United States Patent

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[54] **STIRRING DEVICE**
1 Claim, 5 Drawing Figs.

[52] **U.S. Cl.** **259/111,** 416/142
[51] **Int. Cl.** **B01f 7/18**
[50] **Field of Search** ..... 259/ (Inquired), 103, 106—108, 111, 114, 119, 121, 122, 133—135, 138, 144; 416/142

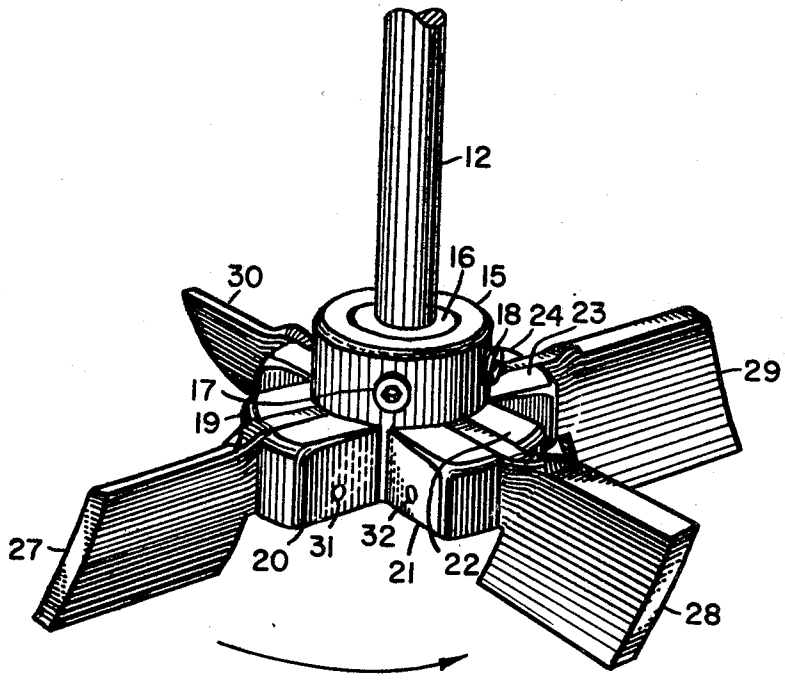
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ABSTRACT: A device for stirring liquid contained in a bung-type drum, the stirring action being generated by a shaft-mounted rotor having vanes retractable into a configuration permitting insertion of the rotor through the bung with the shaft.



