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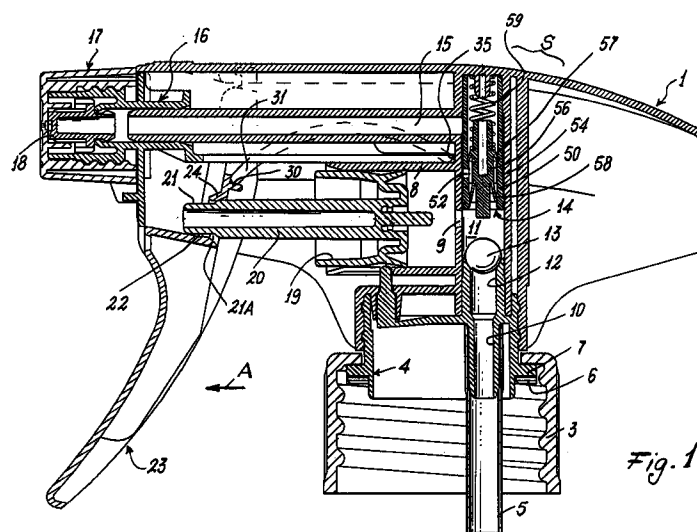
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(54) **Sprayer device with precompression pump operated manually by a trigger lever**

(57) A precompression delivery valve (14) is mounted in the delivery conduit of the device. To facilitate device priming, the piston (19) is provided with a prolongation (62) which acts on and deforms said valve

(14) in such a manner as to open an escape path for the air compressed by the piston (19).



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Description

This invention relates to a manually operated sprayer device comprising: a body fixable to a container containing the liquid to be sprayed, a cylinder within this body, a piston movable within said cylinder, and an operating lever of trigger type mounted rotatable in said body and connected to said piston in such a manner as to move it in the two directions and on which there act elastic return means which react against the body and are out of contact with the liquid to be sprayed, a suction valve, a delivery valve, and a nozzle which receives the liquid pumped by the piston.

Such a device is described for example in European patents 0529254, 0529256 and 0529255, all in the name of the present applicant.

An object of the present invention is to provide a device of the described type which prevents dripping or not properly atomized delivery of liquid, this happening particularly at the beginning and end of delivery.

A further object of the present invention is to provide a device of the described type in which priming is facilitated.

These and further objects which will be more apparent from the ensuing detailed description are attained by a device in accordance with the accompanying claims.

The invention will be more apparent from the detailed description of a preferred embodiment thereof given hereinafter by way of non-limiting example with reference to the accompanying drawing, in which:

Figure 1 is a middle longitudinal section through the device of the invention;

Figures 2, 3 and 4 are longitudinal sections to an enlarged scale showing that part of the device with which the invention is concerned.

With reference to the figures, the manual sprayer device S shown therein comprises a body 1 to be connected to a container containing the liquid to be dispensed. The connection is made by an axially holed screw cap 3 to be screwed onto the threaded neck of the container, an insert 4 forced into the body 1 which carries on its tubular appendix 10 a conventional dip tube 5 passing through said screw cap 3, and an annular gasket 6 which is forced against the top of the container neck by an external flange 7 of the insert 4 when the screw cap 3 is screwed onto said neck.

In the body 1 there is provided a cylinder 8. This cylinder has an aperture 9 which communicates with a channel within which the liquid to be dispensed moves. This channel is composed of a first portion represented by the dip tube 5 and the tubular appendix 10 on which it is mounted; a second portion formed by a chamber 11 bounded by a tubular appendix 12 of the insert 4, a ball 13 acting as an intake valve and seated on said tubular appendix 12, a precompression delivery valve 14 (described in greater detail hereinafter), the body 1 and

a third portion, indicated by 15, which extends into the body 1 and into a threaded tubular appendix 16 which, together with a nozzle 17 screwed to it, defines a chamber in which a member 18 acting as a mixing head is provided. The members 17 and 18 can be of any known type and as the present invention does not depend on them, the description will not further describe these parts.

Within the cylinder 8 there is movably mounted a piston 19 having a hollow extension or rod 20 which terminates with a portion of smaller cross-section via a step 21A. The end portion 21 extends through an intermediate aperture 22 of a trigger lever indicated overall by 23, rotatably secured to the body 1 in a manner known from the initially stated state of the art.

