

[54] **MAGNETIC STRUCTURE FOR
TREATING LIQUIDS CONTAINING
CALCAREOUS MATTER**

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[58] Field of Search.....210/42, 222, 223, 304, 458,
210/497.1, 487; 209/212, 223, 213, 221,
224; 204/248

[56] **References Cited**

UNITED STATES PATENTS

2,951,586 9/1960 Moriya 210/223
3,371,790 3/1968 Kudlaty et al.....210/223

FOREIGN PATENTS OR APPLICATIONS

675,369 7/1952 Great Britain 210/222

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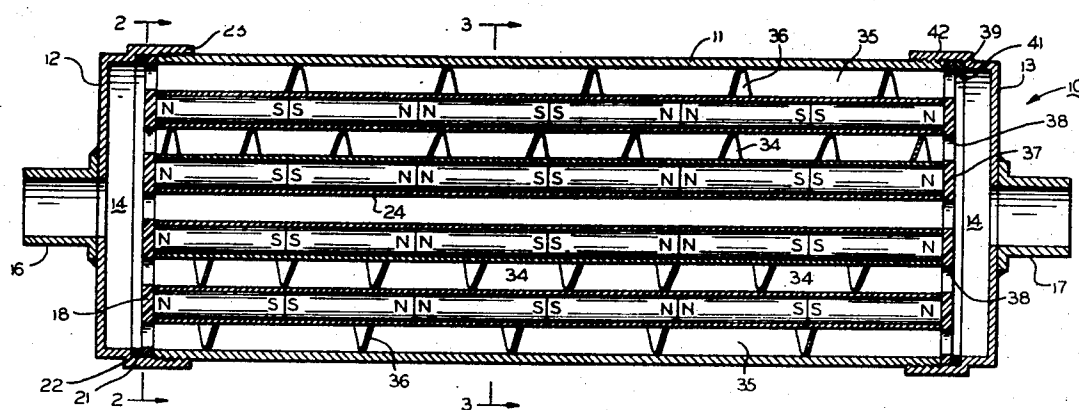
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[57] **ABSTRACT**

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 number of substantially helical concentric flow paths enabling the lines of force to be cut at right angles thereto.

