May 13, 1952 T. I. S. VERMEIREN 2,596,743

ELECTRIC DEVICE

Filed Oct. 1, 1946

Fig. 1

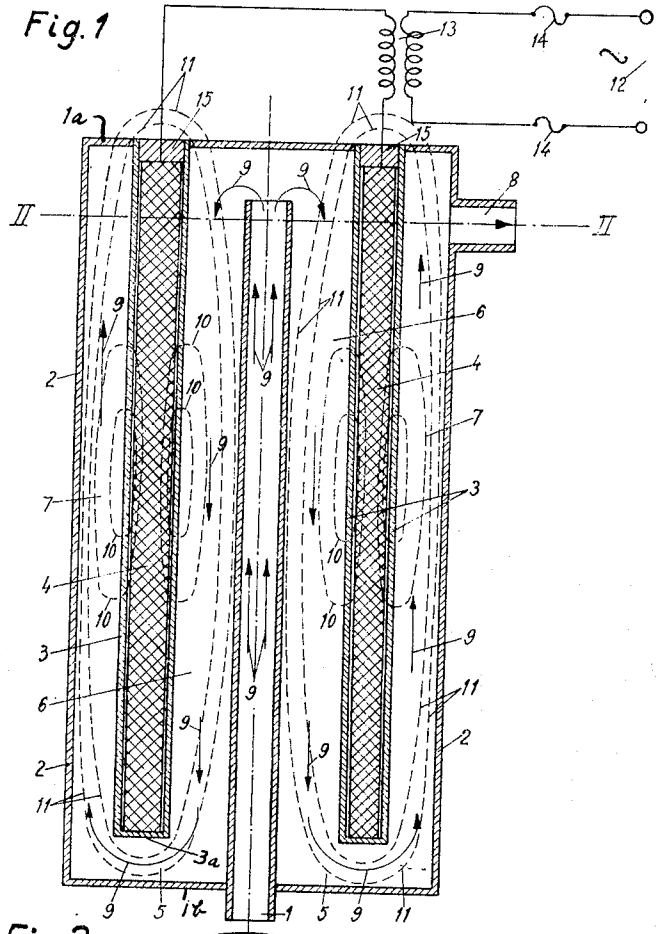
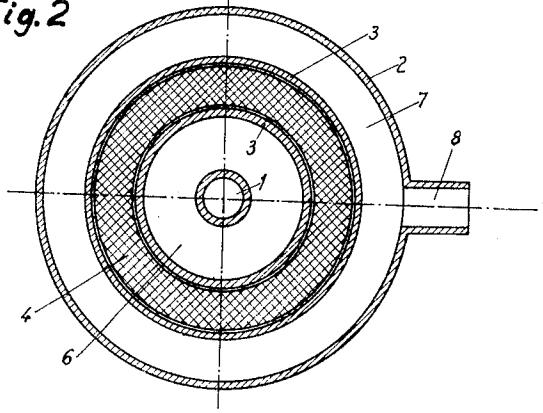


Fig. 2



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ELECTRIC DEVICE

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1 Claim. (Cl. 210—1.5)

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The present invention relates to an electric device to prevent the formation of calcareous incrustations, in apparatus containing water giving rise to the formation of incrustations of this kind, this device comprising a solenoid fed by a periodically variable current, within which solenoid there is a container in the form of a duct in which the water to be treated is contained.

The object of this invention is to obtain the maximum efficiency for a solenoid of specified characteristics fed by a specified current and to allow the largest possible number of lines of force to pass into the liquid to be treated.

To this end, according to the present invention, the device comprises a cylinder having a closed top and bottom with a pair of concentric tubular baffles extending downwardly from the top to a region close to, but spaced from the bottom to divide the upper portion of the cylinder into inner and outer chambers communicating with each other adjacent the bottom of the cylinder. A solenoid is mounted in the space between the two tubular baffles which is closed at its lower portion by a suitable closure member. A water supply duct extends upwardly through the bottom of the cylinder and has its discharge opening positioned in the upper portion of the inner chamber. With this arrangement, the water will flow axially through the center of the solenoid, be reversed and flow in the opposite direction through the center of the solenoid, and then be again reversed and flow in the opposite direction about the external portion of the solenoid to a discharge opening in the outer upper portion of the cylinder.

Other details and particulars of the invention will appear from the description of the drawing annexed to the present specification and which represents, as a non-restrictive example, a particular form of carrying into effect the subject of the invention.

The Figure 1 is a diagram of a device according to the invention shown in section, and its feeding circuit.

