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(54) Automatic device for feeding strips or the like to a conveyor element, in particular for packing box assembling machines.

(57) The present invention relates to an automatic device for feeding strips or the like to a conveyor element, in particular for machines for assembling packing boxes. The device comprises a loader element for a stack of strips, which is arranged above a resting plane which has traction elements which are controllably movable along a feed direction. There is a supporting element which defines a resting region for a first end of the lower strip of the stack in a direction which is transverse to the feed direction. Proximate to the supporting element there is an extractor element which can engage the lower strip and is controllably movable along a path which has a component which is transverse to the feed direction to obtain the disengagement of the lower strip from the resting region with the passage of the strip from a first position, in which it rests with its first end on the supporting element above the resting plane and with its second end, which is opposite to the first one, on the resting plane in a position of non-interference with the traction elements, to a second position, in which it is translated along a direction which is transverse to the feed direction and is rested on the resting plane in a position suitable for being moved by the traction elements.

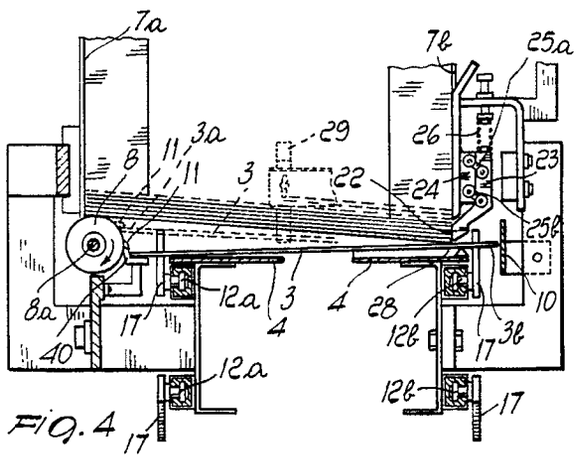


FIG. 4

EP 0 421 412 A1

AUTOMATIC DEVICE FOR FEEDING STRIPS OR THE LIKE TO A CONVEYOR ELEMENT, IN PARTICULAR FOR PACKING BOX ASSEMBLING MACHINES

The present invention relates to an automatic device for feeding strips or the like to a conveyor element, in particular for machines for assembling packing boxes, such as for example fruit trays or the like.

Automatic devices for sequentially feeding stacked strips to a conveyor element which enters a machine for assembling packing boxes, such as trays for fruit or other products, are known.

Said devices generally comprise a loader element which is arranged above the conveyor element to be fed and in which the strips are arranged so that they are stacked and orientated transversely to the advancement or feed direction of the conveyor element.

The stack of strips is laterally supported by a pair of guides which are usually vertical and is supported below by a pair of opposite supports which are arranged proximate to the lower end of the guides.

A first extractor element is arranged proximate to the lower end of one of these guides and acts on an end of the lower strip of the stack so as to move said strip laterally, i.e. transversely to the extension of the guides, by an extent which is greater than the dimensions of the corresponding support in order to disengage it therefrom. The guide which is opposite to the first extractor element has, proximate to its lower end, a slot which corresponds to the thickness of a strip so as to allow the movement actuated by the first extractor element, which thus, as mentioned, releases an end of the strip from one of the supporting elements.

A second extractor element is arranged on the outer side of said slot and acts on the other end of the strip in the opposite direction and subsequently with respect to the first extractor element. Said second extractor element disengages the other end of the strip from the corresponding support, making the strip fall onto the conveyor element.

Said known types of device have some disadvantages. More particularly, since the strip, once it is disengaged from the pair of supports of the loader element, falls freely onto the conveyor element, poor precision in the placement of the strips on the conveyor element is observed. This lack of precision is such as to compromise the correct feeding of the strips to the subsequent assembly line when a high feed speed is required, since the free fall of the strips cannot obviously be made any faster.

The use of two opposite extractor elements is furthermore a source of problems in the design and setup of these devices, in view of the high precision required.

Another disadvantage is due to the fact that the strip to be disengaged from the supports scrapes against the overlying strip for the entire duration of the movement performed by the first extractor element. Since the strips used in this field are not very uniform, are not surface-finished and have poor mechanical resistance, damage, breakage of the strips or jammings of the device can in fact occur and can even force the halting of the assembly line, with considerable productivity losses.

With feeder devices of the above described type it is furthermore extremely difficult to correctly feed low-thickness strips due to the intrinsic structure of the supporting elements and of the extractor element.

