

[54] REMOVABLE AGITATOR

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[58] Field of Search 259/122, 118, 119, 120, 259/121, 111, 107, 108, 102, 103, 66, 67, DIG. 38; 416/238

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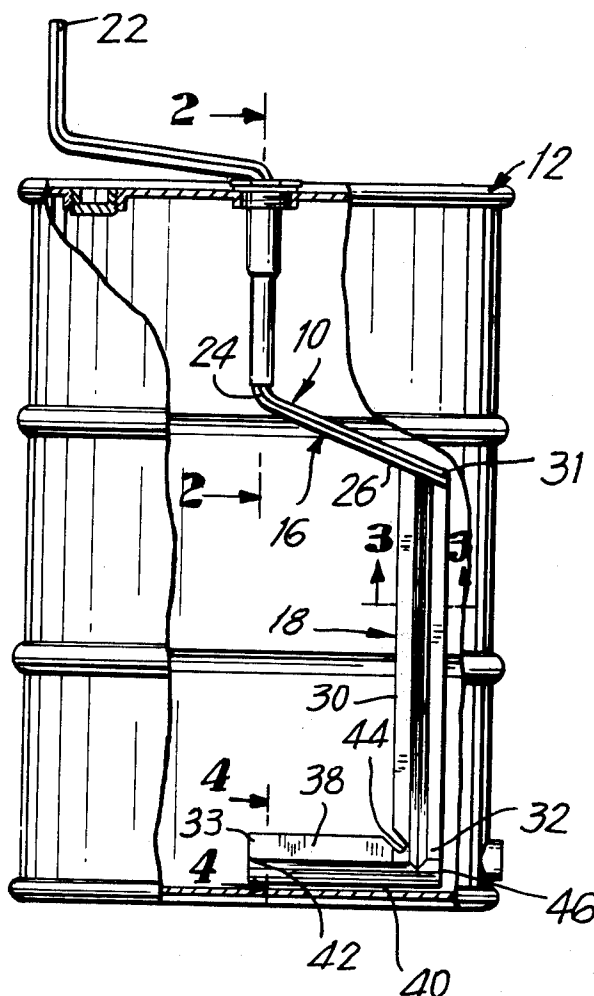
