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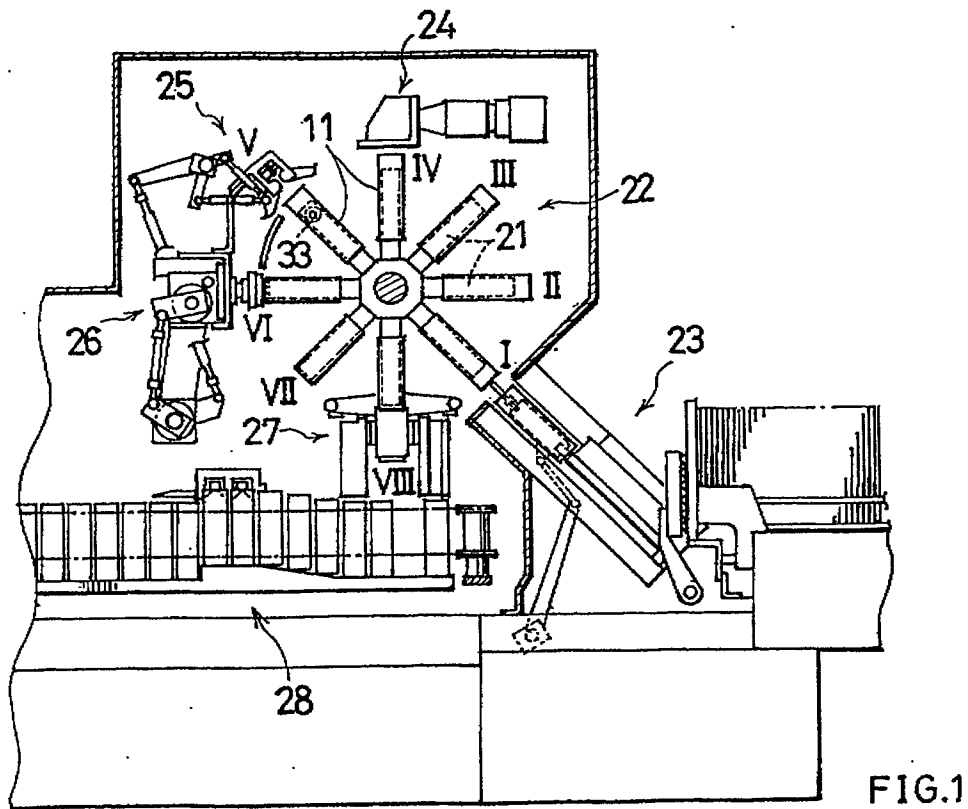
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Packaging machine.

A packaging machine comprises a folding device 25 operable on a container 11 fitted around a mandrel 21 as stopped at a folding station V for folding an end portion 14 of the container to form the bottom thereof, and a pressure member 33 for pressing the container 11 against the mandrel 21 to hold the container 11 against an axial force exerted on the container 11 by the folding operation of the

folding device 25. The pressure member 33 is biased by a spring 68 so that operation of the folding device 25 before starting the folding operation permits the pressure member 33 to press the container 11 against the mandrel 21. The container is released from the pressure member 33 against the spring 68 by operation of the folding device 25 subsequent to the folding operation thereof.

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The present invention relates to a packaging machine including a bottom folding device for containers such as cartons for containing milk.

As disclosed, for example, in the specification of U.S. Patent No. 4,776,830, such packaging machines comprise a rotor having a mandrel wheel provided by radial mandrels which are successively stoppable at a folding station, a folding device operable on a container fitted around the mandrel as stopped at the folding station for folding an end portion of the container to form the bottom thereof, and a pressure member for holding the container against an axial force exerted on the container by the folding operation of the folding device. The folding operation of the folding device and the pressing operation of the pressure member are effected respectively by two hydraulic cylinders which are operated in synchronism.

The known machine described requires a control device for synchronizing the two hydraulic cylinders and is therefore complex.

The main object of the present invention is to provide a packaging machine having a simple construction and comprising a folding device and a pressure member which can be operated in synchronism by a single drive source.

The present invention provides a packaging machine which comprises a rotor having a mandrel wheel provided by radial mandrels, the mandrels being successively stoppable at a folding station, a folding device operable on a container fitted around the mandrel as stopped at the folding station for folding an end portion of the container to form the bottom thereof, and a pressure member for holding the container against an axial force exerted on the container by the folding operation of the folding device. The packaging machine is characterized in that the pressure member is biased by a spring so that an operation of the folding device before starting the folding operation permits the pressure member to press the container against the mandrel, the container being releasable from the pressure member against the spring by an operation of the folding device subsequent to the folding operation thereof.

With the packaging machine of the present invention, the pressure member is biased by a spring so that an operation of the folding device before starting the folding operation permits the pressure member to press the container against the mandrel, and the container is relieved of the pressure of the pressure member against the spring by an operation of the folding device after the folding operation. Accordingly, the present machine requires no hydraulic cylinder for operating the pressure member unlike the conventional machine described first.

