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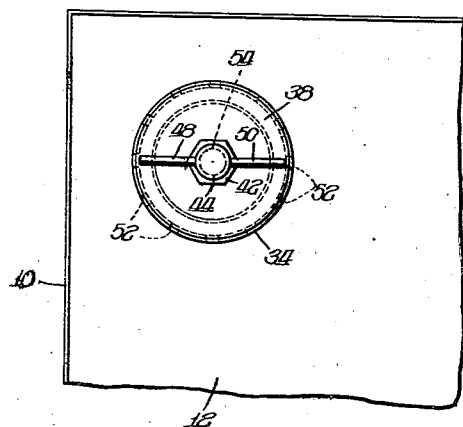
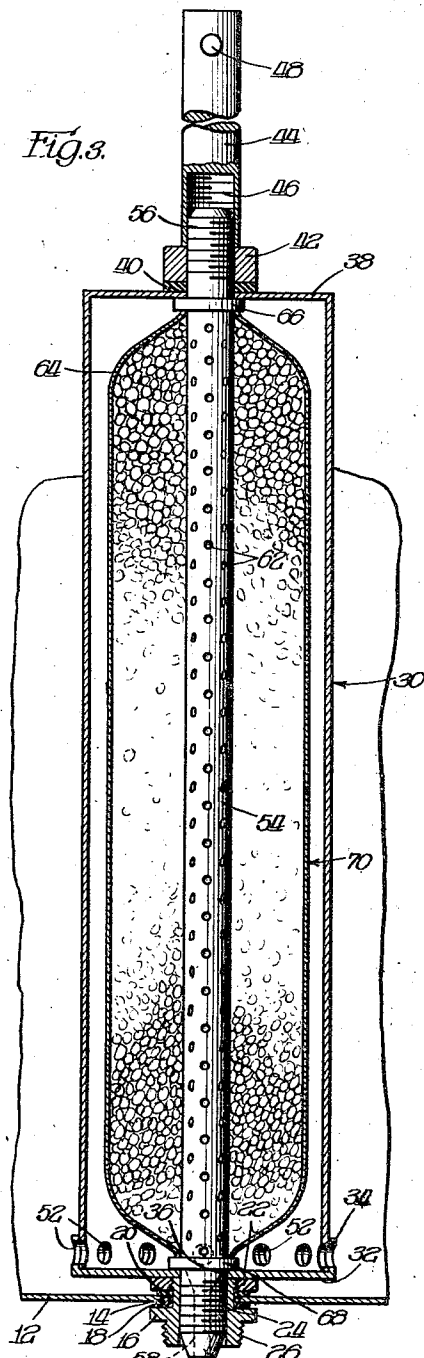
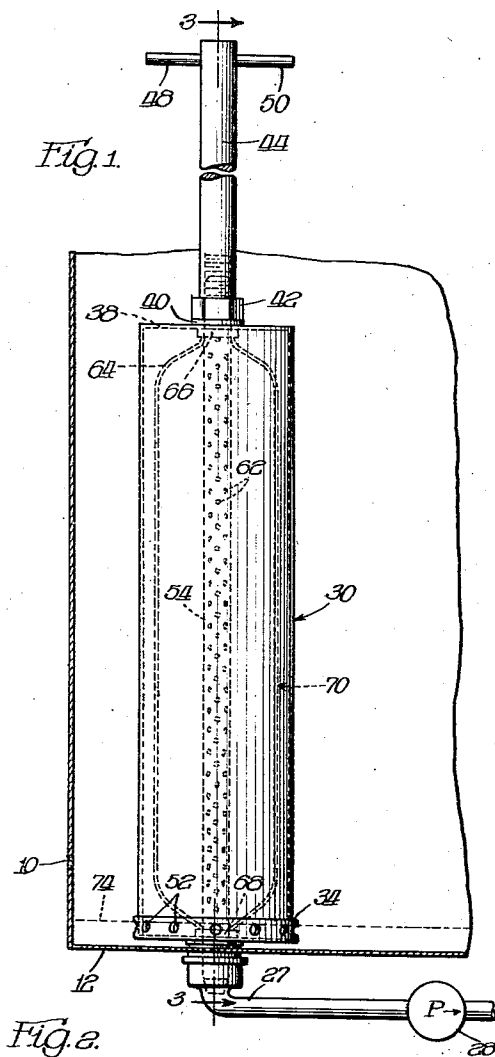
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2,358,748

