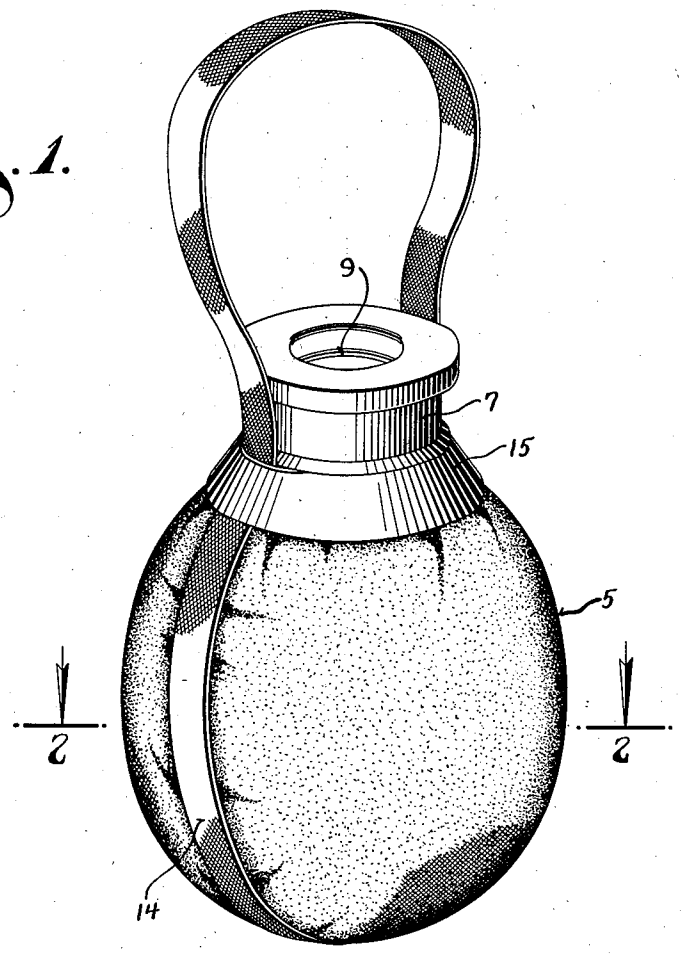
May 28, 1940. A. GUDMUNDSEN 2,202,001

WATER SOFTENER

Filed April 13, 1938 2 Sheets-Sheet 1

Fig. 1.



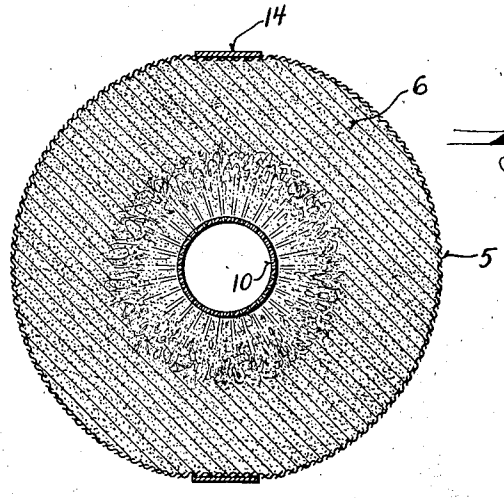


Fig. 2.

Inventor;
Austin Gudmundsen
By Dodge Smith & Jones
Attorneys

May 28, 1940. A. GUDMUNDSEN 2,202,001

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Filed April 13, 1938 2 Sheets-Sheet 2

Fig. 3.

