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(71) Applicant: Elopak A/S
Postboks 160
N-3400 Lier(NO)

(72) Inventor: Siegreist, Hendrik Jan george
Grote Sluis 34
NL-2026 JZ Spaarndam(NL)

(72) Inventor: Sorby, Tore
Voldstadveien 2
3300 Hokksund(NO)

(74) Representative: Burrows, Anthony Gregory et al,
Haseltine Lake & Co. Hazlitt House 28 Southampton
Buildings Chancery Lane
London, WC2 1AT(GB)

(54) Liquid-flow control apparatus.

(57) A dosing device for filling liquid into containers comprises a filler body 1 and a metering device 2. The device 2 communicates with the interior of a rotary valve 7 through an end cover 9 of the valve housing 10, the valve 7 including a valve seat 11 and a check valve closure member 12 spring-biased towards the seat 11. The valve 7 includes three rotary ports 34, 34' and 39 and two fixed ports 36 and 40. Downstream of the port 40 is an anti-drip suction-producing device 8 of a piston-and-cylinder form whereof the stroke of the piston 15 is adjustable. Upstream of the port 36 is a throttling valve 24 lowerable into an operative position downstream of inlet holes 21 from a liquid-containing tank. For a high viscosity liquid, it is drawn into the device 2 through the holes 21, the ports 36 and 34 and the end cover 9, the valve 7 is rotated to align the port 34' with the port 40 and to close the port 36, and the liquid is then expelled from the device 2 through the end cover 9, the ports 34' and 40 and an outlet nozzle 38. A low viscosity liquid is drawn into the device 2 through the holes 21, the lowered valve 24, the ports 36 and 34 and the end cover 9, and is then expelled from the device 2 through the end cover 9, the valve 11, 12, the ports 39 and 40 and the nozzle 38.

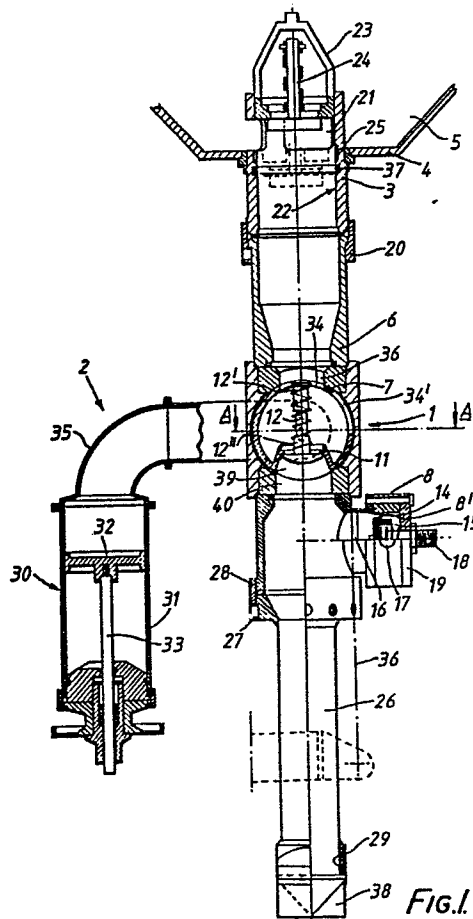


FIG.1.

1 LIQUID-FLOW CONTROL APPARATUS

The present invention relates to apparatus for controlling liquid flow.

According to one aspect of the present invention,
5 there is provided apparatus for controlling liquid flow, comprising duct means, a rotary valve interposed in said duct means and including a fixed inlet port and a fixed outlet port arranged at an angular interval from each other, and first and second rotatable ports arranged at
10 said interval from each other, characterized in that a check valve is carried by said rotary valve and arranged to close said second rotatable port.

Owing to the invention, it is possible to provide apparatus which smoothly and efficiently controls the
15 flow of high viscosity liquids as well as low viscosity liquids.