WATER FILTER

Filed Feb. 14, 1941

2 Sheets-Sheet 1



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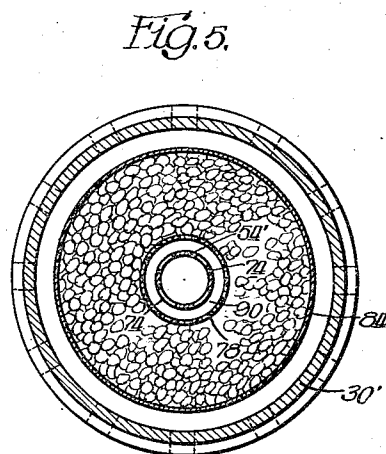
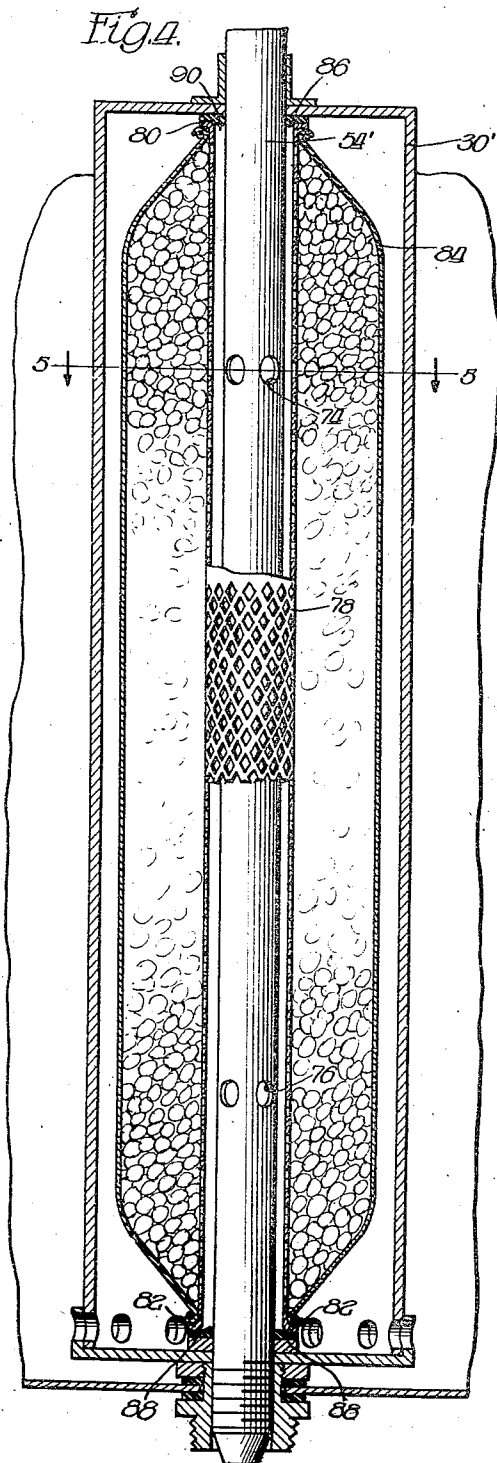
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WATER FILTER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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WATER FILTER

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Application February 14, 1941, Serial No. 378,854

2 Claims. (Cl. 210—98)

This invention relates to a water filter. More particularly it relates to a water filter for use in conjunction with a drink vending machine wherein water is to be filtered as rapidly as required for the preparation of beverages.

