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(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, a fluid pressure cylinder (33) 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 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.

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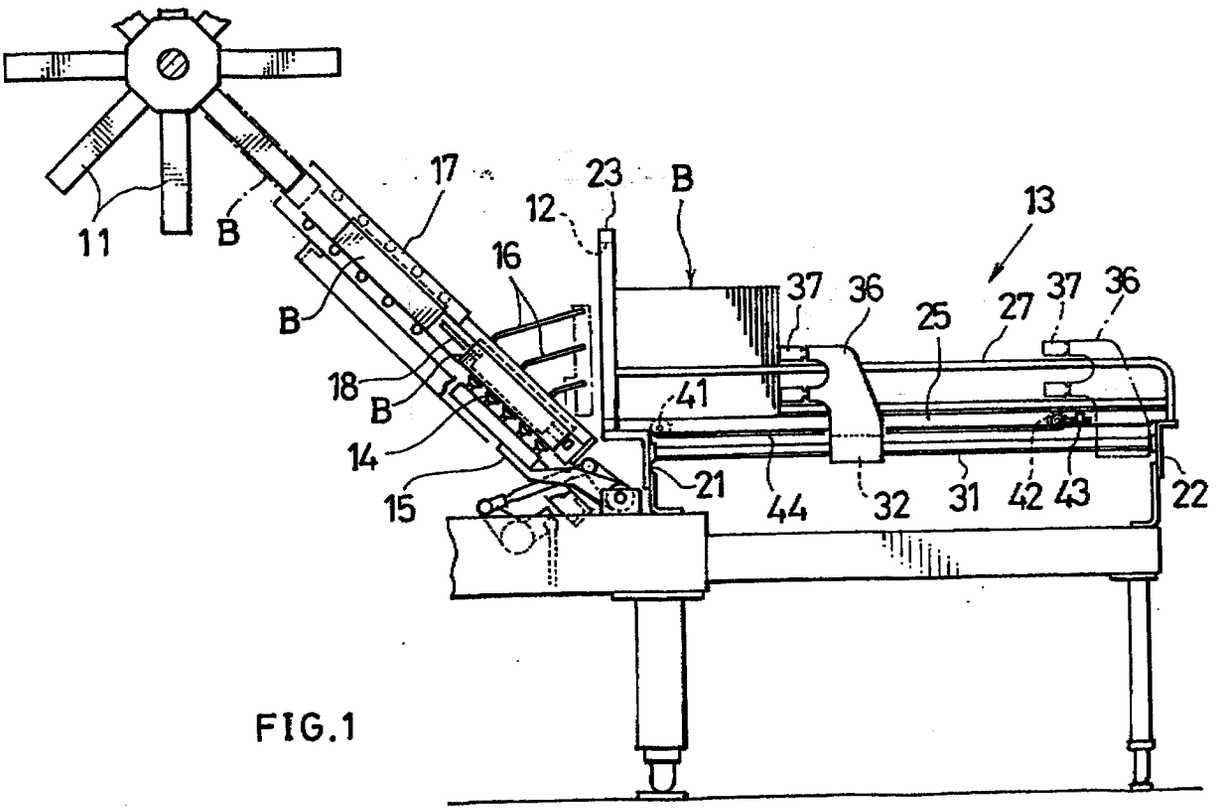
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FIG.1

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, more particularly 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, the blanks being 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 taking out the blanks within the magazine successively one by one from the innermost position through the outlet.

With the above device, it is desirable that the blank taken out from the outlet spontaneously unfold generally to a rhombic form in cross section owing to the resiliency of the blank itself because if otherwise, namely if remaining flat, the blank is difficult to unfold into a square tube.

