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(54) **Unpacking tobacco bales.**

(57) Apparatus for unpacking a tobacco bale which is contained inside a plastic bag within a telescopic cardboard container, the container having a surrounding plastic strap. The apparatus includes (1) a destrapping station having a cutter adapted to ride along the top of the carton to cut the strap; (2) a lifting device for removing the top of the container by gripping it around the upper corners and then moving it away from the bale and collapsing it and (3) a bag removal device which pulls the bag from the bale, after it has been inverted so that the bottom of the bag is uppermost.

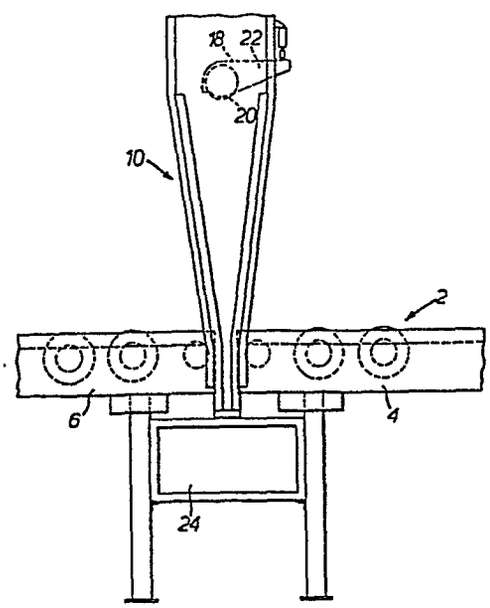

FIG.1.

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"Unpacking Tobacco Bales"

This invention relates to unpacking bales of tobacco as they are delivered to a tobacco processing factory.

The bales are about 1m long and 750mm high and are contained in telescopic cardboard cartons. The cartons are usually held closed by a plastics or metal strap which extends around the top and sides of the carton, maintaining the top and bottom halves of the container properly telescoped together. Inside the container, the tobacco is contained within a large plastic bag.

When the packaged bales arrive at the factory, the strap must be removed and the top half of the box must be slid off. Conventionally, this is done manually but it is of course a very tedious and labour intensive operation when there are a large number of bales to be handled.

Accordingly, the present invention seeks to provide apparatus for unpacking a tobacco bale from a carton, including means for removing a strap from the carton, means for lifting a slidably removable carton from the bale, and also means for removing a plastic bag from the bale, after removal of the carton.

According to a first aspect of the invention, there is provided a device for removing a surrounding plastics strap from a container, comprising a conveyor arranged to convey the container past a destrapping station, the container being positioned, in use, on the conveyor with the strap extending laterally relative to the direction of movement of the conveyor, and the conveyor having a laterally extending gap at the destrapping station; and a cutting device including means for engaging the top of the container and cutting

means for cutting the strap, the cutting device being positioned above the conveyor, whereby in use the movement of the carton past the cutting device causes the strap to be cut so that it falls from around the container, through the said gap in the conveyor.

Preferably, the cutting device comprises a body which is pivotable about a horizontal axis transverse to the direction of movement of the conveyor, and carries a powered rotary cutting or abrading member which rests on the top of the carton so as to engage with the strap as the carton passes the destrapping station.

Preferably, a receptacle is provided beneath the gap in the conveyor, to receive the cut straps, and in addition, guard covers may be provided on either side of the conveyor at the destrapping station, to prevent the strap from flying outwards violently when it is cut, since it is usually tensioned.

According to a second aspect of the invention, there is provided a device for removing and collapsing the top half of a carton constructed from folded sheet material, comprising a vertically movable head member including means for gripping the carton, actuating means adapted to lower the said head member and to engage it with the carton, by means of the gripping means and then to raise the top half of the carton from the bale; and traversing means adapted to move the head carrying the carton away from the bale, and to deposit it at a collapsing station.

Preferably, the carton collapsing station comprises a vertically retractable member having a head adapted to receive the carton with its open side downwards, and to apply outward forces to the walls of the carton, to fold it into a flat condition.

Preferably, the extendable member carrying the head is

adapted to be swung from the vertical position in which it receives the carton, to a horizontal position in which the folded carton can then be removed from the head.

In a preferred arrangement, the carton is removed from the head by extending the ram carrying the head, when it is in its horizontal position, so that an edge of the carton engages with detent means arranged to retain the carton, as the ram is retracted. The ram may then be returned to a vertical position, so that the head can receive the next carton.