Carbonated beverages prepared and dispensed by most types of vending machines are not as uniform in taste nor as free from alien matter as are bottled beverages for the reason that bottlers generally use filtered water in the preparation of beverages while most operators of drink vending machines use whatever tap water is available at the location of the vending machine. In some localities tap water is so free from impurities that the difference between a beverage prepared from tap water and a beverage prepared from filtered water can not be detected, but localities in which such tap water is available are few. The impurity or the turbidity of the water available at most vending machine locations is sufficiently great to impair the taste of a beverage prepared from it. Moreover, many communities introduce various amounts of chlorine to the water and chlorinated water retains the chlorine taste in most beverages prepared from it.

Some operators of drink vending machines have sought to overcome this quality differential between bottled beverages and vending machine beverages by supplying filtered water to the vending machines. This procedure is successful but has the disadvantage of introducing a water hauling problem of serious proportions. For every gallon of syrup or beverage concentrate that must be carried by a vending machine service man, there must be carried four to six times as much filtered water, which in turn affects the size and type of truck to be used by the service men.

To eliminate this hauling problem, applicant proposes to filter water in the vending machine and to use in conjunction with the filter some substance such as activated carbon for removing chlorine. Filtering water in a vending machine encounters serious obstacles due to vending machine design and to the method of servicing vending machines. In those beverage vending machines which are portable, that is, those which do not require a water pipe connection, all water for beverages is obtained from a water reservoir within the vending machine and this water reservoir is filled periodically by a service man. The capacity of the water tank is five or six times that of the capacity of the syrup tank or tanks and the vending machine is permitted to function until it has exhausted or nearly

exhausted the ingredients for preparing beverages, at which time the machine is automatically locked. If a filter is positioned in the lower part of the water tank, one of two difficulties are encountered depending upon whether the water reaches the mixing assembly by gravity or by means of a pump. If the machine design employs a gravity system, water will not pass through the filter as rapidly as required when the vending machine is operating during a heavy load period, with the result that in order to keep the machine continuously in commission, a second reservoir for filtered water approximating in size the reservoir of unfiltered water must be placed in the vending machine. Space is at a premium in vending machines and this second reservoir, consequently, is not wanted. On the other hand, if the machine design employs a pump for delivering the water to the mixing assembly, the filter must be located in the water line in such a way that it can be removed from the water line only by opening water tight couplings. Because it is not practical to send qualified technical men to vending machine locations for the purpose of opening water lines and cleaning or exchanging filter elements, and because the average service man is not qualified to do this work, filtering water in vending machines has not reached a commercial stage of development.

The first object of this invention is to utilize the suction of a vending machine pump for filtering the water as rapidly as required for the preparation of beverages while nevertheless so positioning the filter element between the water reservoir and the beverage mixing assembly that water tight couplings need not be opened in order to remove the filter element. One of the features of this invention is the positioning of a filter element on the low side of the pump inside the water reservoir in such a manner that the pump can obtain water from the water reservoir only by drawing it through the filter element regardless of the depth of the water in the tank while the filter element itself, nevertheless, may be quickly removed from the tank. By this arrangement, the ordinary service man (one who fills water and syrup tanks and cup magazines) may remove the filter element for cleaning purposes without touching any of the pipe fittings.

