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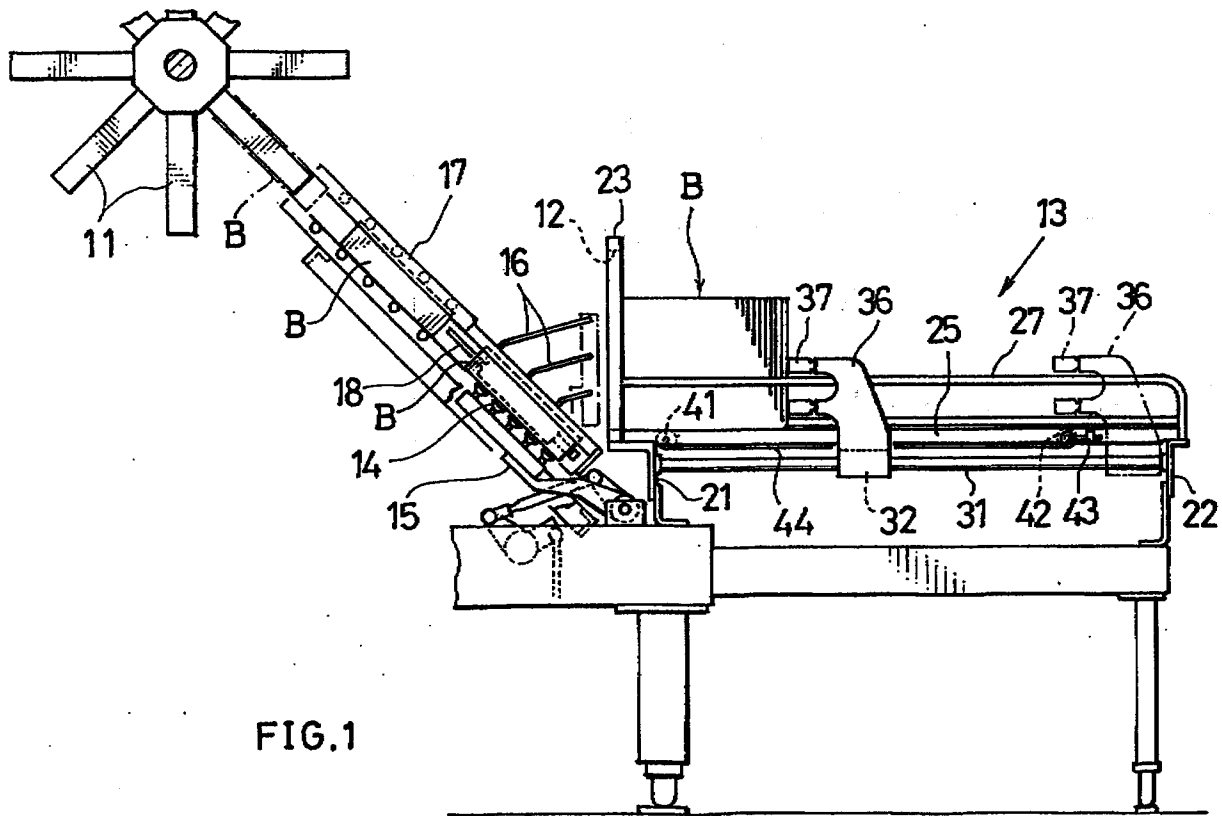
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NL-5600 AP Eindhoven (NL)(54) **Blank feeder.**

(57) A blank feeder comprises a magazine (13) having an outlet (12) at an inner end thereof for accommodating a multiplicity of blanks B as closely arranged side by side from the inner end toward an outer end of the magazine (13), the blanks B being folded flat so as to be unfoldable into tubes of square to rectangular cross section, pressure means for inwardly pressing the blank B at the outermost

position so as to move the blanks B within the magazine (13) toward the outlet (12), and guide means for guiding the blanks B with their bottoms resting thereon while the blanks are moved toward the outlet (12). The guide means comprises inner and outer pulleys (41, 42) arranged as spaced apart by a specified distance, and an endless belt (44) reeved around the inner and outer pulleys (41, 42).



BACKGROUND OF THE INVENTION

The present invention relates to a feeder for supplying a container forming device with blanks for containers to be filled, for example, with milk, i.e., blanks which are folded flat so as to be unfoldable into tubes of square to rectangular cross section.

Such feeders are already known which comprise a magazine having an outlet at an inner end thereof for accommodating a multiplicity of blanks as closely arranged side by side from the inner end toward an outer end of the magazine and folded flat so as to be unfoldable into tubes of square cross section, pressure means for inwardly pressing the blank at the outermost position so as to move the blanks within the magazine toward the outlet, and means for guiding the blanks with their bottoms resting thereon while the blanks are moved toward the outlet, the guiding means comprising rails extending longitudinally of the magazine.

