United States Patent [19]

Hughes et al.

[11] **3,871,614**

[45] **Mar. 18, 1975**

[54] **FOUR WAY HYDRANT VALVE**

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[21] Appl. No.: **418,860**

[52] **U.S. Cl.** **251/104**, 137/569, 137/599.1, 137/610

[51] **Int. Cl.** **F16k 35/00**

[58] **Field of Search** 251/104, 308, 90; 137/569, 137/599.1, 385, 610

[56] **References Cited**

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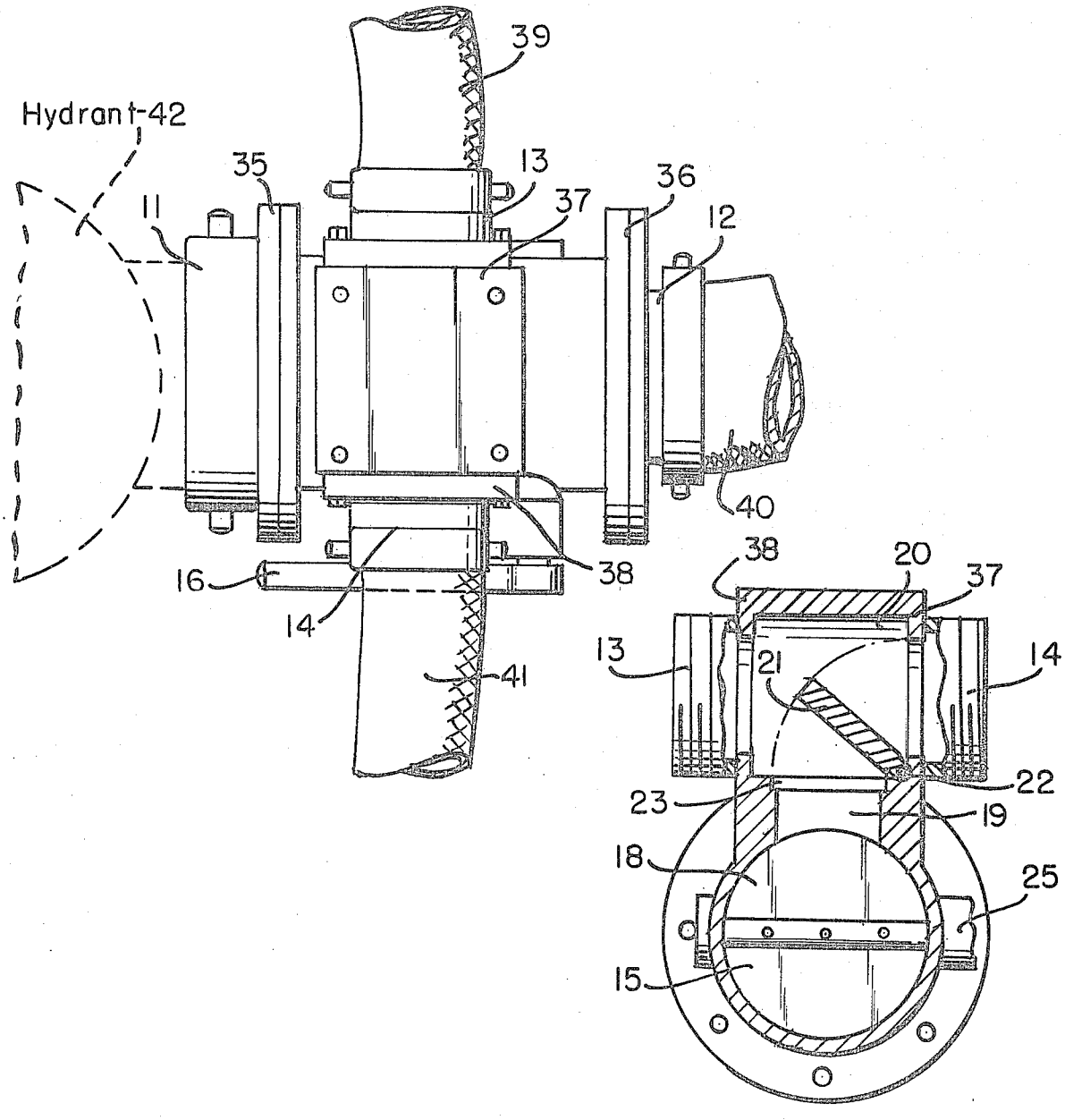
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Primary Examiner—Henry T. Klinksiek