Another object of this invention is to provide means for substantially emptying the water reservoir so that the vending machine locking mechanism may be set to lock the machine only when the water tank has become practically empty. While it would appear comparatively

simple to position a filter near the bottom of a water reservoir so as to permit a pump to suck water into a space therebelow, obtaining the necessary seal between the filter element and the inside tank wall is possible only by sacrificing ready removability of the filter. In order to provide a filter having a large surface area and yet having the ability to substantially empty the water reservoir, applicant has positioned a filter element of considerable height on an outlet in the bottom of the reservoir and over this filter element has positioned an air-tight hood excepting for openings near the bottom of the water reservoir. By this arrangement the pump on the first cycling of the machine creates a space reduced pressure inside the hood which space is immediately occupied by water from the reservoir. This water upon further cycling of the machine passes through the filter to the pump in the normal manner. The filtering of the water will continue after the water level in the reservoir has dropped below the top of the air-tight hood and until the water level reaches the openings in the hood near the bottom of the hood, at which time, the suction in the hood will be destroyed and the system will cease to function. Inasmuch as this occurs when the water reservoir is substantially empty the machine will have become locked by other means in the vending machine.

A further object of this invention is to assemble the filter element and the air-tight hood into a single assembly which may be referred to as a filter cartridge and provide simple means for removably mounting this filter cartridge in the outlet of the water reservoir. Applicant provides interior threads on the reservoir outlet fitting and a threaded member on the cartridge, whereby a service man may remove the top of the water reservoir and screw the filter cartridge into the threaded means. An elongated handle on the upper portion of the cartridge makes it possible to do this without reaching any great distance into the water reservoir.

A further object of this invention is to provide a filter member which is readily removable from the filter cartridge so that a service man on location need only clean the inside of the cartridge if the filter element itself is in such condition that he cannot clean it. By this arrangement a service man may carry replacement filter elements and it will never be necessary to place the vending machine out of commission while the filter element is being returned to a plant for cleaning.

A further object of this invention is to provide a removable bottom for the filter cartridge in conjunction with the positioning of inlets to the filter cartridge at a point slightly above the bottom. By this arrangement a basin is provided in the bottom of the filter cartridge for catching sludge. This removable bottom being shallow is readily cleaned.

Another object of this invention is to position the openings into the filter cartridge at a point slightly above the bottom of the water reservoir whereby impurities in the water in the reservoir may collect on the reservoir bottom and not be disturbed by water flowing into the filter cartridge. In many communities water contains a very large amount of suspended matter which will collect on the bottom of whatever vessel is holding the water when the water is at rest. It is highly desirable that this action be not impaired during the cycling of a vending

machine because it materially reduces the work of the filter and thereby increases the time between filter element exchanges or filter cleanings.

Applicant's invention includes other features. One of which is the provision of a large tapering end on the means for assembling the filter cartridge with the water reservoir outlet whereby a service man without looking down into the reservoir, which may be difficult due to the vending machine design, will be able to assemble quickly the filter cartridge once the tapered end has found the outlet hole.

These and such other objects as may herein after appear are attained in one embodiment of this invention shown in the accompanying drawings, wherein:

Figure 1 is a view of a portion of a water reservoir with applicant's filter cartridge mounted therein and diagrammatically of a connection to a water pump;

Figure 2 is a plan view of the structure shown in Figure 1;

Figure 3 is a view in section of applicant's filter cartridge taken on the line 3—3 of Figure 1;

Figure 4 is a view in section of a modified form of applicant's invention; and

Figure 5 is a sectional view taken on the line 5—5 of Figure 4.

