A structure for subjecting liquids having a dissolved and suspended calcareous content to magnetic lines of force. The liquid is caused to pass around a number of permanent magnets developing lines of force through which the liquid moves in a path intersecting such lines of force. This is achieved by mounting the magnets in a non-ferrous carrier with the poles thereof in opposed relationship, i.e., north to north, and south to south. The liquid is confined in such a manner so that it has a substantially helical flow path enabling the lines of force to be cut at right angles thereto.

1 Claim, 7 Drawing Figures
1 MAGNETIC STRUCTURE FOR TREATING LIQUIDS CONTAINING CALCAREOUS MATTER

BACKGROUND OF THE INVENTION

1. Field of the Invention.

This invention relates to devices having the property of treating calcareous laden liquids with a magnetic field. Such treatment appears to have the effect of modifying the scale producing propensities of the liquid, and it has been found that liquid treated magnetically does not deposit the calcareous components thereof as a hard scale. Rather the calcareous material is soft in texture and does not adhere as readily to heat exchange surfaces.

2. The Prior Art.

The prior art is exemplified in U.S. Pat. No. Mack 2,825,464; Green et al. 2,939,830; Vermeiren 2,652,925 and 3,345,594.

SUMMARY OF THE INVENTION

The structures according to the present invention constitute an improvement over that shown in the reference to patents in the fact that the liquid to be conditioned is confined in a path giving it maximum exposure to magnetic lines of force. The liquid is introduced to the conditioning chamber and withdrawn therefrom by a nonmagnetic pipe which also supports the magnet array. The liquid is guided helically in its path past the magnetic lines of force.

THE DRAWING

FIG. 1 is an isometric view of the magnetic structure according to one embodiment of the present invention;

FIG. 2 is a longitudinal section thereof; and

FIG. 3 is a longitudinal section showing the supply tube and the directing vane in elevation;

FIG. 4 is an elevational view of a magnetic structure according to another embodiment of the invention;

FIG. 5 is a longitudinal section therethrough;

FIG. 6 is a detailed section of one end of the magnetic structure; and

FIG. 7 is a similar section to an enlarged scale.

The improved magnetic structure according to one embodiment of the present invention is denoted by the reference numeral 10 and comprises an essentially cylindrical outer jacket 11 constructed of ferro-magnetic material and walls 12 and 13 closing the ends thereof to define a treating chamber 14. A hollow supply tube 16 of non-magnetic corrosion resisting material such as copper is supported in openings 17 in end walls 12 and 13. Walls 12 and 13 have fluid tight connections with jacket 11 and tube 17 also has fluid tight connections to said walls. The axis of tube 17 is coextensive with the longitudinal axis of jacket 11.

Tube 16 affords a support for a plurality of permanent magnets PM of high retentivity and high flux density. These are preferable cylindrical in form and may be made of barium titanate, alnico or ferrite compounds. They are shown as three in number, but more may be employed, and are arranged in a line with like poles of contiguous magnets adjacent each other to create lines of force LF extending laterally of said supply tube. A closed path for said lines of force is provided by outer jacket 11.

The magnets PM are held in position within tube 16 by plugs 18 and 19 which make a fluid tight seal with tube 16. Tube 16 has an entrant portion 21 and a discharge portion 22. An inlet opening 23 in tube 16 and within chamber 14 admits the liquid to chamber 14, and an exit opening 24 in tube 16 connects with discharge portion 22.

The liquid thus moves through chamber 14 cutting the lines of force LF created by magnets PM to treat the water as described. Structure is provided for insuring that the path taken by the water is such as to cut the lines of force with optimum effect, and to this end a helix 26 comprised of a single continuous vane 27 is arranged to be supported on tube 16 within chamber 14. Vane 27 is preferable of non-magnetic material such as copper and is brazed or soldered to tube 16 as at 28.

In order to divert the water to the helical path provided by helix 26 the inlet opening 23 has a diverter vane 29 thereat. A second embodiment of the invention is shown in FIGS. 4 to 7 and is denoted by the reference numeral 30. It is comprised of inner and outer cylindrical jackets 31 and 32, the former being made of resinous material such as polyvinyl chloride, polyethylene or the like, and the latter being preferably of magnetically permeable ferrous material. Inner end walls 33 and 34 close inner jacket 31 and are cemented thereto, and outer end caps 35 and 37 are threaded to outer jacket 31. The assembly thus far described defines a chamber 38.

A plurality of magnets PM of high retentivity and high flux density are supported within the chamber 38, and are of a type and number as previously described, and arranged in like fashion. Magnets PM are adapted to be supported by a helically wound tube 39, the inside of helically wound 39 tightly embracing the magnets PM, and the outside thereof in contact with the inner surface of inner jacket 31.

Liquid to be treated by the lines of force of magnets PM courses through a passageway 41 in tube 39, and the ends 40 thereof are connected to a male fitting 42 threadably connected to a female fitting 43 with a gasket 44 therebetween.

Female fitting 43 is received within an opening 46 in wall 34, and has a hollow boss 47 extending outward from end cap 37.

It will be understood that the opposite end of the device 30 is constructed in like fashion, and the supply to the device is by tubes 48.

We claim:

1. Apparatus for the treatment of calcareous water with magnetic lines of force comprising:
   a. an essentially cylindrical outer jacket formed of magnetically permeable material;
   b. walls closing the ends of said outer jacket to define a treating chamber;
   c. a supply tube of non-magnetic material for calcareous water, said supply tube having an inlet opening therein to said outer jacket and an exit opening therefrom;
   d. said supply tube being supported in said walls and having entrant and discharge portions extending outward from said walls;
   e. a plurality of permanent magnets mounted in said supply tube between said inlet opening and said exit opening;
   f. said magnets being arranged in line with like poles of contiguous magnets adjacent each other to create lines of force extending laterally of said supply tube;
   g. means extending between said supply tube and said cylindrical outer jacket for directing water entering said chamber in directions to cut said lines of force as the water moves to said exit opening comprising:
      i. means disposed between said supply tube and said cylindrical outer jacket for constraining said water for movement in a helical path between said supply tube and said cylindrical outer jacket;
      ii. said last named means being in the form of a helix made of non-magnetic material unafflicting the distribution of the lines of force provided by said permanent magnet;
      iii. whereby the movement of said water provides maximum cutting of said lines of force and minimum movement of said water in directions parallel to said lines of force.

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