

- [54] **DISPENSING DEVICE HAVING LOST MOTION PISTON PUMP**
- [75] Inventor: **Oskar Roth, Zurich, Switzerland**
- [73] Assignee: **Involvo AG, Verpackungsmaschinen, Bunzen, Switzerland**
- [22] Filed: **Feb. 11, 1972**
- [21] Appl. No.: **225,421**

3,091,233	5/1963	Dunlap .....	222/146 HE
3,221,937	12/1965	Kamborian .....	222/334 X
3,398,435	8/1968	Nouel .....	425/245 X
3,531,023	9/1970	Mercer .....	222/146 HE
3,622,050	11/1971	Acton et al. ....	222/309

**FOREIGN PATENTS OR APPLICATIONS**

1,249,159	12/1960	France .....	425/245
-----------	---------	--------------	---------

*Primary Examiner*—Robert B. Reeves  
*Assistant Examiner*—David A. Scherbel  
*Attorney, Agent, or Firm*—Michael S. Striker

- [30] **Foreign Application Priority Data**  
 Feb. 15, 1971 Switzerland..... 2178/71
- [52] **U.S. Cl.**..... **222/146 HE, 222/309, 222/380, 222/383**
- [51] **Int. Cl.**..... **B67d 5/40**
- [58] **Field of Search**..... 222/146 H, 146 HE, 309, 222/355, 359, 383, 387, 504, 334, 380; 425/4, 244, 245, 246; 417/511, 513

- [56] **References Cited**  
**UNITED STATES PATENTS**

2,885,734	5/1959	Wacher.....	425/246 X
3,007,202	11/1961	Wucher .....	425/245 X
3,023,936	3/1962	Marsh et al. ....	222/380 X

[57] **ABSTRACT**  
 A piston rod extends longitudinally through a chamber of a cylinder which is provided in one end wall with a dispensing nozzle. A piston surrounds and is slidable along the piston rod between a forward position expelling matter through the nozzle, and a retracted position. One or more passages are provided in the piston and/or the piston rod and these passages connect opposite axial ends of the piston but are open only when the piston is in the forward position. A supply of material to be dispensed communicates with the chamber rearwardly of the piston.