The intermediate aperture 22 is provided at the end of an axially hollow approximately frusto-conical projection 24 on the trigger lever 21. As described and represented in European patent 0529255 to which reference should be made for details, the aperture 22 comprises saw-toothing which enables the end portion 21 of the rod to be inserted into the aperture 22, but prevents its extraction as in this case the toothing would bite into the rod material, which is chosen suitably softer than that of the lever. In this manner a reliable unidirectional connection is achieved between the lever 23 and the piston 19.

Said toothing enables movement to be transmitted in one direction by the trigger lever to the piston (in the case of Figure 1, towards the left, arrow A), the engagement between the step 21A and the inner face of the hollow frusto-conical projection 24 of the lever 21 enabling movement to be transmitted in the reverse direction.

As known from the said state of the art, the trigger lever also comprises two seats or recesses 30 positioned symmetrical about the plane of the drawing in proximity to the upper part of the lever. These recesses 30 house the ends of two arched springs 31 (only one is visible in Figure 1) of plastic material, as is practically the entire device, their other ends resting against internal supports 35 on the body 1. These springs are described for example in European patent 0529254.

The trigger lever is pivoted to the body 1, for example as described in detail in European patent 0529255, to which reference should be made.

The precompression delivery valve 14 is visible in Figures 2, 3 and 4 in various operating positions described hereinafter. This valve is mounted in the body 1, downstream of the chamber 11, in a tubular part 54 of said body which communicates with the portion 15 of the liquid passage channel.

The valve 14 comprises a guide bush 50, inserted into the tubular part 54 and retained therein by forced engagement between its frusto-conical rim 51 (projecting outwards) within the softer material of the body 1.

Above the rim 51 the bush comprises one or more holes 52 which open into an annular interspace 53 judiciously provided between the bush and tubular part 54

as far as the mouth of the portion 15 of the channel through which the liquid to be dispensed flows. Said rim 51 seals the lower end of the interspace 53. An annular projection 55 is provided in correspondence with the rim, on the inside of the bush.

Within the bush and forming part of the valve 14, there is slidably mounted a valving piston 56 provided with two spaced-apart seal lips 57 and 58 and lowerly with a prolongation 70. A compression spring 59 acts on the valving piston 56 and against the roof 60 of the tubular part 54 where an integral spring guide 61 is provided.

When the valving piston 56 is in its rest position (Figure 2) the lower seal lip seals against the internal projection 55 of the guide bush 50, while the upper lip 57, by acting on an inner annular step 71 of the bush, maintains the valving piston 56 in situ (preventing its escape from the bush). This latter can be inserted into the bush on assembly by virtue of the flexibility of the seal lips.

Aligned with the hole 9, the piston 19 comprises a prolongation or appendix 62 which, as shown in Figure 3, on reaching its right end-of-travel position through the hole 9, engages the prolongation 70 of the valving piston 56 to deform the lower lip 58 and establish a connection between the chamber 11, the hole 52, the interspace 53, the channel 15 and the outside via the nozzle 17.

