Feb. 20, 1962 C. A. MILLER 3,021,862

FLUID INJECTION SYSTEM

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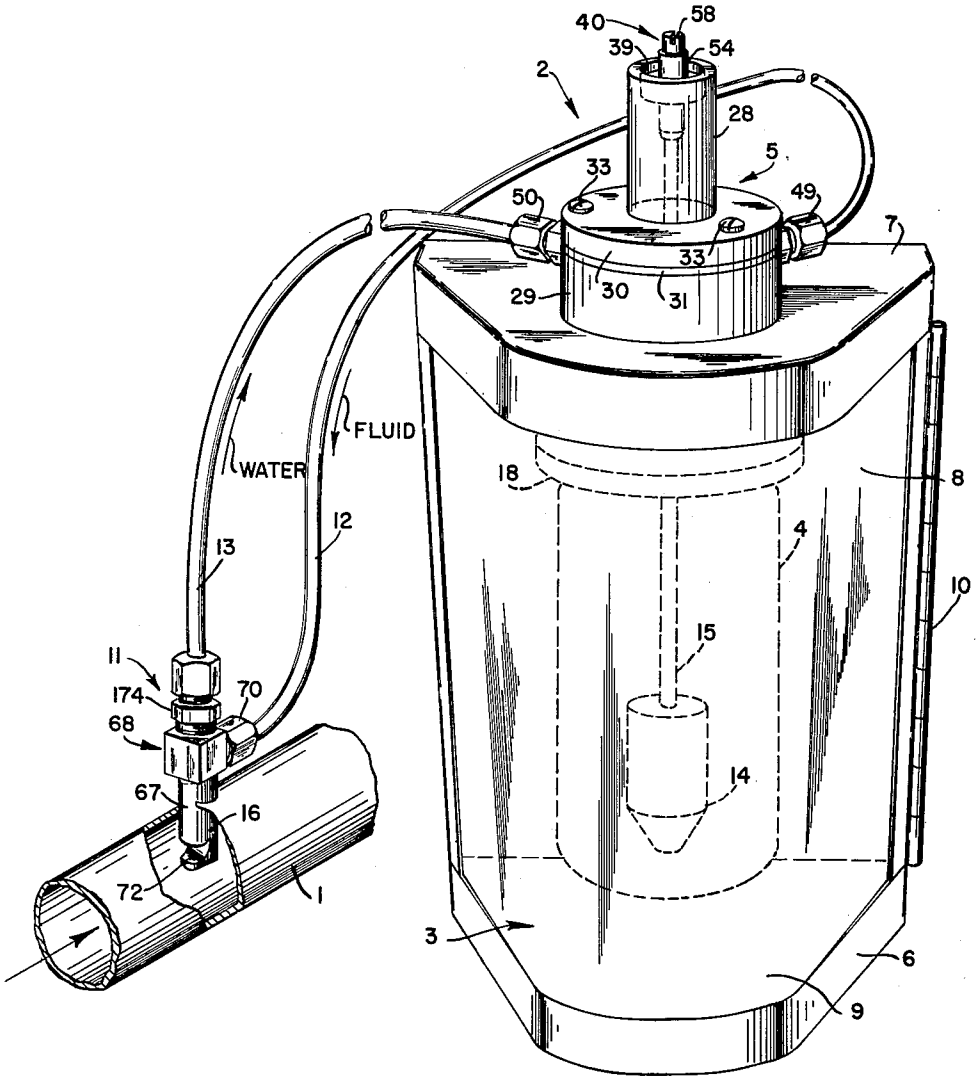


FIG. 1

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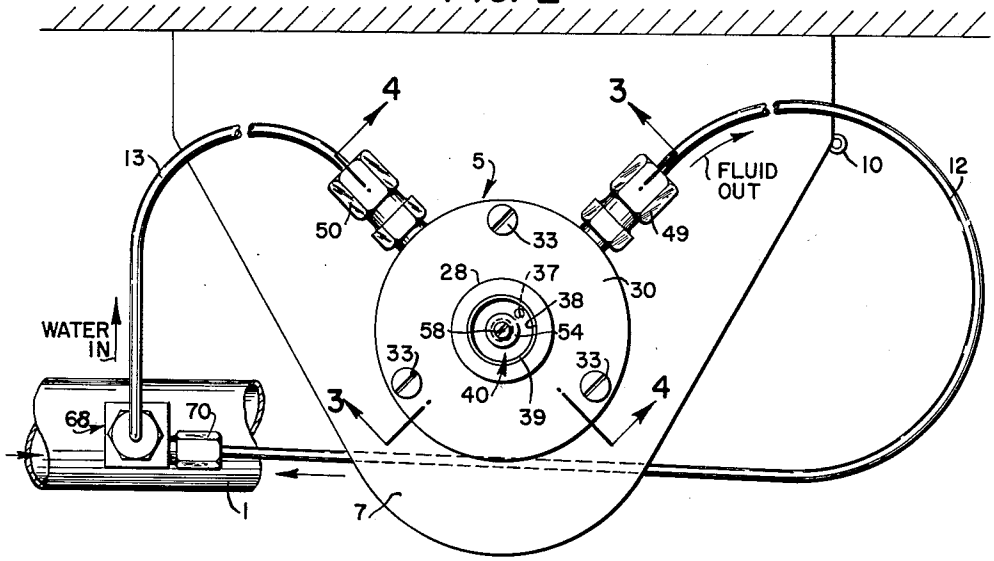
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FIG. 2