The aim of the present invention is to obviate the disadvantages described above by providing an automatic device for feeding strips or the like to a conveyor element which ensures high reliability in the feeding of the strips even with high operating speeds, so as to allow the full exploitation of the productive potentiality of modern assembly lines for packing boxes.

Within the scope of this aim, an object of the invention is to provide a feeder device which can feed without interruption an assembly line even in the presence of strips which have defects related to their thickness and degree of finishing.

Another object of the invention is to provide a feeder device which can operate correctly even in the presence of deformed strips.

Not least object of the invention is to provide a device which does not have excessive requirements of precision in its setup.

This aim, these objects and others which will become apparent hereinafter are achieved by an automatic device for feeding strips or the like to a conveyor element, in particular for packing box assembling machines, characterized in that it comprises a loader element for a stack of strips, said loader element being arranged above a resting plane provided with traction elements which are controllably movable along a feed direction and a supporting element which defines a resting region for a first end of the lower strip of the stack in a direction which is transverse to said feed direction, an extractor element being provided proximate to said supporting element, being engageable with said lower strip and being controllably movable along a path which has a component which is transverse to said feed direction for the disengagement of said lower strip from said resting region,

with passage from a first position, in which it rests with said first end on said supporting element above said resting plane and with its second end, which is opposite to said first end, on said resting plane in a position of non-interference with said traction elements, to a second position, in which it is translated along a direction which is transverse to said feeding direction and is rested on said resting plane in a position which is suitable for traction on the part of said traction elements.

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

figure 1 is a schematic lateral elevation view of the device according to the invention;

figure 2 is a schematic top plan view of the device;

figures 3 and 4 are enlarged sectional views of figure 1 taken along the axis III-III, illustrating the passage of the lower strip of the stack from the first position to the second position;

figure 5 is an enlarged view of a detail of figures 3 and 4;

figure 6 is a perspective view of the same detail as figure 4; and

figure 7 is a sectional view, taken similarly to figure 5, of a variated embodiment of the same detail.

With reference to the above figures, the device according to the invention, generally indicated by the reference numeral 1, comprises a loader element 2 intended to support a stack of strips 3 to be deposited on a resting plane 4, 4a which has traction elements 5 which are controllably movable along a feed direction indicated by the arrow 6 in figure 2.

More particularly, the loader element 2 is constituted by a pair of guides 7a and 7b which are substantially mutually parallel and extend in a plane which is perpendicular to the portion 4a of the underlying resting plane and is perpendicular to the feed direction 6.

The guide 7a is delimited downward by a supporting element 8 which defines a resting region for a first end 3a of the strip of the stack which is arranged below all the others.

The guide 7b is open downward and is spaced from the resting plane 4a with its wall which laterally contains the strips by a preset extent so as to define a gauged slot 9 the height whereof is slightly greater than the individual thickness of the strips 3.

A stop abutment 10 for the other end, or second end, 3b of the lower strip of the stack is provided laterally to the slot 9 on the opposite side with respect to the supporting element 8, as will become apparent hereinafter.

Conveniently, in order to prevent the return of the strip from the consequent impact against the stop abutment 10, a counter-abutment 40 is arranged below the supporting element 8, which faces the stop abutment 10 and which is laterally adjacent to the resting plane 4a.

According to the invention, proximate to the supporting element 8 there is an extractor element 11 which can engage the lower strip 3 and is controllably movable along a path which has a component, in the plane defined by the guides 7a and 7b, which is transverse to the feed direction 6 in order to push the lower strip with its end 3b through the slot 9.

Advantageously, the supporting element 8 is constituted by a roller which is arranged proximate to the lower end of the guide 7a and is controllably rotatable about its axis 8a in a plane which is substantially parallel to the plane defined by the guides 7a and 7b. The roller 8 defines, with its lateral surface, the resting region for the end 3a of the lower strip of the stack of strips, and along said lateral surface there is at least one tooth which protrudes radially and constitutes the extractor element 11 according to the invention.

The tooth 11 protrudes from the lateral surface of the roller 8 by an extent which is slightly smaller than the thickness of a strip, so that by means of the rotation of the roller 8 about its axis the tooth 11 cyclically engages only the lower strip of the stack.

In this manner, the extractor element or tooth 11 moves along a substantially circular path which has not only a transverse component in the direction 6, i.e. a component which is longitudinal to the strip on which it acts, but also a component which is orientated toward the resting plane 4a.

