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RANGE STIRRING APPARATUS

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FIG.1.

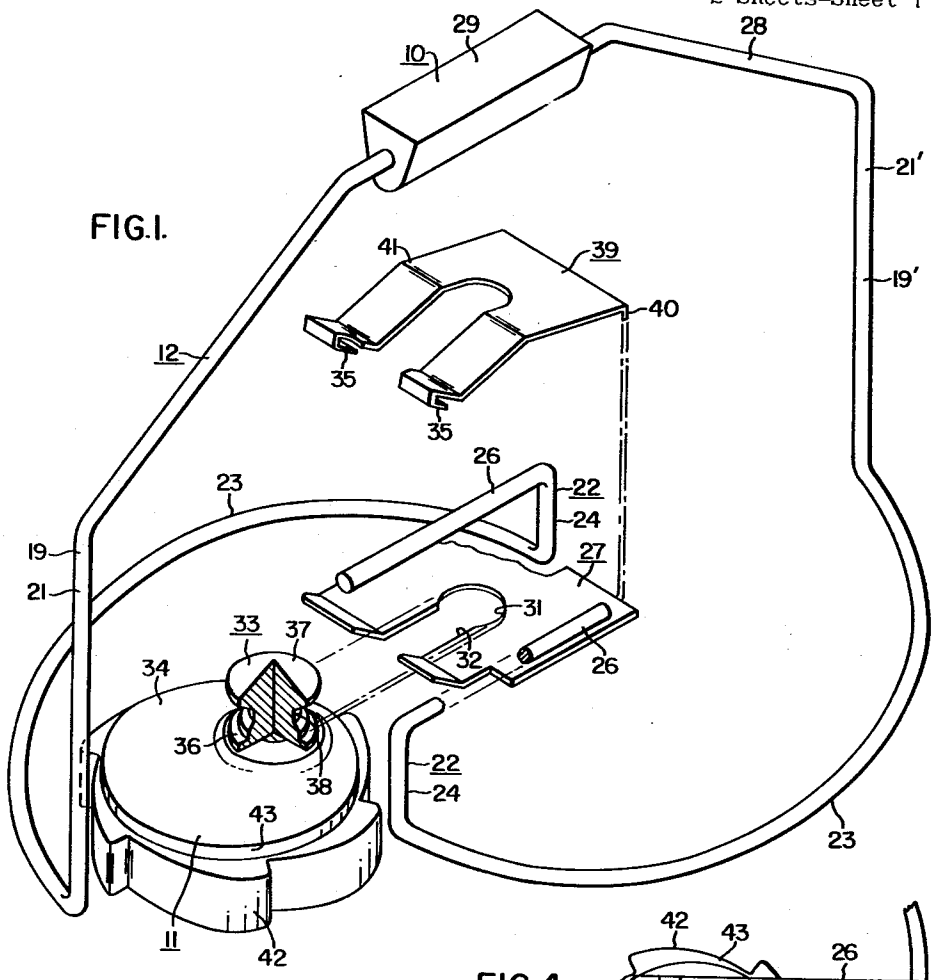
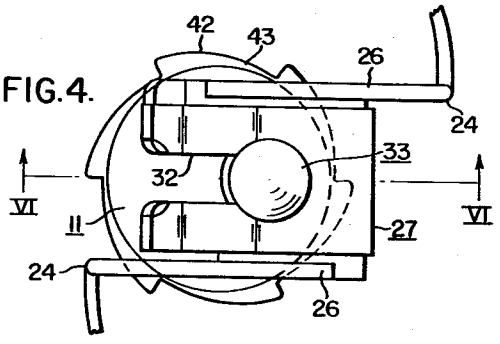


FIG.4.



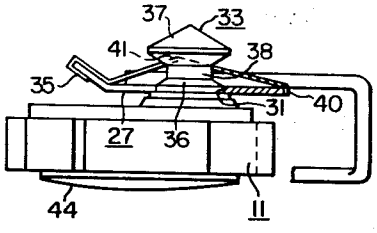


FIG.6.

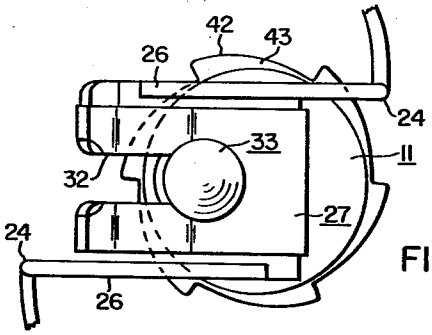


FIG.5.

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RANGE STIRRING APPARATUS

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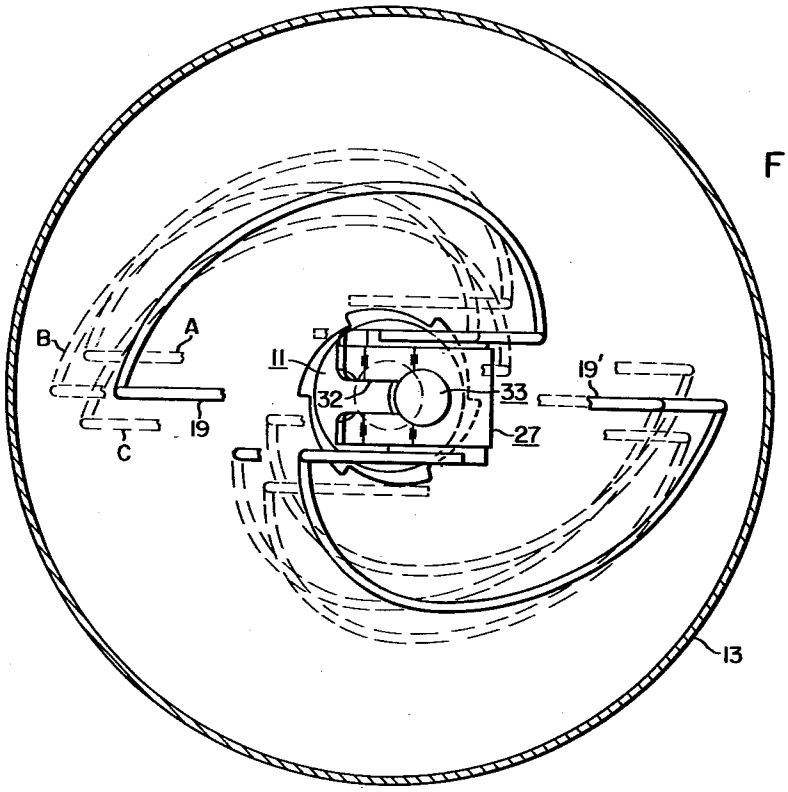

FIG.2.

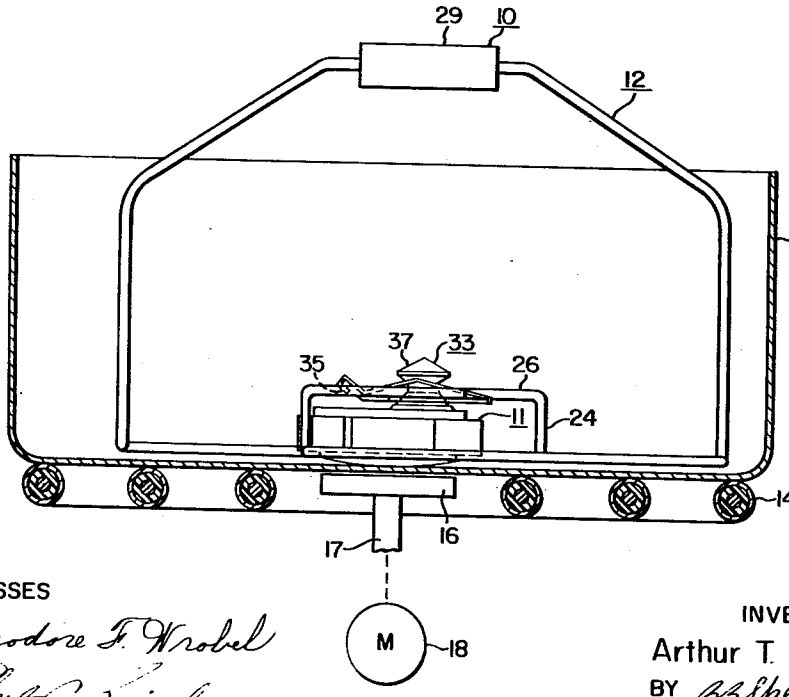

FIG.3.

WITNESSES

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RANGE STIRRING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Automatic stirrer comprising a rotatable hub consisting of a permanent magnet and an agitator structure frictionally coupled to a top wall of the hub at a point remote from the axis of rotation thereof to produce both oscillatory and rotational movement of the agitator structure in response to rotation of the hub.

This invention relates, in general, to automatic stirring apparatus and, more particularly, to an agitator for use therewith.

Automatic stirrers comprising a rotatable hub consisting of a permanent magnet and an integral agitator supported concentrically with respect thereto have, heretofore, been utilized for the purpose of mixing liquid as well as other substances. A magnet adapted to be rotated by motor means is supported beneath a non-magnetic container or vessel in which the foregoing agitator is supported for rotation through magnetic coupling with the magnet when rotated by the motor. In the case where the consistency of the liquid remains substantially the same throughout the mixing process, the above-described arrangement has been found to be quite satisfactory, however, where the consistency of the liquid increases due, for example, to the addition of heat thereto, it has been found that rotation of the agitator ceases due to the increased viscosity which renders the magnetic coupling totally ineffective.

Accordingly, it is the general object of this invention to provide, in stirring apparatus, a new and improved agitator.

It is a more particular object of this invention to provide a new and improved agitator adapted for both rotational and oscillatory motion.

Briefly, the present invention accomplishes the above cited objects by providing a stirrer structure comprising a hub consisting of a permanent magnet adapted for rotation and having a pivot member disposed thereon at a point remote or offset from the center of rotation of the hub. An agitator supported by the pivot member rotates with the hub when the liquid which is being mixed has a relatively low viscosity. This is accomplished in one manner—through bias means interposed between a portion of the pivot member and a part of the agitator supported by the pivot. In another manner, this is accomplished by a turbulent force in the liquid impinging on portions of the agitator which force is created by a plurality of fins disposed on an annular wall of the hub. When the viscosity of the liquid increases to the point where resistance to rotation of the agitator tends to stall its rotation, relative movement between the hub and agitator commences, at which point the offset pivot member serves to impart oscillatory motion to the agitator in a direction toward and away from the center of rotation of the hub. Consequently, the agitator continues to mix the liquid.

Further objects and advantages of the present invention will become more apparent when considered in view of the following detailed description and drawings, in which:

FIGURE 1 is an exploded perspective view representing the invention;

FIG. 2 is a top plan view representing one mode of operation of the invention;

FIG. 3 is a side elevational view of apparatus incorporating the invention;

FIG. 4 is a fragmentary top plan view of interconnection means forming a part of the invention;

FIG. 5 is a fragmentary top plan view of the interconnecting means shown in FIG. 4, but in a different operating position; and

FIG. 6 is a cross-sectional view taken on the line VI—VI of FIG. 4.

Referring now to the drawings, especially FIGURES 1 and 3, reference character **10** designates generally an agitator structure comprising a hub member **11** and an arm structure or stirring means **12**. As shown in FIG. 3 the agitator is freely or detachably supported within a vessel or container **13**, made from any non-magnetic material, for example, aluminum, the vessel, in turn, being supported by a suitable electric heater comprising a plurality of coils **14**.

A permanent magnet **16** secured to a shaft **17** of an electric motor **18** (shown schematically in FIG. 3) is adapted to be suitably supported subadjacent the vessel **13** directly below the hub member **11** which consists of a permanent magnet shrouded by a suitable material, for example, nylon. The proximity of the two magnets provides a magnetic coupling therebetween serving to effect rotation of the hub member **11** with the magnet **16** when the latter is rotated by the motor **18**.

The arm structure or stirring means **12**, which is adapted to be rotated in the same or counterclockwise direction with the hub member **11** in a manner to be described hereinafter, comprises a pair of arms **19** and **19'** (best shown in FIG. 1), each having a substantially vertical leading member **21** and an offset trailing member **22** joined by a horizontally disposed spiral member **23**. Each of the offset members is provided with a vertical segment **24** and a horizontal segment **26**, the latter being secured in a suitable manner, for example, by spot welding to an interconnecting member **27**. Substantially V-shaped handle means **28** including a grip member **29** joins the arms **19** and **19'** at the vertical leading members **21** and, together with the interconnecting member **27**, form an integral structure. The interconnecting member **27** is provided with an aperture **31** centrally thereof and an elongated slot **32** extending from one end thereof to the aperture **31**.

A post or pivot member **33** is secured to a top surface **34** of the hub member **11** with its axis parallel to the axis of rotation of the hub, but at a point remote therefrom. The pivot member **33** comprises a tenon portion **36** adjacent its lower extremity and a head portion **37** adjacent the opposite extremity (see particularly FIGS. 1 and 6). A necked-down portion **38** of the pivot member **33** which is disposed intermediate the tenon and head portions is insertable through the slot **32** and into the aperture **31**, into which the tenon **36** is subsequently insertable. A bifurcated spring member **39** is adapted to be postively secured to the interconnecting member by means of clip portions **35** and a flange portion **40** (best illustrated in FIGS. 1 and 6) at the opposite end such that bent leg portions **41** thereof engage the underside of the head **37** (FIG. 6) to provide a frictional coupling between the interconnecting member **27** and the pivot member **33**. It will be appreciated that the arm structure **12** in thereby adapted to rotate counterclockwise as viewed in FIG. 2, with the hub member **11** about its axis of rotation of the hub. It will further be appreciated that as the viscosity of the liquid increases while in the process