When the blanks are moved within the magazine, the bottoms of the blanks are in frictional contact with the rails, so that it is difficult for the blanks to move smoothly toward the outlet owing to great frictional resistance.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a blank feeder wherein blanks are smoothly movable within a magazine toward the outlet thereof.

The invention provides a blank feeder which comprises a magazine having an outlet at an inner end thereof for accommodating a multiplicity of blanks as closely arranged side by side from the inner end toward an outlet end of the magazine, the blanks being folded flat so as to be unfoldable into tubes of square to rectangular cross section, pressure means for inwardly pressing the blank at the outermost position so as to move the blanks within the magazine toward the outlet, and guide means for guiding the blanks with their bottoms resting thereon while the blanks are moved toward the outlet, the feeder being characterized in that the guide means comprises inner and outer pulleys arranged as spaced apart by a predetermined distance, and an endless belt reeved around the inner and outer pulleys.

With the blank feeder of the present invention, the belt moves in revolution with the movement of blanks, so that the frictional resistance involved in the movement is small, permitting the blanks to smoothly move within the magazine toward its outlet.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall side elevation of a blank feeder embodying the invention;

FIG. 2 is a fragmentary perspective view of the feeder;

FIG. 3 is a fragmentary side elevation of the same;

FIG. 4 is a fragmentary plan view of the same;

FIG. 5 is a view in section taken along the line V-V in FIG. 4;

FIG. 6 is a view in section taken along the line VI-VI in FIG. 4;

FIG. 7 is a diagram of a pressure control circuit for pressure means; and

FIG. 8 is a pressure application timing chart of the pressure means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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

FIG. 1 shows a blank feeder which comprises a magazine 13 disposed obliquely above and outwardly of a phantom outward extension of a bottom forming mandrel 11 which is brought to a halt at a feed station and which obliquely extends outwardly downward. The magazine 13 has an inward outlet 12 at an inner end thereof and adapted to accommodate a multiplicity of flat blanks B which are closely arranged side by side from the inner end toward an outer end of the magazine 13. The feeder further comprises a transport arm 15 having vacuum cups 14 for taking out blanks B from the magazine 13 one by one and transporting each blank B onto the outward extension, guide rails 16 for guiding the blank B while it is transported by the arm 15 so as to unfold the blank B from the flat form into a tube of square to rectangular cross section, a holder 17 for holding the blank B as unfolded to the tubular form and positioned on the extension, and a loader 18 for fitting the blank B held by the holder 17 around the mandrel 11.

As shown in greater detail in FIGS. 2 to 4, the magazine 13 comprises inner and outer support frames 21, 22 spaced apart by a predetermined distance and each inverted L-shaped in cross section, a gate member 23 provided upright on the inner support frame 21 and surrounding the outlet 12 along with the inner support frame 21, a pair of opening claws 24 attached to the respective vertical bars of the gate member 23, a pair of horizontal support bars 25 parallel to and spaced apart from each other and interconnecting the support frames 21, 22 as attached to the top side of these frames, and L-shaped side guide bars 26, 27 each extending between and attached to the outer support

frame 22 and an intermediate portion (with respect to the height) of the vertical bar of the gate member 23.

A pair of horizontal guide rods 31 extend between and are attached to the inner and outer support frames 21, 22 at the middle of height of these frames. A slider 32 is supported by the guide rods 31. A rod-less cylinder 33 has a main body 34 fixed to the slider, and a cylinder tube 35 positioned between the two guide rods 31 and extending between and attached to the support frames 21, 22. A pair of brackets 36 extend upright from opposite ends of the slider 32. A pair of pressure pawls 37 are pivoted to each bracket 36. The pawls 37 are each biased inward by an unillustrated spring.

An inner pulley 41 is mounted directly on the support bars 25 and positioned close to the inner ends thereof. An outer pulley 42 is attached by take-ups 43 to the support bars 25 close to their outer ends. An endless belt 44 is reeved around the inner and outer pulleys 41, 42. With reference to FIGS. 5 and 6, the portion of the belt 44 along the upper path of travel is supported by a slip plate 45. In this state, the belt 44 is positioned as projected upward beyond the support bars 25 by an amount corresponding to the thickness of the belt 44.

