

Oct. 13, 1953

W. T. FERGUSON

2,655,170

AIR VENT FOR WATER SYSTEMS

Filed Aug. 11, 1950

2 Sheets-Sheet 1

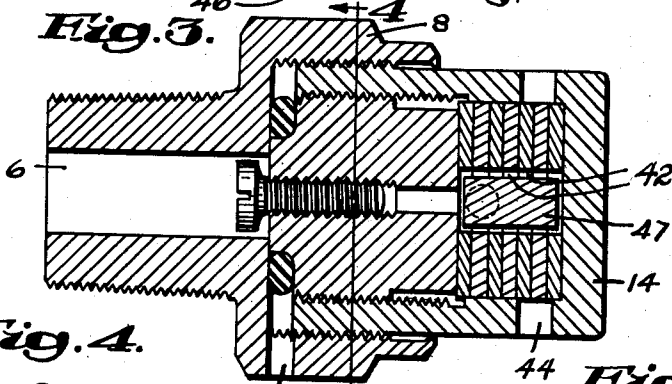
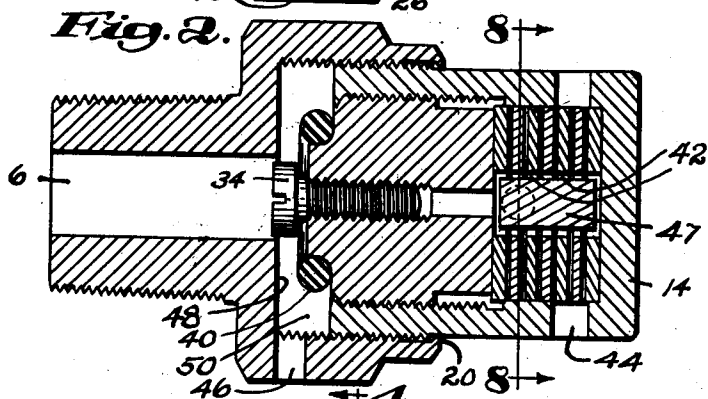
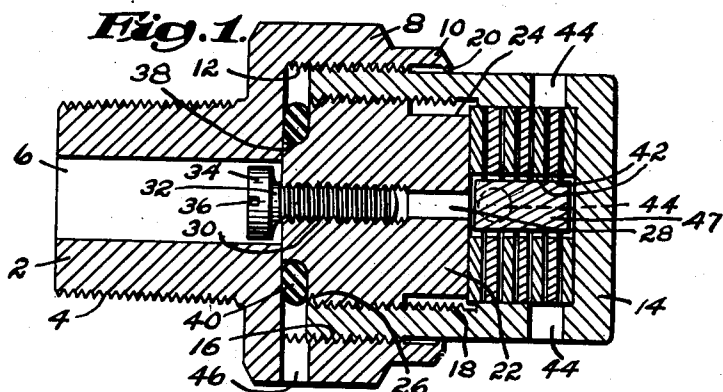
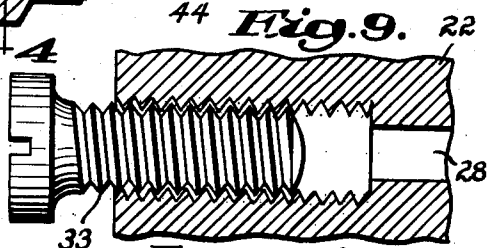
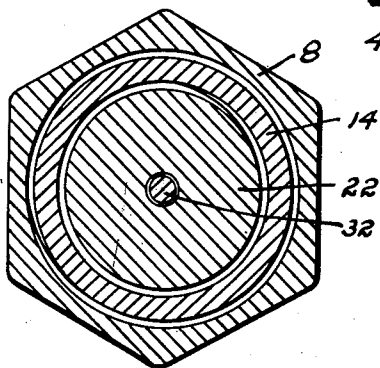


Fig. 4.



Inventor:
Warren T. Ferguson,
by Cephalus Chittick
Attorney

Oct. 13, 1953

W. T. FERGUSON

2,655,170

AIR VENT FOR WATER SYSTEMS

Filed Aug. 11, 1950

2 Sheets-Sheet 2

Fig. 5.

