United States Patent [19]

Loewenthal

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[54] **DOSAGING DEVICE FOR LIQUIDS AND PASTE-LIKE SUBSTANCES**

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[52] **U.S. Cl.** **222/207,** 222/214, 222/309, 222/321, 222/494

[51] **Int. Cl.** **G01f 11/08**

[58] **Field of Search** ... 222/207, 209, 212, 214, 309, 222/321, 494, 504, 320, 493

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Assistant Examiner—Frederick R. Handren
Attorney, Agent, or Firm—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

A dosaging device for liquids and paste-like substances is provided with an inlet valve mounted on a horizontal plate which also has attached thereto the upper end of a vertically disposed and vertically compressible bellows. The inlet valve introduces the liquid or paste-like substance into the upper end of the bellows the lower end of which is attached to a horizontal plate carrying a discharge valve and is vertically movable up and down with respect to the other or upper horizontal plate. In operation the inlet valve is opened and the discharge valve is closed to introduce the liquid or the paste-like substance into the bellows by said inlet valve when the lower horizontal plate is moved downwardly, and the inlet valve is closed and the discharge valve is opened to permit the discharge valve to introduce the liquid or the paste-like substance into a cup-like container when the lower horizontal plate is moved upwardly.

3 Claims, 3 Drawing Figures

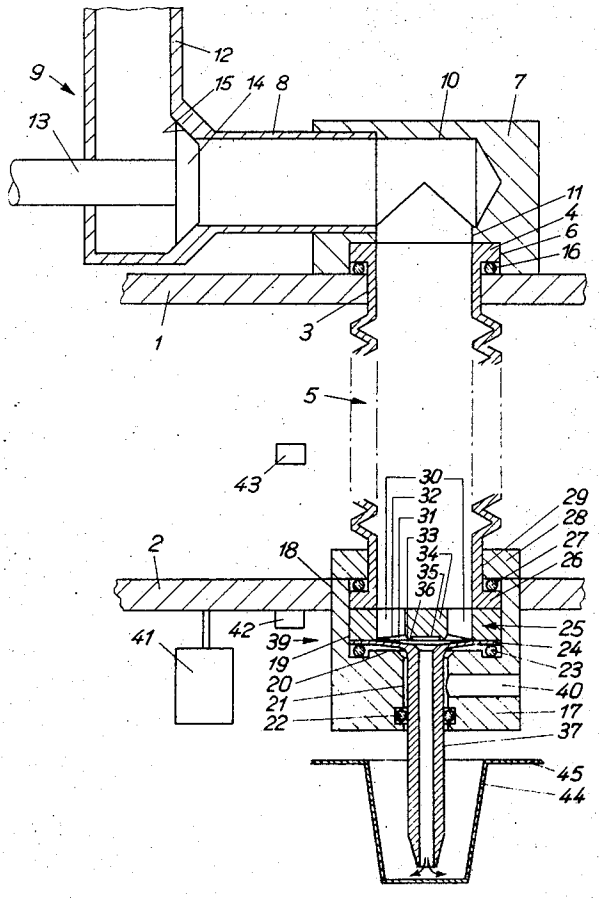

Fig. 1

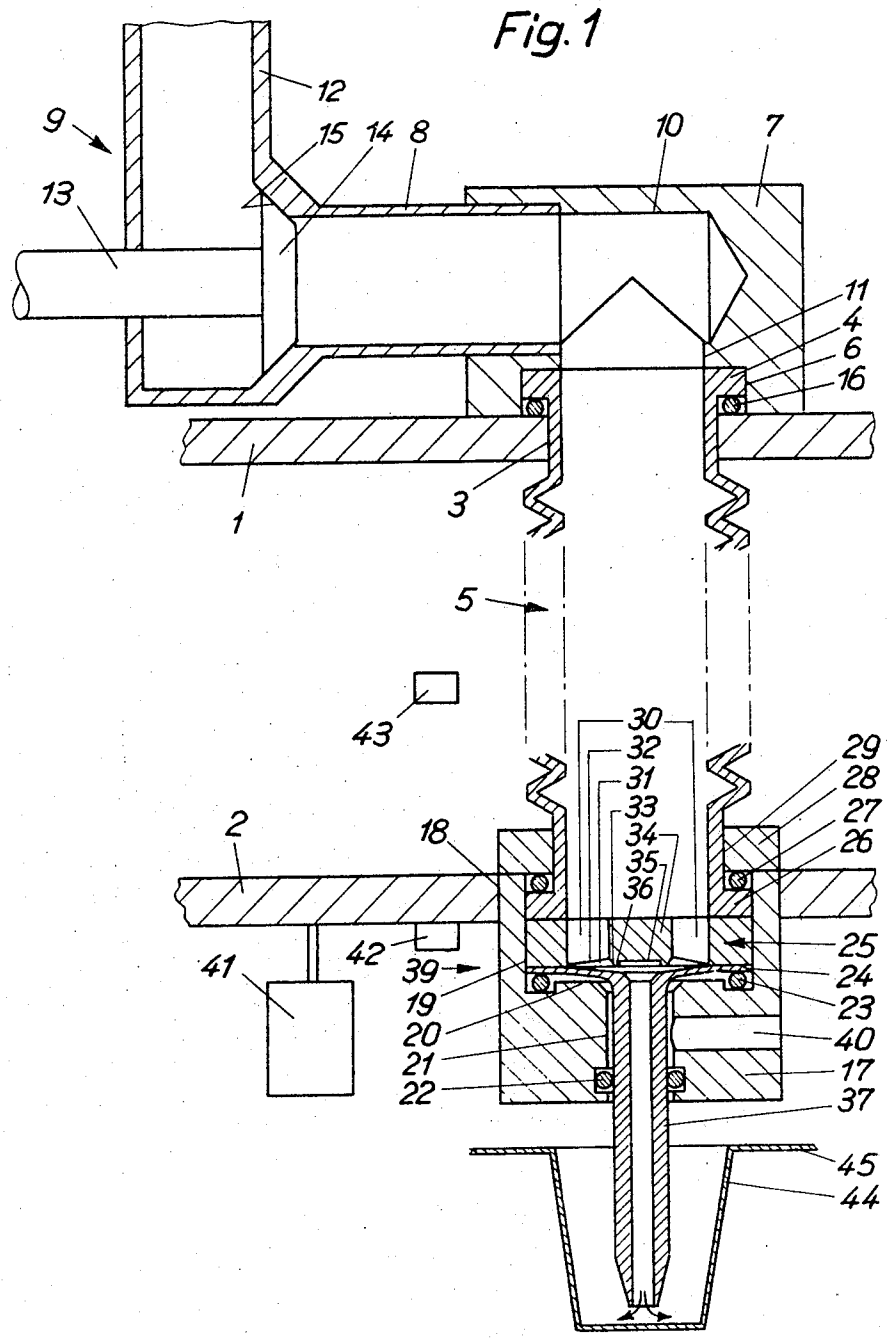
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Fig. 2

