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(54) **Machine for packing and tying foldable cases and boxes made of card board or similar materials with self adjustable speed.**

(57) A continuous flow of folded boxes, which are arranged on a horizontal plane and are parallel to each other and arranged in a fish-scale pattern coming from a folding/gluing machine, reaches over a roller conveyor (1), which is placed in a hortogonal position in relation to the longitudinal axis of the machine, the working surface of the machine self, which is equipped with conveyor belts (5). Then a new fish-scale flow, arranged in the hortogonal direction in relation to the one in which it has been received, will be recreated and the boxes accumulate against a mobile barrier (6) and begin a vertical compacting process.

After a certain pre-selected number has been reached, while the incoming boxes are temporarily halted on the working surface of the machine by a plate-shaped barrier (16), the selected parcel is compacted and pushed out of the compacting area by the combined action of two forks (17, 19), which transport the parcel to the unloading area and tie it by soldering a film made of plastic material; afterwards the parcel is removed by a conveyor belt (26) which is placed in a hortogonal position in relation to the machine.

The machine automatically adjusts the speed of the conveyor belts by means of a rod-shaped sensor (9) connected to a potentiometer which acts on the speed adjustor; said sensor undergoes an angular displacement according to the height of the pile of units which accumulates at the beginning of the machine; therefore, its rotation causes a varation of the conveyor belt speed, so as to keep the level of the pile a constant height.

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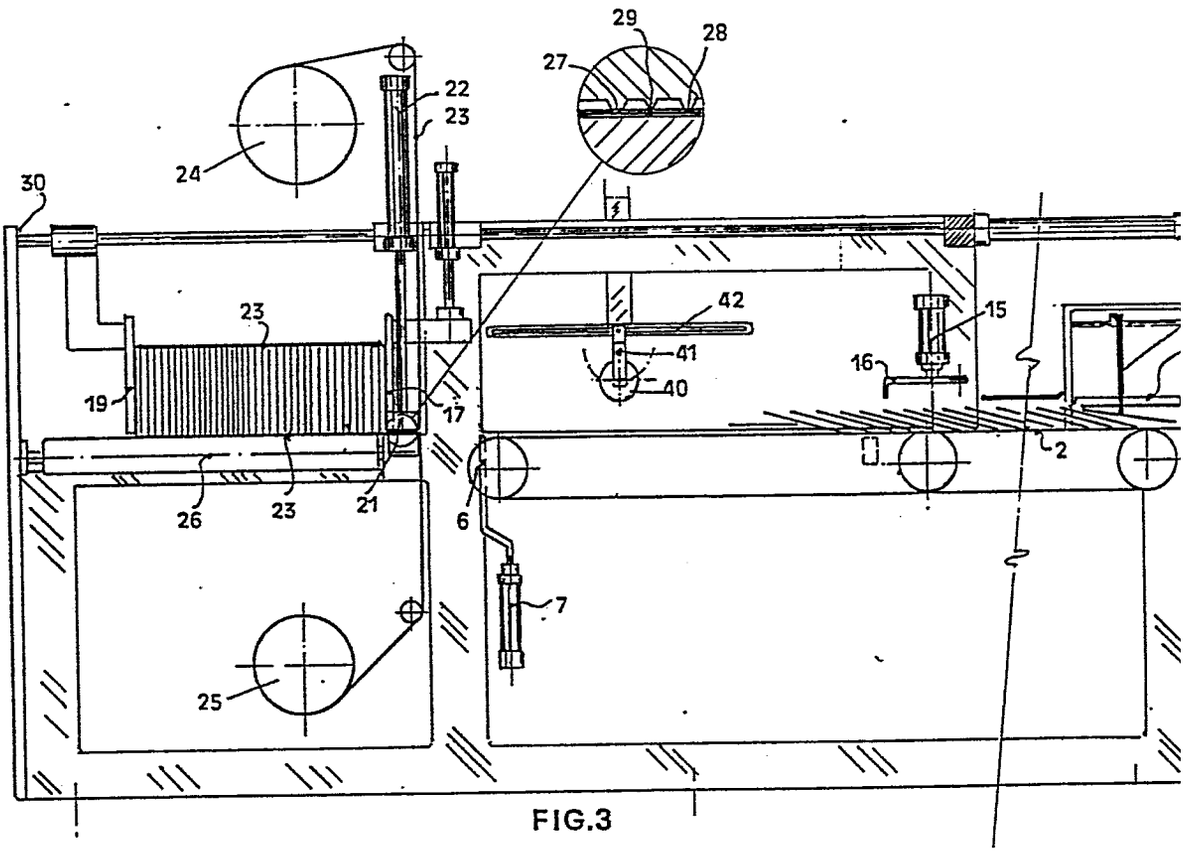

FIG.3

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MACHINE FOR PACKING AND TYING FOLDABLE CASES AND BOXES MADE OF CARD-BOARD OR SIMILAR MATERIALS WITH SELF-ADJUSTABLE SPEED

The present invention relates to a machine, the function of which is that of compacting and then tying, by means of a plastic, thermically soldering film, a pre-determined number of foldable cases and boxes, which will be used for packing food or industrial products in general.

