

- [54] **EQUIPMENT FOR POINT BY POINT APPLICATION OF AN ADHESIVE**
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- [51] **Int. Cl.** **G01f 11/00**
- [58] **Field of Search** 118/410, 411; 222/318, 222/383, 372, 319, 181; 239/124, 125

3,248,020 4/1966 Spalding 222/318 X

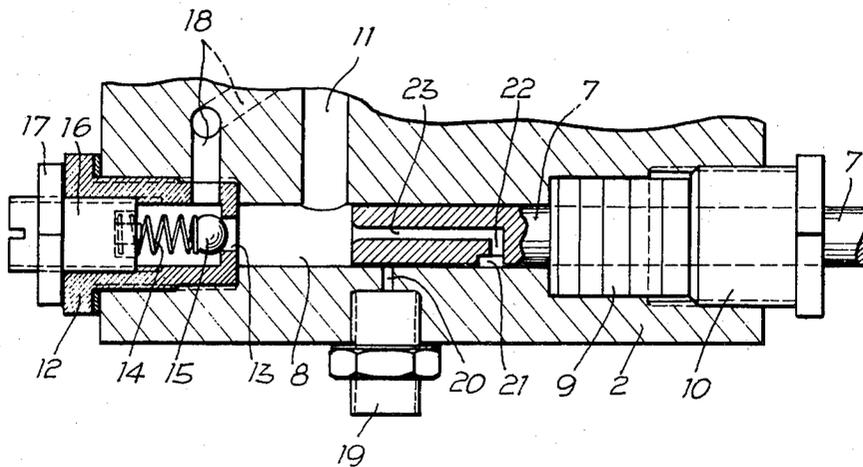
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Attorney, Agent, or Firm—Wigman & Cohen

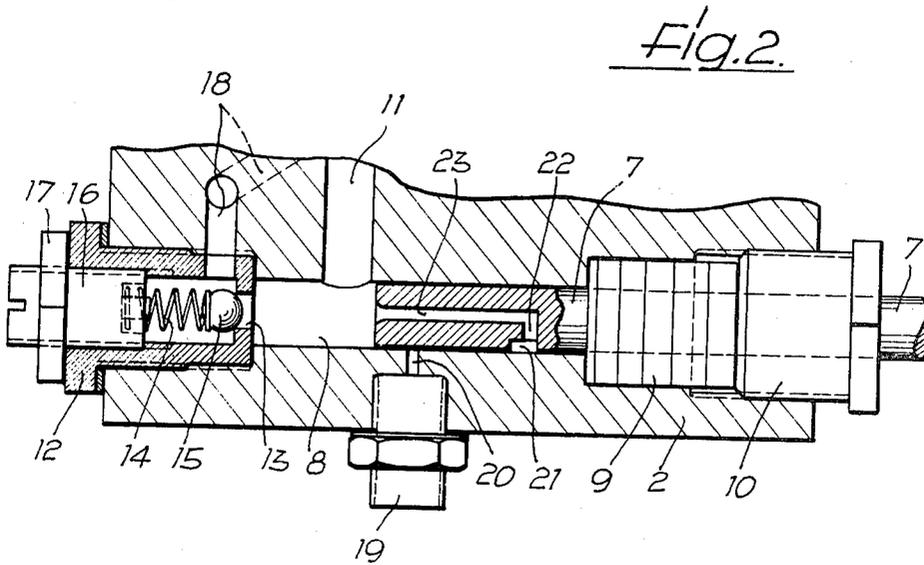
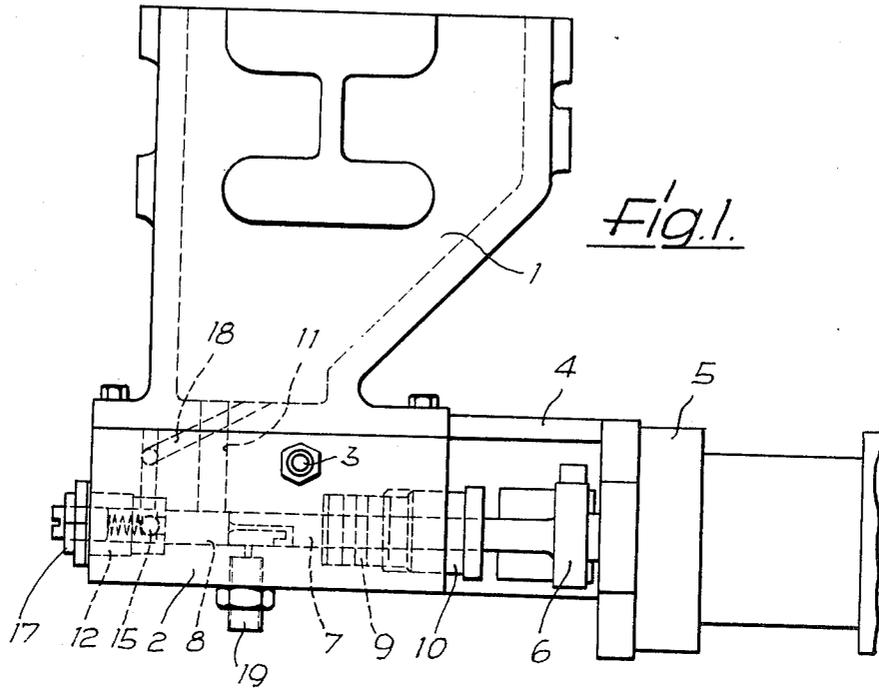
[57] **ABSTRACT**