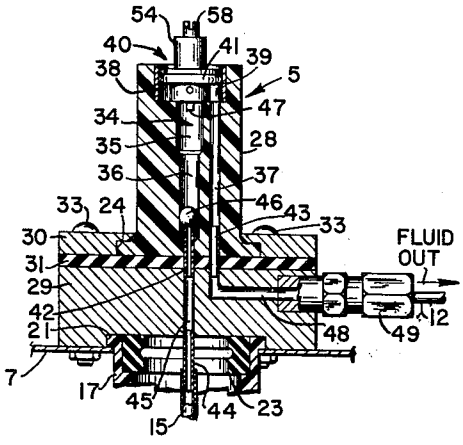


FIG. 3

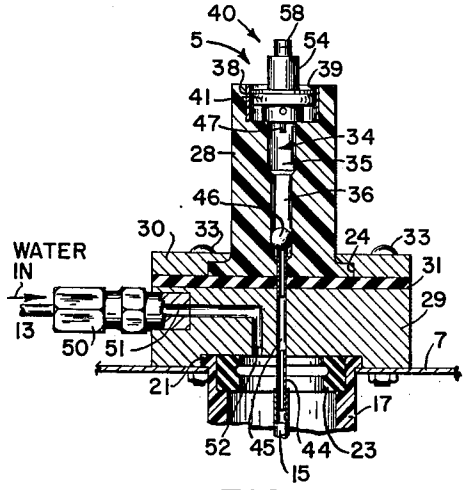


FIG. 4

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FIG. 12

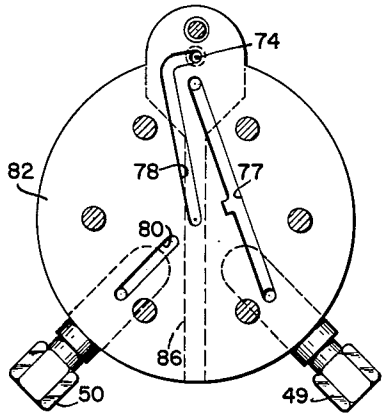


FIG. 8

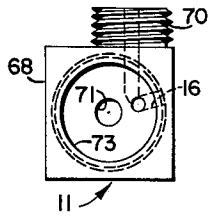


FIG. 9

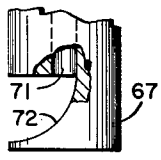


FIG. 7

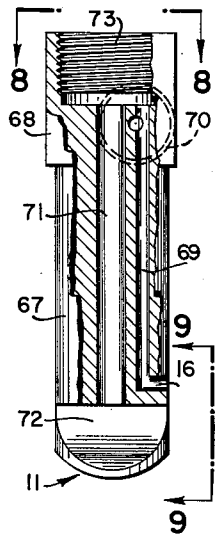


FIG. 14

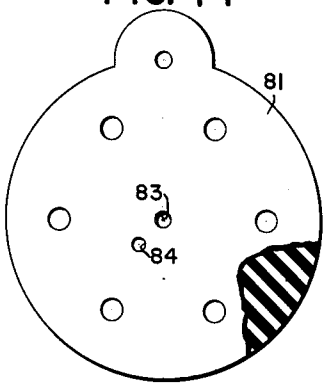


FIG. 13

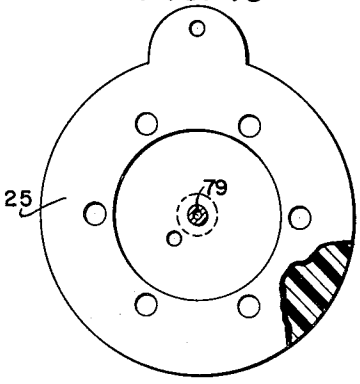
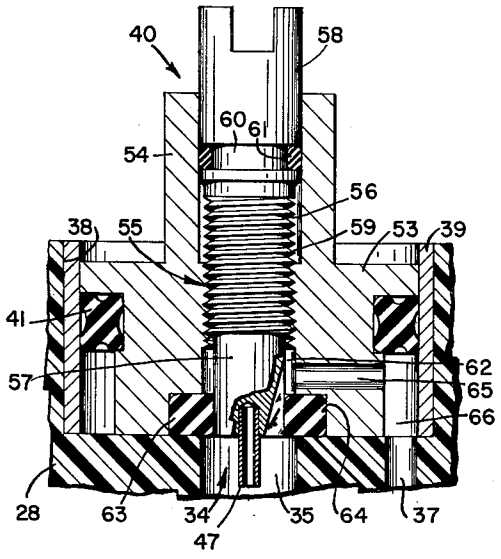


