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54 **Handling apparatus.**

57 Apparatus for handing and folding articles, especially pairs of socks, comprises conveyor means (13) for presenting the articles in sequence to a folding station (14), folding means for folding the articles across a notional transverse line, holding means for holding first and subsequent folded articles in face to face relationship, means for presenting a folded rider card to said folded articles, means for gripping said card and articles together, and means for securing said rider card to said articles.

The various operational means may be disposed at stations around a carousel mechanism.

The invention also includes a pick and place mechanism for withdrawing rider cards from a stack thereof and folding them about predetermined fold lines.

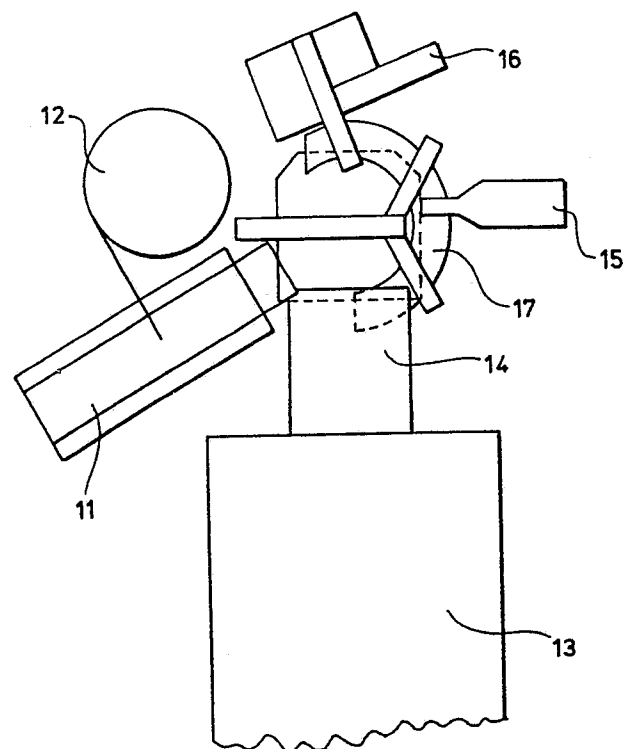


FIG 1

EP 0 373 774 A2

## HANDLING APPARATUS

This invention relates to handling apparatus especially for packaging articles, such as items of clothing or other articles made from filamentary or fabric material, in pairs or other multiples of unity for sales display purposes.

It is frequently desired by retailers to offer for sale multiple items of clothing in unitary packaging. Whereas some items of clothing may be merely bundled into pouches or bags for display purposes, other items are generally folded and suspended from a suitable hanger on a display rail. Such items include socks, pairs of which may be required to be folded and attached in twos held face to face by a rider card, which typically gives information relevant to the price, quality, material or other property of the product and which includes a hook or other means for suspension thereof from a display rail.

It is an object of the present invention to provide apparatus for automatically handling socks or other items of clothing or household goods so that they become folded and attached to a rider card, for suspension display purposes.

According to the invention, apparatus for article folding and handling comprises conveyor means to present the articles in sequence to a folding station, folding means to fold the articles across a notional predetermined transverse line, holding means to hold first and subsequent folded articles in face to face relationship, rider card presentation and gripper means, and means to secure the rider card to the articles.

Preferably the various operational means are disposed at stations around a carousel mechanism. Thus, the folding, holding, and presentation and gripper means may be carried out at a first station; rider cards may be supplied from another station and secured in place, preferably by stitching, at a third station, while a fourth station may be for final delivery and removal of the packaged articles.

The mechanism for performing at least the rider card gripping operation may be pivotably supported on a horizontal axis so that the articles and rider cards are held vertically up to and including card presentation and gripping and are caused to pivot to a horizontal position, on indexed rotation of the carousel mechanism, for presentation to the securing means. One way of causing the pivoting is to equip the carousel chassis with a raised camming formation between the first station and stitching station, the formation engaging the distal end region of the gripper means as the carousel moves to the stitching station, thereby deflecting it from the vertical to the horizontal position.