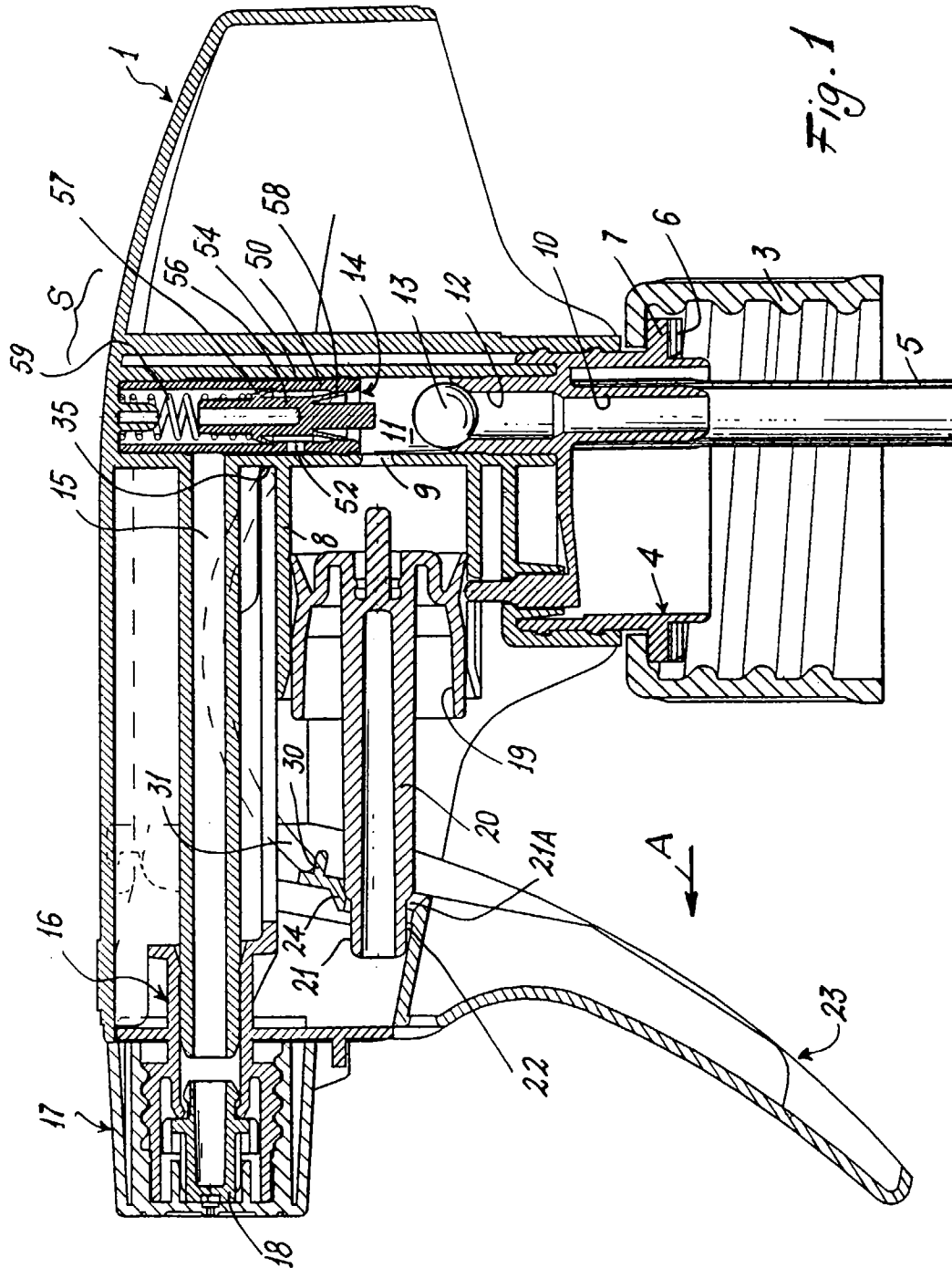
Its operation is as follows: if the pump is already primed, movement of the piston 19 towards the left (Figure 1), produced by the return springs 31 on releasing the trigger lever 23, results in liquid being drawn from the container through the dip tube 5 and the intake valve 13 (open), this liquid passing into the chamber 11 and into the cylinder 8. During pumping (movement towards the right produced by the user operating the trigger lever 23) the valving piston 56 of the delivery valve 14 advances (rises) within the guide bush 50 to compress the spring 59, starting from its rest position of Figure 2. During the delivery stroke the lower lip 58 (Figure 4) passes beyond the annular projection 55 against which it sealed, to enable liquid to flow out through the hole 52, the interspace 53 and the channel 15 to the nozzle 17. The pressure applied in opening the valve 14 and in pumping is proportional to the opposing force of the spring 59. At the end of pumping, when pressure and flow are in their final stage, the spring 59 returns the valving piston 56 to its rest position and then interrupts the flow. On operating the sprayer device, the embodiment of the invention is able to create a precompression (about 5-6 bars) and consequently produce a virtually instantaneous liquid emission and interruption.

If the sprayer device is not primed, during its travel towards the right the piston 19 (Figure 3) moves the appendix 70 of the valving piston 56 to deform its lower lip 58 so that the trapped air can escape through the nozzle 17 of the device via the hole 52, the interspace 53 and the channel 15. If this air were not expelled, because of its compressibility it would not be able to

raise the valving piston 56, and the elastic air cushion formed would hinder or prevent intake.