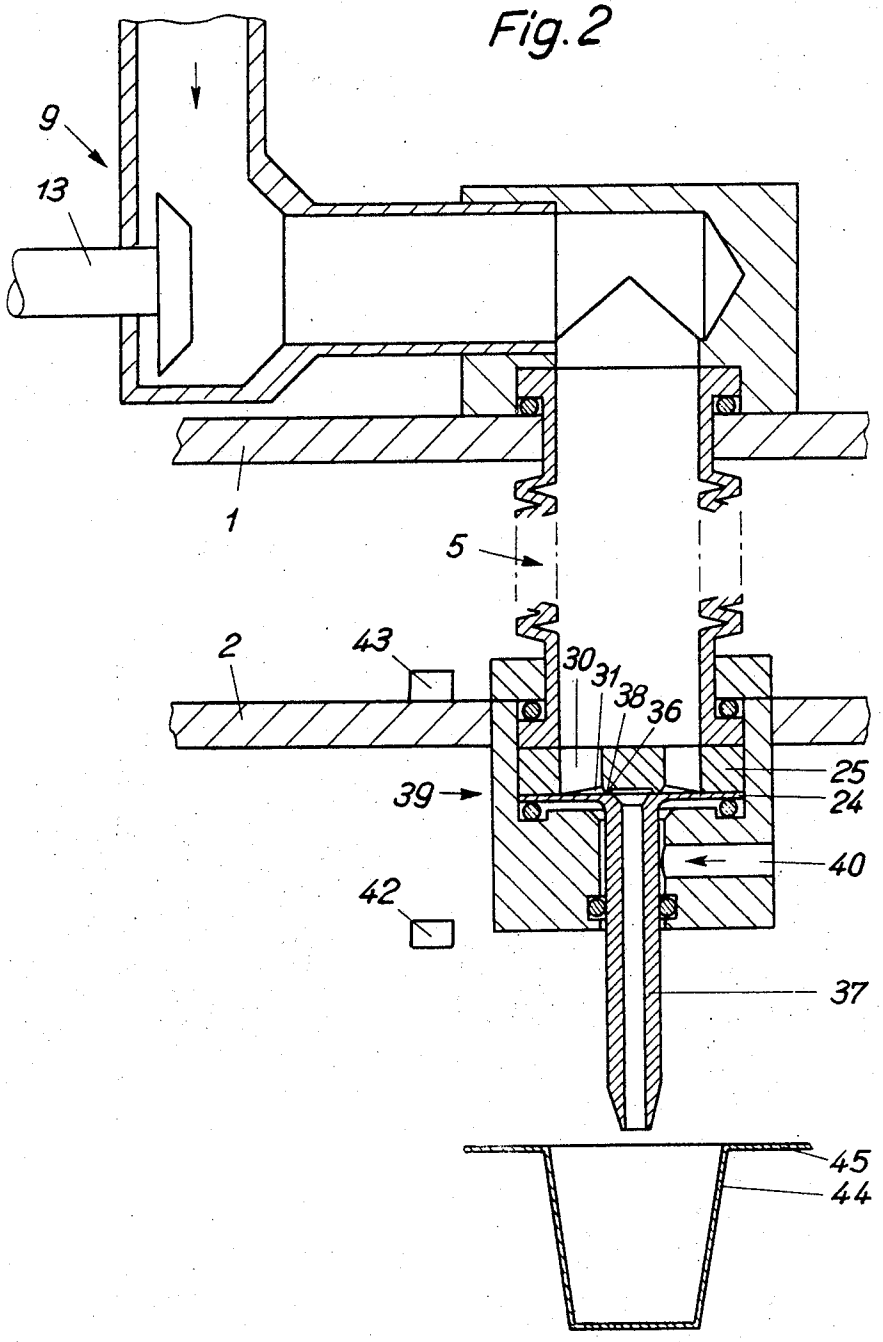