The machine is employed at an advantage if it is connected after a folding/gluing machine, which is already widely used in this line of business and which has the task of folding one or two edges of the boxes and then glues these on the side of the box which is prearranged for this purpose.

With the present invention, a machine has been developed which can be connected after any type of folding/gluing machine, and which, therefore, does not take into consideration the speed of the latter, the size of the boxes and the more or less continuous flow which the feeder machine supplies.

The above-mentioned results have been obtained without any mechanical or electrical connection between the folding/gluing machine and the machine which is the object of the present invention.

The machines known and used at present for the packing purpose in this line of business do not carry out the compacting and the tying of the parcel; they only receive the flattened boxes conveyed by a conveyor belt and arranged in a fish-scale pattern on the horizontal surface and they assemble them edgewise in a vertical position, until a photocell feels that one of the boxes has been previously rearranged in a different position as compared to the others, and the assembling in the vertical sense is halted. At this point, the parcel of boxes which has been formed but not tied, is dropped into an underlying box, having the right dimensions for this purpose, where they will place themselves. If the underlying box is meant to receive several rows of boxes, it will have to be moved to the suitable position after every fall, so as to obtain a complete filling. This need complicates considerably the mechanisms of the packing machine.

On the contrary, with the present invention a machine is realized, which has the maximum flexibility because of the size of the boxes which it can receive, because of the self-adjusting speed of the machine, and because of the fact that no containers are necessary for the storage of the boxes.

In fact, the parcel of boxes which is formed by the machine will be tied by it with a film of thermically soldered plastic film, so that at the end of this working process a parcel of pre-counted and ready-to-be-stored boxes will be supplied.

In actuality, the machine of this invention consists of a first feeding

roller-conveyor arranged in a hortogonal position in relation to the machine on which arrive the flattened boxes, arranged in a fish-scale arrangement, which are coming out of the folding/gluing machine located prior to this machine.

The flow of boxes which arrive on the feeding roller conveyor fall on the working surface of the machine and a new fish-scale arranged flow is created by means of the conveyor belts which are present on the working surface and which are parallel to the longitudinal axis of the machine. A mobile vertical striker which is located at the end of the conveyor belts allows the boxes to assemble vertically until, after a certain pre-selected number has been reached, a barrier which is located in the central area of the machine stops the boxes which keep on coming. The combined action of two mobile forks, one of which is placed at the end of the machine in relation to the soldering area, the other one being placed approximately at the center of the machine, compacts the pre-selected and pre-counted boxes, so as to form a parcel, which is then transferredto the end part of the machine, where it is tied with a thermically retractable film made of plastic material. The machine is also equipped with a sensor which allows it to vary the speed of the conveyor belts and therefore the speed for the formation and the binding of the parcel, according to the flow arriving from the folding/gluing machine. This is done by means of a rod with dandy movement, which is connected with a potentiometer adjusting the conveyor-belt speed. The rod rests on the collector of the boxes which have just fallen on the machine and it feels the height variation due to a higher or lower piling of the underlying boxes and, as a consequence, it causes the speed variation of the conveyor belts and thereby tends to keep at a stable level the pile of boxes which it controls. In this fashion, the production of the machine is made flexible and it is allowed to adjust itself to the flow variations from the preceding m It also allows it to recover, in some cases, abnormal accumulations or to stop in case of lack of feeding.

Another characteristic of the machine is that the feeding roller conveyor consisting of loose rollers can be lengthened by adding some supplementary rollers so that it can be adapted to boxes of different sizes. In fact it is necessary that the boxes fall on the working surface in such a way that the fish-scale arrangement which forms anew has its axis coinciding with the longitudinal axis of the surface of the machine, so that the final tying process also occurs on the axis of the formed parcel.

Another characteristic of this machine is that it is equipped with a mechanism, which at the same time keeps the flow of boxes at a constant

level and counts them. It consists of an rod which is adjustable in height and which terminates with a moulded head, under which a flow of boxes arranged in a fish-scale arrangement passes. The height of the flow is constant. This head is also equipped with a bar which is connected with an impulse counter, which counts the passing boxes.