The apparatus is particularly intended for fold-

ing and handling pairs of socks which are presented flat and already paired on the conveyor. The folding means preferably comprises a vertically-disposed rectangular plate with a groove or channel section formed in its upper edge, the plate moving in a vertical plane parallel with the direction of movement of the conveyor and upwardly from beneath the plane of the conveyor, the upper edge of the plate contacting the socks about the notional transverse line so that the end regions of the socks at each side of the line fall under gravity against respective sides of the plate, whereby the socks assume an inverted "U" suspended from the upper edge of the plate. The holding means in this embodiment preferably comprises a finger which moves longitudinally within the groove in the plate, thereby to lie immediately beneath the inverted "U" of the socks, so that the plate may be retracted to leave the socks suspended from the finger. The finger may then be displaced to one side to allow a second pair of socks to be brought by the plate from the conveyor to the folded condition adjacent the first pair, and a second finger may extend within the groove to support the second pair of socks, and so on, until the desired number of pairs for ultimate attachment to a rider card are suspended on fingers in face-to-face relationship.

Rider cards are supplied pre-printed at a printer station and flat with perforations or score lines defining where the cards will be folded so that the ends of the card form ears which extend from a central bridging part. Generally, the bridging part will include a slot which accommodates a hook. The rider cards are preferably supplied individually from a stack to a hook attachment station and thence are presented to the socks by means of a pick and place/card folding mechanism which forms another aspect of the present invention. According to this aspect of the invention, a pick and place mechanism for withdrawing and folding rider cards comprising a central bridging part and ears which extend outwardly therefrom, the extent of the bridging part and ears being defined by fold lines, comprises jaw members for gripping the sides of the bridging part of the rider cards, the jaw members being mounted on a block which is moveable vertically relative to and between lateral plates, whereby the plates cause the ears to be deflected and bent along the fold lines. Preferably the block includes a cut-away portion to receive the hook of the card; to enable each card correctly to assume the desired position relative to the mechanism, the cut-away portion is preferably provided with a sloping face against which the hook lies.

Individual rider cards are transported by the pick and place mechanism to where the socks are held by the suspension fingers, as already described. The fingers are preferably caused to move towards one another in readiness to receive the rider card, which is positioned over the socks and moved downwards relative to the socks so that the ears of the rider card are positioned respectively on each side of the socks with the apex of the inverted "U" described by the socks located beneath the bridging part of the rider card. Gripper bars are then preferably positioned adjacent the tail ends of the ears of the rider cards; the gripper bars then move towards each other whereby they clamp on the external surface of the rider card and grip the socks therebetween. The suspension fingers may then be withdrawn.

In the next stage, the carousel is advanced to the securing station, preferably causing the gripper bars to tilt so that the suspended socks and rider card are pivoted from a vertical orientation to a substantial horizontal orientation. The rider card is secured, preferably stitched, in position at the securing station, according to methods known in the art, and the gripper bars may then be withdrawn and the carousel advanced so that the socks are positioned at a delivery/removal station.

The location of the hooks in the rider cards is performed by apparatus according to yet a further aspect of the invention. According to this aspect, apparatus for separation of the end hook from a row thereof suspended on a rod and presentation thereof to a laminar support having a receiving slot formed therein comprises an eccentrically-mounted roller having a peripheral groove defined by flanges, the inner flange having a cut-away portion at a first circumferential position and the outer flange having a cut-away portion at a second circumferential position, the base of the groove defining a rising camming surface between the first and second positions, whereby the end hook has access to the groove via the cut-away portion of the inner flange at the first position and on rotation of the roller is separated from the adjacent hook by the inner flange, the camming surface causing the hook to be progressively tilted on the rod until at the second position the hook is disengageable from the rod and has egress from the groove via the cut-away portion of the outer flange, from whence it may be removed for presentation to the slot in the laminar support.

In general, therefor, apparatus according to the invention comprises, in combination, means for printing pre-cut rider card blanks including a slot formed therein; means for feeding individual hooks to individual printed rider cards for insertion of the hook into the slot; pick and place and folding means for removing and folding rider cards com-

plete with hooks to an article folding/holding station at which articles are supplied sequentially, folded and held in pre-determined pluralities in face-to-face relationship; means to engage and secure respective said rider cards with respective said pluralities of articles; and means for delivery of said articles attached to rider cards to a removal station.

The bridging part of the rider cards may be selected from various widths, according to the thickness and number of pluralities of articles to be held. The required width is programmed in at the printing station which preferably transmits the information to adjust the height of the carousel table to accommodate the various widths at the securing station.

The entire apparatus is numerically-controllable and driven by pneumatic piston/cylinders, stepper motors and the like, as commercially available.

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

Figure 1 illustrates diagrammatically a floor plan of apparatus according to the invention for handling pairs of socks;

Figure 2 illustrates diagrammatically viewed from above the operating components of the folding, holding and gripping functions of the apparatus of Figure 1;

Figure 3 illustrates an exploded side elevation of a pick and place mechanism according to the invention; and

Figure 4 illustrates the operation of a hook placement apparatus according to the invention.

