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MAGNETIC DRIVE AGITATOR

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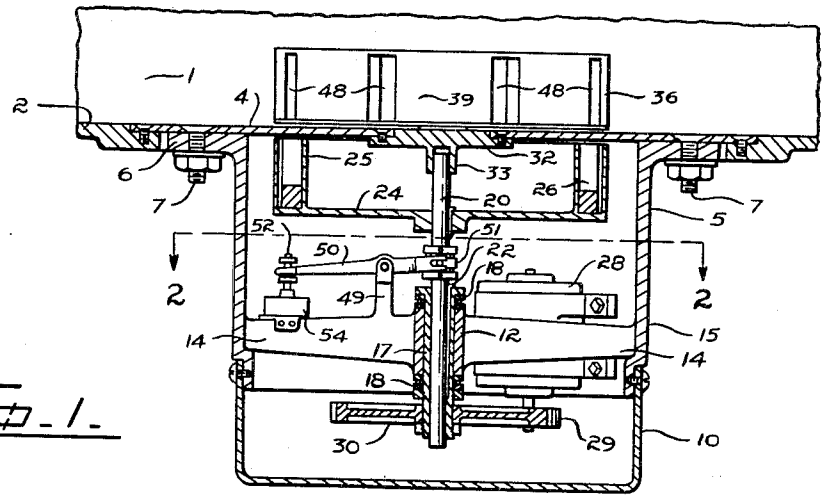

FIG. 1.

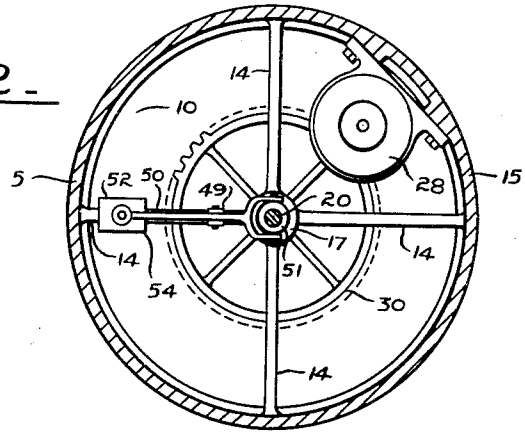

FIG. 2.

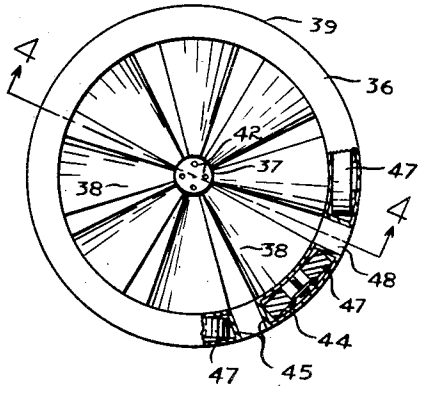

FIG. 3.

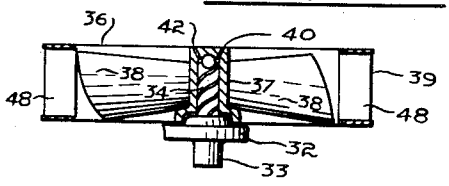

FIG. 4.

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MAGNETIC DRIVE AGITATOR

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7 Claims. (Cl. 259—108)

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Our invention relates to improvements in magnetic drive agitators.

The conventional running shaft drive with one or more packing glands for the purpose of agitating edible fluids, such as dairy products, has proven very unsatisfactory insofar that bacteria can and do develop readily between the moving parts and contamination of the fluid results since it is quite impossible to keep the several parts of the drive clean and sterile when in use.

The objects of the present invention are to provide means for rotating an immersed agitator mounted in the interior of a tank or vat, wherein there is no mechanical connection between the driving element and the driven or agitating element; to provide a device of the above described type using magnets to transmit rotation from one part to another, and to provide automatic means for stopping and re-starting the driving motor subsequent to the motor having lost its load, and to provide means whereby the objections inherent in the conventional agitator drives are overcome.

The invention consists of a motor driven spindle fitted with an annulus of permanent magnets disposed adjacent a wall of a tank, and a freely rotatable agitator within the tank and mounted upon the wall, said agitator having a plurality of magnets spaced to correspond with the magnets of the annulus.

Referring to the drawings:

Figure 1 is a sectional view of the invention.

Figure 2 is a plan view taken on the line 2—2 of Figure 1.