When the pressure of the pressure means is relatively great, the great pressure impairs the resiliency of blanks as accommodated in the magazine, and the blank remains flat when taken out. Further if the pressure is great, there arises the problem that the blank at the innermost position becomes tightly held between the blank in the next position and the edge portion of the outlet. Conversely, if the pressure is relatively low, the pressure applied to the outermost blank is not transmitted effectively to the innermost blank, failing to smoothly move the blanks within the magazine. This tendency becomes pronounced especially when a relatively large number of blanks remain in the magazine. When failing to move smoothly, the blanks will not be taken out properly.

Because of the above problems, setting the pressure means to a high pressure is in conflict with setting the means to a low pressure, and it has been impossible to set the pressure means to the desired pressure.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a blank feeder comprising pressure means which can be set to a desired pressure.

The present 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 outer 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 means for taking out the blanks within the magazine successively one by one from the innermost position through the outlet, the blank feeder being characterized in that the pressure means is provided with a change-over means for changing over the pressure thereof from high to low and vice versa.

With the blank feeder of the present invention, the blanks within the magazine are smoothly movable when the pressure of the pressure means is high, whereas the resiliency of the blanks will not be impaired when the pressure is low. Thus, the pressure means can be set to the desired pressure.

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 accompanying 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 as 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 rodless 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 there-after 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/cm^2, and the high pressure is 3 to 5 kg/cm^2.

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

means for taking out the blanks B within the magazine (13) successively one by one from the innermost position through the outlet (12),

the blank feeder being characterized in that the pressure means is provided with a change-over means for changing over the pressure thereof from high to low and vice versa.

2. A blank feeder as defined in claim 1 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, and the change-over means is a pressure control valve (52) mounted on piping between a pressure source (51) and the fluid pressure cylinder (33).

3. A blank feeder as defined in claim 2 wherein the pressure control valve(52)is a pilot-operated valve, and lower pressure and high pressure setting valves (53, 54) alternatively apply a pilot pressure to the pressure control valve (52) upon a change-over.

4. A blank feeder as defined in claim 1 wherein the taking-out means has a transport arm (15) provided with blank attracting vacuum cups (14), and an encoder (55) for detecting an angle of inclination of the transport arm (15) and outputting a signal corresponding to the detected angle, the pressure means having pressure members (37) movable inward and outward and a fluid pressure cylinder (33) for urging the pressure members (37) inward, the change-over means being a pilot-operated pressure control valve (52)mounted on piping between a pressure source (51) and the fluid pressure cylinder (33), low pressure and high pressure setting valves (53, 54) being alternatively operable upon a change-over in accordance with the signal from the encoder(55)to apply a pilot pressure to the pressure control valve (52).

5. A blank feeder as defined in claim 4 wherein during one cycle of operation of the transport arm (15)to take out one blank from the magazine (13), the pressure control valve (52) is subjected to the pilot pressure of the low pressure setting valve (53) for a required period within which the vacuum cups (14) attract thereto the blank B from the innermost position within the magazine (13), and the pressure control valve (52) is subjected to the pilot pressure of the high pressure setting valve (54) for a period other than said period.

6. A blank feeder as defined in any one of claims 1 to 5 which comprises guide means for guiding the blanks B with their bottoms resting thereon while the blanks are moved toward the outlet (12) the guide means comprising 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).

