United States Patent

Holmes

[15] **3,653,266**

[45] **Apr. 4, 1972**

[54] DISPENSER VALVE FOR THICK LIQUIDS OR SLURRIES

[72] Inventor: **Robert E. Holmes,** Marshall, Tex.

[73] Assignee: **Thiokol Chemical Corporation,** Bristol, Pa.

[22] Filed: **Mar. 5, 1970**

[21] Appl. No.: **16,831**

[52] **U.S. Cl.** .....**73/422 TC,** 222/367

[51] **Int. Cl.** **G01n 1/10**

[58] **Field of Search**.....222/193, 194, 216, 217, 344, 222/367, 404; 73/422 R, 422 TC, 424

[56] **References Cited**

UNITED STATES PATENTS

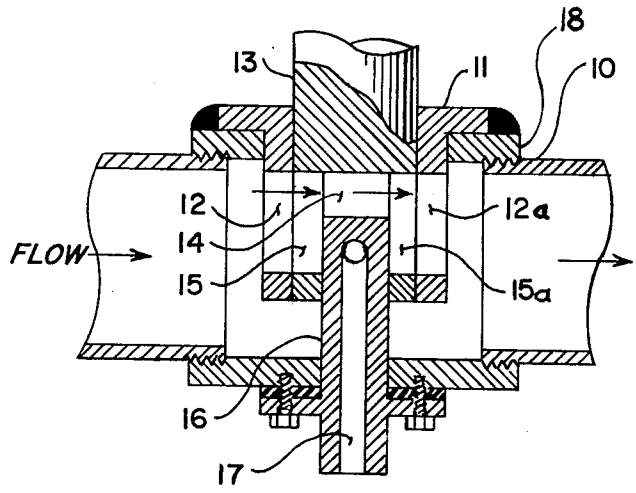
2,784,594 3/1957 Struck 73/422

Primary Examiner—Robert B. Reeves
Assistant Examiner—Francis J. Bartuska
Attorney—William R. Wright, Jr.

[57] **ABSTRACT**

A valve is presented which is capable of metering and dispensing a quantity of a thick liquid or slurry on a rapid production basis. The valve allows the slurry to move through it freely except for momentary interruption during the actual metering and dispensing cycle and thus the heavier or more solid components of the slurry do not tend to settle out nor collect in the valve as readily as they would otherwise. Also, the valve is simple to construct and maintain having but one moving part in the slurry which first rotates to close the valve to enclose an exact metered portion of the slurry and then translates to dispense it.

5 Claims, 4 Drawing Figures



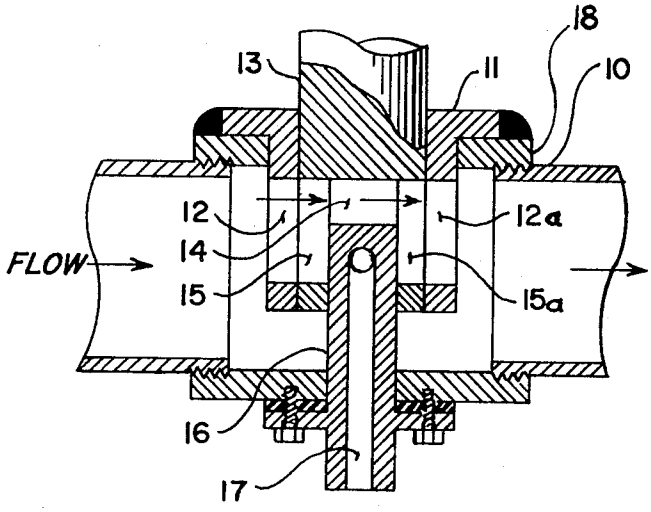


Fig. 1

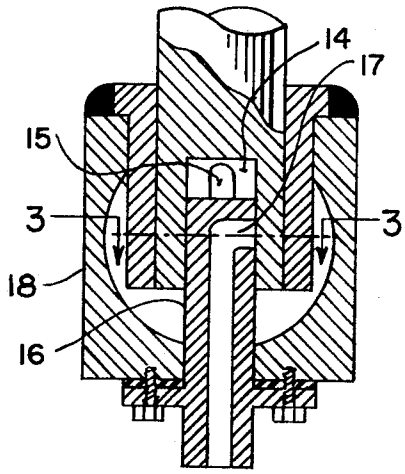


Fig. 2

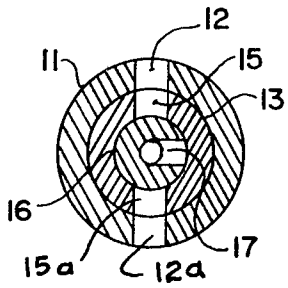


Fig. 3

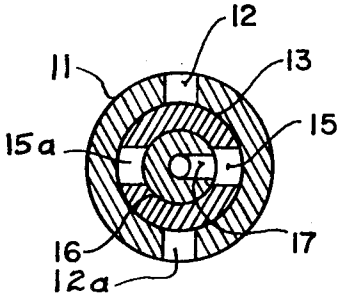


Fig. 4

Robert E. Holmes
INVENTOR.