Continuing to refer to the drawings, and particularly to Figure 1, the numeral 10 identifies a side wall of a water reservoir and 12 the bottom of the water reservoir. Referring to Figure 3, in a hole 14 is positioned a pipe fitting 16 which is maintained in water tight relationship with the bottom 12 by means of seals 18 and 20 and a nut 22. Any other type of water tight fitting would serve as well. The inside wall of the fitting 16 is threaded at 24 and other means such as threads 26 are provided for coupling a water line 27, schematically shown in Figure 1, leading to a pump 28. The filter cartridge 30 comprises a hood, being a metal jacket, which is air tight throughout its height excepting for holes near its lower edge which is closed by a removable sludge pan 32. A fairly tight fit between a flange 34 around the circumference of the sludge pan 32 and the outer bottom portion of the wall of the filter cartridge 30 is provided in order to hold the two in assembled relationship while nevertheless permitting a service man to remove easily the sludge pan 32 for purposes of cleaning or for removing the filter element. A hole 36 is centrally positioned in the sludge pan 32. The top end wall 38 of the filter cartridge 30 has at its center a hole 40 of the same size as the hole 36 and a nut 42 establishes a water tight connection between a handle 44 and the filter cartridge 30 when a tubular supporting member 54 is drawn up tight therein. The handle 44 is interiorly drilled and threaded at 46. It may be of any desired length, depending upon the depth of the water reservoir, and has finger gripping means such as 48 and 50, see Figure 1, on the upper end. A plurality of holes 52 through the flange 34 are in registry with holes 31 in the filter cartridge 30 and together provide passageways for water from the reservoir into the filter cartridge 30.

The filter element, generally identified by the numeral 70, consists of the tubular supporting member 54 having each end threaded as at 56 and 58 with a tapered guide tip 60 on one end. The tubular supporting member 54 is perfo-

rated by a plurality of holes 62 and this perforated portion of the tube is surrounded by a water permeable filter element comprising a filter casing 64 held in position by ring members 66 and 68. Disposed between the filter casing 64 and the tubular supporting member 54 is any suitable substance such as activated carbon for moving from water certain undesirable substances such as chlorine.

It will be observed that the holes 52 are positioned slightly above the bottom of the reservoir. This is for the purpose of reducing water flow at the bottom 12 of the water reservoir. This distance may be varied to suit requirements. Permitting the collection of undesirable particles in the bottom of the reservoir greatly decreases the load on the filter element.

The filter element is a unit in itself. When the filter cartridge 30 has been removed from the reservoir, the filter element 70 may be removed from the cartridge by removing the sludge pan 32 and unscrewing the tubular supporting member 54 from the nut 42 and the handle 44. The two ends of the filter element are identical so that it is immaterial which end is mounted inside the filter cartridge.

Importance is not attached to the height of the filter element or the filter cartridge. The dimensions of the filter element will conform to the dimensions of the filter cartridge and the dimensions of the filter cartridge may be varied to suit the particular water reservoir in use in any given vending machine. The filter cartridge would perform its function if it were short and broad or again, if it were taller. The limit of its effective height is, of course, the limit to which atmospheric pressure will force water vertically through the holes 52.

In operation, assuming that the water reservoir is full at the time when the filter cartridge is screwed into the fitting 16, the first cycle of the vending machine will cause the pump to create a partial vacuum on its low side, that is, inside the tubular supporting member 54. Because air will pass through the filter element 70 with greater ease than will water, water will be drawn through the openings 52 upwardly around the entire filter element 70 so as to fill the filter cartridge completely. In actual practice one cycle of a vending machine which draws about five ounces of water for each drink will fill the filter cartridge with water. Subsequent cycling of the vending machine will direct water through the filter element and through the holes 62 in the tubular supporting element 54 downwardly through the opening 72 into the pipe leading to the pump 28. The filter will continue to function as the water level drops downwardly, referring to Figure 1, until the reservoir has been emptied so that the water level stands at 74. During all of this time the air-tight hood 30 has remained full of water and the suction of the pump has been fairly effective in drawing water through the filter element 70 at all points into the tubular supporting member 54. When the water reaches the level 74, air enters the air-tight hood 30. When this occurs, the filter will no longer supply filtered water to the pump as required and it is essential that the vending machine be in locked condition when the water drops to this level. The manner of locking the vending machine is generally made dependent upon the number of drinks drawn, maintaining a safe margin, or by some water level device.

It will be appreciated that in one aspect applicant's invention resides in positioning a water filter having a large filter area intermediate a water reservoir and a suction pump without holding the height of the filter to a point below the lowest level of the water in the reservoir desired to be reached before the reservoir must be refilled. Applicant draws water up into a filter cartridge and then provides means for passing the water through a comparatively large filter element whereby the capacity of the filter remains high and substantially uniform regardless of varying depths of the water in the reservoir.