These and other advantages will be better emphasized by the description of a preferred form of execution, which is given by way of explanation, but which is not limiting and which is illustred in the enclosed drawings, where:

- Fig. 1 represents a schematic view of the machine in its entirety, while the parcel of boxes is being formed; fig. 2 represents a top view of the same.
- Fig. 3 represents a view of the machine, while the soldering process of the parcel by means of a thermically soldered film made of plastic material is being carried out.
- Fig. 4 shows a view of the machine in the direction of its longitudinal axis and from the side where the boxes are introduced, so that the sensor adjusting the speed of the convejor belts is visible.
- Fig. 5 shows the detail of the roller conveyor, which is extensible, according to the size of the boxes.
- Fig. 6 shows the mechanism which maintains the fish-scale arranged flow at an even height and which counts the passing boxes.

From the folding/gluing machine which is placed prior to the machine being the object of this invention, come the boxes, flattened and arranged in a fish-scale pattern, that is tilted on the horizontal plane and parallel to each other and one superimposed on the other slightly joggled. They are conveyed to the roller conveyor 1 and then they fall on the surface of the machine which is indicated with No. 2 in fig. 1. A vertical striker 3, visible in fig. 2 allows the boxes, which form the fish-scale to arrange themselves in a hortogonal position in relation to the direction of flow and to create in turn a second fish-scale flow, as indicated in 4 of fig. 1. In fact, the surface of the machine is equipped with the conveyor belts 5, which cause the forming fish-scale until the latter reaches the striker no.6. Such striker consists of a vertical fork which surfaces from the machine surface by means of a pneumatic cylinder 7.The boxes of the fish-scale, pushed by the conveyor belts (5), change from the tilted position shown in 4, to the vertical position (8), thus beginning the formation of the parcel.

In order to allow an orderly flow of the boxes conveyed in a fish-scale arrangement and, at the same time to to l erate without problems a variable flow at the entrance, two adjusters of said flow are foreseen.

The first element consists of a rod -shaped sensor 9 (fig. 4) which is located immediately below the feeding roller conveyor and which - since it is hinged in 10 - always remains in contact with the boxes of pile 11, which is created by the feeding done by roller plane 1.

Each height variation of this pile changes into an angular displacement of rod 9, which is connected to a potentiometer placed hinge 10; this potentiometer acts by adjusting the speed of conveyor belts 5 of the machine.

In this way, if the height of pile 11 increases, as a consequence the speed of conveyor belts 5 also increases, so that there is a tendency to re-establish a certain optimum height; if, on the contrary, the height of pile 11 decreases, rod 9 will drop, as a consequence, and the new position acquired by potentiometer causes a slow-down of the conveyor belt speed, so as to re-create a pile of the desired height. In the case of lack of feeding, rod 9 will reach its lowest position and cause the machine to stop.

It is obvious that this irregularity in the initial flow of the boxes to the machine would cause in any case a different height in the fish-scale flow, which goes to form the parcel, if this were not prevented by the second adjusting element, which keeps this height at a constant level and makes it easier to count the boxes. Fig. 6 shows this adjusting device 12 which is located after pile 11, and therefore, immediately after the formation of the flow of boxes in relation to the longitudinal axis of the machine.

This device has a height adjustment and can, therefore, be positioned according to the specific need; the form which it takes causes the flow of boxes to maintain a constant height. Device 12 is also equipped with an impulse counter (13), with a small lever (14) which makes it possible to count the passing boxes. When the counting has reached a certain pre-selected number, cylinder 15 (fig.1) causes hook 16, consisting of a "L"-shaped plate, which is suited to forestall the flow of the incoming boxes, to drop. Thus the separation between the boxes which have been counted and have arrived at the compacting step toward fork 6 from the boxes which are still beyond hook 16, is carried out. As soon as hook 16 has dropped and the photocell (45) which is present on the surface of the machine is uncovered, the upper fork 17, operated by a pneumatic cylinder, drops until it skims the working surface.

Immediately afterwards, the piston of the horizontal cylinder 18 springs

into action and pushes fork 17 in such a direction that it will compact the parcel being formed. The compacting process of the boxes in a vertical position is made easier by the presence of two rollers of the type shown in 40 (fig. 1 and fig. 3), which oscillate on hinge 41 and are liable to be positioned, according to the specific need, along the slit in the horizontal rod 42. Simultaneously with the drive which lowers the upper fork 17, the striker formed by fork 6 is lowered and the parcel being formed rests against forefork 19. While fork 17, pushed by cylinder 18, pushes the ready parcel out of the machine, forefork 19 follows this displacement by opposing a certain degree of resistance, because of its connection to cylinder 20 (fig. 2). Such resistance, which can be adjusted and preselected, has the purpose of further compacting the formed parcel. As soon as fork 17 begins the horizontal displacement, hook 16, which had temporarily stopped the fish-scale shaped flow, resumes its lifted position and thereby allows the accumulated boxes to proceed toward the compacting area.