BY William A. Wright, Jr.
HIS AGENT

DISPENSER VALVE FOR THICK LIQUIDS OR SLURRIES

The present invention relates to valves of the general type which dispense an exact predetermined quantity of a liquid or a slurry with each operation of the valve. It relates more particularly to a valve of the foregoing type in which the amount of fluid is accurately measured within the valve without the need for any measuring equipment separate from the valve itself.

In the chemical processing or manufacturing industries, it is frequently necessary to dispense a measured quantity of liquid or semi-liquid which is then utilized as a component of some device being manufactured or as a portion of some other chemical mixture. For instance, in the preparation of explosive devices some of the components are slurried explosives which must be dispensed into the mechanical arrangement in an accurately controlled and consistent quantity with a minimum of handling. The present invention is useful in such an instance and achieves this purpose in an improved manner because it has only one moving part in the valve proper which first rotates to close off an accurately measured void or chamber through which the liquid or slurry has previously been allowed to flow and then translates as a plunger to dispense the slurry through an outlet. Because a rotary action is employed, the flowing stream of slurry is stopped at both sides of the valve simultaneously or is open for a straight through passage of flowing slurry. As a result of having only one moving part in the slurry-immersed valve proper, improved durability and easier maintenance of the valve are achieved over that which would result from valves having more than one working part in such an environment. Also, the direct immersion of the valve in the flowing slurry helps to eliminate piping with its possibility of leakage and reduces handling of the slurry to a minimum.

One of the particular problems associated with slurries is that they must be kept in motion in order that the various ingredients will not settle out nor separate and thereby cause an inconsistency in the final slurry material as used in the product being manufactured. Accordingly, the present invention is adapted to be placed directly in a constantly flowing stream of the slurry material and the material is allowed to flow nearly straight through it with but a momentary interruption of the flow through the valve as the closure and dispensing cycle occurs.

It is, therefore, an object of the invention to provide a dispensing valve which is capable of measuring and dispensing a specific predetermined volume of a thick liquid or slurry with accuracy and consistency.

It is also an object of the present invention to provide an improved dispensing valve of the foregoing type which is simple, has only one moving part in the valve proper and eliminates the need for extra piping and handling of the thick liquid or slurry.

It is also an object of the present invention to provide an improved dispensing valve of foregoing type in which the single moving part in the valve proper is moved in a rotary manner to effect closure and to trap fluid and thereafter in a translatory manner to effect positive expulsion of the trapped fluid in a quick and forceful manner thus assuring rapid and efficient operation in a device of improved durability and maintainability.

It is also an object of the present invention to provide an improved dispensing valve of the foregoing type wherein the thick liquid or slurry is allowed to remain in motion through the dispensing mechanism at all times except during the actual closure and dispensing cycle.

Other objects and advantages will be apparent from the description and drawings which follow.

In the drawing:

FIG. 1 is a cross sectional front view of the valve showing it in the open position to receive the liquid or slurry and to allow the slurry to pass through it;

FIG. 2 is a cross sectional end view of the valve showing it in the position of FIG. 1;

FIG. 3 is a cross sectional top view of the valve taken on line 3—3 and showing it with the metering chamber open to the flow of the slurry;

FIG. 4 is a cross sectional top view of the valve similar to FIG. 3 but showing the valve with the metering chamber closed to the flow of slurry but open to the dispensing outlet.

With reference to FIG. 1 of the drawings, conduit **10** is a supply pipe carrying liquid or slurry and interposed in it and in communication with it, in the manner shown, is valve body **18**. Extended downwardly into body **18** and fixedly attached to it is outer sleeve **11** which is in the form of a hollow cylinder with slots or ports **12**, **12a** oppositely disposed in its wall and extended therethrough. Disposed within sleeve **11** and hollow at its lower end and having ports **15**, **15*a***, is a cylindrical rotary closure and plunger member **13** which is adapted both to rotate and to slide in sleeve **11** and is accurately fitted in place as by lapping so that there will be no substantial leakage. A tube **16** extends upwardly in the hollow portion of member **13** and is closely fitted to it as by a sliding lapped fit, and a central conduit passage **17** is provided in tube **16** terminating at its lower end at the place where the slurry is to be dispensed and at its upper end extending through its side. Tube **16** is fixedly attached to valve body **18** and does not rotate but is removable for disassembly of the valve for clean-out or other maintenance purposes should they be necessary.

