April 5, 1966 A. P. FATTOR 3,244,397

REMOTE CONTROLLED, NON-CORROSIVE VALVES

Filed March 4, 1963 2 Sheets-Sheet 1

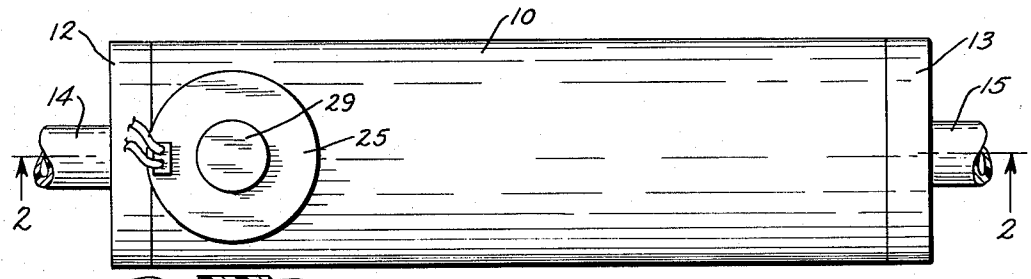


Fig. 1

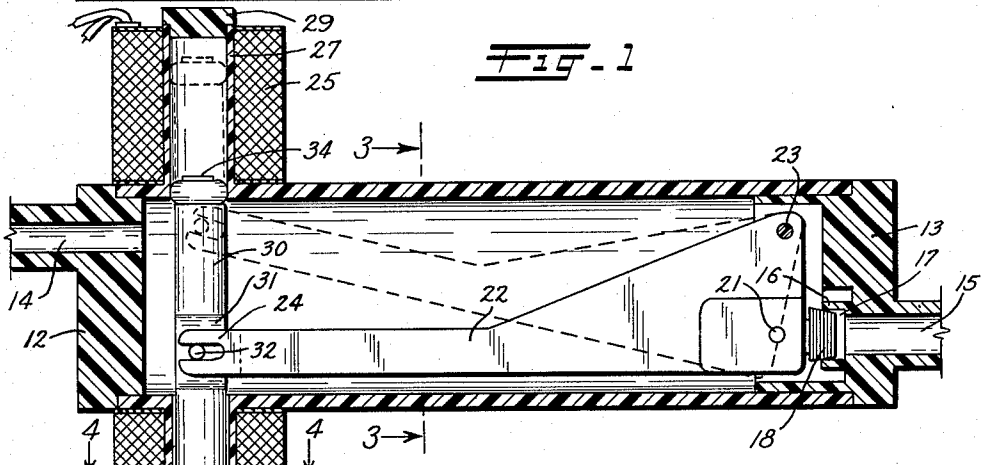


Fig. 2

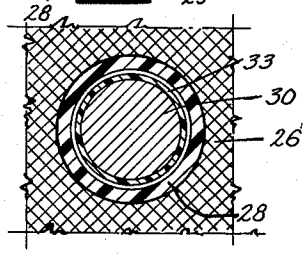


Fig. 4

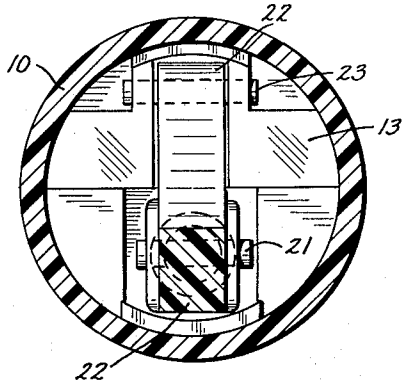


Fig. 3

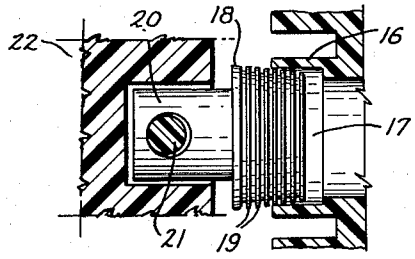


Fig. 5

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REMOTE CONTROLLED, NON-CORROSIVE VALVES

