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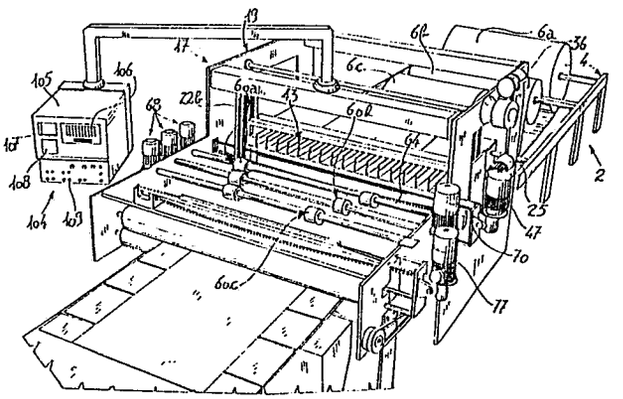
(54) Automatic machine for the processing of corrugated paper.

(57) The present invention relates to an automatic machine for the processing of corrugated paper so as to obtain containers. Said machine is composed of a first station (2) for the multiple feeding of corrugated cardboard (6a, 6b, 6c), even of different widths. Successively, a second station is provided for inserting the corrugated cardboard (6a, 6b, 6c) of the preset width, followed by a third station adapted for allowing the transverse cutting thereof. A fourth and fifth station respectively allow to achiev the scoring and dinking of said corrugated cardboard (6a, 6b, 6c) which is then removed from the machine. Said machine is provided with control and data input means (104–109) which allow the programing, the command and the control of the operating phases of the machine.



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AUTOMATIC MACHINE FOR THE PROCESSING OF CORRUGATED PAPER

The present invention relates to an automatic machine for the processing of corrugated paper in order to obtain containers.

Currently, the need to place the various industrial products in suitable containers forces the individual companies, due to the plurality of items produced thereby which differ in dimensions, to resort to large stocks of containers in various sizes.

The machines currently known for providing said containers allow the manufacturing of a single product, or more than one but with features which are very similar to each other in dimensions and type of stiffening or reinforcement.

The main aim of the present invention is therefore to eliminate the disadvantages described above in known types by devising an automatic machine which allows to obtain containers in corrugated cardboard which are provided, according to the specific requirements, with the required dimensions and the desired stiffenings and reinforcements.

Within the scope of the above described aim, a further important object is to devise a machine which associates to the previous characteristics that of being provided with high flexibility in use, allowing, at the same time, to obtain a product which can be stored optimally.

Another object is to provide a machine which allows to obtain, in sequence, containers having even different dimensions and characteristics from one to the next.

The aim and the objects mentioned above and others which will become apparent hereinafter, are achieved by an

automatic machine for the processing of corrugated paper, characterized in that it is composed of:

a) a first station for the multiple feed of corrugated cardboard with the possibility of different widths;

b) a second station for inserting the corrugated cardboard;

c) a third station for cutting said cardboard;

d) a fourth station for scoring said cardboard;

e) a fifth station for the dinking of said corrugated cardboard;

f) a sixth station for removing the cardboard and for the eventual glueing and folding of the flaps resulting from the process, control and data input means being provided for the programing, command and control of the operating phases of the machine.

Further characteristics and advantages of the invention will become apparent from the detailed description of a particular, but not exclusive, embodiment, illustrated only by way of non-limitative example in the accompanying drawing tables, wherein:

Fig. 1 is a perspective view of the machine;

Fig. 2 is a lateral view of the first station;

Fig. 3 is a partly sectional front view of the end of the shafts which support the rolls;

Fig. 4 is a view taken along the cross section plane IV-IV of Fig. 3;

Fig. 5 is a lateral, partly sectional view of the second station;

Fig. 6 is a partly sectional front view of one of the three pairs of rollers associated to the lifting assembly;

Fig. 7 is a plan view of the third station;

Fig. 8 is a partial front view of the same station;

Fig. 9 is a view taken along the cross section plane IX-IX of Fig. 8;

Fig. 10 is a partly sectional lateral view of the fourth station;

Fig. 11 is a fragmentary partly sectional front view of a scoring assembly and related advancement devices;

Fig. 12 is a fragmentary perspective view of the dinking assembly;

Fig. 13 is a fragmentary partially sectional front view of the fifth station;

Fig. 14 is a sectional view taken along the cross section plane XIV-XIV of Figure 13;

Fig. 15 is a plan view of the sixth station;

Fig. 16 is a front view of the latter;

Fig. 17 is a view of a device adapted for allowing the glueing of two corrugated cardboards associated with counterposed corrugations;

Fig. 18 is a view, similar to the one of Fig. 6, of a different aspect of one of the pairs of rollers; and

Figs. 19 and 20 are views of another aspect of the means for centering the cardboard.

With reference to the above described figures, the machine 1 is composed of a first station 2 for the multiple feed of corrugated paper or cardboard 3.

In the particular embodiment chosen, rolls of cardboard have been positioned at the station 2, which comprises a supporting frame 4 to the side members of which the shafts 5 of three rolls, indicated with the reference numerals 6a, 6b and 6c, are freely pivoted.

Each roll may be composed of corrugated cardboard having a different width and/or different length.

Preferably, the cardboard of the rolls 6a and 6b is unrolled by making it slide on free rollers 7a and 7b arranged below and transversely with respect to the frame 4.

The axes of said rollers lie in planes arranged parallel to each other, between the same and the ground there being provided separation rods indicated with the reference numerals 8 and 9.

In order to prevent the inertia imparted during the unrolling of the cardboard from excessively unrolling the rolls, a brake 10 is associated to one of the ends of the shafts 5.

Said brake is composed of two identical jaws 11a and 11b arranged diametrically with respect to the shaft 5 and placed on a plane which is perpendicular thereto.

Each jaw is provided with a throat, arranged concentrically with respect to the shaft 5, to which a rubber crown 12 is rigidly coupled; the two jaws are mutually associated to each other by means of screws 13 concentrically to which springs 14 are arranged which interact with the facing surfaces of the jaws.

The lower jaw 11a, rotating together with the shaft 5 during the unrolling, interacts with a pin 15 which projects from the frame 4.

Said pin, which is provided with an axis parallel to the one of the shaft, thus allows the brake 10 to always keep the corrugated cardboard 3 at the optimum tension.

The shaft 5 is indeed gripped vice-like during the interaction with said pin.

The station 2 can be composed of a plurality of frames 4 joined to each other so as to allow the use of cardboard rolls having different characteristics.

Consecutively to the station 2, the second station 16, for the insertion of the cardboard, is provided, composed of a supporting frame 17 which supports a lifting assembly 18.

The frame 17 is provided with two rectangular lateral shoulders 19, provided, on the side arranged proximate to the first station, with a pair of free transverse rollers 20a and 20b, the axes of which are arranged on the same plane as those of the rollers 7a and 7b.

Three more free transverse rollers 21a, 21b, and 21c, with the axes arranged on the same plane perpendicular to the one of the axes of the pair 20a and 20b, allow the feed of the corrugated cardboard 3 on parallel planes within the station 16.

The roller 21c takes up the cardboard directly from the roll 6c, as illustrated in Fig. 2.

The lifting assembly 18 is composed of two identical rectangular lateral plates 22a and 22b, transversely to which three pairs of rollers are pivoted, each being indicated with the reference numeral 23, the axes of which, parallel to each other, are arranged on the same plane, perpendicular to the base or rest plane of the station.

Each pair of rollers 23 is composed of a motorized roller 24, driven by a suitable motor 25, and of a free counter-roller 26, the axis 27 of which is associated, at each end, to a slot 28 with a vertical axis formed on the plates 22a and 22b.

Each end of the axis 27 is furthermore engaged in a groove 29 provided on the stem of a swinging element 30, which is essentially Y-shaped, and freely pivoted to the plates 22a and 22b at the terminal end of the stem facing opposite to the station 2.

Between the flaps of each element 30, a shaft 31 is provided, mounted on an eccentric element 32, which can be operated by means of a lever 33.

The rotation of the lever 33, as illustrated in Fig. 5, causes the element 30 to rotate with respect to its pivot axis, thus raising or lowering the flaps of said element 30.

At the same time, the axis 27 of the counter-roller 26 is raised or lowered, thus allowing its uncoupling-coupling with the motorized roller 24.

This allows the manual insertion of the corrugated cardboard 3 in the initial phase or during the eventual roller replacement phase.

Fig. 18 illustrates another aspect of the invention, in which two eccentric elements, indicated with the reference numerals 114 and 115, are associated to the end of the axis 27 of the free counter-roller 26, which eccentric elements are rotatably associated with the lateral plates 22a and 22b.

The angular position of the eccentric element 115 can be varied by means of the lever 33, it being possible to fix said lever, by means of a suitable locking element interposed between said lever and the plate 22a, in a preset position.

This allows one to preset the interspace between the motorized roller 24 and the counter-roller 26.

The vertical motion of the lifting assembly 18 is imparted by means of a pair of chains 34, each of which is provided with its ends associated to the upper and lower ones of one of the plates 22a and 22b.

On the upper and lower crosspieces of the shoulders 19, two toothed wheels are provided, indicated with the reference numerals 35a and 35b: the first wheel 35a is keyed on the axis of a motor and reducer assembly 36, while the second wheel 35b is freely rotatable.

The motion along a vertical axis, perpendicular to the base of the station, is instead allowed by the presence of a pair of driving shafts 37, arranged vertically between the upper and lower crosspieces of the shoulders 19 proximate to the beam facing towards the third station 38.