After removal of the top half of the carton, the bale may be inverted, so as to present the remaining lower half of the carton to a further carton removal unit of the type described above, so that the bale is then only wrapped in its polythene wrapper.

According to a further aspect of the invention, there is provided a device for removing a polythene bag from a bale of tobacco, after the bale has been inverted so that the bottom of the bag is uppermost, the device comprising a vertically movable head including means for gripping the bag, whereby the head can be moved downwardly to bring the gripping means into engagement with the bag, after which the gripping means can be actuated to engage the polythene and the head can then be retracted upwardly, to pull the polythene away from the bale.

Preferably, means are provided for traversing the head away from the bale to a position in which the polythene is released from the gripping means and falls into a suitable receptacle.

Some embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a destrapping

unit;

Figure 2 is an end elevation of the unit of Figure 1;

Figure 3 is a perspective view of a carton removal unit, and

Figure 4 is a perspective view of a polythene bag removal device.

Referring to Figure 1, the destrapping unit comprises a conveyor unit 2 having two conveyor runs 4 and 6 which are separated by a gap 8 between their facing ends. A framework generally indicated at 10 is mounted above the gap 8 and comprises a transverse beam 12, Figure 2, and a pair of facing box-like structures 14, one on either side of the conveyor run. The box members 14 are open on their inner faces 16, so that they form an enclosure around the region of the conveyor at the position of the gap 8.

A cutting device 18 is mounted on the beam 12, above the conveyor, and carries a rotary cutting blade 20 which is aligned with the centreline of the conveyor. The body of the cutting device is pivotally mounted about an axis 22, which is "upstream" of the centre of gravity of the cutting device, relative to the direction of movement of the bale along the conveyor (indicated by the arrow A on Figure 1).

In operation, when the bale moves along the conveyor in the direction of arrow A, the blade 20 of the cutting device rests on top of the carton containing the bale, and is rotated by an air motor so that it cuts through the strap as the strap passes over the gap 8. Owing to the inherent tension in the strap, it flies outwards after cutting, the ends being restrained by the box structures 14 on either side of the conveyor, and drops down into a receptacle 24 positioned beneath the gap. In this way the straps can be removed from a

number of cartons in succession, without any manual intervention.

The destrapped carton then moves along a continuation of the conveyor 6, to a box removal station. Since the box comprises two telescopic halves, the top half must be lifted from the bale, and the bale inverted for removal of the bottom half of the box, and consequently the box removal station comprises a first unit of the type shown in Figure 3, a "turnover" unit which is not shown, and then a second unit of the type shown in Figure 3 following the turnover unit.

The box removal unit shown in Figure 3 comprises a head 26 which is mounted on a vertically retractable ram 28. The head comprises four diagonally outwardly extending arms 30, each of which carries a vertically extending metal angle piece 32 at its outer end.

Each of the angle members 32 is mounted on a respective sliding member 34 which fits telescopically within the arm 30. A pneumatic ram 36 is mounted on each arm 30, and its retractable member 38 is connected to the member 32 so that the latter can be moved inwardly or outwardly, relative to the arm 30.

The retractable member 28 is mounted on a trolley 40, which runs on overhead rails 42 extending transversely relative to the conveyor 2. A pair of hollow tubes 44 are also connected to the head 26, their upper ends being slidable in the trolley 40, and these tubes carry air lines 46 to a manifold in the head 26, arranged to supply air to the pneumatic rams 36. One of the lines 46 carries air under pressure, whilst the other provides a vent to atmosphere, and the rams 36 may thus be extended or retracted, by suitable setting of control valves in the head 26.

In operation, the de-strapped carton 48

arrives at the box removal unit, and the head 26 is lowered so as to bring the metal angle pieces 32 into position adjacent the top corners of the box. The rams 36 are then retracted, so that the angle pieces 32 engage around the corners of the box. The interior surface of each angle piece 32 carries at least one small sharp protrusion, which is arranged to dig in to the surface of the carton when the respective ram 36 is retracted, so that the top half of the carton is securely gripped by the four angle pieces 32.

The ram 28 is then retracted, so that the upper half of the carton slides free of the bale, and the trolley 40 is traversed along the rails 42, which extend at right angles to the direction of the conveyor, until the top of the carton is above a container receiving station 50.

The container receiving station comprises a pneumatically extendible arm 52 which carries at its upper end a head (not shown) adapted to receive the removed part of the carton 48, from the head 26.