According to another aspect of the present invention, there is provided dosing apparatus for emitting liquid doses, comprising an outlet chamber,
20 means for supplying doses of liquid to said chamber and including an inlet valve to said chamber, outlet means from said chamber, and a suction-producing device communicating with said chamber at a location downstream of said inlet valve and upstream of said outlet means and
25 arranged to produce suction in said chamber, said device including a wall portion of said chamber movable inwardly and outwardly to reduce and increase, respectively, the internal volume of said chamber, and adjusting means for adjusting the stroke of said wall portion.

30 In order that the invention may be clearly understood and readily carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Fig. 1 shows a view, mainly in vertical section,
35 of a dosing apparatus for filling liquid into containers,

Fig. 2 shows a view which is mainly a horizontal

1 section taken on the line A-A of Fig. 1,

Figs. 3 and 4 are respective views similar to Fig. 1, but diagrammatic and illustrating the apparatus during high viscosity liquid prefilling and filling stages, respectively,

Figs. 5 and 6 are respective views similar to Figs. 3 and 4, but during low viscosity liquid prefilling and filling stages, respectively, and

Fig. 7 shows two half-views of a modification of the apparatus, an upper half-view being substantially a vertical section, and the lower half-view being a sectional side elevation.

Referring to the drawings, the apparatus comprises a filler body 1 and a metering device 2, the filler body 1 having an upper portion 3 extending through and projecting upwards beyond the bottom wall 4 of a liquid tank 5 and communicating with the tank 5, and an intermediate portion 6 fixed to the upper portion 3 by a threaded nut 20, and a suction-producing device 8. The metering device 2 communicates via a tube 35 with a rotary valve 7 through an end cover 9 of the rotary valve housing 10, the rotary valve 7 including an internal built-in valve seat 11 and a check valve closure member 12 urged towards the valve seat 11 by a helical tension spring 12', a bushing on the valve stem 12'' limiting the downward stroke of the member 12. The rotary valve is rotatable through 113° by an air cylinder 41 or a mechanical drive, itself controlled by a timer, and includes three rotary ports 34, 34' and 39 arranged at intervals of 67° between the ports 34 and 34' and of 113° between the ports 34' and 39, and two fixed ports 36 and 40 at 180° intervals. The device 8 is fixed to a lower cylindrical part of the intermediate portion 6 and includes a vacuum chamber 8' separated from the interior of the filler body 1 by a roll membrane 14 and connected to a vacuum pump (not shown), a membrane piston 15 being

1 pressed towards a stop pin 16 by a spring 17 when the
chamber 8' is not under vacuum, and the length of stroke
being adjustable by a screw 18 centrally threaded in a
vacuum chamber cover 19 of the device 8. The negative
5 pressure in the chamber 8' can be adjusted with a bleeder
nozzle (not shown).

The upper portion 3 has inlet openings 21 for high
viscosity liquid. Below the openings is an O-ring 37
mounted in an annular groove in the inner surface 22 of
10 the portion 3.

An inlet piston 23 has, for low viscosity liquid,
an inlet check valve 24 built-in. When the filler is
used for low viscosity liquid the piston 23 is lowered
axially in the portion 3 to seal against the O-ring 37.
15 The piston 23 is operated by an air cylinder not shown in
Fig. 1.

The piston 23 has to be lifted by the air cylinder
to release trapped air from the body 1. Vertical grooves
25 are made in the surface 22 to allow the escape of
20 surplus liquid when the piston is lowered.

The lower portion of the filler body 1 comprises a
tubular part 26 which is attached to the intermediate
portion 6 by means of a fastening nut 27 screwed on a
threaded end 28 of the portion 6. A flexible nozzle 38
25 is mounted in a groove 29 on the lower end zone of the
tubular part 26. The nozzle is made of a resilient
material and has outlet lips which are pressed sealingly
together by the resilience of the material.

