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2,845,080

AUTOMATIC OR MANUAL HOT WATER VENT VALVE ASSEMBLY

El Roy J. Kraft, Des Plaines, Ill., assignor to The Dole Valve Company, Chicago, Ill., a corporation of Illinois

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The present invention is directed to an air vent valve and is primarily useful in conjunction with radiators forming part of a heating system utilizing fluid heating media.

The air vent valve of the present invention is primarily designed for the purpose of providing a positively acting, efficient air vent valve which is capable of venting gaseous fluids from the conduits of a heating system utilizing fluid heating mediums and automatically preventing liquid fluids from leaking out of the conduits or into the space being temperature conditioned.

It is highly desirable that gaseous fluids such as air be vented out of the closed fluid circuit of a heating system, thereby to reduce heating losses, prevent air hammer, and improve the efficiency of the entire heating system. A difficult problem has been presented, however, in providing a venting structure which will not only vent the gaseous fluid but will effectively prevent venting of the heating medium itself, which is usually a fluid such as hot water or steam.

Some vent valve structures of the past have made use of hygroscopic materials which have the property of becoming substantially swollen in contact with water or other fluid to control a venting opening in an air vent valve. The valve described and claimed in Mikeska U. S. Patent No. 2,467,217 is an excellent example of one of the better valves employing this type of material.

The present invention constitutes an improvement in this form of air vent valves.

One of the features of the present disclosure resides in the provision of a hygroscopic type vent valve having an improved control structure affording a more positive opening and closing action. There is a definite position of adjustment wherein automatic operation is afforded and there is also a definite shut off if so desired. Furthermore, the valve may be utilized in manual operation.

Still another object of the invention is to provide an improved air vent valve for use with hot water heating systems having a reduced number of parts and which is simple and economical to manufacture, easy to maintain and completely efficient for its intended purpose.

The valve of the present invention accomplishes the above objects by providing an inter-engaging body member and bushing; the bushing being adjustable within the body member, and a valve element including an enlarged end portion or valve head having a pair of longitudinally spaced, oppositely-facing valve seating surfaces movable from a valve closing position in which one of the valve seating surfaces engages a seat provided in the body member, to a valve opened position in which the other of the seating surfaces is engaged on a suitably formed seating face in the bushing.

A further description of the present invention will be made in conjunction with the attached sheet of drawings which illustrates a preferred embodiment of the invention.

In the drawings:

Figure 1 is a plan view of the valve assembly;

Figure 2 is a cross-sectional view, with parts in eleva-

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tion, illustrating the interior of the valve when the valve is in its closed position;

Figure 3 is a view similar to Figure 2 but illustrates the valve in its opened position; and

Figure 4 is a view taken substantially along the line IV—IV of Figure 3.

The particular valve shown in the drawings includes a body member 10 having an enlarged hexagonal tool engaging portion 11 medially thereof and a tapered, externally threaded base portion 12 forming a reduced diameter neck at one end.

The body member 10 is provided with an axial bore which defines an inlet 13 communicating with the interior of the radiator or, in other words, with the interior of a closed fluid circuit through which a fluid heating medium is circulated. The bore 13 is successively counterbored as at 13a, 13b, 13c terminating in a centrally disposed enlarged bore 14. The body member 10 is also formed with a plurality of radially extending outlets 15 (Figure 4) which intersect the enlarged central bore 14 thereby placing same in communication with the atmosphere outside of the body member 10.

A portion of the walls forming the bore 14 is provided with threads 16 arranged to receive a bushing 17 in threaded engagement. As best seen in Figures 2 and 3, the bushing 17 has a threaded neck portion 18 received in threaded engagement with the threads 16 in the body member 10. The bushing 17 also has a reduced diameter portion 19 and a central bore 21 communicating with the bore in the body member 10. A pair of ports 22 and 23 communicate the central bore 21 to the atmosphere in the vicinity of the reduced diameter portion.

Disposed between the lower edge of the bushing 17 and the base of the central bore 14 of the body member 10 are a plurality of hygroscopic disks or washers 26 which have the ability of becoming expanded to a considerable extent when in contact with water, and of reverting substantially to their initial dimensions after drying. Typical specifications for such material require that each washer expand to an extent of at least 30% over its original thickness when immersed in water at room temperature for one hour. Further, the washer, when dried at room temperature for approximately one hour after this immersion, should be capable of returning to a thickness within about 5% of its original thickness. These hygroscopic washers are commercially available materials, and usually include unglazed, uncalendered vulcanized fibers matted together.