The tooth 11 has, in an intermediate region of its extension in a direction which is parallel to its axis, a notch 41 for passing without interference beyond the counter-abutment 40 during the rotation of the roller 8.

The traction elements 5 are substantially constituted by a conveyor composed of two chains 12a and 12b which extend mutually parallel along the direction 6.

The chains 12a and 12b wrap around pairs of pinions 13, 14, 15 and 16 so as to laterally follow the resting plane 4, 4a and link up to themselves. The chains 12a and 12b have links which are appropriately spaced from one another and have raised portions 17 which protrude upward from the resting plane 4, 4a.

The arrangement of the chains is such that the raised portions 17, above the resting plane 4, are arranged along two rows, of which: a first row is

located between the guides 7a and 7b, below the strip resting region defined by the roller 8, and the second row is located between the slot 9 and the stop abutment 10.

The advancement of the chains along the feed direction 6 is obtained for example by means of an electric motor 18 which actuates one of the pairs of pinions, for example the pinions 16, which are mechanically connected to the roller 8, for example by means of a pair of gearwheels 19, 20 with a universal joint 21 interposed, so that the advancement speed of the chains 12a and 12b is in sync with the rotation of the roller 8 about its own axis.

Advantageously, the slot 9 is delimited upward by a shoulder 22 which is elastically yielding so as to enlarge, if necessary, the slot 9 in the direction which corresponds to the thickness of the strips, as will become apparent hereinafter.

The shoulder 22 is defined by an arm 23 which is articulated to a block 24, which is fixed to the guide 7b, by means of a pair of connecting rods 25a and 25b which are mutually parallel and allow the arm 23 to perform a translatory motion parallel to itself away from the resting plane 4a. The translatory motion of the arm 23 away from the plane 4a is contrasted by a spring 26.

According to a variated embodiment of this detail, illustrated in figure 7, for which the same reference numerals have been kept except for the connecting rods, which are indicated by the numerals 27a and 27b, said connecting rods, instead of being mutually parallel, could also be arranged variously inclined with respect to one another so as to obtain not only a translatory motion away from the plane 4a but also an oscillation toward the stop abutment 10 to facilitate the passage of the end 3b of the strips.

The slot 9 is delimited downward by a T-shaped raised portion 28 with two arms which are aligned parallel to the feed direction 6 and a stem which extends perpendicular to said direction and is inclined downward toward the guide 7a so as to obtain, upon the passage of the end 3b through the slot 9, a momentary straightening of possibly deformed strips.

A retention element 29 is conveniently provided on the side of the loader element 2 which is directed toward the direction 6, and is constituted for example by a portion of metal plate which is rigidly coupled to the guides 7a and 7b and contains on the front side the strips 3 which rest on the roller 8.

Advantageously, an idle supporting roller 30 is provided along the guide 7b so as to prevent all the strips from bearing on the lower strip which rests on the roller 8.

If the strips to be fed have a reduced thickness and therefore a reduced weight, it is possible to provide, on the region of the resting plane 4a which is arranged below the loader element 2, an opening 31 which is connected to a known suction device 32.

The operation of the feeder device according to the invention is as follows.

The strips 3, inserted in the loader element 2, rest partly against the roller 30, whereas the lower ones rest on the roller 8. In particular, the strip 3, which is arranged below all the others, is placed in a first position in which its end 3a rests on the roller 8 while its end 3b rests on the plane 4a at the slot 9.

The rotation of the roller 8 about its own axis moves the tooth 11 to interfere with the end 3a of said strip and to push its end 3b through the slot 9.

It should be noted that at the same time the tooth 11 follows the strip and rests it with its end 3a on the resting plane.

In the first position, the strip cannot be engaged by the raised portions 17, whereas in this second position, with the end 3b of the strip against the stop abutment 10, the engagement occurs and the strip is pulled along the feed direction 6 by the raised portions 17 of the chains 12a and 12b.

The rotation of the roller 8 and the synchronized advancement of the chains 12a and 12b cyclically obtains the extraction of a strip from the loader element 2 and its deposition on the plane 4a, with its consequent advancement along the plane 4.

The strips 3 progressively descend by gravity along the guides 7a and 7b.

If the strips have a low weight, the suction opening 31 cushions any rebounds of the strip on the plane 4a.