FIG. 5



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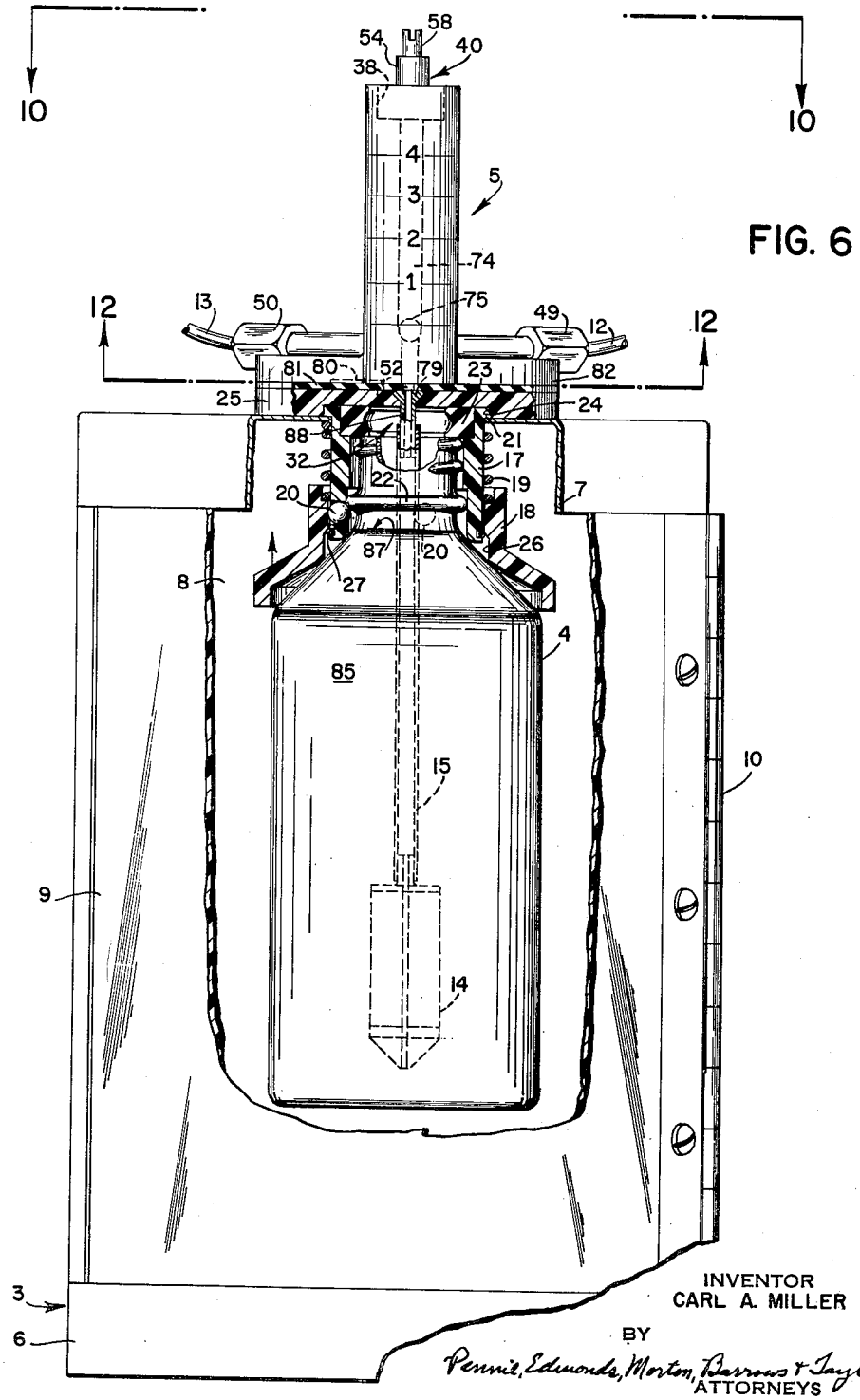


FIG. 6

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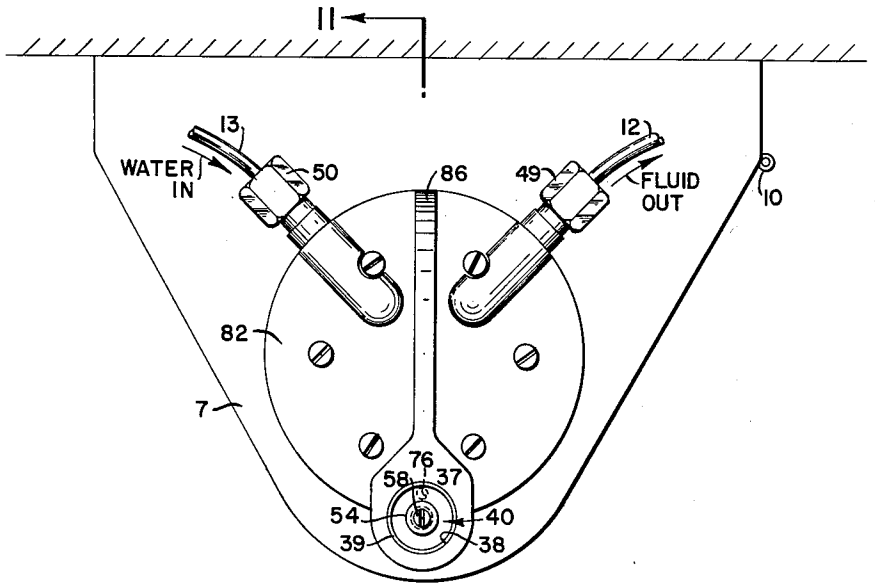


FIG. 10

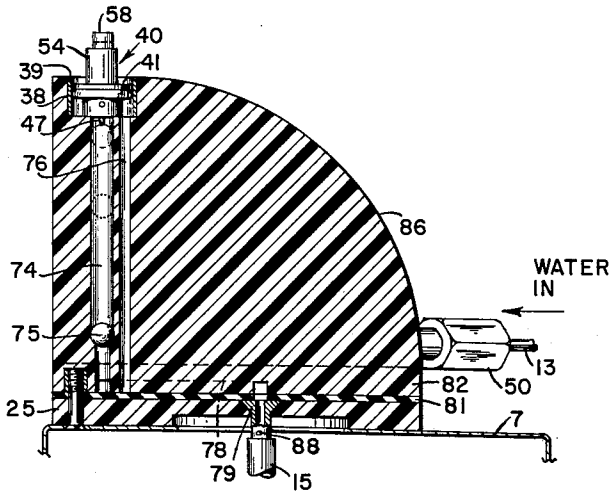


FIG. 11

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3,021,862
FLUID INJECTION SYSTEM

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Filed Oct. 5, 1960, Ser. No. 60,624
12 Claims. (Cl. 137—205.5)

This invention relates to fluid injection systems and especially to those of the type employed in connection with dishwashing machines and the like.