The metering device comprises a metering cylinder
30 30 comprised of a cylindrical body 31, a piston 32 and a
piston rod 33.

Operating the filler for high viscosity liquid filling

With the piston 23 permanently in its upper
position, the downward stroke of the piston 32 in the
35 metering cylinder 30 permits liquid to flow into the
cylinder from the tank 5 through the openings 21, 36 and

1 34 and the end cover 9 and the tube 35 (Figure 3). When
the downward stroke is completed, the rotary valve 7 is
turned through 113° by means of the air cylinder 41 or
mechanical device to close the port 36 and open the ports
5 34' and 40 to the nozzle 38. When the metering piston 32
moves upward the liquid flows from the metering cylinder
30 to the nozzle 38 and into a container to be filled
(Figure 4).

As the metering piston 32 reaches its top position
10 the rotary valve 7 turns back 113° . When the port 40 is
closed, the vacuum chamber 8' is immediately evacuated
and a negative pressure is created in the part 26.

Operating the filler for low viscosity liquid filling

With the port 34 open, the metering cylinder 30 is
15 filled by a downward stroke of the piston 32. The piston
23 is in its top position to release air. When the
filling starts, the piston 23 is moved downwards to seal
against the O-ring 37. Surplus liquid in the filler body
1 will then partly escape to the tank 5 through the
20 grooves 25 and partly be pressed out through the check
valve 12 (Figure 5). When the piston 32 is moved upwards
the check valve 24 closes and the check valve 12 opens
and liquid is discharged through the nozzle 38 (Figure
6).

25 When the piston 32 ends its upward stroke the
spring-loaded check valve 12 closes.

If the check valve 12 does not create the
necessary negative pressure in the nozzle 38, the device
8 is operated by an external vacuum control valve (not
30 shown).

The dosing apparatus described above has an
advantage that it can be changed between handling low
viscosity liquid and handling high viscosity liquid by
simply raising or lowering the piston 23 and by simply
35 rendering operative or inoperative the rotary valve 7, so
that it is not necessary to dismantle and change any part

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1 of the apparatus. Another advantage is that the vacuum
in the chamber 8' can be readily adjusted without
interrupting production.

In the modification shown in Figure 7, the
5 membrane piston 15 of the device 8 has been replaced by a
piston 115 sealingly encircled by an O-ring 110 housed in
an annular internal groove in a cylinder 103. The piston
115 includes a central rod 119 on which is held by a nut
116 a piston ring 113 between two clamping rings 104 and
10 105. The piston 115 is double-acting, compressed air
being introduced alternately through parts 106 and 107 at
respective opposite sides of the piston ring 113. A set
screw 118 screwed axially into the outer end of the
cylinder 103 adjustably sets the stroke of the piston and
15 thus the magnitude of the suction produced in the chamber
between the valve 7 and the nozzle 38. A boss or a hole
114 for an Allen key or the like is formed in that end of
the piston 115 bounding the latter chamber, to permit
tightening of the nut 116 without the need to dismantle
20 the device 8.

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CLAIMS

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1. Apparatus for controlling liquid flow, comprising duct means (1), a rotary valve (7) interposed in said duct means (1) and including a fixed inlet port (36) and a fixed outlet port (40) arranged at an angular interval from each other, and first and second rotatable ports (34,39) arranged at said interval from each other, characterized in that a check valve (11,12) is carried by said rotary valve (7) and arranged to close said second rotatable port (39).

15

2. Apparatus according to claim 1, and further comprising a metering device (2) communicating with the rotary valve (7) by way of a further port (9) via which said metering device (2) can receive a desired amount of liquid through said fixed inlet port (36) and said first rotatable port (34) and can emit said amount through said second rotatable port (39) and said fixed outlet port (40).

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3. Apparatus according to claim 2, wherein said rotary valve (7) comprises a third rotatable port (34') which can be brought, by rotation of said rotary valve (7), to a position substantially aligned with said fixed outlet part (40) and through which and said fixed outlet port (40) said metering device (2) can emit said amount, alternatively to through said second rotatable port (39) and said fixed outlet port (40).