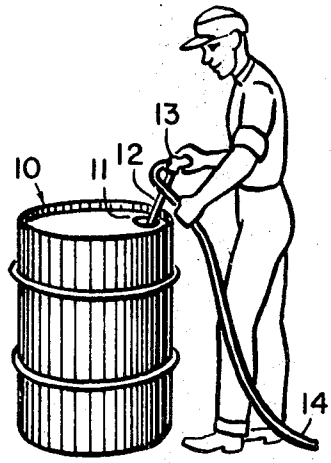


Fig. 1

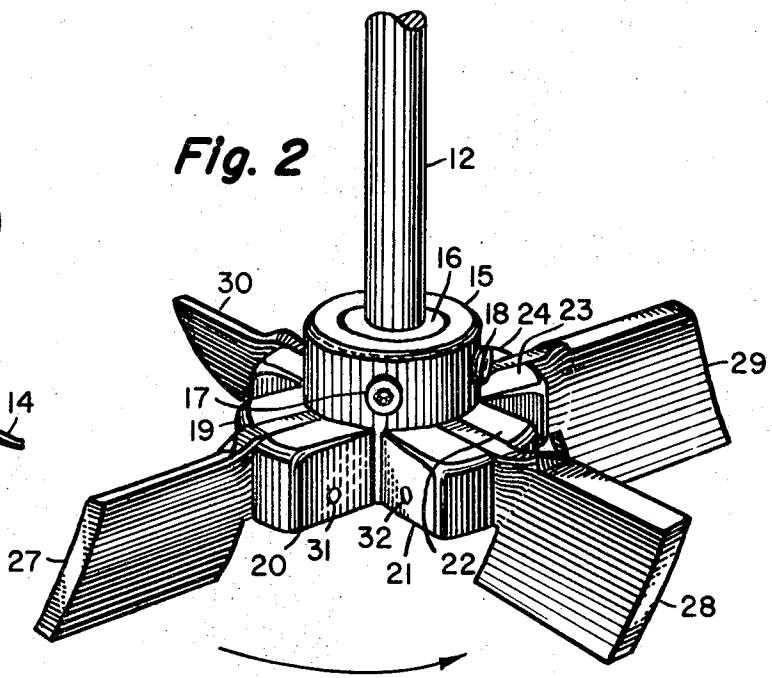


Fig. 2

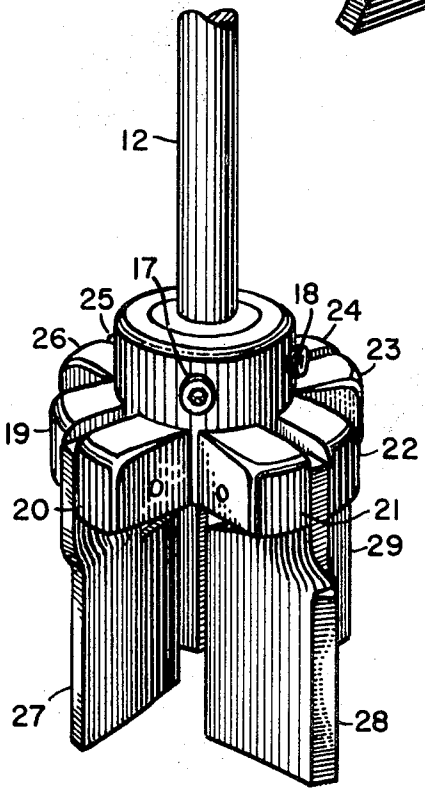


Fig. 3

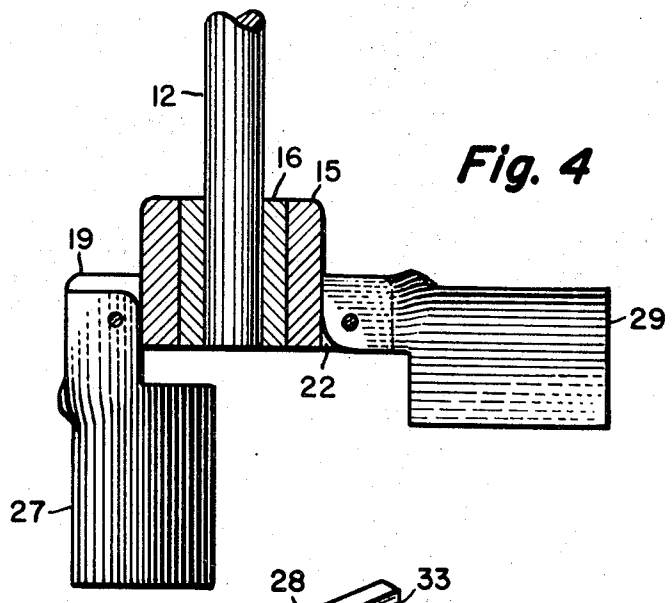


Fig. 4

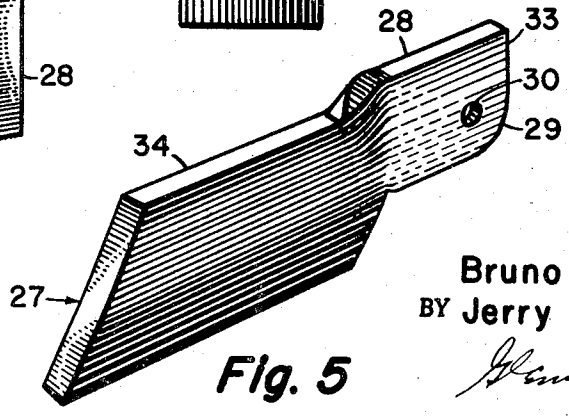


Fig. 5

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STIRRING DEVICE

BACKGROUND

It is common practice to store paints and other liquid materials in relatively large drums, and storage for any length of time immediately creates a problem of restoring the suspension of solid materials, such as pigments that settle out. Small containers can be handled conveniently in shaking devices which generate enough circulation of the liquid within the drum to restore suspension. In the case of large drums, however, the shaking equipment becomes prohibitively large and costly, and also involves handling procedures that become a nuisance. These problems have tended to cause liquids having a settle-out problem to be stored in containers that have an entire end removable. This arrangement permits the insertion of mixing devices and agitators functioning on the same general principle as a malted-milk mixer in a drug store.

There are a number of advantages, however, to handling liquids in bung-type containers, particularly when large quantities of material are involved. In the case of paints, it is undesirable to expose the surface of the liquid to air any more than is absolutely necessary. The formation of surface skin on a container of paint is very troublesome, and unnecessary exposure of the paint also creates a vapor problem within the work area.

SUMMARY OF THE INVENTION

The present invention permits the use of large bung-type drums for storing liquids containing suspended solids, without interfering with the possibility of stirring the liquid to restore the suspended condition. A stirring action is provided by a rotor mounted on a shaft driven by any convenient form of portable motor unit, with the rotor having preferably a group of retractable vanes that can be placed in a position permitting insertion of the entire rotor through the bung opening, followed by extension of the vanes into operating position by the effect of centrifugal force, or by dynamic forces generated within the liquid through movement of the rotor.