With reference to FIG. 7 showing a circuit for controlling the air pressure of the rodless cylinder 33, an air source 51 supplies air to the rodless cylinder 33 through a pilot-operated solenoid control valve 52. Pilot pressure setting valves 53, 54 for low pressure and high pressure, respectively, alternatively apply a pilot pressure to the control valve 52 upon a change-over in accordance with a signal from an encoder 55. The encoder 55 detects the angle of rotation of a main shaft (not shown) for driving the transport arm 15 and outputs a signal corresponding to the detected angle.

The operation of the feeder to take out blanks B will be described next with reference to FIG. 8. Every time the main shaft makes one turn of rotation (360 deg), the transport arm 15 performs one cycle of operation. In the state shown in FIG. 2, the loader 18 feeds a blank B to the mandrel 11, whereupon the transport arm 15 moves upward, attracting the innermost blank B in the outlet 12 by suction, and stops. The arm 15 then moves down, taking out the blank B as attracted to the arm 15 from the magazine 13 while unfolding the blank B into a tube of square or rectangular cross section. The blank B taken out is transported to the location of the holder 17, whereupon the transport arm 15 is stopped. The arm 15 is thereafter allowed to stand by in the stopped position before initiating an upward movement in the next cycle.

In the cycle of operation described, air of low pressure is supplied to the rodless cylinder 33 during the period after the start of upward movement of the transport arm 15 and before the arm 15 reaches an intermediate point of the path of its downward movement with the attracted blank B. Air of high pressure is supplied to the rodless cylinder 33 only during the following period some time before the standby period in the stopped position is elapsed. The high-pressure air is thereafter changed over to the low-pressure air again. The low pressure is 1.5 to 2.5 kg/cm², and the high pressure is 3 to 5 kg/cm².

The blanks B accommodated in the magazine 13 are subjected to the pressure of the pressure pawls 37. This pressure is changed over from high to low and *vice versa* by supplying air of alternating low pressure and high pressure to the rodless cylinder 33. This permits the blanks B to move smoothly within the magazine 13 as the quantity of blanks B successively decreases with the withdrawal of blanks.

The blanks B within the magazine 13 move as supported by the belt 44, which also moves in revolution with the movement of the blanks B. Accordingly, the blanks B are movable free of any resistance.

Claims

1. A blank feeder comprising:

a magazine (13) having an outlet (12) at an inner end thereof for accommodating a multiplicity of blanks B as closely arranged side by side from the inner end toward an outer end of the magazine (13), the blanks B being folded flat so as to be unfoldable into tubes of square to rectangular cross section,

pressure means for inwardly pressing the blank B at the outermost position so as to move the blanks B within the magazine (13) toward the outlet (12), and

guide means for guiding the blanks B with their bottoms resting thereon while the blanks are moved toward the outlet (12),

the blank feeder being characterized in that the guide means comprises inner and outer pulleys (41, 42) arranged as spaced apart by a predetermined distance, and an endless belt (44) reeved around the inner and outer pulleys (41, 42).

2. A blank feeder as defined in claim 1 wherein a pair of parallel support bars (25) are arranged at opposite sides of the endless belt (44) and have the inner and outer pulleys (41, 42) mounted thereon, and the endless belt (44) has along the upper path of its travel an upper

surface positioned at a higher level than the upper surfaces of the support bars (25).

3. A blank feeder as defined in claim 2 wherein the difference in level between the upper surface of the endless belt (44) along the upper path and the upper surfaces of the support bars (25) corresponds to the thickness of the belt. 5
4. A blank feeder as defined in any one of claims 1 to 3 wherein the endless belt (44) has a portion positioned along the upper path of its travel and supported by a slip plate. 10
5. A blank feeder as defined in any one of claims 2 to 4 wherein a take-up (43) is provided between the outer pulley (42) and each of the support bars (25). 15
6. A blank feeder as defined in any one of claims 1 to 5 wherein the pressure means has pressure members (37) movable inward and outward and a fluid pressure cylinder (33) for urging the pressure members (37) inward. 20 25
7. A blank feeder as defined in claim 6 which comprises a pressure control valve (52) for changing over the air pressure to be supplied to the fluid pressure cylinder (33) from high to low and vice versa. 30

