

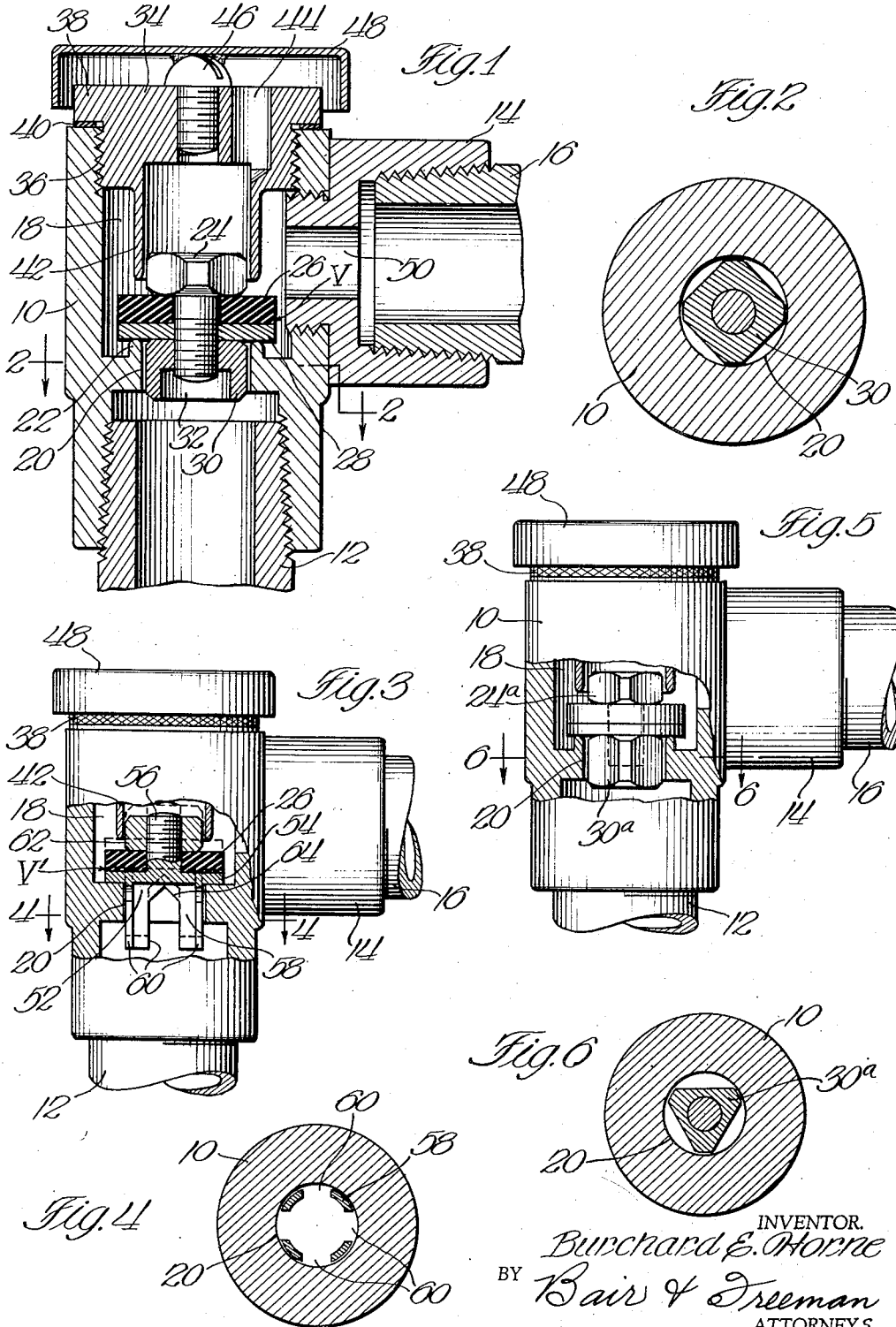
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VACUUM BREAKER

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VACUUM BREAKER

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My invention belongs to that class of devices utilized for venting a pipe line or the like to atmosphere, when the pressure in the line drops to atmospheric, to prevent the creation of a vacuum in the line.

An object of my invention is to provide a vacuum breaker which shall be positive and dependable in operation.

Another object is to provide such a vacuum breaker which will not leak from the vent when subjected to fluctuations or rapid variation in line pressure.

A further object is to provide in a vacuum breaker a vent which is surrounded and protected in a manner to prevent the entry of dirt or other foreign matter which might injure or clog the valve surfaces.

Another object is to provide such a device in which the valve is guided on to its seat to assure a secure closure even under conditions of severe hydraulic or mechanical disturbance.

Another object is to provide a modified form of vacuum breaker in which the guide is of slotted tubular form to improve the operation of the breaker under certain conditions.