Consequently, the folding device and the pressure member are operable in synchronism by a single drive source. The packaging machine provided by the invention is therefore simplified in construction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a folding device and a rotor which are included in a packaging machine embodying the invention;

FIG. 2 is a perspective view of the folding device;

FIG. 3 is a side elevation of the folding device;

FIG. 4 is a view showing the device as it is seen in the direction of the arrow line IV-IV in FIG. 3;

FIG. 5 is a view in section taken along the line V-V in FIG. 3;

FIG. 6 is a view in section taken along the line VI-VI in FIG. 3; and

FIG. 7 is a perspective view of a container to be handled by the packaging machine of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the invention will be described next with reference to the drawings.

FIG. 7 shows a container 11 as inverted. The container 11 comprises a trunk forming portion 12 for providing a trunk portion, a top forming portion 13 to be made into a top portion, and a bottom forming end portion 14. The bottom forming end portion 14 comprises rectangular first to fourth bottom panels 15 to 18 which are integral with one another endlessly. An inverted V-shaped score 19 is formed in the first and third bottom panels 15, 17. With reference to FIG. 2, the container 11 is fitted around a mandrel 21 with its bottom forming end portion 14 projecting outward beyond the mandrel 21. The first and third bottom panels 15, 17 extend orthogonal to the direction of movement of the mandrel (indicated by arrows in FIGS. 2 and 3). The second and fourth bottom panels 16, 18 extend in parallel to the direction of movement of the mandrel.

As shown in FIG. 1, the packaging machine comprises an intermittently drivable rotor 22 having eight radial mandrels 21 so arranged as to stop at first to eighth processing stations I to VIII successively, a container feeder 23 disposed at the first processing station I, a bottom heater 24 disposed at the fourth processing station IV, a bottom folding device 25 at the fifth processing station V, a bottom compression bonding device 26 at the sixth station VI, a container discharge device 27 at the eighth processing station VIII and a container trans-

port conveyor 28 extending from the eighth processing station VIII as the starting end of its transport path.

The second processing station II, third processing station III and seventh processing station VII are all supplementary stations.

With reference to FIGS. 2 to 6, the bottom folding device 25 comprises a yoke 30 disposed outwardly of and in alignment with the mandrel 21 as stopped at the fifth processing station V, a pair of first folding members 31 mounted on the yoke 30 and openable in the direction of movement of the mandrel, a pair of second folding members 32 mounted on the yoke 30 and openable in a direction orthogonal to the direction of movement of the mandrel, and a pressure member 33 for pressing the container 11 against the mandrel 21 before the first folding members 31 perform a folding operation.

The yoke 30 is in the form of a box which is open inward, and is fixedly connected to the bottom compression bonding device 26 by a bracket 34. The bonding device 26 is supported by a machine frame. A pair of inner support shafts 35 extending in parallel to each other in a direction orthogonal to the direction of movement of the mandrel are rotatably mounted on the yoke 30 at its inner end. A pair of outer support shafts 36 extending in parallel to each other in the direction of movement of the mandrel are rotatably provided externally of the shafts 35. A pair of meshing gears 37, and a pair of meshing gears 38 are fixed to the inner support shafts 35, and the outer support shafts 36, respectively.

Each of the two first folding members 31 comprises a depending plate 41 fixed at its upper end to the inner support shaft 35 and a triangular plate 42 secured to the lower end of the depending plate 41. When combined together, the pair of triangular plates 42 are in an inverted V-shape in vertical section (indicated in broken lines in FIG. 3).

Each of the two second folding members 32 comprises a depending bar 43 fixed at its upper end to the outer support shaft 36 and a horizontal rod 44 secured to the lower end of the depending bar 43. The pair of horizontal rods 44 of the members 32 extend in parallel to each other. One of the bars 43 has a contact portion 45 extending inward for the pressure member 33.

Disposed outwardly of the yoke 30 is a horizontal rotary shaft 50 extending in parallel to the inner support shaft 35. The shaft 50 is supported and driven by unillustrated means. Fixed to the rotary shaft 50 are a downward first arm 51 and an upward second arm 52. The first arm 51 has connected thereto one end of a first rod 53, the other end of which is connected to one of the first folding members 31. On the other hand, a second rod 54

has one end connected to the second arm 52 and the other end connected to a third arm 55 secured to one of the outer support shafts 36.

When the rotary shaft 50 is driven, one of the first folding members 31 is pivotally moved through the first arm 51 and the rod 53, and this movement is transmitted to the other first folding member 31 via the inner support shafts 35 and the gears 37, consequently opening or closing the first folding members 31. At the same time, the rotation of the rotary shaft 50 is transmitted to one of the outer support shaft 36 by way of the second arm 52, second rod 54 and third arm 55 to cause the gears 38 to rotate the outer support shafts 36 in opposite directions. As a result, the two second folding members 32 are opened or closed.

The pressure member 33 comprises a pressure pad 61 facing the path of movement of the mandrel, and a retractable rod 62 extending from the pressure pad 61 in a direction opposite to the mandrel 21 and orthogonal to the axis of the mandrel.