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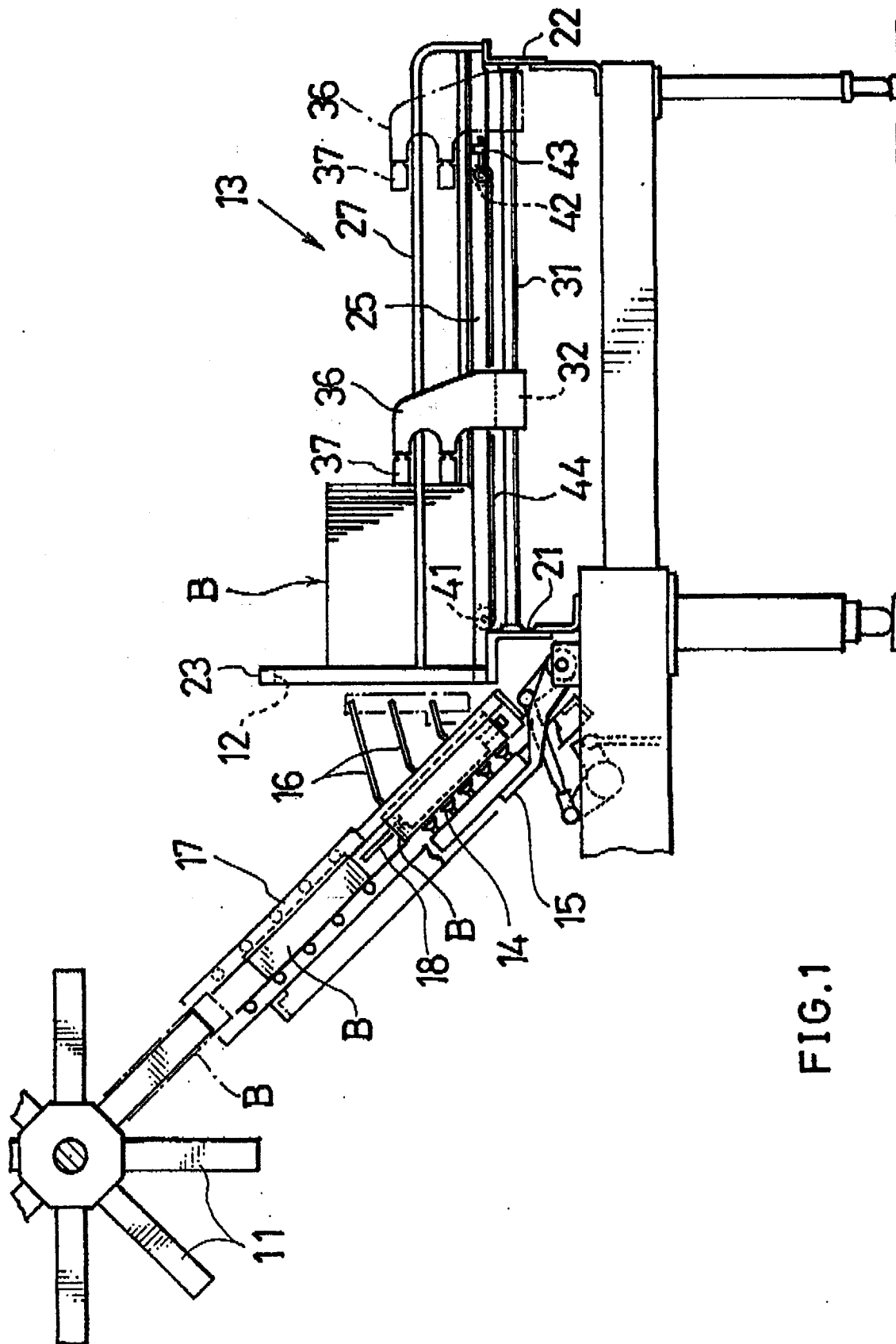