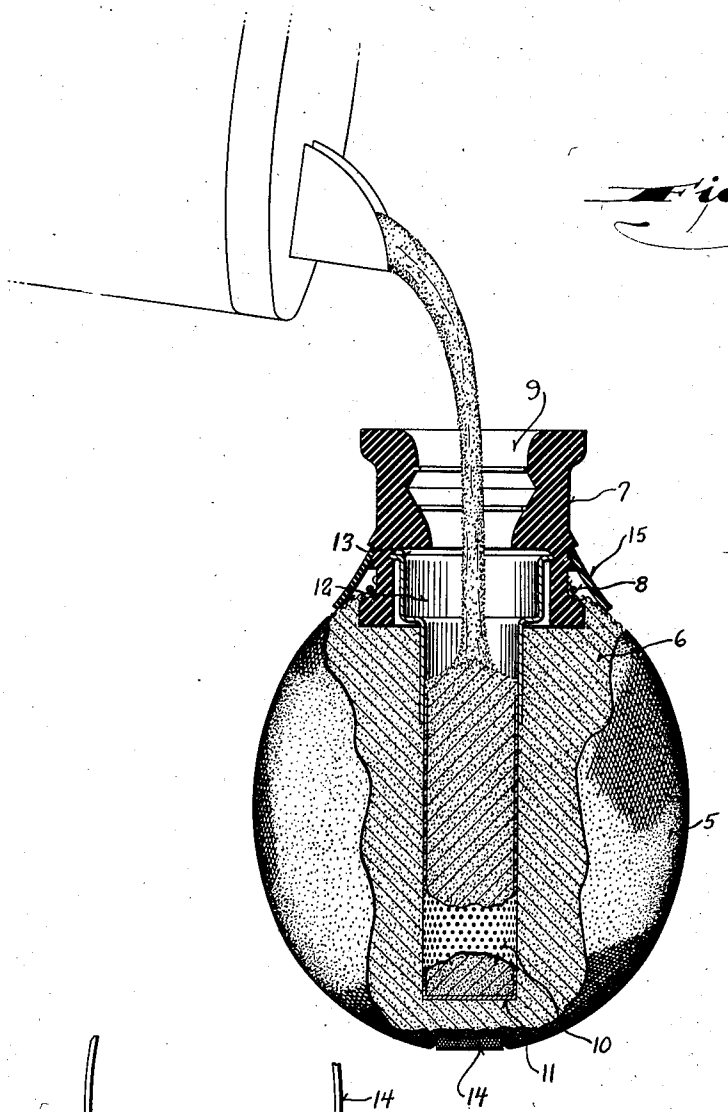
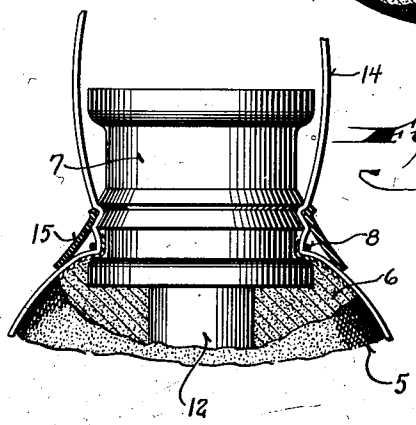


Fig. 4.



Inventor:
Austin Gudmundsen
By Smith & Jones
Attorneys

Patented May 28, 1940 2,202,001

UNITED STATES PATENT OFFICE

2,202,001

WATER SOFTENER

Austin Gudmundsen, Milwaukee, Wis., assignor to Gudmundsen-Stratton Laboratories, Inc., Milwaukee, Wis., a corporation of Wisconsin

Application April 13, 1938, Serial No. 201,718

4 Claims. (Cl. 210—24)

This invention relates to improvements in water softeners of the portable type shown in the copending application of Austin Gudmundsen, Serial No. 85,244, filed June 15, 1936, and of which this application is a continuation in part.

As in said copending application, it is a general object of this invention to provide a convenient small water softener especially adapted for attachment to faucets of hand basins and sinks.

Besides this general object, the present invention specifically contemplates the provision of a water softener so constructed that regeneration of its base exchanging material is easily and quickly accomplished by simply pouring a quantity of salt into the mouth of the softener and running enough water through the unit to dissolve the salt and carry it into the base exchanging material.

