Oct. 5, 1954 J. R. SNYDER 2,690,859

DISPENSING APPARATUS FOR MULTIPLE FLUIDS

Filed Nov. 21, 1951 6 Sheets-Sheet 1

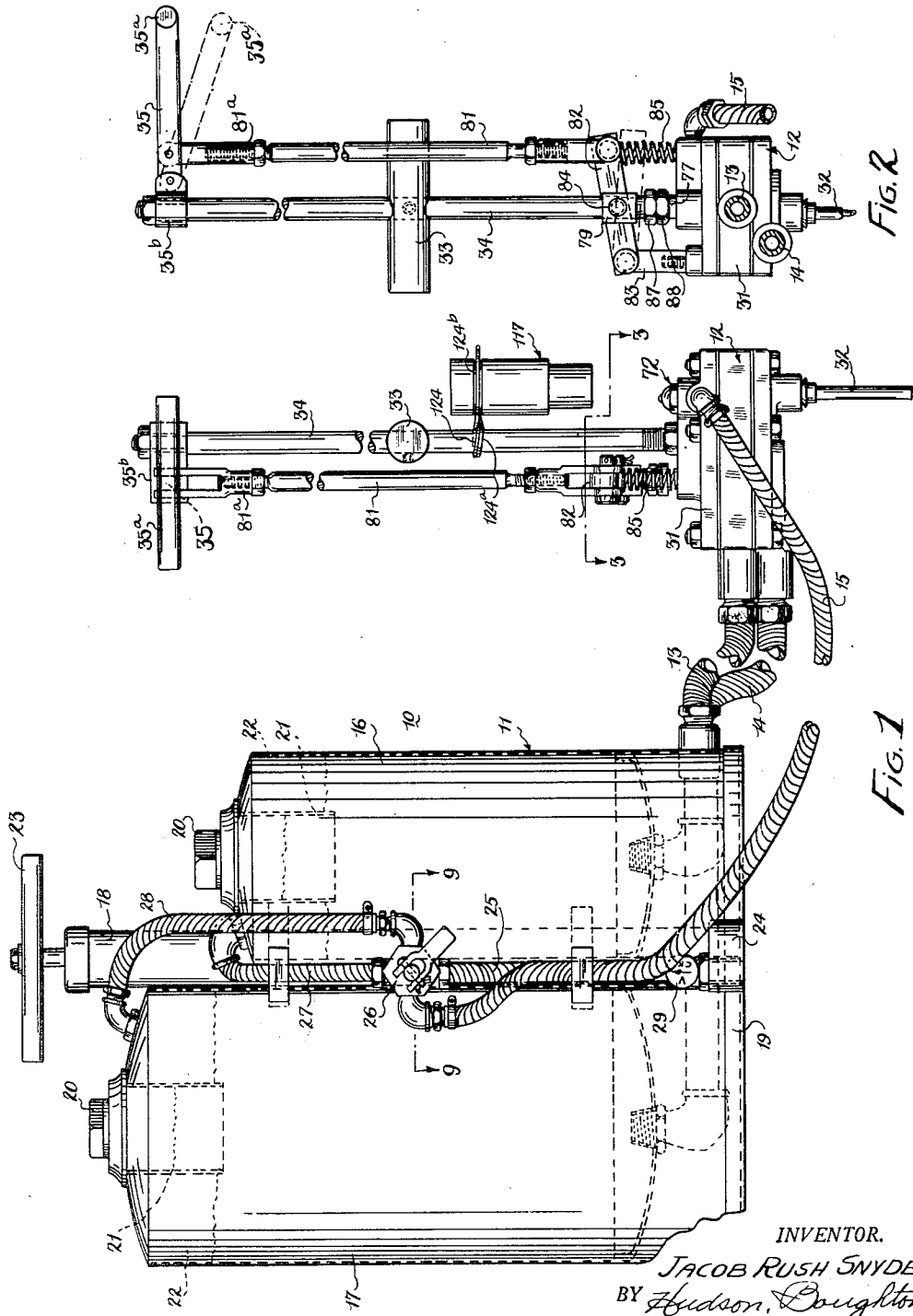


FIG. 2

FIG. 1

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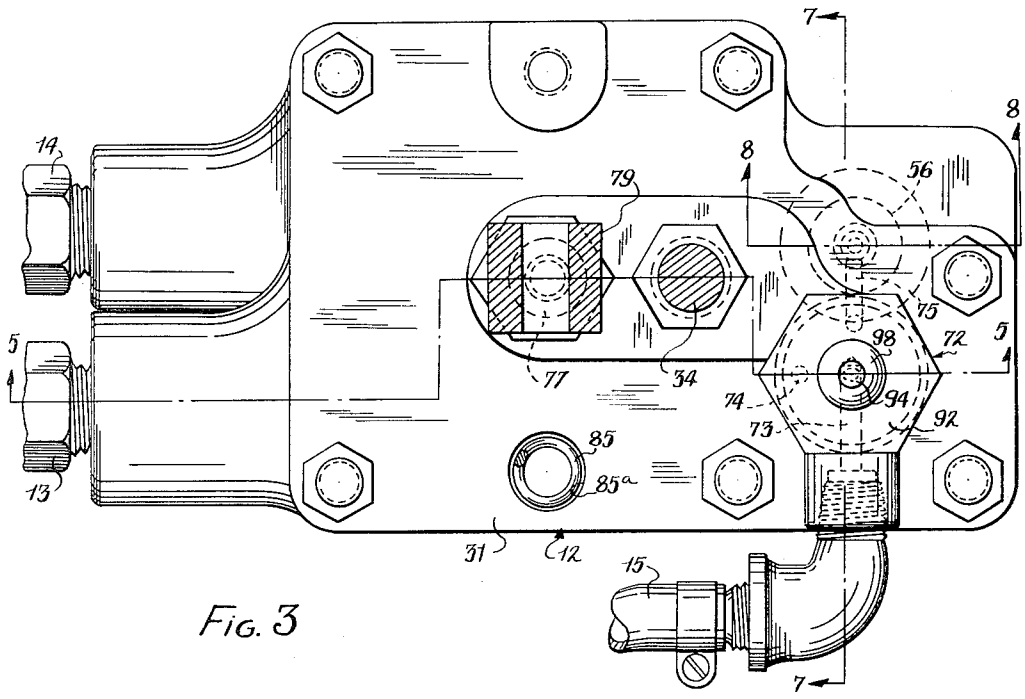