The assembly shown in Figures 2 and 3 also includes a valve element 27 consisting of a threaded stem portion 28 received in threaded engagement within a threaded bore 29 extending axially of the bushing 17 and communicating with the enlarged central bore 21 thereof.

The valve member 27 may include an enlarged end portion forming a valve head 31 disposed substantially axially of the valve and within the hygroscopic washers 26. A first valve seating face 32 is provided by chamfering or otherwise tapering the end of the enlarged portion 31, and a similar but oppositely directed seating face 33 is formed at the upper end of the enlarged portion 31 in longitudinally spaced relation to the seating face 32.

As evident from an inspection of Figure 2, the valve seating face 32 is arranged to engage a valve seat 34 formed in the body member 10 so as to close off the inlet 13 and interrupt fluid communication between the inlet 13 and the outlet 15.

At the other end of its travel, the valve element is seated by virtue of the engagement of the valve seating face 33 against a valve seat 36 provided at the lower end of the bushing 17. In this position, the valve element closes off ports 22 and 23 so that the liquid and gaseous

materials entering through the inlet 13 pass only through the hygroscopic washers 26 before being vented to the outlet 15.

The spacing dimension between the faces 32 and 33 is less than the spacing dimension between the seats 34 and 36, thereby affording movement or adjustment of the valve head 31 between the seats 34 and 36. If the valve head 31 is positioned medially with respect to the seats 34 and 36, a flow path around the valve head 31 will pass through the passages 22, 23, the bore 14 and the outlets 15.

Thus, if the valve head 31 is moved to either end of the limit of travel, it will be positioned at a full close-off position or at "automatic," but manual operation may be attained through adjustment to intermediate position.

The valve member 27 is secured to a shell-like cover 37 to facilitate opening and closing the valve member. The cover 37 is received against the stem 28 and held thereagainst by a spun over portion 38 of the valve stem 28.

Normally, the valve element will be located with the valve seating face 33 seated against the valve seat 36, as shown in Figure 3. In this position, air is freely vented through the relatively porous hygroscopic washers 26, but any water is rapidly absorbed by the hygroscopic washers. Should there be an excessive amount of water carried into the valve, the water will cause the washers 26 to swell up substantially and close off the outlet ports 15, thereby completely shutting off the flow through the valve. When the condition of excessive water flow has ceased, the hygroscopic washers are able to dry out and lose their swollen condition, so that the valve is again able to vent air.

Manual operation may be desired, as for example when radiators have been drained and are being refilled so that it becomes desirable to vent the radiators at a faster rate than would be possible under conditions of normal operation. The position of the valve element is then selected so that the enlarged end portion or valve head 31 is intermediate the two seated positions as illustrated in Figures 2 and 3. In this condition the air flows not only through the hygroscopic washers 26, but is also vented laterally through the ports 22 and 23 formed in the bushing 17.

In assembling the valve, it is simply necessary to insert the hygroscopic washers 26 in axial alignment within the central bore 14 of the body member 10. Subsequently, the bushing 17 and the valve element 27 are threaded into position with the valve in its seated position as shown in Figure 2. Then, the cap 37 can be connected to the element by spinning over the portion 38, as previously described.

From the foregoing, it will be appreciated that the valve of the present invention provides an inexpensive but effective means for venting air and trapping liquids present in the radiator fluid from a heating system. The valve element is positive in operation, has a definite automatic position and shut off position and is capable of being set to accommodate conditions of extreme flow, if necessary.

It will be appreciated that various modifications can be made to the described embodiment without departing from the scope of the present invention.