FIG.1

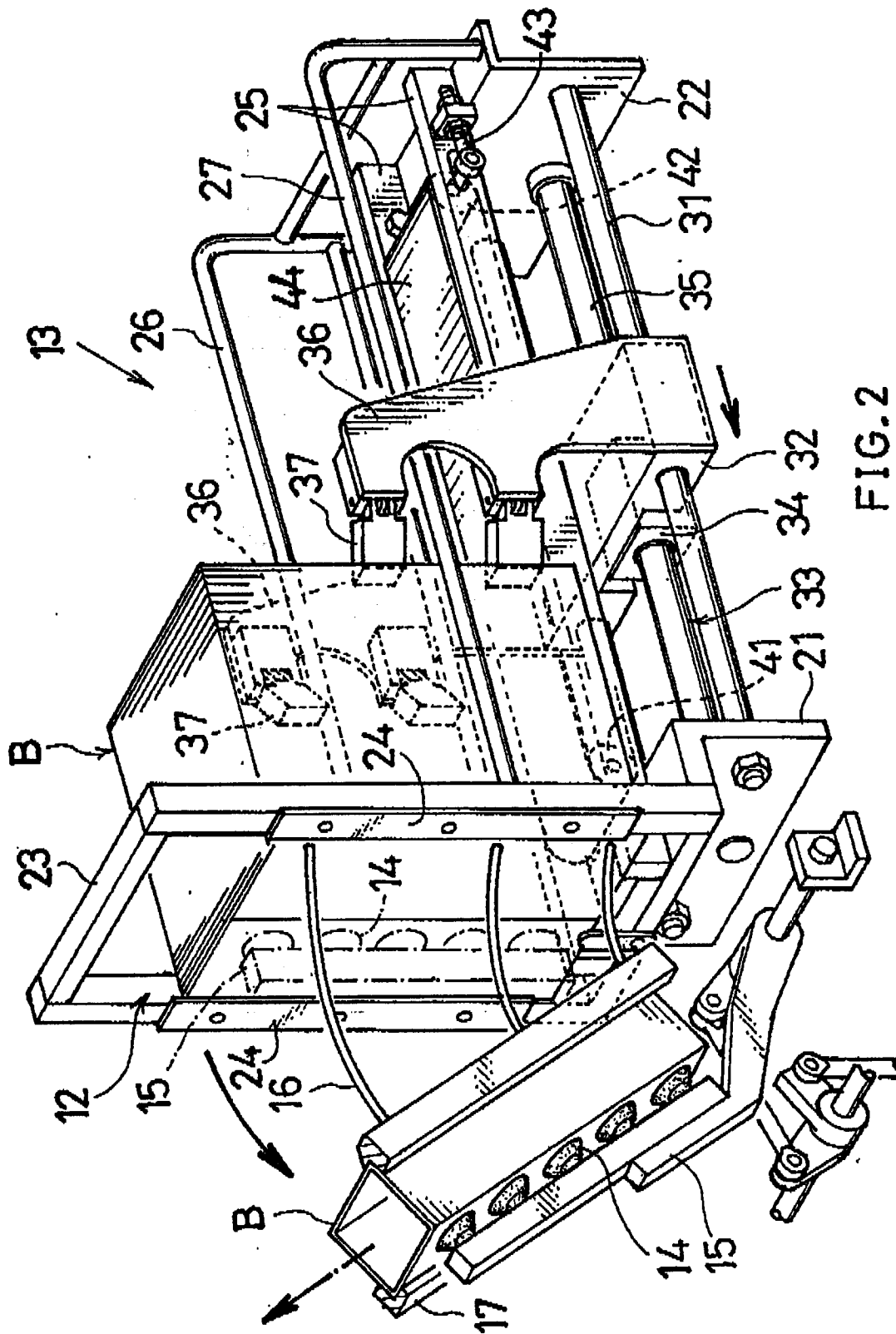


FIG. 2