FIG. 3

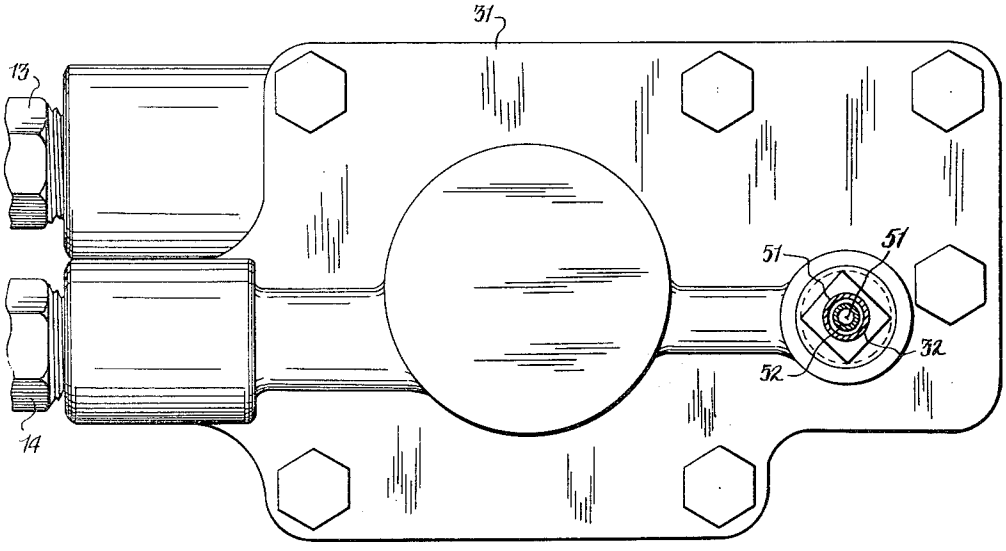


FIG. 4

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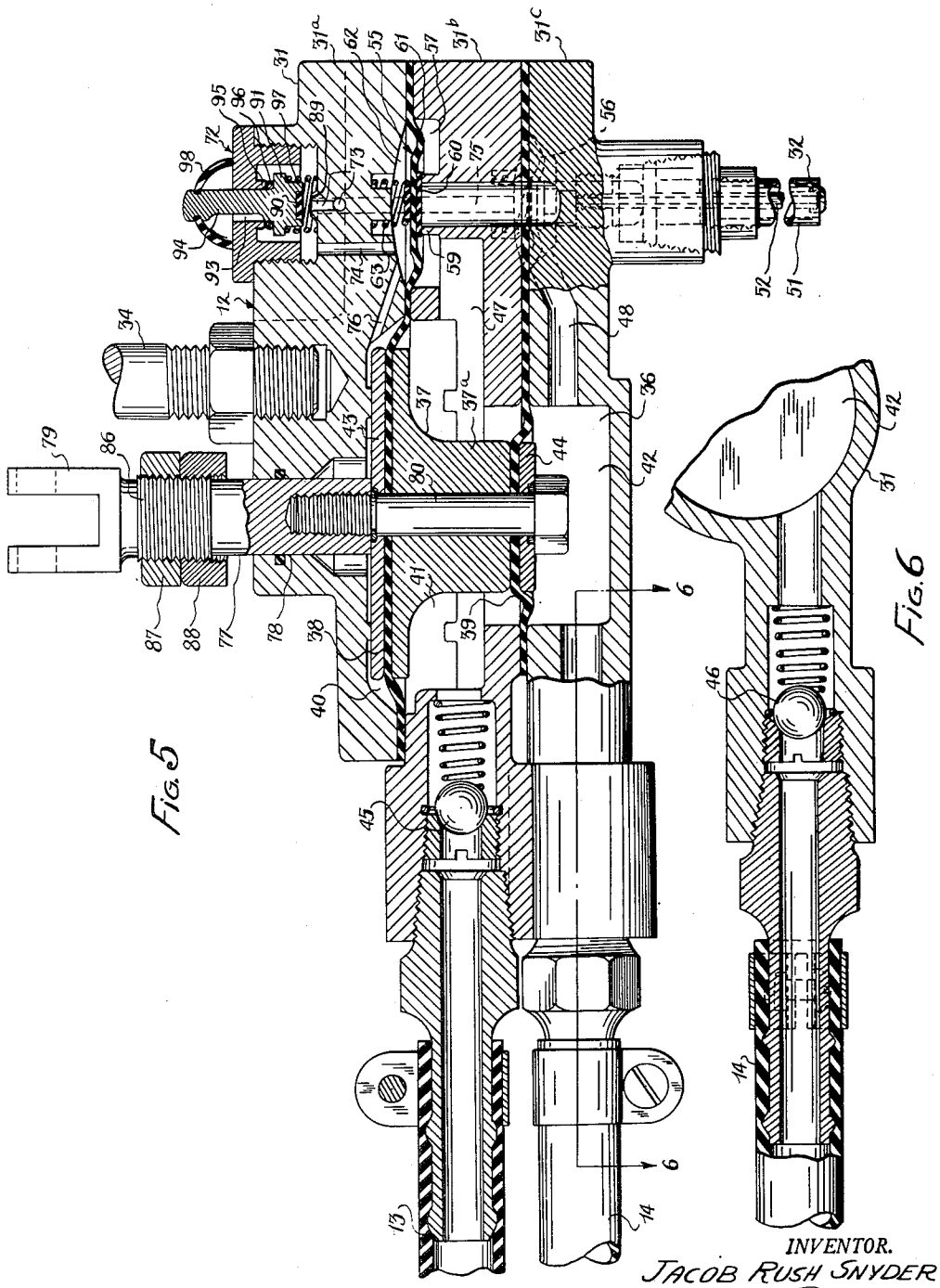


Fig. 5

Fig. 6

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DISPENSING APPARATUS FOR MULTIPLE FLUIDS

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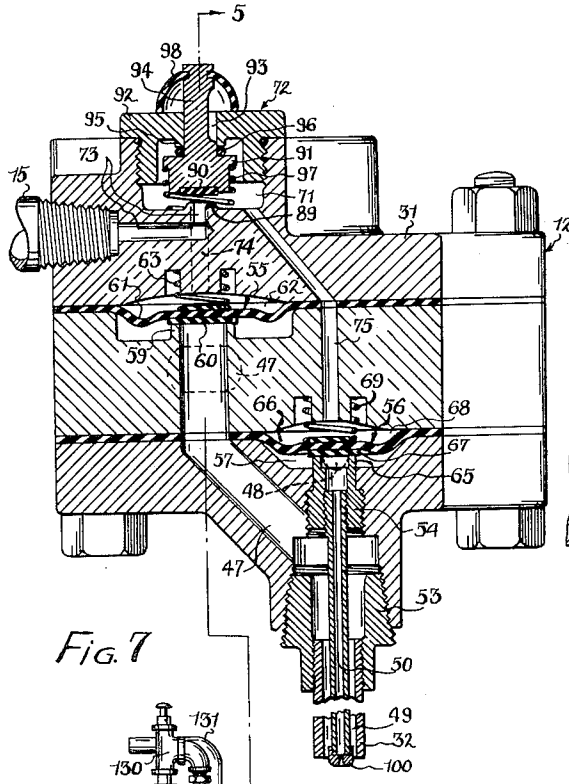


Fig. 7

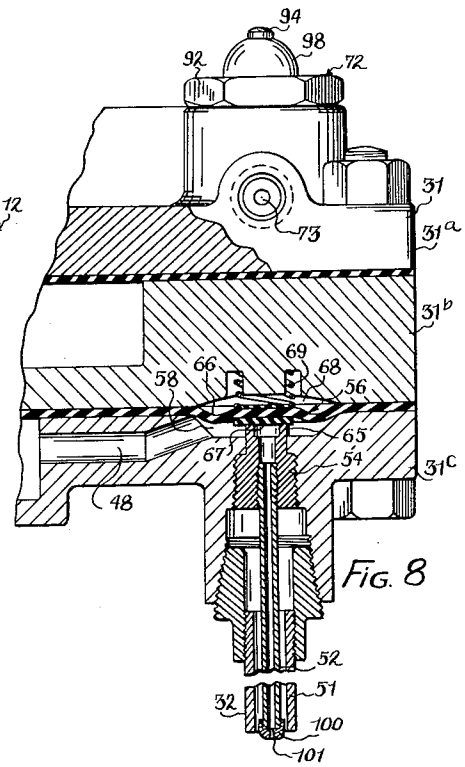


Fig. 8

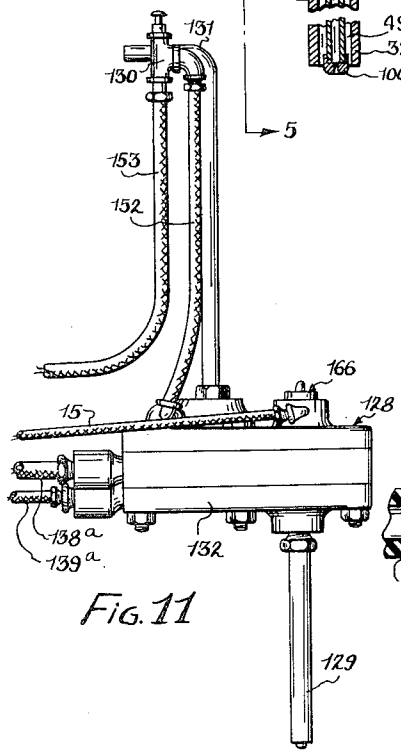


Fig. 11

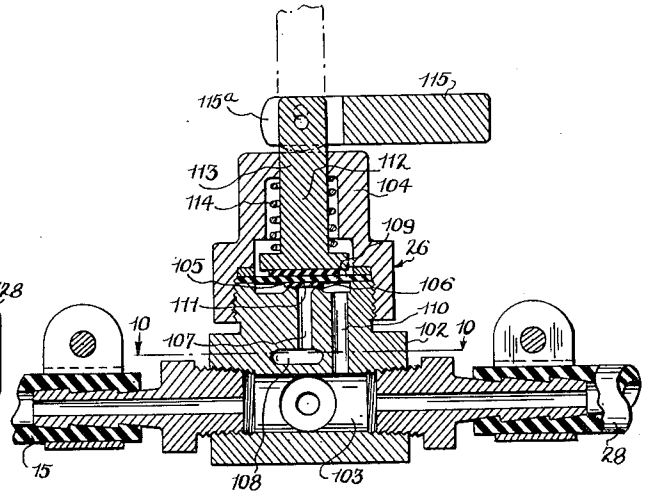


Fig. 9

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DISPENSING APPARATUS FOR MULTIPLE FLUIDS

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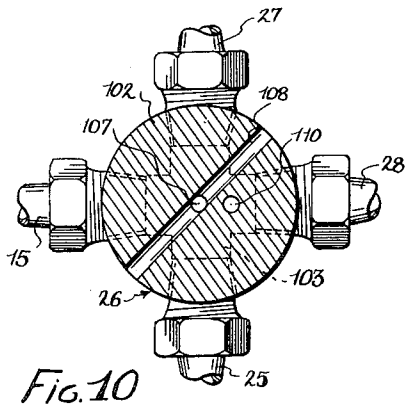