[57] **ABSTRACT**

A valve for controlling water to a fire hose having a main valve chamber with a butterfly valve, said chamber having an inlet and an outlet for 4 ½ inch ID fire hose. A separate conduit having an inlet and an outlet for 2 ½ inch ID fire hose has an intermediate opening communicating with said chamber upstream of the butterfly valve. Another valve closes said opening when the pressure at the inlet of said separate conduit exceeds the pressure in said main valve chamber.

6 Claims, 9 Drawing Figures



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SHEET 1 OF 2

FIG. 1.

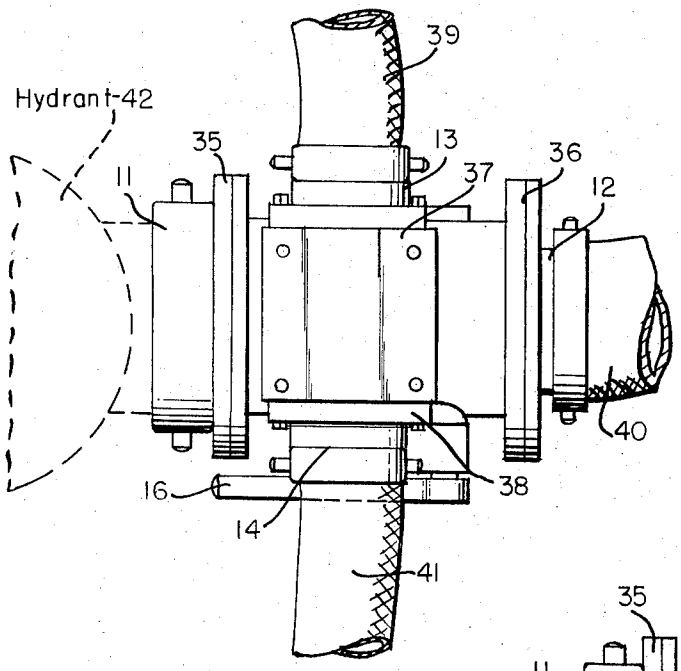


FIG. 5.

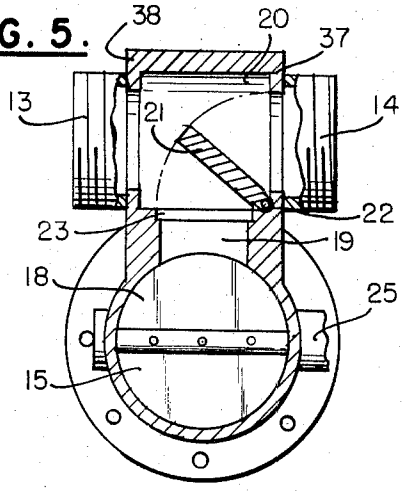


FIG. 2.

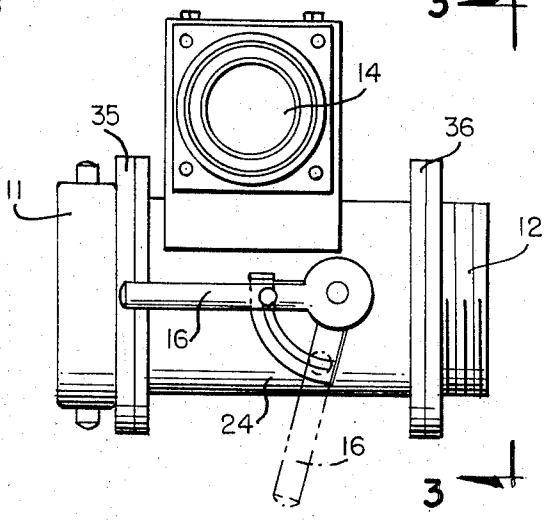


FIG. 3.