Another object of this invention is to provide a water softener so constructed that the velocity of the inflowing water is utilized to effect automatic healing of embryo channels or short circuits to guard against loss of efficacy.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of a complete water softener embodying this invention;

Figure 2 is a cross sectional view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a side view of the softener, with parts broken away and in section, and illustrating how conveniently it may be regenerated; and

Figure 4 is a detail sectional view to show the manner in which the supporting strap is held in place.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts, the numeral 5 designates a porous container, preferably a fabric bag, containing a mass of base exchanging material 6. The mouth of the bag fits over the lower end or neck of a rubber nipple 7 and is secured thereto in any suitable manner, as by tie-wires or cords 8.

The nipple 7 has a central longitudinal passage or bore 9 therethrough, which is formed with portions of different internal diameters to fit different sized water faucets. Suspended from the bottom of the nipple 7 is a perforated tube 10 which extends down into the mass of base exchanging material to a point near the bottom of the bag so that very little base exchanging material lies below the closed lower end 11 of the tube.

The tube may be secured to the nipple in any suitable manner, and in the present instance, a cup-shaped collar 12 fixed to the upper end of the perforated tube has an outwardly directed annular flange 13 which seats in a groove formed in the side wall of a counterbore in the bottom of the nipple.

A binding member 14 extends longitudinally around the bag to hold its lower end up close to the bottom of the tube and prevent shifting of the base exchanging material to the extreme bottom of the bag. This binding member 14 is preferably an endless fabric strap and is conveniently held in place by the tie wires 8. An elastic band 15 covers and conceals the tie-wires to improve the appearance of the unit.

The upper looped end of the strap extends a substantial distance above the top of the nipple, and, as shown in Figure 1, provides a handle by which the unit may be carried about.

The base exchanging material used is preferably zeolite and is of exceptionally fine grain size, being from 40–70 mesh. In consequence of this fine grain size, considerably greater surface area for a given mass of material is obtained, which gives it very high activity. However, as pointed out in the copending application hereinbefore referred to, fine grain zeolite could not be used with softener constructions heretofore in use for the reason that the packing which was inevitable with these constructions so restricted the flow rate as to make the unit impractical.

This objection may be overcome by elastically confining the mass of zeolite and by having the water flow outwardly from the core of the mass, as in the aforesaid copending application, but allowing the bed to "breathe" in this manner, makes it important that particular consideration be given the objectionable possibility of localized flow or channeling. Hence, in the construction forming the subject matter of the aforesaid copending application, the zeolite bed or mass is elastically confined under sufficient pressure to substantially balance the outward water pressure.

In the present invention an entirely new principle is utilized to prevent channeling. It consists in using high velocity impingement of the water with the zeolite. To insure this action uniformly throughout the entire length of the tube, the tube has an internal diameter large enough to render friction losses negligible. In other words, the internal diameter of the tube is sufficiently large that it acts substantially as a reservoir with the outward pressure on all portions thereof equal. Preferably the tube diam-

eter is no smaller than the smallest diameter of the nipple.

In addition, the size of the perforations and their distribution over the length of the tube is such that the jets issuing therefrom strike the adjacent portions of zeolite with substantial force.

This forceful impingement of the water on the adjacent portions of the fine grain zeolite mass constantly maintains the same in a state of flux or turbulence so that the zeolite mass or bed is self-healing. In other words, this state of flux or turbulence prevents channeling by allowing the floating or moving fine particles of zeolite to automatically migrate to the region of greatest local flow thereby healing or closing up embryo channels. In this manner, there is created in effect an unbroken shell of uniformly packed zeolite directly under the inner surface of the bag which, during operation, assumes a substantially spherical shape.

To insure the continuance of this condition for the life of the unit notwithstanding losses of zeolite through the interstices of the cloth bag as the particles are reduced in size by attrition, the bottom of the bag, as stated hereinbefore, is close to the bottom of the tube when the unit is new, and the length of the supporting strap is such that it holds the bottom of the bag in this position.

Hence, there is very little, if any zeolite outside the range of the radially outwardly projecting jets and as a consequence, substantially all of the central portion of the mass is maintained in the desired state of flux.