I claim as my invention:

1. An air vent valve comprising a body member having a central cavity and an inlet and an outlet, said cavity providing a fluid passageway between said inlet and said outlet, a bushing received within said cavity in said body member in adjustable position, a valve element adjustably positionable along said bushing, said valve element including an enlarged end portion having a pair of spaced valve seating surfaces, means in said body member providing a rigid seat for one of said surfaces, means in said bushing providing a rigid seat for the other of said surfaces, said valve element being moveable to place

said surfaces selectively on their respective seats, and an expansible hygroscopic means disposed in said cavity between said bushing and said body member in circumscribing relation to a portion of said valve element, said hygroscopic means being arranged to absorb liquid passing between said inlet and said outlet and to close off said outlet after absorption of a substantial amount of said liquid.

2. An air vent valve comprising a body member having a central cavity an inlet and an outlet, a bushing received within said body member in adjustable position, a plurality of individual hygroscopic washers received between said bushing and said body member and arranged to close off said outlet when in a swollen condition, a valve element received in threaded engagement within said bushing and having an enlarged end portion formed with a pair of spaced valve seating surfaces, said enlarged end portion being received within said hygroscopic washers, means in said bushing providing a rigid seat for one of said seating surfaces and means on said body member providing a rigid seat for the other of said surfaces, said valve element being selectively movable from one seated position to the other, said bushing having a port arranged for fluid communication with said inlet when said enlarged end portion of said valve member is positioned intermediate the said seating positions on said bushing and on said body member.

3. An air vent valve comprising a body member having a central cavity and an inlet and an outlet, said cavity providing a fluid passageway between said inlet and said outlet, a bushing received within said body member in adjustable position, said bushing having a reduced diameter portion, a plurality of individual hygroscopic washers received in said cavity between said reduced diameter portion of said bushing and said body member and arranged to close off said outlet when in a swollen condition, a valve element received in threaded engagement within said bushing and having an enlarged end portion formed with a pair of spaced valve seating surfaces, said enlarged end portion being received within said hygroscopic washers, means in said reduced diameter portion providing a rigid seat for one of said seating surfaces and means on said body member providing a rigid seat for the other of said surfaces, said valve element being movable selectively into the two seating positions, said bushing having a port extending through said reduced diameter portion and arranged for fluid communication with said inlet when said enlarged end portion of said valve member is positioned intermediate its two seating positions.

4. An air vent valve comprising a body member having an inlet and an outlet, said body member having a centrally extending enlarged bore providing a fluid path between said inlet and said outlet, a bushing received within said bore, said bushing having a central bore communicating with the bore in said body member, a threaded rod received in the bore of said bushing, said rod including an enlarged head portion arranged to be received in said enlarged bore, said enlarged head portion including a pair of spaced valve seating faces, means on said bushing providing a rigid seat for one of said seating faces, means on said body member providing a rigid seat for the other of said seating faces, said head portion being movable selectively between the two seating positions, and a plurality of hygroscopic washers disposed in said enlarged bore in circumscribing relation to said enlarged head portion to provide a barrier for liquid flow from said inlet to said outlet.

5. A vent valve comprising a body member having a reduced diameter externally threaded neck at one end thereof, a bore formed in said neck and being successively counterbored to form a passage through said body member with an enlarged bore partially threaded adjacent the opposite end of said body member, a first valve seat in said passage between said enlarged bore and said

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neck, a closure member threaded into said enlarged bore, said closure member having a reduced diameter neck providing an axially recessed end face forming a second valve seat and being transversely recessed to communicate the valve seat with said enlarged bore, a valve 5 having a stem extending through said closure member and a valve head in said enlarged bore, said first and second valve seats being longitudinally spaced apart from one another on opposite sides of said head, said closure member and said body member each having an annular 10 shoulder formed radially outwardly of and concentric to said first and second valve seats, a plurality of hygroscopic disks confined in said enlarged bore between said annular shoulders and controlling fluid flow therebetween, said body member having an outlet formed therein 15 communicating with said enlarged bore, and threads

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formed between said stem and said closure member to axially adjust said valve head, said valve head having first and second oppositely facing longitudinally spaced apart seating faces selectively engaging either corresponding 5 seat, respectively, to either close said passage or provide a passage past said first seat through said disks to said outlet, said valve head being medially positioned with both faces unseated to provide a passage through both said seats, through the transverse recess of said closure mem- 10 ber and to said outlet.

References Cited in the file of this patent

UNITED STATES PATENTS

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737,273	Reynolds -----	Aug. 25, 1903
2,467,217	Mikeska -----	Apr. 12, 1949