Figure 3 is a plan view of the agitator.

Figure 4 is a sectional view taken on the line 4—4 of Figure 3.

In the drawings like characters of reference indicate corresponding parts in each figure.

The numeral 1 indicates a portion of a tank or vat having a bottom wall 2 which is apertured to receive a thin disk 4 preferably of stainless steel or non-ferrous material. A cylindrical housing 5 is provided with a flange 6 by which it is secured by bolts 7 to the underside of the disk 4. The heads of the bolts 7 are preferably flush with the inner surface of the disk 4 and are so flushed with solder or other filler as to leave the upper surface of the disk free from interstices of any kind where germ life may harbour. The housing

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5 is fitted with a cup shaped base 10 which is removable to afford access to working parts. A vertical hub 12 is carried by spokes 14 extending to the peripheral wall 15 of the housing 5. The hub 12 is bored to receive a vertical sleeve 17 which is journalled upon thrust bearings 18 at opposite ends of the hub. Slidably mounted on the sleeve 17 is a vertical shaft 20 which is non-rotatably connected to the sleeve 17 by a key and keyway 22. The shaft 20 is fitted adjacent its upper end with a rotor 24 having a peripheral wall 25 in which a plurality of permanent magnets 26 are supported, the pole pieces of the magnets lie in a plane close and parallel to the disk 4.

Mounted within the housing 5 is a motor 28 having a driving pinion 29 in constant mesh with a gear 30 secured upon the lower end of the sleeve 17 to impart a drive to the shaft 20.

The centre portion of the disk 4 is fitted with a plate 32 having a bearing boss 33 on its underside and a stem or stub shaft 34 on its upper side. The bearing boss 33 serves to slidably support and journal the upper end of the shaft 20 and the stub shaft 34 is adapted to journal an agitator generally indicated by the numeral 36.

The agitator 36 consists of a hub 37 having radial propeller blades 38 which are surrounded by an annular rim 39. The hub 37 is bored to freely fit the stub shaft 34 and sits upon a ball bearing 40 carried by said stub shaft. A plurality of apertures 42 are drilled into the bore of the hub to permit a free flow of fluid therethrough. The rim 39 of the agitator 36 consists of a plurality of pockets 44 having end walls 45, each pocket is fitted with a horseshoe magnet 47 whose pole pieces project downwardly into close proximity with the upper surface of the disk 4. The pockets 44 will carry the same number of magnets as the rotor 24 and the magnets will have similar sized pole pieces and their pole pieces will be similarly spaced. The interspaces 48 between end walls 45 of adjacent pockets 44 permit a free flow of fluid past the periphery of the agitator, thus affording adequate circulation being set up within the tank. The pockets 44 are suitably sealed in any desired manner to insure against the entrance of bacteria thereto.

The weight of the rotor 24 and its shaft 20 is materially less than the vertical pull of the magnets 47 so that at any time when, due to such

resistance developing to rotation of the agitator that the rotor ceases to drive said agitator, said rotor and shaft will drop below the position shown in Figure 1.

Mounted in a fork 49 extending from one of the spokes 14 is a rocking lever 50, one end of which is coupled to a trunnion collar 51 on the shaft 29 and the opposite end engages the stem 52 of a push pull switch 54, which switch is adapted to automatically control the motor 28 through a suitable motor circuit, not shown.

The agitator 36 being freely mounted upon its stub shaft 34 will obviously come to rest with the pole pieces of the magnets 26 and 47 in vertical alignment with each other, north pole pieces of the magnets 26 being attractively opposed to south pole pieces of the magnets 47.

In use, if the motor circuit is opened by manual control the motor will be stopped and the rotor and agitator will assume the position as above described, the attraction of the several magnets will cause the rotor to lift to the position in which it is shown in Figure 1, the trunnion collar 51 will have caused the lever 50 to rock and close the push pull switch 54. With the two sets of magnets 26 and 47 being in close relation, the motor 28 can be started and the agitator can start in step with the rotor. Should resistance of sufficient magnitude be imposed on the agitator as to allow the magnets of the agitator to lag out of step to an appreciable extent the rotor and its shaft will drop, causing the switch 54 to open and so remain until the speed of the rotor has slowed down to approximately that of the agitator. The magnets 26 and 47 will quickly attain a position of mutual vertical attraction sufficient to lift the rotor again and dispose the north pole pieces of the magnets 26 directly above a south pole piece of a magnet 47 and vice versa, thus completely restoring the maximum tractive effort between the rotor and the agitator. If the resistance to rotation is too great to allow the magnets of the opposing elements to attain normal shaft speed at once, this cycle is automatically repeated, each time giving further impetus to the agitator until the several magnets can maintain their load without separating.