Another object is to provide such a device embodying a restricted orifice between the main valve chamber and the outlet passage.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawing, wherein:

Figure 1 is a vertical sectional view of a vacuum breaker embodying my invention.

Figure 2 is a horizontal sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a vertical elevational view partly in section similar to Figure 1 showing a modified form of my invention.

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a vertical elevational view partly in section similar to Figure 3, and showing another modified form of my invention.

Figure 6 is a horizontal sectional view taken on the line 6—6 of Figure 5.

In the accompanying drawing I have used the reference numeral 10 to indicate generally a casing which may be of brass or any other suitable material and may be cast, forged or made up from rolled stock as best fits the requirements of particular cases.

At its lower end the casing 10 is threaded to receive a standard pipe or pipe fitting 12. A portion of my device is formed as an internally threaded hub 14 which may be either a separate piece threadedly engaging the body 10, as in Figure 1, or may be formed integrally with the body 10, as I have shown it in Figures 3 and 5.

The hub 14 receives a threaded pipe or pipe fitting 16.

In the interior of the body 10 I form a chamber 18. At the bottom of the chamber 18 the material of the body 10 is formed in a restricted aperture constituting a port 20 surrounding which I may form an upstanding annular rim 22. A valve member indicated generally as V includes a bolt 24 preferably having a square head as I have shown it in Figure 1. On the bolt 24 I secure a composition washer 26 and the metal washer 28 by means of the nut 30 threadably engaging the lower end of the bolt 24. In the lower end of the nut 30 I preferably form a recess 32.

To close the top of the chamber 18 I provide a plug 34 having a threaded engagement with the body 10 at 36 and having a portion 38 of enlarged diameter which is preferably knurled as in Figure 3 to facilitate its removal without tools. Between the portion 38 and the body 10 I preferably employ a gasket 40 to effect a leak-proof seal.

The plug 34 has a downwardly extending tubular portion 42 having an internal diameter slightly greater than the greatest distance across the "sharps" of the head of the bolt 24. The portion 42 constitutes a guide for the head of the bolt 24 as can be plainly seen in Figure 1.

In the plug 34 I provide a passage 44 constituting a vent between the inside of the tubular portion 42 and the external atmosphere. A number of such passages 44 may be provided if desired. Also, in the top of plug 34 I provide for the threaded engagement of a screw 46 which has affixed to it by soldering or by other suitable means, a cap or bonnet 48. This cap prevents the entry of dirt or other foreign material into the passages 44 which might injure or foul the valve surfaces or which might obstruct the vents 44.

The hub portion 14 has a restricted aperture 50 forming an outlet from the chamber 18.

My device is intended to be installed in the water supply line to a household fixture or the like, and the pipe 12 will be the inlet passage, connected to the source. The pipe 16 will be connected to the fixture. My vacuum breaker should be installed in the supply system at a level above

the outlet of the fixture which it serves, preferably at least six inches or more above that outlet.

Under normal operating conditions when the proper supply pressure exists in pipe 12 the supply line pressure will exist in the chamber 18 and the valve assembly V will be held in raised position with the composition disc 26 in engagement with the lower end of the tubular portion 42. This position of the valve, which I will call the inoperative position, is shown in dotted lines in Figure 3.

However, should the pressure in the supply line 12 fall for any reason, the valve assembly V will drop as soon as the supply line pressure is reduced to atmospheric. At that point the valve assembly V will move downwardly, guided by the coaction of the head of the bolt 24 with the inside of the tubular portion 42 and also by the coaction of the nut 30 with the port 20. The pipe 16 is then vented to atmosphere through the opening 50, the chamber 18 and the vent passage 44. This venting function assures that any condition of vacuum which might occur in the pipe 12 will not be communicated to the pipe 16, and hence the danger that foreign materials or dirty water might be drawn into the system by reverse flow from the outlet of the fixture which may be connected to pipe 16 is eliminated.

It will be observed also that the engagement of the washer 28 with the annular seat portion 22 forms a check valve arrangement which substantially prevents the entry of air into the pipe 12 when a vacuum exists therein.

In the abnormal situation where the supply pressure fails and a vacuum occurs in the supply line (as for example when a fixture is opened on a lower floor), my vacuum breaker accomplishes in a very efficient manner two desirable functions, to-wit:

a. It vents the fixture line 16 to atmosphere as soon as the supply line pressure drops to atmospheric;

b. It serves as a check valve preventing the entry of air into the portions of the supply system ahead of the vacuum breaker.

The first function is desirable as pointed out above to prevent contamination of the supply system by reverse flow. In some fixtures, as in certain bathtub installations, the outlet of the faucet may be below the water level and my device prevents back siphonage in case of failure of the supply pressure.

