Sept. 22, 1959 C. L. WISE 2,905,453

MIXING DEVICE

Filed Sept. 24, 1956

FIG-1

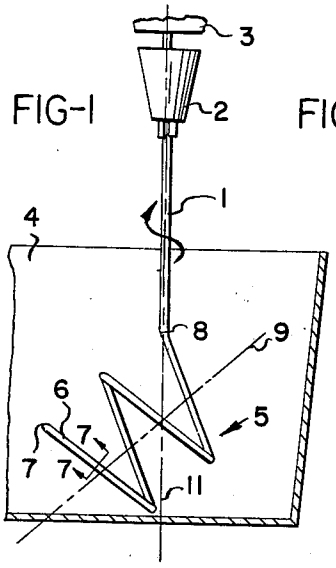


FIG-2

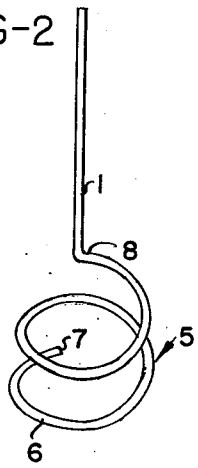


FIG-4

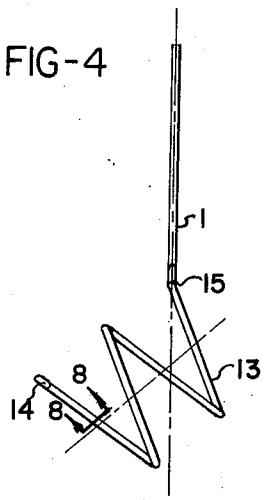


FIG-3

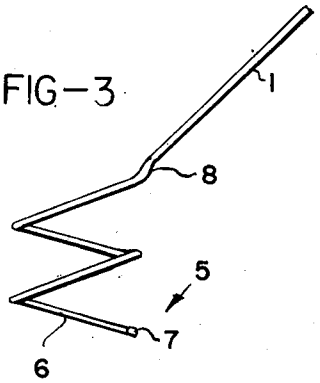
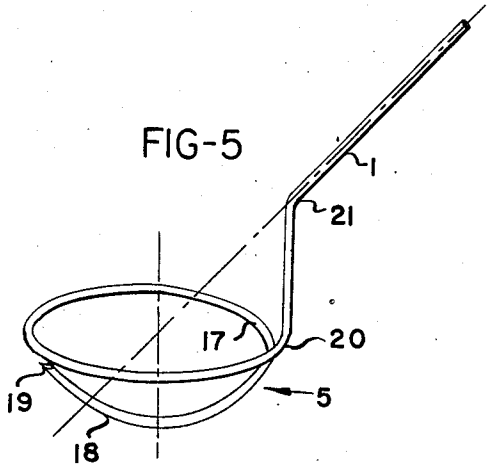


FIG-5



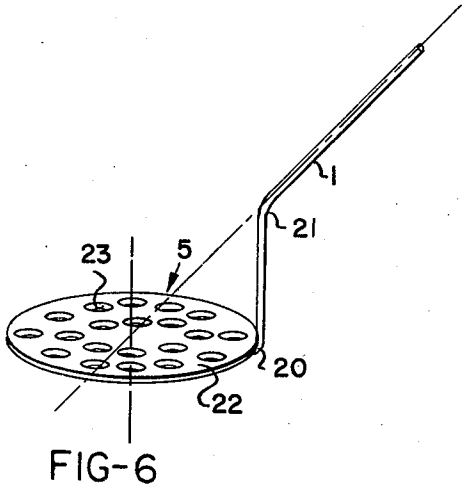


FIG-6

FIG-7



FIG-8



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2,905,453

MIXING DEVICE

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Application September 24, 1956, Serial No. 611,424

10 Claims. (Cl. 259—134)

My present invention relates to mixing devices and particularly to mixing devices such as are commonly employed in the household, in the mixing of paints and sprays, and in baking and creamery applications, for example.