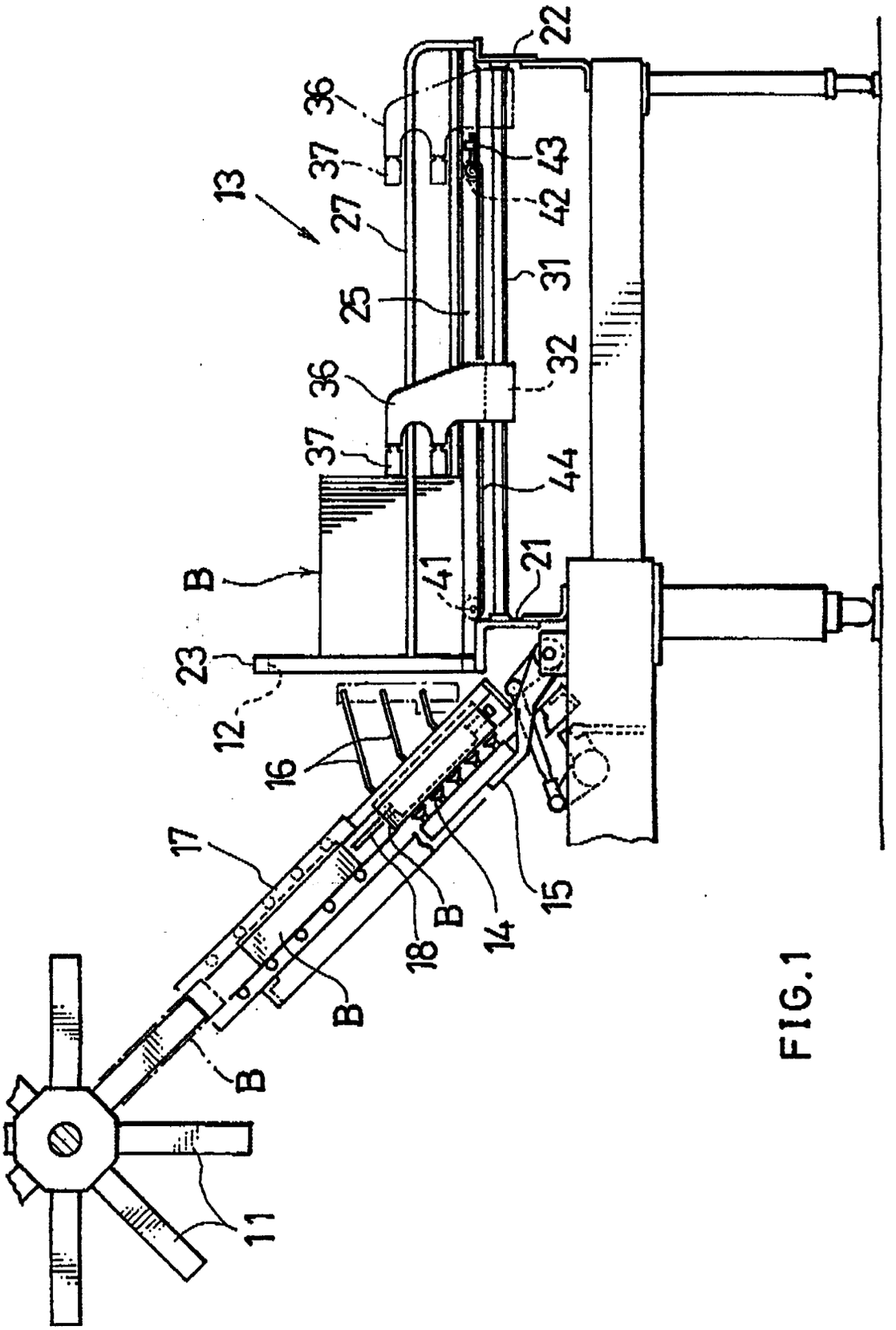
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FIG.1

