This invention relates to a valve unit capable of multiple functioning.

The chief object of the present invention is to provide a valve unit that is capable of functioning as an anti-scald valve and which may be utilized for common or independent discharges.

One chief feature of the invention resides in its simplicity of construction.

Another chief feature resides in the specific piston type member utilized.

A third chief feature resides in the partition plug utilized when independent discharges are desired.

A further chief feature resides in the clean-out plug provisions.

Still a further feature resides in the cut-off plug utilized.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Fig. 1 is a central sectional view of an embodiment of the invention, the supply line thereto and discharge lines therefrom being shown in elevation and the piston valve being illustrated in the cold water supply position.

Fig. 2 is a side elevation of the valve unit, the supply and discharge lines being omitted.

Fig. 3 is a bottom plan view, the supply lines being omitted.

Figs. 4, 5 and 6 are longitudinal sectional views of modified forms of piston valve.

Fig. 7 is a perspective view of the partition plug.

Fig. 8 is a perspective view of the clean-out plug.

Fig. 9 is a view taken on line 9-9 of Fig. 1 and in the direction of the arrows and with the separation plug removed.

In Fig. 1, H and C designate hot and cold water supply lines and HH and CC hot and cold water discharge lines. F indicates generally a valve body having intake ports 11 and 12 and discharge ports 13 and 14.

In proximity to portions 11a and 12a and communicating therewith is a transverse intake bore 15 opening at 16 and adapted to receive cut-off and clean-out plug 17, see Figs. 1 and 8, having threaded end 18 and two spaced, transversely disposed passages 19 and 20 therethrough.

The body, opposite portions 11a and 12a, has ports 21 and 22 aligned with said portions. A cylinder bore 23 has one end exposed at 24 and slidably supported therein is piston valve 25, the latter retained by clean-out plug 26.

The cylinder bore 23 is disposed parallel to bore 15. Parallel thereto is discharge bore 27 opening outwardly at 28 to take clean-out and closure plug 29. A pair of tangentially disposed ports 27a are directed from the cylindrical bore toward the center of the receiving bore 51. A similarly disposed pair of ports 30 are oppositely directed and the body stock therebetween is circularly counterbored, as at 31, see Figs. 1 and 9.

The body, in alignment with ports 15 and 16, includes portions 13a and 14a which communicate with receiving bore 27. Between ports 15 and 14 is the threaded opening 32 adapted to take the separator plug 33, see Figs. 1 and 7, same having stem 34 and vane termination 35. When this plug is positioned as shown in Fig. 1, the hot and cold water sides are independent. When the vane is disposed at right angles to that position, the width thereof is insufficient to bridge the gap across the respective pairs of ports 27a-27a and 30-35 and also said vane is not long enough. Consequently, when the plug is thus positioned, bore 27 comprises a mixing chamber.

When cleaning, repair, or replacement is required, the plug 17 may be turned 90° or 90° and both supplies H and C are cut off for such service.

Reference will now be had to the piston valve shown in Fig. 1 and several modifications thereof shown in Figs. 4, 5 and 6.

In Fig. 1 the piston valve 25 includes two, oppositely directed, axially aligned elongated chambers 36 and 37 separated by the central partition 38. Each chamber opens at the other end, and defining such opening is the lip 39a and 39b.

Herein the piston includes a plurality of spaced annular channels 38a and 38b and 38a and 38b providing end collars 40 and 41, intermediate collars 42 and 43 and central collar 44. Connecting channel 38a with chamber 39a are the ports 45. Channel 38b connects therewith by ports 46. Chamber 37 communicates with channel 38b by ports 47 and with channel 39b by ports 48.

In Fig. 1 the lands aforesaid have a common diameter slightly less than the cylinder bore. In Fig. 4 numerals of the one hundred series designate like or corresponding parts. This form only differs from Fig. 1 by the land 140 being longitudinally ported as at 140a, the land 142 as at 142a, the land 141 as at 141a, and the land 143 as at 143a. Central land 144 is not so ported.

In Fig. 5 the corresponding parts are designated by numerals of the two hundred series.
termediate lands 242 and 243, however, are of lesser diameter than the central and end lands. In Fig. 6 corresponding parts are designated by numerals of the three hundred series. Herein intermediate lands 342 and 343 are of lesser diameter. Also end lands 340 and 341 are longitudinal port as at 340° and 341° similar to Fig. 4 piston.

In certain pistons the lips may be omitted. In certain pistons certain of the piston ports may be plugged. Special operating conditions will determine which specific form of piston is to be preferred over the others, although all forms are functionally operative.

The structure herebefore described is extremely sensitive and by way of example only, results of one piston embodiment, tested at the Pittsburgh testing laboratory, shows the following:

With the cold water supply at 67 degrees under 70 pounds per square inch and the hot water supply at 142 degrees under the same pressure, the respective pressures were at 99 1/2 and 60 1/2 pounds per square inch, with the desired water blend at 100 degrees. When the cold water supply was robbed by draw off to the extent of 49 1/2 pounds per square inch, the 100 degree temperature was still maintained. When due to loss of temperature in the hot water supply of one degree and excessive draw off again sustained, the resulting blend temperature was 99 1/2 to 100 degrees. Thus only a difference, over the entire range, of approximately 1/8 degree occurred. The closest commercial known, when tested under identical conditions, has a range of 14 degrees of variation. The present valve, accordingly, may be said to be peculiarly applicable to maintain, as long as supply temperatures are maintained, a constant predetermine blend temperature, regardless of cold water draw off or robbing.