Fig. 10

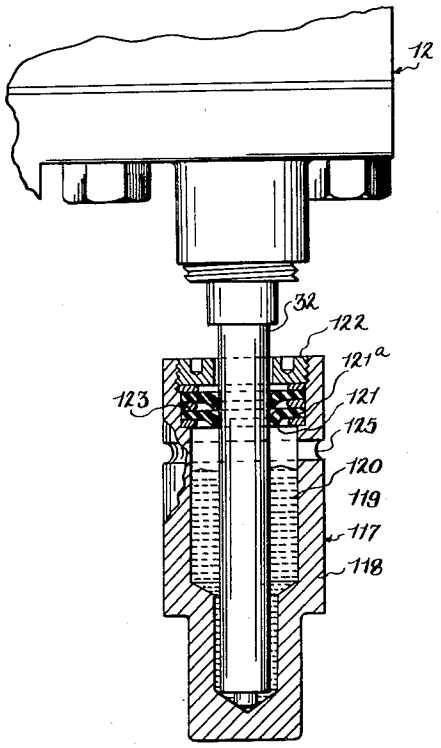


Fig. 14

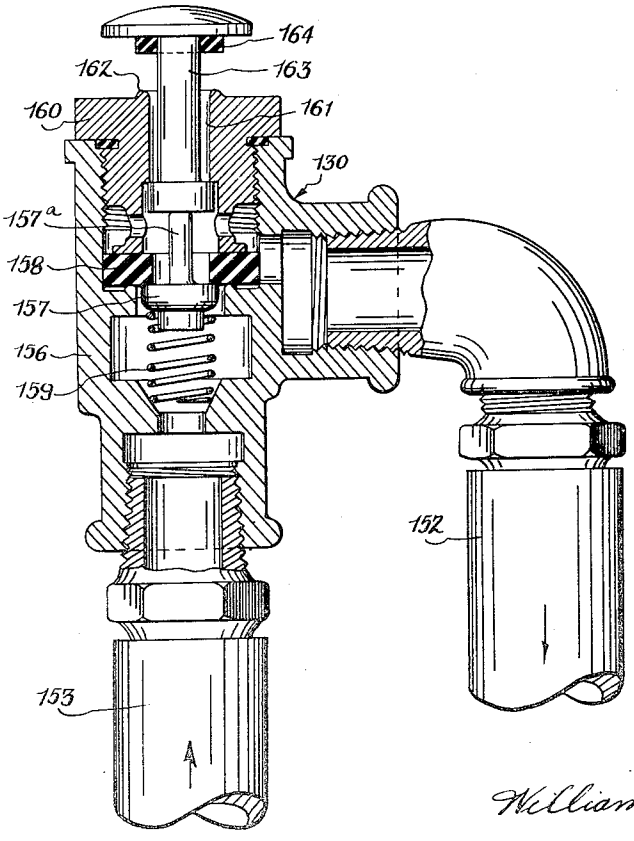


Fig. 13

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DISPENSING APPARATUS FOR MULTIPLE FLUIDS

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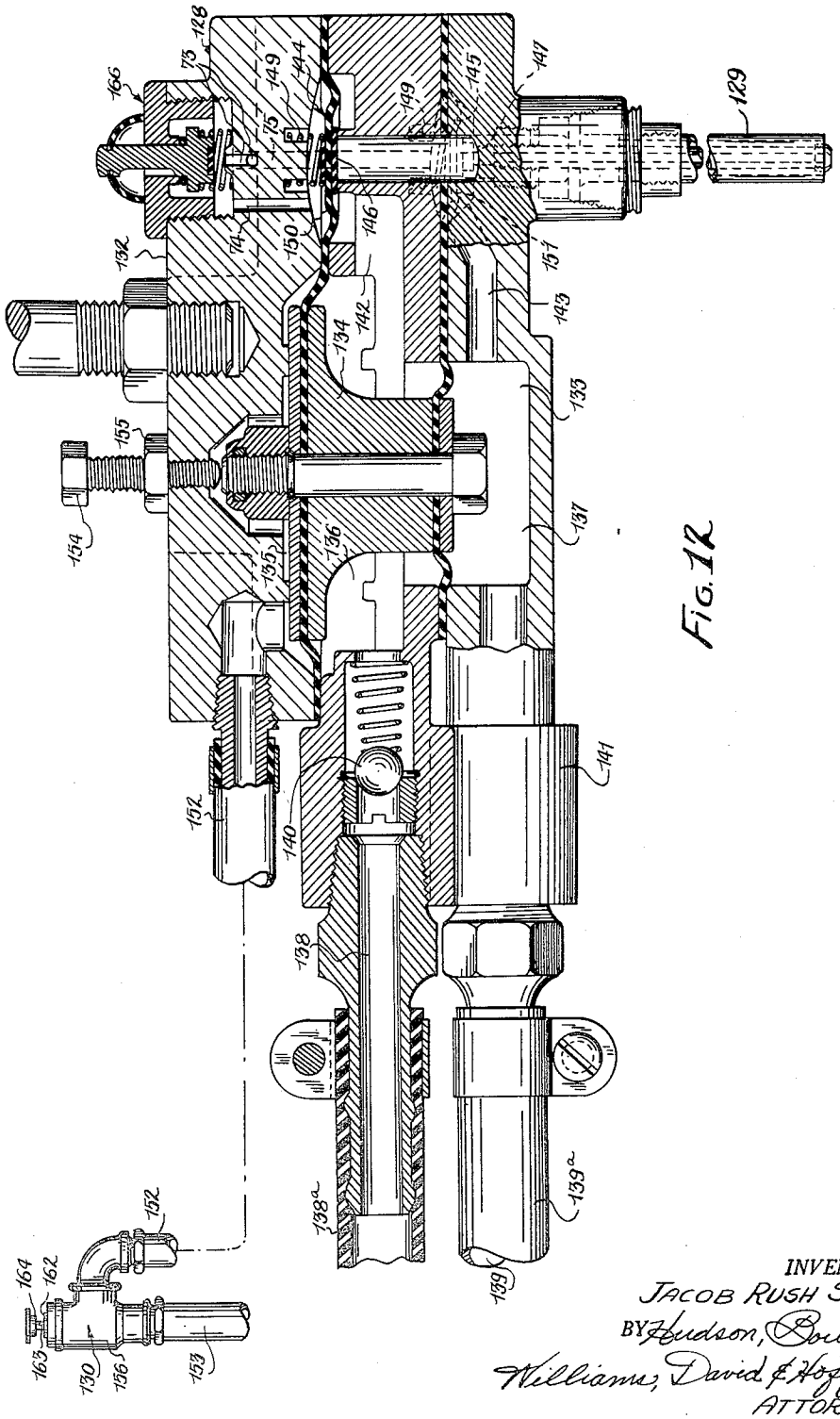


FIG. 1R

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Patented Oct. 5, 1954 2,690,859

UNITED STATES PATENT OFFICE

2,690,859

DISPENSING APPARATUS FOR MULTIPLE FLUIDS

Jacob Rush Snyder, Cleveland, Ohio

Application November 21, 1951, Serial No. 257,615

14 Claims. (Cl. 222—134)

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This invention relates to dispensing apparatus for delivering predetermined amounts of a desired fluid or fluids and, more particularly, to improved apparatus of this kind by which the fluid being delivered can be applied to a desired point of use. This improved dispensing apparatus is hereinafter described as being used for introducing predetermined amounts of treating fluid into preformed holes of wood railway ties, but the invention is not limited in this respect since the apparatus can be used to advantage for various other dispensing and applicator purposes.

An object of the present invention is to provide improved dispensing apparatus of this character having plunger means operable in a pump chamber for delivering a measured quantity of the dispensing fluid and in which novel outlet valve means is employed to control the discharge passage leading from the pump chamber.

Another object is to provide dispensing apparatus of the character just mentioned in which the novel outlet valve means comprises a diaphragm-actuated valve having a normally closed position for initially retaining the dispensing fluid in the pump chamber but which is movable to an open position in response to pressure of the dispensing fluid against one side of the diaphragm means.

Another object is to provide dispensing apparatus of this kind in which the plunger means is formed, at least in part, by a flexible diaphragm and in which the outlet valve means is formed, at least in part, by a portion of the diaphragm of the plunger means.