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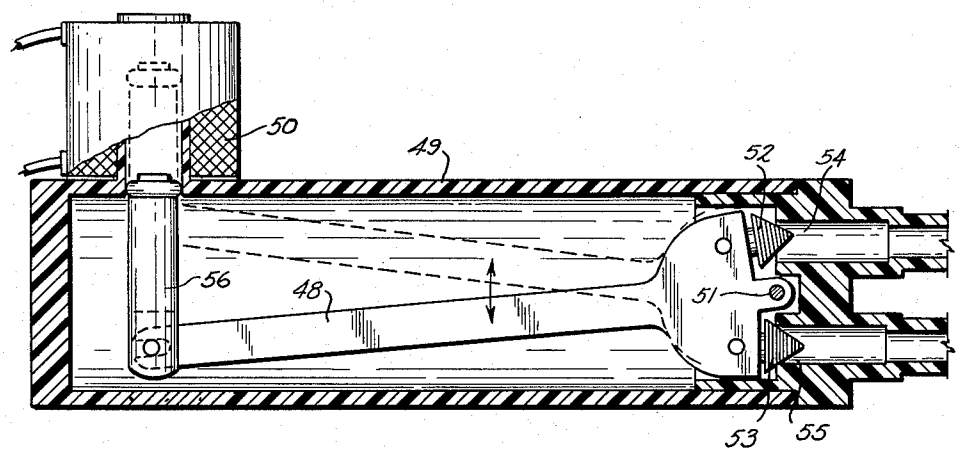


Fig. 6

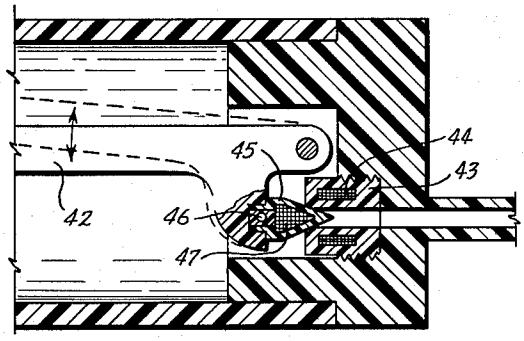


Fig. 7

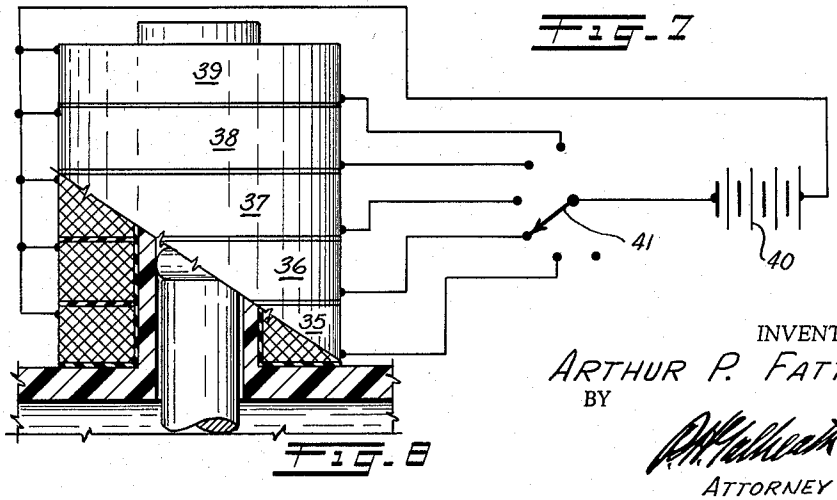


Fig. 8

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REMOTE CONTROLLED, NON-CORROSIVE VALVES

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1 Claim. (Cl. 251—137)

This invention relates to a remote controlled, non-corrosive valve, more particularly for use in controlling the flow and measurement of noxious, toxic and corrosive liquids and gases.

The principal object of the invention is to provide a highly efficient valve in which all sealing gaskets, stuffing boxes, protruding valve stems, etc., will be completely eliminated and to provide an easily operated valve which will be completely and permanently sealed against escape and leakage of the liquids and gases being controlled.

Another object is to provide a valve with the above characteristics which provide a positive, long-lined self-seating and self-retaining closure against flow in either desired direction and which will have a rapid opening and closing action.

A further object is to so construct the valve that it can be operated electrically from a remote control and in which all of the electrical elements will be completely sealed away from the liquids or gases being controlled.