A principal object of the invention is the provision of a mixing device which mixes more readily than conventional devices, that is, it will occasion better mixing in a shorter period of time.

Objects of the invention also include the provision of a mixing device which provides, in combination, both a rotary action of wide scope and a rectilineal action in a direction generally transverse to that of the rotary action; the provision of a balanced mixing device in which the end of the drive shaft is connected eccentrically or at an outer edge portion of an agitator element, the device being balanced by the angular relationship between the shaft and agitator element; and the provision of a mixing device which when rotated at high speeds will cause a whipping action. Thus when the device is rotated in a vertical position it causes an up and down motion of material being mixed, with each revolution of the device; it also causes a right and left motion, when employed in a horizontal position. Such actions develop a churning motion which contributes to the rapidity of the mixing.

These and other allied objects of the invention will be more fully understood by reference to the following detailed description and accompanying drawings wherein:

Figure 1 is an elevational and fragmentary view of one embodiment of the invention shown secured to a chuck;

Figure 2 is a view of the agitator element of Figure 1 taken substantially at right angles to the view of Figure 1;

Figure 3 is a perspective view of the agitator element of Figure 1;

Figure 4 is an elevational view of an embodiment of the structure of invention similar to that shown in Figure 1, but having the coil forming the agitator element wound in an opposite direction to that of Figure 1;

Figure 5 is a perspective view illustrating a further modification of the structure of Figure 1;

Figure 6 is a perspective view of yet another modification of the structure of Figure 1;

Figure 7 is an enlarged sectional view taken substantially on line 7—7 of Figure 1; and

Figure 8 is an enlarged sectional view taken substantially on line 8—8 of Figure 4.

In the drawings, insofar as practical, similar numerals designate corresponding parts.

Referring to the drawings more in detail, the numeral 1 designates a shaft which is suitably in the form of a heavy steel wire having a diameter, for example, of about 3/16 of an inch. Shaft 1 is supported on a conventional chuck 2 and depends below the frame 3 of any suitable power source.

The shaft 1 may be driven suitably by an electric drill unit, for example, or a hand-operated unit, or a unit such as commonly employed in connection with kitchen mixing apparatus. The numeral 4 designates a container in which material is to be mixed.

Integral with and depending from the shaft 1 at a pitch angle to the axis of the shaft 1 is an agitator element designated generally at 5 and in the form of a coil of wire represented at 6, the coil having a plurality of turns, being of the same diameter wire as the shaft 1, and having a terminal point indicated at 7. At the junction of the shaft with the agitator element an obtuse angle 8 is formed as is shown in Figures 1, 2 and 3.

The coil 6 has an axis 9 which passes through the center of mass of the coil. Axis 9 intersects and forms with the shaft axis or the shaft axis extension designated by the numeral 11 an acute angle.

A particular feature of the structure of invention is the provision of the angle means between the driving portion of shaft 1, to which the chuck 2 is secured, and the outer edge portion of the agitator element 5. The angle means provides for the balancing of the mixing unit as a whole for smooth rotative motion. Thus the angle designated at 8 compensates for the offset or eccentric relation of the agitator element 5 with respect to the shaft 1.

The offset relation of the agitator element 5 provides that the agitator element will be balanced for rotation and in its rotation will move through a relatively wide path eccentric to the shaft, as may be seen from Figure 1.

The intersection of the axis 11 with the axis 9 at substantially the center of mass of the agitator element provides for such balancing. In this connection the terms "center of mass" and "center of gravity" are, for the purposes of this invention, substantially synonymous, and may be used interchangeably in this invention.