If there is a damaged strip or a strip with a thickness lower than the protrusion of the tooth 11, said tooth simultaneously pushes two strips through the slot 9. This problem, which in many conventional types of machine is the cause of a jamming of the device, is brilliantly overcome by the device according to the invention, which by virtue of the yielding of the arm 23 allows the passage of both strips through the slot 9 and therefore their simultaneous feed along the plane 4.

The fact of simultaneously feeding two strips can very rarely cause the jamming of an assembly line, which generally treats the two strips as if they were one, assembling them to the remaining part of the box without trouble.

After the passage of the two strips, the arm 23 returns to the correct position by virtue of the spring 26.

It should be noted that it is the extraction element 11 itself that rests the strip on the resting plane, contrary to the extractors of conventional

devices. Furthermore, except for the beginning of the movement of the strip performed by the extractor element, the lower strip scrapes against the upper strip only with a small portion, thus avoiding damage to the strips.

In practice it has been observed that the feeder device according to the invention fully achieves the intended aim, since by virtue of the fact that the strips are rested on the resting plane by the extractor element it is possible to achieve high operating speeds which can fully and very reliably exploit the productive potentialities of modern assembly lines.

A further advantage is that of not interrupting the feed even in the presence of strips which have thicknesses which are lower than required.

Not least advantage is the fact of being able to feed even low-thickness strips correctly and without problems.

The feeder device thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with technically equivalent elements.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

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

Claims

1. Automatic device for feeding strips or the like to a conveyor element, in particular for packing box assembling machines, characterized in that it comprises an element for loading a stack of strips, said loader element being arranged above a resting plane which is provided with traction elements which are controllably movable along a feed direction and a supporting element which defines a resting region for a first end of the lower strip of the stack in a direction which is transverse to said feed direction, an extractor element being provided proximate to said supporting element, said extractor element being engageable with said lower strip and being controllably movable along a path with a component which is transverse to said feed direction for the disengagement of said lower strip from said resting region with passage from a first position, in which it rests with said first end on said supporting element above said resting plane and with its second end, which is cpposite to said first end, on said resting plane in a position of non-interference with said traction elements, to a second position, in which it is translated along a direction which is transverse to said feed direction and is rested on said resting plane in a position which is suitable for being moved by said traction elements.

2. Device according to claim 1, characterized in that said extractor element is controllably movable along a path with a component which is transverse to said feed direction parallel to said resting plane and with a component which is substantially perpendicular to said resting plane for following said lower strip in its passage from said first position to said second position.

3. Device according to claims 1 and 2, characterized in that said loader element is constituted by a pair of guides which are mutually substantially parallel and extend in a plane which is substantially perpendicular to said resting plane and to said feed direction, said supporting element being arranged proximate to the lower end of one of said guides.

4. Device according to one or more of the preceding claims, characterized in that said supporting element is constituted by a roller which is arranged proximate to the lower end of one of said guides and is controllably rotatable about its axis in a plane which is substantially parallel to the plane defined by said guides, the lateral surface of said roller defining a resting region for said first end of the lower strip, a tooth being furthermore provided on at least one portion of the lateral surface of said roller, said tooth constituting said extractor element and protruding radially by an extent which is substantially smaller than the thickness of a strip.

5. Device according to one or more of the preceding claims, characterized in that a slot is defied proximate to the lower end of the guide of said pair of guides which is opposite to said roller, said slot substantially corresponding to the thickness of a strip for the passage of said second end of the lower strip following the action exerted thereon by said tooth of the roller.

6. Device according to one or more of the preceding claims, characterized in that said slot is delimited downward by said resting plane and upward by a shoulder which yields elastically to increase the width of said slot in the direction of the thickness of said strip.

7. Device according to one or more of the preceding claims, characterized in that said slot is delimited downward by a raised portion of said resting plane, said raised portion having a substantially T-shaped configuration with two arms which are aligned substantially parallel to said feed direction and with a stem which extends transversely to said feed direction and is inclined downward in the direction of said extractor element.

8. Device according to one or more of the preceding claims, characterized in that said traction elements are constituted by a conveyor with raised portions which protrude upward from said resting plane and are arranged on two rows which are parallel to one another and to said feed direction, of which: one is arranged between said pair of guides below said resting region defined by said supporting element and the other is arranged externally to said pair of guides on the side of said slot between said slot and a stop abutment for said second end of the strip.

9. Device according to one or more of the preceding claims, characterized in that the advancement speed of said traction means is synchronized with the rotation rate of said roller.