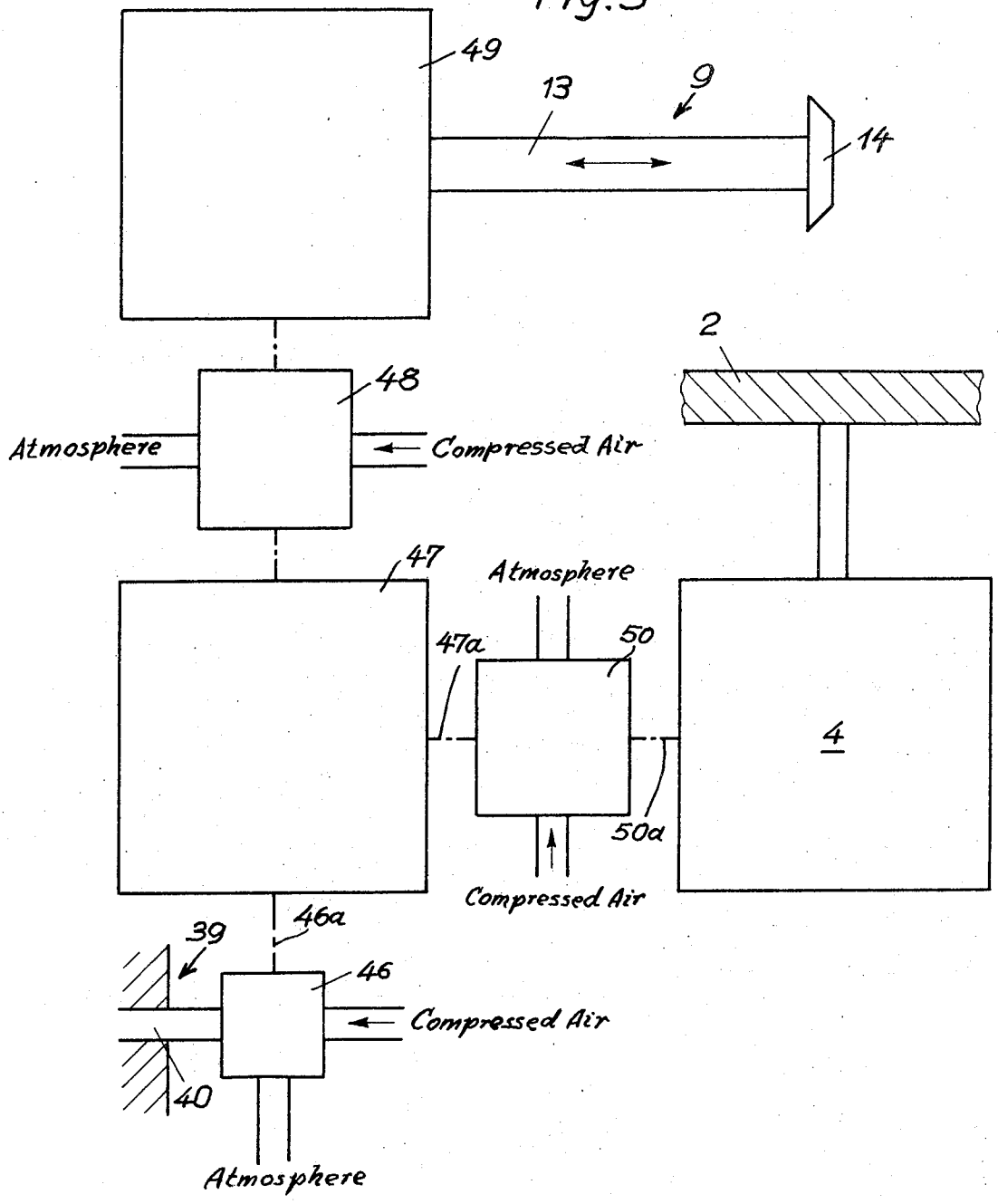


