Nov. 8, 1960 L. L. FOWLER 2,959,288

MAGNETIC CLARIFIER DRUM

Filed March 28, 1958

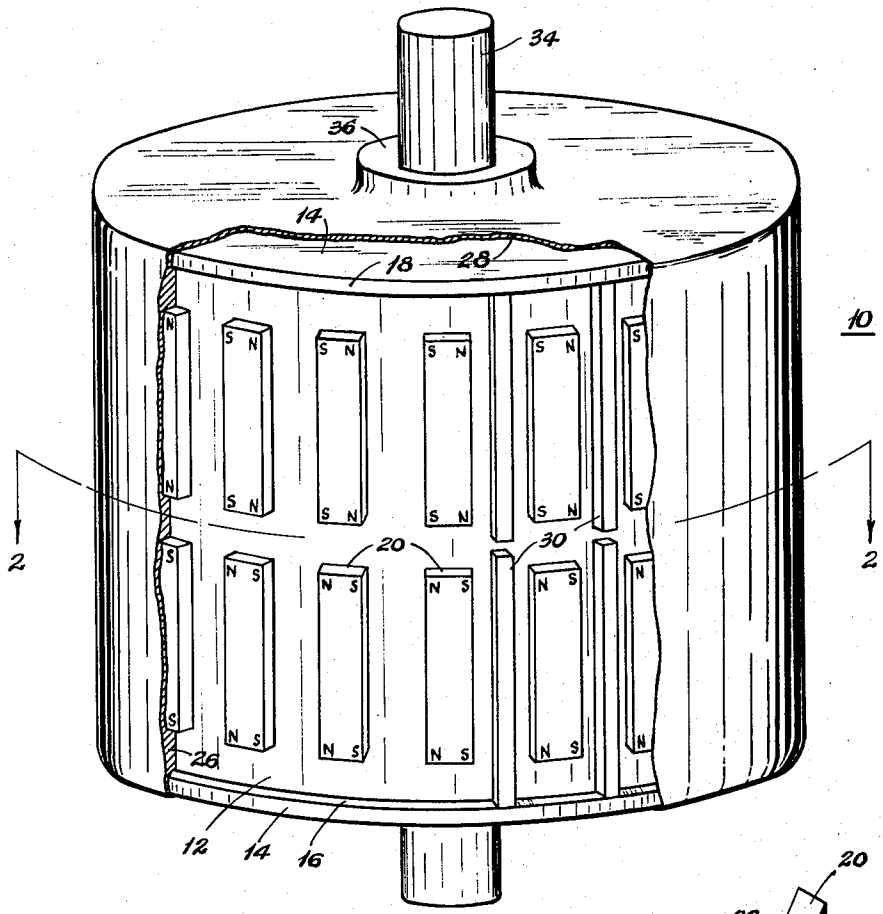


Fig. 1.

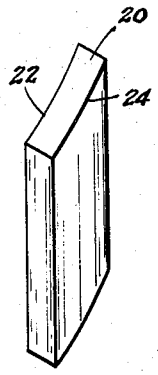


Fig. 3.

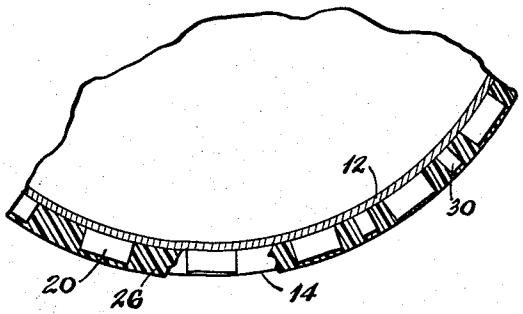


Fig. 2.

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MAGNETIC CLARIFIER DRUM

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8 Claims. (Cl. 210—222)

This invention relates to an improved drum for a magnetic separator and has reference to a drum of the type in which permanent magnets are mounted in spaced rows around the periphery of the drum.

It is an object of the invention to provide an improved drum for a magnetic separator which is simple and economical in construction.

Another object of the invention is to provide a liquid-tight drum for a magnetic separator.

A further object of the invention is to provide an improved drum for a magnetic separator which utilizes bar magnets as the source of magnetic force.

Other objects of the invention will become apparent from the description and claims which follow.

In the removal of ferrous particles from liquids, such as coolants and cutting oils used in machining operations, to condition the liquids for re-use or disposal, the contaminated liquid ordinarily is directed into an arcuate pan or apron into which a rotatably-mounted, magnetic drum extends.

In such magnetic clarifiers it has been usual to mount horseshoe magnets inside of a drum and support them either by an inner cylinder, a spider or the like. The horseshoe magnets are bolted in longitudinal rows with the pole pieces of the magnets in contact with the inner surface of the drum. This construction is bulky and heavy, requiring also relatively large pans to accommodate the bulky drums. Great care has been taken to make these drums liquid-tight; however, despite such care, seepage does occur sometimes, with the result that ferrous contaminants become attracted to the pole pieces of the magnets. This shunts some of the magnetic flux away from the drum and materially reduces the ability of the drum to remove ferrous contaminants from the liquid.

In my invention the problem of seepage as well as the bulkiness and heavy weight inherent in the use of horseshoe magnets have been eliminated. Briefly, a magnetic drum according to the invention comprises a hollow cylindrical core of suitable material around the outer periphery of which permanent bar magnets are arranged in longitudinally extending, spaced rows; a pair of end plates closing the ends of the core and extending beyond the core to provide annular rims which serve as shunts for the magnets; and a sheath of plastic material encasing the core, magnets and end plates. As usual, the drum is adapted for rotation in the liquid to be treated.

My invention will be fully understood by reference to the drawings which form a part hereof and wherein like reference characters in the several figures designate similar elements.