Referring first to Figure 1, the apparatus consists of a rider card printer 11, a hook feeder mechanism 12, a conveyor 13 for conveying pairs of socks to a sock folding and holding station 14 at which rider cards are also presented to the folded socks, a stitching station 15 and a removal/delivery mechanism 16. The apparatus operates on the carousel principle and an arcuate track 17 extends from the folding and holding station to the removal/delivery mechanism. The track is engaged by a roller mounted on the distal end of the sock holding mechanism which is pivotally suspended from the upper end thereof, and the track rises between the folding and holding station and stitching station to provide a camming surface, whereby the sock holding mechanism is caused to pivot from a vertical orientation to a horizontal orientation for presentation to the stitching table.

Referring to Figure 2, the essential parts of the folding and holding mechanism are shown. Pairs of socks 21 are delivered in sequence on conveyor belts 22. When the leading sock reaches the position represented by socks 23, a vertically-disposed rectangular plate 24 with its upper edge formed as a groove defined by walls 24A is raised from its

position below the plane of the conveyor and between the two central conveyor belts to contact the socks about a notional fold axis (coincident with the centre line 25 of the mechanism), whereby on continued elevation of the plate 24 the socks are completely removed from the conveyor and suspended from the plate with the toe ends and calf ends hanging on respective sides of the plate.

A pair of fingers 26 and 27, in the form of rectangular-section bars, sized to slide within the groove formed in the upper edge of the plate 24 and positioned at a height to coincide with the groove when the plate is in the raised position, are attached via brackets 28, 29 to the pistons of respective operating cylinders 30, 31 for movement between an extended position, as represented by finger 26, an intermediate position, as represented by finger 27, and a fully-retracted position, not shown. The cylinders 30, 31 are carried for independent lateral movement by an overhead gantry, not shown, lateral movement being controlled by detent cylinders 32, 33. The lateral movement of the cylinders 30, 31 causes the fingers 26, 27 to be brought into alignment with the vertical plane containing the centre line 25, to be displaced to either side, as shown, or to move towards one another.

A pair of gripper fingers 34, 35 are disposed below and on each side of the fingers 26, 27. The gripper fingers are attached to cranked arms 36, 37 which are pivotally-mounted and connected via link rods 38, 39 to an operating cylinder 40, whereby the gripper fingers may be caused to perform simultaneous movement towards or away from each other. The cylinder 40 and the assembly of gripper bars and link rods are carried on a bracket 41 which is pivotally mounted on the carousel turntable to enable the bracket to swing about a horizontal axis which, in the position shown in Figure 2, coincides with the vertical plane containing the centre line 25. The bracket is fitted with a roller at a lower corner (obscured by arm 37) to engage with the arcuate track 17.

In use, the holding and gripping mechanism works as follows: the finger 26 in the intermediate position is moved by detent cylinder 32 into alignment with the groove in the plate 24, already carrying a pair of socks as hereinbefore described. The finger is then moved by cylinder 30 to the extended position, so that the finger slides into the groove formed in the plate 24. The plate is then retracted to its position beneath the plane of the conveyor, ready to receive the next pair of socks, leaving the first pair suspended from the finger 26. This finger is then displaced laterally to the position illustrated in Figure 2, and the process is repeated with the next pair of socks and finger 27, to result in the two pairs suspended respectively in face-to-

face relationship from the fingers 26 and 27. The fingers are then caused to move laterally towards one another and are withdrawn to the intermediate position between the gripper fingers 34, 35.

At this stage a rider card is presented to the socks, as more fully described hereinafter with reference to Figure 3, and the gripper fingers are caused to move towards one another to grip the lower ends of the tails of the rider card to the socks, whereupon the fingers 26 and 27 may be withdrawn to the fully-retracted position to allow the gripper fingers with the rider card and socks clamped therebetween to be indexed by a stepper motor in the direction of the arrow to the stitching station. A further assembly of gripper fingers and associated parts 34 - 41 simultaneously arrives in position to receive the next two pairs of socks and rider card at the first station.

Referring now to Figure 3, a pick and place mechanism for handling rider cards is shown in an exploded condition. The mechanism consists of two principal inter-related pairs: a beam member 42 and a block member 43. The block member 43 has upstanding rods 44 which are slidably engaged within corresponding holes 45 formed in the beam; compression springs 46 are carried by the rods to bias the beam and block apart, stops being provided at the upper ends of the rods to prevent total disengagement. The beam is provided with depending side plates 47 with their inner-facing surfaces being chamfered at their lower ends 47A.