Fig. 3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13
9
14
2
48
Atmosphere
Compressed Air
47
Atmosphere
47a
50
4
50a
Compressed Air
46a
39
46
Compressed Air
40
Atmosphere

DOSAGING DEVICE FOR LIQUIDS AND PASTE-LIKE SUBSTANCES

The invention relates to a dosaging device for liquids and paste-like substances.

The customary dosaging devices for liquids and paste-like substances are relatively expensive and require much space. This is particularly disadvantageous when a large number of packaging containers are to be filled with small cans. The dosaging device in accordance with the invention eliminates the mentioned disadvantages and is distinguished by at least one structural unit which is provided with an inlet valve which communicates with a vertically disposed bellows, the lower outlet end having attached thereto a vertically disposed discharge valve the body of which comprises a diaphragm connected with a discharge tube, whereby both ends of the bellows of each structural unit are connected with two members which by a drive means are relatively movable with respect to one another upwardly and downwardly at an adjustable distance in such a manner that during the relative downward movement of the lower member the inlet valve is open and the discharge valve is closed, while during the relative upward movement of the lower member the inlet valve is closed and the discharge valve is open.

In the drawings which illustrate by way of example, one embodiment of the dosaging device of the invention,

FIG. 1 is a vertical sectional view of the dosaging device,

FIG. 2 is also a vertical sectional view in the same manner as FIG. 1, but in another operative position, and

FIG. 3 illustrates diagrammatically the cooperation of the feed valve and the discharge valve of the device.

Referring to the drawings, the illustrated dosaging device is provided with a stationary horizontal plate 1 and spaced below the same is arranged an upwardly and downwardly movable horizontal plate 2. The upper plate 1 is provided with an aperture 3 through which extends the upper flanged end 4 of a vertically disposed bellows 5 which for instance consists of tetrafluoropolyethylene. If the flanged end 4 cannot be easily elastically de-formed in order to pass it through the aperture 3, then this aperture 3 may be provided at one portion of its circumference with a small enlargement the radius of which is greater than the radius of the flange 4 and then the flanged end 4 may be inserted through this enlargement to assume the position illustrated in the drawing, namely, just above the top surface of the plate 1. The flanged end 4 is disposed in a recess 6 in the bottom of a cap 7 which is connected with a horizontally disposed tubular stub 8 of the housing of a corner valve 9. A horizontal bore 10 in the cap 7 communicates with a vertical or transverse aperture 11 which in turn is in communication with the interior of the vertically disposed bellows 5. The valve casing of the valve 9 is provided with a vertically disposed tubular feed stub 12 which, in a manner not illustrated in the drawing, leads to a feed line for the liquid, for instance, cream to be dosaged. A valve shaft 13 is horizontally disposed in axial alignment with the horizontal tubular stub 8 and is provided at its end disposed within the valve housing with a valve plate 14 adapted to be seated as shown in FIG. 1 on a valve seat 15 so as to close the valve. The cap 7 is attached in a not illustrated manner, for instance by screws, to the top surface of the horizontal plate 1,and between the cap 7 and the flanged end 4 at the upper end of the bellows 5 is arranged a seal 16.

While the upper end of the bellows 5 is connected by the flanged end 4 and the cap 7 to the plate 1, the lower end of the bellows is fixedly connected by means of a valve housing 17 to the plate 2. The upper end of the valve housing 17 is disposed in an aperture 18 of the plate 2 and has a vertical axial bore 19 which is connected by an annular shoulder 20 with an axial bore 21 of a substantially smaller diameter. In the bore 19 are arranged, one above the other, a seal 23, an annular diaphragm 24, a disc 25, a flange 26 arranged at the lower end of the bellows 5, and a seal 27. All these parts 23 to 27 are compressed between the annular shoulder 20 and an annular ring 28 which, in a not illustrated manner, is rigidly connected with the valve housing 17 and the plate 2. The ring 28 has a central aperture 29 for the passage of the lower end of the bellows 5 and may have the same diameter as the aperture 3. The disc 25 is provided with a circular series of holes 30 which are in communication with an annular groove 31 formed by two conical surfaces 32 and 33. The central portion 34 of the disc 25 has in its bottom face a shallow recess 35 so that between this recess 35 and the inner conical surface 33 an annular valve seat 36 is formed.

The ring shaped diaphragm 24 is integrally formed at its inner circumference with a tubular discharge member 37. The valve body comprising the parts 24 and 37 may for instance consist of tetrafluoropolyethylene. It is obvious that when the valve body 34, 37 is disposed in the position illustrated in FIG. 1, in which the diaphragm 24 is downwardly curved, that any liquid in the bellows 5 may flow through the holes 30 and the annular groove 31 into the interior of the discharge member 37, and may flow downwardly from the latter. If, however, as shown in FIG. 2, the annular zone 38 of the valve body 24, 37 is pressed against the annular valve seat 36, then the passage of the fluid through the valve, designated as a whole, with 39, is not possible.