Claims

1. A manually operated sprayer device comprising: a body (1) fixable to a container containing the liquid to be sprayed, a cylinder (8) within said body (1), a piston (19) movable within said cylinder (8), and an operating lever (23) of trigger type mounted rotatable in said body (1) and connected to said piston (19) in such a manner as to move it in the two directions and on which there act elastic return means (31) which react against the body (1) and are out of contact with the liquid to be sprayed, a suction valve (13), a delivery valve (14), and a nozzle (17, 18) which receives the liquid pumped by the piston (19), characterised in that the delivery valve (14) is of precompression type.
2. A device as claimed in claim 1, wherein the precompression valve comprises a valving piston (56) provided with seal means (57, 58) on which a compression spring (59) acts.
3. A device as claimed in the preceding claims, wherein the valving piston (56) is mounted slidable within a stationary guide body (50) provided with at least one hole (52) communicating with an interspace (53) of limited extension leading to the liquid delivery channel (15).
4. A device as claimed in the preceding claims, wherein the guide body (50) is sealedly coupled at its lower end (at 51) to the seat (54) in which said body is mounted.
5. A device as claimed in the preceding claims, wherein the seal means (57, 58) of the valving piston (56) are two axially spaced-apart seal lips.
6. A device as claimed in the preceding claims, wherein to facilitate its priming, both the piston (19) and the valving piston (56) comprise appendices (62, 70) which mutually engage during the delivery stroke of the piston (19), to produce an escape path for the trapped air.