The coupling between the shafts 37 and the plates 22a 22b occurs by means of a wheel 39a and a pulley 39b freely pivoted onto a pair of tabs 40 which protrude from the plates.

At the end of the plates 22a and 22b where the cardboard feed occurs, proximate to each of the pairs of rollers 23, oscillable bars 41, slideable on crosspieces 42, are provided, suitable for allowing the exact centering of the cardboard with respect to the middle longitudinal axis of the machine 1, which axis may be indicated hereinafter as the operating axis.

This centering is facilitated, since the beams of the shoulders 19 are sufficiently mutually spaced apart.

Downstream of each pair of rollers 23, combs 43 are provided which are adapted for facilitating the insertion of the cardboard selected among the three available by the

lifting assembly 18.

Figures 19 and 20 illustrate an aspect of the invention which is adapted for maintaining the cardboard straight in case the cardboard is uneven in its dimensions due, e.g., to thermal changes it has been subject to. This is obtained by providing the adjustment of the position of the lifting assembly 18 by rigidly coupling to the plate 22b a pair of U-shaped tabs 40, and closed at the free end by an abutment 116. Inside each of said tabs, sliders 117 are slideable and accommodatable, and the wheel 39a and the pulley 39b are pivoted thereto and interact with the shaft 37.

Said sliders 117 are rigidly mutually interconnected by means of a beam 118. The terminal end of the stem 119 of a piston 120, connected to the plate 22b, is associated proximate to the middle portion of said beam.

Should the cardboard thus have a certain conicity, the operation of the piston 120 allows the angular motion of the entire lifting assembly 18 with respect to the plane of arrangement of the shafts 37, fixed to the shoulders 19, until it straightens and thus allows to center the cardboard for subsequent processing.

The cutting station 38 is composed of a cutter assembly which comprises a supporting frame 44, pivoted to a transverse guiding rail 45 and moved by means of a chain 46 operated by a suitable motor and reducer assembly 47.

The frame 44 accommodates a tempered rotating blade 48, arranged on a plane which is transverse with respect to the machine 1; the blade is of the self-sharpening type, since it cooperates with a replaceable fixed abutment blade 49, above which the cardboard is pushed by means of the roller

24.

The blade 48 is freely pivoted on a small shaft 50, which is connected to the frame 44; a spring 51, coaxial to the small shaft, allows a regular motion of the blade 48 and an adequate pressure on the fixed abutment blade 49. A cylinder with trapezoidal cross section 52 is arranged to the side of the latter, which cylinder interacts, during the transverse motion of the frame 44, with the ends of a metal strap 53 tilted towards the cardboard feed region and, at the other end, pivoted to a transverse axis. The blade 48 is fixed coaxially with respect to the cylinder 52.

The strap thus blocks the corrugated cardboard in the cutting phase, preventing the formation of burr.

At least one elastically deformable element 54 is associable with the strap, for adjusting the inclination thereof; accordingly, the blade 48 can also assume a desired angle with respect to the fixed blade 49.

This, together with the fact that the frame 44 can swing slightly with respect to the axis 45, renders the blade 48 self-sharpening, and facilitating cutting at the same time.

In order to prevent said blade 48 from leaving the cutting seat in any way, a biasing bar 55 is provided above the frame 44, which bar interacts with a connecting rod 56 by means of a bearing 57 freely pivoted thereto.

Said connecting rod is in turn freely pivoted, at one end, to the frame 44; between the other end and said frame, a cylindrical helical compression spring 58 is instead interposed.

It should be observed that it is possible to extract,

to the side of one shoulder 19, the entire cutting assembly, thus allowing maintenance and/or the eventual replacement of the rotating blade 48 and coaxial cylinder 52.

In order to gain access to the abutment blade 49, instead, it is sufficient to raise the strap 53.

Consecutively to the station 38, a fourth station 59 follows for the scoring of the corrugated cardboard.

In the particular embodiment chosen, said station is composed of three pairs of scorers, each scorer of the three pairs being indicated with the reference numerals 60a, 60b and 60c.

Each scorer of each pair is pivoted on a transverse shaft 61 and is associated to a fork 62, upwardly provided with a cylindrical guide 63 which is slideable on a transverse shaft 64, which is fixed and parallel to the previous one.

Each scorer of each pair can furthermore be positioned symmetrically with respect to the operating axis of the machine 1 by means of a suitable worm screw 65.

Said worm screw is arranged transversely with respect to the station along an axis which is parallel to the one of the shafts 61 and 64 and is associated to the fork 62 by means of a bush 66.

As indicated in Figure 11, a locking ring 67, associable to the bush 66, allows the manual adjustment of the initial position of each scorer, so that each pair of scorers is arranged symmetrically with respect to the operating axis of the machine.

The motion of each pair of scorers along the transverse axis is allowed by the fact that each worm screw 65 is

motorized with its own motor and reducer assembly 68.

In order to allow movements in opposite directions from a one-way rotation of the worm screw 65, said worm screw has formed thereon half a left-handed thread and half a right-handed thread.

Each scorer interacts with a roller 69, placed below and provided with an axis parallel to the one of the small shaft 61, allowing to perform the longitudinal scoring of the cardboard.

Advantageously, the ends of said roller 69 are mounted on eccentric elements so as to permit adjustment of its parallelism with respect to the shaft 61 to thus allow the optimum scoring of the corrugated cardboard 3.

A single motor 70, instead, controls the rotation of the shaft 61 of the scorer 60c and therefore, by means of suitable transmissions constituted by toothed wheels 71 interacting with matchingly toothed wheels keyed to one end of the shafts 61 of the scorers 60a, 60b and 60c, the advancement of the corrugated cardboard 3.

Subsequently to the station 59, the fifth station is provided for the punching or dinking of said cardboard.

As illustrated in Figs. 12, 13 and 14, the fifth station is composed of two dinking bodies 72a and 72b which comprise a box-like supporting frame 73a and 73b, pivoted laterally to a transverse guiding rail 74.

The end of a same chain 75 is associated with each frame, which chain is transmitted, at the extreme sides of the machine, by two identical toothed wheels 76, of which one is freely rotating and the other is keyed on the axis of a motor and reducer assembly 77.

The two dinking bodies operate by moving simultaneously towards the operating axis of the machine 1: indeed, the chain 75 is associated, in the upper part, to the frame 73a of the right-hand punching body 72a (Fig. 13) and, in the lower part, to the frame 73b of the left-hand punching body 72b (Fig. 12).

Each frame 73a and 73b accommodates a pair of identical, mutually counterposed rotating blades 78, which are furthermore mutually blocked between two disks 79a and 79b to ensure their parallelism.

Said blades, are mounted on the same small shaft 80 arranged transversely with respect to the frame, are allowed an axial clearance, and are spaced from the inner surfaces of the frame.

Coaxially to the small shaft, a cylindrical helical spring 81 is arranged interposed between the inner surfaces of the disks.

A cylinder with a trapezoidal cross section 82 is coaxially associated to the disk 79a and interacts, during the transverse motion of the dinking body, with the end of a transverse metal strap 83 tilted towards the side where the cardboard 3 is fed, and associated at the other end to an axis arranged transversely with respect to the machine.

Said strap thus blocks, similarly to what occurred for the cutter assembly, the corrugated cardboard 3 during the dinking.

The dinking body furthermore comprises two fixed abutment blades 84a and 84b, arranged on the plane of the cardboard, replaceable and arranged mutually parallel with such an interspace as to allow the passage of the blades 78,

and having moreover such a shape as to make the latter self-sharpening.

Again similarly to the cutter assembly, at least one elastically deformable means 85 is associable with the strap 83, between the two ends, which means adjusts the inclination of the blades 78, since the frame 73a and 73b can swing slightly with respect to the guiding bar 74.

Again similarly to the cutter assembly, each frame 73a and 73b is upwardly provided with a connecting rod 86 interacting, by means of a bearing 87 pivoted freely thereto proximate to the middle portion, with a biasing bar 88.

The connecting rod is freely pivoted, at one end, to the frame of the dinking body, between the other end and said frame there being interposed a cylindrical helical spring 89.

Also in this case, each dinking body can be moved out of the lateral shoulders 90 of the station in order to perform operations.

The ends of the chain 75 are associated with the frames 73a and 73b so that their position can be adjusted until it is symmetrical with respect to the operating axis of the machine.

In order to allow each dinking body to perform the required path, and therefore to punch the cardboard correctly, each frame 73a and 73b is provided with a mechanical stroke limit at the location of a blade which is fixed to and projects from the pair of scorers 60c, which is closest to the operating axis of the machine.

Each dinking body is furthermore provided with means adapted for the removal of the strip of cardboard obtained

during the dinking.

Said means, illustrated in Fig. 13, comprises a magnet 91, associated to the frame to the rear of the work area of the blades, which magnet controls the motion, along a vertical axis, of a small bar 92 to which an arm 93 is downwardly freely pivoted and is angled and arranged on a plane passing through the connecting plane of the pair of blades 78.

One end of said arm 93, adjacent to the pivoting point of the small bar 92, is in turn freely pivoted to the frame whilst at the other end of the arm 93, underlying the pair of blades 78, there is associated a blade 94, facing towards the direction of said blades 78.

When the magnet is not activated, the end of the blade 94 is arranged on a plane which is lower than the rest plane of the cardboard: when the magnet is activated, the small bar 92 is drawn upwards, raising the arm 93 and thus causing the blade 94 cut the terminal end of the cardboard strip.

A suitable switch keeps the magnet activated for a fraction of a second while the punching body is returned to a position proximate to the walls 90: this allows the tearing off of the cardboard strip if it has not been cut off previously.