When the head 26 reaches the position at which it is immediately above the receiving station 50, the ram 52 is in its initial, vertical position (not shown), so that its head is directed vertically upwardly, and the carton can thus be dropped onto it. The head of the ram 52 includes a pair of laterally outwardly movable members which are extended after the carton has been deposited on it, so as to engage the corners 54 of the carton, so that it tends to flatten in to a parallelogram shape, as shown in Figure 3, and in order to facilitate this flattening, the head also includes rotary actuators with radial arms which are adapted to push the side and end flaps 56 and 58 outwardly from the top of the box to the position shown on the left hand side of Figure 3.

The lower end of the ram 52 is pivotally mounted so that the ram can be swung outwardly and downwardly to the position shown in Figure 3, and at the same time extended so that the collapsed carton top projects through a framework 60. The ram 52 is brought down to an almost horizontal position, at which the extended head carrying the carton projects right through the framework 60, and the ram is then retracted so that the trailing edge 62 of the container (whose general position is arrowed in Figure 3) is trapped behind the lower horizontal member 64 of the framework 60. The flattened carton tops will therefore be deposited on a stack in the position generally indicated at 66 in the Figure, on the opposite side of the framwork to the ram 52.

When the top half of the carton has been removed, the top surface of the bale is left with loose folds of polythene over it, which comprise the open end of the large polythene bag in which the bale is wrapped before it is placed in the carton. At this stage, therefore, to facilitate further unpacking of the bale, the loose edges of the bag are pulled manually away from the top of the bale, and folded down around the outside of the side walls of the bale. The bale is then moved into a turnover unit, not shown, so that it is inverted and then passed to another box removal unit identical to that shown in Figure 3, in which the lower half of the carton is removed.

The bale then proceeds to a bag removal station which is of the form shown in Figure 4. The apparatus of Figure 4 includes a head 68 which is mounted in the same way as the head 26 of Figure 3, on a trolley 70 which can be traversed on a rail structure 72. The head 68 is connected to the trolley by a retractable ram 74 which can be extended and retracted

pneumatically, so as to raise and lower the head 68, and the head is connected to the trolley 70 by a pair of hollow columns 76 carrying air lines 78 which are arranged similarly to the air lines 46 of Figure 3.

The head 68 is generally elongate in shape, extending in the direction of movement of the conveyor 6, and has a tranversely extending beam 80 at each end. Each of the beams 80 carries a pair of slidable carriages 82 which are movable towards and away from the centre of the beam as indicated by the arrows A. A pneumatic ram 84 is mounted with its cylinder portion fixed to one of the carriages 82, and the outer end of its piston 86 connected to the other carriage 82 of the pair, so that extension of the ram causes the two carriages to move apart towards the opposite ends of the beam 80, whilst retraction of the ram causes them to move together.

The lower surface of each carriage 82 carries a block 86, and the undersurfaces of the blocks, and their facing surfaces 88 are covered with a flexible rubber material, which is adapted to provide the block with a high friction surface. One suitable material is that described as a 5/16 inch thick anti-vibration pad supplied by Messrs. Vulcascot Ltd., 43, Wales Farm Road, London W3. This material has deep corrugations on its surface, which are arranged in use, so that they extend parallel to the direction of the conveyor 6, that is to say, tranversely to the direction of movement of the carriages 82.

When the bale reaches the position at which the bag is to be removed, it has already been inverted, as noted above, so that the bottom of the bag is uppermost. In operation, the pneumatic rams 84 are first extended so that the blocks 86 are moved outwardly by the carriages 82, so that there is a wide gap between

the facing surfaces 88 of the blocks. The ram 74 is then extended, bringing the head 68 downwards so that the lower surfaces of the blocks 86 contact the outer surface 88 of the polythene.

The rams 84 are then retracted, so that the blocks 86 move inwardly towards the central area of the bale, and because of the frictional material on their lower surfaces, they gather the polythene of the bag inwardly, so that it is trapped between the facing surfaces 88.

The ram 74 is then retracted slowly, pulling the bag away from the bale, and the trolley 70 is then traversed along the rail 72 until it is positioned above a receptacle 90. The rams 84 are then actuated once again so as to move the blocks 86 apart, releasing the polythene so that it is deposited in the receptacle 90. The trolley can then be traversed back to its initial position, ready to operate on another bale.