A further object is to provide improved fluid dispensing apparatus of the kind having a pump chamber and plunger means operable therein and in which the plunger means divides the pump chamber into a power compartment and a dispensing compartment of which the latter is adapted to be connected with a source of dispensing fluid under pressure and the former is adapted to be supplied with motive fluid pressure.

Still another object is to provide improved fluid dispensing apparatus of this kind in which the pressure of the motive fluid being supplied to the power compartment and the initial pressure of the dispensing fluid in the dispensing compartment produce a substantially pressure-balanced condition of the plunger means and in which a manually movable means is operable to cause a dispensing stroke of such pressure-balanced plunger means.

As a further object, this invention provides improved dispensing apparatus of the character

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mentioned, having means including a manually operable control valve for supplying motive fluid to the power compartment at a pressure above the initial pressure of the dispensing fluid for causing a power actuated dispensing stroke of the plunger means.

Yet another object is to provide improved dispensing apparatus of the character referred to above in which novel priming means is employed to cause unseating of the normally closed outlet valve to facilitate the initial filling of the dispensing compartment from the source of dispensing fluid under pressure.

It is also an object of the present invention to provide improved dispensing apparatus of the character already mentioned in which the pressure of the motive fluid is utilized for holding the diaphragm-actuated outlet valve in its normally closed position and in which the priming means comprises manually operable vent valve means for removing the pressure of the motive fluid from the diaphragm of the outlet valve.

As still another object, this invention provides improved dispensing apparatus in which the dispensing compartment or compartments and the plunger means are contained in a manually portable applicator unit or dispensing head having nozzle means connected therewith and adapted for positioning in a spike hole or the like of the wood member being treated.

This invention also provides improved dispensing apparatus of the character mentioned having multiple dispensing compartments and valve controlled discharge passages for delivering measured quantities of different dispensing fluids simultaneously.

Additionally, this invention provides improved dispensing apparatus of the kind above referred to in which the nozzle means has multiple passages therein for the plural fluids being dispensed and in which novel cover means is provided for temporary application to the nozzle means.

Other objects and advantages of the invention will be apparent in the following detailed description and in the accompanying sheets of drawings in which;

Fig. 1 is a side elevation showing one form of dispensing apparatus of the present invention and which apparatus embodies a reservoir unit and a manually portable dispensing head or applicator unit;

Fig. 2 is another side elevation of the portable applicator unit;

Fig. 3 is a horizontal sectional view of the ap-

plicator unit taken substantially on section line 3—3 of Fig. 1;

Fig. 4 is a bottom plan view of the applicator unit;

Fig. 5 is a longitudinal vertical section taken through the applicator unit substantially on section line 5—5 of Figs. 3 and 7;

Fig. 6 is a fragmentary section showing a portion of the applicator unit and taken on section line 6—6 of Fig. 5;

Fig. 7 is a transverse vertical section taken through the applicator unit substantially on section line 7—7 of Fig. 3;

Fig. 8 is another transverse vertical section of the applicator unit taken on section line 8—8 of Fig. 3;

Fig. 9 is a transverse section taken through the pressure release valve of the reservoir unit as indicated by section line 9—9 of Fig. 1;

Fig. 10 is another transverse section taken through the release valve on section line 10—10 of Fig. 9;

Fig. 11 is a side elevation showing a dispensing head or applicator unit of a modified form;

Fig. 12 is a longitudinal vertical section similar to that of Fig. 5, but taken through the modified applicator unit of Fig. 11;

Fig. 13 is a sectional view taken through the manually operable control valve of the modified applicator unit; and

Fig. 14 is an elevation partially in vertical section showing a removable cover applied to the nozzle means of the applicator unit.

In the embodiment of the invention illustrated in Figs. 1 to 10 inclusive the improved dispensing apparatus 10 is shown as comprising, in general, a reservoir unit 11 and a manually portable and manually operable applicator unit or dispensing head 12 which is connected with the reservoir unit 11 by flexible conduits or hoses 13, 14 and 15.

The reservoir unit 11 comprises tanks adapted to contain quantities of the fluids to be dispensed, in this instance two such tanks 16 and 17, and a source of air under suitable pressure and which is here represented by a manually operable air pump 18. The tanks 16 and 17 and the pump 18 are suitably mounted on a supporting base 19 so as to enable the reservoir unit to stand in upright relation on the ground or, if desired, on a rail car or other suitable vehicle (not shown). The tanks 16 and 17 are of suitable size to contain appropriate quantities of the fluids to be dispensed and are here shown as having a size relationship to each other corresponding substantially with the volume ratio according to which the dispensing fluids are to be dispensed in measured quantities as is explained more fully hereinafter.

As has already been indicated above, the dispensing apparatus 10 is intended for use in treating wood railway ties or the like by supplying measured quantities of the desired treating fluids to preformed spike holes in such ties. Any desired fluid or fluids can be used in this dispensing apparatus, but by way of example, it can be stated that it has become the practice to use a synthetic resin glue material in such spike holes and the present apparatus can be used to advantage in supplying such synthetic resin glue material to the spike holes.

The synthetic resin glue material used for this purpose is of a potentially thermosetting character and as employed in the spike holes may comprise a mixture of the potentially thermosetting resin and a catalyst or accelerator. To

avoid premature setting of this material, it is necessary to maintain the resin and catalyst in segregated relation prior to their introduction into the spike hole. In the improved dispensing apparatus 10, a quantity of one of these treating fluids, for example resorcinol formaldehyde, is contained in the tank 16 and a quantity of the other of the two treating fluids, such as a resin accelerator comprising a mixture of urea and formaldehyde, is contained in the tank 17.

During use of the dispensing apparatus 10, the treating fluids in the tanks 16 and 17 are maintained under pressure, such as a pressure of appproximately 35 pounds per square inch, for supplying the fluids from the reservoir unit to the applicator unit 12. The tanks 16 and 17 are each provided at the top thereof with a removable plug 20 closing a filling opening. Each tank is also provided with a short axial sleeve 21 extending thereinto from the filling opening and which insures the presence of an air pocket 22 at the upper ends of the tanks when they are filled with the treating fluids. The treating fluids contained in the tanks 16 and 17 are supplied from the bottoms thereof to the applicator unit 12 through the hoses 13 and 14 respectively by the air pressure maintained in the tanks.

The pump 18 may be of the conventional tire pump type having a reciprocable operating handle 23. At its lower end the pump 18 is provided with an air delivery box or manifold 24 from which the air to be supplied to the upper ends of the tanks 16 and 17 is delivered through a conduit 25 and a combined distributor and pressure release valve device 26. Branch conduits 27 and 28 connect two of the outlets of the device 26 with the upper ends of the tanks 16 and 17. A third outlet of the device 26 is connected with the applicator unit 12 by the flexible conduit 15. A check valve 29 located in the conduit 25 prevents a return flow of air from the tanks 16 and 17 to the pump 18 and thus enables the pump to charge the tanks with the desired air pressure for delivering the treating fluids therefrom.

The applicator unit or dispensing head 12 comprises a housing 31 formed by connected upper, intermediate and lower housing sections 31a, 31b and 31c and having a delivery nozzle 32 connected therewith for delivery of the dispensing fluids. In this instance, the delivery nozzle 32 is connected directly with the housing 31 in depending relation thereto for convenient insertion into a spike hole to be treated, although if desired, the delivery nozzle could be connected with the housing by a flexible conduit.

The applicator unit 12 is provided with a suitable carrying handle 33 enabling the same to be manually carried and manipulated. The handle 33 is connected with the housing 31 by an upright rod 34 on which the handle is mounted at an intermediate point thereof. The applicator unit 12 is also provided with a manually movable operating lever 35 having a handle portion 35a and to which further reference will presently be made. At this point it is sufficient to explain that the lever 35 is pivotally mounted on rod 34 adjacent its upper end, as by means of the bracket 35b.

The housing 31 contains a pump chamber 36 having a plunger means 37 operable therein. The plunger means 37 is formed by a plunger body 37a and a pair of spaced upper and lower diaphragms 38 and 39 which extend tranversely of the pump chamber 36 and divide the same

into three compartments comprising a power compartment 40 and a pair of dispensing compartments 41 and 42. The plunger means 37 also includes clamping members 43 and 44 by which the diaphragms 38 and 39 are clamped against the plunger body 37a.

As shown in the drawings, the hose 13 leading from the tank 16 is connected with the dispensing compartment 41 through a check valve 45. The hose 14 leading from the tank 17 is connected with the dispensing compartment 42 through a similar check valve 46. The air pressure in the tanks 16 and 17 causes the fluids thereof to be supplied through the hoses 13 and 14 and to flow past the check valves 45 and 46 into and substantially fill the dispensing compartments 41 and 42. These dispensing compartments have discharge passages 47 and 48 leading therefrom and through which the fluids are delivered when these fluids are subjected to increased pressure in the dispensing compartments 41 and 42 by the plunger means 37.