The use of chemical drying agents has recently become rather general in commercial dishwashing machines, because of the consequent saving in time and expense, as well as because of the resulting great improvement in the appearance of the tableware after washing. The present invention comprises new and improved means for automatically injecting an accurately controlled minute quantity of drying agent, or rinse fluid, into the rinse water of a dishwashing machine.

In brief, the system of the invention comprises a fixture in which a rinse-fluid container, such as a glass bottle, is secured beneath a fluid-flow indicating and controlling head. The bottle is hermetically sealed to the underside of the head, but is readily removable for replacement when empty. A flexible tube extends nearly to the bottom of the bottle and is connected to a flow indicator and a control valve from which the fluid passes through small tubing to a fluid injection device comprising, in part, a Pitot tube which is sealed in the hot water pipe feeding the dishwashing machine. The fluid is ejected from a small orifice in the side of the Pitot tube. A second length of small tubing carries water forced by the Pitot tube from the feed-water pipe at a pressure depending on the velocity of the water flow in the pipe. The water in this tubing is discharged into the mouth of the bottle of rinse fluid, and the consequent pressure in the bottle forces the fluid out of the bottle through the flexible tube at a very slow rate which is finely adjustable by the mentioned valve. The water and fluid do not mix appreciably in the bottle because the fluid is of greater density than the water and is not readily soluble therein. The fluid is distinguishable from the water by its color. One such well-known fluid is known as "Rinse Dry."

The various components provided in accordance with the invention have many novel features which co-operate to provide an unusually advantageous system, as will be apparent from the following description considered in connection with the accompanying drawings, in which

FIG. 1 is an isometric view of a fluid injection system according to the invention, which includes a fluid-flow indicating and controlling head of preferred form;

FIG. 2 is a plan view of the system of FIG. 1;

FIG. 3 is a vertical cross section taken along the line of 3—3 of FIG. 2;

FIG. 4 is a vertical cross section taken along the line 4—4 of FIG. 2;

FIG. 5 is an enlarged vertical view, mostly in cross section, of a micrometer valve according to the invention;

FIG. 6 is a vertical view, partly in cross section, showing an alternative form of indicating and controlling head in accordance with the invention, as well as means for detachably securing a fluid container in the dispenser fixture employing either head;

FIG. 7 is a front view in elevation, partly in cross section, of a combination injection and Pitot tube device according to the invention;

FIG. 8 is a plan view of the device of FIG. 7;

FIG. 9 is a side view, partly in section, of the bottom portion of the device of FIG. 7;

FIG. 10 is a plan view of the head unit of FIG. 6;

FIG. 11 is a vertical cross-section of the head unit

shown in FIG. 10, taken along the line 11—11 of that figure;

FIG. 12 is a view of the under side of the upper section of the head illustrated in FIGS. 6, 10 and 11;

FIG. 13 is a view of the under side of the lower section of the head illustrated in FIGS. 6, 10 and 11; and

FIG. 14 shows a sealing gasket which is clamped between the upper and lower sections of the head illustrated in FIGS. 12 and 13.

The system of the invention is shown in FIG. 1, wherein pipe 1 is assumed to feed hot water into a dishwashing machine, or the like, in the direction of the arrow. The purpose of the invention is to inject into the water stream within the pipe, a minute volume of rinse fluid so that it will be sprayed in highly diluted form over the dishes, glass-ware and silver-ware, for example. A concentration in the order of 100 parts per million is a useful amount. Although the ratio is not critical, the fluid flow should be minutely adjustable.

In accordance with the invention, a fixture 2 is provided to comprise a self-contained fluid-dispensing unit which includes a stand 3 in which a fluid container 4 is enclosed and also on which a fluid flow-controlling and indicating head unit 5 is mounted.

Although the stand 3 may be of any convenient form and material, the one here illustrated comprises a bottom piece 6 and a top piece 7, both formed from stainless sheet steel. The rear of the stand is closed by a back piece 8 also of stainless steel. The front and sides are enclosed by a curved cover 9 of heavy transparent plastic material which is secured to the back piece 8 by a hinge 10 which permits the cover to be swung out when a container of rinse fluid is to be placed in the stand. The fluid flow-controlling and indicating head 5, which is mounted on the upper side of the top piece 7, is described in detail below. It is connected to a fluid injecting device 11 by means of suitable tubing 12 and 13 which may be of any suitable material, but plastic tubing has proved to be satisfactory. Since ejecting device 11 also comprises a Pitot tube, it intercepts water flowing in pipe 1, and is conducted, under pressure, through tube 13, through the bottom of head 5 and into the top of the container 4. The resulting pressure in container 4 forces the rinse fluid 85 through strainer 14 and flexible tube 15, through head 5 and thence through tube 12 into the injection device 11, from which it is discharged into the water stream through injection orifice 16. The line 87 represents the interface between the fluid 85 and the water above it, and is apparent because of the different color of the fluid.