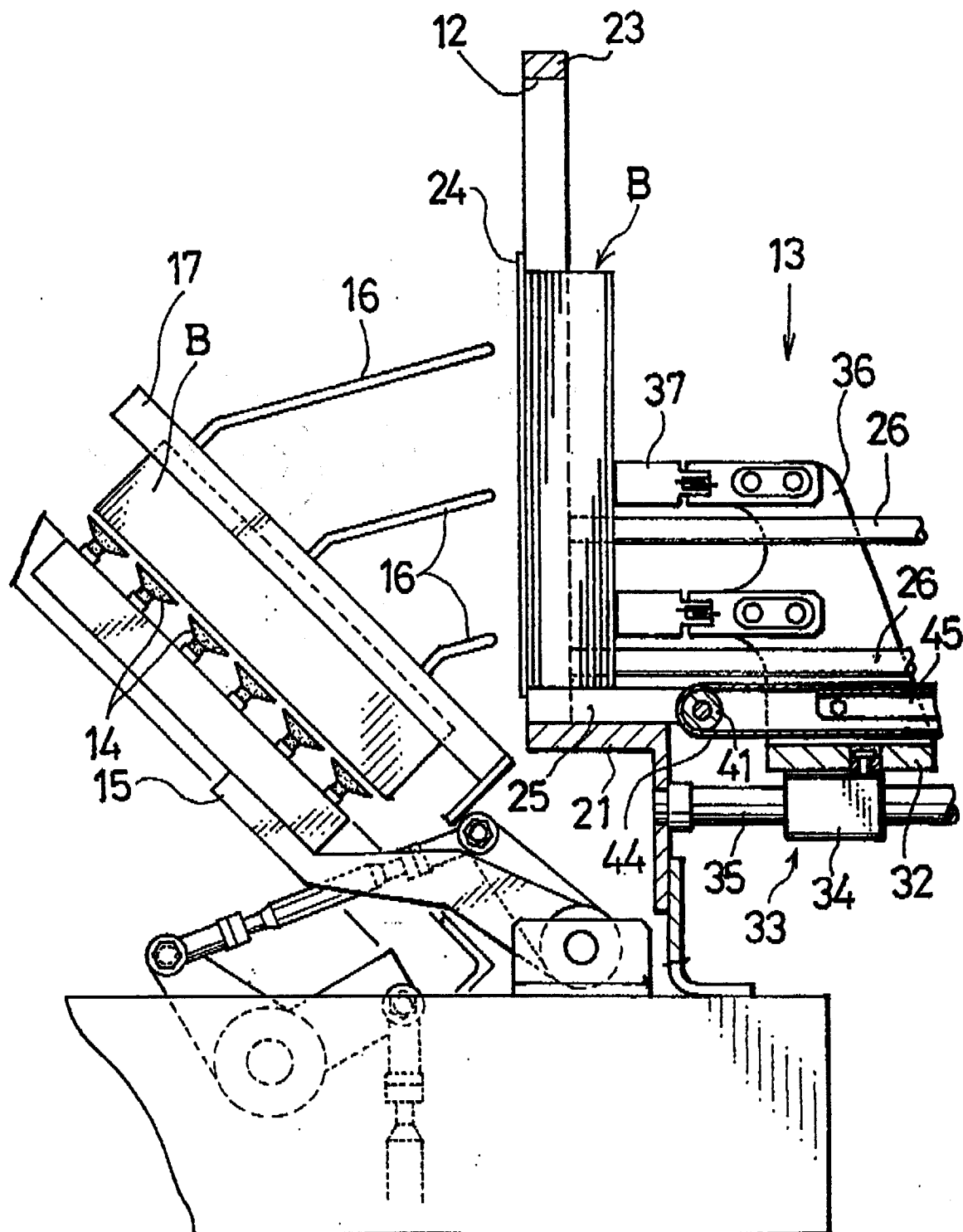


FIG.3

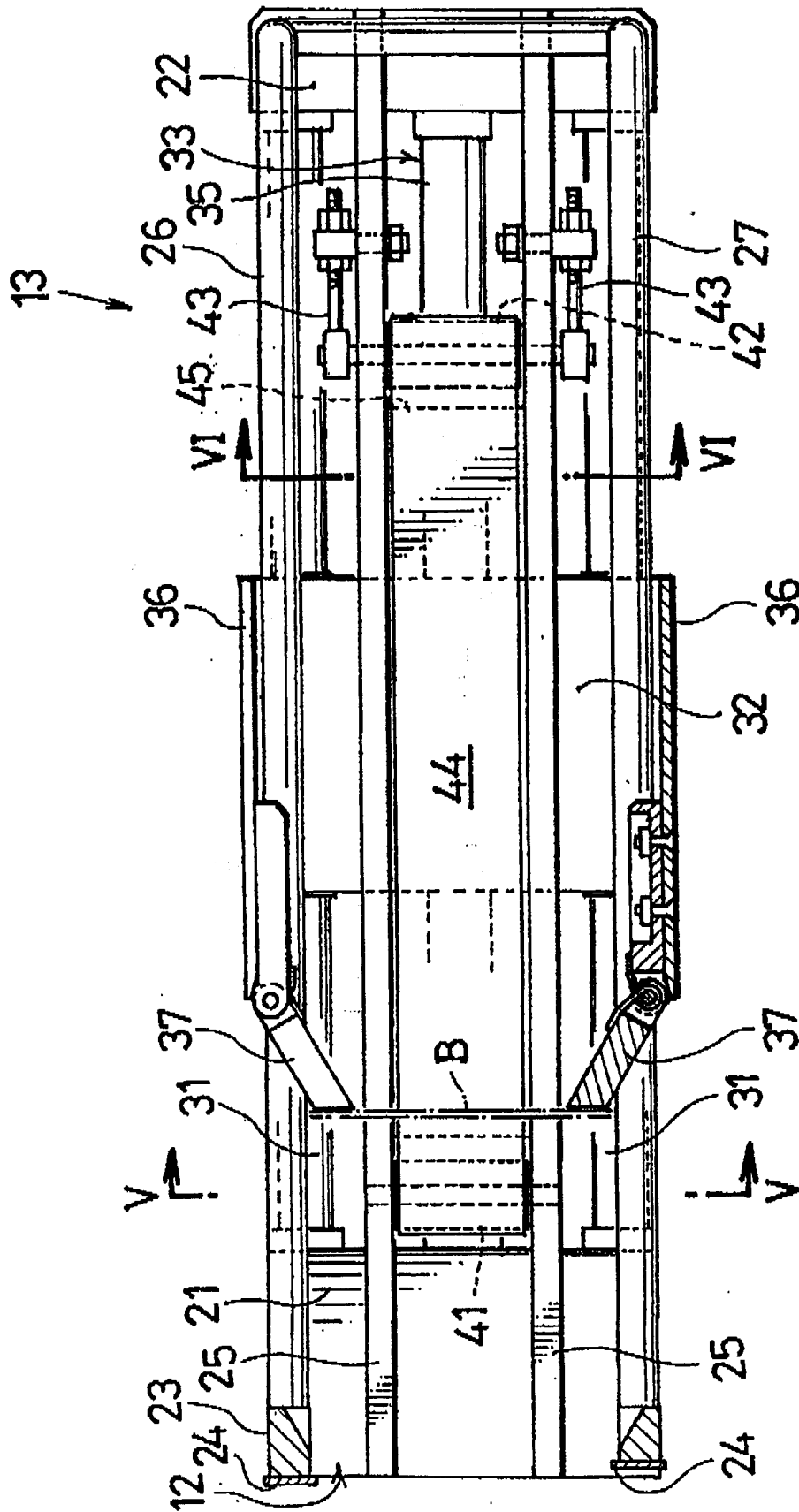