This disclosure relates to apparatus for the point by point application of a thermoplastic adhesive, comprising a feeder device including a piston which can be reciprocated in a cylinder through a compression stroke and a return stroke. The adhesive is introduced into the cylinder from a storage container during the return stroke, and then forced out of the cylinder to an application nozzle during the compression stroke. The outlet passage extends axially through the piston and is open only during the end phase of the compression stroke and the beginning phase of the return stroke. A low pressure is created in the cylinder during the beginning phase of the return stroke which communicates with the nozzle thereby retracting the adhesive disposed therein.

6 Claims, 2 Drawing Figures

- [56] **References Cited**
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EQUIPMENT FOR POINT BY POINT APPLICATION OF AN ADHESIVE

The invention concerns a piece of equipment for the point by point application of an adhesive, especially a hot melting or thermoplastic adhesive, onto a structure, by which the adhesive is pressed from a feeder device to an application nozzle, and the adhesive exiting from the nozzle is guided by a control device.

The known constructions of this kind are, especially when used for the application of hot melting adhesive, very expensive and sensitive. First of all, this is based on the fact that those constructions are provided with a valve as control device. It is rather expensive to keep such a valve in working condition and to guide it in a way, by which the adhesive can be applied in a point by point fashion. In many cases the insufficient working speed is also of a disadvantage.

The invention is based on the intention to construct a device as stated in the beginning, which is simple in its structure and without problems during operation, even when a hot melting adhesive is used. This problem can be solved by the discovery that a piston pump is used as feeder device, and that the control device consists of an open passage that is created within the connection between cylinder space and application nozzle only during the end phase of the compression stroke and the thereupon following beginning phase of the backstroke of the piston.

The special advantage of such a device consists in the fact that, with the start of the backstroke of the piston, a low pressure results in the cylinder space which has the effect that the adhesive in the channel, which leads from the cylinder space to the application nozzle, and in the application nozzle itself, is sucked back whereby, even in a very tough or viscous hot melting adhesive, a sudden break in the outflow of the adhesive is effected at the nozzle. In this manner, even a very tough adhesive can, by means of high pressure speed, be measured exactly and applied point by point. The high working speed is partly based on the fact that the piston pump renders it possible that the pressure in the cylinder space, which presses the adhesive on its way to the application nozzle, can, in a simple way, be regulated for the most favorable results. An especially uncomplicated construction of the device can be achieved, when the channel leading from the piston pump to the application nozzle leads into the cylinder space of the piston pump within the piston channel, and the piston acting as control part has a connective channel, which connects the channel leading to the application nozzle during the latter phase of the compression stroke and the thereupon following beginning phase of the backstroke with the cylinder space. Thereby, an additional control link is eliminated, since the piston itself determines the moment, at which the way is clear for the adhesive to move from the cylinder space to the application nozzle. From this moment on, the adhesive exits from the application nozzle until the piston starts the backstroke, thereby effecting a disruption in the adhesive flow. It is, furthermore, of advantage that, because of the simple construction of the device, it is relatively free from interference. Since the beginning and the ending of the adhesive flow at the application nozzle, as well as the pressure in the cylinder space, can be exactly controlled, and thereby also the exit speed of the adhesive from the nozzle, the amount of the dispensed adhesive can also be exactly regulated. This, coupled with the

simple structure of the device, results in an extremely high working speed.

The connective channel shows, if favorably constructed, a first section which leads from the piston base in axial direction into the piston, and a second section which leads from the outer protective layer or surface of the piston to the first section, whereby the opening of the second section, which is inside the outer protective layer of the piston, is formed as a slot which extends axially along the surface of the piston. The position and length of this slot determine the time period, in which the adhesive can flow from the cylinder space to the application nozzle. It is of further advantage that, with the compression stroke, the adhesive is directly pressed into the connective channel, which insures, that it is always completely filled.