The block member 43 has pivotally attached at its lower corners jaw members 48 controlled by pistons 49 of cylinders 50, attached to horns 51 extending from the rear of the jaw members via ball and socket joints. The jaws are pivotal between an open position, shown in dashed outline, and a closed position, shown in solid outline, and are biased to the closed position. An offset central section of the block member is formed in its front face with a recess 52 which has an outwardly-sloping face.

In use, the mechanism is positioned over a pre-printed rider card with a hook attached to the central bridging part thereof, the card being flat but having perforation or fold lines separating the ears from the bridging part. The mechanism is then lowered so that the hook assumes a position as shown at 53 within the recess 52 and resting against the sloping face and the jaw members are automatically displaced towards the open position by contact between the lower sloping faces thereof and the edges of the bridging part 54 of the card, until they snap-engage beneath the card as shown at 55. At this stage, the ears of the card extend on each side out of the plane represented by the drawing, and the base 56 of the hook member extends below the card and at a slight angle to the

said plane.

On further lowering the mechanism, the beam member 42 is caused to move downwardly relative to the block member, against the pressure exerted by springs 46, so that the side plates 47 contact the upper surfaces of the ears of the rider card and, facilitated by the chamfered surfaces 47A, fold the ears downwardly about the pre-formed perforations or fold lines, to the position represented by 57 in the drawing. It will be understood that at this stage the block member is located between the side plates and close under the lower surface of the beam member, the lower ends or tails of the ears of the rider card extending below the side plates.

With the rider card thus folded and supported, it is transported to the position of presentation to the folded socks on the fingers 26, 27, whereupon the gripper fingers 34, 35 can clamp the tails of the ears of the rider card and the socks together, allowing the fingers 26 and 27 to be withdrawn and the pick and place mechanism to be released by retracting the jaw members to the open position.

Referring now to Figure 4, a hook selection and placement apparatus includes a roller 58 having an eccentric axis of rotation 59. The roller is formed with a peripheral groove the base of which is indicated 60 and is defined by an inner flange 61 and an outer flange 62. In Figure 4, the roller is thus viewed from the side of the inner flange, which has a cut-away portion 63 to receive the end-most hook 64 into the groove from a supply of such hooks suspended from a rod 65. The outer flange 62 has a cut-away portion 66 to allow egress of the hook from the groove.

Figure 4A shows the access or receiving position of the roller. On rotation of the roller in the direction indicated by the arrow, the eccentric axis of rotation causes the base of the groove to act as a progressively-rising camming surface which causes the hook, still suspended from the rod but separated from the next adjacent hook by the inner flange 61, to tilt until the position represented by Figure 4B is attained at which the hook is ready to fall from the rod and has egress from the groove via the cut-away portion 66 in the outer flange. The hook in this position is received by a cradle (not shown) and presented to a rider card transported from the printing station, the card including a slot to receive the hook up to the shoulders of the body portion.

## Claims

1. Apparatus for article folding and handling comprising conveyor means for presenting the articles in sequence to a folding station, folding means

for folding the articles across a notional transverse line, holding means for holding first and subsequent folded articles in face to face relationship, means for presenting a folded rider card to said folded articles, means for gripping said card and articles together, and means for securing said rider card to said articles.

2. Apparatus according to Claim 1, in which various of the operational means are disposed at stations around a carousel mechanism.

3. Apparatus according to Claim 2, in which the gripping means is pivotably supported for movement about a substantially horizontal axis so that on rotation of the carousel mechanism the articles and rider cards are caused to pivot from a substantial vertically-held position to a substantial horizontal position for presentation to the securing means.

4. Apparatus according to Claim 3, in which the carousel chassis is provided with a rising camming track between said gripping means station and said securing station whereby the gripping means is deflected by contact with the camming track on movement of the carousel mechanism.

5. Apparatus according to any preceding claim, in which the folding means comprises a substantially vertically-disposed plate, the plate being movable vertically from beneath the conveyor means to lift articles from the conveyor means folded about the notional fold line.

6. Apparatus according to Claim 5, in which the holding means comprises a finger which is longitudinally slidably insertable within a channel formed in the upper edge of the plate, whereby the plate may be retracted to leave the folded article suspended from the finger.