When a fresh bottle of fluid is clamped in place, it is usually full to approximately the line 87, the space above being filled with air—hence, when the system is put into operation, the water which comes in through orifice 52 must displace this air—for this purpose a very small hole 83 is drilled through the side of nipple 79 to vent the air into the fluid discharge line via passage 74. Obviously after the air is replaced with water, a very small volume of water will flow through this vent into the fluid stream. This is an advantage because it automatically keeps the entire system purged of air.

Although any suitable fluid container can be employed, a glass bottle has proved to be satisfactory. Such a bottle is illustrated in FIG. 6, together with a suitable device for clamping and sealing it beneath the head 5. This clamping device comprises a sleeve 17, a circular skirt 18, a helical spring 19 and three steel balls 20, one of which is shown in FIG. 6. The cylindrical sleeve 17, advantageously of plastic material, has a foot 21 extending outwardly to support the sleeve where it passes through a hole in top piece 7 of the stand. Three holes equidistantly spaced around the sleeve near the bottom edge thereof, carry the three steel balls 20. The diameter of

these balls is greater than the thickness of the material of the skirt, as shown in the drawing. The skirt **18** also advantageously of plastic material, encircles the sleeve **17**, and is free to slide over it. When the skirt **18** is in the locking position as shown, it forces the balls **20** inwardly where they lock themselves under the neck ring **22** of the bottle, tending to urge it upwardly and thus secure it tightly against the annular bottle-sealing gasket **23**. The upper side of gasket **23** lies in a recess **24** in the lower section **25** of the unit **5**, and leaves open a space **32** above the bottle. When lower section **25** is secured to the top piece **7**, as by screws, it also retains sleeve **17** securely in position.

Helical spring **19**, being of the compression type, urges skirt **18** downwardly, thus maintaining it in locked position. When skirt **18** is manually raised against spring **19**, the wider releasing portion **26** of the skirt is adjacent the locking balls which thus roll outwardly in their retaining holes so as to permit the neck ring **22** to pass them. The spring retaining ring **27**, disposed in a suitable groove near the bottom of sleeve **17**, prevents the skirt **18** from dropping away from the sleeve. When spring **19** is fully compressed, it acts as a stop, preventing the skirt **18** from being raised beyond its releasing position above mentioned. The flow-controlling and indicating unit **5**, and the manner in which it co-operates with the other elements of the system, will be explained in connection with FIGS. 3 and 4.

Referring to FIG. 3, flow-indicating and controlling head **5** comprises an upstanding member or upper section **28** and a base or lower section **29**. Each may be of any suitable material, but here the upper section **28** is of a transparent plastic and the lower section **29** is of stainless steel. The stainless steel ring **30** retains the upper section **28** in place upon the sealing gasket **31**, through which suitable holes are punched to accommodate the retaining screws **33** and the fluid channels to be described. As shown in the drawing, the upper section contains a first fluid passage **34** of which the upper section **35** is of larger diameter than the lower section **36**, and a second fluid passage **37**, both of which extend vertically. As shown, the first passage **34** is in the center of section **28**, and passage **37** is to one side thereof. Both of these passages terminate at the top in a counterbore **38**. Within the counter-bore is a thin metal ring **39**, which may be anchored in place by knurling, for example on its outer surface. Within ring **39** a control valve **40**, which is described in connection with FIG. 5, is inserted and sealed therein by suitable means such as the rubber O-ring **41**. This valve is of the micrometer type and, by adjustment thereof, the liquid flow between passages **34** and **37** which it spans can be controlled to an extremely minute degree.

The central channel **34** continues downwardly, although in reduced diameter, through the bottom of section **28**, through gasket **31** and finally as hole **45**, through the lower section **29**, as illustrated. A short section of stainless steel tubing **42** is forced into the bottom of section **28** so as to extend upwardly into the lower part **36** of the passage, as well as to extend downwardly below the bottom of section **28**. By extending downwardly, it facilitates assembly of the parts **29** and **31** and also assists in improving the seal. A similar length of tubing, **42**, is also forced into the lower end of passage **37** for the same purpose. A third length of metal tubing **44** is forced into the bottom of hole **45** in order to provide a nipple to which the flexible plastic tube **15** can be attached in the manner better shown in FIG. 6.

The ball **46**, of suitable material depending upon the chemical nature and density of the fluid within the passage **34**, comprises a visual fluid-flow indicator. This ball should have a density slightly greater than the density of the fluid so that it will fall in the absence of fluid flow, but so it will rise in response to a very small degree of fluid flow. The density of the fluid used in this example was approximately 1.02. In that example, the ball was of stainless steel of density approximately 7. Since the clearance between the ball and the cylindrical passage **36** is small, viz., in this instance 0.002 inch, very little liquid escapes around it. Consequently, this indicator is very sensitive to the flow, such that an extremely small flow rate will raise the ball in the lower section **36** up to the bottom of the upper section **35**. Since the clearance here is considerably greater, the ball will remain at or in this upper section for substantially the complete range of fluid flow which would be normal in this indicator. In a typical case, the maximum flow is of the order of 8 milli-liters per minute. In an extreme case, the indicator ball might strike the upper stop **47** which is attached to the valve, as shown more clearly in FIG. 5, to prevent the ball from closing the outlet of fluid passage **34** into the valve. It will also be seen in FIG. 3 that the ball **46**, when at rest, sits on the top of tube **42**, thus acting as a check valve against reverse flow, as well as providing maximum initial sensitivity to fluid flow upwardly from the tube **42**.