10. Device according to one or more of the preceding claims, characterized in that said loader element has, on its side directed toward said feed direction, an element for retaining the strips which rest on said supporting element.

11. Device according to one or more of the preceding claims, characterized in that a suction opening is arranged on said resting plane below said loader element.

12. Device according to one or more of the preceding claims, characterized in that means for the yielding support of the upper portion of the stack of strips are provided along said pair of guides.

13. Device according to one or more of the preceding claims, characterized in that a counter-abutment is provided below said roller, is applied laterally to said resting plane and faces said stop abutment to contain said strip in a direction which is transverse to said feed direction on said resting plane.

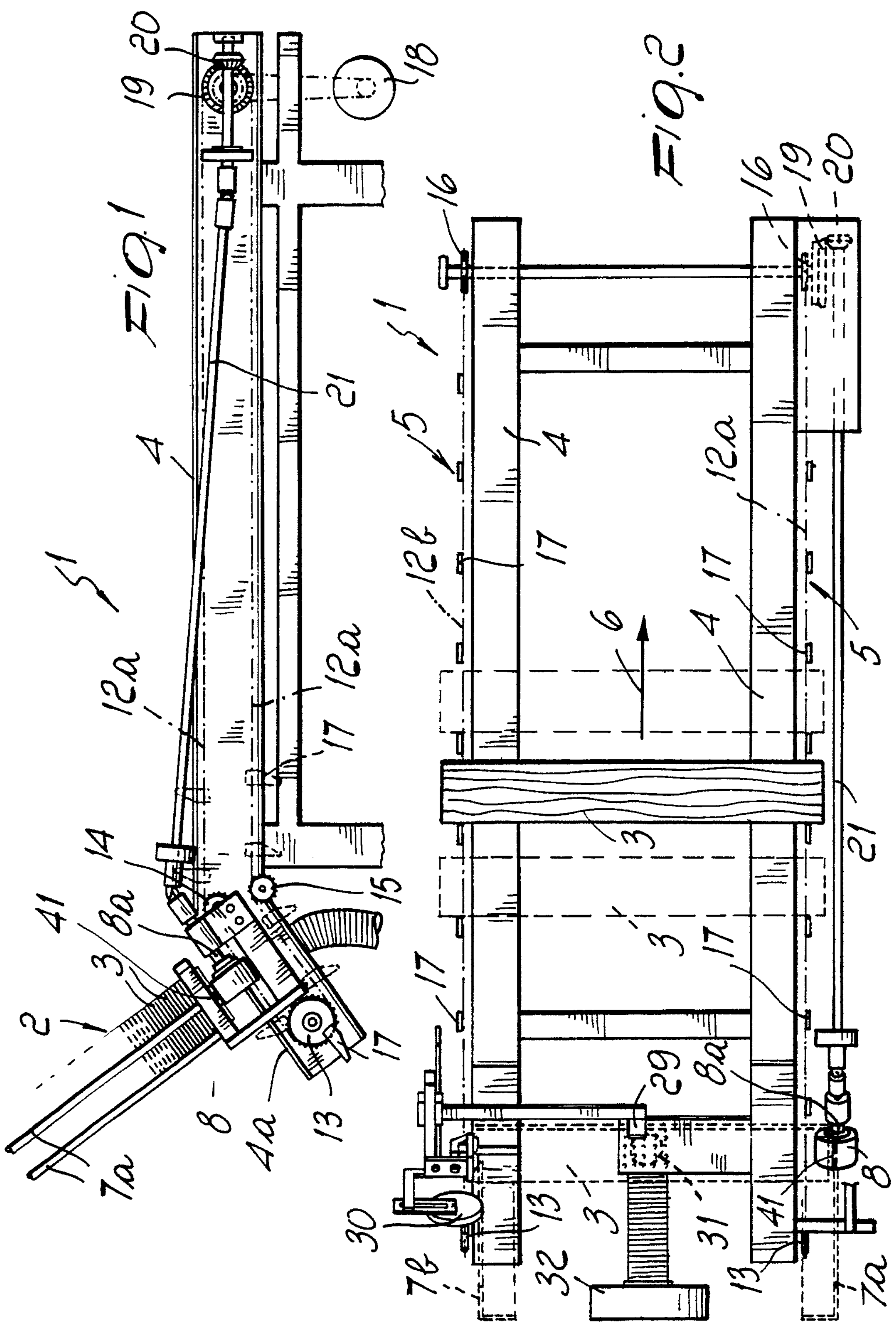
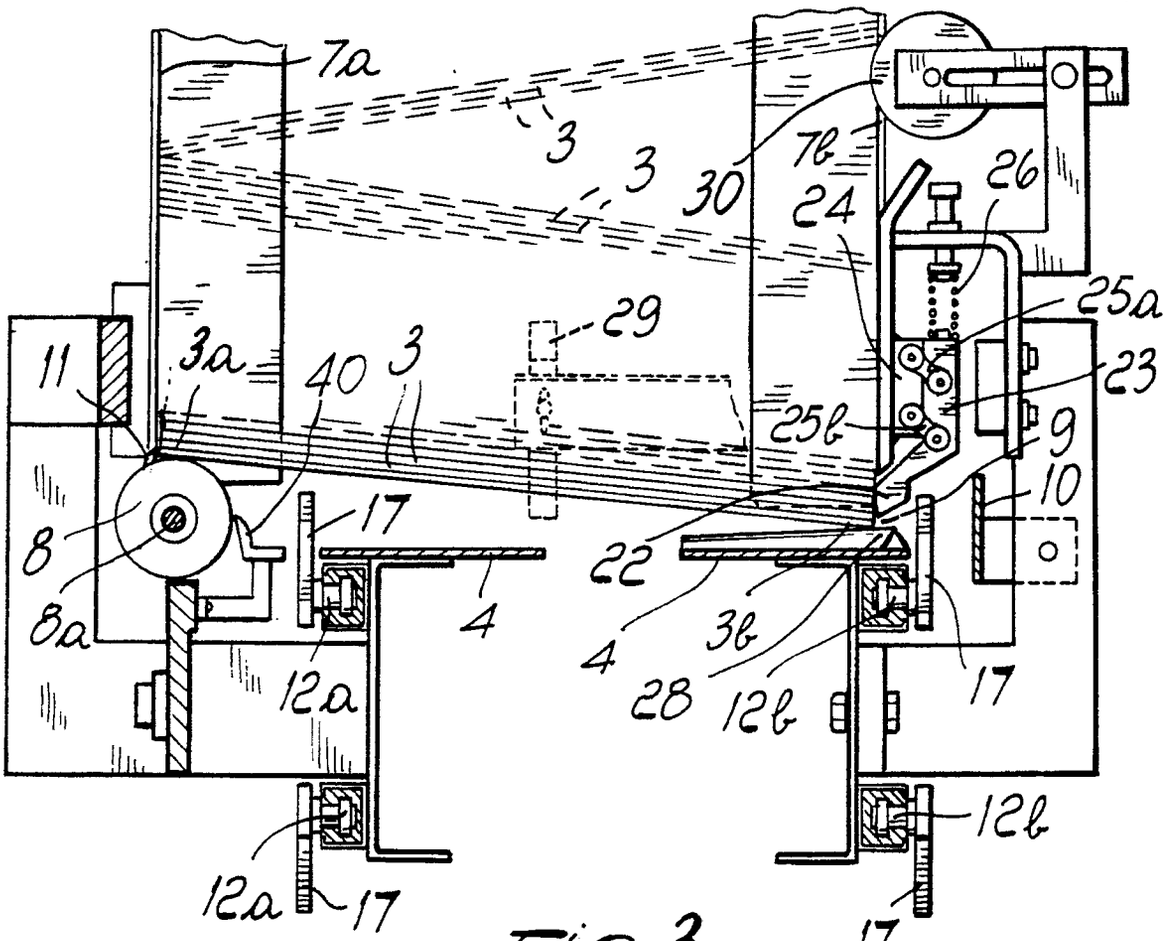