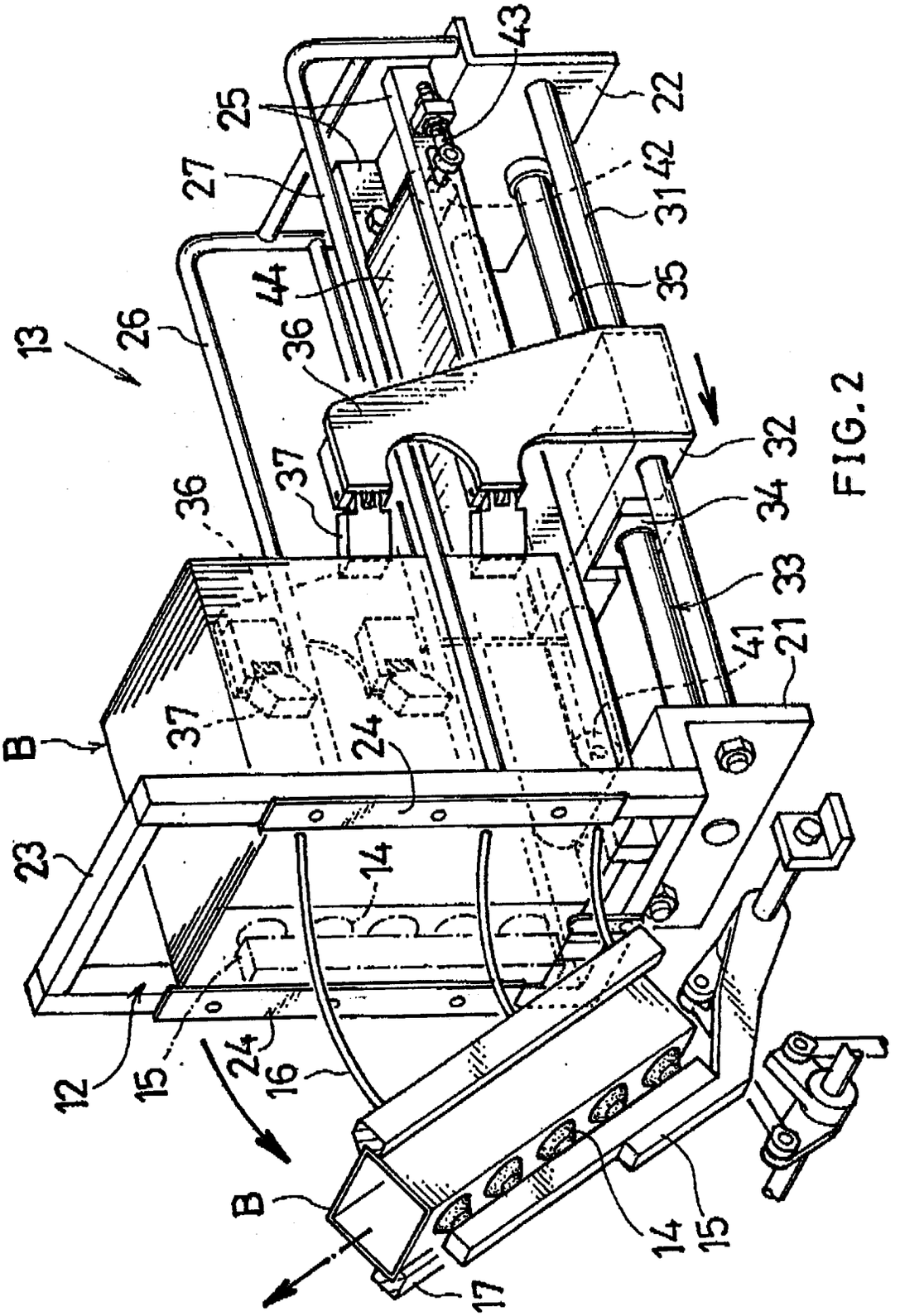
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FIG.2