**12 Claims, 3 Drawing Figures**

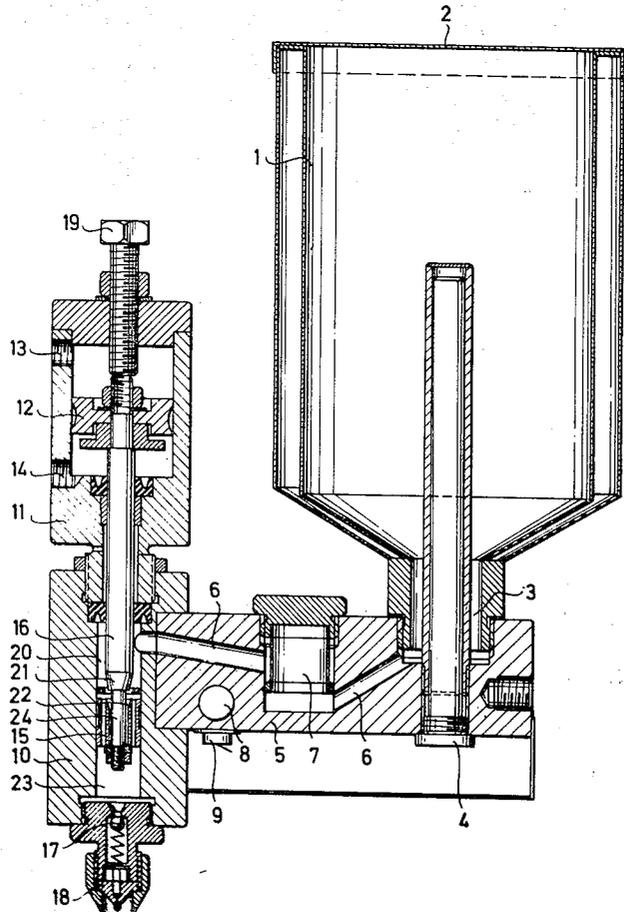
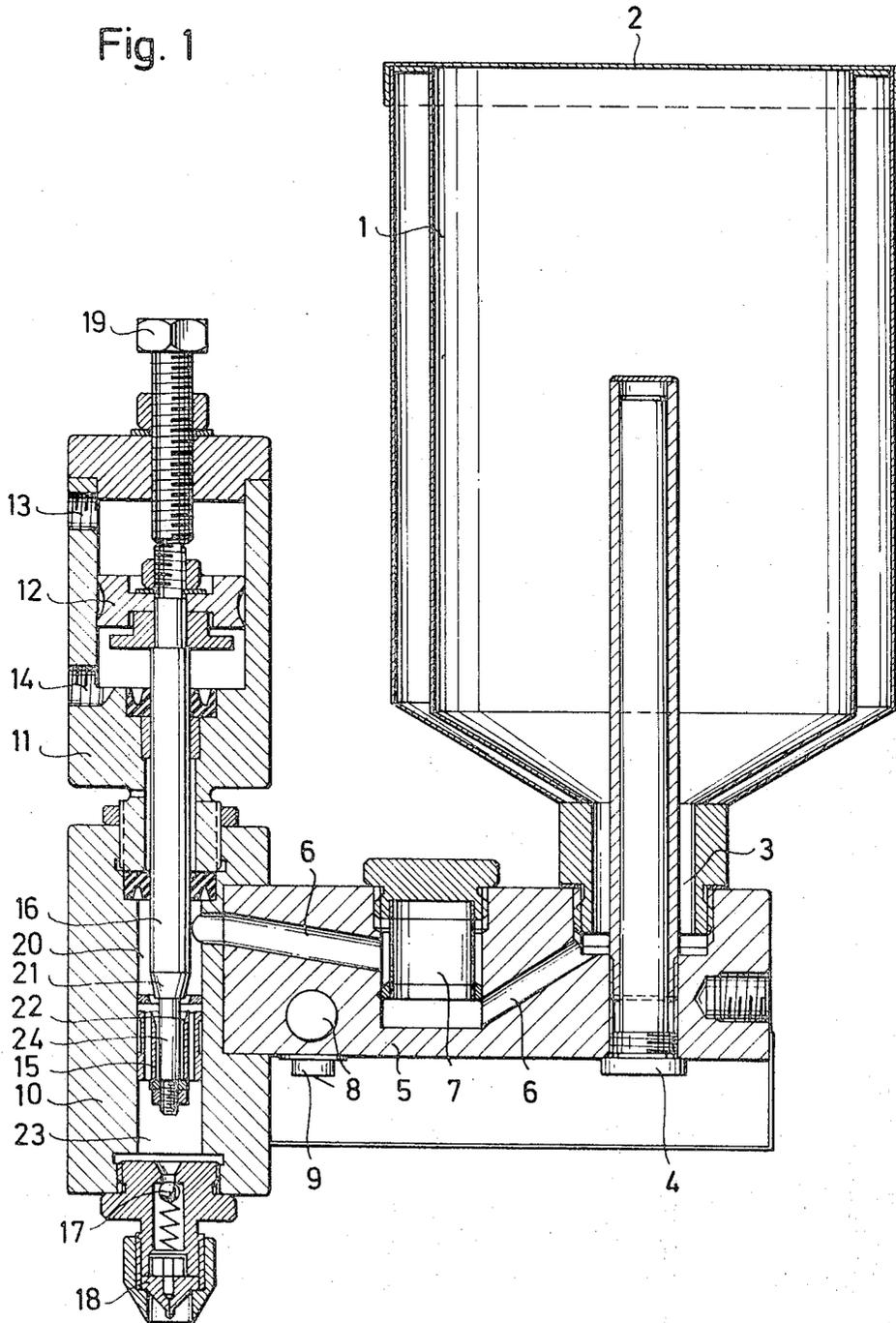