CLAIMS

1. A device for removing a surrounding plastics strap from a container, comprising a destrapping station, a conveyor (2) arranged to convey the container past the destrapping station, with its strap extending laterally relative to the direction of movement of the conveyor; a laterally extending gap (8) in the conveyor at the destrapping station; and a cutting device (18), the cutting device including means for engaging the top of the container and cutting means (20) for cutting the strap, the cutting device being positioned above the conveyor, whereby in use the movement of the carton past the cutting device causes the strap to be cut so that it falls from around the container, through the said gap in the conveyor.

2. A device for removing a surrounding plastics strap from a container according to claim 1 in which the cutting device comprises: a body (22) which is pivotable about a horizontal axis transverse to the direction of movement of the conveyor, and a powered rotary cutting or abrading member (20) mounted on said body and adapted to rest on the top of the carton in use so as to engage with the strap as the carton passes through the destrapping station.

3. A device according to claim 2 further comprising a receptacle (24) positioned beneath the gap in the conveyor, to receive the cut straps; and a guard cover (14) on each side of the conveyor at the destrapping station, to prevent the strap from flying outwards when it is cut.

4. A device for removing and collapsing the top

half of a carton constructed from folded sheet material, comprising: a vertically movable head member (26); means (32) for gripping the said carton; actuating means (28, 30, 34, 36) adapted to lower the said head member and to engage the gripping means with the carton and then to raise the top half of the carton from the bale; and traversng means (40, 42) adapted to move the head carrying the carton away from the bale, and to deposit it at a collapsing station (50).

5. A device according to claim 4 in which the carton collapsing station comprises a vertically retractable member (52); a head mounted on said retractable member and adapted to receive the carton with its open side downwards; the said head being further adapted to apply outward forces to the walls of the carton, to fold it into a flat condition.

6. A device according to claim 5 in which the retractable member is adapted to be swung from the vertical position in which it receives the carton, to a horizontal position in which the folded carton can then be removed from the head.

7. A device according to claim 6 in which the carton collapsing station further comprises detent means (64) adapted to engage an edge of the carton, whereby the retractable member (52) can be retracted to leave the carton at the collapsing station.

8. A device for removing a polythene bag from a bale of tobacco, after the bale has been inverted so that the bottom of the bag is uppermost, the device comprising a vertically movable head (68) including means (80-88) for gripping the bag, whereby the head can be moved

downwardly to bring the gripping means into engagement with the bag, after which the gripping means can be actuated to engage the polythene and the head can then be retracted upwardly, to pull the polythene away from the bale.

9. A device according to claim 8 further comprising means (70, 72) for traversing the head away from the bale to a position in which the polythene is released from the gripping means and falls into a suitable receptacle.