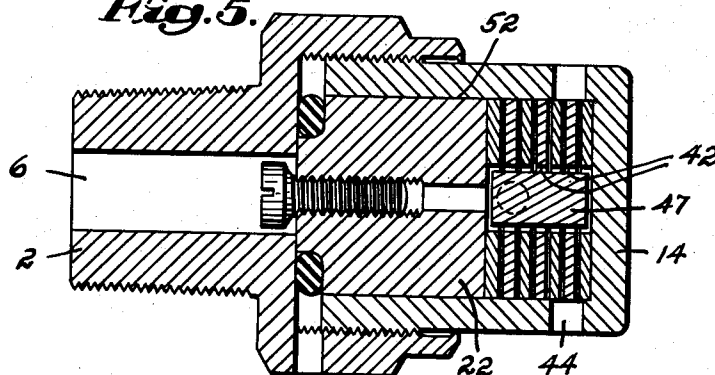


Fig. 6.

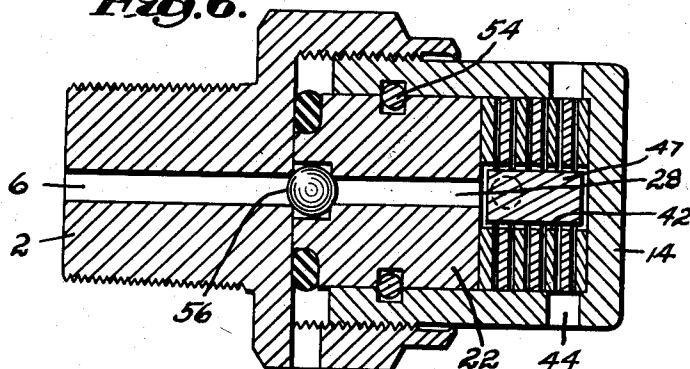


Fig. 7.

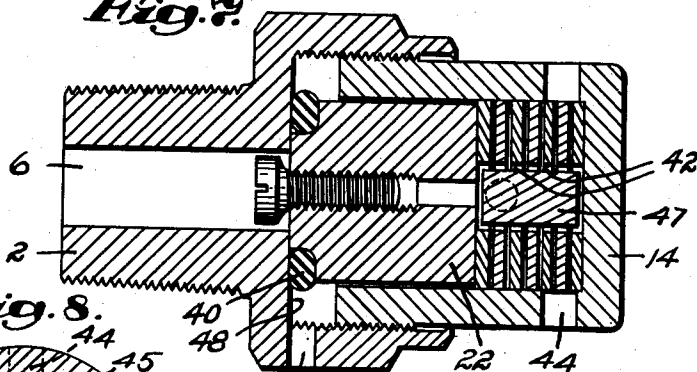
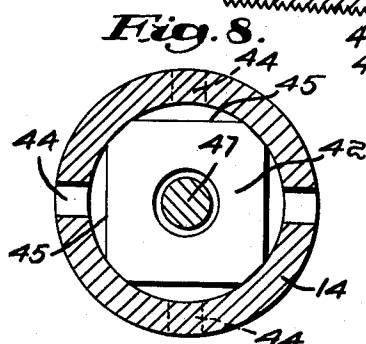


Fig. 8.



Inventor:
Warren T. Ferguson,
by **Cyrilley Chittick**
Attorney

UNITED STATES PATENT OFFICE

2,655,170

AIR VENT FOR WATER SYSTEMS

Warren T. Ferguson, Newton Highlands, Mass.,
 assignor to Anderson Products, Inc., Cam-
 bridge, Mass., a corporation of Massachusetts

Application August 11, 1950, Serial No. 178,857

12 Claims. (Cl. 137—197)

1

This invention relates to air venting valves. It is particularly concerned with an air vent which may be used in connection with a hot water heating system to vent the air in each individual radiator at the beginning of the heating season, and which will function thereafter to vent slowly such air as may accumulate in each radiator as the heating season progresses.

The conventional practice up to the present in hot water heating systems of the type commonly used in homes, is to provide a small key operated valve near the top of each radiator. At the beginning of each heating season, the system is filled with water. The trapped air in the top of each radiator is permitted to escape by opening the key operated valve and after the radiator is filled with water and the air expelled the valve is closed. Thereafter, as the system functions, air that is present in the water gradually escapes therefrom to accumulate in the top of each radiator. Thus, the water level in each radiator falls and the heating efficiency correspondingly declines.

While the water level in the radiators may fall as the air separates out, there is ordinarily sufficient pressure available to restore the water to its proper level as soon as the air in the top of the radiator is vented therefrom. This heretofore has required repeated manual opening of the radiator valve which is usually not attended to with proper regularity. Accordingly, it has been found that in general the heating efficiency tends to decline as the heating season progresses.

Therefore, it is an object of the present invention to provide a valve of such character and construction that it may be substituted for the present key actuated valve to permit the immediate and continuous escape from the radiator of any air that collects in the upper portion. This assumes, of course, that there is a suitable supply of water under adequate pressure to raise the level in the radiator and expel the gas therefrom.