After the fluid passes through the valve **40**, it descends in passage **37** through tubing **43** into outlet channel **48** and into the outlet coupling **49** which is attached to tube **12** (see also FIG. 1).

FIG. 4 shows a sectional view of the head unit just described in connection with FIG. 3 taken at 90° to the section of FIG. 3. Consequently, the connection of the water inlet tubing **13** is shown. This tubing is connected to the head unit by water inlet coupling **50** which connects to water inlet channel **51** which, in turn, terminates in an orifice **52**. When the liquid container bottle is secured in place as illustrated in FIG. 6, this water orifice communicates with the interior of the bottle.

The micrometer valve **40**, which coistitutes an important element in the system of the invention, is shown in detail in the enlarged sectional view, FIG. 5. It comprises a body **53** of metal such as stainless steel, conveniently of circular form, which is provided with an integral upper neck **54**. Through the center of this body, a hole is bored. The central portion **55** of this hole is threaded as shown, and the upper portion **56** and the lower portion **57** are of larger diameter to provide clearance for the valve stem **58**. This valve stem has a threaded central part **59** which engages the threads **55** in the body. In the upper portion of the valve stem is a groove **60** into which a rubber O-ring **61** is inserted to provide a seal between the stem and the neck **54**. The lower end of the valve stem **58** is of smaller diameter than the central threaded portion **55**, so as to form an annular passage **62**. At the bottom, this annular passage is bounded by O-ring **63** which is disposed in a counter-bore **64** formed in the bottom of the valve body **53**. This O-ring bears against the cylindrical lower portion **57** of the valve stem and provides a seal between the body and the stem at its lower end. The O-ring **63** also seats against the top surface of the upper section of member **28** and thus provides a seal is respect to this member also.

Channel **62** is connected to the passage **37** through a first fluid conduit **65** and a second fluid conduit **66**. Conduit **66** is annular because it comprises the space between the inside surface of ring **39** and the outside surface of the body **53** which, as shown, is of smaller diameter than the upper portion of the body. It will be noted that at the top, conduit **66** is bounded by O-ring **41** which is of quad type to improve the seal. The valve channel **67** is cut longitudinally of the valve stem and is tapered inwardly toward the bottom end thereof so that, as the valve stem is screwed downwardly as seen in the figure, the interconnection between fluid passage **34** and fluid passage **37** decreases, and conversely. Although it is not shown in the drawing, channel **67** is also tapered in width, viz., it decreases in width uniformly from the bottom to the top thereof which provides a greater change of volume control per degree of adjustment. This com-

pound taper is not always desirable, however. From the foregoing, it will be observed that when the valve stem is screwed downwardly until the top of the tapered channel coincides with the O-ring 63, the flow will be entirely cut off.

The construction of the combination injector-Pitot tube device 11 is shown in detail in FIGURES 7, 8 and 9. This device comprises a lower or body portion 67, which advantageously is of circular cross-section, and an upper or coupling portion 68 which remains on the exterior of the water pipe into which it is secured through a suitable hole. Device 11 must be sealed in the pipe to prevent leakage; and this may readily be accomplished by use of a suitable saddle clamp and sealing gasket in well known manner. Longitudinally through the body portion a small hole is drilled to form a fluid passage 69 which terminates at the side of the body to form an orifice 16. It will be noted that orifice 16 is at the side and slightly above the scoop opening. This location enhances the fluid emission into the passing stream and prevents entry of fluid into the water intercepted by the scoop. Passage 69 terminates at its top in a threaded nipple 70 extending from the side of coupling portion 68 to permit suitable fluid tubing 12 (FIG. 1) to be coupled thereto.

In the center of the body 67 of device 11, a larger hole is drilled to form a water passage 71 which opens at its lower end into the top of the scoop 72, as shown. The upper end of water passage 71 terminates in a threaded receptacle 73 into which a suitable coupling member 174 (FIG. 1) is provided to couple water tubing 13 thereto. Thus, according to a well known principle of hydraulics, when the device 11 is positioned in a water pipe, as illustrated in FIG. 1, the velocity of the incoming water stream forces water upwardly in passage 71 and into tubing 13 as previously described.

The flow indicating and controlling head above described is shown in alternative form in FIGS. 6 and 10–14 inclusive. In the embodiment here illustrated, the upper and lower portions of the head proper are both cast from suitable transparent plastic material, although obviously other suitable material could be substituted. Fundamentally this embodiment is the same as the one described in connection with FIGS. 1–4, but the parts are constructed differently because they are molded from plastic material. In addition, the present embodiment, as illustrated especially in FIG. 6, is modified so as to indicate the rate of fluid flow as well as the existence of fluid flow, as in the first embodiment. From FIG. 6, it will be seen that the fluid passage 74 is of uniform diameter throughout the principal portion of its length and that the diameter thereof is only enough greater than the diameter of the float ball 75 to permit free movement of the float in its passage. The second passage, 76, corresponds to passage 37 in the preceding figures and conducts the fluid downwardly, into grooved channel 77 (FIG. 12) which connects to fluid outlet coupling 49, as before. From FIGS. 6, 11 and 12, it will be seen that the fluid flows from the container 4 upwardly through flexible tube 15, nipple 79, and grooved channel 78 to the bottom of passage 74.