7. Apparatus according to any preceding claim, further including a hook attachment mechanism for removing an end hook from a suspended row thereof for presentation to a rider card, the mechanism comprising an eccentrically-mounted roller having a peripheral groove defined by flanges, the inner flange having a cut-away portion at a first circumferential position and the outer flange having a cut-away portion at a second circumferential position, the base of the groove defining a rising camming surface with respect to the axis of the roller between the first and second positions, whereby in use the end hook has access to the groove via the cut-away portion of the inner flange at the first position and on rotation of the roller is separated from the next adjacent hook by the inner flange and the camming surface causes the hook to be progressively tilted about its suspension point until the hook is disengageable from its suspension and has egress from the groove via the cut-away portion of the outer flange.

8. Apparatus according to Claim 1 and comprising, in combination, means for printing pre-cut

rider cards including a slot formed therein; means for feeding individual hooks to individual rider cards for insertion of the hook in the slot; pick and place and folding means for removing and folding rider cards complete with hooks and supplying them to an article folding/holding station to which articles are supplied sequentially, folded and held in predetermined pluralities in face-to-face relationship; means to engage and secure respective said rider cards with respective said pluralities of articles; and means for delivery of said articles attached to rider cards to a removal station.

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9. A method of folding and attaching articles to rider cards, the method comprising supplying articles to be folded on a conveyor to a folding station, lifting said articles from the conveyor along a notional fold line so that respective ends of the articles hang on each side of said line, holding first and subsequently folded articles in face-to-face relationship and presenting thereto a folded rider card, gripping said card and articles together and securing said card to said articles.

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10. A method according to Claim 9, in which rider cards are supplied individually from a stack thereof to a hook attachment station and thence to the folded articles by means of a pick and place/card folding mechanism which folds the cards to define a central bridging part and depending ears.

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11. A method according to Claim 10, in which a folded rider card is positioned above articles folded to describe an inverted "U" and moved downwards relative to the articles whereby the folded-down ears of the rider cards are positioned respectively on each side of the articles with the apex of the "U" located beneath the bridging part of the rider card, and gripper bars move laterally inwardly to clamp said articles between said ears.

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12. A pick and place mechanism for withdrawing rider cards from a stack thereof and folding said cards about fold lines which define a central bridging part and ears which extend outwardly therefrom, the mechanism comprising jaw members mounted on a block movable vertically relative to and between lateral plates, whereby in use the jaw members hold the sides of the bridging part of a selected rider card and the relative movement causes the ears to be deflected by the lateral plates and folded along the fold lines.

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Neu eingereicht / Newly filed  
Nouvellement déposé