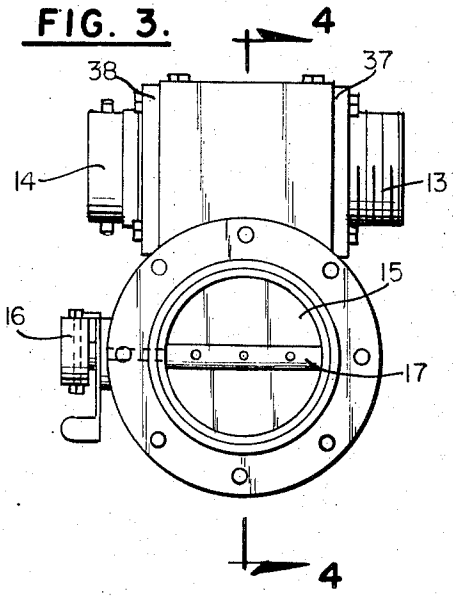


FIG. 4.

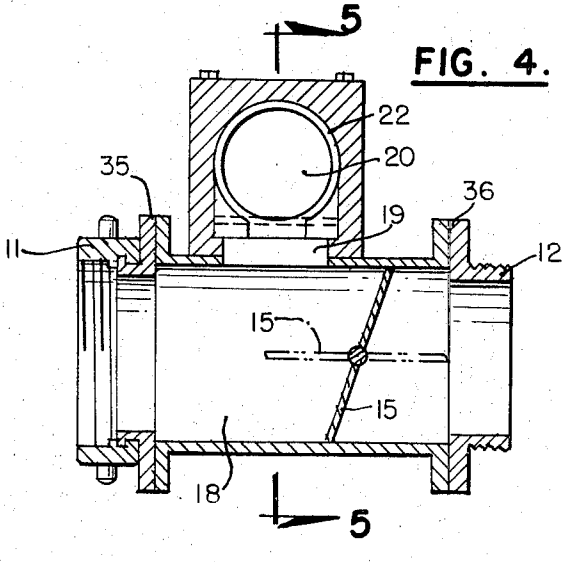


FIG. 6.

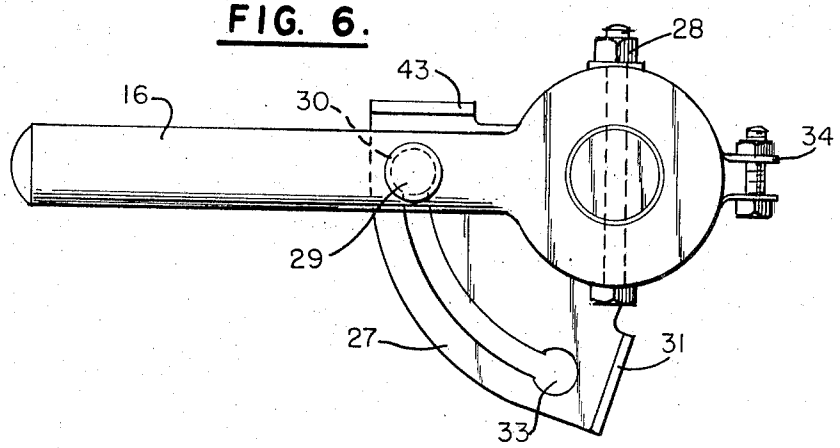


FIG. 7.