The water coming in from the Pitot tube device flows through coupling 50, grooved channel 80, orifice 52, into the space 32 above the bottleneck, and thence into the container or bottle 41. The grooved channels 77, 78 and 80 are closed by the rubber gasket 81 which, in the assembly, is firmly pressed against the under side of the upper section 82 of the head. Holes 83 and 84 in gasket 81 are positioned so as to permit the fluid to flow through the gasket and into the lower section 85. The sector piece 86 extending towards the rear of the upstanding member which contains the flow indicator is, in this instance, cast integrally with the entire upper section of the head. The purpose of this element is to mechanically reinforce the upstanding member as well as to enhance the appearance of the head.

I claim:

1. In a fluid dispensing unit, a fixture comprising a bottom portion and a top member having upper and lower surfaces, means for supporting a fluid container beneath said top member, fluid-flow controlling and indicating means mounted on the upper surface of said top member, said controlling and indicating means comprising an upstanding member of solid material at least part of which is transparent, first and second fluid passages extending downwardly in said upstanding member, said first passage being visible through said transparent part, a flow indicating float slidably disposed in said first passage, a counterbore in the top of said upstanding member in which the upper ends of both of said passages terminate, a valve sealed in the counterbore and arranged to inter-connect said bores, means for adjusting said valve to control the flow from said first bore to said second bore, coupling means for connecting a fluid discharge line to the lower end of said second bore, means for removably securing a fluid container within the bottom portion of said fixture and beneath said top member, and a fluid intake tube depending from the under side of said top member and connecting to the bottom of said first passage.

2. In a fluid dispenser, a fluid-flow controlling and indicating unit comprising an upstanding member of solid material at least part of which is transparent, first and second parallel bores extending downwardly in said member, said first bore being visible through said transparent part, a flow indicating float slidably disposed in said first bore, a counterbore in the top of said member in which the upper ends of both of said bores terminate, said first bore and said counterbore being concentric and said second bore entering said counterbore near the periphery thereof, an adjustable valve sealed in said counterbore and arranged to interconnect the upper ends of said bores, said valve comprising a body shaped to fit said counterbore and having a hole therethrough which is in alignment with said first bore, the lower portion of said hole being of greater diameter than an upper portion thereof, said upper portion of the body being threaded, a threaded valve stem rotatable in said body so as to be adjustable longitudinally in said hole, the lower portion of said valve stem being spaced from said body to form an annular passage therebetween, a tapered longitudinal channel on the lower portion of said valve stem, fluid-sealing means disposed to seal, except as interrupted by said channel, the lower end of the valve stem with respect to said body, a fluid inlet connected to the lower end of said first bore, and a fluid outlet connecting said annular passage of the exterior of said upstanding member.

3. In a fluid dispenser according to claim 2, a piece for rigid material depending from the lower end of said valve stem and extending into the upper end of said first bore to comprise a stop for said float whereby to prevent the float from closing the inlet to said valve.

4. A fluid dispensing and injecting system for dishwashers and the like, including a dispensing unit comprising a fixture for receiving a fluid container; said fixture including means for attaching said container to and detaching it from the fixture; a fluid-flow controlling and indicating head mounted on said fixture, means for sealing the container to said head, a fluid conducting tube depending from said head and adapted to extend into said container, an orifice on said head disposed to discharge water into said container, said head including visual flow-indicating means and an adjustable valve of the micrometer type, a fluid coupling on the exterior of said head, fluid conducting means by which said tube, indicator and valve are series-connected to said fluid coupling, and a water inlet passage extending from the exterior of said head to said orifice; an injection device adapted to be sealed into a water pipe leading to a dishwasher, said device comprising a body portion adapted

to be within the pipe and a coupling portion outside the pipe, said body portion being of the Pitot tube type having a water scoop at the lower end and a water passage leading therefrom to said coupling portion, and a fluid passage in said device leading from said coupling portion into the body portion and terminating in an injection orifice in the side of said body portion; a water-carrying tube connecting the water passage in said coupling portion to the water passage in said head, and a fluid-carrying tube connecting the fluid coupling in said head to the fluid passage in the coupling portion of said injection device.

5. In a fluid dispensing and injecting system for a dishwater having a feed water pipe, the improvement comprising a fluid controlling unit including fluid-flow indicating and controlling means, a fluid outlet for said unit, a fluid container connected to supply fluid to said unit, and means for injecting a minute volume of fluid into the water in said pipe, comprising an injection device adapted to be sealed into said pipe, said device comprising a body portion adapted to be within the pipe and a coupling portion adapted to be outside the pipe, said body portion having an injection orifice in the side thereof and a fluid passage from said coupling portion to said orifice, fluid-carrying tubing connecting said outlet to said coupling portion and to said fluid passage in said injection device, a water scoop formed in the lower end of said body portion, a water passage leading from said water scoop to said coupling portion, and means including water-carrying tubing connecting said water passage to said dispensing unit for feeding water under pressure from said pipe into said fluid container.

6. A combined Pitot tube and fluid injection device adapted to be sealed in a feed-water pipe to a dishwashing machine, or the like, comprising a body portion adapted to be sealed within the pipe and a coupling portion adapted to be outside the pipe, a scoop at the end of said body portion, a water passage leading from the top of said scoop to the coupling portion, a fluid injection orifice, disposed in the side of said body portion removed from said scoop such that, when said scoop is positioned to face upstream in the pipe, fluid discharged from said orifice is prevented from entering said scoop, and a fluid passage separate from said water passage and connecting said coupling portion to said orifice.