The foregoing data relates to the Fig. 1 piston in a cylinder of .825” diameter with a clearance of .003”. Pistons similar thereto, but having clearances of .001” and .005”, were also tested and maximum temperature differences were 1 1/8 degrees for all pistons, the hot water supply temperatures, in these higher differences, dropping as much as 2 1/2 to 3 degrees.

These tests demonstrated that the tight piston was a snubbed, relatively speaking, and loosest piston performed excellently. The intermediate side piston functioned within one-half degree even though the hot water supply temperature dropped 1 degree. Without supply temperature drop, the blend temperature was maintained.

Accordingly, the intermediate piston, if it should wear in use to the size of the loosest piston, will still perform far better than any other known anti-scald valve structure.

If it be assumed that the supplies C and H are subject to line pressure, cut off valve IF can cut same off for cleaning, repairing and/or replacement purposes.

If individual control valves are disposed in the lines CC and HH, same are adjusted manually to obtain a predetermined blend temperature at the shower nozzle or head. The piston valve then substantially maintains such blend temperature regardless of cold water draw off. In this instance the separation plug is disposed as shown in Fig. 1.

If individual control valves are disposed in the supplies upstream of the piston valve, the separator valve may be disposed as shown, or at 90 degrees thereto. Whatever valve setting is provided, the piston valve, regardless of cold water draw off will maintain the predetermined blend temperature.

Of course, if desired, a single common discharge line may be applied to openings 32 and openings 13 and 14 plugged for single line discharge. This valve unit, therefore, is capable of a wide variety of uses.

The fundamental characteristic of the piston valve, see Fig. 1, and its operation is that all the water passed to discharge passes through the valve and the valve is of the automatic proportioning type for blend constant temperature maintenance. The vanes utilized are provided for greater sensitivity.

The piston is arranged so that the high pressure will close toward the low pressure side at the same time thereby maintaining the predetermined proportion.

In Fig. 1 high pressure in supply H and low pressure in cold water supply C results in the piston valve moving to the left to the position shown. This prevents accidental scalding. Upon cold water draw off cessation or when the pressure in line C builds up, the same proportionally moves the piston valve to the right, thus opening the hot water supply to the desired degree to correspond with the cold water supply for the desired blend. Thus, the piston valve, in a system such as a hotel with many toilets and baths, maintains at each shower the desired temperature when the cold water line is excessively used.

The preferred form Fig. 1 piston is of a character wherein all the water discharged from the valve unit must pass through the central bores of the piston. This accounts for the sensitivity of this form. In the others, Figs. 4 to 6, a small proportion does not necessarily have to pass through the central bores of the piston, hence their sensitivity is not as great.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered illustrative and not restrictive in character.

The several modifications described herein, as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A valve unit comprising a valve body having a discharge bore, an intermediate bore and an intake bore, the axes of said bores being parallel; said discharge bore having spaced apart ports connecting with said intermediate bore and having discharge ports; said intake bore having intake ports and discharge ports communicating with said intermediate bore; a piston-like control valve slideably mounted in said intermediate bore having an axial central bore divided by an intermediate wall to provide two separate passages each open at one end, each of said passages having an intake port adapted for communication with an intake port of said intermediate bore, and an outlet port adapted for communication with a discharge port of said intermediate bore and valve lands at the opposite ends of said control valve for controlling the discharge through the discharge ports of said intake bore into said intermediate bore.

2. A valve unit comprising a valve body having a discharge bore, an intermediate bore and an
intake bore, the axes of said bores being parallel; said discharge bore having spaced apart ports connecting with said intermediate bore and having discharge openings; said intake bore having intake ports and discharge ports communicating with said intermediate bore; a piston-like control valve slideably mounted in said intermediate bore having a central axial bore divided by an intermediate wall to provide two separate passages, each open at one end; each of said passages having an intake port adapted for communication with the intake ports of said intermediate bore, and an outlet port adapted for communication with a discharge port of said intermediate bore; valve lands at the opposite ends of said control valve for controlling the discharge through the discharge ports of said intake bore into the intermediate bore, and a cutoff valve in said intake bore for cutting off communication between the intake ports in said bore and the discharge ports in said bore.

5. A valve unit comprising a valve body having a discharge bore, an intermediate bore and an intake bore, the axes of said bores being parallel; said discharge bore having spaced apart ports connecting with said intermediate bore having intake ports and discharge ports communicating with said intermediate bore; a piston-like control valve slideably mounted in said intermediate bore having an axial central bore divided by an intermediate wall to provide two separate passages, each open at one end; each of said passages having an intake port adapted for communication with an intake port of said intermediate bore; an outlet port adapted for communication with a discharge port of said intermediate bore; valve lands at the opposite ends of said control valve for controlling the discharge to the discharge port of said intake bore into the intermediate bore; a piston land on said control valve intermediate of its ends dividing said intermediate bore into separate chambers; and secondary piston lands interposed between said intermediate piston land, and said valve land on said valve member.

PAUL W. SANFORD.

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