Figure 1 is a perspective view of the improved magnetic drum with part of the sheath removed;

Figure 2 is a fragmentary, cross-sectional view, partly broken away, taken along line 2—2 of Figure 1, with the plastic fill between the magnets added; and

Figure 3 is a perspective view of a preferred form of a magnet.

Referring now to the drawings, a magnetic drum, indicated generally at 10, comprises a hollow cylindrical core 12 to which end plates 14 are rigidly affixed in any suitable manner, such as by welding. Each end plate 14 extends beyond the periphery of the core 12, as shown at 16 in Figure 1, to form an annular shunt ring 18. The plates 14 may be made entirely of a ferrous material, such as soft iron or steel, or they may be made of a non-ferrous material with only a shunt ring 18 of ferrous material.

The core 12 may be made of any material of sufficient rigidity. However, I prefer to use a ferrous material, such as soft iron or steel, for the core so that it will serve as a shunt for the magnets to be mounted thereon and will direct the magnetic flux away from the core and into the liquid to be treated.

While various types of permanent bar magnets may be used, I prefer to use ceramic bar magnets, such as those sold under the tradename "Indox" by the Indiana Steel Products Company, of Valparaiso, Indiana.

A preferred embodiment of a bar magnet is shown in Figure 3. The magnet 20 has a concave face 22 which is shaped on a radius to conform to the outside diameter of the drum and a convex face 24 which is shaped on a radius to conform to the outside diameter of the end plates 14. The shape of the magnet 20 permits bringing the face 22 of the magnet 20 into more intimate contact with core 12 than can be obtained with a flat bar magnet and also results in a drum which has a smoother outside diameter.

The magnets 20 are mounted on the outside of the core 12 with their north and south poles in facing relationship and are attracted to the core 12 by magnetic force. To maintain the magnets 20 against accidental displacement, the spaces between the magnets may be filled by any suitable material such as a mastic or a plastic, such as a plasticized polyvinyl chloride resin, as shown at 26. The entire assembly of core, end plates and magnets is surrounded by a liquid-tight plastic sheath 28. Preferably, the sheath 28 and the fills 26 between the magnets are formed by dipping the assembly into a suitable plastic material.

The core 12 may also be made of a non-ferrous material in which case it is desirable to provide a backing or shunt plate of ferrous material for each magnet and to attach shunt bars 30 of ferrous material, such as soft iron or steel to the core 12 by any suitable means, not shown. Although only two shunt bars 30 are shown in the drawing for purposes of illustration, it will be obvious that a bar 30 will be mounted between each pair of magnets 20. The shunt bars 30 serve to concentrate the magnetic flux flowing from the magnets 20 which rebounds from them back to the magnets. The shunt bars permit control of the strength and width of the magnetic flux.

A shaft 34 extends through the drum 10 as shown and is rigidly affixed to the end plates 14 by hubs, such as 36. The shaft 34 may be connected to a suitable drive means, not shown, to rotate the drum 10 through a stream or body of the liquid to be treated.

It will be seen that my invention overcomes many deficiencies of drums used in prior art magnetic separators and utilizes the powerful magnetic force of ceramic magnets.

Many modifications and variations may be made by persons skilled in the art without departing from the spirit and scope of the invention. Therefore, the construction shown and described is to be taken as constituting a preferred embodiment of the invention rather than limitations thereof.

I claim:

1. A magnetic clarifier drum adapted to magnetically remove ferrous particles from a liquid by rotation through the liquid, comprising a hollow drum member having a

cylindrical side wall and a pair of end walls, a plurality of permanent bar magnets supported on and in contact with the outer face of said side wall, said magnets being aligned about said cylindrical side wall in rows parallel to said end walls and with their north and south poles in spaced facing relationship, and a unitary liquid tight coating of plastic material covering said drum member and said magnets, said cylindrical side wall being made so as to form a shunt of ferrous material between adjacent magnets which concentrates the flux pattern on the outside of said coating.

2. The drum of claim 1 wherein said magnets are ceramic magnets, each having a concave face and a convex face.

3. The drum of claim 1, wherein said end walls extend beyond said cylindrical side wall.

4. The drum of claim 3 wherein said end walls are of ferrous material to provide shunt rings around said cylindrical side wall.

5. The drum of claim 3 wherein said end walls are of non-ferrous material and are each fitted with a rim of ferrous material providing a shunt ring around said cylindrical side wall.

6. The drum of claim 1 wherein said liquid-tight coating is made of a plasticized polyvinyl chloride resin.

7. A magnetic clarifier drum adapted to magnetically remove ferrous particles from a liquid by rotation through the liquid, said drum comprising a drum member rotatable about an axis and having a cylindrical side wall and a pair of end walls of larger diameter than said side wall, a plurality of permanent bar magnets adhering

to the outer face of said side wall by magnetic attraction, said magnets being aligned about said side wall in rows at right angles to the axis of rotation of said drum, and with their north and south poles in spaced facing relationship, said sidewall and at least the portions of said end walls extending beyond said side wall being made of ferrous material and providing shunts for said magnets deflecting the magnetic flux away from said side and end walls, a filling of plastic material in the spaces between said magnets, and a unitary liquid tight coating of plastic material about said drum member and said magnets.

8. Means adapted to magnetically remove ferrous particles from a liquid by rotation through the liquid, said means comprising a plurality of permanent bar magnets, a hollow drum member having a side wall and a pair of end walls, at least said side wall being made of ferrous material and formed as a shunt for said magnets, said magnets being supported on the outer face of and in contact with said side wall with their north and south poles in spaced facing relationship, and a unitary liquid tight coating of plastic material covering said drum member and said magnets.

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