A still further object is to incorporate the improved valve principles in a measuring or batching element whereby a predetermined volume of gas, liquid or other reagent can be accurately added proportionately to a flowing stream or quantity of fluid or gas or liquid.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

FIG. 1 is a top plan view of the improved valve;

FIG. 2 is a longitudinal, medial section therethrough taken on the line 2—2, FIG. 1;

FIG. 3 is an enlarged cross section therethrough taken on the line 3—3, FIG. 2;

FIG. 4 is a similarly enlarged cross section looking downwardly on the line 4—4, FIG. 2;

FIG. 5 is a still further enlarged fragmentary, detail section illustrating a plug valve and seat as used in the improved valve;

FIG. 6 is a longitudinal section similar to and on the scale of FIG. 1, illustrating a measuring embodiment of the improved valve;

FIG. 7 is a fragmentary, longitudinal, enlarged, detail section showing an alternate form of plug valve and seat for the valve of this invention; and

FIG. 8 is a fragmentary, partially broken away view illustrating a type of solenoid and operating circuit which could be used to operate the improved valve.

Referring to FIGS. 1–5, the improved valve mechanism is enclosed in a hollow cylindrical valve body **10** preferably molded or otherwise formed from a plastic resin such as "Plexiglas," and closed by means of tightly fitting heads **12** and **13** which are permanently cemented or thermally welded into and against the opposite extremities of the body **10**. Pipe or tubing nipples **14** and **15** are molded or otherwise permanently mounted on the heads **12** and **13**, respectively, and open through the latter to convey liquids or gases to and from the hollow interior of the body **10**.

A circular valve seat collar **16** is formed about the passage to the nipple **15** on the interior face of the head **13**. The collar **16** is reamed, as shown at **17** in FIG. 5, to provide a valve seat to receive a tapered plug valve element **18**. The plug valve element is formed from a resilient, corrosion resistant resin such as "Teflon" and has a truncated conical exterior which will wedge into the valve seat **17**. The conical surface is preferably grooved to form annular parallel sealing fins **19** thereon which facilitate the seating and sealing of the valve element in its seat. The above described materials, selected for their corrosion-resistance are also ideal for producing a leakproof fit at the valve. The materials "Plexiglas" and "Teflon" are sufficiently rigid to maintain their form without significant distortion under moderate pressures, however, compared with metals they are quite elastic. When the sealing action takes place as described, the cylindrical wall **16** forming the seat **17** will expand a very small amount and at the same time the sealing fins **18** will elastically compress within the seat a like small amount. This elastic expansion and compression of the materials will provide sufficient deflection or give as to permit a tight leakproof closing fit by the valve.

A stem portion **20** is formed on the valve element **18** and this stem extends into and is tiltably mounted on a pivot pin **21** in a socket in the forward extremity of a fulcrum arm **22**. The fulcrum arm **22** and the pivot pin **21** are formed from non-corrosive resin such as "nylon."

The fulcrum arm **22** is pivotally suspended from a "nylon" shaft **23** fixed in the head **13** diametrically above the valve seat collar **16** and extends rearwardly in the valve body terminating in a forked extremity **24** adjacent the head **12**. It can be seen that if the extremity **24** of the fulcrum arm be elevated, the plug valve **18** will be withdrawn from its valve seat **17** in the collar **16** and that if the arm extremity be lowered, the plug valve will be urged into its seat as shown in FIG. 5.

The actuation of the fulcrum arm is accomplished magnetically by means of an upper solenoid coil **25** and a lower solenoid coil **26** surrounding upper and lower solenoid tubes **27** and **28**, respectively. The tubes **27** and **28** open to the interior of the valve body and are positioned in alignment with each other in the plane of movement of the fulcrum arm **22** and are integrally molded or permanently formed on the body. The tubes are formed from a non-corrosive resin such as nylon or Plexiglas and are completely closed at their outer extremities by means of plastic plugs **29** permanently cemented therein.

An elongated solenoid armature member **30** is longitudinally movable in and reciprocates between the two solenoid tubes **27** and **28**. The armature member is formed with a medial flat portion **31** which fits into the forked extremity **24** of the fulcrum arm **22**. The furcations of the forked extremity are notched to receive a pivot pin **32** projecting oppositely outward from the flat portion **31**. The armature member **30** is formed from iron, is completely surrounded by a plastic envelope **33** and terminates in plastic wear caps **34** which slidably engage the interior wall of the tubes **27** and **28**.