Fig. 1



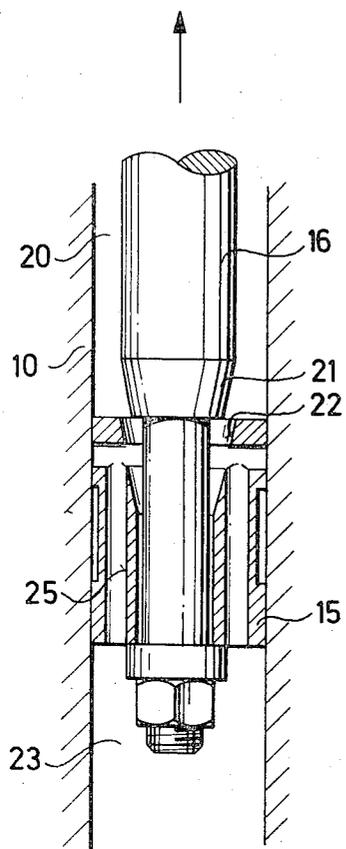


Fig. 2

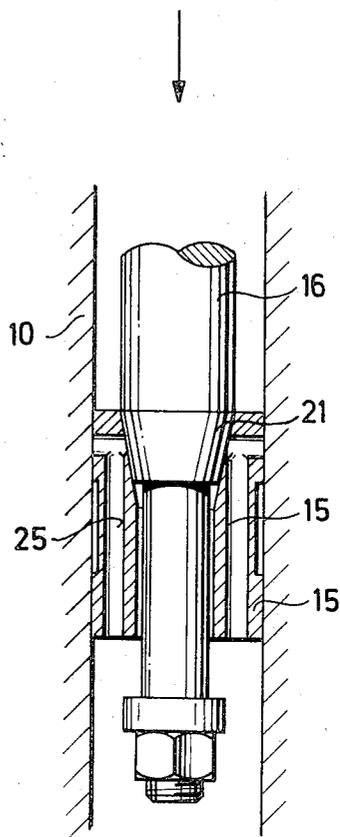


Fig. 3

## DISPENSING DEVICE HAVING LOST MOTION PISTON PUMP

### BACKGROUND OF THE INVENTION

The present invention relates generally to a dispensing device, and more particularly to a device for dispensing a bonding agent. Dispensing devices are already known and in use in the book-binding art and in similar applications, wherein an adhesive or a bonding agent is to be dispensed and applied to a point of use. In these devices the bonding agent is accommodated in a supply vessel which can be heated in order to heat the bonding agent itself. The bonding agent is supplied from the vessel via a similarly heatable connecting conduit under pressure to a spray or dispensing arrangement. The supply vessel itself is not part of a structural unit with the spraying arrangement. When a valve is actuated the bonding agent is expelled from the nozzle of the spraying arrangement.

These known constructions have certain disadvantages. One of these is the fact that it is not possible to precisely meter the quantity of bonding agent which is to be dispensed during each incident of use. Another is that it is not possible to produce during discharge a perfectly straight stream of bonding agent, so that the application of the bonding agent to specific point is often difficult. In addition the relatively significant distances between the supply vessel and the spraying arrangement itself require substantial expenditures for heating of the connection conduit and for thermally insulating the same, which of course is expensive.

### SUMMARY OF THE INVENTION

It is accordingly a general object of the present invention to provide a dispensing device of the type under discussion which is not possessed of the disadvantages of the prior art.

More particularly it is an object of the present invention to provide such an improved dispensing device in which the quantity of material dispensed during each incident of use can be precisely controlled.

An additional object of the invention is to provide such a dispensing device in which a straight spray or stream of material is dispensed during each incident of use, so that the stream can be directed without difficulty to a desired location, and wherein further the stream has a well defined beginning and end at the initiation and termination of the incident of use.

In pursuance of these objects, and of others which will become apparent hereafter, one feature of the invention resides, briefly stated, in a dispensing device, particularly for applying a bonding agent. This dispensing device comprises cylinder means having an elongated internal chamber provided with two end walls. Dispensing nozzle means is provided and communicates with the chamber at one of the walls. A piston rod extends longitudinally through the chamber and a piston surrounds and is slidable along the piston rod between an expelling position closer to and a retracted position farther from the one end wall. The piston divides the chamber into two compartments which are located at opposite axial sides of the piston. Passage means is open and connects the compartments when the piston is in its expelling position, and is closed when the piston is in its retracted position. Supply means forms a part of the dispensing device and communi-

cates with the chamber intermediate the piston and the other of the end walls for supplying material to be dispensed.