1 Claim, 3 Drawing Figures



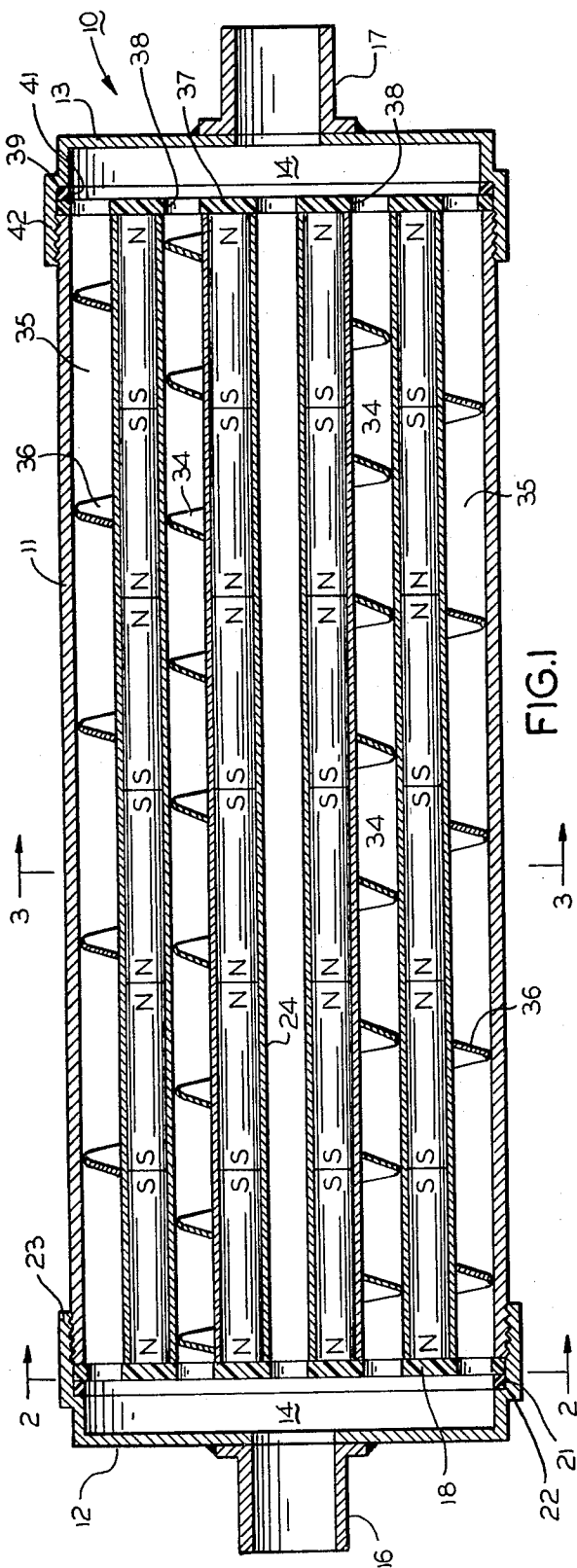


FIG. 1

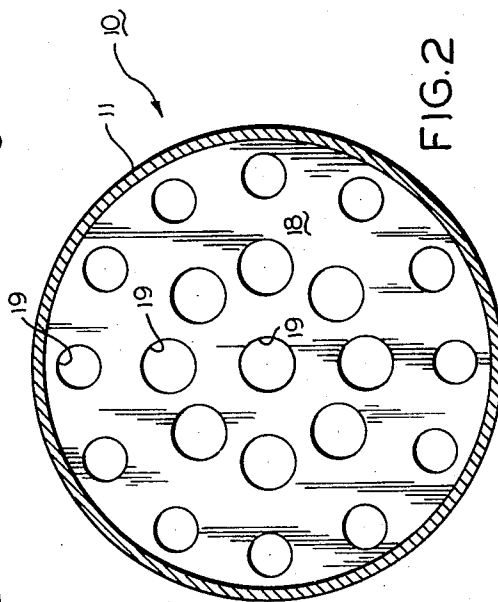


FIG. 2

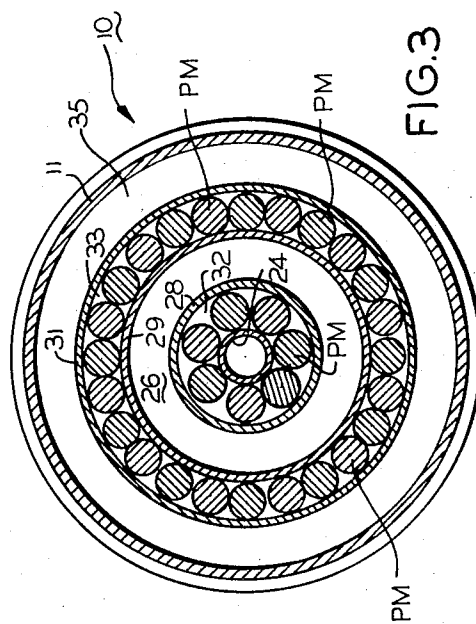


FIG. 3

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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 appears to be best exemplified in Mack U.S. Pat. No. 2,825,464; Green et al. U.S. Pat. No. 2,939,830; Vermeiren U.S. Pat. No. 2,652,925 and U.S. Pat. No. 3,345,594.

SUMMARY OF THE INVENTION

The structure according to the present invention provides a path for the flow of the calcareous material bearing liquid whereby the liquid will be caused to intersect lines of force provided by permanent magnets arranged with the poles thereof in opposed relationship. Moreover, the paths of movement of the liquid are concentric, and are arranged that maximum exposure to the lines of force is obtained. The magnets are arranged concentrically with concentric passageways therebetween, certain of these passageways being provided with vanes directing the liquid with maximum effect thereon.