The sixth station is provided at the outlet of the fifth station, which sixth station comprises a pair of transverse rollers 95a and 95b adapted for ensuring the outgoing entrainment of the cardboard, as well as the off-cuts or punchings. In this case, the motion occurs by means of a toothed belt 96 trained around toothed wheels 97a and 97b; the first wheel takes up the motion from the roller 69

and the second one transmits it to a roller 97c which moves the roller 95a which transmits the motion to the 95b, via the belt 96.

This solution has been adopted to allow the optimum adjustment of the parallelism between the rollers 95a and 95b according to the thickness of the cardboard.

After said rollers, a motorized set of rollers 98 is provided for the transport, the glueing and the folding of the flaps of the cardboard obtained by scoring.

Said functions are obtainable by means of glue dispensers 99 and L-shaped swinging arms 100 hinged at the end of the shortest part.

Both dispensers and arms may be moved transversely with respect to the set of rollers, and provided with a bush 101 interacting with a worm screw 102.

The worm screw is operated by a single motor 103: the symmetry of the pairs of dispensers and arms with respect to the operating axis of the machine is allowed by virtue of the fact that the worm screws 102 are provided along half of their length with right-handed thread and along the other half of their length with a left-handed thread.

The machine 1 finally comprises a means 104 for control and data input for the programing, command and control of the operating phases.

Said means is constituted by a central logic unit contained within a box-like structure 105.

The data can be input by means of a keyboard 106 and can be displayed on a monitor 107 or a printer 108 may be provided for printing the cardboard.

A button panel 109 finally allows manual intervention

in case of malfunction, as well as the verification, by means of suitable optical indicators, of the functionality of the various components.

The machine 1 is furthermore provided with sensors and actuators so as to allow the control means 104 to command and control the various processing phases.

The use of the machine 1 initially entails the positioning of the corrugated cardboard 3 of each roller 6a, 6b and 6c, each proximate to a pair of rollers 23.

This positioning is facilitated by the presence of the eccentric element 32 which allows the lifting of the counter-roller 26 when inserting the cardboard.

The oscillable or swinging bars 41 furthermore allow the exact centering of the cardboard with respect to the operating axis of the machine, said axis being the reference axis for the control means 104.

Subsequently, the control means 104 will command the actuation of the motor and reducer assembly 36, which positions the lifting assembly 18 so that the desired cardboard is positioned at the working plane of the third station 38.

In the case illustrated in Fig. 5, this is the cardboard of the roll 6b.

Entrained by the rollers 24, the cardboard may be initially trimmed by the cutter assembly and then introduced into the fourth station.

Meanwhile, the control means 104 will have positioned the scorers 60a, 60b and 60c in the required positions, so as to perform the required scorers or creases.

After passing beyond the last scorer 60c, the cardboard

will enter in the fifth station, where the two dinking bodies 72a and 72b will perform the dinking of the cardboard, removing at the same time the strip of punched-off cardboard.

Meanwhile, the control means 104 will have activated the cutter assembly of the third station 38, which will cut the cardboard once it reaches the required length.

Should it be required to perform trailing dinkings, the cutting of the cardboard is ensured in any case by the presence of the pair of rollers 95a and 95b of the sixth station.

In the sixth station the last phase of the processing occurs, which entails the eventual glueing of the flaps of the cardboard and their folding.

It has thus been observed that the invention achieves the intended aim and objects, an automatic machine being provided which allows one to obtain cardboard which is punched and scored or creased so as to obtain a container having the desired dimensions and reinforcements.

Since it is furthermore possible to preselect the cardboard of the required dimensions, the machine allows remarkable flexibility in use, it being possible to provide punched and scored cardboards for the obtainment of containers of any dimensions.

Naturally, the invention thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the same inventive concept.

Thus, as an example, one of the three scoring assemblies 60a, 60b and 60c may be replaced by a cutter assembly for the longitudinal cutting of the cardboard.

Similarly, an assembly for the transverse scoring of the cardboard may be provided, positioned, for example, after the station 38.

Regarding the type of cardboard used, it may also be constituted by sheets of corrugated paper, by pleated cardboard, or by similar material with which a box may be produced. Fig. 17 illustrates the use of an oscillably mounted container 110 which contains glue 111 which is applied to the cardboard 3 by means of one or more brushes 112 connected to an outflow duct.

The container can be refilled, is pivoted between two beams which constitute the frame 4, and its angle with respect to the plane of the underlying cardboard can be adjusted by means of a suitable screw 113 protruding, below the pivoting point of the container, from the beam of the frame.

Said container allows, e.g., to stably and mutually associate two sheets of corrugated cardboard unrolled from two contiguous rollers so that they are associated with counterposed corrugations.

Naturally the processed cardboard may have any dimensions and thickness, and it may be obtained by superimposing a plurality of individual sheets.

Naturally, the materials and the dimensions of each individual component of the machine may be any according to requirements.

Also, all of the individual components may be replaced with technically equivalent elements.

CLAIMS

1) Automatic machine for the processing of corrugated paper, characterized in that it is composed of:
a) a first station for the multiple feed of corrugated cardboard with the possibility of different widths;
b) a second station for inserting the corrugated cardboard;
c) a third station for cutting said cardboard;
d) a fourth station for scoring said cardboard;
e) a fifth station for the dinking of said corrugated cardboard;
f) a sixth station for removing the cardboard and for the eventual glueing and folding of the flaps resulting from the manufacturing process, control and data input means being provided for programing, command and control of the operating phases of the machine and for printing the cardboard.

2) Machine according to claim 1, comprising a first station characterized in that it is provided with eventual means for the jointing and the centering of said cardboard and/or for the glueing of at least two of said mutually superimposable cardboards.

3) Machine according to the preceding claims, comprising a second station characterized in that it comprises a multiple and movable insertion assembly for said corrugated cardboard, said assembly being provided with means for guiding said cardboard, means for the quick insertion thereof and means for centering the same with respect to the middle longitudinal axis of the machine.

4) Machine according to the preceding claims, comprising a third station characterized in that it is

composed of one or more self-sharpening cutters which are extractable from the station and are provided with means for the temporary blocking of the corrugated cardboard during the cutting phase, as well as with means suitable for retaining them in the cutting seat.

5) Machine according to the preceding claims, comprising a fourth station characterized in that it is composed of one or more independently motorized scoring assemblies, each assembly being composed of a pair of scorers which interact with a means for the traction of the cardboard and are symmetrical with respect to the middle longitudinal axis of the machine, each of said pairs being provided with means for the adjustment of their mutual position and with means for maintaining the parallelism with said cardboard traction means.

6) Machine according to the preceding claims, comprising a fifth station characterized in that it is composed of at least one pair of dinking punches extractable from the station and provided with means for adjusting their position with respect to the longitudinal middle axis of the machine, each of said punches being provided with a means suitable for allowing the removal of the punched cardboard strip.

7) Machine according to the preceding claims, comprising a first station characterized in that it comprises a supporting frame, to the lateral beams of which the shafts of three rollers are freely pivoted, having different width and/or length, at the end of each of said shafts there being associated a brake adapted for preventing the excessive unrolling of the cardboard, the latter being

fed to the subsequent station by means of three transverse free rollers, arranged mutually parallel to each other with the axes arranged on the same plane perpendicular to the base plane of the machine.

8) Machine according to the preceding claims, comprising a second station consecutive to the previous one characterized in that it comprises a supporting frame which supports a lifting assembly composed of two lateral plates, identical and rectangular, transversely to which three pairs of rollers are pivoted, their axes, mutually parallel to each other, being arranged on the same plane perpendicular to the base plane of the station, each of said pairs of rollers being composed of a motorized roller, operatable by means of a suitable motor, and of a free counter-roller arranged above the previous one, the axis of each counter-roller being associated, at the ends, to a slot with a vertical axis provided on the plates.

9) Machine according to claims 1 and 8, comprising three free counter-rollers, each of which is characterized in that it is provided with the end engaged in a throat provided on the stem of an essentially Y-shaped swinging element, said element being in turn freely pivoted to the lateral plates at the terminal end of the stem facing opposite to the first station, between the flaps of each swinging element there being provided a shaft mounted on an eccentric element which can be operated by means of a lever, said eccentric element allowing the coupling and the uncoupling between the counter-roller and the motorized roller.

10) Machine according to claims 1, 8 and 9, comprising

a lifting assembly characterized in that it is moved along a vertical axis by means of a pair of chains each of which is provided with ends associated with the upper and lower one of the lateral plates of the lifting assembly, said chains being trained around toothed wheels upwardly and downwardly associated with the frame constituting said second station, one of said wheels being free and the other motorized.

11) Machine according to claims 1, 8, 9 and 10, comprising a lifting assembly the lateral plates of which are characterized in that each is provided with a pair of tabs protruding therefrom, to said tabs there being associated a wheel and a pulley which cooperate with a guiding element composed of a cylindrical shaft arranged vertically with respect to the frame which constitutes said second station.

12) Machine according to the preceding claims, comprising a lifting assembly the lateral plates of which are characterized in that three pairs of swinging bars are associated thereto in the direction of the first station, which bars are slideable on crosspieces, and allow the exact centering of the cardboard with respect to the longitudinal mid-axis of the machine, downstream of each pair of said rollers there being provided combs suitable for facilitating the insertion of the cardboard selected among the available ones by the lifting assembly.

13) Machine according to the preceding claims, comprising a third station characterized in that it is composed of a cutter assembly comprising a box-like supporting frame pivoted laterally by a transverse guiding bar and moved by means of a chain operated by a motor and

reduced assembly, said frame accommodating a rotating tempered blade arranged on a plane which is transverse with respect to the machine, said rotating blade cooperating with a fixed abutment blade which can be removably accommodated on the plane of the cardboard.