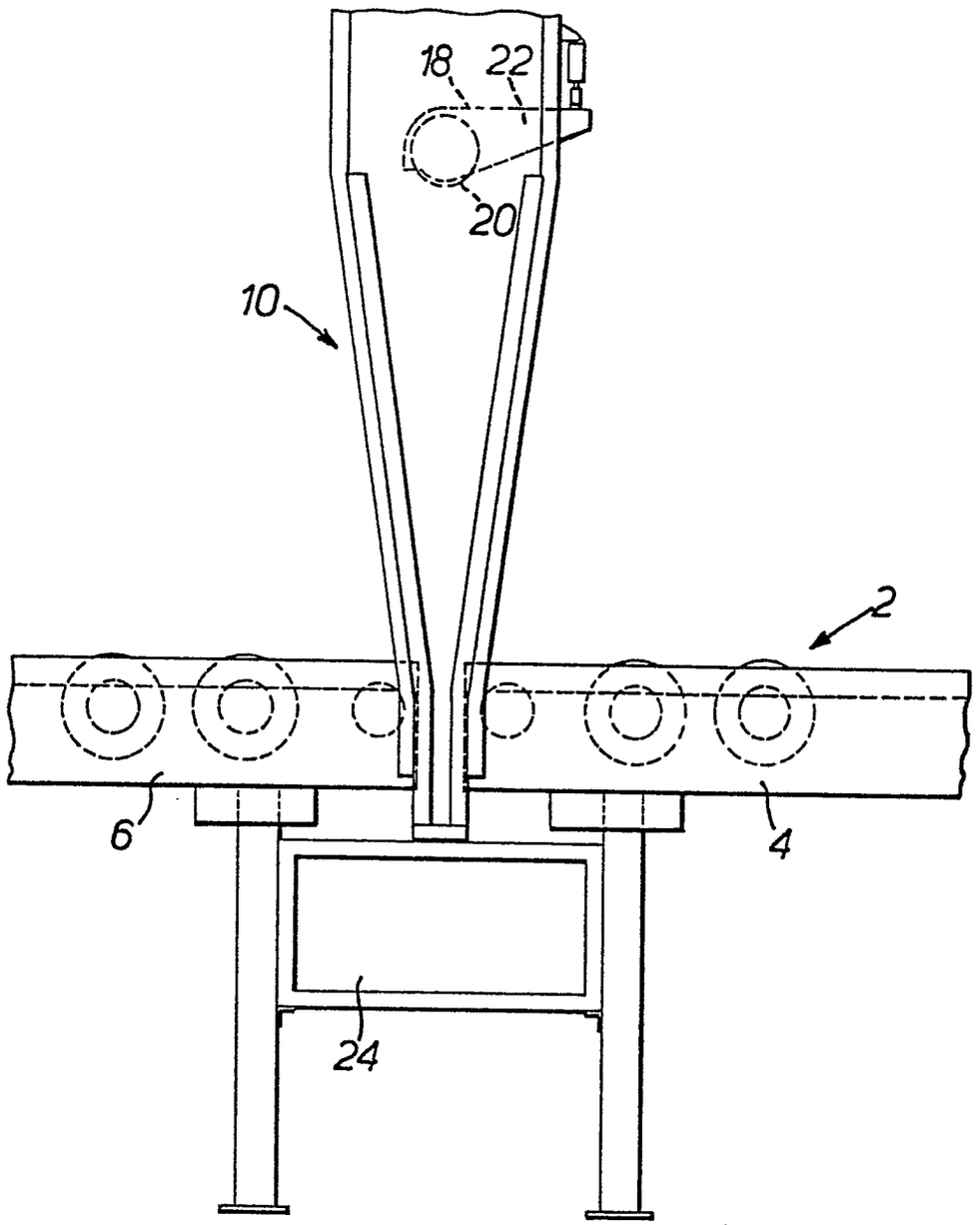

FIG.1.