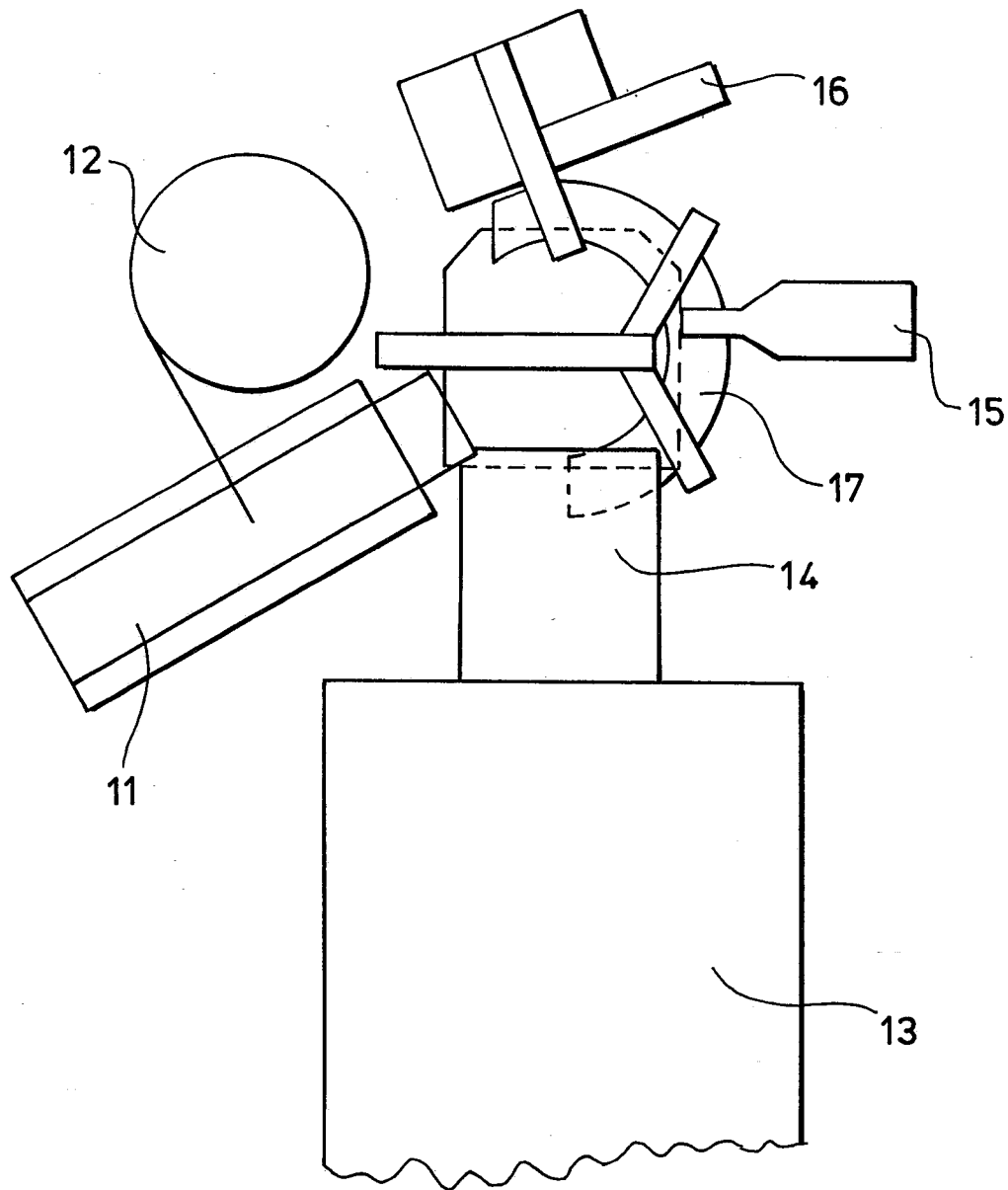
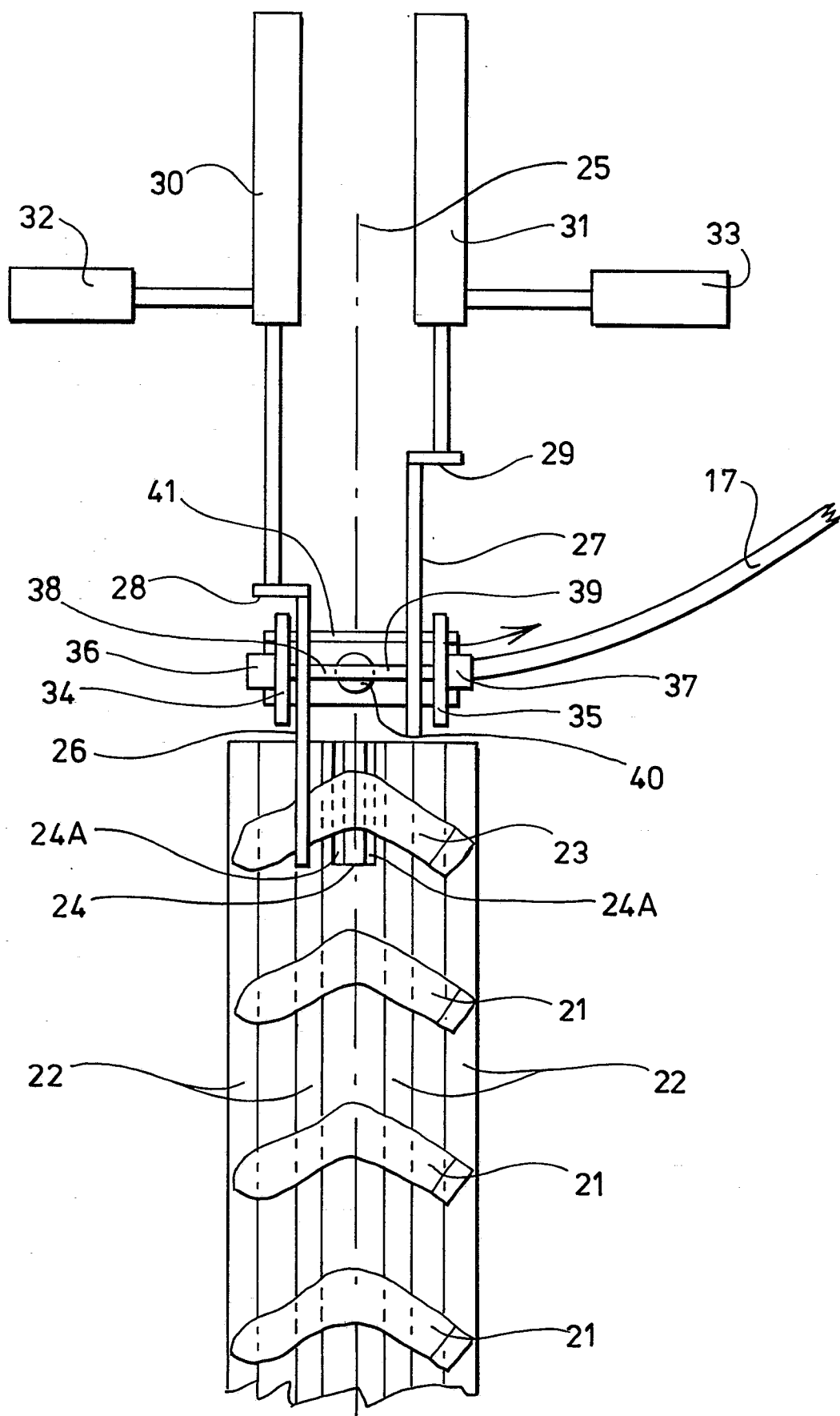