With reference to FIGS. 2 and 4, the rotor 22 has two mandrel wheels. Disposed between two mandrels 21 brought to a halt at the fifth processing station V is an inclined post 63 extending from a rotor bearing in parallel to the mandrels. Arranged on a support plate 64 on the upper end of the post 63 are the retractable rods 62 of two pressure members 33 corresponding to the two mandrels. These rods 62 extend in opposite directions in alignment with each other, and are each supported by a bearing 65 on the plate 64 so as to project outward beyond the bearing 65. A pusher plate 66 and a spring retainer 67 are secured to each of the opposed ends of the two retractable rods 62. A coiled compression spring 68 is provided between the two spring retainers 67, whereby each pressure member 33 is always biased toward the corresponding mandrel 21.

When a container 11 is brought to the fifth processing station V, the first and second folding members 31, 32 are both in their open position (in the solid-line state shown in FIGS. 2 to 4). In this state, the contact portion 45 of the second folding member 32 is in bearing contact with the pusher plate 66, holding the pressure member 33 away from the mandrel 21 against the spring 68.

Upon the delivery of the container 11 to the fifth processing station V, the rotary shaft 50 is driven counterclockwise in FIG. 3, and the first and second folding members 31, 32 start to move from the open position toward, a closed position at the same time. In the course of this movement, the first folding members 31 first fold the first and third bottom panels 15, 17 of the container 11 as fitted around the mandrel 21 inward along the scores 19. Subsequently, the second folding members 32 in-

wardly fold the second and fourth bottom panels 16, 18 over the folded first and third bottom panels 15, 17. On the other hand, as the second folding members 32 move from the open position toward the closed position, the pressure member 33 moves toward the mandrel 21 and is pressed against the mandrel 21 with the container 11 positioned therebetween. The time when the pressure member is thus pressed is before the first folding members 31 perform the folding operation.

Although the container 11 fitted to the mandrel 21 by the folding operation of the first and second folding members 31, 32 is subjected to outward and inward forces, the container 11 is held to the mandrel 21 against movement by being pressed against the mandrel 21 by the pressure member 33.

The first and second folding members 31, 32 reach the closed position, whereby the folding operation is completed, whereupon the rotary shaft 50 is now driven clockwise in FIG. 3. The first and second folding members 31, 32 start to move from the closed position toward the open position at the same time. The first folding members 31 directly move to the open position, while the second folding member 32 comes into contact with the pusher plate 66 of the pressure member 33 in the course of the movement and moves to the closed position while moving the plate 66 away from the mandrel 21.

The rotor 22 is then driven by one pitch, the container 11 with the folded bottom is brought out of the fifth processing station V, the container 11 to be folded next is delivered to the station V, and the machine resumes the initial state to complete one cycle of folding operation.

Claims

1. A packaging machine comprising:
 - a rotor (22) having a mandrel wheel provided by radial mandrels (21), the mandrels (21) being successively stoppable at a folding station V,
 - a folding device (25) operable on a container (11) fitted around the mandrel (21) as stopped at the folding station V for folding an end portion (14) of the container to form the bottom thereof, and
 - a pressure member (33) for holding the container (11) against an axial force exerted on the container (11) by the folding operation of the folding device (25),
 - the packaging machine being characterized in that the pressure member (33) is biased by a spring (68) so that operation of the folding device (25) before starting the folding operation permits the pressure member (33) to

press the container (11) against the mandrel (21), the container-being releasable from the pressure member (33) against the spring (68) by operation of the folding device (25) subsequent to the folding operation thereof.

2. A packaging machine as defined in claim 1 wherein the folding device (25) has first folding members (31) and second folding members (32), both the first folding members (31) and the second folding members (32) being free to open and close, the container end portion (14) being formed by four bottom panels (15) to (18), first and third bottom panels (15, 17) extending in a direction orthogonal to the direction of movement of the mandrels and being foldable first by the first folding members (31) when the first folding members (31) move from an open position toward a closed position, second and fourth bottom panels (16, 18) extending in parallel to the direction of movement of the mandrels and being foldable subsequent to the first and third bottom panels (15, 17) by the second folding members (32) when the second folding members (32) move from an open position toward a closed position, the pressure member (33) being movable toward or away from a side portion of the mandrel (21), the pressure member (33) being movable away from the mandrel (21) against the spring (68) when the second folding members (32) move from the closed position toward the open position, the pressure member (33) being movable toward the mandrel (21) by the spring (68) when the second folding members (32) move from the open position toward the closed position.

3. A packaging machine as defined in claim 2 wherein the pressure member (32) comprises a pressure pad (61) so positioned as to face the mandrel (21), a retractable rod (62) extending from the pressure pad (61) in a direction opposite to the mandrel (21) and orthogonal to the axis of the mandrel and axially movably supported by a support member (65), and a pusher plate (66) mounted on the retractable rod (62) so as to enable the second folding member (32) to come into bearing contact therewith when the second folding member (32) moves from the closed position toward the open position.