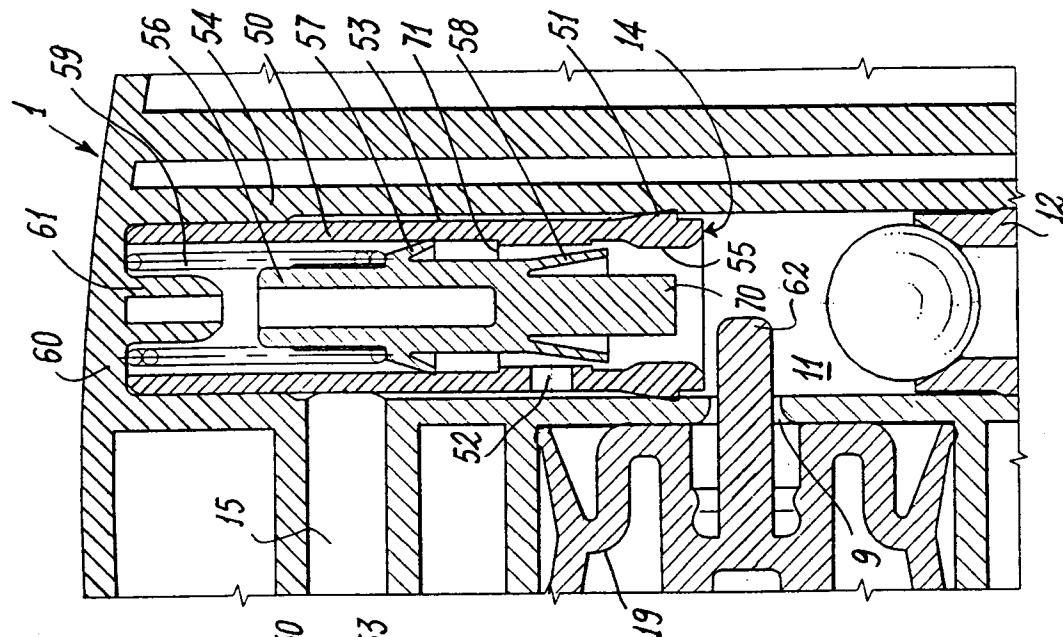


Fig. 4

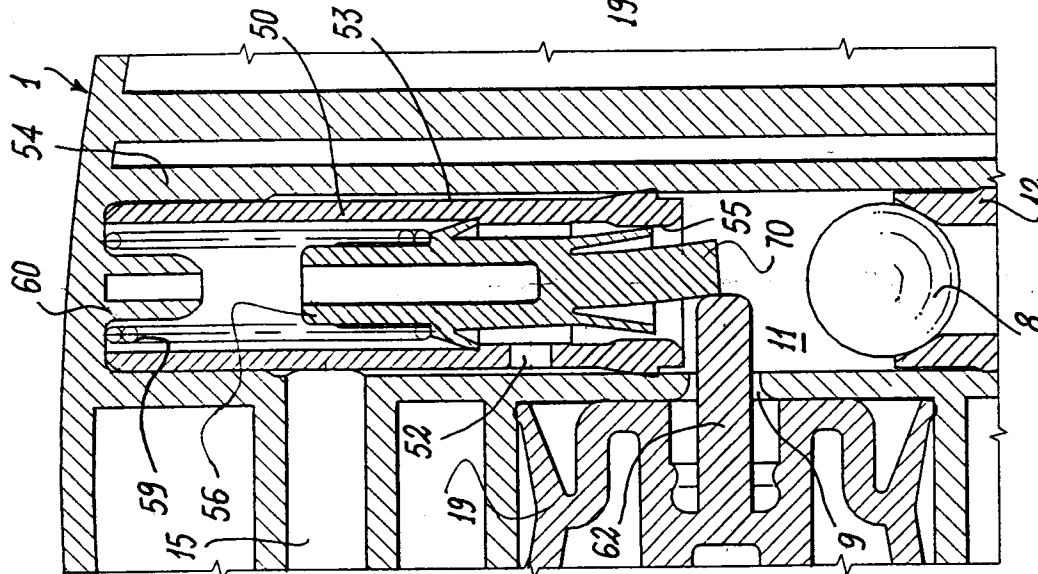


Fig. 3

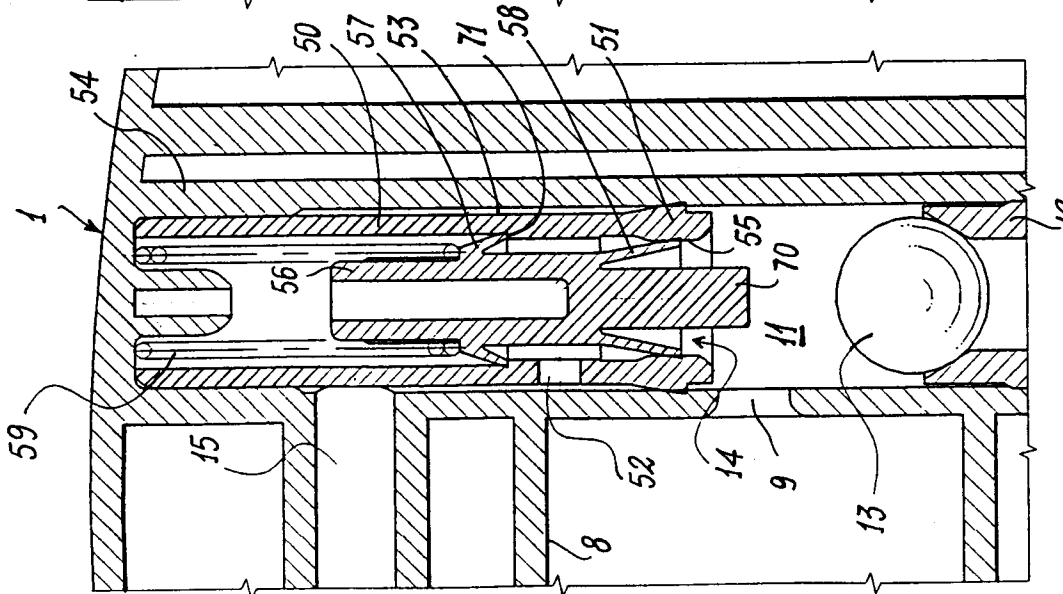


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 97 10 5012

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.6)
X	US 4 596 344 A (CORSETTE DOUGLAS F) 24 June 1986 * column 4, line 7 - column 5, line 62; figures 1,2 *	1-5	B05B11/00
X	US 4 174 056 A (LOEFFLER HERBERT H) 13 November 1979 * column 6, line 20 - column 7, line 15; figures 4,5 *	1-3	
A	US 5 467 900 A (MAAS WILHELMUS J J ET AL) 21 November 1995 * column 6, line 9 - column 7, line 4; figures 1-3 *	1,2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B05B
Place of search MUNICH		Date of completion of the search 8 July 1997	Examiner Innecken, A
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			

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