Fig.1

Fig.2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3b
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12b
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12a
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12a
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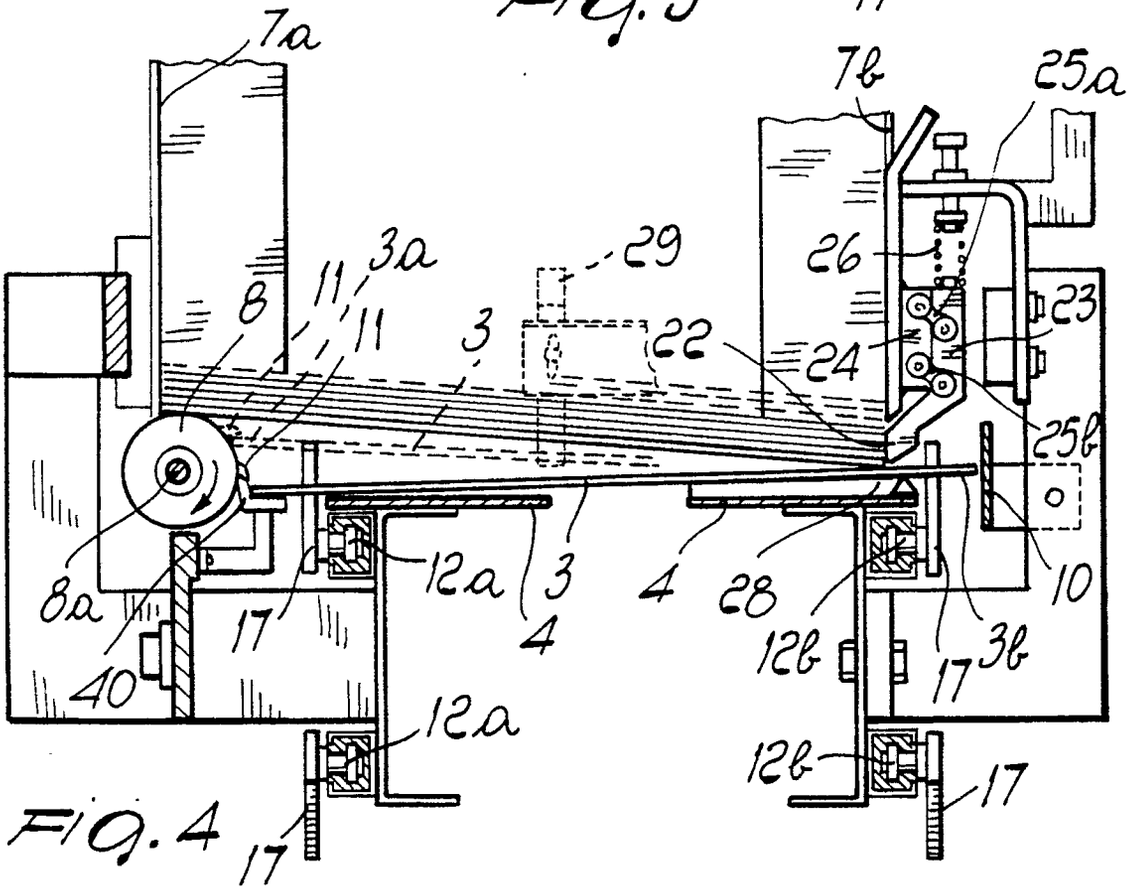
17

FIG. 3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25b
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FIG. 4