The valve 39 is controlled by compressed air which, from a not illustrated source, is introduced into a transverse bore 40 of the valve housing 17. The transverse or radial bore 40 is in communication with the vertical axial bore 21, the diameter of which is larger than the exterior diameter of the tubular discharge member 37, so that when compressed air is introduced into the valve 39 this compressed air will reach the lower surface of the diaphragm 24 and thereby the valve body 24, 37 is moved into its closed position. A seal 22 around the valve body 24, 37 in the lower portion of the housing 17 prevents a discharge of the compressed air at this location.

For effecting a movement of the plate 2, there is employed a diagrammatically illustrated operating device 41 shown only in FIG. 1. This operating device 41 is capable of moving the plate 2 in vertical direction upwardly and downwardly a distance which is adjustable, for instance a pneumatic cylinder may be provided which moves the plate 2 in vertical direction between two abutments 42 and 43 of which at least one may be adjustable in vertical direction.

For the purpose of discharging correctly measured amounts of cream into cups 44 arranged in a plane

below the discharging device, the operation of this discharging device is as follows:

When the horizontal plate 2 according to FIG. 2 has been moved to its highest position, and the contents of the bellows 5, in this position is the lowest one, the discharge valve 39 is closed by the introduction of compressed air and the inlet valve 9 is opened. During the now following downward movement of the plate 2 into the position illustrated in FIG. 1, the liquid is drawn through the inlet valve 9 into the bellows 5. When the plate 2 is in its lowest position the inlet valve 9 is closed and the discharge 39 is opened when the compressed air is discharged. For this purpose the compressed air line has arranged therein a three-way valve which is connected with the source of compressed air and the atmosphere, and this three-way valve is also operatively connected with the operating mechanism of the valve shaft 13 which obviously is synchronized with the drive mechanism for the plate 2. The diaphragm 24 is biased in such a manner that when the compressed air is released the diaphragm 24 will move in its downwardly curved position, as shown in FIG. 1. When now the plate 2 again is moved to its uppermost position, the compressed bellows 5 discharges exactly the amount of liquid into the cup 44 as was previously drawn into the bellows 5. It is obvious that by changing the stroke of the drive device for the plate 2 by an adjustment of the abutments 42 and or 43, the desired quantity of liquid to be discharged by the valve 39 may be changed. The structural unit comprised principally of the valves 9 and 39 and the bellows 5 requires very little space and can be manufactured very economically. This is of particular importance when a large number of cups 44, produced by a drawing operation in a plastic band 45, are to be filled at the same time. The plastic band 45 may, for instance, be provided with two rows each having eight cups, namely sixteen cups altogether, and which are arranged very closely one next to the other and for which are provided a corresponding number of structural units 9, 5, 39 between the horizontal plates 1 and 2. In such an arrangement a single drive device 41 for stretching and compressing the bellows 5 and for the control of the discharge valves 39 and for the operation of the inlet valves 9 is required. The filled cups 44 are then closed in customary manner by a common plastic foil and are then separated from each other. In the embodiment of the discharging device illustrated in the drawings, the upper horizontal plate 1 is fixedly arranged so that when the liquid portion is expelled the other plate 2 and therewith the tubular discharge member 37 performs an upward movement. In this arrangement the length of the upward movement is always proportionate to the expelled amount of the product. In this manner the filling of the cups 44 takes place without any complicated devices and there are obtained optimum conditions.

Another advantage of the described device resides in the fact that the device may be cleaned thoroughly in a very simple manner, in that cleaning media is passed through the device 9, 5, 39, when the valves 9 and 39 are open. One may use the customary cleaning media such as hot water, steam, bleaching solutions and the like.