When cylinder 18 has pushed fork 17 to the end of its travel (see fig. 3), the soldering head 21, activated by air-cylinder 22, drops and the soldering process and the cutting of the thermically soldering film made of plastic material are operated simultaneously, while the lower fork 6 goes back up again to receive the new boxes flowing in. In fact the formed parcel is already tied with the film of plastic material: this can be understood if one observes pict. 1 where, next to the parcel being formed, it is possible to see plastic film 23 placed in a vertical position and stretched without interruption between spools 24 and 25; when the formed parcel pushed by fork 17 runs over conveyor belt 26, it drags along plastic film 23 and is tied by it. In the area of operation of soldering head 21 there are, therefore, two overlapping layers of plastic film and the head operates two soldering actions, one on the left and one on the right and at the same time it cuts the two plastic layers at the center. Fig. 3 shows a magnified view of the head and there it is possible to see the two soldering areas (27 and 28) and the cutting area (29). By this operation the head seals the film band around the formed parcel and at the same time it joins the two ends of the spools by the second soldering process: these two ends having being created by the cutting operation performed by the head self.

At the end of these operations the parcel comes out tied and the band has returned to its initial condition, as is seen in fig. 1. While the soldering operation is taking place, fork 17 resumes its lifted position and it runs backwards, until it reaches its starting position, the position i.e. which

is represented in fig. 1. After the soldering process has been completed, cylinder 22 forces head 21 to resume its upper position, and striking fork 19 (see fig. 3) detaches itself from the tied parcel and it runs to the end of its travel, until it reaches area 30, thereby freeing the parcel, which is transported to the unloading area by conveyor belt 26, which is now set in motion.

Conveyor belt 26 (see fig. 2) is placed transversally in relation to conveyor belts 5 of the machine and it can be operated indifferently in one direction or the other, according to where the unloading area is located. After the unloading operation has been performed, conveyor belt 26 stops again and striking fork 19 goes back to the initial position shown in fig 1.

It is worthwhile to point out that the use of spools 24 and 25 containing the thermically soldering plastic film, not only allows the re-joining together of the film after each cutting process because of the special form of the soldering head, but by equal diameters of the spools employed, they also double the autonomy of the machine. Besides, in the case of the boxes of considerable dimensions, as for instance large boxes for detergents, the machine which is the object of the present invention, can receive two soldering heads and four spools of plastic film instead of two and this in order to allow a double tying of the formed parcel. In this case it is possible to provide a direct feeding system of the machine, i.e. with a feeding conveyor parallel to the longitudinal axis of the machine, rather than one placed at 90°, as previously described.

Fig 5 shows in detail the loose-roller conveyor 1 on which the flow of boxes pass before reaching the machine. The possibility of extending this roller-conveyor is obtained by means of a sliding guide in the shapes 31 and 32 where the rollers are placed in relation to the fixed shapes 33 and 34. Other rollers are added through slits 35 and 36 in order to create the necessary continuity of the roller conveyor and the blocking of the two parts of the roller conveyor is done by means of bolts 37 and 38.

CLAIMS

1) A machine for the packing and tying of foldable cases and boxes including a loading roller conveyor (1) having its axis hortogonal in relation to the longitudinal axis of the machine, on which a flow of folded boxes arranged in a fish-scale pattern passes, a horizontal surface on which there is a series of conveyor belts (5) which are parallel to the longitudinal axis of the machine, and a transversal conveyor belt (26) located in the terminal part of the machine, characterized by the fact that the flow of folded boxes overlapping each other in a fish-scale pattern coming from a machine located prior to this machine, passes over the roller conveyor and falls on the conveying surface of the machine hitting against a vertical blade (3) placed on said surface, so as to re-create a similar fish-scale arranged flow with a direction which coincides with the axis of the machine, such flow being transported by conveying belts (5) having an adjustable speed which is self-adjusted according to the incoming flow, so that boxes can accumulate in a vertical position in the terminal part of the machine, which is equipped with a mobile, fork-shaped striker (6); said machine being provided with a barrier (16) which halts the continuous flow, after a certain pre-selected number of boxes has been reached, and afterwards the combined action of a mobile fork (17), which is also mobile and located in the terminal part of the machine, compacts the formed parcel, while the vertical fork (6) withdraws and transfers it to the unloading conveyor belt (26), the subsequent tying of the parcel being made possible by means of a head, which solders a thermically retractible film made of plastic material contained on at least two spools and being the parcel thus tied subsequently unloaded from the machine by means of a mobile conveyor belt (26) placed in a hortogonal position in relation to the axis of the machine.