With regard to the function b, it is desirable so far as possible to prevent entry of air into the system (except for the vented portion between the vacuum breaker and the fixture, represented by the pipe 16) because when pressure is re-established and the faucet or other fixture is opened the imprisoned air usually issues from the fixture in almost explosive bursts which may be injurious to fixtures and piping and is certainly annoying and distressing to the household.

Vacuum breaker valves of this general type are not new but many of those on the market are unsatisfactory because they are not positive and trouble free in operation. Leakage through the vent, for example, is a very troublesome and annoying fault in a device of this kind.

In the construction which I have employed, the arrangement by which the valve is guided as it moves vertically contributes materially to constant and dependable operation of the valve be-

cause the manner in which it seats is the same every time.

Various methods of guiding the valve V may be provided and come within the scope of my invention. In Figure 1 the nut 30 is substantially square with rounded corners as appears more plainly in Figure 2. The head of the bolt 24 is of similar shape. However, I do not limit myself to square formation either in the nut 30 or the head of the bolt 24 but I may, for example, use a triangular shape as shown in Figures 5 and 6, in which I have designated the parts by the reference numerals 24a and 30a.

The triangular shape permits somewhat greater room for passage of fluid between the "flats" of the nut 30A and the walls of the port 20. This will be apparent by comparison of Figures 2 and 6, taking into consideration that the figures are not to the same scale. Any other forms, such as hexagonal, may be employed, if desired.

In Figure 1 the valve assembly V is shown in what will be called the operative position, which is the position taken when the pressure in the pipe 12 is equal to or less than the atmospheric pressure outside the device. When the pressure is restored in pipe 12, it will exert a force against the underside of the nut 30 tending to move the valve assembly V upwardly. It will be seen, however, that as soon as the valve assembly is lifted, water will flow into chamber 18, building up some pressure there, and the resulting flow will have the effect of reducing the net lifting force effective on the underside of the valve assembly. The result sometimes is that the valve does not move promptly and firmly into inoperative position (indicated by dotted lines in Figure 4) but may hesitate or pulsate momentarily and allow some leakage of water from the vent. My guided valve arrangement as contrasted with earlier forms of breakers is usually sufficient to overcome this tendency, since it prevents tipping of the valve or lateral displacement, either of which may cause unsatisfactory seating and erratic operation.

Furthermore, for installations where the device is subject to severe hydraulic or mechanical vibration, or where the conditions of supply pressure are so variable that ordinary breakers will not work consistently, I have devised a modified form of my invention which fills the need. This form is shown in Figures 3 and 4 in which the valve assembly, indicated as V', includes as a single element the unit 52 comprising a disk-like portion 54, a threaded stud portion 56 and a downwardly extending tubular guide member 58. The composition washer 26 is retained against the disk-like portion 54 of the unit 52 by a nut 62 threaded on to the stud 56.

The tubular member 58 is provided with longitudinally extending slots 60. These slots are shown as open at the lower end of the member 58 but, if desired, the tubing may be circumferentially complete at the lower ends, thus closing the ends of the slots and giving greater strength.

As will be seen in Figure 4, I have provided four of the slots, spaced equi-distant. It is obvious, however, that any suitable number may be used.

The tubular guide 58 has an external diameter slightly less than the internal diameter of the port 20 and hence serves to guide the unit 52

and the parts associated with it in their vertical movement when the valve functions.

An important detail of the tubular guide portion 58 is the tapered shape of the upper ends of the slots 60, as indicated at 64 in Figure 3. After the valve assembly V' has been in operative position (full lines Figure 3) and the pressure in pipe 12 is subsequently restored, the assembly V' will move upward, but since only the apex of the tapered portions 64 will at first project above the top of the port 20, the water flow in the chamber 18 will be held to a small amount until the valve has traversed a substantial part of its movement on the way to its inoperative position (dotted lines Figure 3). In other words, the cycle of movement of the valve assembly is well under way before there is enough build-up of pressure in the chamber 18 to effect any substantial reduction of the net lifting force on the valve. Positive, trouble-free operation is the result.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope

without sacrificing any of the advantages thereof.

I claim as my invention:

1. In a vacuum breaker, a casing, an inlet passage to said casing, a plurality of outlet passages from said casing, and a valve assembly comprising a headed bolt, a metal washer, a composition washer, and a nut retaining said washers on said bolt, the head of said bolt engaging the wall of one of said outlet passages and being guided thereby and said nut engaging the wall of said inlet and being guided thereby.

2. In a vacuum breaker, a casing, a chamber therein, an inlet passage to said chamber for connection with a pressure supply line, a plug closing one end of said chamber, a tubular extension of said plug projecting into said chamber, a passage through said plug from the outside thereof to the inside of said tubular extension, and a valve assembly comprising a headed bolt, a metal washer, a composition washer, and a nut retaining said washers on said bolt, the head of said bolt engaging the inside wall of said tubular extension and being guided thereby and said nut engaging the wall of said inlet and being guided thereby.

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