14) Machine according to claims 1 and 13, comprising a rotating blade characterized in that it is freely pivoted on a shaft connected to the frame, to the side of said blade there being arranged a cylinder with a trapezoidal cross section which interacts, during the transverse motion of the frame, with the end of a metal strap, angled towards the cardboard feed region and pivoted at the other end to a transverse axis, between the ends of said strap there being associatable an elastically deformable means adapted for adjusting the inclination of the rotating blade.

15) Machine according to claims 1, 13 and 14, comprising a box-like frame characterized in that it is upwardly provided with a connecting rod which interacts, by means of a bearing freely pivoted thereto proximate to the middle portion, with a biasing bar, said connecting rod being freely pivoted at one end to said frame, between the other end and said frame there being interposed a cylindrical helical spring, said connecting rod, bar and spring constituting the means adapted for retaining the rotating blade in the cutting seat.

16) Machine according to claims 1 and 15, comprising a rotating blade, pivoted on a small shaft characterized in that coaxially to said shaft a cylindrical helical spring is provided, interacting at the ends with said frame and said blade so as to impart to the latter an adequate pressure on

the abutment blade.

17) Machine according to the preceding claims, comprising a fourth station composed of three pairs of scorers which are characterized in that each scorer of each pair is pivoted on a first transverse shaft and is associated to a fork upwardly provided with a cylindrical guide which is slideable on a second transverse shaft, fixed and parallel to the previous one, each scorer of each pair being symmetrically positionable with respect to the mid-longitudinal axis of the machine by means of a suitable bush, adjustable and interacting with a worm screw, the latter being provided along half of its length with a right-handed thread and along half of its length with a left-handed thread so as to allow the motion of the scorers in opposite directions due to a one-way rotation of said screw.

18) Machine according to claims 1 and 17, comprising scorer assemblies characterized in that they are moved by means of a single motor keyed on the axis of one of said scorers, the others receiving the motion by means of suitable transmissions constituted by toothed wheels.

19) Machine according to the preceding claims, comprising scorers which are characterized in that they interact with an abutment roller the ends of which are mounted on eccentric elements so as to adjust the parallelism with the axis of the scorer and thus allow the optimum scoring of the corrugated cardboard.

20) Machine according to the preceding claims, comprising a fifth station composed of two dinking bodies, each of which is characterized in that it is composed of a box-like supporting frame laterally pivoted by a transverse

guiding rail, to each frame there being associated the end of a same chain transmitted, to the extreme sides of the machine, by two identical toothed wheels, one of which is free and the other is keyed on the axis of a motor and reducer assembly, said frames being adapted for moving simultaneously in opposite directions, the chain being associated in its upper part to one frame and in the lower part to the other frame, in such points as to allow the positioning of said frames simultaneously at the ends of the machine.

21) Machine according to claims 1 and 20, comprising box-like supporting frames characterized in that each accommodates a pair of identical rotating blades, counterposed to each other and furthermore mutually blocked with two disks, said disks being axially journalled on a small shaft arranged transversely with respect to the frame and being coaxially provided with a cylindrical helical spring interacting on the inner surfaces of said disks, to the one of said disks which faces towards the cardboard feed region there being coaxially associated a cylinder with trapezoidal cross section, interacting, during the transverse motion of the dinking body, with a strap similar to the one used for the cutter body.

22) Machine according to claims 1 and 21, provided with a pair of punches characterized in that they interact with two abutment blades which are removably associable on the resting plane of the corrugated cardboard, said abutment blades being positioned so as to allow the self-sharpening of the rotating blades, to each of said box-like frames there being upwardly associated means suitable for retaining

said rotating blades in the cutting seat, said means being similar to those used in the cutter body.

23) Machine according to claims 1, 22 and 23, comprising box-like frames which are characterized in that a magnet is associated thereto, to the rear of the work area of the blades, which magnet controls the motion, along a vertical axis, of a small bar to which a metal arm is downwardly freely pivoted, which metal arm is angled and arranged on a plane which passes through the one connecting the pair of blades, said arm being provided with the end adjacent to the pivoting point of the bar freely pivoted to the frame, while at the other end an underlying blade is associated and faces towards the blades which provide the dinking.

24) Machine according to the preceding claims, provided with a sixth station characterized in that it comprises two pairs of transverse rollers adapted for ensuring the outgoing entrainment of the cardboard, one of said rollers being motorized by means of a toothed belt associated to a matchingly shaped toothed wheel which takes up the motion from a corrugated cardboard traction roller arranged proximate to a scoring assembly, the motion being transmitted to the other rollers by means of suitable toothed wheels.

25) Machine according to claims 1 and 24, characterized in that it is provided with a motorized set of rollers for the transport, glueing and folding of the flaps of the cardboard.

26) Machine according to the preceding claims, characterized in that it comprises means for the programing,

the command and the control of the processing phases of the machine, which are characterized in that they are composed of a central logic unit contained within a box-like structure provided with a keyboard, a monitor, a printer and a button panel, said central logic unit effecting, by means of suitable sensors and actuators positioned at the various stations, the command and control of the various processing phases.

27) Machine according to the preceding claims, comprising a first station which is characterized in that an oscillable container, associated with a beam of the supporting frame of the cardboard rolls, which container contains an adhesive substance which can be applied to the underlying cardboard by means of suitable brushes downwardly protruding therefrom.

28) Machine according to the preceding claims, comprising a first station characterized in that it is composed of means for feeding pleated cardboard.

29) Machine according to the preceding claims, comprising a first station characterized in that it is composed, of means for feeding individual sheets of corrugated cardboard.

30) Machine according to claims 1, 8, 9, characterized in that said counter-roller is provided, with an axis to the ends of which are associated two eccentric elements rotatably associated with said two lateral plates, the angular position of said two eccentric elements being adjustable in a presettable position by means of a lever.

31) Machine according to claims 1, 11 and 12, characterized in that to at least one of said two lateral

plates a pair of tabs is coupled, within each of which a slider is placed and slides, to which slider said wheel and pulley which interact with said guiding element are pivoted, said sliders being rigidly interconnected to each other by a beam to the middle portion of which the end of the stem of a piston is associated, which piston is rigidly coupled to said at least one of said two lateral plates.

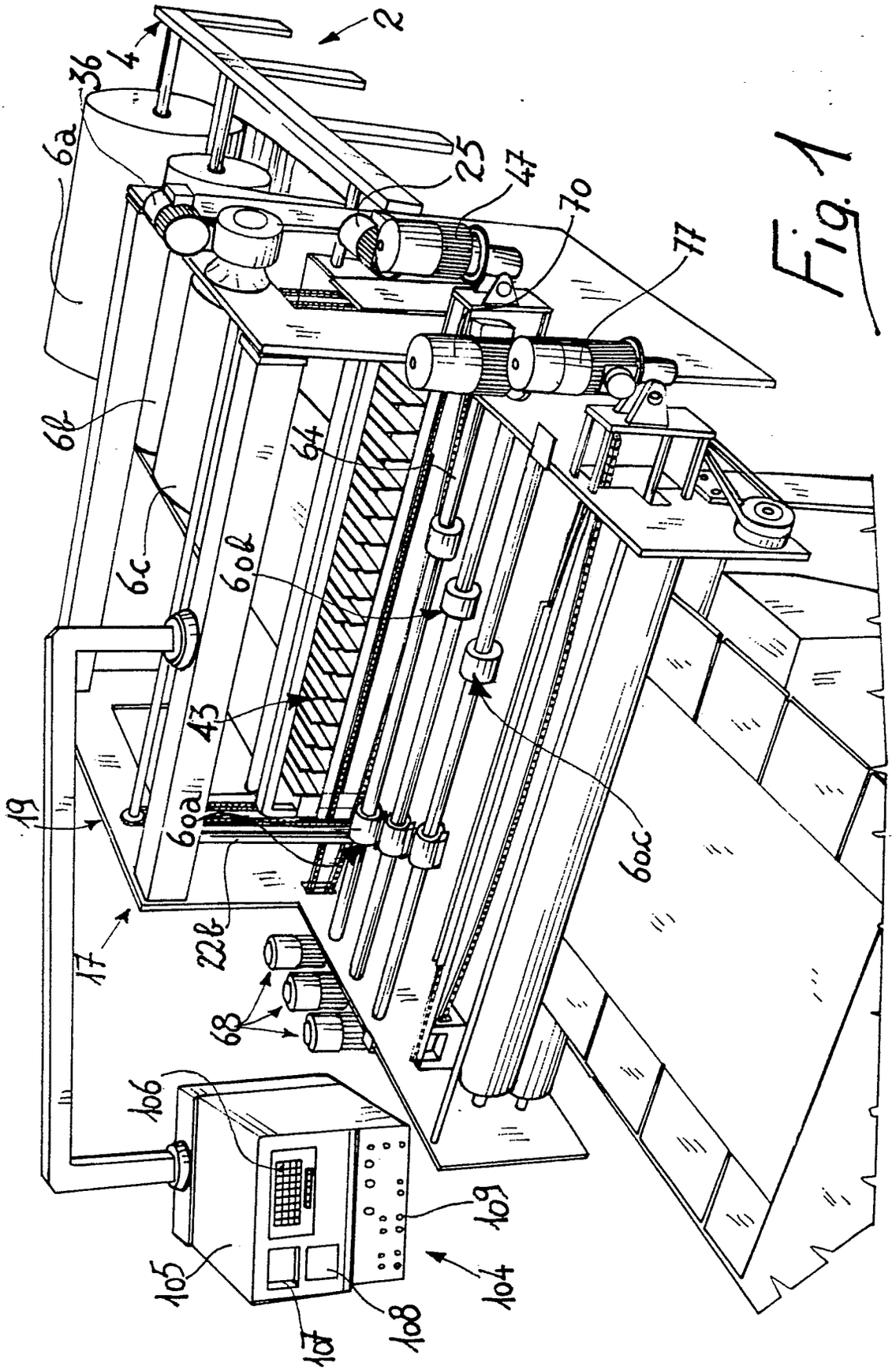
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Fig. 1