The delivery nozzle 32 is provided with multiple delivery passages for the dipsensing fluids, in this instance two such passages 49 and 50. The nozzle 32 is here formed by a pair of coaxially disposed outer and inner tubes 51 and 52 which define the respective outer and inner delivery passages 49 and 50. The outer tube 51 is connected with the housing 31 by a bushng 53 such that the outer delivery passage 49 forms a continuation of the discharge passage 47 leading from the dispensing compartment 41. The inner tube 52 is also connected with the housing 31 by a bushing 54 such that the inner delivery passage 50 forms a continuation of the discharge passage 48 leading from the dispensing compartment 42.

To prevent leakage or the premature escape of the treating fluids from the dispensing compartments 41 and 42, the applicator unit 12 is provided with outlet valve devices 55 and 56 which control the discharge passages 47 and 48 respectively. The valve devices 55 and 56 are located in valve chambers 57 and 58 which constitute enlargements of the discharge passages 47 and 48.

The outlet valve device 55 comprises an annular valve seat 59 extending upwardly into the valve chamber 57 in surrounding relation to a downwardly extending portion of the discharge passage 47, and a movable valve member 60 having a normally closed position in engagement with the seat 59 for preventing the flow of dispensing fluid out of the compartment 47. The valve device 55 also comprises a valve diaphragm 61 extending across the valve chamber 57 above the valve seat 59 and which is formed by a portion of the diaphragh 38 of the plunger means 37.

The diaphragm 61 cooperates with a portion of the housing member 31a to define a pressure compartment 62 located above the diaphragm. The valve member 60 is connected with the diaphragm 61 substantially centrally thereof and on the underside thereof so as to be sealingly pressed against the annular valve seat 59 by motive fluid pressure supplied to the compartment 62 as hereinafter explained. A compression spring 63 located in the compartment 62 is effective on the diaphragm 61 for also urging the valve member 60 toward a position of closed engagement with the valve seat 59.

The outlet valve device 56 comprises an annular valve seat 65 formed on the upper end of the bushing 54 and projecting upwardly into the valve chamber 58 in surrounding relation to the upper end of the delivery passage 50 of the nozzle 32. The valve device 56 also comprises a valve diaphragm 66 extending across the valve chamber 58 above the valve seat 65 and formed by a portion of the diaphragm 39 of the plunger means 37. The valve device 56 also comprises a valve member 67 having a normally closed position in engagement with the valve seat 65.

The diaphragm 66 cooperates with a portion of the intermediate housing member 31b to define a pressure compartment 68 located above the diaphragm. The valve member 67 is secured to the diaphragm 66 on its underside and substantialy centrally thereof such that motive fluid pressure supplied to the compartment 68, as hereinafter explained, will act on the diaphragm to hold the valve member against the valve seat 65. A compression spring 69 located in the compartment 68 is effective on the diaphragm 66 to also urge the valve member 67 toward a position of closed engagement with the valve seat 65.

Air furnished by the pump 18 serves as the above-mentioned motive fluid pressure and is supplied to the applicator unit 12 through the hose 15. The motive fluid being thus supplied to the applicator unit 12 is received in the valve chamber 71 of a priming valve device 72 which will be presently described. The hose 15 is connected with the housing 31 so as to communicate with the valve chamber 71 through a connecting passage 73. The valve chamber 71 is connected with the pressure compartment 62 of the outlet valve device 56 by a passage 74, and similarly, the pressure compartment 68 of the outlet valve device 57 is connected with the valve chamber 71 by a passage 75. The motive fluid pressure supplied to the pressure compartments 62 and 68 through the passages 74 and 75 acts on the diaphragms 61 and 66 to hold the valve members 60 and 67 against their valve seats 59 and 65 as explained above.

A portion of the motive fluid pressure being furnished to the applicator unit 12 through the hose 15 is supplied to the power compartment 40 through a connecting passage 76 which connects this compartment with the pressure compartment 62 of the outlet valve device 56. The motive fluid pressure which is thus supplied to the power compartment 40 is of substantially the same pressure value as the air pressure contained in the tanks 16 and 17 of the reservoir unit 11, and hence, is of substantially the same pressure value as that of the dispensing fluids being supplied to the dispensing compartments 41 and 42. It will accordingly be seen that the pressure of the motive fluid in the compartment 40 is effective on one side of the plunger means 37 to substantially balance the pressure of the motive fluids of the compartments 41 and 42 which is effective on the opposite side of the plunger means.

This pressure-balanced condition of the plunger means 37 is desirable because only a minimum amount of manual effort will then be needed to produce a downward dispensing stroke of the plunger means. Such a downward dispensing stroke of the plunger means subjects the dispensing fluids in the compartments 41 and 42 to an increased pressure causing these fluids to act against the underside of the valve diaphragms 61 and 66 of the valve devices 55 and 56 to produce an opening movement of the valve members 60 and 67. The opening of the valve members 60 and 67 permits the dispensing fluids to be delivered through the discharge passages 47 and 48

and through the delivery passages 49 and 50 of the nozzle 32.

As shown in the drawings, an actuating stem 77 projects from the pump chamber 36 of the housing 31 through an opening 78 of the upper housing member 31a and is provided at its upper end with a yoke portion 79. The inner end of the stem 77 is connected with the plunger means 37 by a screw 80 which extends through the plunger body 37a and through the clamping members 43 and 44.

For manually producing the downward dispensing stroke of the plunger means 37, the manually movable actuating lever 35 is connected with the plunger stem 77 by means of a connecting rod 81 and a lever 82. The pivotal connection of the lever 35 with the bracket 35b permits this lever to be conveniently swung in a substantially vertical plane when grasped by one hand of an operator. The lever 82 has one end thereof fulcrumed on the housing 31 by being pivotally connected with a fulcrum bracket 83. At an intermediate point thereof, the lever 82 is connected with the yoke portion 79 of the actuating rod 77 by means of a transverse pivot pin 84.

The outer end of the lever 82 is connected with the actuating lever 35 by the connecting rod 81 which is adjustable as to length by means of threaded connections 81a embodied therein. A compression spring 85 having its lower end seated in a recess 85a of the housing 31 and its upper end engaging the free end of the lever 82 urges the latter in an upward direction for retracting the plunger means 37 in the pump chamber 36. The spring 85 has sufficient force to normally hold the plunger means 37 in a retracted initial position at the upper end of the pump chamber 36 and to also hold the actuating lever 35 in a corresponding initial position shown in full lines in Figs. 1 and 2.

The measured quantities of the dispensing fluids which are delivered from the dispensing chambers 41 and 42 will depend upon the volume capacities of these compartments and upon the length of the downward dispensing stroke of the plunger means 37. These dispensing compartments can be of any desired size and can have any desired volume relationship to each other. In this instance, the volume relationship between the dispensing compartments 41 and 42 is represented approximately by a three-to-one ratio.

For varying the quantities of the treating fluids to be delivered from the dispensing compartments 41 and 42, the applicator unit 12 is provided with an adjusting means for altering the length of the downward dispensing stroke of the plunger means 37. This adjusting means is here shown as comprising a threaded portion 86 provided on the actuating rod 77 and two nuts 87 and 88 engaging this threaded portion and forming an adjustable stop. During the dispensing operation, the lower end of the nut 88 engages the housing 31 for limiting the extent of downward movement of the plunger means 37.

When the tanks 16 and 17 have been substantially filled with the dispensing fluids and have been charged with air pressure to the desired appropriate 35 pounds pressure value by operation of the pump 18, the apparatus 10 is ready to be placed in use. At the beginning of the dispensing operation, the dispensing compartments 41 and 42 and the supply and discharge passages for these compartments will contain only air. The purpose of the above-mentioned priming valve device 72 is to permit filling of these compartments and passages with dispensing fluid without requiring manipulation of the manual actuating lever 35. By manual actuation of this priming valve device 72, the air trapped in the dispensing compartments 41 and 42 and in the supply and discharge passages thereof is vented to atmosphere so as to permit filling of these compartments and passages with the dispensing fluids in response to the pressures existing in the tanks 16 and 17.