2) A machine as described in claim 1) characterized by the fact that the speed adjustment of the conveying belts (5) is regulated by a bar-shaped sensor (9), located near the roller conveyor (1) and solidly hinged to a potentiometer which is electrically connected to an adjuster of the conveyor belt speed, said sensor (9) leans against the pile (11) which forms at the beginning of the machine, just after the roller conveyor (1) which introduces the boxes.

3) A machine as described in claim 1) and 2) characterized by the fact that another adjustment of height of the flow of boxes is obtained by means of a device (12) placed on the machine immediately after the first pile collector (11); said device consisting of a bar, the height of which

is adjustable and having a moulded head which creates a slit for the passage of the flow of boxes at a constant level; said head being also equipped with a mechanical or optical sensor connected with an impulse counter which allows the counting of the boxes.

4) A machine as described in the preceding claims, characterized by the fact that it has a soldering head (21), shaped so as to allow simultaneously a soldering process on the right side, one on the left side and a cutting operation at the center, so as to insure the tying of the formed parcel and, at the same time, the re-enstatement of the continuity of the thermically soldering film made of plastic material which is supplied by at least two spools (24 and 25) placed in a vertical position above and below the working surface of the machine.

5) A machine as described in the preceding claims characterized by the fact that it is equipped with two soldering heads instead of one.

6) A machine as described in the preceding claims characterized by the fact that the feeding roller conveyor (1) is made extensible by a sliding guide in the shapes supporting the rollers and by the addition of supplementary rollers which are inserted through two slits (35, 36).