Fig.2

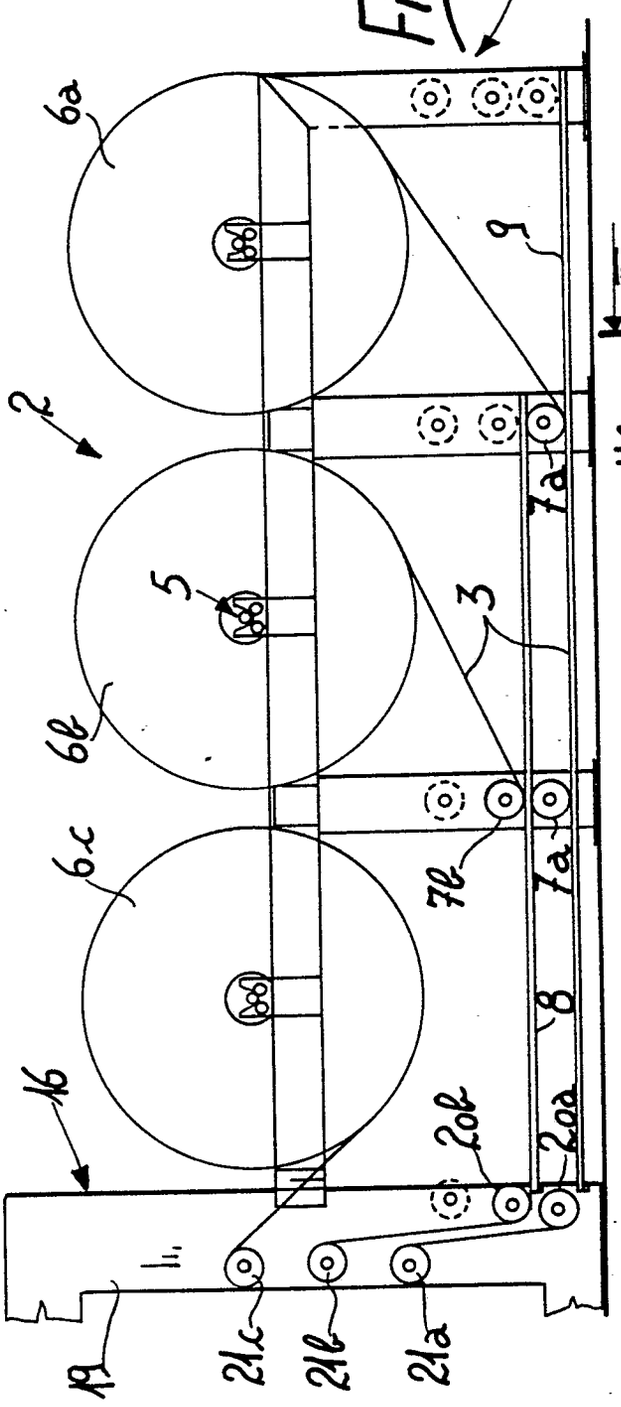


Fig.3

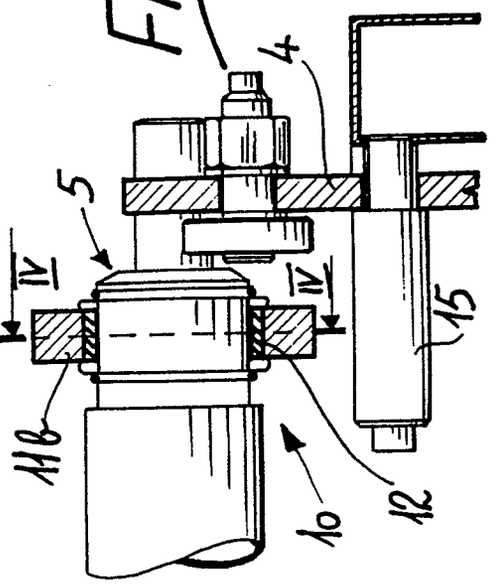
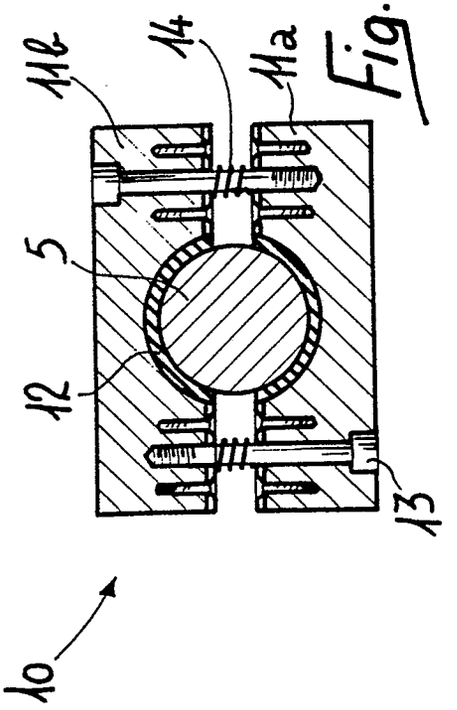