The priming valve device 72 (see Figs. 5 and 7) comprises an annular valve seat 89 extending upwardly into the valve chamber 71 in surrounding relation to the upper end of the air passage 73. This valve device also comprises a valve member 90 carried by a valve plunger 91 and having a normally open position in adjacently spaced relation above the valve seat 89. The valve chamber 71 is defined in part by a cup-shaped cover member 92 which is threadedly connected with the housing member 31a and has a vent passage 93 therein connecting this valve chamber with the atmosphere. The plunger 91 has an actuating stem 94 extending upwardly through the vent passage 93 and to which downward manual actuating movement can be applied by pressure of the operator's thumb on the upper end of this stem.

The priming valve device 72 also comprises an annular valve seat 95 formed on the cover member 92 and extending in depending relation into the valve chamber 71 in coaxial alignment with the annular valve seat 89 and in surrounding relation to the inner end of the vent passage 93. An annular valve member 96, carried by the plunger 91 and disposed in surrounding relation to the stem 94, is engageable with the valve seat 95 for closing the vent passage 93. A compression spring 97 located in the valve chamber 71 acts on the plunger 91 to hold the valve member 96 in a position of normally closed engagement with the valve seat 95 and to also hold the valve member 90 in its normally open position with respect to the valve seat 89. A shield 98, formed of soft rubber or other suitable flexible material and having an inverted-cup shape, is connected with the stem 94 and forms a hood or cover extending over the upper end of the vent passage 93 for excluding foreign matter and insects therefrom.

To accomplish the above-mentioned priming of the dispensing chambers 41 and 42 and their supply and discharge passages with the dispensing fluids, the operator depresses the valve plunger 91 thereby opening the vent passage 93 and closing the air supply passage 73. The opening of the vent passage 93 permits air to be exhausted to atmosphere from the pressure compartments 62 and 68 of the outlet valve devices 55 and 56. This permits the air which is trapped in the dispensing compartments 41 and 42, and which is of the pressure of the pressure values existing in the tanks 16 and 17, to be effective against the underside of the diaphragms 61 and 66 to cause opening of the outlet valves 60 and 67.

The opening of the outlet valves permits the trapped air to be expelled to atmosphere through the delivery passages 49 and 50 of the nozzle 32 and to be replaced by quantities of the dispensing fluids. The operator maintains the valve plunger 91 in its depressed or venting position until the dispensing fluids begin to issue from the nozzle passages 49 and 50. When this occurs, he knows that the dispensing chambers and passages of the applicator unit 12 have been

primed with the dispensing fluids whereupon he releases the plunger 91. The release of this plunger causes the vent passage 93 to be reclosed by the valve member 95 and causes the air supply passage 73 to be again connected with the pressure compartments 62 and 68 of the valve devices 55 and 56 such that the motive pressure fluid will be effective on the diaphragms 61 and 66 for reengaging the valve members 60 and 67 with their seats 59 and 65.

In using the dispensing apparatus 10, the reservoir unit 11 is placed in a position adjacent to a group of spike holes of certain railway ties which are to be treated. The operator carries the applicator unit 12 from one point of use to another within the range of movement permitted by the hoses 13, 14 and 15. He accomplishes this by manually grasping the carrying handle 33, preferably with his right hand, and at the same time grasping the handle 35a of the actuating lever 35 with his left hand.

While thus maintaining the unit 12 in an elevated or suspended position, he lowers or inserts the lower end of the nozzle 32 into an individual spike hole and then depresses the actuating lever 35 to its dotted line position shown in Fig. 2. The resulting downward dispensing stroke of the plunger means 37 causes the desired measured quantities of the dispensing fluids to be delivered through the passages of the nozzle into the spike hole. Before withdrawing the nozzle from the spike hole, the actuating lever 35 is returned to its full line position, or is permitted to be returned to such position by the spring 85, which results in a retracting upward movement of the plunger means 37 and permits the dispensing compartments 41 and 42 to be refilled for the next subsequent dispensing operation.

As shown in Figs. 7 and 8, the lower end of the inner nozzle tube 52 is preferably provided with a cap or fitting 100 having a somewhat restricted orifice 101 therein. During the dispensing operation, the dispensing fluid being delivered through the nozzle passage 50 will emerge from the orifice 101 as a velocity stream which will impinge against the stream of dispensing fluid flowing from the outer nozzle passage 49 and will promote a thorough mixing of the two dispensing fluids in the spike hole.

With respect to the pressure-balanced condition of the plunger means 37, it has been explained above that air under pressure is supplied to the power compartment 40 as a motive fluid pressure. This invention contemplates, however, that instead of supplying air to the power compartment 40, the pressure-balanced condition of the plunger means 37 can be obtained by supplying one of the dispensing fluids under pressure to the power compartment. This can be done by providing direct communication (not shown) between the power compartment 40 and one of the dispensing chambers, for example the immediately adjacent dispensing chamber 41. When one of the dispensing fluids is thus used as a motive fluid pressure in the power compartment 40, the connecting air passage 76 is omitted.

Reverting to the pressure release valve device 26 of the reservoir unit 11, it should be explained that this valve device provides a means by which the air pressure in the tanks 16 and 17 can be released to atmosphere as would be desirable prior to removal of the closure plugs 20 for refilling of the tanks with the dispensing fluids. This release valve device 26 comprises a valve body 102 which is similar in character to a pipe fitting of the kind known as a cross and has a distributing chamber 103 therein through which the hoses 15, 27 and 28 are all connected with the air supply hose 25. The release valve device 26 also comprises a cup-shaped cover 104 which is mounted on the valve body 102 and cooperates therewith in defining a valve chamber 105.

The release valve device 26 also comprises an annular valve seat 106 carried by the body 102 and projecting upwardly into the valve chamber 105 in surrounding relation to the upper end of a vent passage 107 which communicates with a transverse passage 108 leading to atmosphere. The valve chamber 105 is closed by a flexible diaphragm 109 extending thereacross and held in clamped engagement against the body 102 by the cover 104. A passage 110 formed in the body 102 connects the valve chamber 105 with the distributing chamber 103.

A valve member 111, carried by the diaphragm 109 and located substantially centrally thereof, has a normally closed position in engagement with the annular valve seat 106 for closing the vent passage 107. A plunger 112 engaging the diaphragm 109 has a stem portion 113 projecting upwardly through the cover 104. A compression spring 114 of a predetermined load value is housed in the cover 104 and disposed around the stem 113 and acts on the plunger 112 to shift the same downwardly against the diaphragm 109 and urge the valve member 111 toward a position of closed engagement with the annular valve seat 106. An actuating lever 115 is pivotally connected with the upper end of the plunger stem 113 and has a cam portion 115a on the pivoted end thereof.

When the air pressure in the tanks 16 and 17 is to be vented to atmosphere, the lever 115 is swung upwardly to its substantially vertical broken line position shown in Fig. 9, causing the cam portion 115a to engage the upper end of the cover 104 and produce a lifting force which is applied to the plunger 112. This upward movement of the plunger 112 permits the valve member 111 to be moved away from the valve seat 106 by the confined air pressure acting against the underside of the diaphragm 109, thereby establishing communication of the distributing chamber 103 with the atmosphere through the passages 110 and 107. After the tanks 16 and 17 have been refilled with the dispensing fluids and the cover plugs 20 have been replaced, the lever 115 of the release valve device 26 is returned to its full line position shown in Fig. 9 enabling the spring 114 to reclose the valve member 111 prior to actuation of the pump 18 for recharging the tanks with air pressure.

The release valve device 26 also serves as a relief valve means for preventing overcharge of the tanks 16 and 17 with air pressure by operation of the air pump 18. Since the compression spring 114 is of a predetermined load value, as mentioned above, it will permit automatic opening of the valve member 111 by air pressure acting against the underside of the diaphragm 109, to thereby vent excessive air pressure to atmosphere and limit the air pressure in the tanks 16 and 17 to a desired value.

Whenever the dispensing operation employing the apparatus 10 is interrupted, it is desirable to exclude air from direct contact with the dispensing fluids standing in the nozzle passages 49 and 50 because of the characteristic tendency of these fluids to become set when in contact

with the air. The present invention, therefore, provides a temporary cover 117 for the nozzle stem 32 which can be very quickly applied thereto or removed therefrom. The cover 117 comprises a cup-shaped member 119 made of metal, plastic or any other suitable material and having a chamber 119 therein adapted to contain a quantity of oil 120.

At its upper end the cover 119 is provided with a closure formed by a plurality of axially spaced flexible disks 121 extending across the opening of the cover member and having their annular peripheral edges or rim portions 121a held in place by a clamping bushing or ring-shaped nut 122. The annular rim portions of the flexible disks 121 are held in axially spaced relation by intervening spacer rings or washers 123. The disks 121 are provided with substantially centrally located and substantially axially aligned slit openings through which the nozzle stem 32 can be inserted into the chamber 119 for immersion of the lower ends of the nozzle tubes in the oil 120.