4. A packaging machine comprising:
 - a rotor (22) having two mandrel wheels provided by radial mandrels (21), the mandrels (21) of each wheel being individually successively stoppable at a folding station V,

a pair of folding devices (25) corresponding respectively to two mandrels (21) as stopped at the folding station V and each operable on a container (11) fitted around the stopped mandrel (21) for folding an end portion (14) of the container to form the bottom thereof, and

a pair of pressure members (33) corresponding respectively to the two mandrels (21) and each adapted to hold the container (11) against an axial force exerted on the container (11) by the folding operation of the folding device (25),

the packing machine being characterized in that

the two pressure members (33) are biased by a spring (68) so that operation of each folding device (25) before starting the folding operation permits the pressure member (33) to press the corresponding container (11) against the mandrel (21), the container being releasable from the pressure member (33) against the spring (68) by operation of the folding device (25) subsequent to the folding operation thereof,

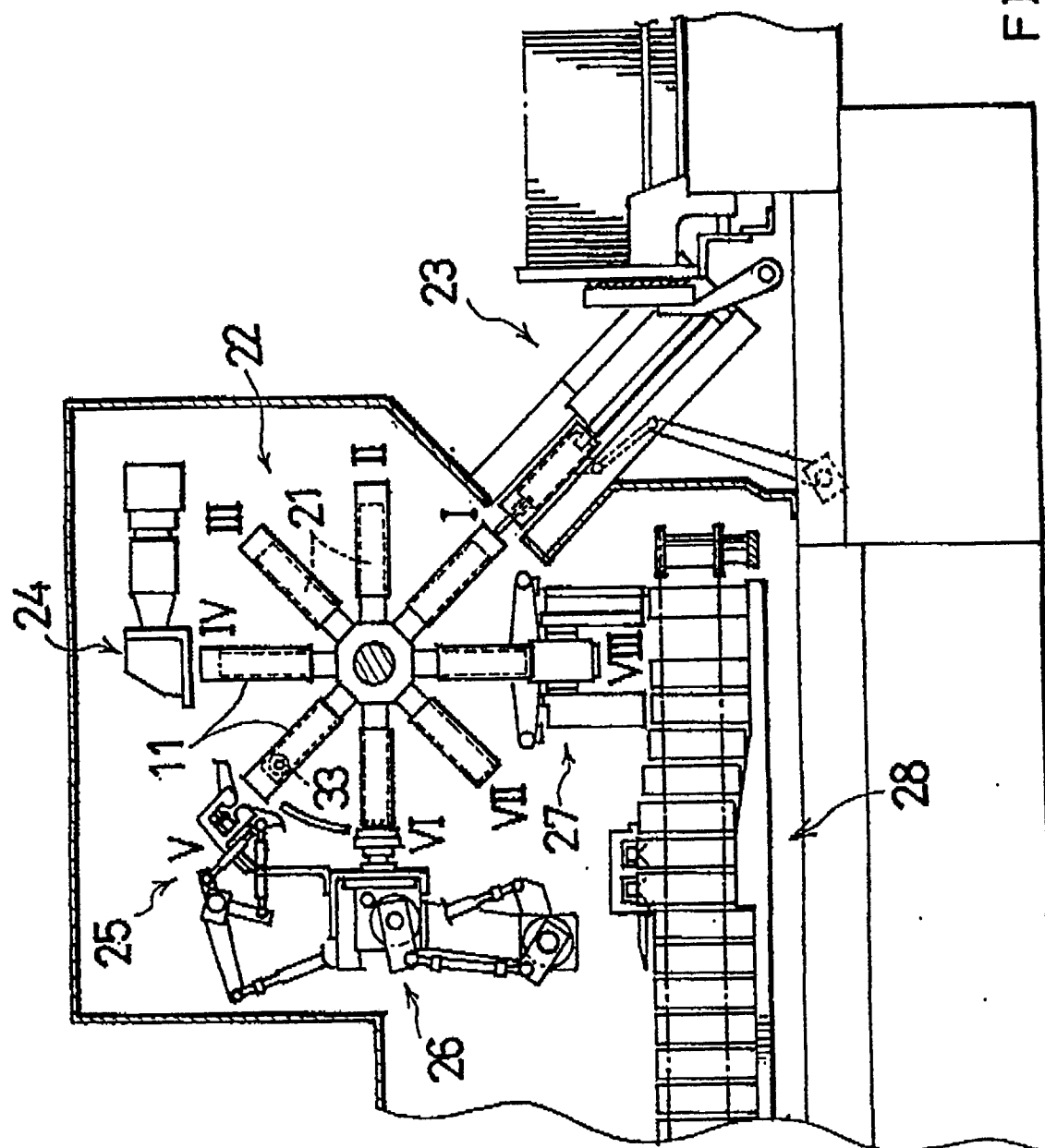
each of the folding devices (25) having first folding members (31) and second folding members (32), both the first folding members (31) and the second folding members (32) being free to open and close, the container end portion (14) being formed by four bottom panels (15) to (18), first and third bottom panels (15, 17) extending in a direction orthogonal to the direction of movement of the mandrels and being foldable first by the first folding members (31) when the first folding members (31) move from an open position toward a closed position, second and fourth bottom panels (16, 18) extending in parallel to the direction of movement of the mandrels and being foldable subsequent to the first and third bottom panels (15, 17) by the second folding members (32) when the second folding members (32) move from an open position toward a closed position,