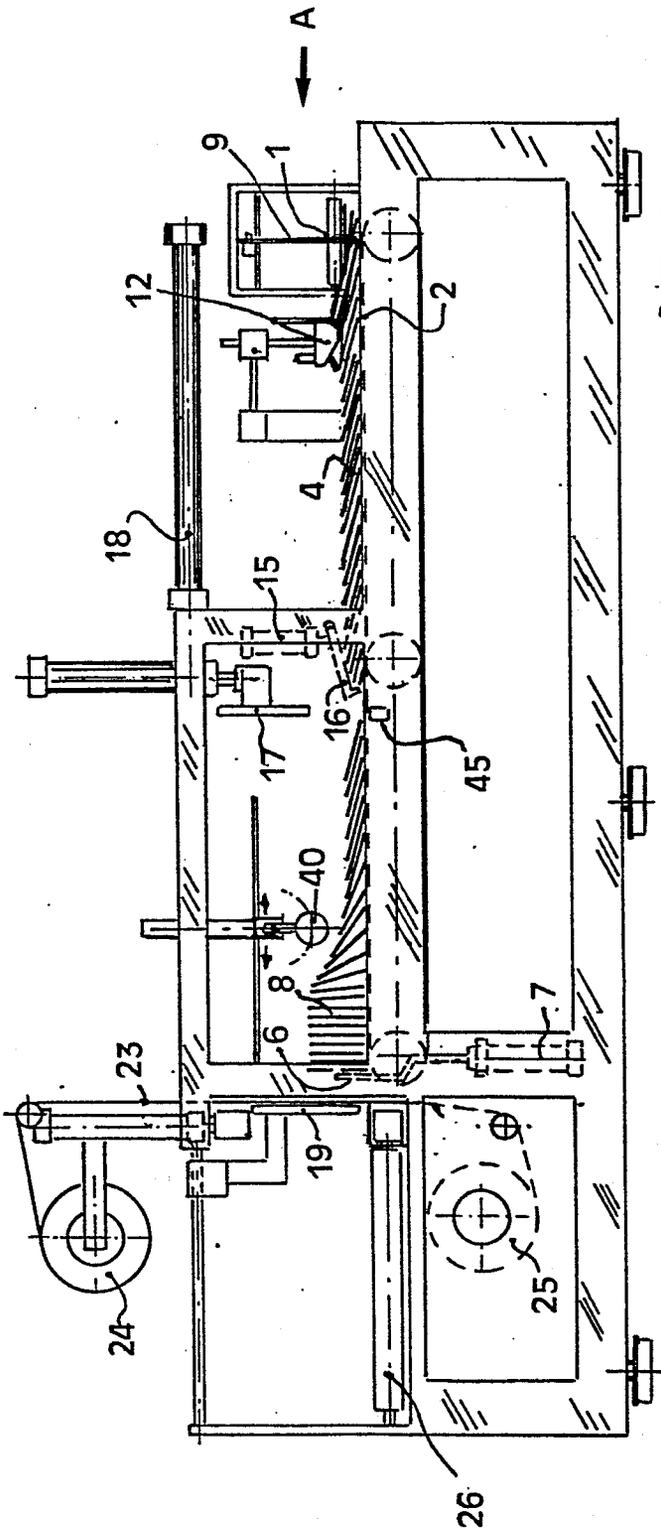

FIG.1

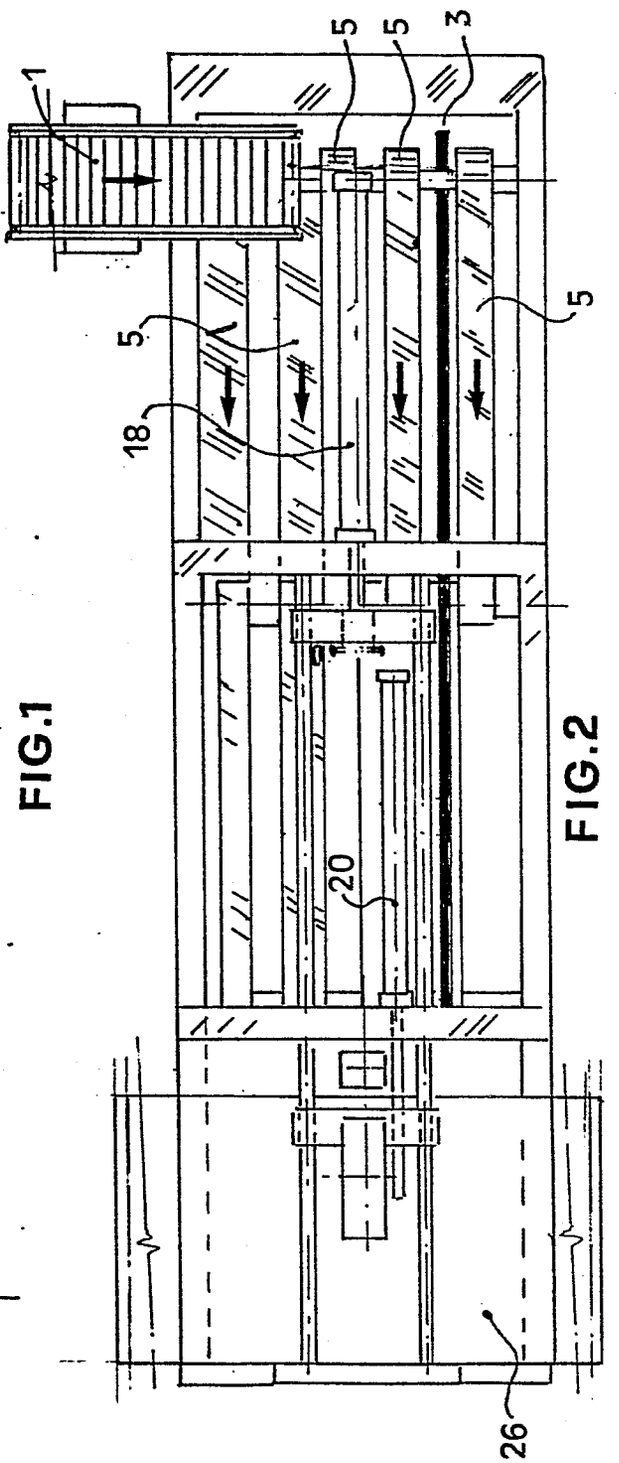

FIG.2

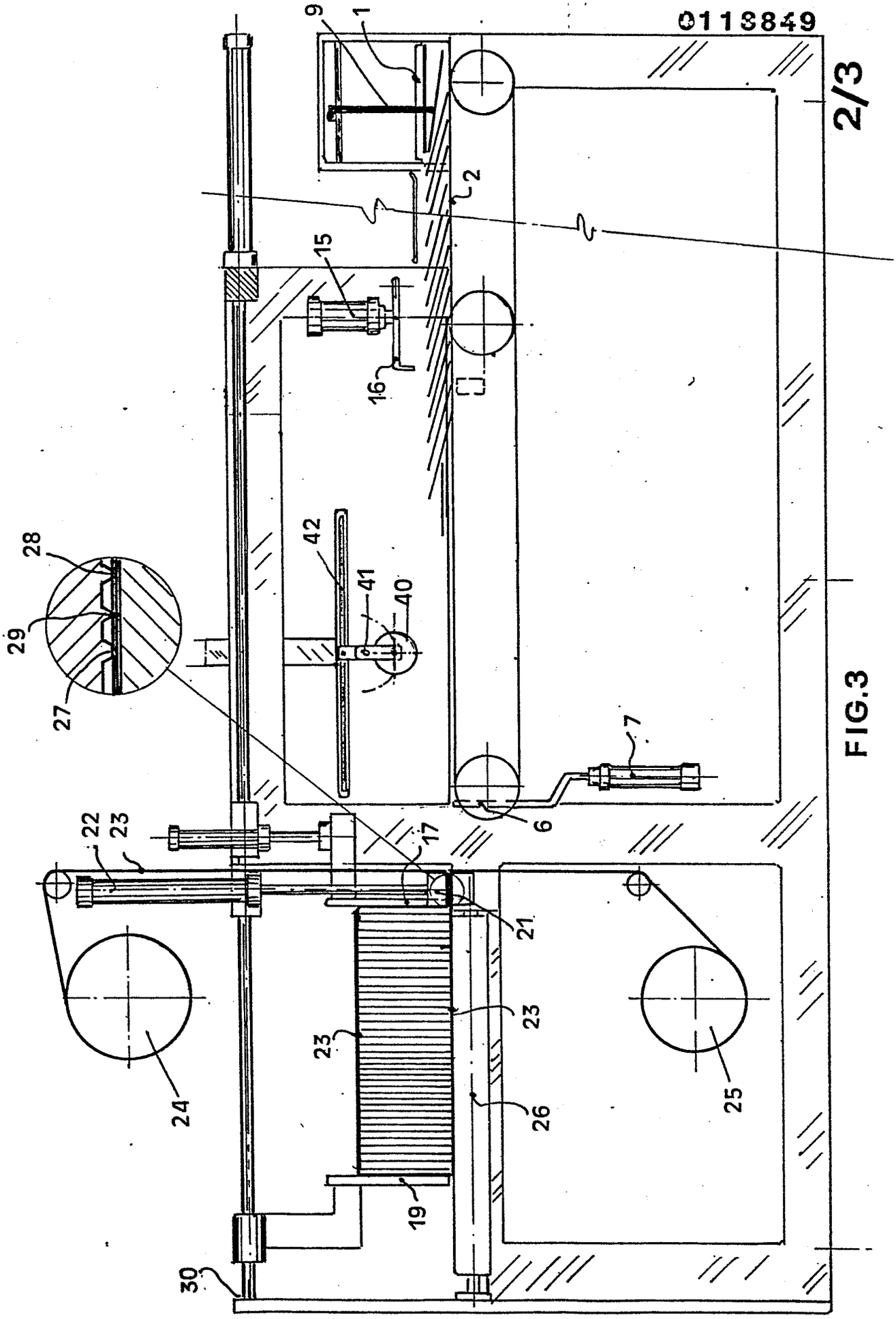

FIG.3

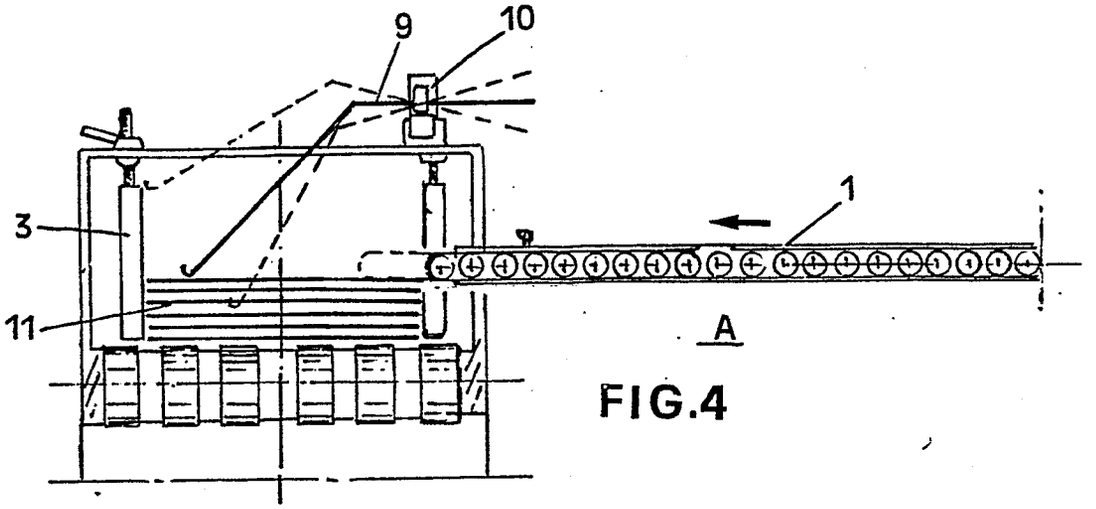

FIG.4

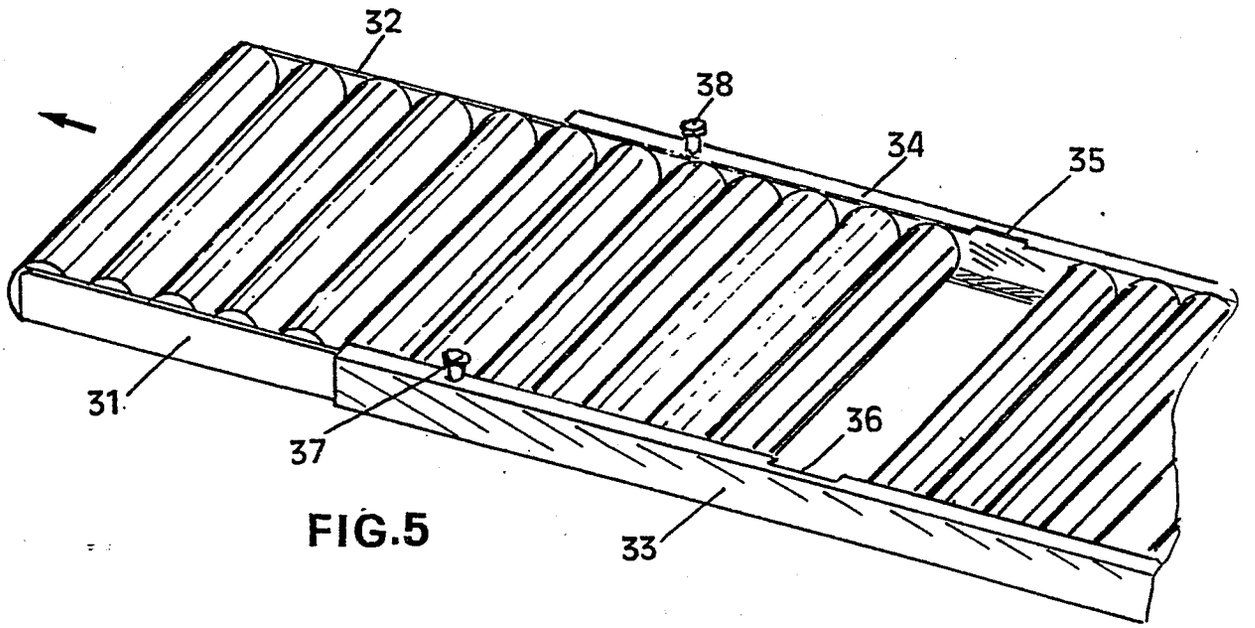

FIG.5

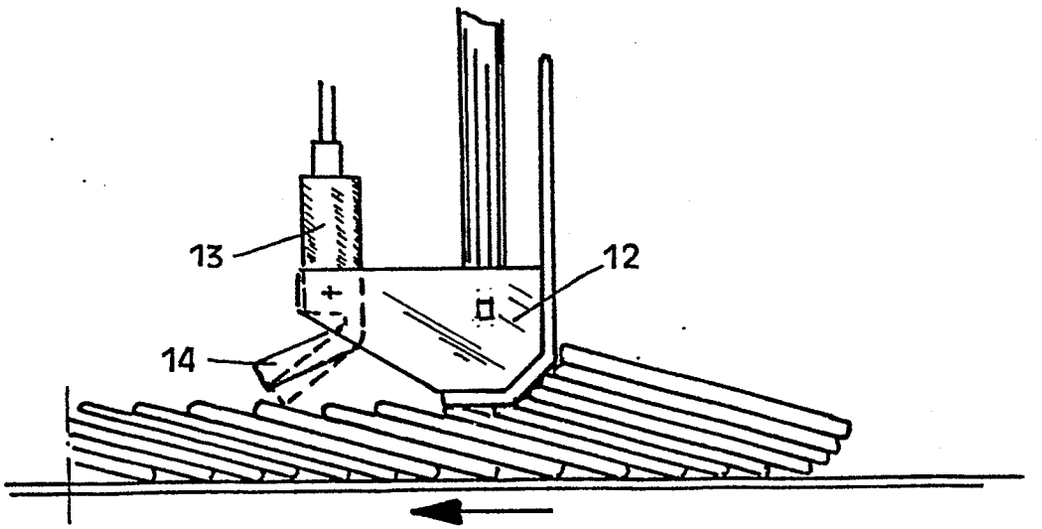

FIG.6

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EUROPEAN SEARCH REPORT

0118849
Application number

EP 84 10 2239

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. ³)
A	DE-B-1 085 409 (HOLWEG) * Column 3, line 45 - column 4, line 5; figures 1,3 *	1	B 65 B 25/14 B 65 H 29/66
A	US-A-3 605 980 (DONAHUE) * Column 3, lines 4-12; figure 1 *	1	
A	FR-A-2 327 926 (WINDMÖLLER & HÖLSCHER) * Page 5, lines 10-39; figures *	1,4	
A	US-A-3 756 591 (MÜLLER) * Column 4, lines 40-62; figure 2 *	2	
A	FR-A-2 343 675 (JAGENBERG) * Whole document *	3	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	DE-A-2 634 216 (MEYER) * Page 21, lines 14-24; figure 1 *	1	B 65 B B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18-06-1984	CLAEYS H.C.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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