When the unit is not in use, there is, of course, a tendency for the zeolite to pack down toward the bottom of the bag below the closed end of the tube; but immediately upon the initial waterflow, the bag assumes its substantially spherical shape and any slack is taken thereby lifting the accumulation of zeolite from below the tube back into the range of the water jets issuing from the tube.

Even though quite a loss in volume is experienced as the unit reaches the end of its longevity, the supporting strap being of substantially constant length will at all times draw the bottom of the bag up into juxtaposition to the bottom of the tube as the bag is expanded by internal pressure, thus assuring that all of the zeoolite will be available for effective use.

Another very important advantage of the present invention is the ease with which the softener may be regenerated. The perforated tube being of relatively large diameter forms a reservoir to hold a supply of salt adequate for one complete regeneration of the base exchanging material, and by virtue of the relatively large diameter of the tube, the filling of this reservoir with salt, as shown in Figure 3, is a simple operation and can be effected so handily that daily regeneration of the softener is not an inconvenience such as would dissuade the housewife from using the softener for all purposes.

The specific manner of using the softener is believed to be obvious, but it is desired to point out that its small size and convenient regeneration are factors which highly recommend, and in fact persuade, its use in ordinary household work, such as washing dishes and the like.

What I claim as my invention is:

1. A substantially nonfiltering water softening device comprising: a porous flexible container of substantially spherical shape and of a size to be held in one hand; a nipple attached to the mouth of the container for connecting the same to a water faucet; a tube leading from said nipple axially into the interior of the substantially spherical container and extending substantially across the diameter thereof; and a mass of fine grain base exchanging material filling the container around the tube, said tube having an internal diameter sufficiently large to reduce the friction drop along the tube to a negligible minimum, and said tube having an imperforate upper section extending from its connection with the nipple for approximately one-fourth to one-third of its length and having its bottom closed with an imperforate wall and the remainder of its length provided with perforations of such size and number that water flowing into the tube is discharged through the perforations with a uniform velocity sufficiently high to have the water impinge the adjacent portions of the fine grained base exchanging material with considerable force to impart turbulence thereto and cause the same to automatically migrate to regions of greatest local flow.

2. A small portable water softener comprising: a fabric bag; a tube within the bag; means for connecting the mouth of the bag with the tube and providing for the introduction of water into the upper end of the tube; and a mass of base exchanging material filling the bag around the tube, said tube having an upper imperforate walled section extending for approximately one-fourth to one-third of its length and having its bottom closed by an imperforate wall and the remainder thereof perforated so that water discharges from the tube perforations to impinge the base exchanging material and flow radially outwardly therethrough, and said tube having an internal diameter of no less than one-half inch so that friction losses are negligible and the pressure of the water in the tube is uniform over the entire area of its perforated side wall whereby uniformly high velocity jet action is assured for the water issuing from the perforations, and an adequate reservoir for salt used in regeneration of the base exchanging material is provided.

3. A small portable water softener of the character described comprising: a perforated tube open at the top and closed at the bottom; a nipple connected with the open upper end of the tube and adapted for attachment to a water faucet; a fabric bag surrounding the tube and attached at its open end to the nipple; a mass of base exchanging material within the bag surrounding the tube; and a binding member extending longitudinally around the bag to hold the bottom thereof closely adjacent to the closed bottom of the tube.

4. A small portable water softener of the character described comprising: a perforated tube open at the top and closed at the bottom; a nipple connected with the open upper end of the tube and adapted for attachment to a water faucet; a fabric bag surrounding the tube and attached at its open end to the nipple; a mass of base exchanging material within the bag surrounding the tube; and a binding member extending longitudinally around the bag to hold the bottom thereof closely adjacent to the closed bottom of the tube, said binding member being in the form of an endless loop substantially longer than the longitudinal dimension of the bag and having its upper end forming a handle.

AUSTIN GUDMUNDSEN.