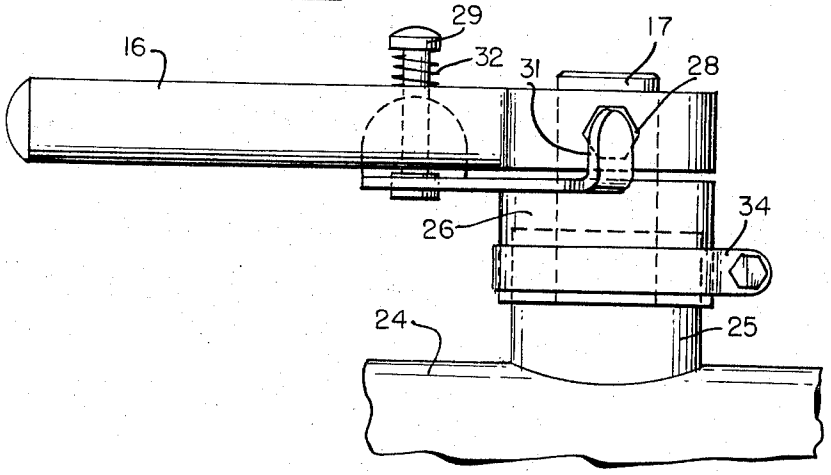


FIG. 8.

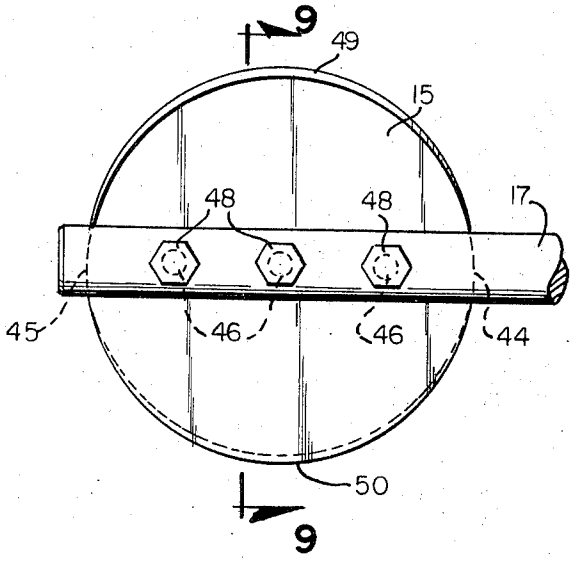
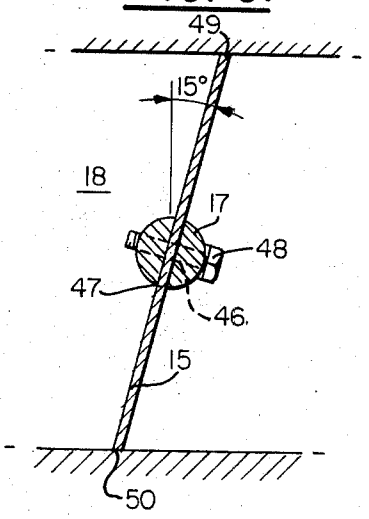


FIG. 9.



FOUR WAY HYDRANT VALVE

BACKGROUND OF THE INVENTION

Most of the fire alarms responded to by fire companies are small fires which may be extinguished by the water carried in a tank on the fire apparatus; but when they respond to large fires, this amount of water is not nearly sufficient, and the apparatus must be connected to some available water source near the site of the fire and make maximum use of that water to prevent as much loss of life and property as possible. The most common available source of water is the fire hydrant. The primary objective of the fire companies for a large fire then is to get the largest amount of available water from these hydrants onto the fire in the minimum amount of time.

There are several types of valves or devices in use that are connected to the fire hydrants for the aforementioned purpose. However, they all have some disadvantages, either in their mode or method of operation, in that they may be difficult to manipulate or complicated and difficult to understand the method of operation, or they may restrict the amount of water available from the hydrant to which they are connected, in that by design the areas of the water ways in the valves are much less than the areas of the water ways in the hydrant. Representative examples of this type of valve are disclosed in U.S. Pat. No. 1,351,781 issued to T. H. Meushaw and C. J. Diez Sept. 7, 1920, and U.S. Pat. No. 1,750,927 issued to C. J. Diez March 18, 1930.