In addition, the piston pump renders it possible that, in a simple manner, the adhesive flow can steer itself from a supply container. For this purpose an adhesive supply channel can be provided which connects the piston pump with the adhesive supply container and which ends at a point in the piston channel of the cylinder that is completely covered by the piston after a starting movement of the compression stroke. In this manner, the adhesive flow is interrupted after the cylinder space has been filled as soon as the piston moves, during the compression stroke, somewhat from the stationary position and the pressure in the cylinder space starts to increase noticeably.

Preferably, the cylinder space should be connected with the adhesive outflow channel which should, preferably, be equipped with an adjustable high pressure valve for the opening pressure. This has the advantage that the pressure which is exerted on the adhesive while it flows to the application nozzle, can be exactly controlled, which is important for the dosage. Furthermore, the high pressure valve permits the selection of the piston in a size that allows, independently from the filling condition of the cylinder space at the outset of the compression stroke, that the required pressure in the cylinder space is definitely reached before the outflow of the adhesive from the cylinder space to the application nozzle is released. Since the high pressure valve can be adjusted, the pressure can be regulated for the most favorable dose.

Appropriately, the outflow line is so constructed that it can, at the same time, act as the return line leading to the adhesive supply container, so that the surplus adhesive can be reused. When hot melting adhesive is used, this construction guarantees that the adhesive does not cool off.

In the following, the invention is explained in details by means of a diagram which shows a construction example:

FIG. 1 A side view of the construction example.

FIG. 2 An enlarged and incompletely presented longitudinal section of the construction example.

A device for the point by point application of a hot melting adhesive onto a surface (not shown) shows, as in FIG. 1, a funnel-shaped supply container which can be heated electrically. The temperature can be selected by means of a thermostat — not shown here either — and can be kept as desired. A cylinder 2 is attached to the lower end of the supply container 1, the longitudinal axis of which lies horizontally in the construction example. The cylinder 2 is also equipped with an electrical heater. With the aid of a regulator, for which the

net value of the temperature is supplied by a temperature feeler 3, the temperature can be regulated to achieve the desired nominal value.

At the front surface of the cylinder 2, a carrier 4, which is tightly connected with the cylinder 2, follows, to which a electric starting magnet 5 is connected horizontally. The piston of this magnet 5 is connected, over connective parts 6, with a cylindrical piston 7, which is axially movable in cylinder 2 in a longitudinal direction in a bore 8 of cylinder 2.

That section of bore 8 which faces the starting magnet 5, is enlarged in diameter and receives a gasket packet 9 which is being held under axial pressure by means of a screwed-in bushing 10, into the end section.

A bore which forms an adhesive supply channel 11, leads into bore 8, the other end of which leads into the base of the supply container 1. The point at which the rectilinear and vertically running adhesive supply channel 11 enters bore 8 has been selected so that the piston 7 opens the outlet totally when it is completely withdrawn. This assures a speedy and complete filling with hot melting adhesive of the cylinder space formed by bore 8.

That part of bore 8 which is turned away from the electro-magnet 5 is likewise enlarged and equipped with a sleeve into which a valve box 12 has been screwed. The valve box 12 has in its base, which faces piston 7, a central passage bore 13, against which, from the inside of valve box 12, by means of a coil spring 14, a valve structure in shape of a ball 15 is being pressed. The coil spring 14, on the other hand, is supported by an adjustment screw 16, which is guided in a central coil bore of the valve box 12, and can be adjusted as desired by means of an adjusting nut 17. A return bore 18 leads into the interior space of valve box 12 which receives ball 15 and coil spring 14, this return channel leads to supply container 1. It is thereby possible to return the hot melting adhesive from the cylinder space into supply container 1 over the high pressure valve consisting of parts 12 and 16, whereby the pressure, at which the high pressure valve opens, can be adjusted with the aid of screw 16.

An application nozzle 19, which has an opening suitable, in form and diameter, to apply the hot melting adhesive in a point by point fashion, is, as FIGS. 1 and 2 show, screwed into the wall of cylinder 2 that points downward, which, in our construction example, shows relatively large dimensions. From this application nozzle, a short bore 20, the diameter of which is considerably smaller than the diameter of bore 8, leads to the latter. Bore 20 leads into the channel of piston 7 at a point which is covered completely by the piston when the piston is in a completely retracted position, as shown in FIG. 2. A connection of bore 20 with the cylinder space is only effected when piston 7 has almost completed its compression stroke, which means, that it is not too far from the point at which it changes its direction. Then, a short longitudinal slot 21 is positioned at the opening of bore 20, into the base of which a bore 22, across the piston, has been drilled, which extends into a central longitudinal bore 23 from the front of piston 7 which faces the high pressure valve. The length of the longitudinal slot 21 has been selected in a manner that the connection of bore 20, through bores 22 and 23, with the cylinder space, remains intact until the piston 7 reaches, during return stroke, that position at which it,

during the compression stroke, effected the connection.