Fig.4



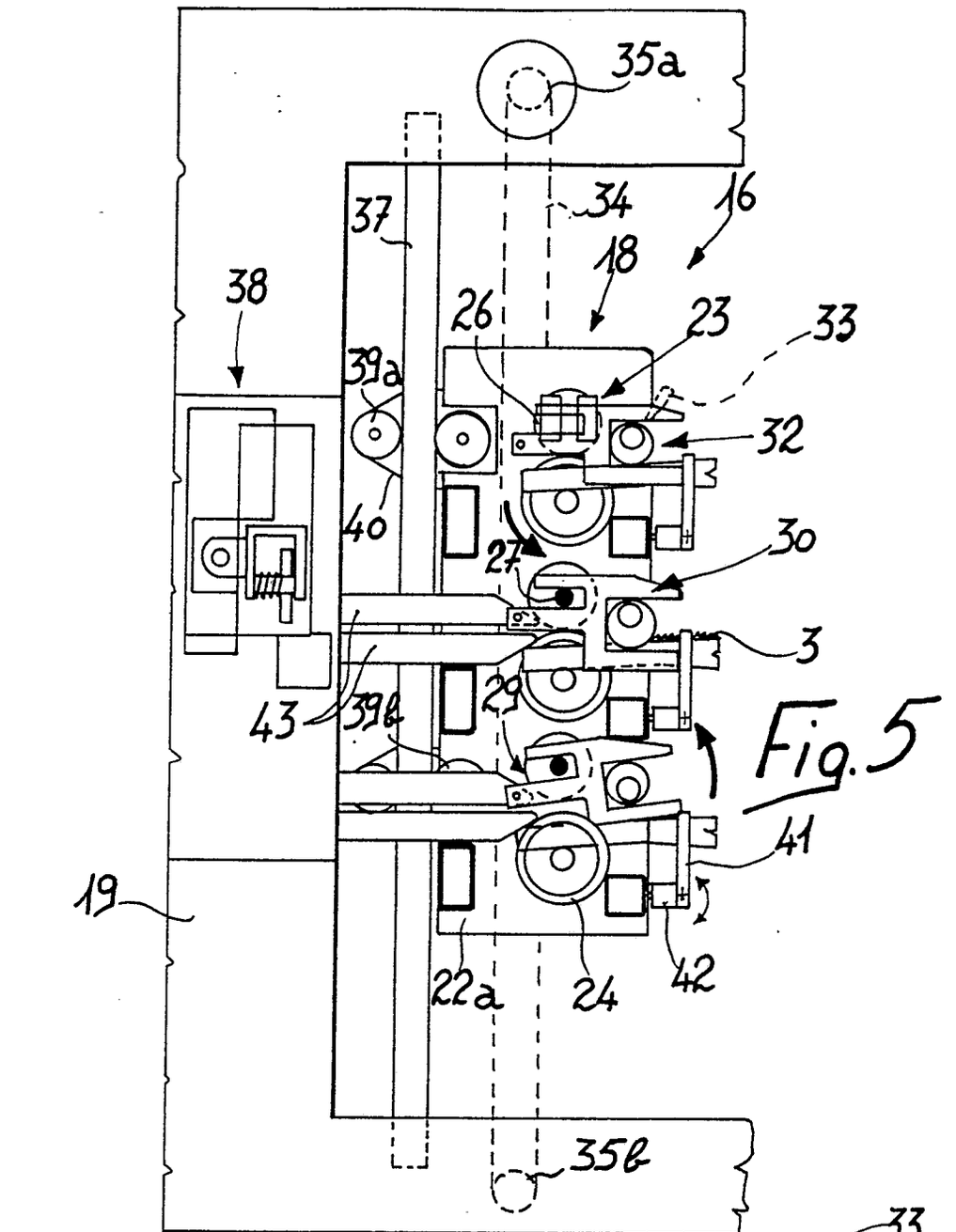

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Fig. 5

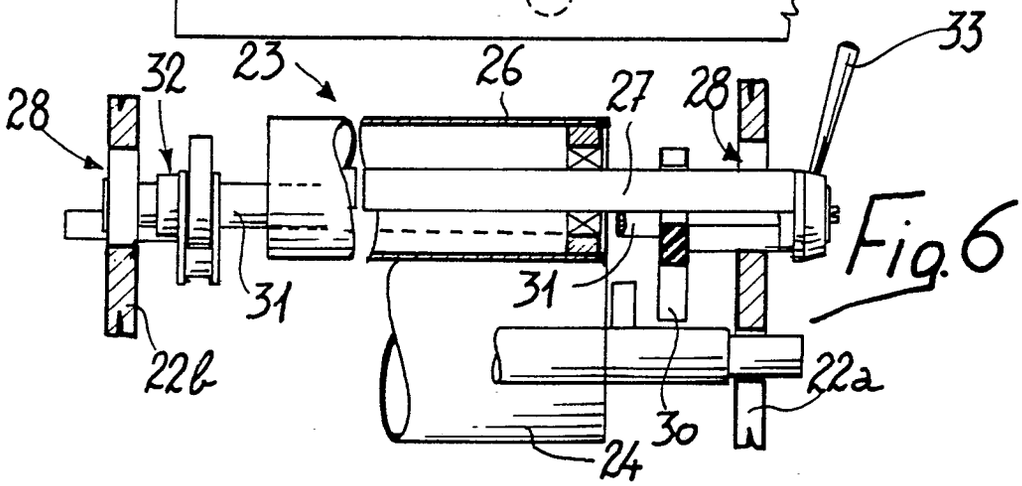
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Fig. 6