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4. Apparatus according to any preceding claim, and further comprising liquid-flow throttling means (24) arranged upstream of said fixed inlet port (36).

5. Apparatus according to claim 4, wherein said liquid-flow throttling means (24) is displaceable between an inoperative position in which it is unable to throttle liquid flowing towards said fixed inlet port (36) and an operative position in which it throttles liquid flowing towards said fixed inlet port (36).

6. Apparatus according to any preceding claim and further comprising an outlet chamber (6,26) downstream of

said fixed outlet port (40), outlet means (38) from said chamber (6,26), and a suction-producing device (8) communicating with said chamber (6,26) at a location downstream of said fixed outlet port (40) and upstream of said outlet means (38) and arranged to produce suction in said chamber (6,26).

7. Apparatus according to claim 6, wherein said suction-producing device (8) includes a wall portion (14,115) of said chamber (6,26) movable inwardly and outwardly to reduce and increase, respectively, the internal volume of said chamber (6,26), and adjusting means (18,118) for adjusting the stroke of said wall portion (14,115).

8. Apparatus according to claim 7, wherein said suction -producing device (8) comprises a piston-and-cylinder device (8), and said adjusting means (18,118) comprises set screw means (18,118) arranged to abut the piston (15,115) of said piston-and-cylinder device (8).

9. Dosing apparatus for emitting liquid doses, comprising an outlet chamber (6,26), means (7,30) for supplying doses of liquid to said chamber (6,26) and including an inlet valve (7) to said chamber (6,26), outlet means (38) from said chamber (6,26), and a suction-producing device (8) communicating with said chamber (6,26) at a location downstream of said inlet valve (7) and upstream of said outlet means (38) and arranged to produce suction in said chamber (6,26), said device (8) including a wall portion (14,115) of said chamber (6,26) movable inwardly and outwardly to reduce and increase, respectively, the internal volume of said chamber (6,26), and adjusting means (18) for adjusting the stroke of said wall portion (14,115).

10. Apparatus according to claim 9, wherein said suction -producing device (8) comprises a piston-and-cylinder device (8), and said adjusting means (18,118) comprises set screw means (18,118) arranged to abut the piston (15,115) of said piston-and-cylinder device (8).

Neu eingereicht / Newly filed
Nouvellement déposé
(R 35)