FIG 1



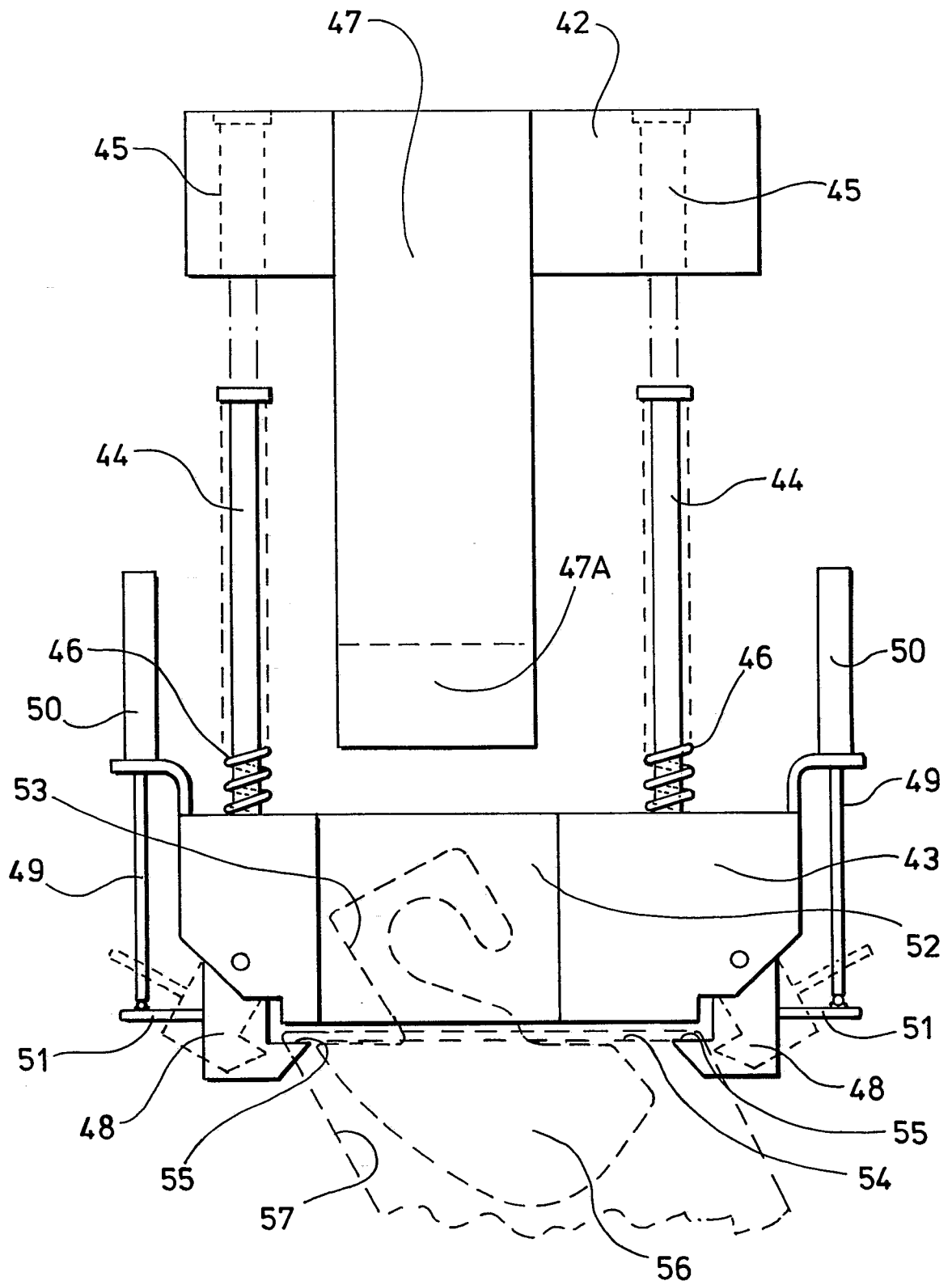


FIG 3

