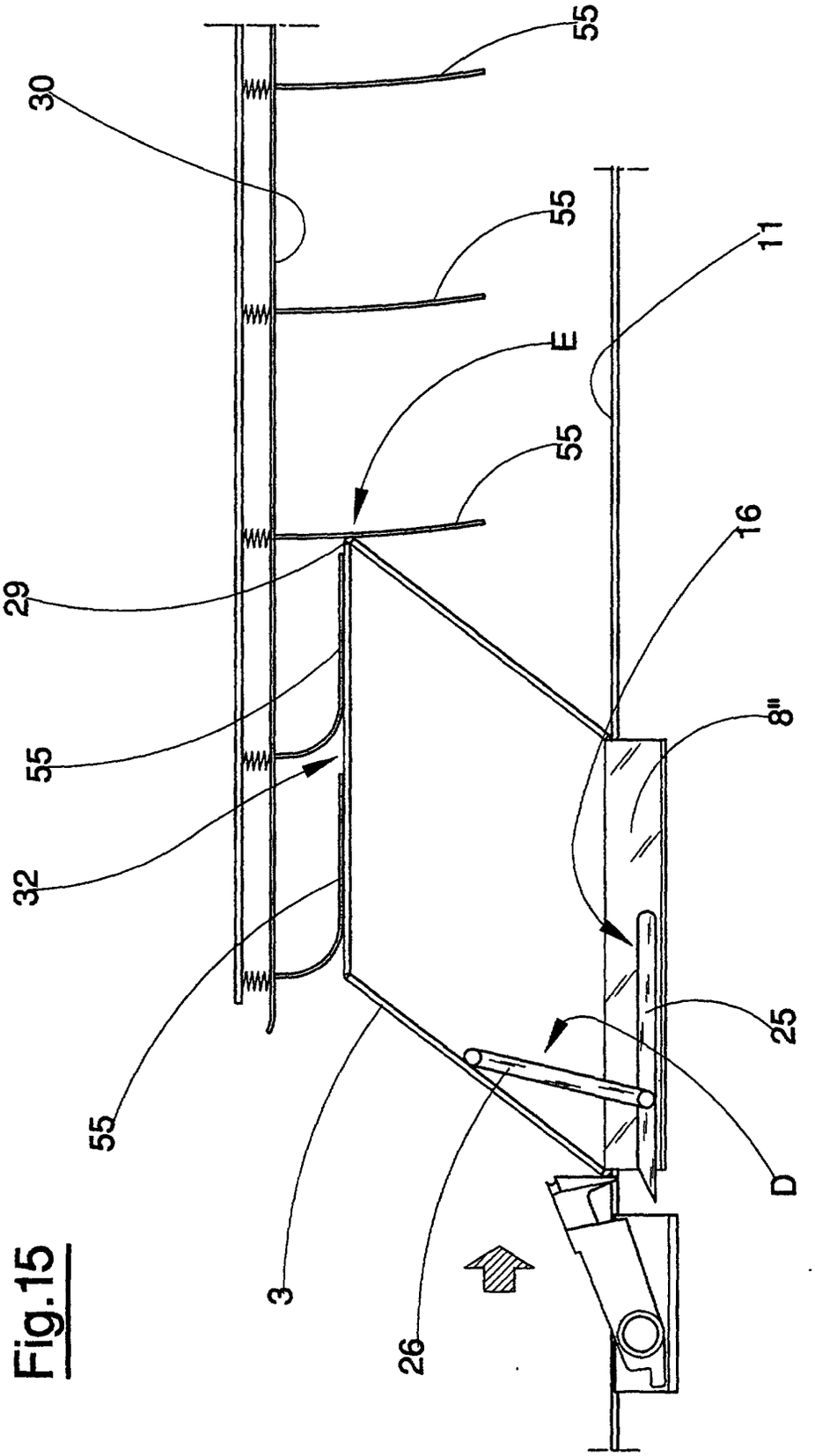


Fig.15