DESCRIPTION OF THE DRAWING

The several features of the invention will be analyzed in detail through a discussion of the particular embodiment illustrated in the drawing. In the drawing:

FIG. **1** is a perspective view showing a workman using the stirring device in a standard bung-type drum of liquid.

FIG. **2** is a perspective view on an enlarged scale, showing the rotor and shaft of the stirring device, with the vanes in the extended position.

FIG. **3** is a view of the device shown in FIG. **2**, with the vanes in the retracted position.

FIG. **4** is a cross section through the axis of the rotor showing the configuration of the vanes and the hub for establishing the interacting stops defining the extended position of the vanes.

FIG. **5** is a perspective view on an enlarged scale, showing the rotor vane separately.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a standard drum **10** has a bung opening **11** through which the stirring device has been inserted. The shaft **12** is driven by the conventional air motor **13** held in the workman's hand, and supplied with compressed air through the conduit **14**. During the operation of the device, the shaft **12** rotates within the bung opening **11**.

The primary stirring action is generated by the device in the position in which it appears in FIG. **2**. The hub **15** is mounted on the shaft **12**, possibly with the assistance of the adapter **16**. The set screws **17** and **18** secure the hub with respect to the shaft. The hub is provided with a group of pairs of generally radially-extending lugs **19—20**, **21—22**, **23—24**, and **25—26**. The lugs constituting each pair are spaced apart sufficiently to receive the radially innermost ends of the vanes **27—30**, respectively. These vanes are all formed as shown in FIG. **5**, and are provided with the flat inner end portions **28** having the

arcuate corner **29** concentric with the holes **30**, which receive pivot pins in the position shown at **31** and **32**. These pins traverse the pairs of mounting lugs, as well as the holes **30**, with this mounting permitting limited rotation of the vanes in a plane containing the axis of the shaft **12**. When the vanes are extended fully to the radial position shown in FIG. **2** (and in the position of the vane **29** in FIG. **4**), the portion **33** of the vane comes in contact with the fixed structure of the hub, and prevents further swing-out movement of the vane **29**, as shown in FIG. **4**, in a counterclockwise direction. The movement of the vane from the position of the vane **27** in FIG. **4** to that of vane **29** can be accomplished by the action of centrifugal force, either separately or in conjunction with a dynamic force created by the inclination of the outer blade section **34** with respect to a plane perpendicular to the axis of the shaft **12**. This inclination produces the well-known propeller action, and the rotation of the shaft **12** by the motor device **13** should be in such a direction as to induce movement of the vanes from the FIG. **3** position to the FIG. **2** position. The vanes normally depend downwardly (in the static condition of the device) to facilitate insertion into pg,5 the drum, and also to permit withdrawal from the drum after the stirring operation has been completed. It is important to assure that the direction of folding movement is not such that gravity will maintain an extended position of the vanes which would block withdrawal through the bung opening **11**.

It is obvious that the use of the propeller action will serve not only to extend the vanes, but also to generate a very desirable degree of circulation within the liquid in the drum to induce a restoration of the suspended condition of any solids that may have settled out. If a device is carefully handled, it is also possible to use the unit in a slightly modified manner, in which the rotor can be forced down into a settled mass of previously suspended material, and actually scrape it off the bottom of the drum. If the rotation of the motor **13** is reversed when the rotor device is near the bottom of the drum, the resulting dynamic forces on the vanes will tend to move them to the FIG. **3** position. However, the presence of the bottom of the container can be determined so as to permit the vanes to follow the bottom surface to produce a desirable scraping action. The inclination of the vanes under these operating conditions will tend to remove settled mass from the bottom of the container. Cleaning of the device after the stirring operation has been completed is an obviously simple procedure, since it merely involves immersing the unit in a suitable container of cleaning solution, and rotating it, preferably either intermittently, or in opposite directions, to flex the blades from the FIG. **2** to the FIG. **3** position.

The particular embodiments of the present invention which have been illustrated and discussed herein are for illustrative purposes only and are not to be considered as a limitation upon the scope of the appended claims. In these claims, it is our intent to claim the entire invention disclosed herein, except as we are limited by the prior art.

We claim:

1. In combination with a drum having a relatively small bung opening, a device for stirring the contents of said drum comprising:

a shaft insertable in said bung opening;

a hub normally mounted on said shaft, said hub having pairs of generally radially-extending lugs;

a vane rotatably mounted with respect to said hub between each of the lugs constituting said pairs, respectively, for movement between (*a*) retracted position in which said hub and vane are together insertable in said bung opening, and (*b*) extended position, said vane being induced to move outwardly and upwardly to extended position by movement of said shaft, said vanes having the portions thereof which are disposed between said lugs formed to provide a stop engageable with said hub to define the extended and retracted positions of said vanes, said vanes also having offset portions extending toward the axis of rotation of said hub in said retracted position and occupying the space opposite the end of said hub and shaft in said retracted position; and means for driving said shaft.