The valve U.S. Pat. No. 1,351,781 requires the use of a separate wrench to operate one of its interior valves; the valve after being connected to the hydrant may be turned upside down by the force of a connected line being pressurized, being upside down it is very difficult for the operator to know which position the interior valves are in. The manual controls of the valve require unnecessary amounts of time to operate. In both this valve and the valve U.S. Pat. No. 1,750,927, the water ways, by design, are restrictive in that a considerable amount of the area available for water flow is taken up by the controlling valve and its supporting means when the valve is in the open position. Both valves are unnecessarily heavy and bulky, making it difficult for the operator to connect them to the hydrant. Both valves, by design, require the fire company to obtain a new valve if the company has to change or desires to change the type or size thread on their connectors. In addition, all appliances and valves when operating under pump pressure have a given amount of pressure loss due to the friction between the moving water and the interior surfaces of the valve. In both these valves an unnecessary amount of pressure is lost, in that by design both valves require that the water flow, under pressure, change its direction of flow more than 90° causing more pressure loss due to friction and turbulence produced by this change in direction of flow. Neither valve provides for a positive lock in the open or closed positions, which is desirable because inadvertent shutdown of a line of water flow may cause injury.

In its more detailed nature the invention provides a four-way valve embodying certain new and useful improvements over the connector leads disclosed in U.S. Pat. No. 1,351,781 and U.S. Pat. No. 1,750,927. A more simple and compact structure is provided including simplified valve structures. One valve is manually operated with a positive lock for the open and closed

positions. One valve is automatically actuated to control the lower pressure stream distribution and the change to pump pressure distribution without break of flow or loss of pressure below hydrant pressure at any time.

SUMMARY OF THE INVENTION

This invention has for its object to provide a simple and compact four-way valve which may be carried by the pumping apparatus, having the valve preconnected to a discharge line in the hose bed of the pumping apparatus. The valve incorporates both manually and automatically actuable valves.

The valve is connected to a fire hydrant, water flows into the main valve body and is restricted from exiting the main valve chamber at the main valve outlet by a butterfly valve closing the outlet. Water is, however, directed through a passage between the main valve chamber to a conduit, through the conduit to a small outlet adapted for a hose connection and the stream of water may be played on the fire. Hydrant water pressure causes a clapper valve to close the other inlet at the opposite end of the conduit.

If more water is needed from this hydrant a second pumper would lay two lines from the fireground to the hydrant. Arriving at the hydrant he would connect a large suction hose to the main valve body adapted for this hose. Opening the butterfly valve would then supply water from the hydrant through the main valve chamber to the pumper to boost the two lines laid by the pumper to pump pressure. To increase the first line from hydrant pressure to pump pressure a line is connected from the discharge side of the pump to the inlet of the conduit. Water entering the conduit is of greater pressure than that in the main valve chamber and the clapper valve closes the opening between the conduit and the main valve chamber providing a pump pressure stream directly through the conduit to the fire hose on the opposite end. This permits the use of a direct hydrant pressure stream and subsequent connection of a pumper to supply additional lines and change initial hydrant pressure stream to a pump pressure stream without shutting down the hydrant or the initial hydrant stream.

Our invention consists in the novel detail of construction, combination and arrangement of parts; all of which will be fully described in the following detailed descriptions. Other objects will in part be obvious and in part be pointed out herein.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of the valve.

FIG. 2 is a side elevation of FIG. 1.

FIG. 3 is an end view taken on 3—3 of FIG. 2.

FIG. 4 is a half section taken on 4—4 of FIG. 3.

FIG. 5 is a section taken on 5—5 of FIG. 4.

FIG. 6 is a detail of the handle and latching mechanism.

FIG. 7 is an additional detail of the handle and latching mechanism.