The device works in the following manner:

When the piston 7 is in the totally retracted position, as shown in FIGS. 1 and 2, the cylinder space, which is bordered on one side by the piston, and on the other side by the high pressure valve, is filled with hot melting adhesive. During the now following compression stroke piston 7 closes, during its starting movement, the adhesive supply channel 11. Thereupon, the pressure in the cylinder space and also in the longitudinal bore 23, the crosswise bore 22 and the longitudinal slot 21 can be increased to the point, at which the high pressure valve 12 opens. The piston stroke is so regulated that maximum pressure can be achieved before the piston frees the connection to bore 20 through the longitudinal slot 21. This assures that the hot melting adhesive is being pressed into the application nozzle 19 with the desired pressure, and exits from the nozzle as soon as bore 20 communicates with the longitudinal slot 21. During the remaining phase of the compression stroke the pressure in the cylinder space is maintained so that the hot melting adhesive keeps flowing, with the desired speed, from the application nozzle 19. In my construction example, the hot melting adhesive is, at the same time, being pressed back into the supply container 1 through the high pressure valve 12.

As soon as the piston 7 has reached the end position, which means, that the compression stroke has ended, the return stroke begins immediately. Since the adhesive supply channel 11 is still closed by the piston, and the high pressure valve closes immediately when a decrease in pressure occurs, the return stroke has as a result that a low pressure occurs in the cylinder space which has an effect on bores 23 and 22, the longitudinal slot 21, and bore 20 in a manner, by which the hot melting adhesive stream exiting from the application nozzle is, within the shortest time period, completely cut-off, since the adhesive is being retracted into the application nozzle because of the low pressure.

Since the hot melting adhesive stream flowing from the application nozzle can be disrupted within the shortest time period, and since the pressure which moves the hot melting adhesive through the application nozzle can be completely controlled, the amount dispensed by the application nozzle can be regulated very precisely. Besides, the speedy disruption of the hot melting adhesive stream at the application nozzle warrants a very high working speed of the equipment.

If the regulated pressure in the cylinder space with the aid of the high pressure valve is not sufficient to guide the exiting hot melting adhesive amount as desired, only the piston has to be replaced by another one, the longitudinal nut of which should be dimensioned so as to have another opening time.

I claim:

1. Apparatus for the point by point application of a viscous substance, such as a thermoplastic adhesive, comprising a feeder device including a piston slidable in a cylinder, means for reciprocating said piston through a compression stroke and a return stroke in a predetermined timed work cycle, means for introducing the substance into the interior of said cylinder during the return stroke of said piston, means connecting the interior of said cylinder with an application nozzle whereby the substance is moved under pressure from said cylinder to said nozzle during the compression

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stroke of said piston, means blocking said connecting means except during the end phase of the compression stroke and the beginning phase of the return stroke of said piston, said connecting means including a conduit extending through said piston into the interior of said cylinder and a bore extending through said cylinder communicating with said nozzle, said conduit including a first section which extends axially through said piston and a second section extending transversely from said first section to an opening in the outer surface of said piston, said opening being defined by a slot extending axially along the surface of said piston and adapted to be positioned in communication with said bore during the end phase of the compression stroke and the beginning phase of the return stroke of said piston, said slot extending for a greater axial dimension than said bore whereby the communication therebetween will be maintained during a predetermined phase of the compression stroke and the return stroke of said piston, and pressure responsive means for reducing the pressure in said cylinder during the compression stroke of each cycle.

2. Apparatus as defined in claim 1 wherein said blocking means includes the outer surface of said piston.

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3. Apparatus as defined in claim 1, further including a storage container for the viscous substance, and a supply channel extending from said container into the interior of said cylinder through an opening which is adapted to be closed by the outer surface of said piston during the compression stroke and beginning phase of the return stroke of the piston.

4. Apparatus as defined in claim 3, further including a discharge line extending from the interior of said cylinder, and wherein said pressure responsive means include an adjustable high pressure valve mounted in said line and adapted to open in response to a predetermined pressure in said cylinder.

5. Apparatus as defined in claim 4 wherein said discharge line extends back into said storage container.

6. Apparatus as defined in claim 4, wherein said high pressure valve includes a valve box mounted in said cylinder and axially aligned with said piston at a position corresponding to the end phase of the compression stroke thereof, a ball valve disposed in said box and adapted to close a central passage therethrough, means for biasing said ball valve in the closed position, and means for adjusting the degree of force applied by said biasing means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,892,339
DATED : July 1, 1975
INVENTOR(S) : HORST IDLER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 55, "nut" should be --slot--;

Column 6, line 7, "the" (second occurrence)
should be --said--.

Signed and Sealed this
twenty-fifth Day of November 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

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Commissioner of Patents and Trademarks