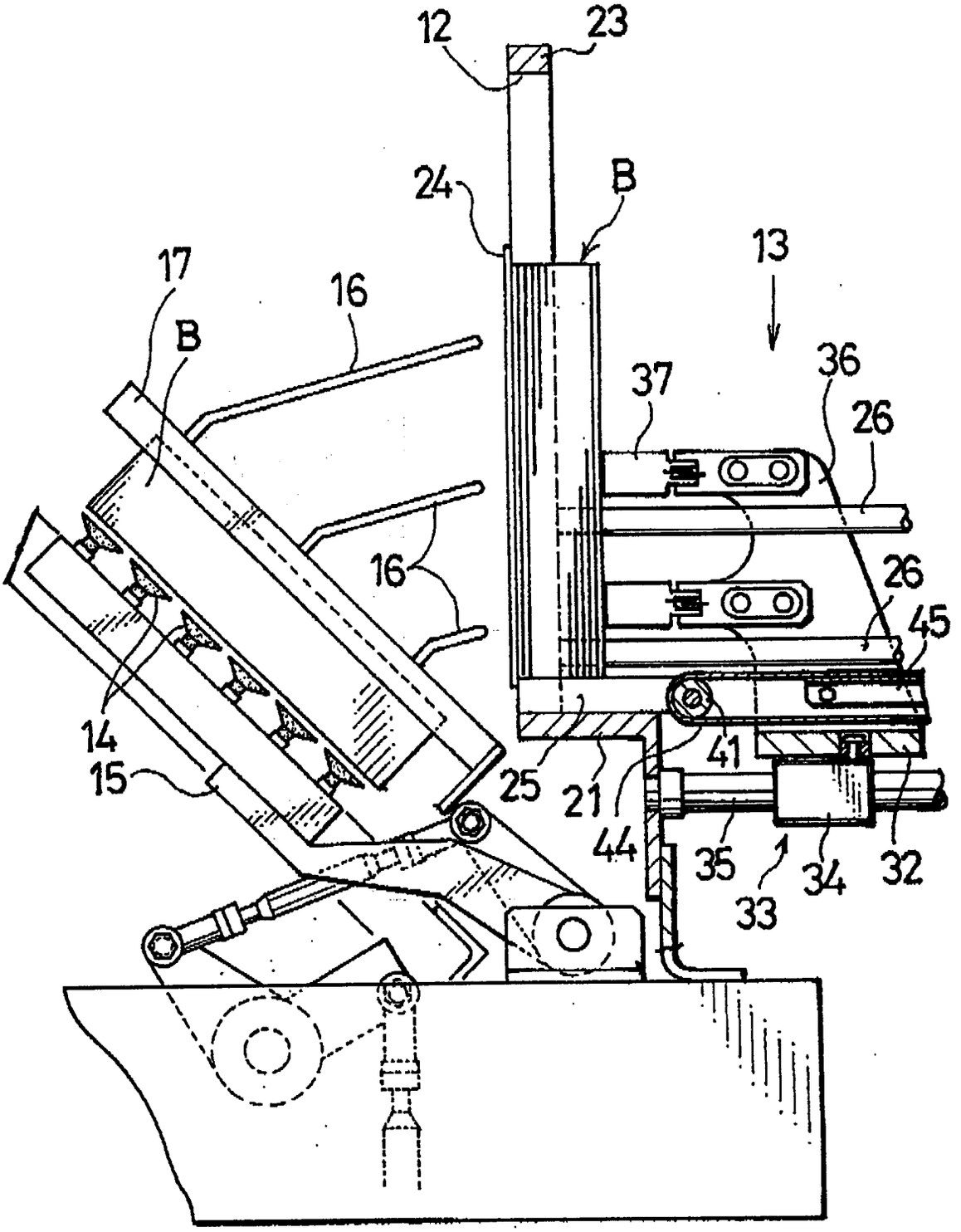

FIG.3

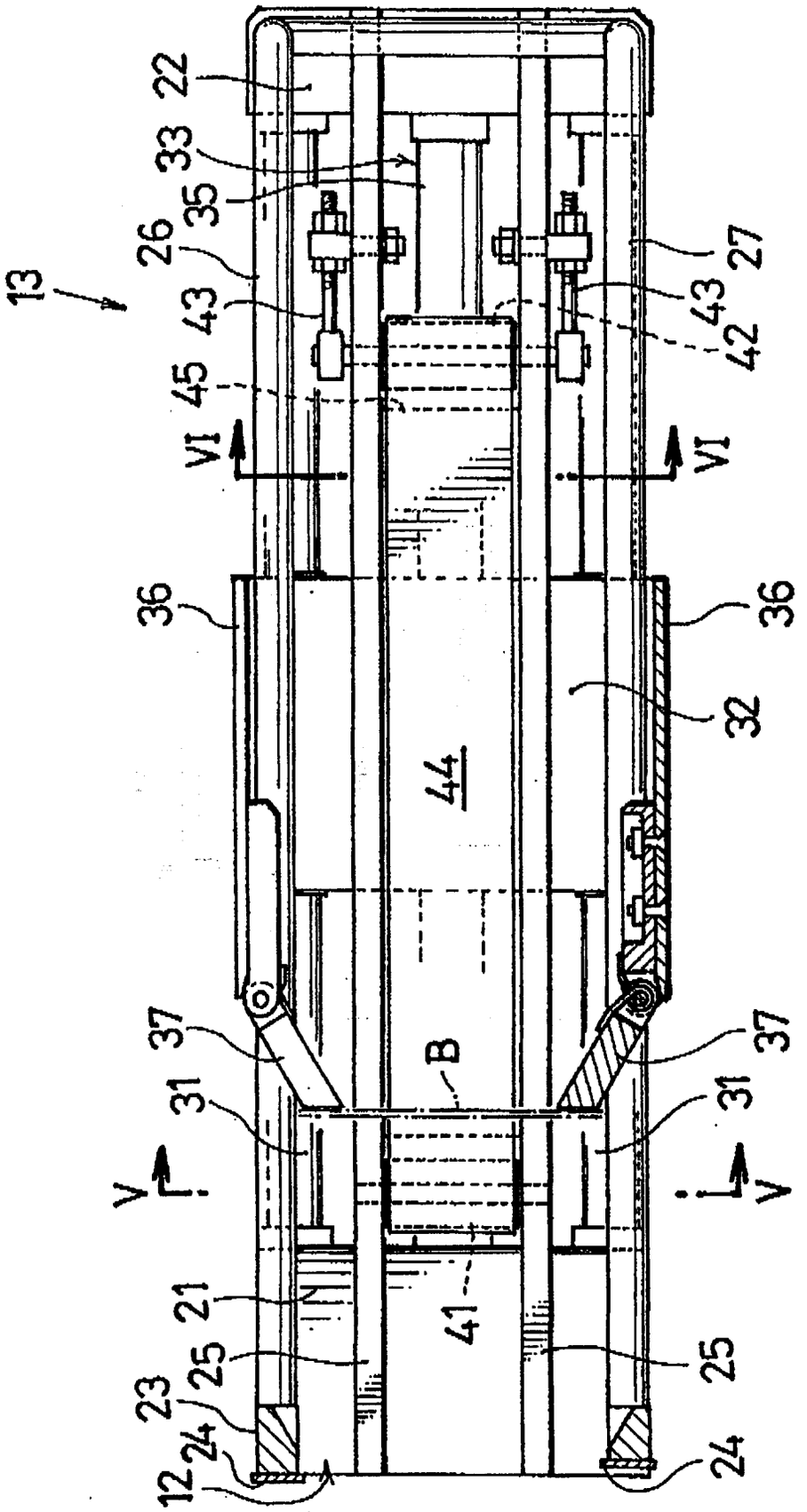

FIG.4

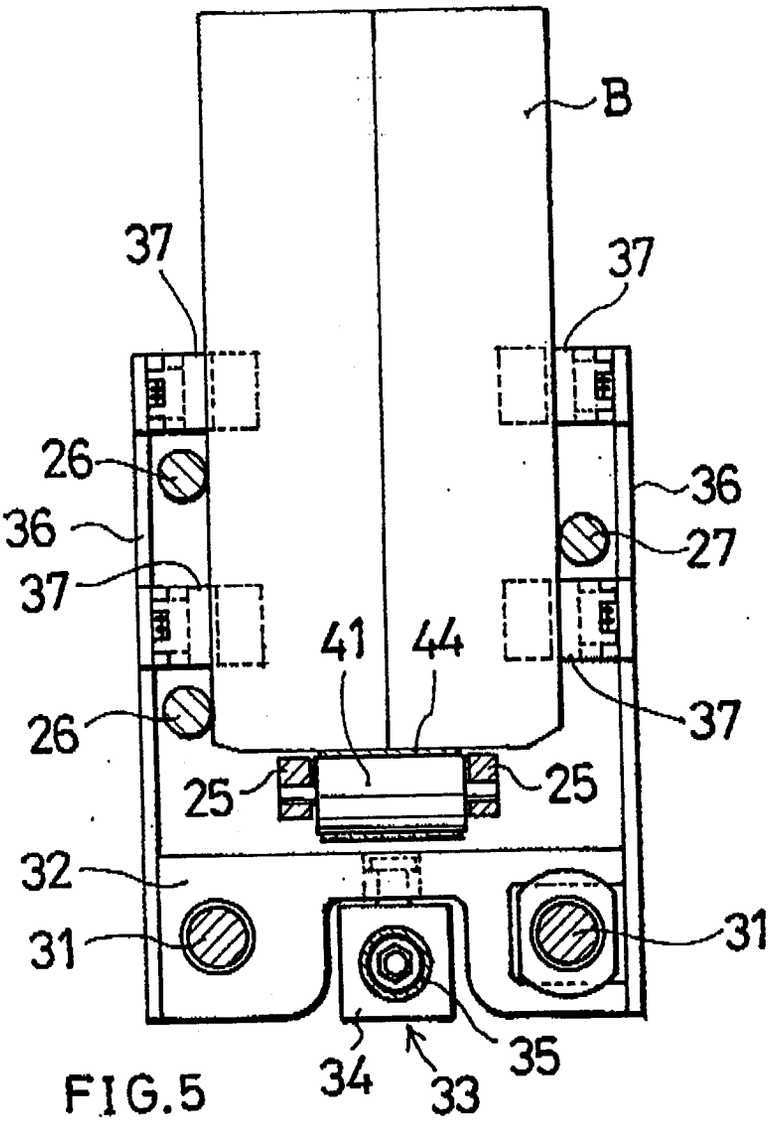

FIG.5

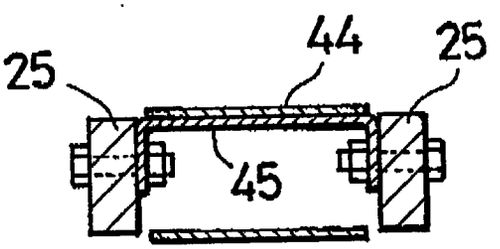

FIG.6

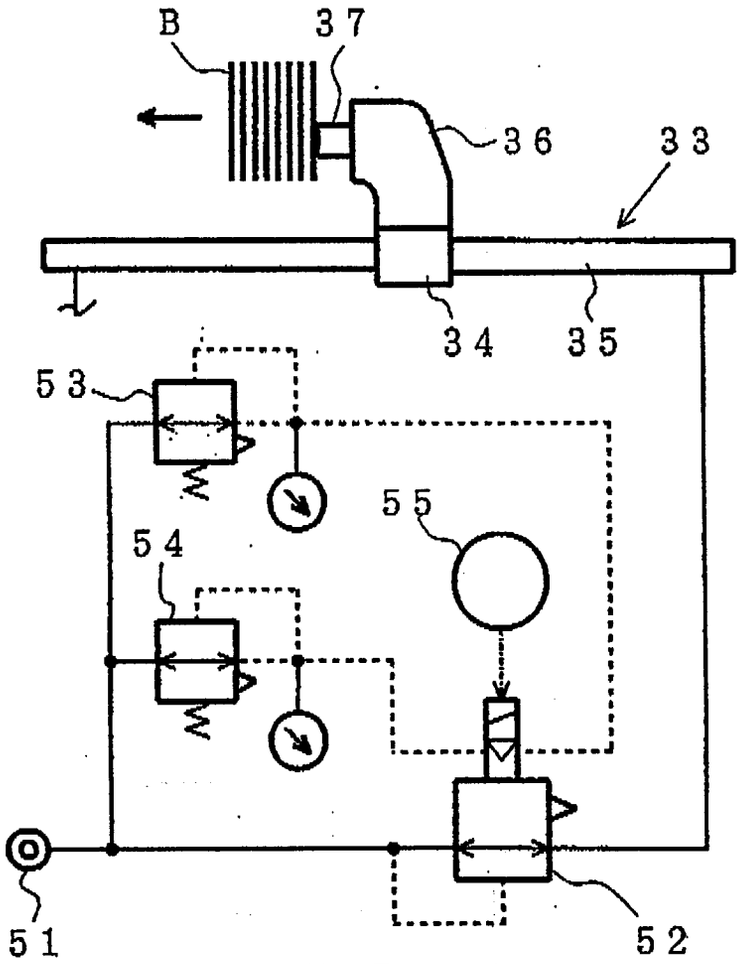
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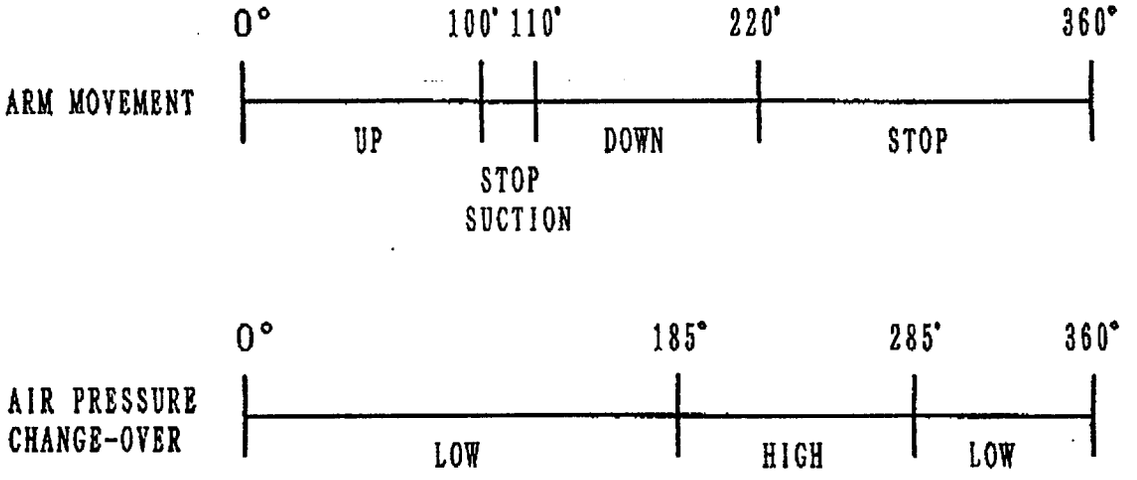
FIG. 7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100°
110°
220°
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ARM MOVEMENT
UP
STOP
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0°
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285°
360°
AIR PRESSURE
CHANGE-OVER
LOW
HIGH
LOW

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 93202502.6

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP - A - 0 492 734 (SHIKOKU KAKOKI) * Fig. 1-6 * --	1-6	B 65 B 43/18
A	US - A - 4 522 016 (DIRICO) * Fig. 6 * --	1-5	
A	US - A - 3 608 440 (REICHERT et al.) * Fig. 11 * --	1-5	
A	DE - B - 2 500 780 (LAFARGE) * Fig. 1,2 * ----	1,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 B 43/00
B 31 B 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	12-11-1993	FIETZ

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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