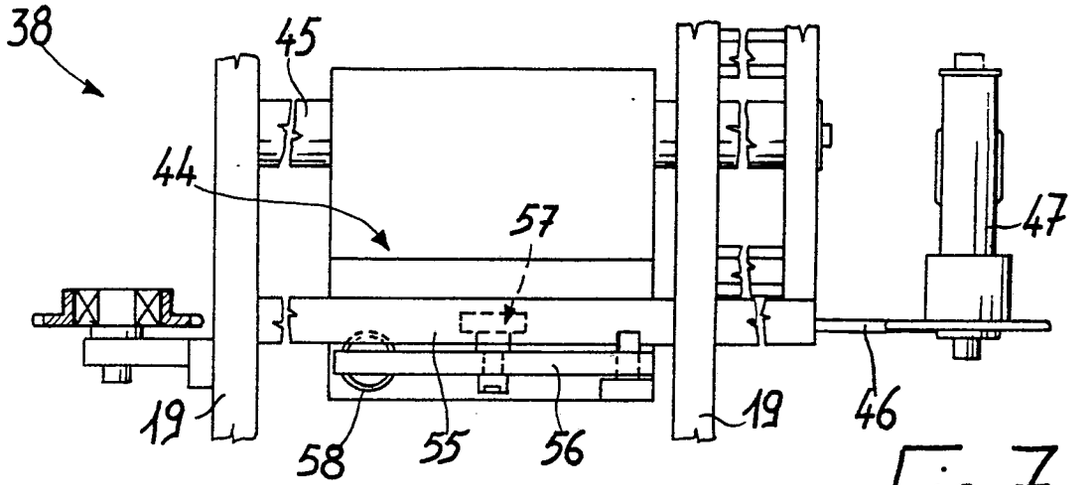

Fig. 7

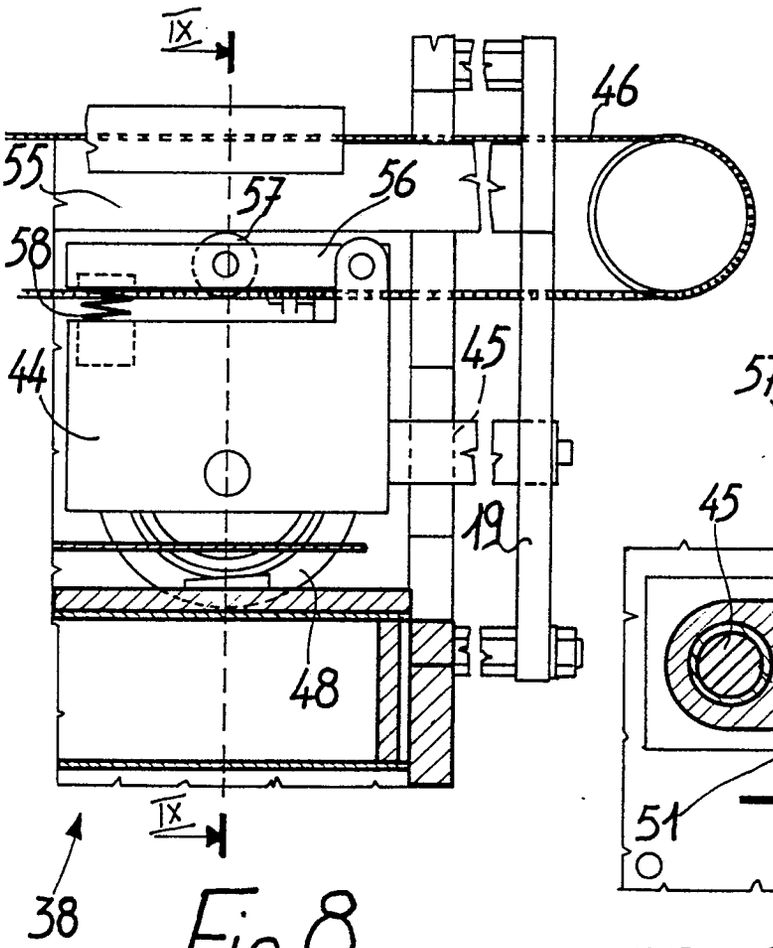

Fig. 8

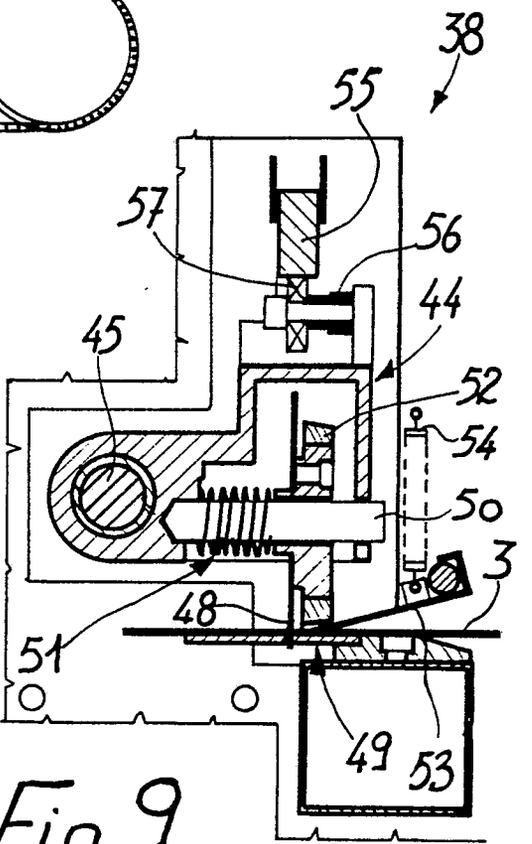

Fig. 9

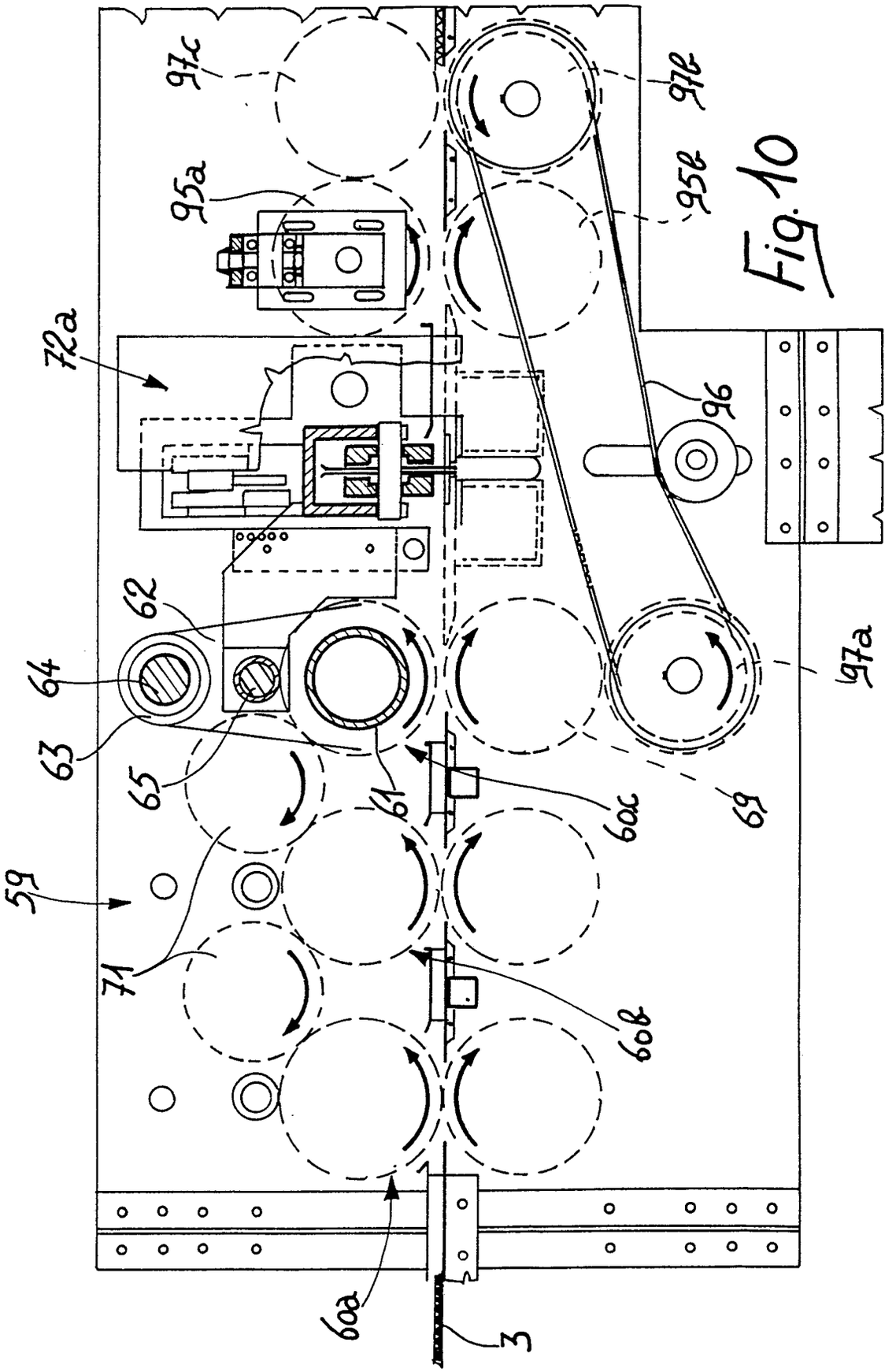

Fig.10

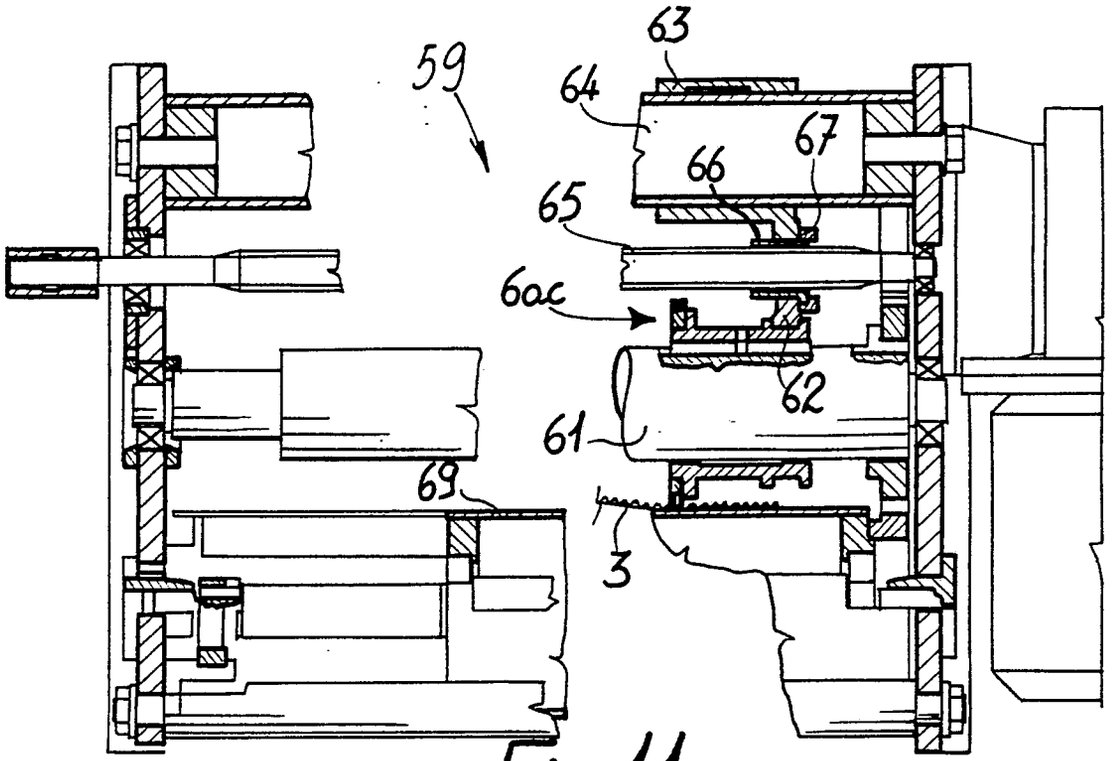

Fig. 11

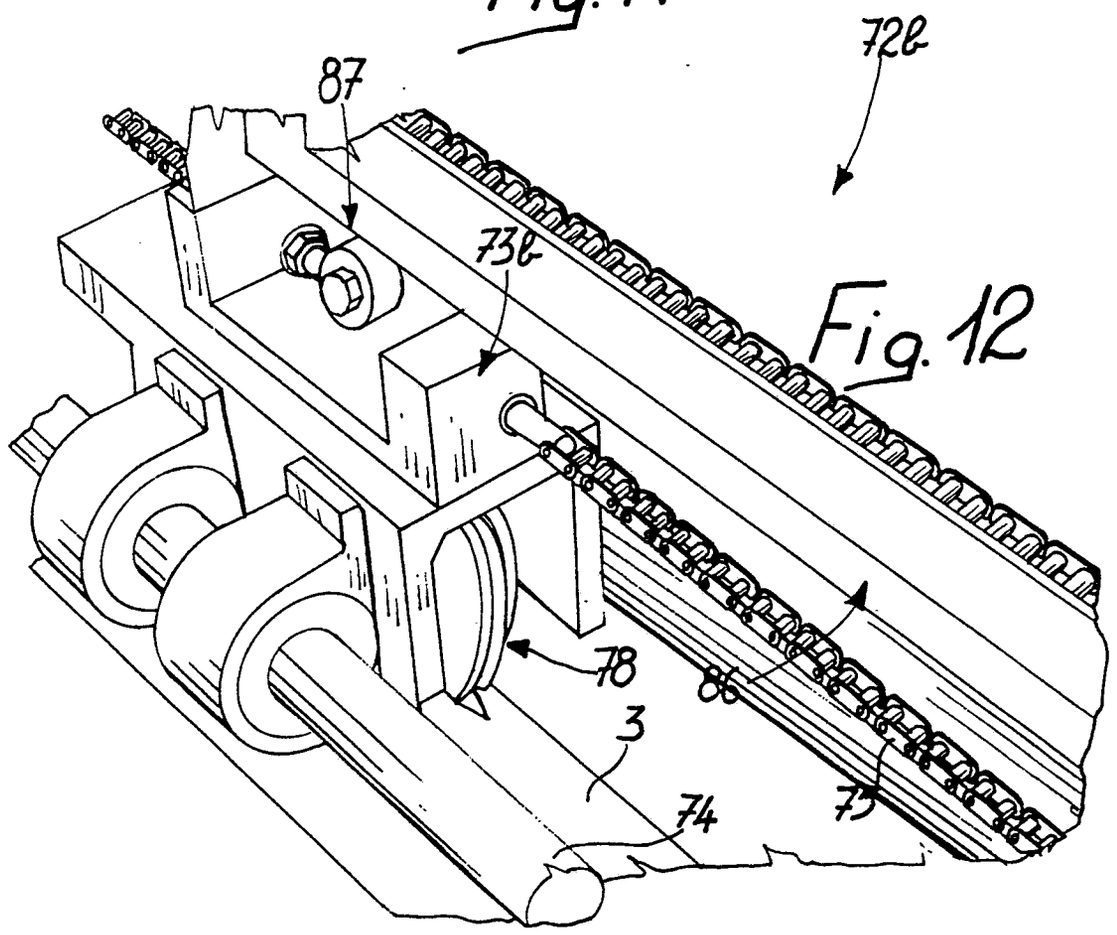

Fig. 12

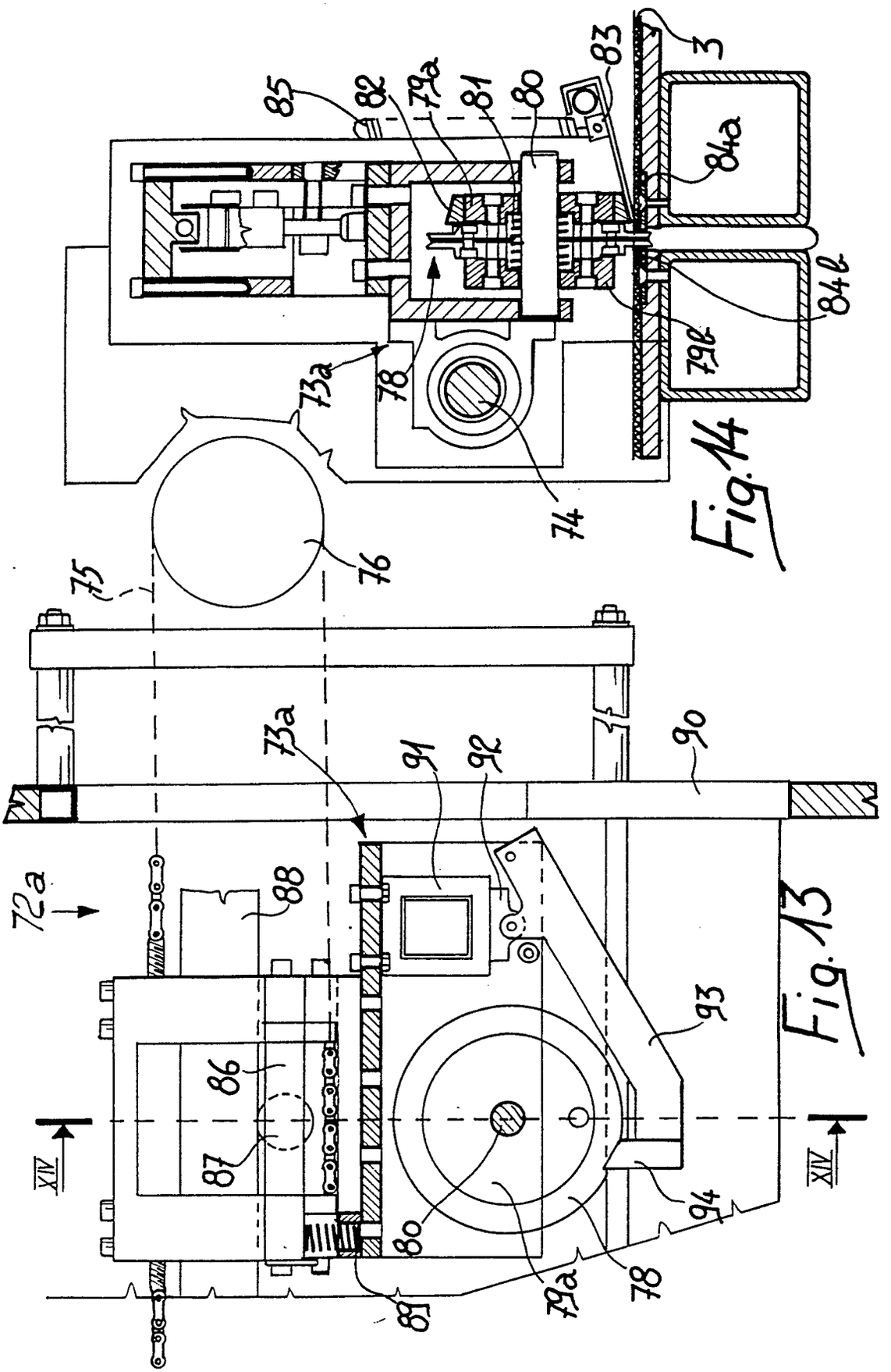
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Fig. 14