FIG. 8 is a front elevation of the butterfly disc.

FIG. 9 is a section taken on 9—9 of FIG. 8.

The four-way valve which is the subject matter of our invention is perferably carried by the fire apparatus with a distribution line 39 preconnected at outlet 13. The valve would be dropped off of the apparatus at the hydrant 42 and while the valve is being connected to

the large connector of the hydrant **42** at valve inlet **11**, the apparatus simultaneously would be laying out the preconnected distribution line **39** to the fireground. Upon a signal from the pump operator the hydrant **42** is charged. When the hydrant **42** is charged, water flow comes into the main valve chamber **18** and is sufficiently restricted from exiting the main valve chamber **18** at the large outlet **12** by the butterfly valve **15**. Water then flows from the main valve chamber through passage **19** into the smaller valve chamber **20**, automatically closing the clapper valve **21** against valve seats **22** preventing water flow out of small inlet **14** and directing hydrant pressure flow through small outlet **13** supplying hydrant pressure to the laid hose line. The fireman has the option of either connecting the laid line **39** to a nozzle and playing a steam of hydrant pressure on the fire or connecting the laid line **39** to the suction side of his pump and playing a stream of pump pressure on the fire. If needed a second pumper would then lay two hose lines from the fireground to the hydrant with the second pumper positioned at the hydrant. Once there he would connect his two laid lines to the discharge side of his pumper and at the same time connect a large suction hose **40** from the suction side of his pumper to the large male outlet **12** of the valve, open the butterfly valve **15** by moving handle **16** connected to shaft **17**, allowing hydrant pressure water to flow through the main valve chamber **18** from the large hydrant inlet **11** to the large outlet **12** through the large suction hose **40** to the suction side of the pump, boosting it to pump pressure to supply the two previously laid lines to the fireground. Simultaneously a discharge hose line **41** is connected from the pressure side of the second pumper to the small inlet **14**. The pump pressure entering the small valve chamber **20**, being of greater pressure than the hydrant pressure existing in the chamber causes the clapper valve **21** to automatically close the passage **19** between the two valve chambers at valve seats **23**, providing a direct pump pressure stream through the small valve chamber **20** through the small male outlet **13** to the hose line **39** laid by the first pumper. All this being done without interrupting flow or reducing pressure below hydrant pressure at any time.

A handle of the type and design illustrated is provided for a three fold purpose; one, to provide a positive lock in the open or closed position to prevent an inadvertent change of position of the butterfly valve by bumping the handle accidentally; two, to allow for infinite adjustment of the closed position of the butterfly valve; three, the handle position indicates the position of the valve in that it is in line with the valve body and the flow of water in the open position and across the valve body and across the flow of water in the closed position.

The handle **16** and the butterfly valve **15** are attached to shaft **17** in the same plane. The shaft **17** projects through the main valve body **24** and the shaft support and seal **25** through the adjusting collar **26** to which is attached an indexing plate **27**. The handle **16** is attached to the shaft **17** with a bolt **28**. FIGS. **6** and **7** show the valve handle in the open position. To close the butterfly valve **15** the operator would grasp handle **16** and simultaneously depress index pin **29** allowing it to clear the open index point **30**, move the valve handle **16** to the closed stop **31**, release the index pin **29** and spring **32** will position the index pin **29** into the closed index position **33** locking the butterfly valve **15** in the closed position.

The butterfly valve **15** is a brass plate disc of elliptical shape mounted along the center-line of the shaft **17**. The disc is machined to fit the inside diameter of the main valve chamber **18**. As a result of the machining, a particular or peculiar edge is a result. At two points on the circumference of the disc **44** and **45**, the edge is exactly 90° to the broad flat surface of the disc; three holes **46** are drilled through the disc along a line directly between these two 90° points. The disc is mounted in a slot **47** in the center of the shaft along the centerline of the longitudinal axis of the shaft. Three holes are drilled through the shaft across the slot. The disc is aligned in the shaft by these holes in the shaft and corresponding holes in the disc. Three bolts **48** secure the disc to the shaft.