The slit-like character of the openings of the disks 121 and the flexibility of these disks causes the same to grip the nozzle stem 32 when the cover 117 has been telescopingly applied thereto. The gripping engagement of the disks with the nozzle 32 forms a fluid-tight seal therebetween which prevents the escape of the oil 120 and also forms a frictional connection with the nozzle by which the cover 117 is retained thereon.

To prevent loss of the cover 117, this device can be suitably anchored or tethered to the applicator unit 12 as by means of a chain or flexible cable (not shown). Preferably, however, a holder 124 is provided in which the cover 117 can be temporarily held or parked during the time that it is disengaged from the nozzle stem 32. The holder 124 is in the form of a wire spring clamp device having a contractible loop portion 124a which extends around and grips the rod 34 (see Fig. 1) for mounting the holder on the applicator unit 12. The holder 124 also comprises a pair of spring arms or jaws 124b which embracingly receive and releasably hold the cover 117 by engaging in the annular groove 125 thereof.

Figs. 11 and 12 of the drawings show a modified form of dispensing head or applicator unit 128 which is generally similar to the unit 12 and can be used with a reservoir unit similar to the unit 11. The applicator unit 128 is also a manually portable unit having a delivery nozzle 129 depending therefrom and is adapted to be moved from one point of use to another for insertion of the nozzle 129 into individual spike holes of the railway ties to be treated. The applicator unit 128 differs from the unit 12 described above, in that the dispensing operation of the unit 128 is carried out by pressure motive fluid of a relatively high pressure and controlled by a manually operable control valve 130.

To enable the applicator unit 128 to be manually carried and manipulated, an upright carrying handle 131 is provided and has its lower end connected with the housing 132 of this unit. The handle 131 also forms a mount for the control valve 130.

As shown in Fig. 12, the applicator unit 128 is provided with a pump chamber 133 located in the housing 132 and a plunger means 134 operable in the pump chamber and dividing the same into a power compartment 135 and a pair of dispensing compartments 136 and 137. Supply passages 138 and 139 defined by hoses 138a and 139a leading from tanks containing dispensing fluids under pressure, such as tanks similar to the tanks 16 and 17 and containing a corresponding relatively low pressure, communicate with the dispensing compartments 136 and 137 and are controlled by check valves 140 and 141. Discharge passages 142 and 143 leading from the dispensing compartments 136 and 137 are controlled by outlet valve devices 144 and 145 which are of substantially the same construction and function in substantially the same manner as the outlet valve devices 55 and 56 described above.

The nozzle 129 is formed by outer and inner nozzle tubes defining delivery passages which constitute continuations of the discharge passages 142 and 143. Valve member 146 and 147, located in the valve chambers of the valve devices 144 and 145, control the discharge passages 142 and 143 and are normally held in a closed position by the compression springs 148 and 149 and by air pressure acting on the diaphragms 150 and 151 of these valve devices and supplied by the hose 15. The air pressure furnished by the hose 15 is of substantially the same low pressure value as the air pressure in the dispensing fluid supply tanks and is supplied to the outlet valve devices 144 and 145 through the same corresponding passages as have been described above in the applicator unit 12 and to which the same reference characters have been applied.

A downward dispensing stroke of the plunger means 134 is produced by supplying pressure motive fluid to the power chamber 135 at a pressure substantially above the 35 pounds per square inch pressure of the dispensing fluids, for example at a pressure of approximately 65 pounds per square inch. The pressure motive fluid is preferably air under pressure and is supplied to the power compartment 135 from an available source of fluid of the required pressure value through a hose 152 and the manually operable control valve 130.

When the applicator unit 128 has been manually moved to a position with the delivery nozzle 129 thereof extending into a spike hole, the operator actuates the valve 130 to thereby supply the pressure motive fluid to the power compartment 135 for producing a downward dispensing stroke of the plunger means 134. When the dispensing stroke has been completed, the operator releases the control valve 130 thereby disconnecting the power compartment 135 from the source of motive fluid and connecting the hose 152 with atmosphere for venting the power compartment 135. The venting of the power compartment 135 permits the plunger means 134 to be moved upwardly through a return stroke by the pressure of the dispensing fluids being supplied to the dispensing compartments 136 and 137 to refill the latter.

The amounts of the dispensing fluids which are discharged from the dispensing compartments 136 and 137 can be varied by controlling the extent of the return movement of the plunger means 134. For this purpose, an adjusting screw 154 is provided in the housing 132 having its inner end extending into the power compartment 135 and forming a stop adapted to be engaged by the plunger means 134. A lock nut 155 on the screw 154 enables the same to be locked in any desired position of adjustment.

The manually operable control valve 130 supplying motive pressure fluid to, and exhausting the same from, the power compartment 135 is a

three-way valve of a suitable construction such as that shown in Fig. 13. This control valve comprises a valve body 156 having a passage extending therethrough for connecting the air supply hose 153 with the hose 152. A movable valve member 157 located in the body 156 and cooperating with a valve seat 158 controls the communication between the hoses 152 and 153. The valve member 157 is normally held in a position of closed engagement with the valve seat 158 by a compression spring 159.

The control valve 130 also comprises a cover or bonnet 160 having a vent passage 161 extending therethrough and an annular valve seat 162 disposed in surrounding relation to the upper end of the vent passage. A manually operable plunger 163 is axially movable in the vent passage 161 and has its inner end in engagement with the stem 157a of the valve member 157. A valve member 164 carried by the plunger 163 is engageable with the valve seat 162 for closing the vent passage 161 when the plunger 163 has been depressed to open the valve member 157. The vent passage 161 is connected with the hose 152 such that the power compartment 135 will be in communication with the atmosphere during such time that the valve member 164 stands in its normally open position as shown in Fig. 14.

The applicator unit 128 is also provided with a priming valve device 166 which is substantially identical with the priming valve device 72 described above and functions in substantially the same manner and for the same purpose.

From the foregoing description and the accompanying drawings, it will now be readily understood that this invention provides improved dispensing apparatus which includes a manually portable dispensing head or applicator unit having therein either a manually operable, or a power actuated, plunger means. It will now also be seen that this improved dispensing apparatus is capable of handling multiple fluids which are maintained in segregated relation. It will be seen further that this improved dispensing apparatus includes normally closed outlet valve devices controlling the discharge passages leading from the dispensing compartments and which outlet valve devices are adapted to be opened in response to an increased pressure of the dispensing fluids acting against valve diaphragms. Additionally, it will be seen that this improved dispensing apparatus embodies novel priming means for venting trapped air to atmosphere so as to permit an initial filling of the dispensing compartments and their associated passages with the dispensing fluids.

Although the dispensing apparatus of this invention has been illustrated and described herein to a somewhat detailed extent, it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope, but includes all changes and modifications coming within the terms of the claims hereof.

Having thus described my invention, I claim:

1. In dispensing apparatus, a housing having a pump chamber therein, a source of dispensing fluid under pressure, a delivery nozzle, plunger means operable in said pump chamber and dividing the same into a power compartment and a dispensing compartment, said housing also having therein a pair of supply and discharge passages communicating with said dispensing compartment and through which said dispensing compartment is connected with said source and with said nozzle, a check valve controlling said supply passage, valve means controlling said discharge passage, means for supplying motive fluid pressure to said power compartment, and manually movable means engaging said plunger means and operable to mechanically apply actuating force to said plunger means while the latter is subjected to said motive fluid pressure.

2. Dispensing apparatus as defined in claim 1 in which said plunger means is substantially pressure-balanced by the pressure of said dispensing fluid on one side thereof and the pressure of said motive fluid on the other side thereof.

3. In apparatus for dispensing multiple fluids, a housing having a pump chamber therein, a plurality of sources of individual dispensing fluids under pressure, a nozzle having delivery passages for the individual fluids, plunger means operable in said pump chamber and dividing the same into a power compartment and a plurality of dispensing compartments, said housing also having supply passages therein connecting said sources with the respective dispensing compartments and discharge passages connecting said dispensing compartments with the respective delivery passages of said nozzle, outlet valve devices controlling said discharge passages, means for supplying motive fluid pressure to said power compartment, and manually movable means engaging said plunger means and operable to mechanically apply actuating force to said plunger means while the latter is subjected to said motive fluid pressure.

4. Dispensing apparatus as defined in claim 3 in which said plunger means is substantially pressure-balanced by the pressure of said dispensing fluids on one side thereof and the pressure of said motive fluid on the other side thereof.