In operation, and with reference to FIG. **1**, slurried material flows through substantially full conduit **10** and passes through ports **12**, **12*a***, **15** and **15*a*** filling both them and chamber **14** with moving slurry. Passage **17** is closed as will be seen in FIG. **2** so that no material can pass through it. The rotary closure member plunger **13** is then rotated by external ordinary means (not shown) less than one quarter turn but sufficiently to bring ports **12**, **12*a*** and **15**, **15*a*** out of register with one another and to close the metering chamber defined by the collective volumes of chamber **14** and ports **15** and **15*a*** except for that portion of port **15** below the top of tube **16**. An exactly measured quantity of slurried material is thus contained in the metering chamber upon the closure of communication between ports **12** and **15**, and, **12*a*** and **15*a***. The known amount trapped in ports **15**, **15*a*** from the top of tube **16** to the bottom of port **15** and from the underside of passage **17** to the bottom of port **15*a***, is later returned to the main flowing stream of slurry when the rotary closure is reopened. It is also important to note that the ports **12**, **15** are definitely closed before outlet passage **17** is opened in order to avoid any through flow from conduit **10**.

Upon the completion of one quarter turn rotation of closure-plunger member **13** (FIG. **4**), it is moved in translation by external ordinary means (not shown) downward as far as it will go and this motion forces the slurried material except for that trapped in the lower parts of ports **15**, **15*a***, from the metering chamber out through passage **17** which is now uncovered as will be seen in FIG. **4**. When all of the slurried material has been ejected, (with the exception noted above) and has been dispensed through passage **17**, closure-plunger member **13** is first rotated back a quarter turn to its original position (FIG. **3**) and then is withdrawn upwardly to its original position both by external means (not shown). This realigns ports **12**, **12*a*** and **15**, **15*a*** and again closes outlet passage **17** so that the valve is in position ready to receive a new charge of slurried material and is thus in condition for the next cycle of operation.

It is to be noted that with the ports again aligned with one another an open and substantially straight through passage is provided in the valve through which the slurry may now again flow freely except during the momentary closure and slurry ejection cycle and that the flow passage is substantially straight through the valve with little deviation of its path. This is advantageous in that heavier components of the slurry can be expected to pass right on through the valve without as much of a tendency to deposit themselves at the various points of diversion of the flow as would be the case with a valve having a more circuitous route for the slurry.

The relatively thick state of the slurry, which should be normally as thick or thicker than SAE 10W motor oil at room temperature, is sufficient to prevent any appreciable leakage of the slurry material from the closely-fitted rotary and translatory parts of the valve. It is, however, desirable that these mating parts be as closely fitted as possible consistent with freedom of the rotary and translatory sliding action.

It should be noted that the valve is very positive in action and yet has, in the valve proper, only one moving part, namely, the rotary closure-plunger member with which both the rotation and the translatory "plunging" are accomplished. There is, therefore, less complication in the manufacture of the valve proper than would be the case if a plurality of moving parts was employed there as has been previously suggested for valves intended for this purpose and improved durability and maintainability are achieved.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departure from the spirit of the invention or the scope of the subjoined claims.

What is claimed is:

1. A valve having a metering chamber substantially immersed in a viscous fluid flowing in a conduit, flow passage means through the valve and its metering chamber in communication with the conduit, a rotary closure member for the flow passage, an outlet in communication with the metering chamber only when the closure member has been rotated and the flow passage closed, a one-piece plunger and rotary closure member adapted to translate toward the outlet after the closure of said passage and the opening of said outlet, whereby that portion of the viscous fluid contained in the metering chamber after the closure of the passage means is forced through the outlet by the movement of the plunger theretoward.

2. The invention set forth in claim 1 with the ports in the valve body substantially aligned with the direction of flow of the fluid in the conduit.

3. The invention set forth in claim 2 with said rotary closure member comprising a hollow cylinder having oppositely disposed ports in its wall in communication with corresponding ports in the valve body with the member in a first position and blocking the ports in the valve body with the member in a second position.

4. The invention set forth in claim 3 with the outlet including a discharge port and at least one of the ports in the valve body in communication with the discharge port when the rotary closure member is in the second position and out of communication therewith when the rotary closure member is in the first position.

5. The invention set forth in claim 4 with the rotary closure and plunger member including a hollow cylindrical portion having an internal bore open at one end and blind at the other and a cylindrical outlet pipe received by said bore in rotary and translatory sliding relationship thereto.

* * * * *