The advantages of applicant's invention are many. In the first place it is no longer necessary to haul water from a filtration plant to the location of the vending machine. Additionally, it is possible to utilize the suction of the pump to filter water as rapidly as the vending machine requires it and under such circumstances that the removal of the filter does not require the opening of any pipe couplings in the water line. In consequence of this ability to filter water as rapidly as required, a vending machine equipped with applicant's filter, which machine has been rendered inoperative because of lack of water, may be placed in condition for resumption of operation by simply filling the tank and cycling the machine once.

From the servicing standpoint the filter cartridge and the means for assembling it with the water reservoir have great advantages. It is not necessary to have a skilled mechanical man make filter exchanges. A regular service man may remove the cartridge from the tank, clean the sludge catching element 32, the filter element 70 and the inside of the air-tight hood 30. He may reassemble them, no particular skill being required, and mount the air-tight hood 30 in the water reservoir.

In Figures 4 and 5, there is shown a modified form of applicant's invention. In this form of the invention, the supporting tube 54' is permanently mounted on the hood element 30' and in place of a plurality of ports such as 62, shown in Figure 3, the supporting tubular element 54' is provided with four or eight comparatively large holes such as 74 and 76. The filter element is a distinct unit comprising a hollow cylindrical core 78, rolled from perforated sheet metal. The ends of this hollow cylindrical core may be turned down to form two collars 80 and 82 or these collars may be provided as distinct elements, as the designer may wish. The filter material disposed within the fabric 84, for example, cotton filter cloth, may be held in assembled relationship by any suitable means such as wire wrappings or the like. In order to provide a tight seal between the inside of the filter element and the hood 30' and the reservoir outlet fittings, sponge rubber seals 86 and 88 are provided.

It will be noted that the inside diameter of the cylindrical core 78 substantially exceeds the outside diameter of the supporting tubular element 54', with the result that any drop in pressure established by the pump within the tubular element 54' will be equally established in that annular space 90, see Figure 5, between the cylindrical supporting element 54' and the hollow cylindrical core 78. This filter functions in the same manner as the embodiment shown in Figures 1 through 3.

The advantage of this particular embodiment lies in the fact that it is desirable to use a strong tubular formed element 54' in order to provide

the requisite support for the filter cartridge as a whole. Drilling the many ports in the tubular supporting element 54 shown in Figure 3 is comparatively expensive. In the arrangement shown in Figures 4 and 5, the tubular supporting element 54' is drilled with only a few large holes, such as 74 and 76, and is spaced from the cylindrical core 78 which is rolled inexpensively from perforated sheet material.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A water filter assemblage comprising a water reservoir, an outlet disposed in the lower portion of said reservoir, a water conduit opening into said reservoir outlet and extending upwardly into the water reservoir, a plurality of ports in the walls of said conduit, a filter element over said ports, an air-tight hood supported on the upper end of said water conduit and extending downwardly to a point below the bottom of the filter element, an opening in the lower part of the side of said hood communicating with said reservoir,

and a sludge catch basin disposed around said water conduit to form a bottom for said air-tight hood without interfering with the admission of water into said hood, whereby much of the sludge accumulations may be readily removed from the filter cartridge by removing the sludge catch basin and cleaning it.

2. A water filter assemblage comprising a water reservoir, an outlet disposed in the lower portion of said reservoir, a supporting tubular member in communication with said outlet and extending upwardly into said reservoir, a hood member sealed to the upper part of said supporting tubular member and extending downwardly toward the bottom of said reservoir, ports in the walls of said tubular member above the bottom of said hooded member, an inlet from said reservoir near the bottom of said hood member, and a removable filter element having a perforated cylindrical core disposed around said tubular supporting member.

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