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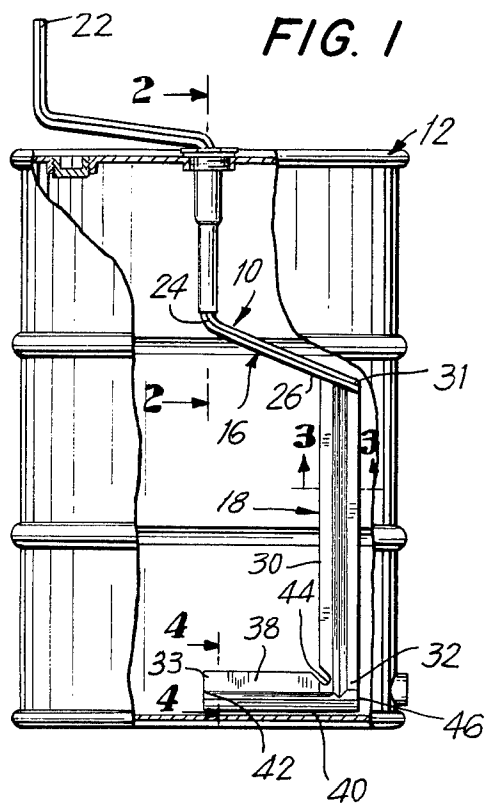
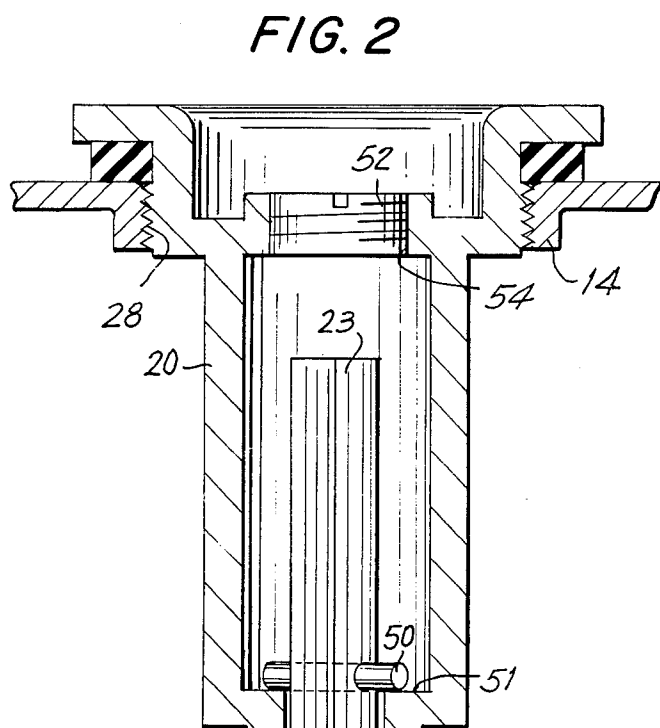
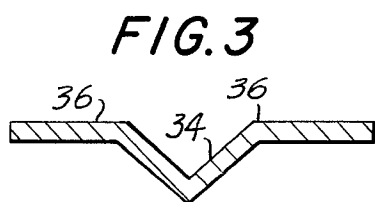
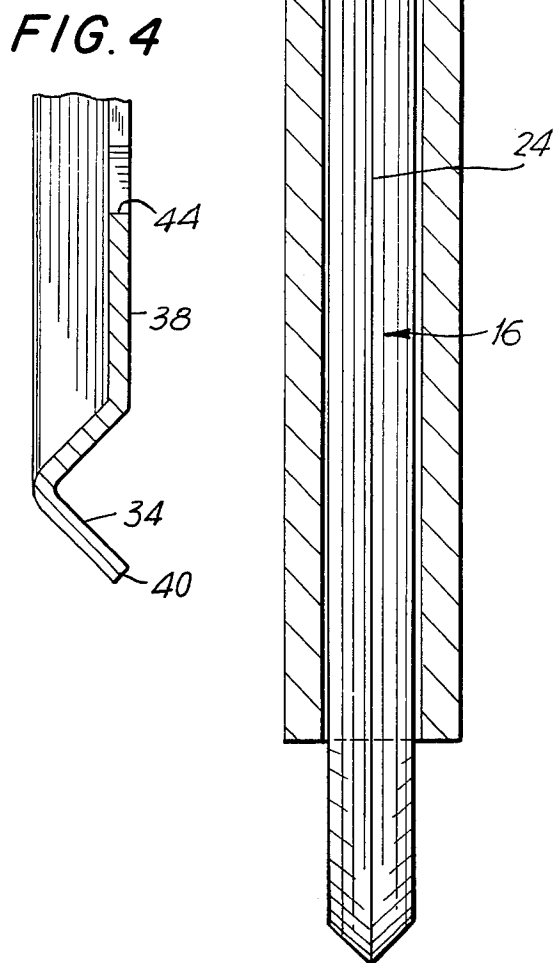
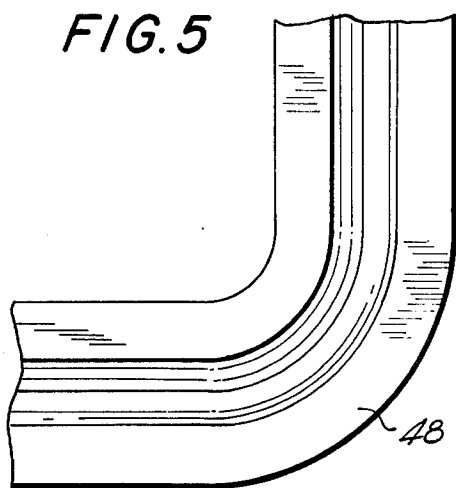
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[57] ABSTRACT