the two pressure members (33) being arranged between the two mandrels (21) and each movable toward or away from the corresponding mandrel (21),

each of the pressure members (33) being movable away from the corresponding mandrel (21) against the spring (68) when the second folding members of the corresponding folding device (25) move from the closed position toward the open position, the pressure member (33) being movable toward the mandrel (21) by the spring (68) when the second folding members (32) of the folding device (25) move from the open position toward the closed position,

the two pressure members (33) comprising two pressure pads (61) each so positioned as to face the corresponding mandrel (21), two retractable rods (62) extending respectively from the two pressure pads (61) toward and in alignment with each other, each orthogonal to the axis of the corresponding mandrel and axially movably supported by a support member (65), and two pusher plates (66) mounted on the respective retractable rods (62) so as to enable the second folding member (32) of the folding device (25) to come into bearing contact therewith when the second folding member (32) moves from the closed position to the open position,

the spring (68) being interposed between the two retractable rods (62).



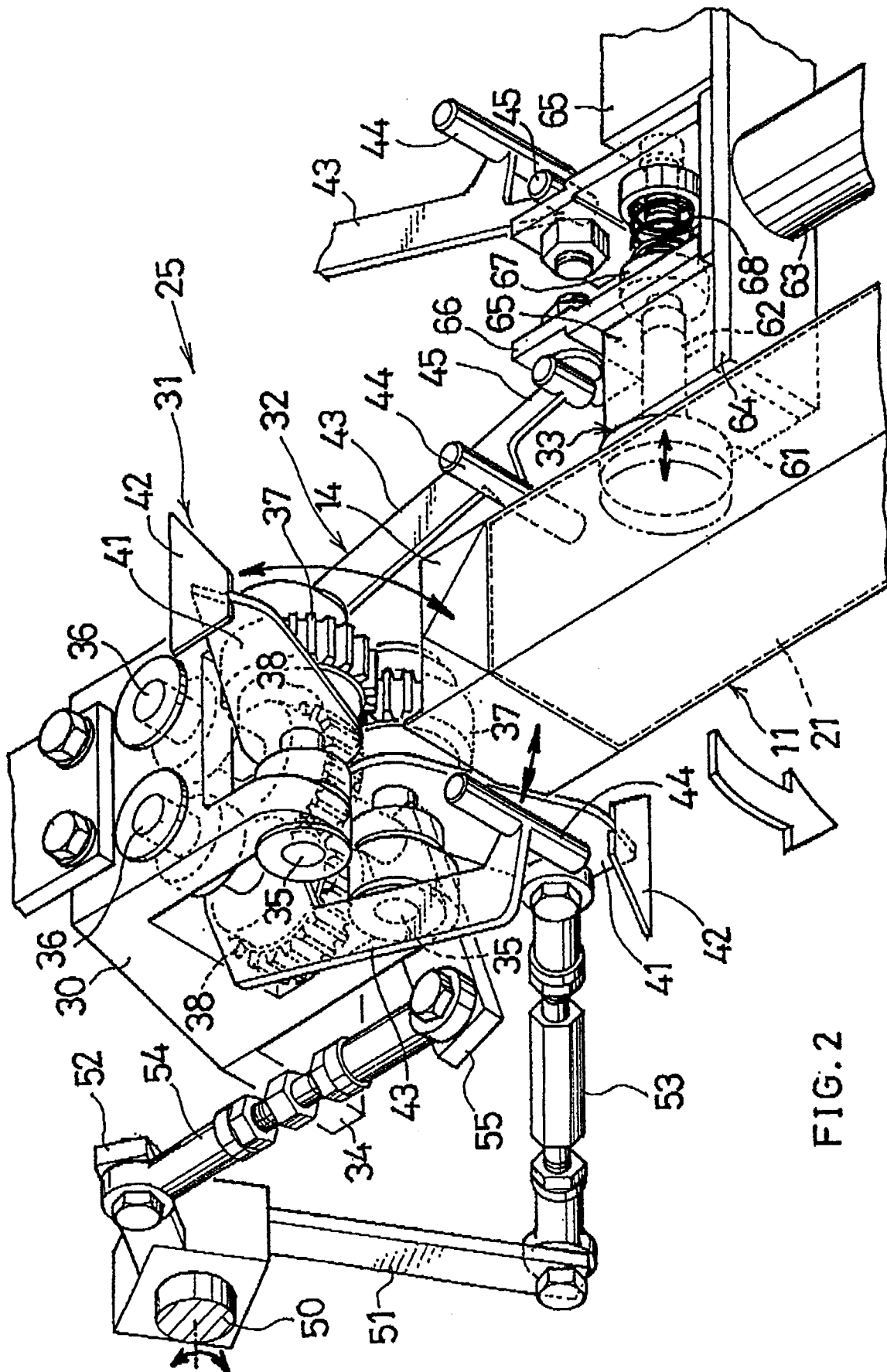


FIG. 2

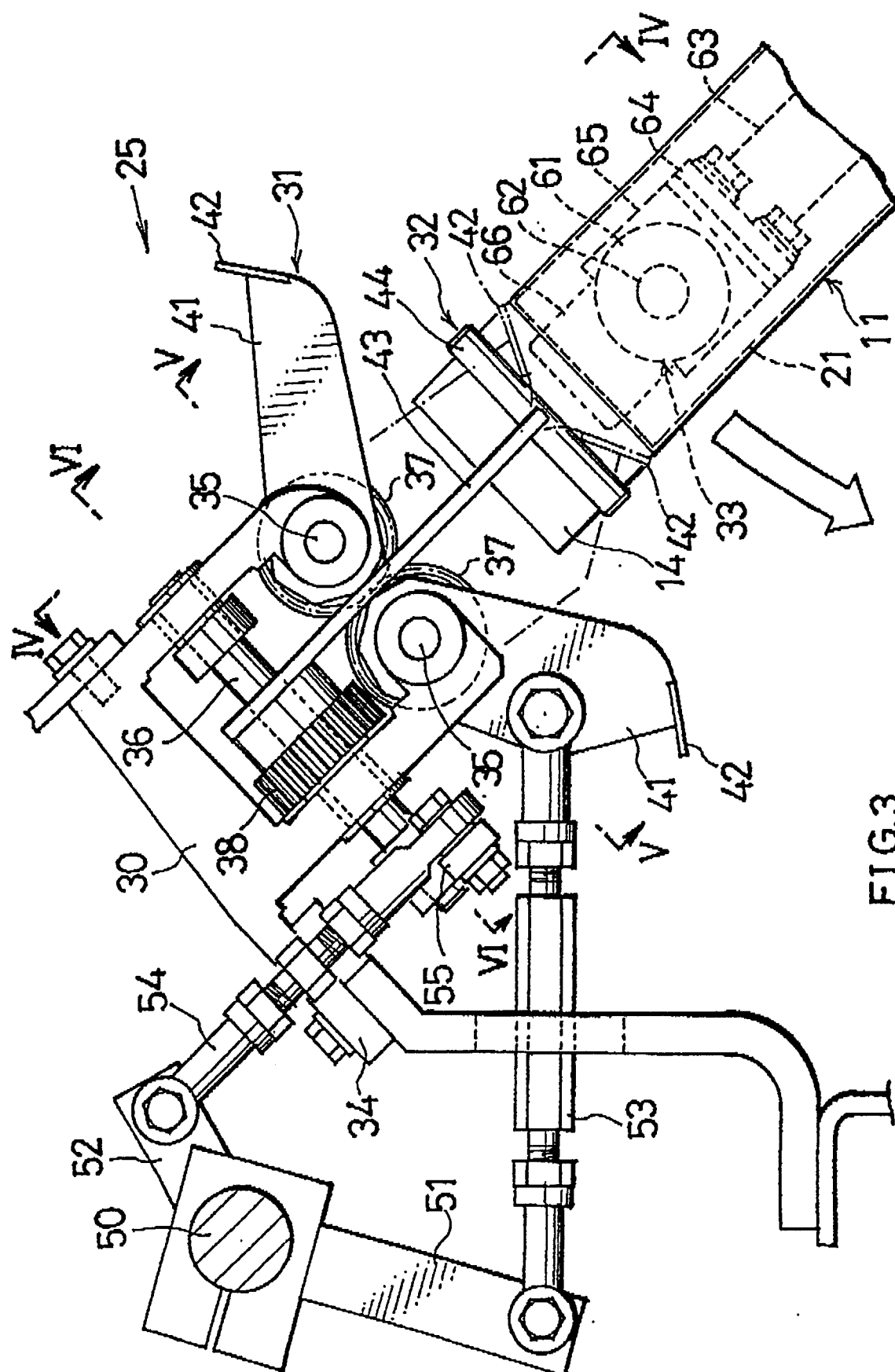


FIG.3

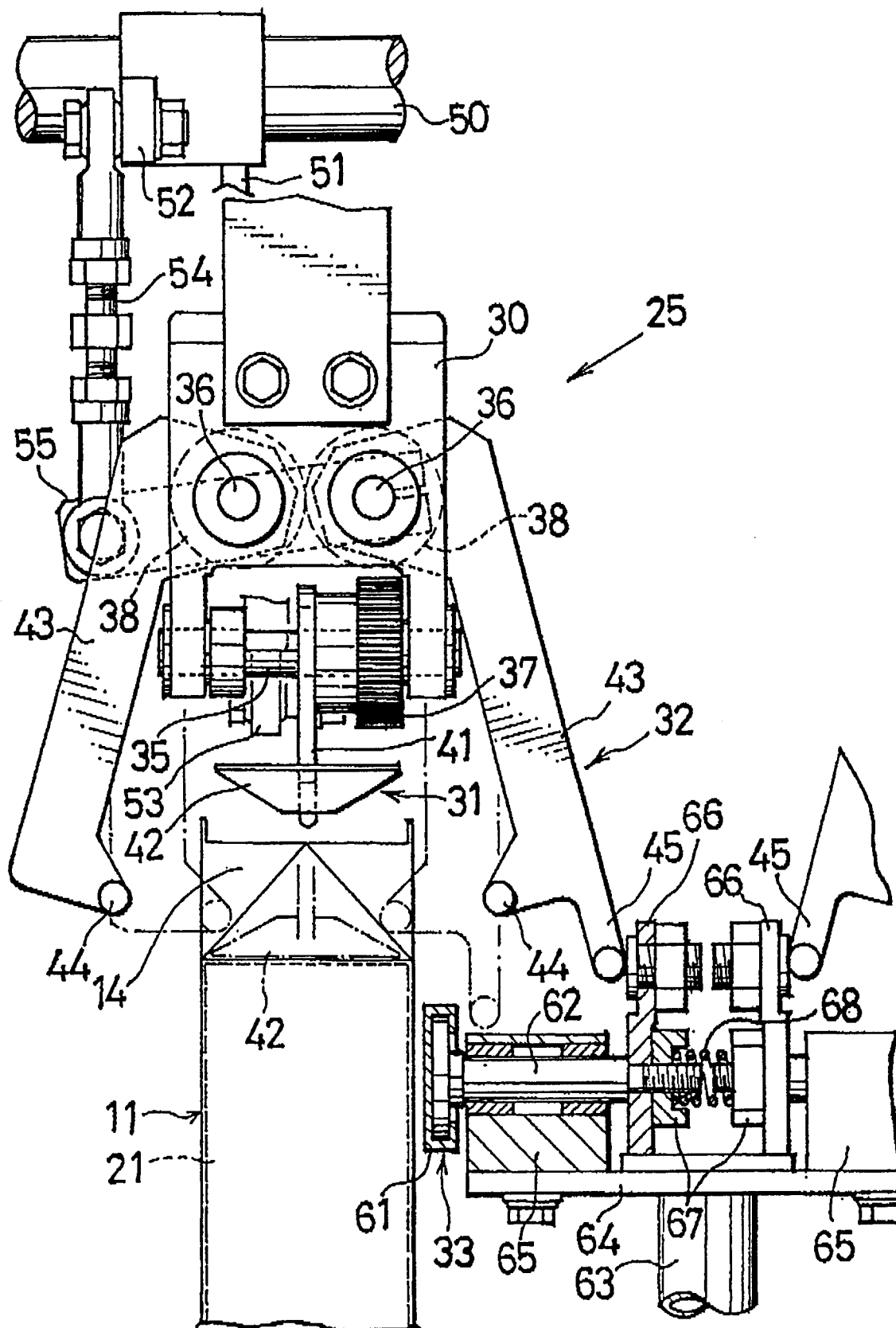


FIG. 4

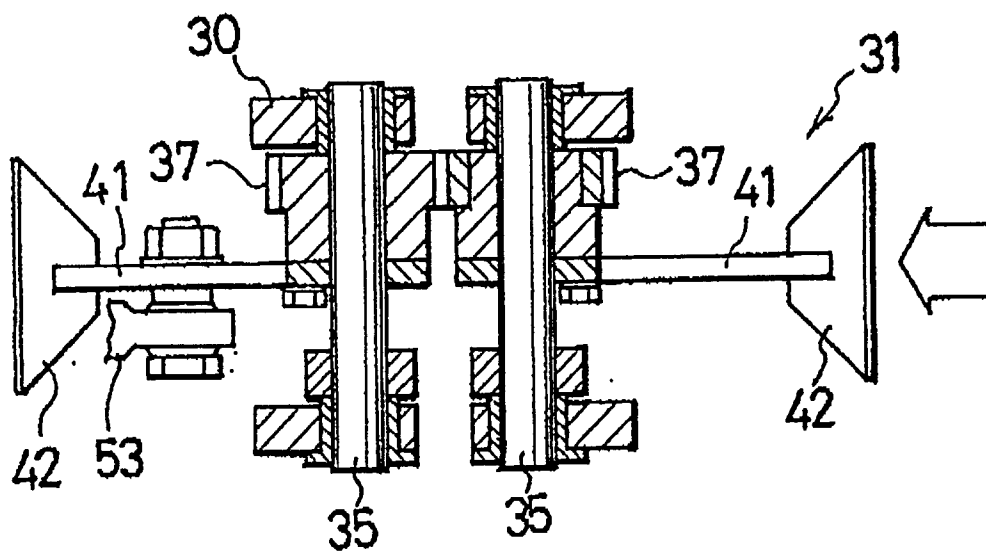


FIG. 5

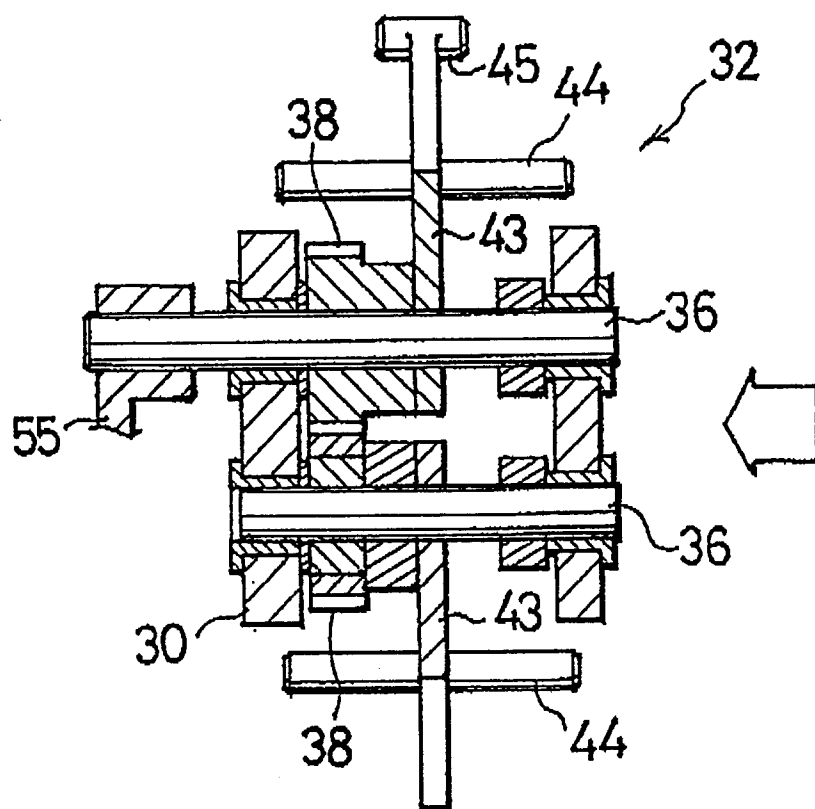


FIG. 6

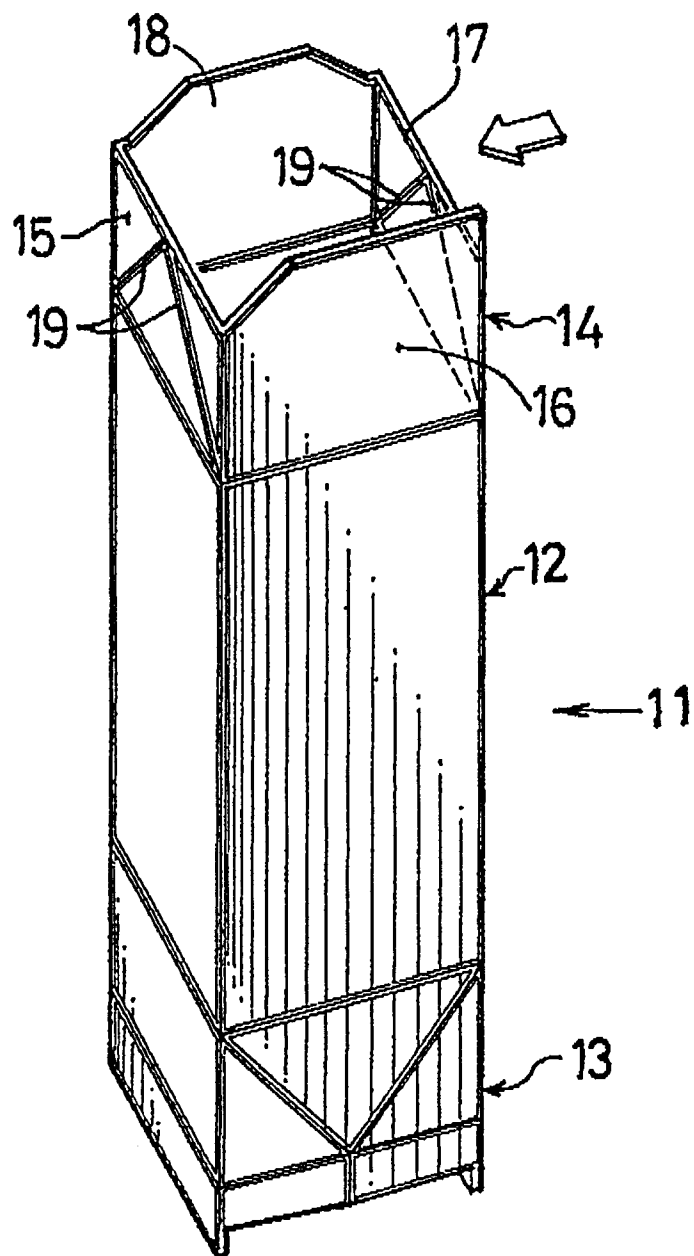


FIG. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 93201735.3
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D, Y	<u>US - A - 4 776 830</u> (FUJIKAWA et al.) * Totality *	1, 2	B 65 B 3/02 B 31 B 3/32
A	--	3, 4	
Y	<u>EP - A - 0 417 864</u> (SHIKOKU KAKOKI) * Fig. 1, 2; column 3, lines 51-56; column 7, lines 12-42 *	1, 2	
A	--	3, 4	
A	<u>US - A - 4 484 431</u> (OKUSHITA) * Fig. 10A; column 7, lines 54-65 *	1, 2, 4	
A	<u>DE - A - 3 125 624</u> (BOSCH) * Fig. 1 *	1, 4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 B 1/00 B 65 B 3/00 B 65 B 5/00 B 65 B 43/00 B 31 B 1/00 B 31 B 3/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 30-08-1993	Examiner FIETZ
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			