THE DRAWING

FIG. 1 is a longitudinal sectional view through the improved magnetic structure according to the present invention;

FIG. 2 is a transverse section taken along the line 2—2 of FIG. 1 looking in the direction of the arrows; and

FIG. 3 is a view looking in the direction of the arrows 3—3 of FIG. 1.

The improved magnetic structure according to the present invention is denoted by the reference numeral 10 and comprises an essentially cylindrical outer jacket 11 constructed of magnetically permeable material with flanged end walls 12 and 13 closing the ends thereof to define a treating chamber 14. End walls 12 and 13 have supply and exit fittings 16 and 17 respectively for the entrance of water to be treated in chamber 14 and the exit of treated water therefrom.

The water to be treated is divided into several streams by a first distribution plate 18 made of non-magnetic material and a plurality of concentric circular openings 19 therein. Plate 18 is held in position against one end of jacket 11, and a gasket 21 is held between plate 18 and a shoulder 22 formed in a flange of end wall 12, the latter being threaded to jacket 11.

The centermost opening 19 is coextensive with a central passage tube 24, also made of non-magnetic material, and the next concentric row of openings 19 is aligned with an annular passage 26 defined by concentric sleeves 28 and 29 also of non-magnetic material. The outermost concentric row of openings 19 is aligned

with a concentric sleeve 31 and the jacket 11. Sleeve 31 is also made of non-magnetic material.

Central passage tube 24 and concentric sleeve 28 provide an annular cavity 32 having a plurality of permanent magnets PM arranged in a circle therein. These are preferably cylindrical in form and may be made of barium titanate, alnico or ferrite compounds and each has high flux density and high retentivity. They are arranged in a line with like poles of contiguous magnets adjacent each other to create lines of force extending laterally of passage tube 24.

Sleeves 29 and 31 define an annular cavity 33 also having a plurality of permanent magnets PM arranged in a circle therein with the poles thereof arranged as shown and in a fashion corresponding to those arranged in annular cavity 32.

Sleeve 31 and jacket 11 define an annular passage 35 in like fashion.

Structure is provided for positioning the aforesaid tube 24 and sleeves 28, 29 and 31 together with the magnets PM, and for providing a helical path of movement in the passageways 26 and 35 to the calcareous water to cut the magnetic lines of force with maximum efficiency. To this end an inner helical vane 34 is interposed between sleeves 28 and 29, and an outer helical vane 36 between sleeve 31 and jacket 11.

A non-magnetic plate 37 is formed in the same fashion as plate 28 and has concentric holes 38 therein aligned with the annular passageways 26 and 35 and central passage tube 24. Plate 37 is held against the other end of jacket 11, there being a gasket 39 interposed between plate 37 and a shoulder 41 formed in a flange 42 threaded to jacket 11.

Liquid to be treated by the lines of force of magnets PM courses through the passageways 24, 26 and 35. Cutting of the magnetic lines of force appears to prevent the mineral therein from forming a hard scale when exposed to hot heat exchange surfaces, the mineral instead being deposited as an easily removable, talc-like substance.

We claim:

1. Apparatus for the treatment of calcareous water with magnetic lines of force, comprising;
 - a. a generally cylindrical outer jacket;
 - b. walls closing the ends of said outer jacket to define a treating chamber;
 - c. a supply opening to and a discharge opening from said treating chamber;
 - d. a plurality of concentrically arranged passages within said treating chamber for movement of calcareous water;
 - e. a plurality of concentrically arranged permanent magnets mounted between said concentrically arranged passages;
 - f. said magnets being arranged in a line with like poles of contiguous magnets adjacent each other to create lines of force extending laterally of said magnets;
 - g. a plurality of concentric sleeves defining said concentrically arranged passages;
 - h. means for maintaining said concentric sleeves in proper spaced relationship including helical members for directing the path of movement of said calcareous water in said passages.

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