It can be seen that when the fulcrum is in the lower, valve closed position of FIG. 2, the armature member will be almost completely withdrawn from the upper solenoid tube **27**. Now if the solenoid coil **25** be energized, the armature member **30** will be instantly attracted upwardly to open the plug valve and allow flow through the valve body. If the solenoid **25** be deenergized, the armature member and fulcrum arm will drop by gravity to force the plug valve to its seat. If the nipple **14** be always used as the intake, the fluid pressure in the valve body will urge the valve element **18** to its seat. In such cases, the lower solenoid coil **26** is unnecessary and may

be omitted. However, in cases where the valve must always, or at times, close against pressure, the lower solenoid coil **26** is installed about the lower tube **28** so that it may be used to draw the fulcrum arm downwardly to urge and maintain the valve to its seat against pressure.

The valve element pivot pin **21** allows the plug valve freedom to automatically and axially align itsef with its seat. There are more than a sufficient number of fins **19** on the plug valve when new but as the valve wears from use, the excess fins will gradually replace the worn fins.

Should it be desired to control the amount of opening of the plug valve, the upper solenoid can be wound to provide a plurality of independent vertically-arranged coils as shown at **35**, **36**, **37**, **38**, and **39** in FIG. 8. These coils are successively energized from a power source **40** through the medium of a controller **41** so that the armature member may be lifted to any desired height in the upper solenoid tube **27** to give the desired valve opening.

In FIG. 7, an alternate magnetic means is shown for urging and maintaining the valve closed. This form is also operated from a fulcrum arm **42** corresponding to the arm **22** previously described. The valve seat in this case, however, comprises a plastic valve seat element **43** in which an annular permanent magnet **44** is imbedded. The valve comprises a Teflon cone **45** in which a second permanent magnet **47** or a piece of magnetic iron is imbedded. It can be seen that the magnetic attraction between **44** and **47** will tend to draw the valve to its seat and to maintain it on its seat until forceably withdrawn.

In FIG. 6, the principles of this invention are shown applied to a device for measuring and delivering a desired quantity of gas or liquid which will find many industrial uses such as for adding chlorine to a flowing stream of water. It employs a fulcrum arm **48**, similar to the fulcrum arm **22** previously described, connected to a solenoid armature **56**. The arm and the armature are completely enclosed in a cylindrical plastic housing **49** provided with a solenoid **50** for actuating the fulcrum arm as previously described.

In the latter case, however, the fulcrum arm, pivoted at **51**, carries two plug valves **52** and **53** which alternately open and close an inlet valve seat **55** and an outlet valve seat **54**, respectively. When in the position of FIG. 6, the fluid or gas to be metered is completely closed off by the inlet valve **53**. If the solenoid **50** be now energized, the outlet valve **52** will be snapped shut and the inlet valve **53** will be snapped open to allow a predetermined quantity to flow into the housing under line pressure. When the solenoid **50** is deenergized, the inlet valve **53** closes and the outlet valve **52** opens to allow the measured quantity to flow from the housing. The housing could, if desired, be connected in the line so that the valve **52** would control the inlet and the valve **53** would control the outlet. Thus connected, with the solenoid deenergized, the fluid or gas to be metered would flow past the valve **52** until the housing is completely filled at line pressure. Then, if the solenoid **50** be energized, the valve **52** will close and the valve **53** will open to allow the contained quantity to flow from the housing.

It will be noted that the various solenoid tubes will fill with the fluid and the latter will act to resist and cushion the movement of the armatures. For a more rapid actuation, the armature can be more loosely fitted in its respective tube or it can be provided with splines or grooves to facilitate flow away from the closed ends of the solenoid tubes.

While a specific form of the invention has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claim, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

An electrically-operated valve for controlling the flow of fluid through a conduit of a non-corrosive type having an elongated, completely sealed body of corrosion-resistant resin materials, including a seat at one extremity thereof, and diametrically opposing closed tubes at the opposite extremity thereof, a fulcrum arm member positioned within and lying longitudinally of the body, a transverse pivot pivoting the arm at one said extremity in diametrically spaced relation to said valve seat, a valve element mounted on the arm at said one extremity in alignment with said seat, a corrosion shielded magnetic armature within the body, extending into said tubes and connected with the arm adjacent to said opposite extremity and being adapted to move into one tube to shift the valve element against the seat for closure thereof and to move into the other tube to shift the valve element away from the seat for opening thereof, and solenoid coils surrounding the tubes adapted to be energized to selectively shift the armature into one tube or the other, and wherein, said seat is formed in a short collar member projecting from the interior of the body and said valve element includes circumferentially extending fins, with the fins being adapted to move into the seat collar to resiliently expand the collar and to be compressed thereby to secure a leak tight fit.

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