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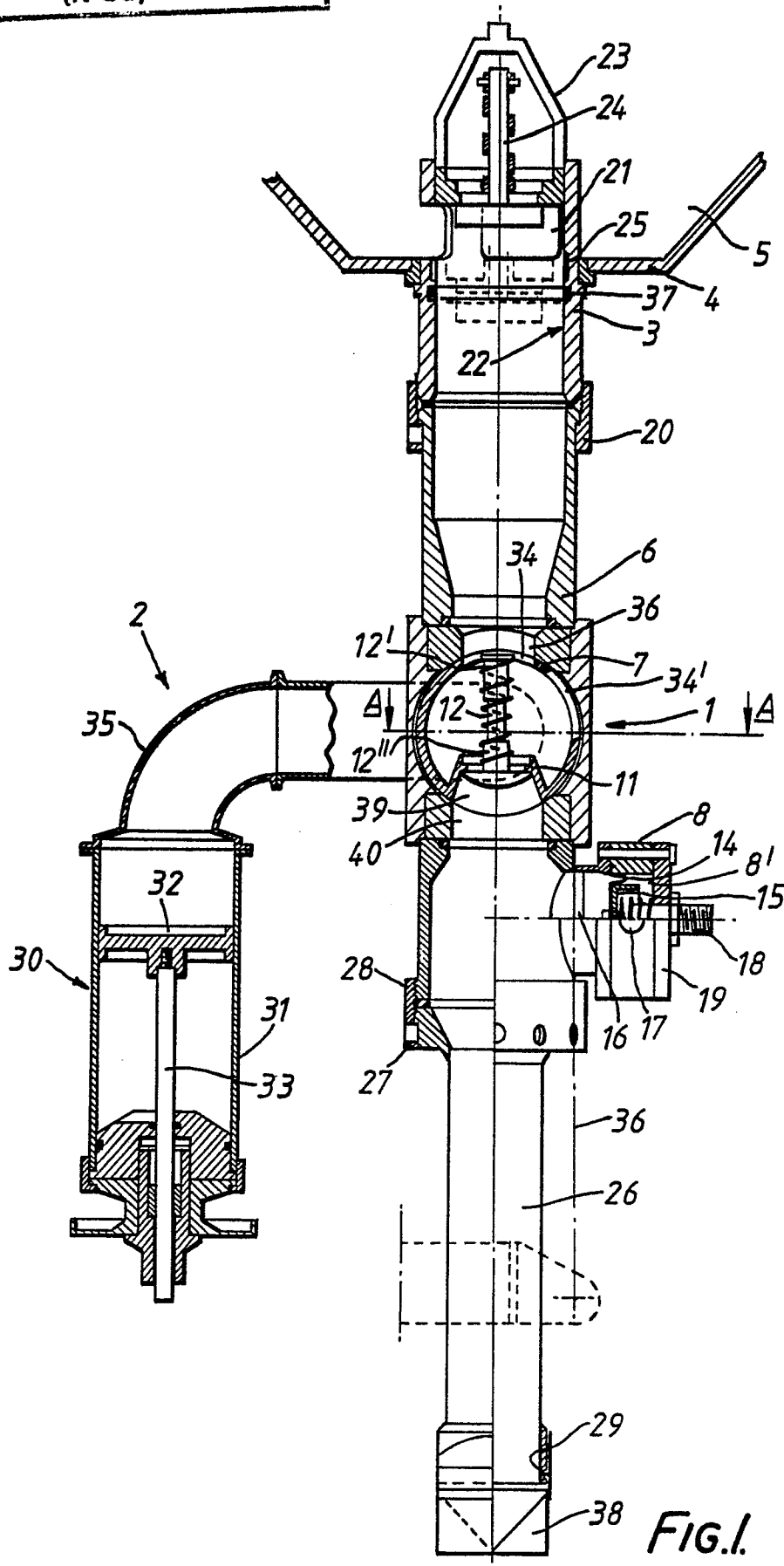


FIG. 1.

Neu eingereicht / Newly filed
Nouvellement déposé
(R 35)