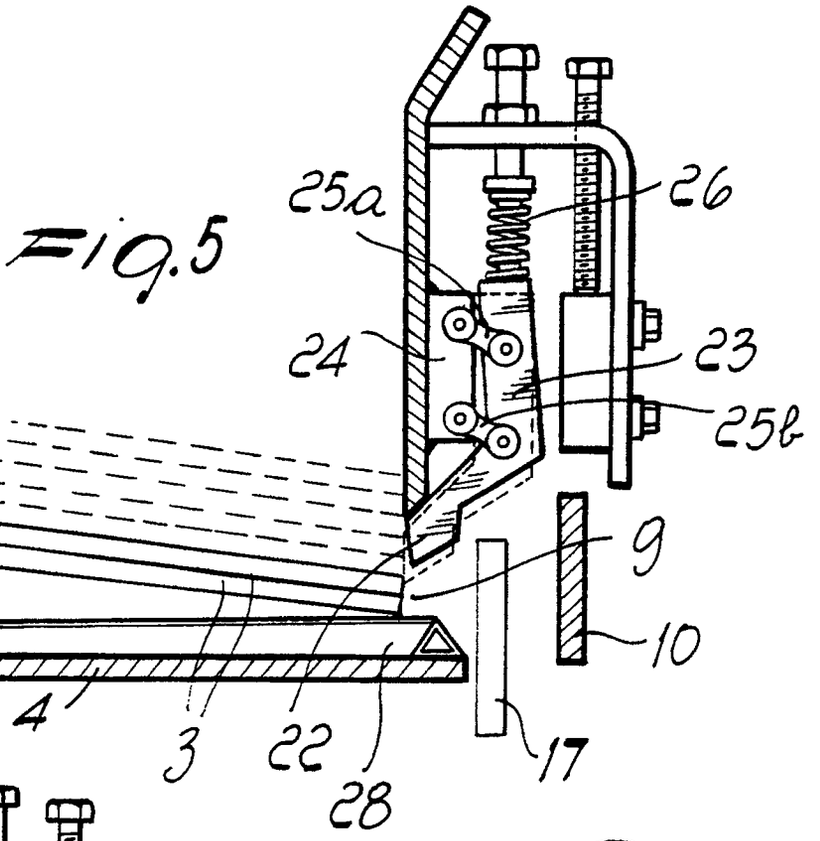

Fig.5

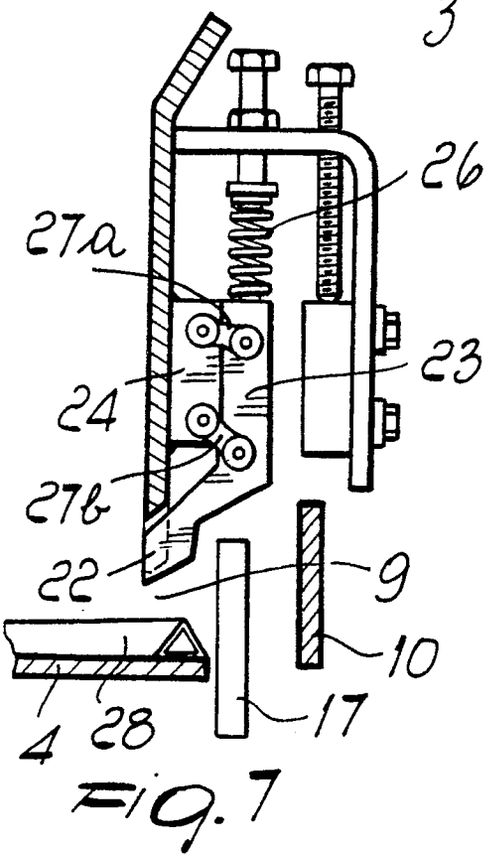

Fig.7

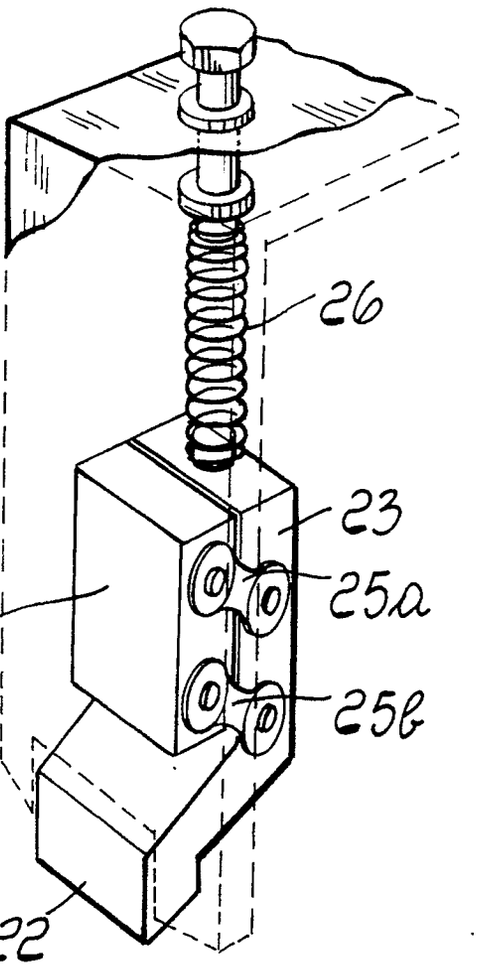

Fig.6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90119016.5

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.5)
A	DE - A - 2 123 192 (CORALI) * Totality *	1,3,10	B 65 B 43/12 B 27 M 3/36
A	US - A - 2 924 357 (KINGSLEY et al.) * Totality *	1,3,8, 10	
A	FR - A - 1 194 210 (STAPLING MACHINES CO.) * Totality *	1,3,8	
A	DE - A - 1 781 242 (FA. MOLLENHAUER) * Page 5, lines 11-14 *	1,8	
A	US - A - 2 942 758 (HOGSTROM) * Fig. 4; Pos. 53 *	1,3,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 27 M 3/00
B 65 B 43/00
B 65 G 59/00
B 65 G 61/00
B 65 H 1/00
B 65 H 3/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	21-12-1990	MELZER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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