With an arrangement according to the present invention the disadvantages of the prior art are overcome, as will become apparent.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

### BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross-section through one embodiment of the invention;

FIG. 2 is a fragmentary detail view is an enlarged-scale section, illustrating the piston of FIG. 1 in its expelling position; and

FIG. 3 is a view similar to FIG. 2 but illustrating the piston in its retracted position.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing in detail, wherein I have illustrated in FIGS. 1-3 a single exemplary embodiment which is not, however, to be considered limiting. It will be seen that reference numeral 1 identifies a supply vessel into which material to be dispensed is introduced, for instance a glue or other bonding agent. A cover 2 is provided to close the vessel 1 which has an opening 3 at its lower end through which a suitable heating element 4 extends into the interior of the vessel, leaving enough space so that material can flow around the heating element 4 and leave the vessel 1. The heating element 4 may be an electrical heating element whose operation and structural details are of no consequences for the purposes of the present invention, it being understood that these heating elements are known per se from the prior art.

The vessel 1 is mounted on and structurally connected with a thermally conductive body 5 in which there is provided a path or conduit 6 for material which leaves the vessel 1 through the opening 3 thereof. A filter 7 may advantageously be interposed in the conduit 6, and a further heating element 8 (of the same type for instance of the heating element 4) with a thermostat 9 for controlling its operation, may also be located in the body 5 in order to transmit heat to material passing through the passage or conduit 6.

Also mounted and structurally connected with the body 5 is a cylinder 10 which is coaxially connected with a pneumatic cylinder 11. A piston 12 is slidably accommodated in the chamber of the cylinder 11, which latter has two openings 13 and 14 for the inlet and outlet of compressed air.

A piston rod 16 is fast with the piston 12 and extends into the cylinder 10 in which there is located a piston 15 which surrounds and is slidable longitudinally of the piston rod 16 in the cylinder 10. A one-way valve 17 closes the lower end of the chamber in the piston 10, that is the outlet path for material to be dispensed by the dispensing nozzle 18 provided at this lower end.

The upper free end of the piston rod 16 faces the upper or rear end of the pneumatic cylinder 11, and an

adjustable screw 19 is mounted at this upper or rear end extending axially towards this free end of the piston rod 16. Depending upon the extent to which the screw 19 is threaded into the interior of the cylinder 11, it will encounter the free end of the piston rod 16 sooner or later during axial displacement of the latter, that is it will limit the extent to which the piston rod can travel.

A conical portion 21 and a cylindrical portion 24 of the piston rod 16 are located in the chamber of the cylinder 10. On the cylindrical portion 24 the piston 15 is mounted for axial sliding movement between an expelling position which is shown in FIG. 2 and a retracted or rest position which is shown in FIG. 3.

As the drawing shows, particularly clearly in FIGS. 2 and 3, the piston 15 is provided with an axial bore or passage 22 which conically opens in direction towards the conical portion or bead 21 of the piston rod 16. When the piston moves to the retracted position illustrated in FIG. 3, the conical portion 21 of the piston rod 16 enters into the conical part of the bore 22 and, inasmuch as connecting passages 25 (of which one or more may be provided) which connect the opposite axial ends of the piston 15 with one another, terminate in the conical part of the bore 22, these passages 25 are closed when the piston 15 is in the position shown in FIG. 3. In other words, when the piston is in the position shown in FIG. 2 the passages 25 establish a communication between the cylinder compartments 20 and 23 which are located at the opposite axial sides of the piston 15, whereas when the piston is in the position of FIG. 3 this communication will be terminated.

The operation of the device disclosed herein will already be clear from what has been set forth thus far. The material to be dispensed, for instance liquid glue, flows via the opening 3 from the vessel 1, flows into the conduit 6. The glue has already been heated by the heating element 4, increasing its flowability. The thermostat 9 regulates a precise maintenance of the desired temperature and the filter 7, if provided, filters any particulate contaminants out of the glue so that they cannot clog the nozzle 18.

From the conduit 6 the glue flows into the compartment 20 which is located rearwardly or upwardly of the piston 15. It is assumed at this point that the piston 12 in the cylinder 11 is itself moved upwardly by admission of compressed air through the cylinder 11 through the opening 14, as shown in FIGS. 1 and 2. At this position the conical portion or bead 21 of the piston rod 16 is withdrawn from the conical part of the bore 22 in the piston 15 so that glue can flow through the bore 22 and the passages 25 and enter into the compartment 23 intermediate the piston 15 and the nozzle 18. Admission of compressed air into the cylinder 11 at the opposite side of the piston 12, that is through the opening 13, causes the piston 12 and thereby the piston rod 16 to be displaced downwardly in FIG. 1. The piston rod slides initially into the piston 15 until the conical portion 21 becomes seated in the conical part of the bore 22 of the piston 15, as shown in FIG. 3, so that communication between the compartments at the opposite sides of the piston 15 is closed and it becomes impossible for further glue to flow into the compartment 23. Further forward or downward movement of the piston rod 16 then causes the piston 15 to move in the same direction, opening the one-way valve 17 and ejecting the glue through the nozzle 18. Subsequent retraction

of the piston 15 results in the development of a vacuum in the compartment 23 between the piston 15 and the nozzle 18, so that additional glue can rapidly be aspirated into this compartment 23 once the passages 25 become opened which takes place as soon as the conical portion 21 of the piston rod 16 is withdrawn from the conical part of the bore 22.