As stated before, at two points **44** and **45** along the circumference of the disc, the surface of the edge is 90° to the surface of both the front and back of the disc. Moving around the circumference of the disc from these points to a point 90° away **49**, the surface of the edge is 15° to the surface of the front on one side and 15° to the surface of the back on the other side **50**.

This design provides a two-fold purpose, one being a seal between the butterfly edge and the cylinder wall of the chamber with the most surface available from the disc when mounted in the chamber 15° from a line perpendicular to the centerline of the valve chamber's longitudinal axis; two, having a disc of this character prevents the operator from turning the valve over center, the more pressure applied to go over center, the better the seal around the valve. In addition, the design provides for easy operation regardless of water pressure in the valve; the force required to change the valve position is the same because whatever water pressure is opposing valve movement on one half the surface of the valve, the same water pressure is assisting the movement on the other half.

The butterfly valve, through normal use, may, over a long period of time, become worn so that greater amounts of water may leak by the valve. The purpose of the butterfly valve is not to provide a leak-proof seal but to restrict water flow sufficiently enough to make the necessary hose connections. A simple and easy means of adjusting the closed position of the valve in relation to the handle and its positive lock is provided so that a sufficient seal can be obtained when necessary. This is accomplished by loosening the clamp **34**, grasping the handle **16** while locked in the closed position, being careful not to press the index pin **29**, the operator rotates the handle as far as possible toward the closed position, and while maintaining this closing pressure retightens the clamp **34**. This provides a new closed position and a better seal for the butterfly valve.

There are several types of threads in use in the fire fighting industry, National Standard, Baltimore Steamer, etc. For this reason our invention by design was developed to accommodate hose connectors and hydrant connectors of any type and size by attaching other connenctors at points **35, 36, 37**, and **38** of the main valve body **24**. The water volume capacity of the water ways of the valve are of sufficient size so as not to limit the available capacity of up to and including 3 ½ service hose line and up to and including 6 inch suction lines lines and 6 inch hydrant connectors.

The operable parts of this four-way valve through their simplicity of design and construction provide for easy in-house maintenance, whether it be only lubrication or repair and replacement of parts.

From the foregoing description, in connection with the accompanying drawings, it is thought that the novel details of construction, the manner in which it is used and the advantages of our invention will be readily apparent to those skilled in the art to which it relates.

We claim:

1. A valve system for controlling flow of water to a fire hose comprising a main valve body having a water inlet adapted to receive water from a fire hydrant and a water outlet adapted to feed water to a fire hose, a butterfly valve means in said body for controlling flow of water from said inlet to said outlet, a conduit having an inlet adapted for connection to a fire hose and an outlet also adapted for connection to a fire hose, the inlet and the outlet of said conduit being substantially coaxial to provide a direct straight path for the flow of water through the conduit whereby to minimize pressure losses, said conduit having an opening intermediate of the inlet and the outlet of said conduit and in communication with said main valve body upstream of the butterfly valve to permit flow of water from said main valve body to said conduit, and valve means at said opening operable in response to higher pressure at the inlet of the conduit than exists in said main valve body for closing the opening that allows water flow from said main valve body to said conduit.

2. A valve system as defined in claim **1** having a handle outside the main valve body for controlling the position of the butterfly valve, the position of the handle being an indication whether the butterfly valve is open or closed.

3. A valve system as defined in claim **2** including latching means for holding the butterfly valve in open position.

4. A valve system as defined in claim **2** including latching means for holding the butterfly valve closed position.

5. A valve system as defined in claim **2** including latching means for holding the butterfly valve in open position and additional latching means for holding the butterfly valve in closed position.

6. A valve system as defined in claim **5** in which the inlet and outlet of said chamber are coaxial to provide a direct straight path for the flow of water through the conduit whereby to minimize losses.

* * * * *