7. A fluid-flow controlling and indicating head adapted to be connected in a rinse-fluid dispensing system for a dishwashing machine, including a lower section and an upper section secured thereto, said upper section being of solid material at least part of which is transparent, first and second fluid passages extending downwardly in said upper section, said first passage being visible through said transparent part, a flow indicating float slidably disposed in said first passage, a counterbore in the top of said upper section, in which the upper ends of both of said passages terminate, a valve sealed in the counterbore and arranged to interconnect said passages, means for adjusting said valve to control the flow from said first passage to said second passage, fluid conduit means extending from the lower end of said second passage into one of said sections for coupling a fluid discharge line to the lower end of said second passage, means for securing a fluid container beneath said lower section, means for sealing the top of said container to the under side of said lower section, a fluid intake tube depending from the under side of said lower section, said intake tube having a length such as to terminate near the bottom of said container, a fluid passage through said lower section for interconnecting the upper end of said intake tube to the lower end of said first passage, a water orifice in the underside of said lower section within said sealing means, and a water conduit extending from the exterior of one of said sections to said water orifice.

8. A fluid-flow controlling and indicating head according to claim 7, in which said first passage comprises a lower portion of diameter only sufficient to permit said float to slide therein, and an upper portion of greater diameter than said lower portion whereby substantially minimum fluid flow causes said float to rise to the top of said lower portion, and considerably greater flow is required to raise the float appreciably in said upper portion.

9. A fluid-flow controlling and indicating head adapted to be connected to a rinse-fluid dispensing system for a dishwashing machine, including a lower section and an upper section, a sealing gasket between said sections and means for drawing said sections together against the gasket, said sections being of solid material and said upper section being at least in part transparent, first and second fluid passages extending from the bottom of said upper section toward the top thereof, said first passage being visible through said transparent part, a flow-indicating float slidably disposed in the first passage, a valve disposed at the top of said upper section and arranged to interconnect said passages, means for adjusting said valve to control the flow from said first passage to said second passage, fluid conduit means extending from the lower end of said second passage through said gasket into the lower section for coupling a fluid discharge line to the lower end of said second passage, means for securing and for sealing a replaceable fluid container to the underside of said lower section, fluid conduit means connected to the bottom of said first passage and extending through said gasket and lower section for conducting fluid from said container to said first passage, and a water conduit opening into said container for displacing said fluid by water.

10. A fluid-flow controlling and indicating head adapted to be connected to a rinse-fluid dispensing system for a dishwashing machine, or the like, including a lower section and an upper section, and means for securing said sections together, said sections being of solid material, two fluid passages extending from the bottom of said upper section toward the top thereof and adapted to carry fluid in opposite directions, a flow indicator actuated by fluid flowing in one of said passages, a valve of micrometer type disposed at the top of said upper section and arranged to interconnect said passages at their upper ends, means for adjusting said valve to control the fluid flow from one passage to the other, fluid conduit means extending from the lower end of one of said passages to the exterior of one of said sections and means for coupling a fluid discharge line thereto, releasable means for sealing a replaceable fluid container to the underside of said lower section, and fluid conduit means connected to the bottom of the other passage and extending through the lower section for conducting fluid from said container to the last-mentioned passage.

11. A fluid-flow controlling and flow rate indicating head adapted to be connected to a rinse-fluid dispensing system for a dishwashing machine, or the like, including a lower section and an upper section, and means for securing said sections together, said sections being of solid material and at least part of said upper section being transparent, two fluid passages extending from the bottom of said upper section toward the top thereof and adapted to convey fluid in opposite directions, a first of said passages being arranged to convey fluid upwardly, said first passage being visible through said transparent part and being of uniform diameter for the principal portion of its length, a float disposed in the uniform portion of said first passage, calibrations on said transparent portion to indicate the positions of said float therein, a valve of micrometer type disposed at the top of said upper section and arranged to interconnect said passages at their upper ends, means for adjusting said valve to control the fluid flow from the first passage to the second passage, fluid conduit means extending from the lower end of the second passage to the exterior of one of the sections and means for coupling a fluid discharge line thereto, releasable means for sealing a replaceable fluid container to the underside of said lower section, and fluid conduit

means connected to the bottom of said first passage and extending through said lower section for conducting fluid from said container to said first passage.

12. A fluid-flow controlling head adapted to be connected in a rinse-fluid dispensing system for a dishwasher, or the like, said head including first and second closely spaced passages, a micrometer valve to control the fluid flow between said passages, said valve comprising a body proportioned to span said passages and having a hole therethrough in alignment with said first passage, the upper and lower portions of said hole having a greater diameter than the central portion thereof, said central portion being threaded, a threaded valve stem rotatable in said body so as to be adjustable longitudinally in said hole, a resilient O-ring on the upper portion of said valve stem to seal the same in said hole, the lower portion of said valve stem being spaced from said body to form an annular passage therebetween, an annular groove in said body at the bottom of the lower portion

of said hole, a second resilient O-ring disposed in said groove so as to comprise a wall of said annular passage, the central hole in the second O-ring being of diameter to provide a seal between said body and the lowermost portion of the valve stem, a fluid conduit in said body connecting said annular passage with said second passage, and a tapered longitudinal channel in the surface of the lower portion of said valve stem which thereby interconnects said first and second passages to a degree determined by the longitudinal position of said valve stem in said body.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,021,862 February 20, 1962

Carl A. Miller

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 35, for "coistitutes" read -- constitutes --; column 6, line 54, for "for" read -- of --; column 7, line 14, for "dishwater" read -- dishwasher --.

Signed and sealed this 12th day of June 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents