June 10, 1958 W. D. JOHNSTON 2,838,007

AGITATING DEVICE

Filed June 1, 1953 2 Sheets-Sheet 1

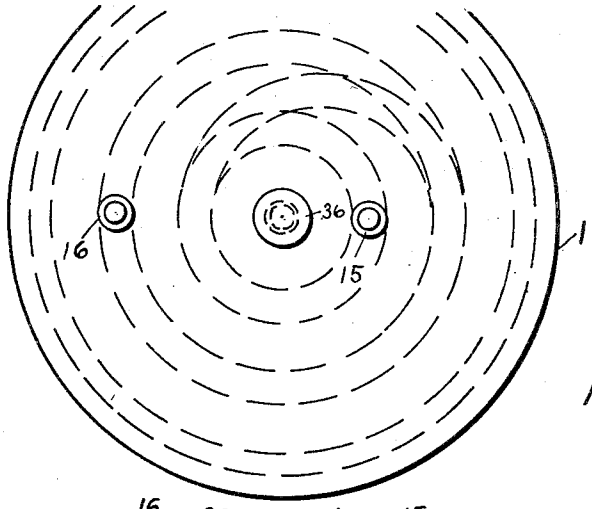


FIG. 2

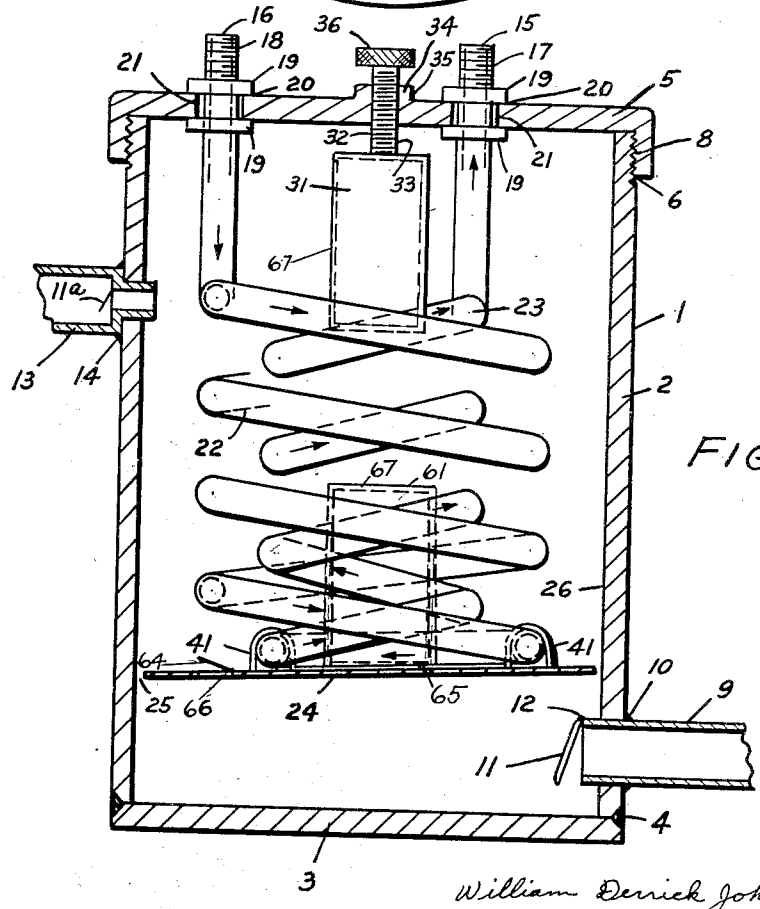


FIG. 1

Inventor
William Derrick Johnston

By
Charles L. Lovercheck Attorney

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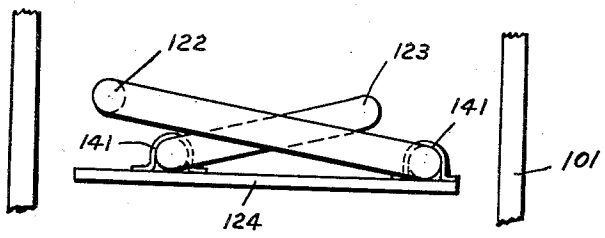
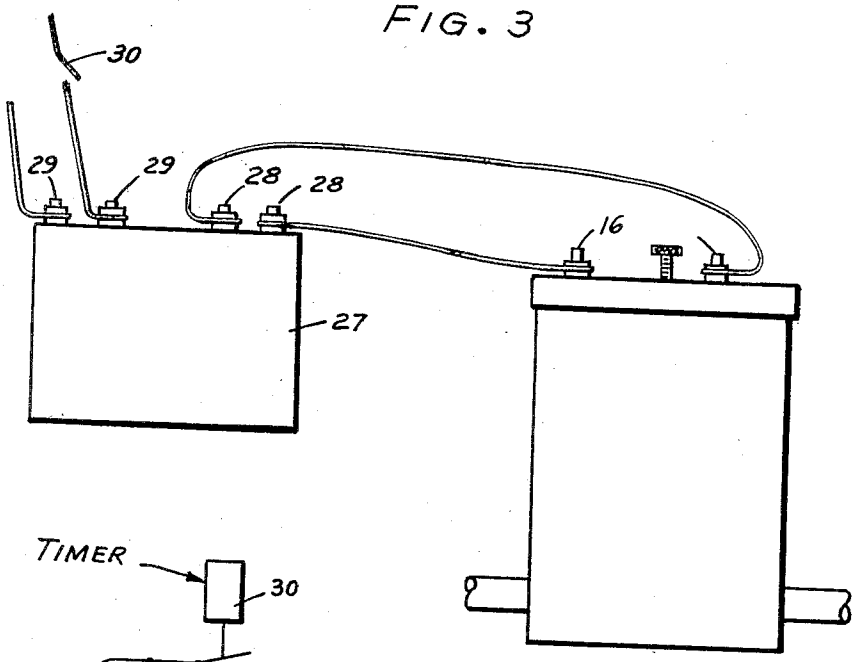


FIG. 3



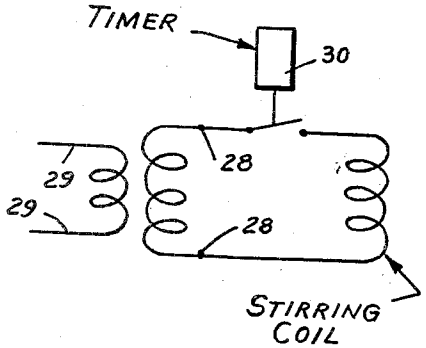


FIG. 4

FIG. 5

Inventor
William Derrick Johnston
By
Charles L. Lovercheck
Attorney

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AGITATING DEVICE

William Derrick Johnston, Erie, Pa.

Application June 1, 1953, Serial No. 358,732

14 Claims. (Cl. 103—53)

This invention relates to pumps and stirring devices and more particularly to pumps and stirring devices for use in sealed containers and conduits wherein it would be impractical to provide an actuating member extending through the walls of the container.

In stirring devices and pumps for use in sealed systems when a high pressure or high vacuum is present, which were made according to previous designs and with which I am familiar, the actuating member such as the shaft of a motor having a stirring member such as an impeller attached thereto inside the container was provided and an electric motor or suitable driving means was attached to the shaft. This often resulted in leakage around the stirring member shaft where it extended through the container and, in the case of a pump, around the hub shaft which extended through the container wall.

It is, accordingly, an object of my invention to overcome the above and other defects in prior stirring devices and pumps and it is more particularly an object to provide a stirring device or pump wherein no movable member extends through the casing of the container.

Another object of the invention is to provide a stirring device for use in high pressure and high vacuum systems wherein the electromagnetic field of a coil is utilized to react on the coil itself to move the coil and to oscillate the coil, resulting from an intermittent flow of current therein.

Another object of the invention is to provide a pump wherein the movable part of the pump is actuated by an electromagnetic field.

Another object of the invention is to provide a novel type of adjusting means for a pump actuated by an electromagnetic field.

Another object of the invention is to provide a pump which will be simple in manufacture, efficient, and economical to use.

Another object of the invention is to provide a stirring device for high pressure or high vacuum systems wherein the device is simple in construction, economical to manufacture, and practical to use.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing:

Fig. 1 is a cross sectional view of a novel pump according to my invention;

Fig. 2 is a top view of the pump shown in Fig. 1;

Fig. 3 is another embodiment of the invention showing a stirring device for use on a coil similar to the coil shown in Fig. 1;

Fig. 4 shows an electrical circuit for use on a pump such as that shown in Fig. 1; and

Fig. 5 shows a wiring diagram of an electrical system for a pump or a stirring device.

Now with more specific reference to the drawing, in Fig. 1, I show a pumping device having a casing 1 made up of a cylindrical side portion 2 and a bottom 3 welded thereto at 4 and having a top or cover 5 removably attached by a suitable connection such as by means of the threads 6 provided on the side portion 2 of the container 1 which mate with the threads 8 on the cover 5. An inlet pipe 9 is connected to the side of the container 1 and attached thereto by welding at 10 or by similar suitable means.

A check valve 11 is swingably attached at 12 so that it will allow fluid to flow into the container 1 but will not allow fluid to flow back through the pipe 9. A similar pipe 13 is connected at 14 by welding or suitable fastening means and the cover 5 is provided with terminals 15 and 16. The terminals 15 and 16 are threaded at 17 and 18, respectively, and have insulated nuts 19 engaging the threads and sealingly engaging the top 5 of the container at 20. Insulated washers 21 are disposed around the terminals 15 and 16 to keep them from forming a short circuit with the top 5. The terminals are tubular and the tubular opening extends through the coil so that a coolant may be passed through it. The terminal 16 is integrally attached to the outside coil 22 and the terminal 15 is integral with the inside coil 23. The outside coil 22 is loosely wound, that is, spaced from the inside coil 23 and wound in such a manner that the electromagnetic field around it will aid the field around the outside coil 22.

A plate 24 is attached to the bottom of the coils by means of brackets 41 to act as the piston of a pump. A clearance 25 is provided between the plate 24 and the inner edge 26 of the casing 1 so that the pressure above the plate 24 will equal that below it. The terminals 15 and 16 are connected to a low voltage high current transformer 27 by means of the terminals 28 and the terminals 29 are connected to a suitable power source. A timer 30 is connected in series with the input so that the current to the pump can be alternately interrupted.

An iron core 31 is supported on threaded member 32 which has threads 33 which engage internal threads 34 in boss 35 and a knurled knob 36 is attached to the top of the threaded member 32 whereby it can be adjusted. It will be noted that the threaded member 32 can be rotated to move the iron core 31 down into the coil or can remove it from the coil to change the magnetic reluctance of the field around the coil.

A second iron core 61 is attached to plate 24 at 65 to increase the reluctance of the magnetic path. Cores 31 and 61 may be made of soft iron and encased in a shell 67 of stainless steel or other non-corrosive material where a fluid corrosive to iron is to be pumped. A check valve 64 may be disposed in plate 24 over aperture 66 to facilitate the pumping action.

It is a well known theory of electricity that when a current has passed through a conductor, a field is established around the conductor and the field will be in a direction determined by the right hand rule; that is, if a person grasps the conductor with his right hand with the thumb pointing in the direction of flow of current, the field around the conductor will be in the direction his fingers will point. This field has the property of inducing magnetism. A magnetic material which may be disposed inside a coil through which current is passing in the field further has a property of repelling a corresponding field in an adjacent conductor wherein the field is in an opposing direction. It is this field around the conductor which is used in the present application to cause the various conductors to repel each other when a current has passed therethrough. The reluctance of the space

through the coil can be changed by inserting a magnetic material therein. This magnetic material will increase the effect of the conductors to repel each other.

It will be noted that when a high current is passed through the coils 22 and 23 on the transformer 27, the electromagnetic field around the coils will react on the coils and tend to cause the coils to contract, that is, for the turns to move closer together. This will cause the plate 24 to move upward, forcing liquid through the check valve 11*a*. Then when the current is broken by timer 30 which will be adjusted to make and break the current at the optimum frequency, the resilience of the coils will tend to force the plate 24 downward, forcing liquid to flow past the plate 24 through the clearance 25. When the timer 30 is set to oscillate the plate upward and downward by means of the electromagnetic field as aforesaid at a very low frequency, a pumping action will result which will tend to draw the liquid from pipe 9 into the space below the plate 24.

A similar method can be used in a closed container such as container 101 wherein a stirring action inside the container is desirable to stir radioactive materials wherein it is desired to isolate the material from the operator or wherein it is desirable to maintain a high pressure in said container. An outside coil 122 similar to coil 22 in Fig. 1 is formed and connected to an inside coil 123 similar to the coil 23 in Fig. 1. A plate 124 is attached to the bottom of the coil by means of brackets 141 with a large clearance between the plate 124 and the inside of the container. The stirring action is obtained by passing a heavy current through the coil to oscillate the stirring member plate 124 up and down in the same manner that the plate 24 in Fig. 1 is oscillated. The coils 122 and 123 are made of tubular material similar to the coils 22 and 23 shown in Fig. 1 so that a coolant, such as water, can be passed through the coils.

From the foregoing, it will be understood that I have provided an economical, efficient, and practical stirring device for material usable in a sealed container and which, with certain changes in construction, can be used as a pump.

In the foregoing specification, I have set forth the invention in its preferred practical forms but I am aware that the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

What I claim is:

1. A device for agitating liquid comprising a closed container adapted to contain liquid to be agitated, electrical conducting means comprising a coiled conductor in said container, a part of said conducting means being immersed in said liquid having terminals extending through one wall of said container, an intermittent source of electrical energy connected to said terminals establishing an electrostatic field around said conducting means urging said conducting means to move relative to said container whereby said conductor is oscillated.

2. A device for agitating liquid comprising a container, electrical conducting means in the form of a coiled conductor in said container having terminals extending out of said container, an intermittent source of electrical energy connected to said terminals whereby said conductor is oscillated, conduits attached to said container whereby liquid may flow into said container and out thereof, and means to adjust the magnitude of oscillation of said conductor.

3. A device for agitating liquid comprising a container adapted to contain liquid to be agitated, a coil of electrical conducting material disposed in said container, a part of said coil being immersed in said liquid, and an intermittent source of electrical energy connected to said coil, said energy flowing in said coil to form a field therearound whereby the turns of said coil are attracted toward each other when said energy is applied to move said coils toward each other and to agitate said liquid when the flow of said electrical energy in said coils is changed, said coils having means to urge them to their original position when said energy is interrupted.

4. The device recited in claim 3 wherein said coil is in the form of a hollow tube whereby a liquid can be circulated therethrough.

5. The device recited in claim 4 wherein said coil comprises a plurality of spaced turns of conductor movable toward and away from each other.

6. The device recited in claim 3 wherein a magnetic core is disposed in said coil, said core being movable into and out of the magnetic field of said coil whereby the magnitude of oscillation of said coil can be varied.

7. The device recited in claim 3 wherein a plate is attached to one end of said coil whereby the agitation of said liquid is increased.

8. The device recited in claim 3 wherein said coil is in the form of a hollow tube whereby a liquid can be circulated therethrough, and a plate is attached to one end of said coil whereby the agitation of said liquid is increased.

9. The device recited in claim 3 wherein a plate is attached to one end of said coil whereby said liquid is agitated, said container being cylindrical in shape, said coil extending axially of said container, and the diameter of said plate being slightly smaller than the diameter of said container.

10. The device recited in claim 3 wherein a plate is attached to the distal end of said coil whereby said liquid is agitated, two pipes are connected to said container on opposite sides of said plate, and a check valve is provided in each said pipe whereby said liquid flows from one said pipe into said container and from said container into the other said pipe when said coil oscillates.

11. The device recited in claim 3 wherein a plate is attached to the distal end of said coil whereby the agitation of said liquid is increased, two pipes are connected to said container on opposite sides of said plate, and a check valve is provided in each said pipe whereby said liquid flows from one pipe into said container and from said container into the other pipe when said coil oscillates, said check valves comprising hinged members attached to the ends of said pipes, one said hinged member being swingable outwardly.

12. The device recited in claim 3 wherein a plate is attached to one end of said coil whereby said liquid is agitated, pipes are connected to said container on opposite sides of said plate, and means, including said plate, is provided to cause liquid from one said pipe to flow through said container into said other pipe when said coil oscillates.

13. The device recited in claim 12 wherein said plate is substantially the same area of the cross sectional area of said container.

14. The device recited in claim 3 wherein a magnetic core is disposed in said coil, said core being movable into and out of the magnetic field of said coil whereby the magnitude of oscillation of said coil can be varied, and a plate is attached to a movable part of said coil, said plate being substantially the same area of the cross sectional area of said container at the point where said plate is supported in said container by said coil.

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