The valve, in addition to its automatic air venting feature, is designed to permit quick venting by manual actuation at any time. Ordinarily, this quick venting operation will occur only at the beginning of each season. Thereafter, the venting will be automatic.

The invention further includes a construction which, while permitting the slow continuous escape of air will automatically seal itself against the escape of water when the water reaches the valve level.

These and other objects of the invention will

2

become more apparent as the description proceeds with the aid of the accompanying drawings in which:

Fig. 1 is a cross section of the valve in normal, slow air venting condition.

Fig. 2 is a cross section of the valve shown in Fig. 1 with the valve manually opened for quick venting.

Fig. 3 is a cross section similar to Fig. 1 showing the condition of the discs when they have been expanded to act as a seal against the escape of water.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 shows a modification in which the outer cap has been secured to the inner plug by a press fit.

Fig. 6 is a cross section of another modification in which the outer cap has been secured to the inner plug by a snap ring and a ball valve has been substituted for the screw threaded valve.

Fig. 7 is a cross section of another modification in which the outer cap is free to move longitudinally with respect to the inner plug with the pressure on the sealing ring being transmitted through the discs.

Fig. 8 is a section on the line 8—8 of Fig. 2.

Fig. 9 is an enlarged fragmentary view of a portion of the inner plug in which is shown a modified form of metering screw.

Referring to Fig. 1, the valve comprises a body 2 having a pipe thread 4 on its exterior and a central passage 6. The body expands into a hexagonal nut portion 8 having a terminal flange 10 with a threaded interior bore 12.

A cap 14 threaded exteriorly at its lower end at 16 and interiorly at 18 is adapted to make screw threaded engagement with threads 12. The terminal flange 10 is shown as being crimped over at 20 to prevent the removal of the cap after it is in position. It will be understood, of course, that this crimping takes place only after the cap has been threaded into position.

A plug 22 externally threaded at one end and of somewhat reduced diameter 24 at the other is in threaded engagement with threads 18 of cap 14. After the plug has been positioned with respect to the cap, as shown, the terminal threads of the cap and plug are distorted as at 26 to hold the plug in fixed relation with the cap.

The plug 22 has a central bore 28 with its left end threaded as at 30 to receive corresponding threads of a metering screw 32 having a head 34 with a screwdriver receiving slot 36. Plug 22 has on its left end a shoulder 38 of reduced diameter

about which is positioned a circular sealing ring 49.

As shown in Fig. 1, the sealing ring 40 is compressed between the flat circular seat formed by the wall 43 (see Fig. 2) and the circular opposite surface on the end of plug 22 adjacent shoulder 33. The pressure applied to ring 40, limited by the engagement of the end of the plug with the inner edge of wall 43 is sufficient to provide an air and water tight seal at this area.

Between the right hand end of plug 22 and the under side of the closed end of cap 14 are a plurality of hygroscopic elements in the form of fiber discs 42. In the present instance 7 discs are shown. These discs may be of any selected configuration such as circular or multi-sided or with notches therein. In the preferred form shown herein the discs have had their sides clipped to render them generally square with curved corners, as shown in Fig. 8. The discs have central openings and fit comfortably within the cylindrical bore in the end of the cap. The squared sides of the discs upon installation assume random angular positions with respect to each other thereby increasing the surface area that is available for speeding evaporation. At a plurality of positions around the cap at the section filled by the discs are slow venting ports 44. There is also a fast venting port 46 through the enlarged portion of body 2 leading to the atmosphere from the area surrounding the exterior of the sealing ring 40.

Positioned in the aligned central openings of the discs is a small round bar 47 which occupies a major portion of the volume within the central openings. Thus, the amount of water that can collect within the discs is limited and subsequent drying is facilitated. This will be referred to more fully hereinafter.

The fit of the threads of metering screw 32 with the threads 39 in plug 22 is such that gas under pressure may pass slowly therebetween to reach the bore 28. If metering screw 32 is turned down tightly, the air passage will be reduced but not eliminated. If the head 34 fits closely enough against the end of plug 22 when the screw 32 is turned down all the way, it is apparent that the air passage could be sealed.

A modified form of metering screw is shown in Fig. 9 in which the number of threads per inch on the metering screw is slightly less than the number of threads per inch in the plug 22. This permits the screw 33 to be screwed into plug 22 for a limited distance with the threads engaging progressively tighter, thus permitting variable control of the passage past the threads.