of being mixed simultaneously mixed and heated, a resistance to rotation of the arm structure is developed thereby causing relative slippage between the bifurcated spring **39** and the pivot member **33**. When this occurs the hub continues to rotate and due to the offset positioning of the pivot member **33**, oscillatory motion toward and away from the center of rotation of the hub member **11**, as shown in FIG. 2, is imparted to the arm structure **12**. While the interconnecting member **27** and the spring **39** also oscillate, such an illustration has been omitted from FIG. 2 for sake of clarity. The path of movement of the arm **19** is from the solid line position shown in FIG. 2 to the first dotted line position indicated at A then to B and C and back to the solid line position.

Two extreme positions of the interconnecting member **27** and the spring **39** are depicted in FIGS. 4 and 5 with the former corresponding to the solid line position of the arm **19**, as shown in FIG. 2, and the latter corresponding to the dotted line position indicated at B in FIG. 2.

As can be seen from FIGS. 1, 4 and 5, the hub member **11** is provided with a plurality of fins **42** extending substantially radially from an annular wall **43** thereof.

As can further be seen from FIGS. 4 and 5, the fins **43**, when the arms **19** and **19'** move between the solid line position and the dotted line position B, pass closer to one or the other of the offset trailing members **22**. It will be understood that as the fins are rotated they create a turbulence in the liquid, the resulting force of which impinges on the vertical and horizontal segments **24** and **26**, particularly the former, thereby tending to rotate the arms **19** and **19'** as indicated by the arrows shown in FIG. 2. Consequently, it is possible to have simultaneous rotation of the arms **19** and **19'** and oscillatory movement thereof.

As can be seen in FIG. 6, the hub **11** is provided with a somewhat rounded bottom surface **44** which permits the agitator structure **10** in FIG. 1 to rock slightly thereby enhacing its stirring capabilities.

Since numerous changes may be made in the above described apparatus and different embodiments of the invention may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In combination, a hub adapted for rotation within a liquid-containing vessel, stirring means for agitating the contents of said vessel, means interconnecting said hub with said stirring means and responsive to rotation of said hub for imparting oscillatory motion to said stirring means, means carried by said hub adapted to cooperate with said stirring means for effecting rotation thereof simultaneously with said hub and in the same direction, said interconnecting means comprises a post member and an apertured member, said post member being loosely received in the aperture of said apertured member, said post member being carried by said hub member at a point remote from its center of rotation.

2. Structure as specified in claim **1**, wherein said means for effecting rotation of said stirring means comprises resilient means disposed intermediate one of said members and at least a part of the other of said members.

3. Structure as specified in claim **1**, wherein said means for effecting rotation of said stirring means comprises a plurality of fins extending substantially radially from an annular wall thereof, said fins serving to move liquid contained in said vessel away from the fins in the direction of said stirring means.

4. Structure as specified in claim **1**, wherein said hub comprises a permanent magnet adapted to be attracted by magnetic forces produced by a magnet rotating beneath said vessel.

5. In combination, a hub adapted for rotation within a liquid-containing vessel, stirring means for agitating the contents of said vessel, means interconnecting said hub with said stirring means and responsive to rotation of said hub for imparting oscillatory motion to said stirring means, said stirring means comprises two identical arms, each having a substantially vertically disposed leading segment, an offset trailing member having horizontal and vertical segments, a horizontally disposed spiral member interconnecting said leading and trailing members.

6. Structure as specified in claim **5**, wherein the horizontal segments and the horizontally disposed spiral members of each arm lie in planes disposed one above the other.

7. Structure as specified in claim **6**, including means carried by said hub, cooperating with said stirring means for effecting rotation thereof simultaneously with said hub.

8. Structure as specified in claim **7**, wherein said interconnecting means comprises a pivot member and an apertured member interconnecting said horizontal segment of said trailing member such that said hub is disposed intermediate said vertical segments of said trailing member, said post member being loosely received in said apertured member, and said pivot member being integral with said hub at a point on the surface thereof remote from the center of rotation thereof.

9. Structure as specified in claim **8**, wherein said means for effecting rotation of said stirring means comprises resilient means interposed between one of said members and at least a portion of the other of said members.

10. Structure as specified in claim **8**, wherein said means for effecting rotation of said stirring means comprises a plurality of of fins extending substantially radially from said hub member, said fins being adapted to create turbulent motion in said substantially liquid substance producing a force which impinges on said trailing members.

11. Structure as specified in claim **10**, wherein said hub is provided with a rounded bottom surface to permit slight rocking of said arms.

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