Fig. 13

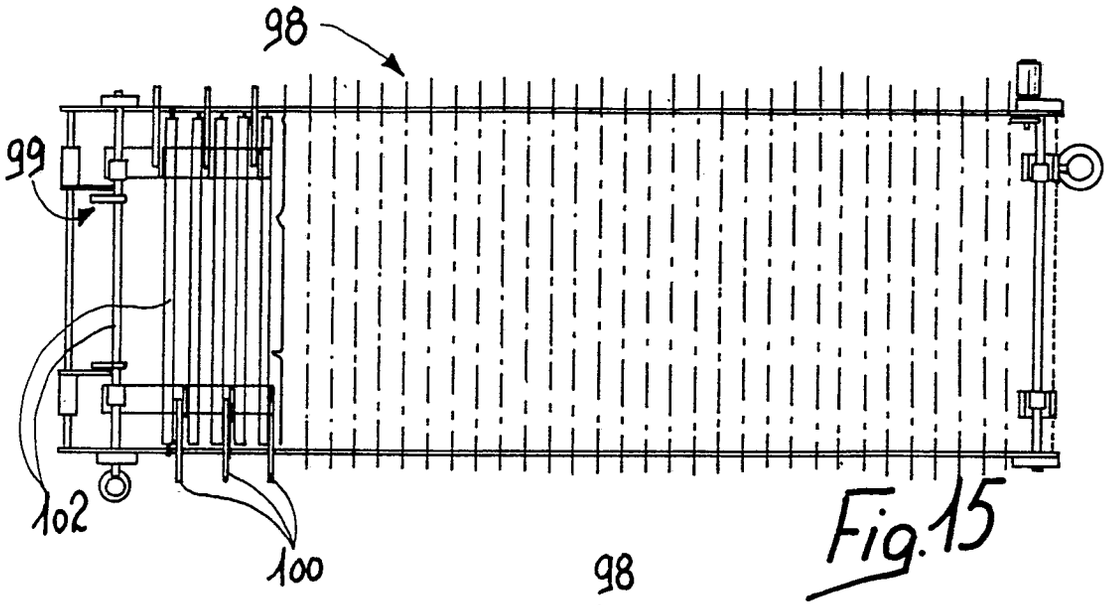

Fig.15

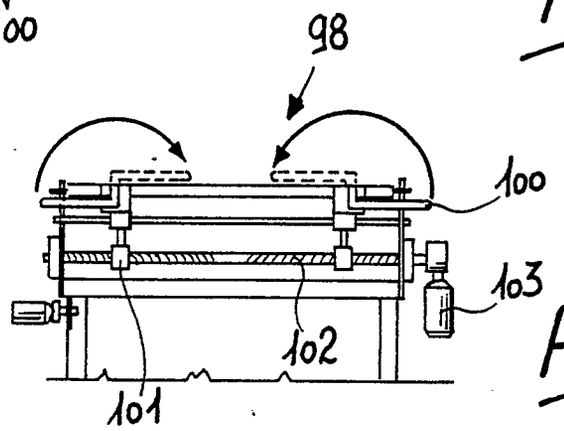

Fig.16

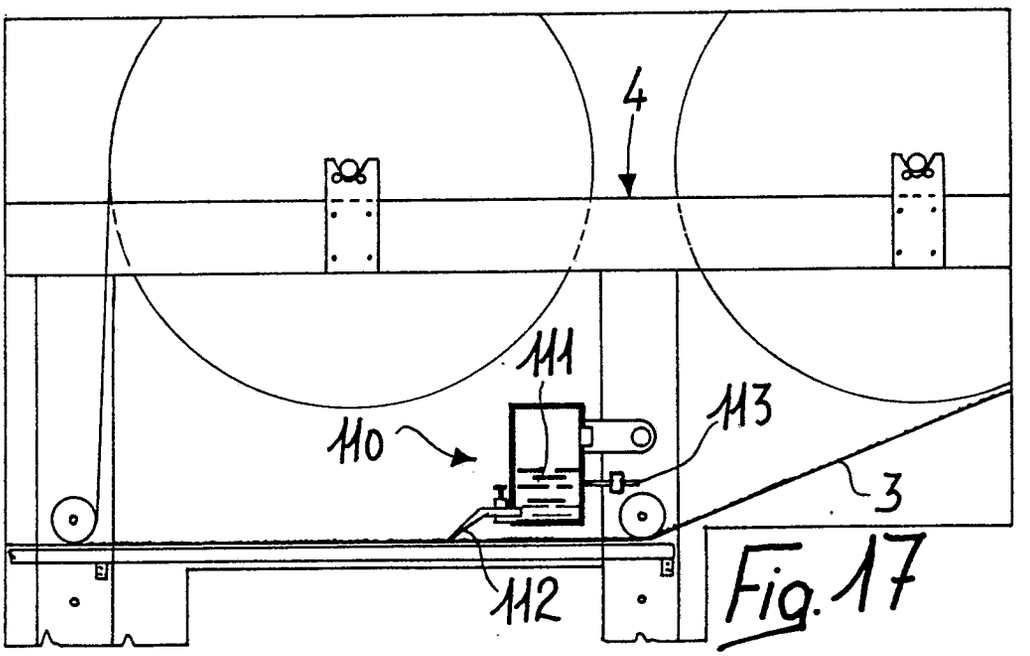

Fig.17

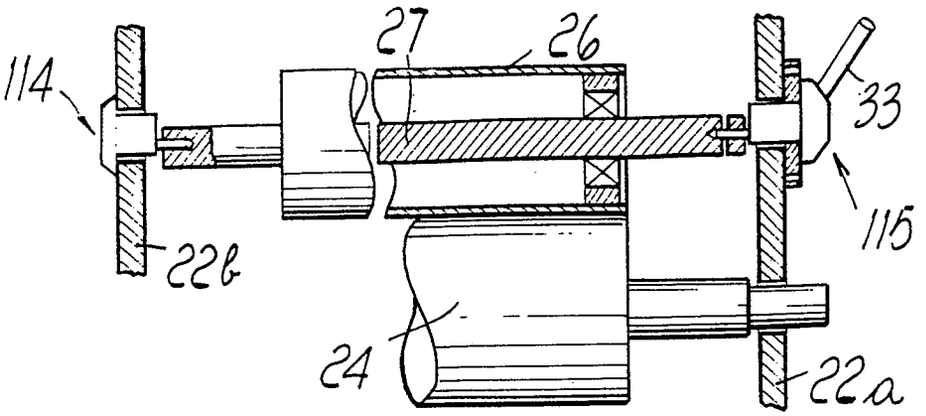

Fig. 18

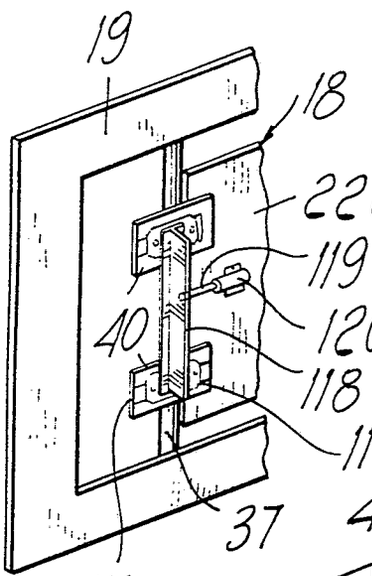

Fig. 19

Fig. 20

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87103312.2

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 4)
A	US - A - 4 500 381 (NORDSTROM) * Totality * --		B 31 F 1/20
A	EP - A2 - 0 129 640 (PETERS) * Totality * --		
A	DE - A1 - 2 436 717 (RENGO) * Fig. 1,5 * ----		

TECHNICAL FIELDS SEARCHED (Int. Cl 4)

B 31 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	01-06-1987	HOFMANN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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