A removable agitator adapted to be inserted in a container through an opening therein. The agitator includes a shaft having a vertical first portion and a second portion extending from said first portion. Means is provided for supporting said shaft within the opening in the container for rotating the shaft about the axis of the vertical first portion. The agitator further includes a stirring blade having one end thereof attached to the second portion of the shaft. The blade includes a support section having a first and second edge and at least one flat section extending from one of the first and second edges in such a manner that the surface area of the blade is greatest in a radial direction which is approximately perpendicular to the direction of rotation of the blade within the container.

7 Claims, 5 Drawing Figures





REMOVABLE AGITATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an agitator, and more particularly to a removable agitator which is adapted to be inserted in a container through an opening therein. Agitators such as those described in the specification and claims are to be understood to cover mixing, dispersing, homogenizing, dissolving and similar actions.

2. Description of the Prior Art

Presently in the United States today, great quantities of steel drums are manufactured and are used for storage and shipment of chemicals, petroleum products, paints, varnishes, food products, etc. Drums which are used for the shipment of paints and varnishes and other products of high viscosity have a tendency to thicken or separate. Therefore, drums of this type in the past have been equipped with agitators which were permanently attached to the flat top and bottom heads of the drum. These agitators were, of course, used to stir and return the liquid to a homogeneous state. By permanently fixing the agitator to the drum, the initial cost of each drum would appreciably increase.

In order to avoid the obvious disadvantages associated with fixed agitators, a portable agitator as described in U.S. Pat. No. 3,295,836 has been provided. This agitator, however, fails to provide maximum efficiency in stirring of the contents of the drum for the following reasons. The maximum surface area of the agitator blade, which is formed between the outer most edges of a V-shaped groove, is parallel to the direction of rotation of stirring, rather than perpendicular thereto, and thus, instead of maximizing the shearing action of the agitator, the shearing is in fact minimized. Furthermore, that portion of the blade between its vertical and horizontal sections is curved in such a manner as to reduce the surface area of the blade at a point distal from the axis of center of rotation of the blade. The opposite end of the horizontal portion of the blade extends past the axis of rotation of the blade, and thus provides no useful purpose, while unnecessarily increasing the cost of the blade. Furthermore, by unnecessarily extending the length of the horizontal portion of the blade, the vertical portion of the blade, which is positioned at a point distal from the center of the axis of rotation of the drum, has to be reduced in height in order to insure the insertion of the blade through the bung hole and into the drum before the end of the horizontal portion jams against the side walls of the drum.

SUMMARY OF THE INVENTION

Purposes of the Invention

It is an object of the invention to provide for an improved removable agitator blade having none of the aforementioned disadvantages;

It is a further object of this invention to provide an improved removable agitator blade adapted to be used within liquid carrying drums wherein the agitator blade is optimally designed to provide maximum surface area in the direction perpendicular to the direction of rotation of the blade.

It is a still further object of this invention to provide an improved agitator blade for stirring sediment from the bottom of the drum so as to render the liquid within the drum homogeneous.

Other objects of the invention will in part be obvious and in part be pointed out hereinafter.

Brief Description of the Invention

According to a broad aspect of the invention there is provided a removable agitator adapted to be inserted in a container through an opening therein. The agitator includes a shaft having a vertical first portion and a second portion extending from said first portion. Means is provided for supporting said shaft within the opening in the container for rotating the shaft about the axis of the vertical first portion. The agitator further includes a stirring blade having one end thereof attached to the second portion of the shaft. The blade includes a support section having a first and second edge and at least one flat section extending from one of the first and second edges in such a manner that the surface area of the blade is greatest in a radial direction which is approximately perpendicular to the direction of rotation of the blade within the container.