The stroke of the piston 15, and thereby the quantity of glue or similar material which can be ejected, can be selected by appropriate positioning of the screw 19, it will be appreciated, of course, that the more rapid the succession of expelling incidents takes place, the more rapidly the next-following quantity of glue must be admitted into the compartment 23, and this is assured by the suction effect resulting from withdrawal of the piston 15 to its retracted position.

While it has been illustrated that the passages 25 are provided in the piston 15, it will be appreciated that other solutions can be found within the concept of the present invention. Thus, for instance, the piston rod 16 itself may be provided with an axial channel which is open in the compartment 23 and which at its upper end, that is when the piston 15 is in its lower position, terminates in the region of the conical portion 21 of the piston rod 16 so as to be opened and closed in the same manner in which the passages 25 in the piston 15 are opened and closed. These passages 25 in the piston 15 can then of course be omitted.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the type described above.

While the invention has been illustrated and described as embodied in a dispensing device, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A dispensing device, particularly for applying a bonding agent, comprising cylinder means having an elongated internal chamber provided with two end walls; dispensing nozzle means having a nozzle passage communicating with said chamber at one of said end walls; a piston rod extending longitudinally through said chamber; a piston surrounding said piston rod and slidable part of the distance between a first and a second position together with said piston rod and part of the distance relative to said piston rod, said piston dividing said chamber into two compartments located at opposite axial sides of the piston; passage means which is open and connects said compartments when said piston slides relative to said piston rod in one direction until said piston is in said first position, and closed when said piston rod and piston slide relative to one another in an opposite direction until said piston is in said second position; supply means communicating with

said chamber intermediate said piston and the other of said end walls for supplying material to be dispensed; and valve means interposed in said nozzle passage, including a valve body responsive to the pressure of material resulting from movement of said piston toward said second position for opening said nozzle passage, and a biasing spring urging said valve body to normally close said passage.

2. A dispensing device as defined in claim 1, said passage means being provided in at least one of said piston rod and piston.

3. A dispensing device as defined in claim 1, said passage means being provided in said piston.

4. A dispensing device as defined in claim 1, wherein said passage means is provided in at least one of said piston rod and piston and comprises at least one passage therein.

5. A dispensing device as defined in claim 1, said piston rod having a front portion closer to and an other portion farther from said one end wall, said other portion being provided with a conical bead; and wherein said piston has a central bore having a cylindrical first section surrounding said front portion and a conically diverging second section facing said bead, said passage means being provided in said piston and communicating with said second section, and said bead being seated in said second section when said piston is in said retracted position.

6. A dispensing device as defined in claim 5, wherein said passage means comprises a plurality of passages.

7. A dispensing device as defined in claim 1, said piston rod comprising a portion which extends out of said chamber and axially into an additional cylinder; and further comprising a double-acting pneumatic piston provided in said additional chamber and fast with said portion of said piston rod.

8. A dispensing device as defined in claim 7, said portion being axially shiftable in said additional cylinder and having a free end; and further comprising an adjusting screw adapted to extend into said additional cylinder to a selectable extend and projecting axially towards said free end so as to contact the same in response to axial shifting of said portion and to selectively limit the extent of such axial shifting.

9. A dispensing device as defined in claim 1; further comprising path-defining means defining a flow path for material to be dispensed and connecting said supply means with said cylinder.

10. A dispensing device as defined in claim 9, wherein said path-defining means is at least in part of thermally conductive material and in thermally conducting contact with said supply means and with said cylinder.

11. A dispensing device as defined in claim 10; and further comprising heating means for heating said material in said dispensing device.

12. A dispensing device as defined in claim 9; further comprising filter means in said path-defining means for filtering of material passing therethrough.

\* \* \* \* \*

35

40

45

50

55

60

65