Obviously, the dosaging device may be produced in many variations. For instance, one may mount the plate 2 stationary or both plates 1 and 2 may be arranged to move relatively toward and away from each other. Furthermore, the diaphragm 24 of the discharge valve 39 may be pre-tensioned to such a degree that when it is not subjected to any force it does not curve downwardly but curves upwardly. In such a case it is not necessary to provide a compressed air control because the valve 39 on whose diaphragm 24 a constant counterpressure acts from the exterior will, in this event, always be in the closed position, as shown in FIG. 2, as long as the plate 2 is not moved upwardly. During the compression of the bellows 5 this pressure is, however, overcome by the pressure of the liquid so that the discharge valve 39 is opened and the fluid may escape. A compressed air control has, however, the advantage that the operating reliability is greater since a fatigue of the diaphragm bias would have no disadvantageous results. In place of the corner valve acting as an inlet valve 9, one may also use an inlet valve having a vertical axis which, if necessary, may be provided with a pneumatic control but need not be constructed as the valve 39.

The valve body comprising the diaphragm 24 and the discharge member 37 does not have to be made of a single piece. When these parts have greater dimensions it may be advisable to make the diaphragm of a plastic and the discharge member 37 of metal.

In the simplest manner the exterior of the diaphragm 24 is subjected to atmospheric pressure. It may, however, also be advisable for the sake of greater safety, to select a somewhat higher counterpressure, namely about .2 –.75 atmospheric pressure. In such a case, the transverse bore 40 does not communicate with the atmosphere, but is in continuous communication with a suitable pressure source.

The valve seat 36 may also comprise a sealing ring which is attached to the disc 25 and need not consist of a portion of this disc itself.

FIG. 3 illustrated diagrammatically the cooperative control of the valves 9 and 39 and the operating device 41, which latter effects the movement of the plate 2. The three-way valve 46 which supplies the valve 39 with compressed air and exhausts it into the atmosphere is operatively connected at 46*a* with the synchronizing machine drive 47. The latter is operatively connected by a multiple valve 48 controlling the forward and rearward movement of a pneumatic cylinder 49 which is connected to the valve shaft 13 of the valve 9. The machine drive 47 also is operatively connected at 47*a* with another multiple valve 50 connected at 50*a* with the operating device 41 for the plate 2.

What I claim is:

1. Dosaging device for liquids and paste-like substances, comprising at least one structure provided with a feed valve, a vertically disposed and vertically compressible bellows having its upper end connected with said feed valve, a discharge valve having a vertical axis and a housing connected with the lower end of said bellows, said discharge valve having a valve body comprising an annular diaphragm and a tubular discharge member extending downwardly from said annular diaphragm, a support on which the upper end of said bellows is attached and a second support on which the lower end of said bellows is attached, means for moving said supports relatively to each other in a vertical direction up and down, means causing said feed valve to open and said discharge valve to close when the distance between said supports is increased, and causing said feed valve to close and said discharge valve to

open when the distance between said supports is decreased, said annular diaphragm being provided on its upwardly directed face with an annular zone adapted to engage a stationary annular valve seat in said discharge valve so as to close said discharge valve, and said annular valve seat being formed by a sealing ring attached to a disc clamped within the housing of the discharge valve against the lower end of said bellows.

2. Dosaging device for liquids and paste-like substances, comprising at least one structure provided with a feed valve, vertically disposed and vertically compressible bellows having its upper end connected with said feed valve, a discharge valve having a vertical axis and a housing connected with the lower end of said bellows, said discharge valve having a valve body comprising an annular diaphragm and a tubular discharge member extending downwardly from said annular diaphragm, a support on which the upper end of said bellows is attached and a second support on which the lower end of said bellows is attached, means for moving said supports relatively to each other in a vertical direction up and down, means causing said feed valve to open and said discharge valve to close when the distance between said supports is increased, and causing said feed valve to close and said discharge valve to open when the distance between said supports is decreased, said tubular discharge member of said discharge valve being arranged in a vertical bore of the housing of the discharge valve, and said bore being larger than said tubular discharge member and being in communication with a transverse bore in said housing for connection with a source of compressed air which is adapted to move said annular diaphragm in a valve closing position.

3. Dosaging device according to claim 2, in which said annular diaphragm is biased in such a manner that it is in a valve closing position when the face of it directed toward the bellows is devoid of any load.

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