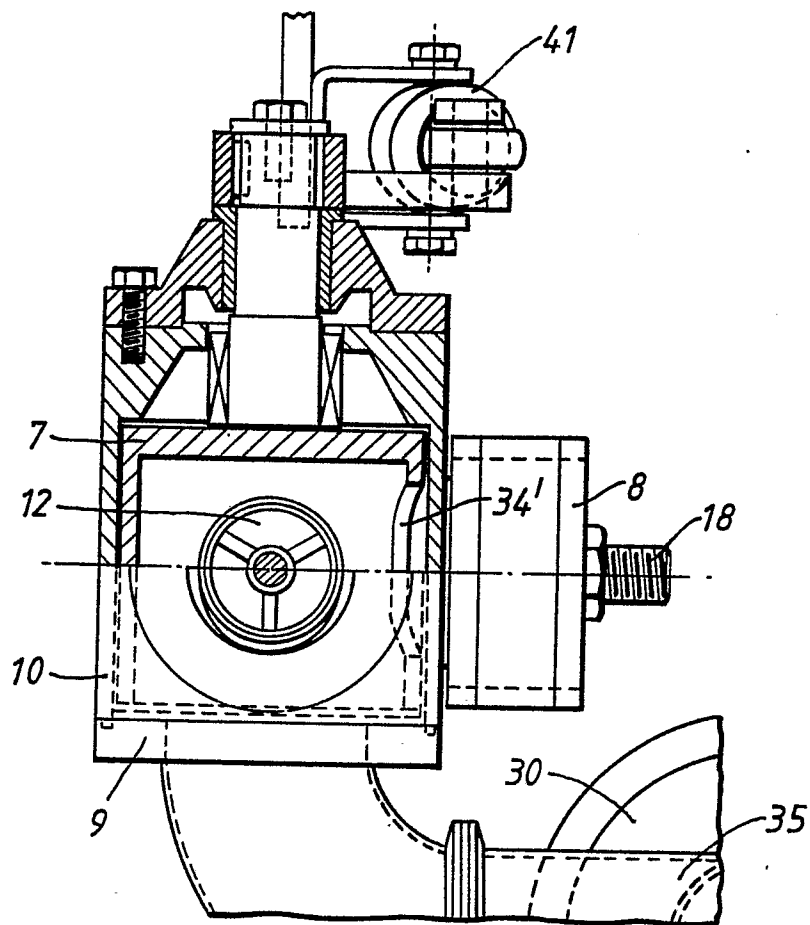


FIG. 2.

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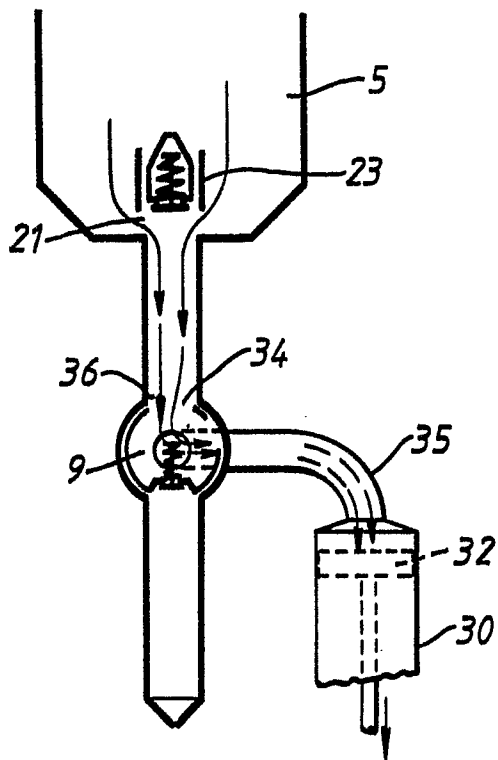


FIG. 3.

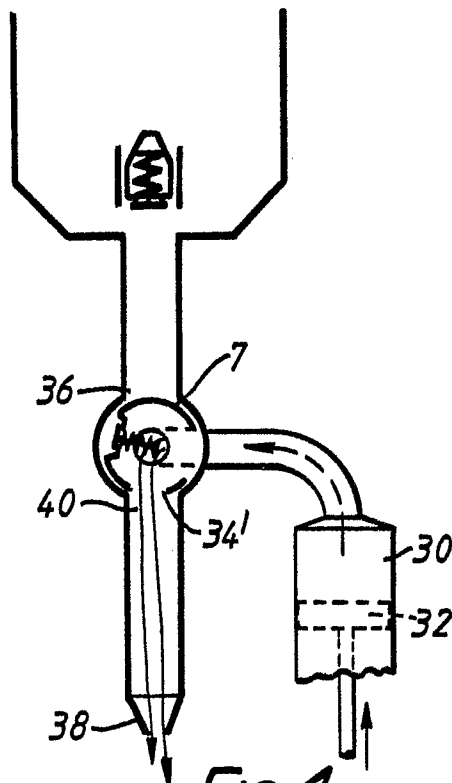


FIG. 4.