The Figure 2 is a section along the line II—II of Fig. 1.

As shown in the drawings, the device of the present invention comprises a cylinder 2 made of non-magnetic material and having a closed top 1a and a closed bottom 1b. Extending upwardly through the bottom 1b is a cylindrical duct 1 which is located centrally in the cylinder 2 and has a discharge opening positioned in the upper central portion of cylinder 2.

Extending downwardly from the top 1a of cylinder 2 are a pair of concentric tubular baffles 3 of non-magnetic material, dividing the upper portion of the interior of cylinder 2 into inner and outer chambers 6 and 7 respectively. Baffles 3 extend from the top 1a downwardly into close proximity to, but spaced from the bottom 1b to provide a passage 5 placing the lower portions of chambers 6 and 7 in communication with each other.

It will be observed that a tubular space is provided between the baffles 3 which is closed at the lower end by a closure wall 3a. In this space is positioned a solenoid coil 4. The upper end of the tubular space is accessible through an opening in the top 1a which is closed by a closure 15.

Water to be treated is introduced into the apparatus through conduit 1 and flows upwardly as indicated by arrows 9 through the discharge opening into the upper portion of chamber 6 where its direction is reversed. From this point, the water flows downwardly to passage 5 where its direction is again reversed to cause it to flow upwardly through chamber 7 and finally out of the cylinder through discharge outlet 8. The baffles 3 prevent the direct transverse flow of water from the opening at the upper end of duct 1 to the discharge outlet 8 and thereby increase the flow path of water through the apparatus.

During the flow of the water through the apparatus as indicated by arrows 9, it is traversed by the lines of force indicated by reference character 10 of the magnetic field created by energizing the solenoid 4. The water in its flow through the apparatus is also subjected to the action of the lines of force indicated by reference character 11 within the cylinder 2 of the magnetic field produced by energizing the solenoid.

In practice there are very few lines of force outside of cylinder 2. Therefore a maximum effect is obtained for a given number of ampere turns. The solenoid 4 is fed by an alternating current system 12, if necessary through the medium of a suitable transformer 13 and fuses 14.

Use may also be made of current of a frequency greater than the industrial frequency or even of pulsating or rectified current.

It has been experimentally ascertained that the alternating magnetic field created produces a break-up of the calcareous incrustations which can then be easily eliminated in the form of mud, and a transformation of the crystalline texture of the incrusting salts which is such that the conditioned water no longer gives rise to the formation of hard concretions.

It should be observed that this physical trans-

formation of the calcareous incrustations is obtained without any passage of current through the liquid to be treated. Its operation therefore is not disturbed when the water to be treated, contains impurities which even embody metals.

The apparatus can be placed on a duct. The space occupied and the consumption are small. It can be used to advantage for removing lime from boiler water and for domestic purposes. It should be observed that the water accomplishes a sharp alteration of direction substantially equal to 180° when flowing from the duct to the enclosure or from the first to the second portion of said enclosure.

The device shown is only one particular form of carrying the invention into effect. Various constructive modifications might be made therein without going beyond the scope of the present application. In particular use might be made of a container of any form in place of the duct 1, altering in consequence the form of the portions 6 and 7 of the enclosure. The outer wall of the enclosure need not necessarily be made of non-magnetic material, although that is preferable. There might also be a larger number of changes of direction of the current of water by creating several enclosures.

I claim:

An electric device to prevent the formation of calcareous incrustations and dislodge those already existing, in apparatus containing water giving rise to the formation of incrustations of this kind, said device comprising a cylinder of non-magnetic material with a closed top and a closed bottom, an inlet duct extending through the bottom of said cylinder up into the central portion of the cylinder and having a discharge opening positioned in the upper central portion of said cylinder for feeding said water into said cylinder, said cylinder having a water discharge outlet in the upper cylindrical wall thereof, a pair of concentric tubular baffles of different diameters surrounding the discharge opening of said duct and extending downwardly from the top of said cylinder to a region in proximity to but spaced from the bottom of the cylinder dividing the upper portion of the cylinder into concentric inner and outer chambers communicating with each other at the lower portion of the cylinder to prevent direct flow of water from the discharge of said inlet duct to the discharge outlet transversely of the cylinder, said baffles providing a tubular space between the same, means closing the lower end of said tubular space, a solenoid in said tubular space and surrounding the inner of said baffles, said solenoid extending from the upper part of said cylinder to the lower part of said tubular space, and means to feed said solenoid with a periodically variable current.

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