As will be apparent from the foregoing description when shaft 1 extends vertically the coil 6 in its rotation not only describes a wide horizontal path, but also acts to move the material being mixed in a vertical direction, due to the fact that the coil has a helical or screw-like movement, and that the outer surfaces of the agitator element are eccentric to the axis of rotation of the shaft. Thus, as viewed in Figure 1, the material leftwardly of the agitator element would be moving in an upwards direction while the material on the opposite side moves in a downward direction, resulting in a churning action which materially benefits the mixing operation.

In the structure of Figure 4 the shaft 1 as shown is integral with the coil 13, which coil has a terminus at 14, the coil being flattened as indicated in Figure 8. The angle 15 is formed in opposite relation to the angle 8 of Figure 1, and the coil is wound in opposite relation to that of the structure of Figure 1. This is advantageous when doughs, for example, or similar materials are mixed, as the coil may be selected such that the terminals 11 and 14 will not tend to dig into the mass being mixed.

Referring now to Figure 5 the wire shaft is again indicated by the numeral 1; the agitator element consists of a single substantially horizontally extending loop 17 provided with a depending integral loop 18, which has an upper terminus 19 extending very nearly to the loop 17. The shaft 1 in this instance is provided with an angle portion 20 connecting the agitator element to the shaft, and is further provided with a reverse angle 21 in the length of the shaft but between the driving upper shaft portion carrying the chuck 2 and the angle portion 20.

It will be noted that in this instance the angle between the shaft 1 and the plane of the agitator element is greater, that is, more sharply inclined than that in the instance of the structures of Figures 1 and 2, and angle 21 provides for effecting the necessary balance of the structure for rotation.

Referring now to Figure 6 the driving shaft 1, as in Figure 5, is provided with angles at 20 and 21; in this

instance, however, the agitator element is in the form of a disc 22 which is secured on the underside thereof, as by soldering, to the end of the driving shaft 1. Disc 22 is suitably provided with a plurality of apertures 23 which are useful in the mixing of liquids having sufficient fluidity to pass through the apertures, thereby increasing the mixing action.

It may be noted from an inspection of the drawings that the agitator element exerts a screw-like action on the material being mixed and that the mixing takes place, not only due to the rotational effect and displacement rotationally of the material being mixed, but a translational movement and displacement of the particles being mixed is also occasioned.

In the structure of Figure 1, wherein the coil 6 comprises two loops forming the spiral of the coil, it is the angular relationship which provides for balance and the angles may be otherwise formed, as has already been indicated in connection with the structures of Figures 4, 5 and 6.

However, it is to be particularly noted in the instance of Figure 1 for example, that if the coil turns were spaced more closely together the angle 8 would have to be altered to provide the axis of the shaft through substantially the center of mass of the coil. Similarly with the structures of the other embodiments, as in Figure 5 for example, altering the pitch of the agitator element alters the position of angle 20 on the shaft.

Accordingly, it will be clear from the foregoing that a single angle or a plurality of angles between the agitator element and the chuck-held portion of the drive shaft may be provided to balance the agitator element for its rotation.

The device described has been found, when utilized either in connection with a manual power source or an electric power source, such as an electric drill, to be highly effective in the mixing of heavy materials, for example, paints, heavy sprays, and whitewashes, as well as dry or powdery materials, and including bakery mixes.

The agitator elements while normally employed in a vertical position of the shaft 1, as shown in Figure 1, may suitably be utilized in planes such that the shaft 1 is horizontal.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. A mixing device which is balanced for rotation comprising, a drive shaft having a driving portion, and an agitator element connected at an edge portion thereof to an end of the shaft remote from the driving portion, the axis of the shaft driving portion and the axis of symmetry through the center of mass of the agitator element intersecting and forming an acute angle substantially at the center of mass of the element.

2. A mixing device which is balanced for rotation comprising, a drive shaft having a driving portion, and an agitator element connected at an edge portion thereof to an end of the shaft and offset from the center of mass of the agitator element, the axis of the shaft driving portion and the axis of symmetry through the center of mass of the agitator element intersecting and forming an acute angle substantially at the center of mass of the element.