As can be seen in Fig. 2, cap 14 has been backed off from body 2 until further movement has been prevented by the crimped-over portion 20. In this position, it will be observed that the sealing ring 40 has been moved away from the wall 43 to form an area 50 within enlarged portion 8 of the valve body. There is also clearance between the head 34 of the metering screw and the walls of passage 6. In this position, it is apparent that gas passing through passage 6 may flow directly through area 50 and out the fast venting port 46. This is the position the valve will assume for quick venting of a radiator.

Fig. 3 is similar to Fig. 1 with the exception that the fibre discs 42 have been expanded by water coming in contact therewith. It will be understood that while the discs 42, for the purpose of explanation, have been shown in Figs. 1 and 2 as physically spaced from each other, they

are not in fact so spaced but are touching each other lightly on their adjacent faces. The discs in Figs. 1 and 2 are dry and therefore porous and capable of passing air therethrough to the ports 44. In Fig. 3 the discs are wet. They may not be completely saturated but they have taken up at least enough water to cause them to expand in the direction of the central axis to press so firmly against each other that further passage of water therethrough is precluded. Upon subsequent drying of discs 42, they will shrink sufficiently to permit the passage of air therethrough until they are again swollen by additional water which may reach the valve due to a rising liquid level.

With the foregoing constructional features in mind, the operation of the valve will now be explained. If it is desired to vent air from the radiator quickly, the user will unscrew cap 14 to the position shown in Fig. 2. Air will then pass directly from the radiator through passage 6, area 50 and vent 46 to the atmosphere. As soon as the radiator is filled with water, which will be recognized by the escape of a small quantity through port 46, the cap is then screwed inwardly to the position shown in Fig. 1. The end of plug 22 may be brought into direct engagement with wall 43 at which point the sealing ring 40 will be sufficiently compressed to prevent the escape of any air or water through vent 46. With the valve in this condition any further escape of air must be through ports 44. To reach ports 44, the air must pass along the threads of metering screw 32, through bore 28 and thence through or between discs 42 to ports 44. If air accumulates in the top of the radiator under pressure greater than atmosphere, the air will follow the aforesaid route, working its way slowly past discs 42, but in sufficient quantity to ultimately vent the radiator. If the pressure continues and the water level rises to a point where water enters passage 6, then the water will follow the same route but on reaching discs 42 it will gradually wet and be absorbed by the discs, causing the discs to swell as indicated in Fig. 3, thereby blocking further passage of the water. In other words, the valve provides for the slow escape of air but will block any attempt of the water to escape along the same route. If the water level in the radiator thereafter falls, the wet swollen discs of Fig. 3 will gradually dry out to assume their original condition, as shown in Fig. 1.

Three modifications of the valve are shown in Figs. 5, 6 and 7. Fig. 5 is substantially the same as that shown in Figs. 1 to 3 except that plug 22 is held in engagement with cap 14 by a press fit between these parts as indicated at 52. The construction and operation are otherwise the same as that heretofore described.

Fig. 6 differs from the other constructions in that cap 14 is secured against longitudinal movement with respect to plug 22 by a snap ring 54. Plug 22 is free to turn with respect to cap 14. In operation, it is immaterial whether these two parts are fixed against rotation with respect to each other. Another difference in the construction of Fig. 6 is the substitution of a metering valve 55 for the metering screw 32. This valve is in the form of a ball which partially but not completely closes bore 28. While the ball is shown in engagement with the right hand end of passage 6 and the left hand end of bore 28, nevertheless, the seating conditions are such that there may be slow but continuous leakage of either water or gas past this valve so that the

5

effect is the same as that achieved with the metering screw 32.

The modification shown in Fig. 7 differs from the previous forms in that there is no connection between plug 22 and cap 14. The plug fits in freely slidable condition within the left hand end of the cap. When the cap is screwed down to bring sealing ring 40 into engagement with wall 48 and the opposed shoulder on plug 22, the pressure is exerted through the discs 42. However, due to the flexibility of sealing ring 40, enough pressure may be brought to bear thereon to close off port 46 while still leaving the discs 42 in such condition that air may pass therethrough in the manner heretofore described. Attention is again called to the fact that the discs 42 in Figs. 5, 6 and 7 are shown as having their faces physically separated from each other. Ordinarily, the discs in their dry condition will have their faces touching although under some circumstances the faces might be separated to a limited extent. However, the discs which are made of any suitable type of hygroscopic material will always expand sufficiently when wet to check the flow of any water to the ports 44. In the preferred form, the hygroscopic material will be fiber but any other form, such as a hygroscopic plastic, may also be used. Furthermore, although a plurality of discs have been shown in the drawings, it will be understood that a single disc of suitable dimensions may be used.

The bar 47, within the discs, limits the quantity of water that must evaporate through the discs before the discs separate sufficiently to permit further venting. The large peripheral areas afforded by the squared edges 45 of the discs likewise speed evaporation through the several ports 44.