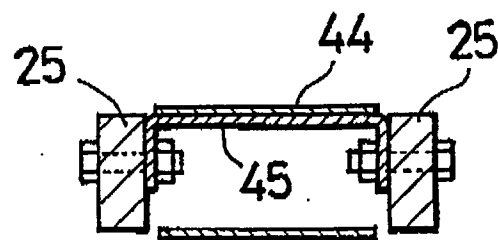
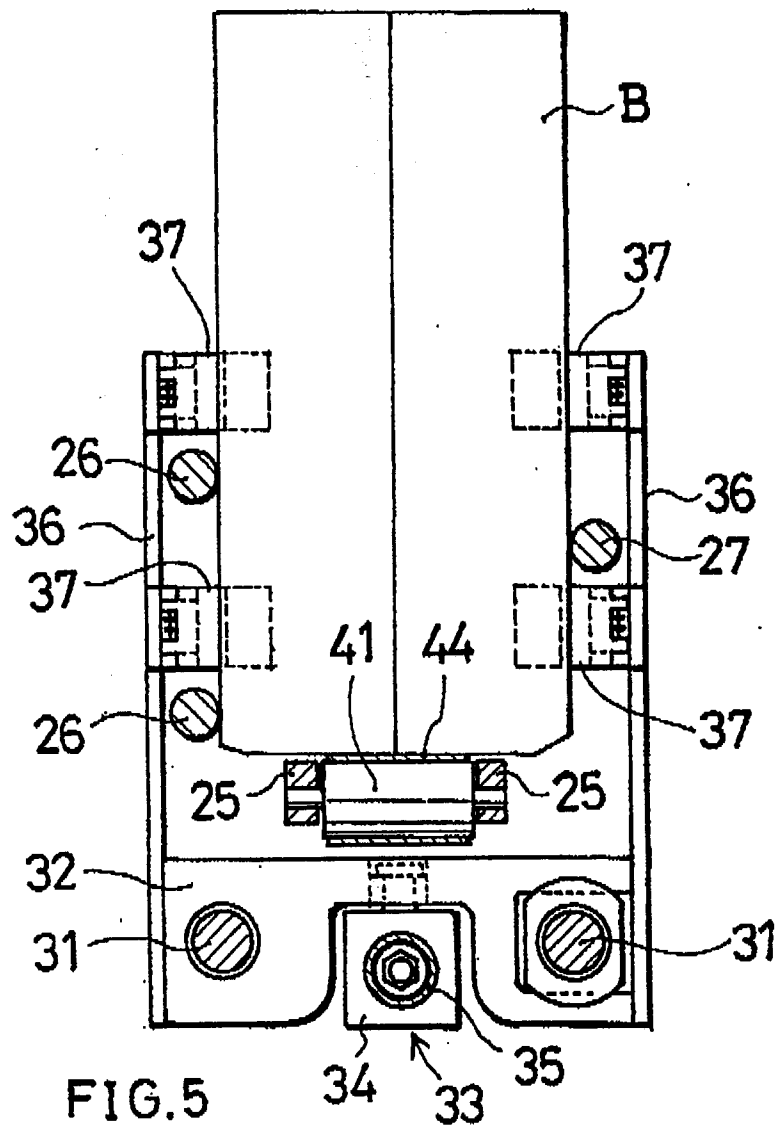