The blade has a vertical portion and a substantially horizontal portion wherein the substantially horizontal portion is adjacent the bottom of the container and extends from the axis of rotation of the blade to a point as near to the wall as possible while still allowing the blade to be inserted within the drum. The vertical portion of the blade extends from the bottom of the container to a maximum height within the container, such that the blade can still be placed within the container through the opening therein.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, in which are shown various possible embodiments of my invention,

FIG. 1 is a broken front view of a drum showing the agitator blade placed therewithin;

FIG. 2 is a cross-sectional view of the agitator shown in FIG. 1 taken between lines 2—2 showing the shaft and means for securing the agitator to the drum;

FIG. 3 is a cross-sectional view of the agitator blade shown in FIG. 1 taken between lines 3—3;

FIG. 4 is a cross-sectional view of the horizontal portion of the agitator blade shown in FIG. 1 taken between lines 4—4; and

FIG. 5 shows an alternate form of interconnection between the vertical and horizontal portions of the agitator blade.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will now be explained with reference to FIGS. 1 to 4. An agitator 10 is shown placed within a steel drum 12. The agitator in this example can be made of 0.08% carbon cold rolled steel. The agitator is so shaped as to fit through a 2¼ inch diameter opening or bung hole in the top of the drum, and is removably secured to an internally threaded flange 14 (shown in FIG. 2) when the agitator blade is properly positioned within the drum so as to seal the drum.

The agitator consists of a shaft 16, a blade 18; a sleeve 20 and a hand crank 22. Shaft 16 has a vertical portion 24 and a bent portion 26 attached thereto. Vertical portion 24, which is positioned at the central axis of the cylindrical portion of the drum, is surrounded by sleeve 20. Sleeve 20 has an externally threaded portion 28 which is screwed into the internally threaded portion of flange 14 so as to seal the drum opening after

the agitator is placed within the drum. Hand crank 22 fits over and is connected to a square top end 23 of vertical portion 24 of shaft 16, when the blade is to be rotated, and the crank may be removed when the blade is not to be rotated. A vertical portion 30 of blade 18 is connected to an end 31 of bent portion 26 of shaft 16 by any suitable means of attachment, such as welding. The bottom end 32 of vertical portion 30 of blade 18 is connected to a substantially horizontal portion 33 of blade 18.

Both the horizontal and vertical portions of blade 18 have a support section for providing rigidity to the blade, and in this example, the support section is a V-shaped rib 34. In this example the outer edges of rib 34 in the vertical portion 30 of blade 18 has flat portions 36 extending outward therefrom in a radial direction with respect to the axis of rotation of the blade, and thus perpendicular to the direction of rotation within the drum. The substantially horizontal portion 33 of blade 18 meanwhile has a flat section 38 extending from the top edge of the rib 34, while the bottom edge 40 of rib 34 scrapes along the bottom of the drum when the blade is being rotated so that the rib serves as a scoop for sediment or thicker portions of the liquid within the drum so as to greatly facilitate the mixing action and distribution throughout the liquid in the drum of the thicker and more solid material which has accumulated on the bottom of the drum. Likewise, flat section 38 of horizontal portion 32 is in a plane radial to the axis of rotation of the blade and perpendicular to the direction of rotation of the blade. In this manner, the horizontal and vertical portions of the blade have the greatest surface area in the direction perpendicular to the direction of rotation of the blade in the drum so as to thereby increase the efficiency and maximize the stirring action of the agitator.

To further maximize the stirring action of the agitator, horizontal portion 32 extends from the central axis of the drum to a point towards the wall of the drum and as close as possible thereto, while still allowing the blade to be inserted within the drum. Vertical portion 30 of blade 18 then extends parallel to the wall to the maximum height which is possible while still allowing the agitator blade to be placed within the drum. In this example for instance, if the diameter of the drum is approximately 22½ inches, the height of the drum being approximately 33 inches, and the length of the horizontal portion being 8½ inches, then the maximum length of the vertical portion can be made approximately 20 inches before end 42 of horizontal portion 38 would jam into the side walls of the drum during insertion of the agitator blade into the drum. Thus, the geometry and dimensions of the drum in this manner effectively limit the maximum length of vertical portion 30 of blade 18.