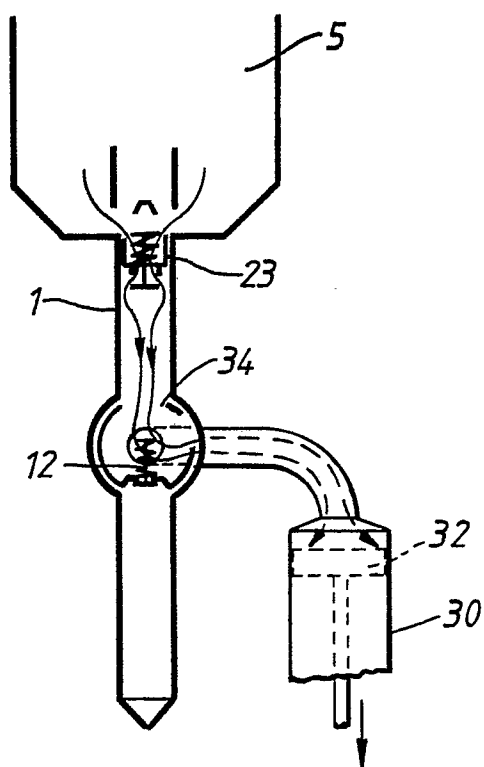


FIG. 5.

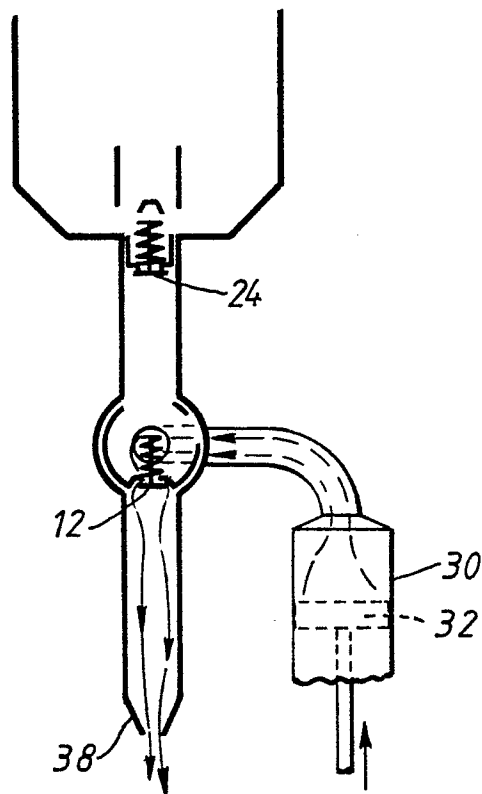
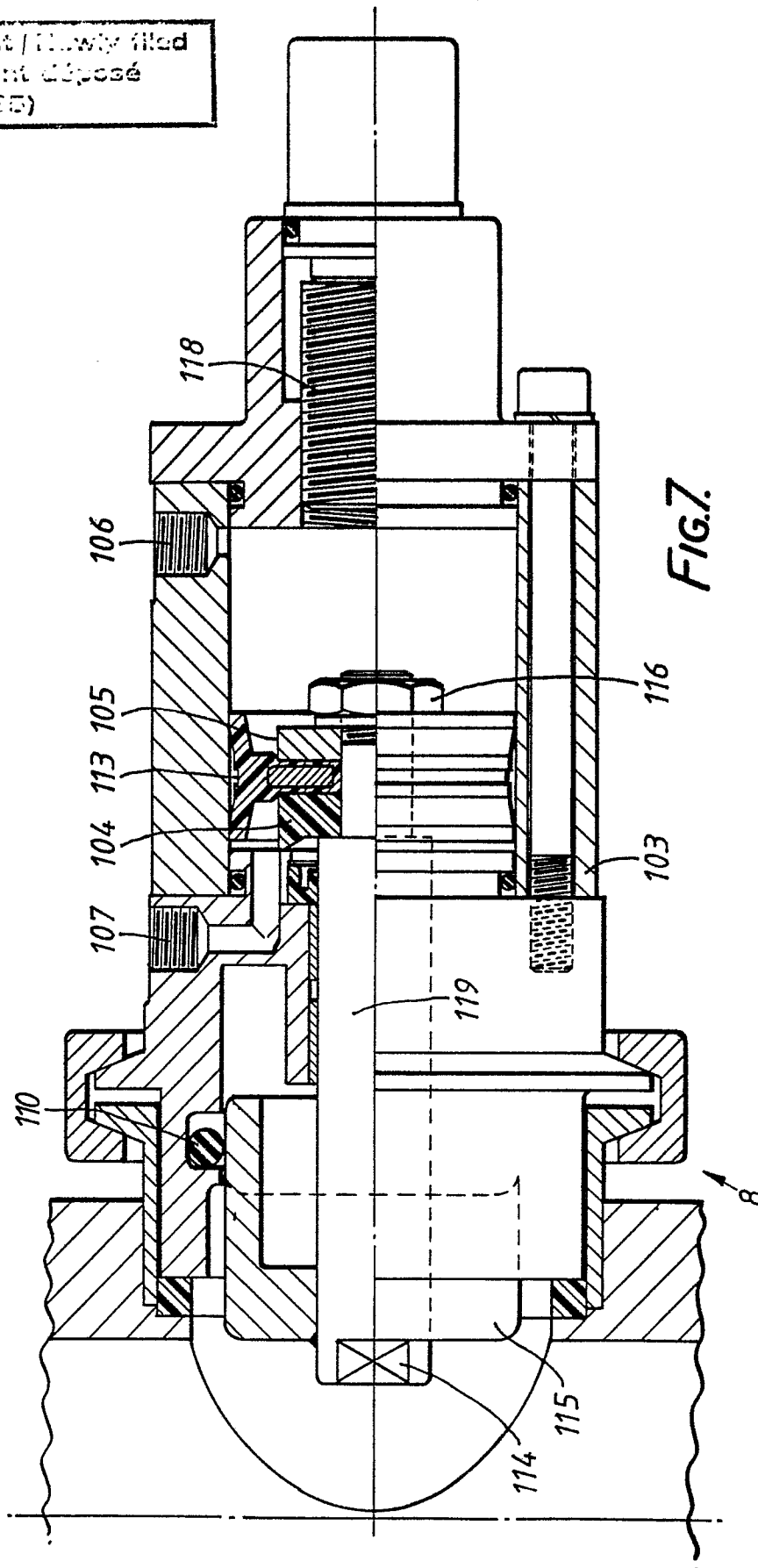


FIG. 6.

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Neu eingezeichnet / Newly filed
Relevé au point déposé
(R 85)





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-2 399 300 (STEWART et al.) * Page 1, left-hand column, lines 34-41; page 1, right-hand column, lines 30-32; figures 1,6-8 *	1,6	B 65 B 3/32
Y		2,4,7,8	
A		3	
Y	--- VERPAKKING, vol. 27, no. 8, April 1975, pages 372-382; L.A. VAN DRIEL et al.: "Doseersystemen bij verpakkingsmachines" * Figures 15,16 *	2,4	
A	--- IDEM	3	
A	--- EP-A-0 138 234 (SHIKOKU KAKOOKI CO. LTD) * Page 7, lines 26-31; figure 1 *	5	
X	--- US-A-4 254 806 (ELSWORTH) * Column 7, lines 40-42; column 9, lines 7-15; figures 1,2 *	9,10	
Y	--- -/-	7,8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13-03-1987	Examiner SCHELLE, J.
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			



EP 86 30 9291

DOCUMENTS CONSIDERED TO BE RELEVANT			Page 2
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 310 479 (JAGENBERG-WERKE) * Page 2, lines 14-16; figure * -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13-03-1987	Examiner SCHELLE, J.
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	