FIG. 4



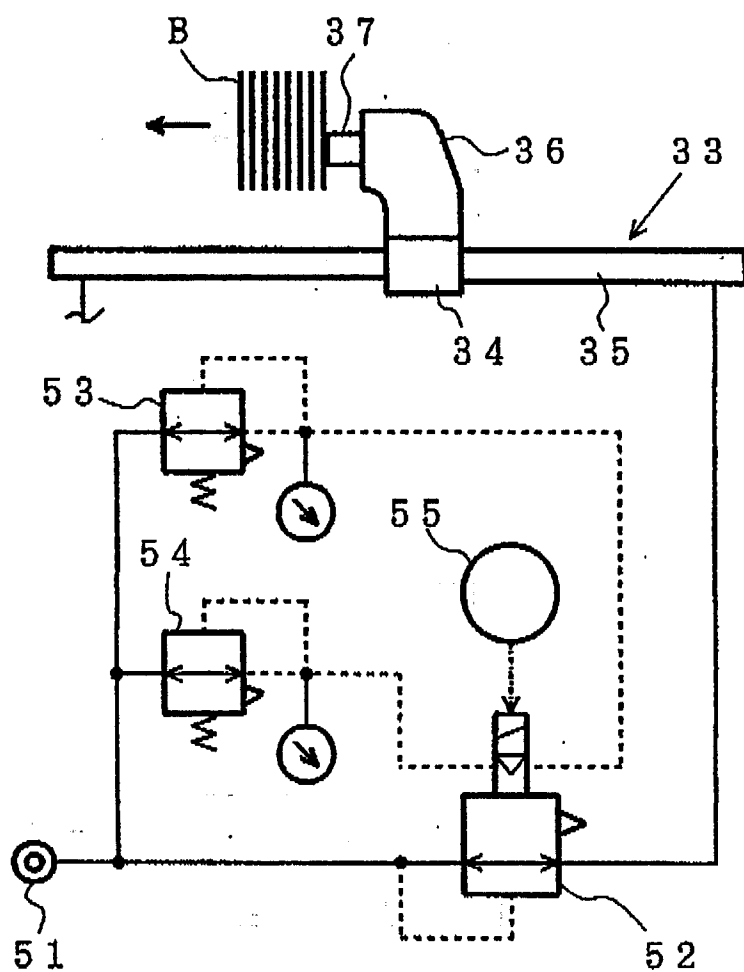


FIG. 7

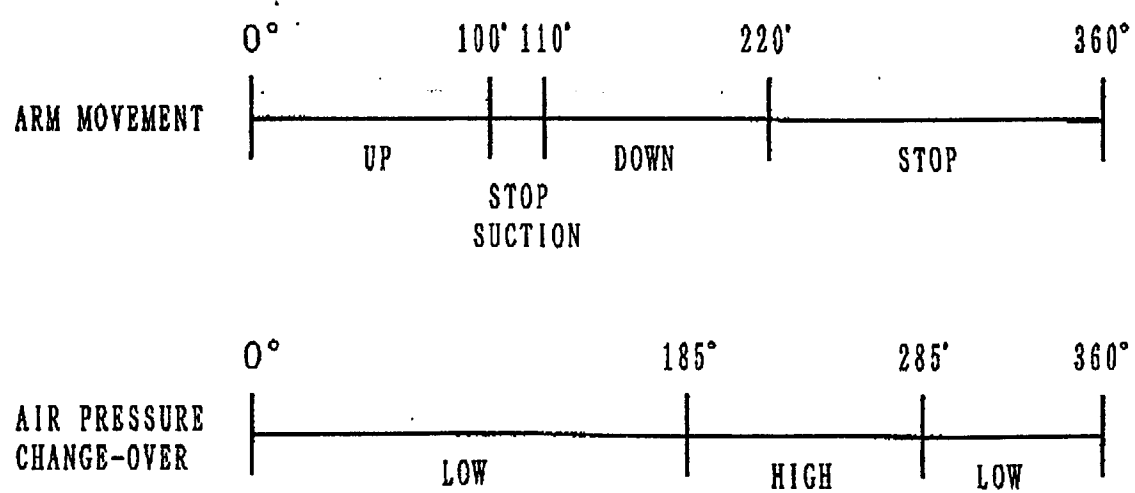


FIG. 8



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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 93202503.4
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	<u>EP - A - 0 492 734</u> (SHIKOKU KAKOKI) * Fig. 1-3 *	1	B 65 B 43/18
A	--	2-7	
Y	<u>DE - B - 2 500 780</u> (LAFARGE) * Fig. 1,2 *	1	
A	--	2-5	
A	<u>DE - A - 4 035 351</u> (CESTIND) * Fig. 1,2 *	1-5	
A	<u>DE - A - 3 249 761</u> (FOCKE) * Totality *	1-7	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 B 43/00 B 31 B 1/00
Place of search VIENNA	Date of completion of the search 12-11-1993	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		I : 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	