Applicant has accordingly provided by the valve disclosed herein means for achieving continuous automatic venting of air from the radiators of a hot water heating system, which means will prevent the escape of water if the water rises to the level of the valve. While the explanation has been made with respect to the use of the valve on the radiators of a hot water heating system, it will be understood that the valves are capable of being used in other situations where similar conditions have to be met. The invention is not to be limited by the specific disclosures shown herein but should be considered as broadly as the scope of the invention set forth in the appended claims.

I claim:

1. An air venting valve comprising a valve body threaded for connection with a radiator, a central passage through said body, an expanded portion concentric with and forming part of said body, a cap closed at its outer end in threaded engagement with said expanded portion, a plug within said cap, a circular seat on said body and an opposed circular surface on said plug aligned with said central passage, a sealing ring positioned between said seat and surface and adapted to be engaged upon movement of said cap and plug toward said body to seal said central passage from the area exterior of said ring, a bore through said plug in series with said central passage, a first vent through said body leading to the atmosphere from the area exterior of said sealing ring, a second vent through the wall of said cap, and a hygroscopic element between one end of said plug and the inner surface of the end of said cap, said hygroscopic element when dry permitting the passage of air from said plug bore to said second vent

6

and, when wet, blocking the flow of water from said plug bore to said second vent.

2. An air venting valve as set forth in claim 1 in which said hygroscopic element is in the form of a plurality of discs having central openings aligned with said bore.

3. An air venting valve as set forth in claim 1 in which said hygroscopic element is in the form of a plurality of discs having central openings aligned with said bore and portions of the edges of said discs are spaced substantially from the interior of the wall of said cap to provide an enlarged evaporation area.

4. An air venting valve as set forth in claim 1 in which said hygroscopic element is in the form of a plurality of discs having central openings aligned with said bore, said discs being noncircular in outline with limited portions of their perimeters in engagement with said cap to provide enlarged evaporation areas.

5. An air venting valve as set forth in claim 1 in which said hygroscopic element is in the form of a plurality of discs having central openings aligned with said bore, and a bar extending through some of said central openings to minimize the free space within said discs.

6. An air venting valve as set forth in claim 1 in which the plug is fixed against longitudinal movement with respect to said cap.

7. An air venting valve as set forth in claim 1, said plug being in screw threaded engagement with said cap to permit initial adjustment of the pressure of said plug against said hygroscopic element.

8. An air venting valve comprising a valve body threaded for connection with a radiator, a central passage through said body, an expanded portion concentric with and forming part of said body, a cap closed at its outer end in threaded engagement with said expanded portion, a plug within said cap, a circular seat on said body and an opposed circular surface on said plug aligned with said central passage, a sealing ring positioned between said seat and surface and adapted to be engaged upon movement of said cap and plug toward said body to seal said central passage from the area exterior of said ring, a bore through said plug in series with said central passage, means for limiting the flow of liquid through said plug bore, a first vent through said body leading to the atmosphere from the area exterior of said sealing ring, a second vent through the wall of said cap, and a hygroscopic element between one end of said plug and the inner surface of the end of said cap, said hygroscopic element when dry permitting the passage of air from said plug bore to said second vent and, when wet, blocking the flow of water from said plug bore to said second vent.

9. An air venting valve as set forth in claim 8 in which said means for limiting flow of fluid through said plug bore comprises a metering screw.

10. An air venting valve as set forth in claim 8 in which said means for limiting the flow of fluid through said plug bore comprises threads on the interior of said bore and a metering screw having a thread differing in pitch from the thread in said bore.

11. An air venting valve as in claim 8, said means for limiting the flow of fluid through said bore comprising a ball valve and seats therefor.

12. An air venting valve comprising a valve body having a threaded portion at one end for screw threaded engagement with an air source, a

7

passage through said body portion, an enlarged body portion interiorly threaded, a wall at the interior end of said enlarged body portion, a cap closed at its outer end and exteriorly threaded at its inner open end and in threaded engagement with said enlarged body portion, a plug within said cap, a hygroscopic element between the inner end of said plug and the closed end of said cap, a sealing ring between said wall and said plug, a port through said enlarged body portion adapted to be sealed from said passage by said sealing ring when said sealing ring is engaged by said

8

wall and plug, a bore through said plug in series with the passage through said body portion, and ports through said cap exteriorly of said element.
WARREN T. FERGUSON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,398,764	Blum -----	Nov. 29, 1921
2,153,726	Scoppola -----	Apr. 11, 1939
2,467,217	Mikeska -----	Apr. 12, 1949