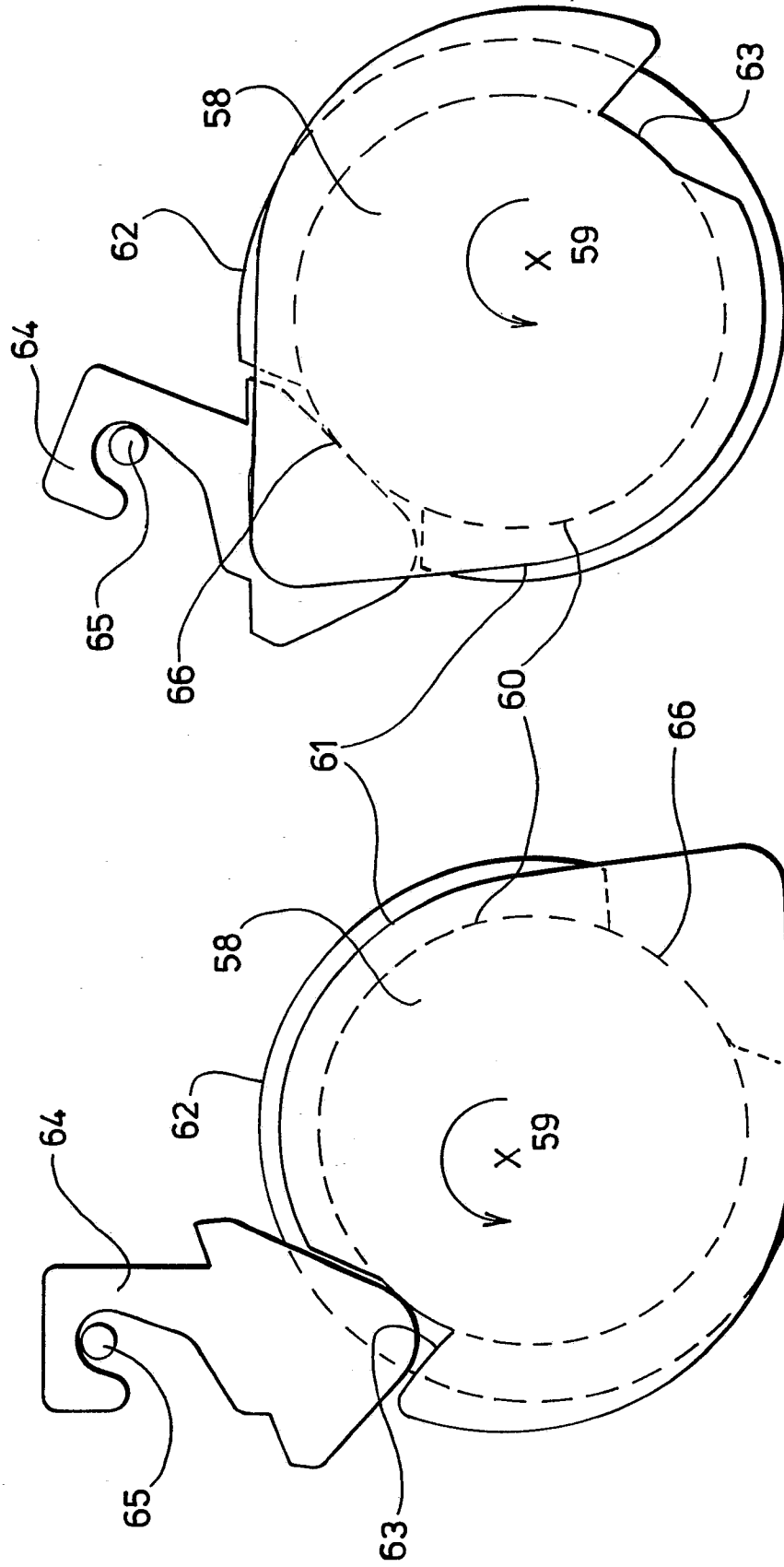


FIG 4B

FIG 4A