5. In dispensing apparatus, a housing having a pump chamber therein, plunger means operable in said pump chamber and dividing the same into a power compartment and a dispensing compartment, a delivery nozzle, said housing having a supply passage therein communicating with said dispensing compartment and adapted for connection with a source of dispensing fluid under the pressure of a motive fluid, a check valve controlling said supply passage, said housing also having therein a valve chamber and a discharge passage connecting said dispensing compartment with said nozzle through said valve chamber, valve means in said valve chamber and controlling said discharge passage, said housing also having passage means therein communicating with said power compartment and adapted for connection with said source for supplying such motive fluid to said power compartment at a pressure to substantially balance the pressure of the dispensing fluid in said dispensing compartment, said valve means comprising a valve member having a normally closed position for preventing escape of the dispensing fluid from said dispensing compartment and being movable to an open position in response to a predetermined increase in the pressure of the dispensing fluid in said dispensing compartment, and manually movable means engaging said plunger means and operable to mechanically apply actuating force to said plunger means for causing said predetermined increase in the pressure of said dispensing fluid.

6. In dispensing apparatus of the character described, a housing having a dispensing compartment therein and dispensing fluid supply and discharge passages communicating with said dispensing compartment, said housing also having a valve chamber therein and located in said discharge passage, plunger means operable in said

dispensing compartment for subjecting dispensing fluid therein to pressure, diaphragm means in said valve chamber and cooperating with a portion of said housing to define a pressure compartment, a valve member movable with said diaphragm means and having a normally closed position for preventing escape of dispensing fluid from said dispensing compartment but being movable to an open position by the pressure of said dispensing fluid againt one side of said diaphragm means, manually movable means engaging said plunger means and operable to cause a dispensing stroke of said plunger means in said dispensing compartment, said housing also having an air supply passage adapted to supply air under pressure to said pressure compartment for holding said valve member in said normally closed position and a vent passage for venting said pressure compartment to atmosphere, and a manually operable priming valve movable to close said air supply passage and to open said vent passage.

7. In dispensing apparatus of the character described, a housing having a pump chamber therein, plunger means operable in said pump chamber and dividing the same into a power compartment and a dispensing compartment, said housing having a supply passage therein communicating with said dispensing compartment and adapted for connection with a source of dispensing fluid under pressure, said housing also having a discharge passage leading from said dispensing compartment and a valve chamber in said discharge passage, said housing also having passage means therein communicating with said power compartment and adapted for connection with a source of air under pressure for supplying air to said power compartment at a pressure to substantially balance the pressure of said dispensing fluid in said dispensing compartment, diaphragm means in said valve chamber and cooperating with a portion of said housing to define a pressure compartment, a valve member movable with said diaphragm means and having a normally closed position for preventing escape of dispensing fluid from said dispensing compartment but being movable to an open position by a predetermined pressure increase in said dispensing fluid effective against one side of said diaphragm means, manually movable means engaging said plunger means and operable to produce a dispensing stroke of said plunger means for causing said predetermined pressure increase in said dispensing fluid, said housing also having an air supply passage communicating with said pressure compartment and adapted to supply air under pressure to the latter for holding said valve member in said normally closed position and a vent passage for venting said pressure compartment to atmosphere, and a manually operable priming valve movable to close said air supply passage and to open said vent passage.

8. In dispensing apparatus of the kind comprising a portable dispensing head having a hollow nozzle stem connected therewith for the delivery therethrough of the fluid being dispensed, a cover for said nozzle stem comprising a cup-shaped member of a size to be telescoped over said nozzle stem and defining a chamber, a quantity of liquid in said chamber and in which the end portion of said nozzle stem is immersed when the cover is in its applied position, and sealing means carried by said cup-shaped member adjacent the open end thereof and forming a liquid retaining closure for said open end when the cover is disengaged from the nozzle stem, said sealing means being flexible and having a normally closed passage therein adapting such sealing means to receive and sealingly grip said nozzle stem when said cover is applied thereto.

9. Dispensing apparatus as defined in claim 8 in which the sealing means of said cover comprises rim-mounted axially spaced flexible disks having substantially axially aligned normally closed slit openings therein.

10. In dispensing apparatus of the character described, a manually portable dispensing head comprising a housing having a pump chamber therein and a depending nozzle stem provided with a delivery passage, carrying handle means connected with said housing and extending thereabove and adapted to be manually grasped, plunger means operable in said pump chamber and dividing the same into a dispensing compartment and a power compartment, said housing having inlet passage means adapted for connection with a source of dispensing fluid under pressure and communicating with said dispensing compartment, said housing also having a valve chamber therein and discharge passage means connecting said dispensing compartment with said delivery passage through said valve chamber, outlet valve means in said valve chamber and controlling said discharge passage, means for supplying pressure motive fluid to said power compartment, and a manually movable actuating lever mounted on said carrying handle means and mechanically connected with said plunger means and effective to apply pumping force to the latter.

11. In apparatus for dispensing multiple fluids, a housing having a pump chamber therein, a plurality of sources of individual dispensing fluids under pressure, nozzle means connected with said housing and having delivery passages for the individual fluids extending substantially entirely therethrough, plunger means operable in said pump chamber and dividing the same into a power compartment and a plurality of dispensing compartments, said housing also having supply passages therein communicating with the respective dispensing compartments and discharge passages connecting said dispensing compartments with the respective delivery passages of said nozzle means, conduit means connecting said supply passages with the respective sources of said fluids, valve means controlling said discharge passages, and manually movable means engaging said plunger means and operable to mechanically apply actuating force to said plunger means for causing a dispensing stroke thereof, said discharge passages and the delivery passages of said nozzle means maintaining said dispensing fluids in segregated relation.

12. In apparatus for dispensing multiple fluids, a housing having a pump chamber therein, a plurality of sources of individual dispensing fluids under pressure, nozzle means connected with said housing and having delivery passages for the individual fluids extending substantially entirely therethrough, plunger means operable in said pump chamber and dividing the same into a power compartment and a plurality of dispensing compartments, said housing also having supply passages therein communicating with the respective dispensing compartments and discharge passages connecting said dispensing compartments with the respective delivery passages of said nozzle means, conduit means connecting said supply passages with the respective sources of said fluids, valve means controlling said discharge passages,

a source of air pressure of a pressure value substantially equal to the pressure of said dispensing fluid sources, conduit means connecting the air pressure source with said power compartment, and manually movable means engaging said plunger means and operable to mechanically apply actuating force supplemental to said air pressure to said plunger means for causing a dispensing stroke of the latter, said discharge passages and the delivery passages of said nozzle means maintaining said dispensing fluids in segregated relation.

13. In dispensing apparatus, a housing having a pump chamber therein, plunger means operable in said pump chamber and dividing the same into a power compartment and a dispensing compartment, tank means adapted to contain a supply of dispensing fluid and having an air pressure compartment therein above the supply of dispensing fluid, a delivery nozzle, said housing having a supply passage therein communicating with said dispensing compartment, said housing also having therein a valve chamber and a discharge passage connecting said dispensing compartment with said nozzle through said valve chamber, conduit means connecting the supply passage of said housing with said tank means at a point adjacent the bottom of the latter, valve means in said valve chamber and controlling said discharge passage, and other conduit means connecting said power compartment with said air pressure compartment of said tank means, said valve means comprising a valve member having a normally closed position for preventing escape of the dispensing fluid from said dispensing compartment and being movable to an open position in response to a predetermined increase in the pressure of the dispensing fluid in said dispensing compartment, and manually movable means engaging said plunger means and operable to mechanically apply actuating force to said plunger means for causing said predetermined increase in the pressure of said dispensing fluid.

14. In dispensing apparatus, a housing having a pump chamber therein, plunger means operable in said pump chamber and dividing the same into a power compartment and a plurality of dispensing compartments, tank means having compartments therein adapted to contain a plurality of dispensing fluids in segregated relation with air pressure compartments above the bodies of dispensing fluids, nozzle means connected with said housing and having delivery passages for the individual dispensing fluids extending substantially entirely therethrough, plunger means operable in said pump chamber and dividing the same into a power compartment and a plurality of dispensing compartments, conduit means connecting said dispensing compartments with the dispensing fluid compartments of said tank means, said housing also having discharge passages therein connecting said dispensing compartments with the respective delivery passages of said nozzle means, valve means controlling said discharge passages, other conduit means connecting said power compartment with the air pressure compartments of said tank means, said valve means comprising valve members having a normally closed position for preventing escape of the dispensing fluids from said dispensing compartments and being movable to an open position in response to a predetermined increase in the pressure of the dispensing fluids in said dispensing compartments, and manually movable means engaging said plunger means and operable to mechanically apply actuating force to said plunger means for causing said predetermined increase in the pressure of said dispensing fluids, said discharge passages and the delivery passages of said nozzle means maintaining said dispensing fluids in segregated relation.

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