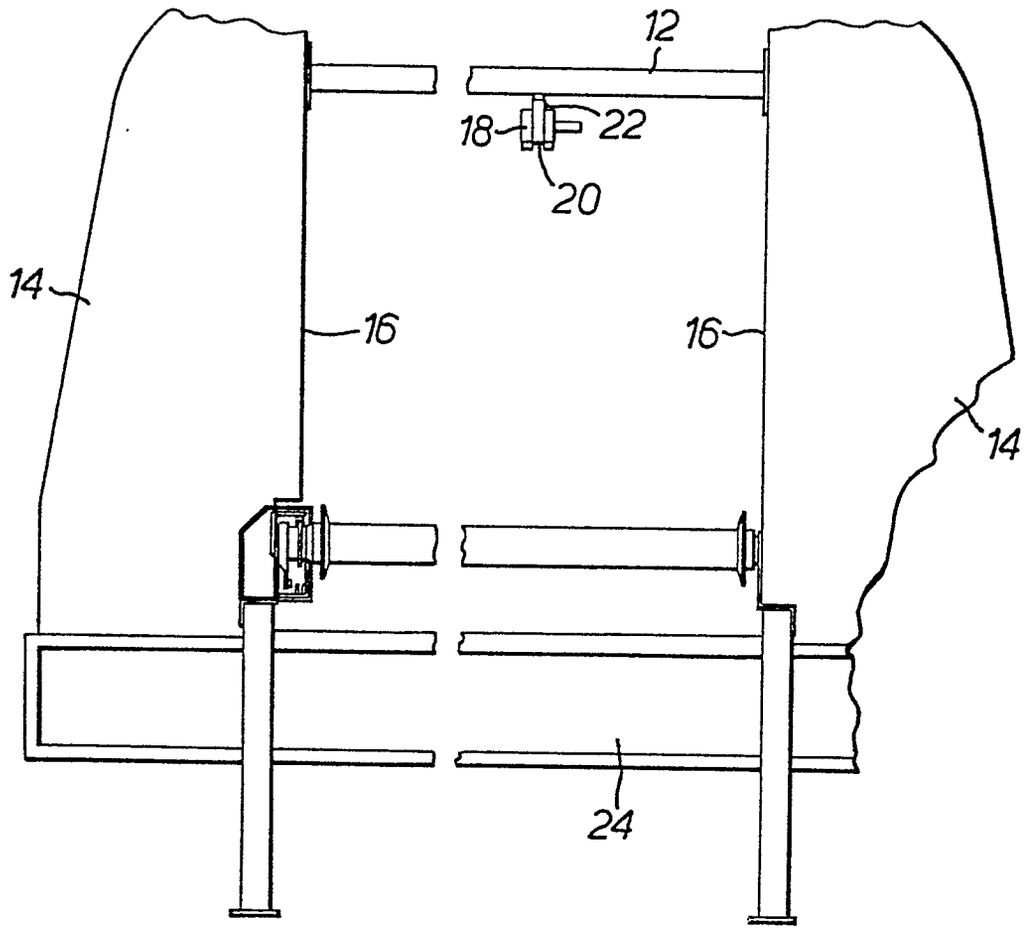

FIG.2.

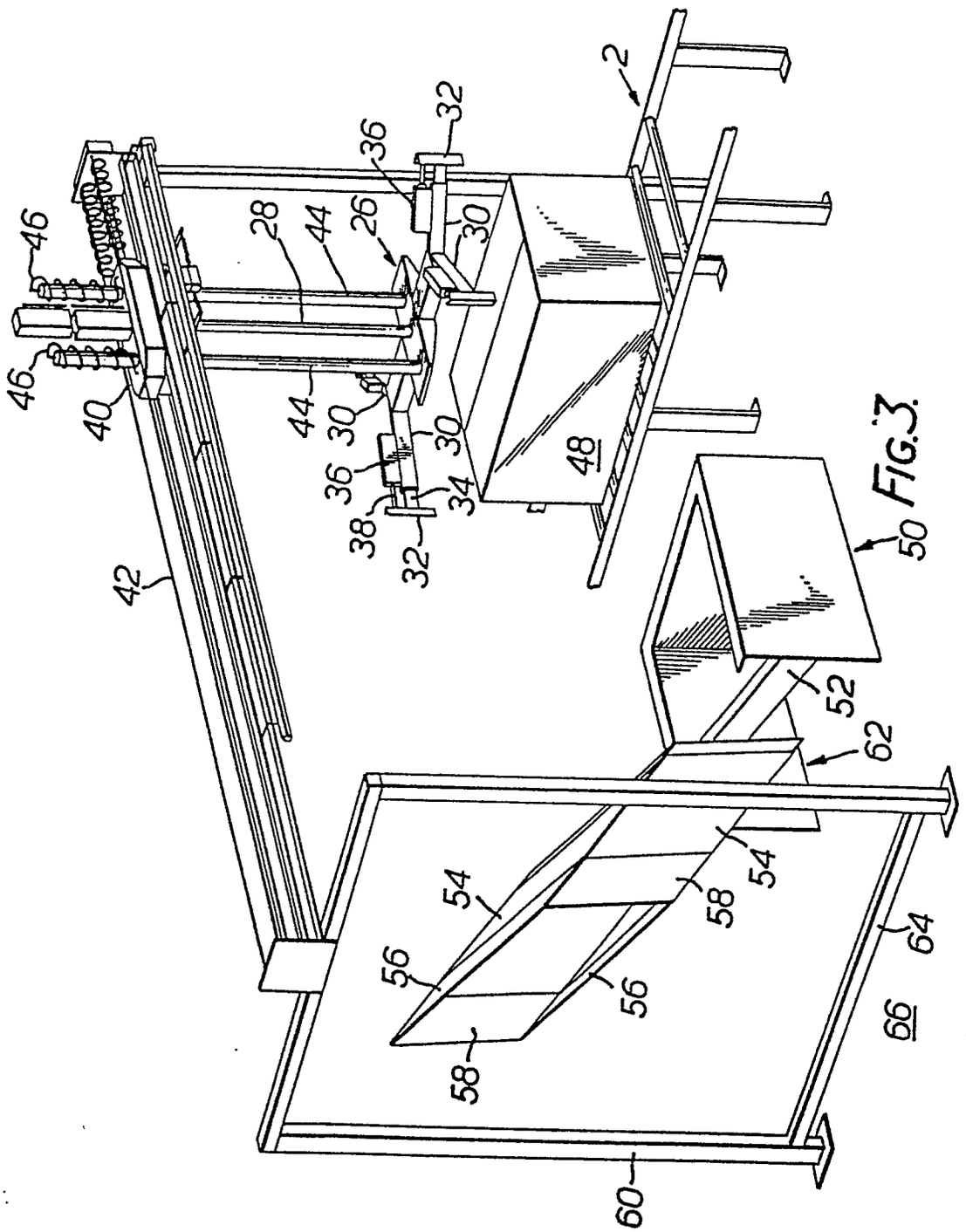
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FIG.3.