What we claim as our invention is:

1. A device for imparting rotation to an agitator or the like by magnetic force comprising the combination of a wall, an element mounted on one side of said wall and having an annular ring of spaced magnetic members freely rotatable in a plane parallel to said wall, a rotor coaxially aligned with the element, said rotor having a similar ring of spaced magnetic members and being secured upon a shaft, one set of magnetic members being permanent magnets adapted for registration with the magnetic members on the opposite side of the wall, a motor for driving the shaft and the rotor, a circuit for the motor, said rotor being slidable axially away from the wall by gravity when the magnetic members of the element and those of the rotor are out of register with each other, and means actuated in response to said movement of the rotor for breaking the motor circuit.

2. A device for imparting rotation to an agitator or the like by magnetic force comprising the combination of a wall, an element mounted on one side of said wall, said element having an annular ring of spaced magnetic members freely rotatable in a plane parallel to said wall, a motor driven rotor coaxially aligned with the element, said rotor having a similar ring fitted with spaced magnetic members, the magnetic members of one of said rings being permanent magnets and being adapted for registration with the magnetic members of the other annular ring, said rotor being mounted to run in close proximity to the opposite side of the wall and being adapted to recede axially from said wall by gravity when the magnetic members of the two rings are out of register with each other and means responsive to the recession of the rotor from the wall for stopping the motor.

3. A device for imparting rotation to an agitator or the like by magnetic force comprising the combination of a wall, an element mounted on one side of said wall, said element having an annular ring of spaced magnetic members freely rotatable in a plane parallel to said wall, a motor driven rotor coaxially aligned with the element, said rotor having a similar ring fitted with spaced magnetic members, the magnetic members of one of said rings being permanent magnets and being adapted for registration with the magnetic members of the other annular ring, said rotor being mounted to run in close proximity to the opposite side of the wall, and being adapted to recede axially from said wall by gravity when the magnetic members of the two rings are out of register with each other, said magnetic members being of such attractive force as to return the rotor to normal running position when the opposing members are relatively and substantially at rest in substantial alignment with each other, and means responsive to the recession of the rotor from the wall for stopping the motor.

4. A device for imparting rotation to an agitator or the like by magnetic force comprising the combination of a wall, an element mounted on one side of said wall, said element having an annular ring of spaced magnetic members freely rotatable in a plane parallel to said wall, a driven rotor coaxially aligned with the element, said rotor having a ring of magnets spaced to conform to the spacing of the magnetic members, said rotor being mounted upon a driven shaft and adapted for endwise movement towards and away from the element, a motor for driving the shaft and a switch for controlling said motor, a rocking lever operatively connecting the switch and the shaft to cause said switch to open as the rotor recedes from the element and to close said switch as the rotor approaches said element.

5. An agitator adapted to be rotated by permanent magnetic force from a driven rotor, said rotor having an annular ring of spaced permanent magnets, said agitator comprising a hub journalled upon a stub shaft which is supported coaxially of the rotor and a ring of permanent magnets spaced to coincide with the magnets of the rotor, said rotor being slidable axially toward and away from the agitator to make and disrupt the drive between the agitator and the rotor.

6. An agitator adapted to be rotated by permanent magnetic force from a driven rotor, said rotor having an annular ring of spaced permanent magnets, said agitator comprising a hub journalled upon a stub shaft which is supported coaxially of the rotor and a ring of magnetic elements spaced to coincide with the magnets of the rotor, said rotor being slidable axially toward and away from the agitator to make and disrupt the drive between the agitator and the rotor.

7. An agitator adapted to be rotated by permanent magnetic force from a driven rotor, said rotor having an annular ring of spaced magnetic

members, said agitator comprising a hub journalled upon a stub shaft which is supported coaxially with the rotor, and a ring carried by the hub having spaced openings in its periphery, said ring supporting a plurality of circumferentially arranged permanent magnets adapted to coact with the magnetic members of the rotor, said permanent magnets being spaced to coincide with the magnetic members of the rotor, said rotor being slidable axially towards and away from the agitator to make and disrupt the drive between the agitator and the rotor.

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