If, as in this example, the diameter of the opening in the drum is 2¼ inches, the widest dimension of either the vertical or horizontal portions of blade 18 would be restricted to somewhat less than 2 3/16 inches so as to enable the agitator to be either positioned within or removed from the drum. Furthermore, that part of the blade between the vertical and horizontal portions has a slot 44 formed therebetween and extending from that edge facing the center of the drum, as shown in FIG. 1, so that the corner section between the vertical and horizontal portions does not exceed the dimension of the hole opening in the drum, so as not to impede the plac-

ing of the agitator within or removing it from the drum. By forming slot 44 in that part of the blade which faces the central axis of the drum, that portion 46 of substantially horizontal portion 38 is made to extend to a more distal point from the central axis of the drum so as to effectively increase the stirring action of the agitator by providing more surface area further from the center of the axis of rotation of the agitator, and also provide for a scraping of a much larger area of the bottom of the drum.

In an alternate embodiment shown in FIG. 5, that portion 48 between the vertical and horizontal portions of the agitator blade is shown to be rounded so as to insure that the widest dimension of the blade is not so excessive as to prevent the passage of the blade through the hole in the drum.

It should be noted in FIG. 2 that blade 16 is loosely fit within sleeve 20. A pin 50 passes through the blade and rests on a flange 51 within sleeve 20 so as to allow the blade to rotate. A plug 52 may be screwed into a seat 54 within sleeve 20 when hand crank 22 is removed from vertical portion 24 of shaft 16, so as to seal the drum.

While hand crank 22 may actually be stirred by hand, agitator 10 can be adapted to be automatically stirred using any of the conventional techniques shown in the prior art or referred to in U.S. Pat. No. 3,295,836.

It thus is seen that there are provided removable agitators which achieve the several objects of the invention and are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having described the invention, there is claimed as new and is desired to be secured by Letters Patent:

1. A removable agitator adapted to be inserted through a central opening in a fixed top wall of a container comprising

- A. a sleeve including means detachably securing the sleeve in a vertical position in said opening,
- B. a shaft having a first portion journaled in said sleeve for rotation about a vertical axis,
- C. said shaft including a second portion connected at one end to the lower end of the first portion, said second portion extending radially outwardly toward the side wall of the container and being downwardly inclined,
- D. an elongated stirring blade of L-shaped configuration with a vertical segment and a horizontal segment, the upper end of the vertical segment being attached to the outermost end of the second portion of the shaft, the vertical segment disposed adjacent the side wall of the container and the horizontal segment being disposed adjacent the bottom wall of the container when the sleeve is secured in the central opening,
- E. a substantial portion of the width of said blade over the entire length thereof, including the vertical and the horizontal segments, being flat and in a vertical plane that includes the axis of rotation of the shaft, and
- F. rigidifying means extending along the entire length of the blade,

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G. the corner between the vertical segment and the horizontal segment of the stirring blade being disposed adjacent the bottom corner of the container between the side wall and bottom wall thereof.

2. A removable agitator in accordance with claim 1 wherein the rigidifying means constitutes a V-shaped rib.

3. A removable agitator in accordance with claim 2 wherein the apex of the rib faces away from the direction of rotation of the stirring blade.

4. A removable agitator in accordance with claim 2 wherein the rib is in the center of the vertical segment of the stirring blade.

5. A removable agitator in accordance with claim 4 wherein the rib is in the lower portion of the horizontal segment of the stirring blade so as to scoop up sediment from the bottom of the container.

6. A removable agitator in accordance with claim 1 wherein the inside corner of the stirring blade, where the horizontal segment is jointed to the vertical segment, is slotted.

7. A removable agitator in accordance with claim 1 wherein the horizontal segment terminates near the center of the bottom wall of the container.

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