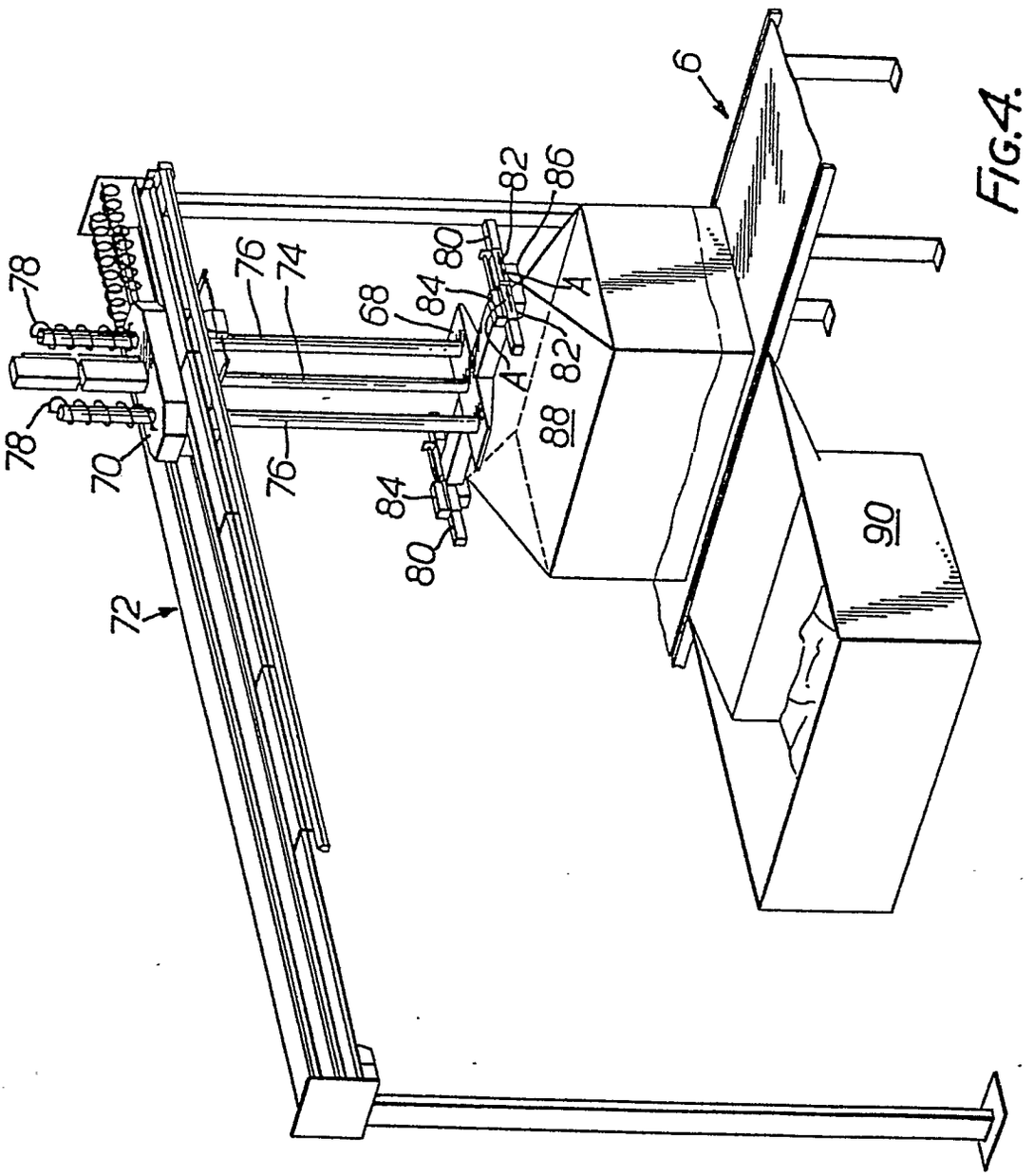

FIG.4.