3. In a mixing device which is balanced for rotation, in combination, an agitator element, a drive shaft having a driving portion at one end thereof, the shaft having the other end thereof secured to an edge portion of the agitator element and forming an obtuse angle with the element, the axis of the shaft driving portion and the axis of symmetry through the center of mass of the agitator element intersecting and forming an acute angle substantially at the center of mass of the element.

4. In a mixing device, which is balanced for rotation, in combination, a drive shaft having a driving portion, and an agitator element depending from the shaft and in the form of a coil having one end on an edge portion thereof joined to an end of the shaft and the other end thereof remote from the shaft and free, the coil having a major axis passing through the center of the coil and intersecting the axis of the shaft driving portion at substantially the center of mass of the agitator element, the coil forming with the shaft at the juncture thereof an obtuse angle.

5. In a mixing device which is balanced for rotation, in combination, a drive shaft having a driving portion adjacent one end thereof, an agitator element secured to the other end of the drive shaft, the shaft connecting with the agitator element at an edge portion of the element in eccentric relation to the center of mass of the element, and angle means between the agitator element and drive portion of the shaft formed to position the axis of the drive portion to intersect the axis of symmetry which passes through the center of mass of the element substantially at the center of mass of the element.

6. In a mixing device, which is balanced for rotation, in combination, a drive shaft having a driving portion adjacent one end thereof, an agitator element secured to the other end of the drive shaft, said agitator element being substantially in the form of a helix, the shaft connecting with the agitator element at an edge portion of the element in eccentric relation to the center of mass of the element, and angle means between the agitator element and drive portion of the shaft formed to position the axis of the drive portion to intersect the axis of symmetry which passes through the center of mass of the element substantially at the center of mass of the element.

7. In a mixing device, which is balanced for rotation, in combination, a drive shaft having a driving portion adjacent one end thereof, an agitator element secured to the other end of the drive shaft, said agitator element being substantially in the form of a disc, the shaft connecting with the agitator element at an edge portion of the element in eccentric relation to the center of mass of the element, and angle means between the agitator element and drive portion of the shaft formed to position the axis of the drive portion to intersect the axis of symmetry which passes through the center of mass of the element substantially at the center of mass of the element.

8. In a mixing device which is balanced for rotation, in combination, a drive shaft having a driving portion adjacent one end thereof, an agitator element secured to the other end of the drive shaft, said agitator element being substantially in the form of an apertured disc, the shaft connecting with the agitator element at an edge portion of the element in eccentric relation to the center of mass of the element, and angle means between the agitator element and drive portion of the shaft formed to position the axis of the drive portion to intersect the axis of symmetry which passes through the center of mass of the element substantially at the center of mass of the element.

9. In a mixing device which is balanced for rotation, in combination, a drive shaft having a driving portion adjacent one end thereof, an agitator element secured to the other end of the drive shaft, the shaft connecting with the agitator element at an edge portion of the element in eccentric relation to the center of mass of the element, said shaft having a plurality of angles formed therein between the driving portion of the shaft and the agitator element, the angles being formed to position the axis of the shaft drive portion to intersect the axis of symmetry which passes through the center of mass of the element substantially at the center of mass of the element.

10. In a mixing device which is balanced for rotation, in combination, a drive shaft having a driving portion adjacent one end thereof, an agitator element secured to the other end of the drive shaft forming a juncture

therewith, the shaft connecting with the agitator element at an edge portion of the element in eccentric relation to the center of mass of the element, said shaft having a plurality of angles formed therein between the driving portion of the shaft and the agitator element, the element being in the form of a loop and having a portion depending from the loop extending across the loop therebelow and terminating at a point opposite the juncture formed by the agitator element and shaft, the said angles of the drive shaft being formed to position the axis of the drive portion to intersect the axis of symmetry which passes through the center of mass of the element substantially at the center of mass of the element.

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