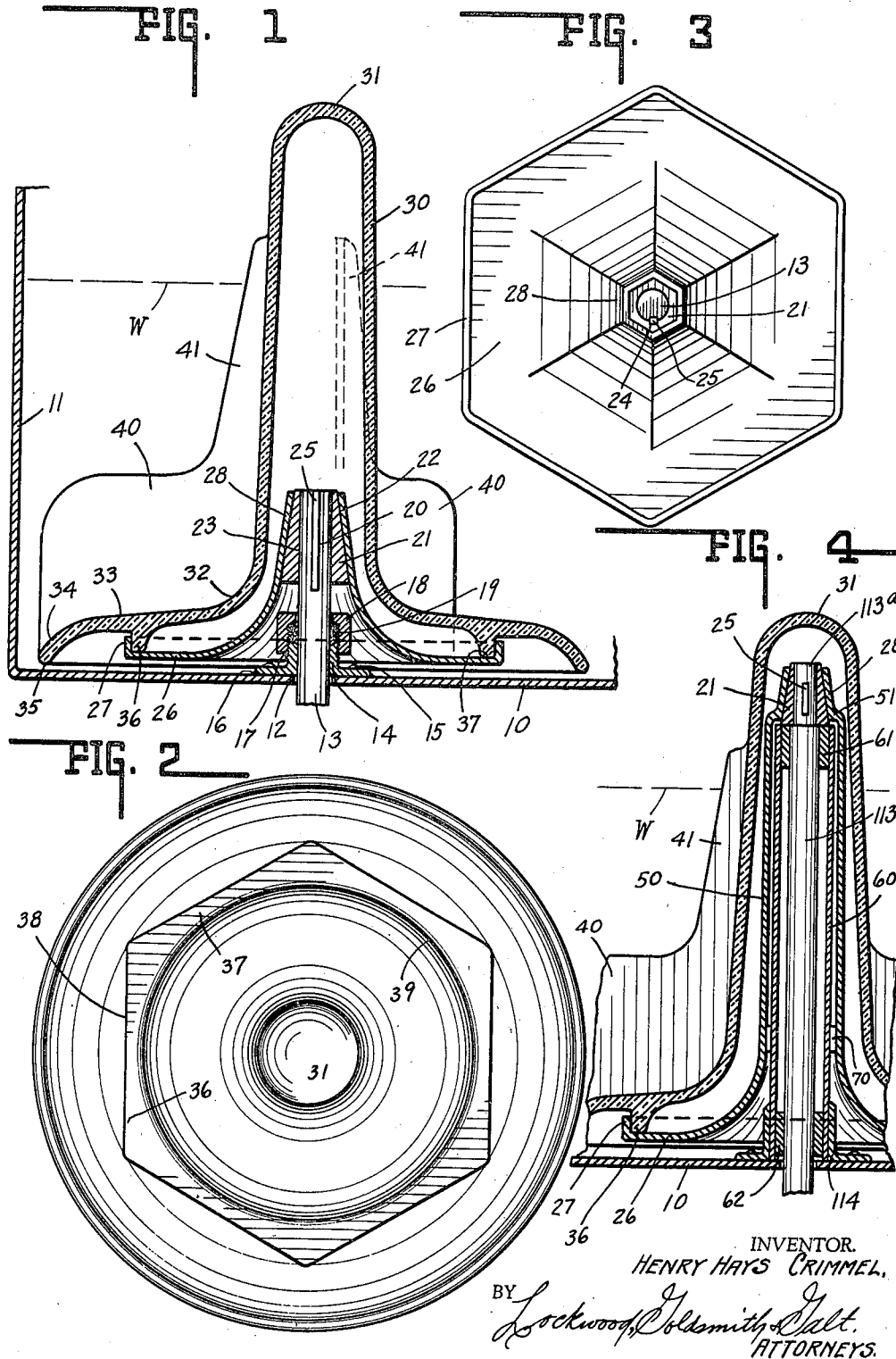


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COMPOSITE AGITATOR AND DRIVE WITH MOLDED
COMPRESSION STRAIN DRIVEN ELEMENT
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COMPOSITE AGITATOR AND DRIVE WITH
MOLDED COMPRESSION STRAIN, DRIVEN
ELEMENT

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8 Claims. (Cl. 68—134)

The invention relates to an agitator and drive connection thereto which agitator is suitable for washing machines and the like.

The chief object of this invention is to provide a drive connection to an agitator element of the type wherein the same is of a material held together and in form by compression; in other words, skin tension. Such a material is glass but same is not the only one for plastics, broadly speaking, are similar thereto.

The chief feature of the invention consists in driving an agitator of this particular type of material in such a manner that the driving force is applied as a compression aid and opposes centrifugal force tension stresses induced in the agitator by rotation thereof.

A corollary feature of the invention consists in driving such an element from the lower side interiorly of the outer periphery thereof and more particularly immediately adjacent said periphery and immediately adjacent the base of said agitator.

By way of explanation for more than ten years' strenuous efforts have been made to successfully solve the problem of utilizing a glass agitator in a washing machine. This problem has defied solution until the present invention has been perfected, failures being primarily attributed to a lack of recognition of the material stresses and limitations involved and present success being predicated upon the compensating application of forces to the agitator and this through the broad application of the structural arrangement hereinbefore recited as a corollary feature.

Other objects and features will be more fully described hereinafter.

The full nature of the invention will be more fully understood from the accompanying drawing and the following description and claims.

In the drawing,

Fig. 1 is a central sectional view of an agitator for a washing machine and the like, and a drive therefor, same embodying a representation of the invention, the tub bottom being shown in section.

Fig. 2 is a bottom plan view of the agitator element.

Fig. 3 is a top plan view of the driver element and driving shaft.

Fig. 4 is a view similar to Fig. 1 and of a modified form of agitator drive and its support.

In the drawing 10 indicates the bottom of what is known as the tub of a conventional washing machine, 11 indicates a side wall thereof, 12 indicates a central opening in the bottom through

which projects an agitator drive shaft 13 which may rotate or oscillate as determined by the type of power applied to shaft 13 and such a shaft may rotate a plurality of revolutions in one direction before reversing and rotating a plurality of revolutions in the opposite direction or may rotate in one direction a partial revolution and then reverse, and rotate a like or different amount in the reverse direction, et cetera. These various driving actions of the shaft 13 are well known in the washing machine art.

The shaft 13 is suitably and rotatably supported in the bearing 14, usually riveted at 15, and welded at 16 to the tub bottom. The member 14 extends upwardly into the tub bottom and is externally threaded as at 17 to receive a gland nut, or the like, 18 for retaining packing 19 about the shaft 13 for water sealing said shaft in the bottom of the tub.

The upper end of the shaft is grooved as at 20 and a frusto polygonal member 21 having the aforesaid external surface 22 and the cylindrical bore 23 therethrough is provided with a keyway 24 and in the same and in the shaft groove 20 is mounted the key 25. Hence, member 21 moves with the shaft 13.

The driver element of the embodiment selected for illustration or exemplification of the invention is a metal plate 26 having at its outer periphery edge a rim 27. This rim is rigid and of the polygonal outline, as shown more particularly in Fig. 3. The plate portion 26 centrally is directed upwardly and this tubular upper portion 28 is of peripheral interior outline having a formation complementary to the external formation of the member 21. Hence, when the driver 26 is telescoped upon the member 21, it seats thereon by gravity and other gravitation forces transmitted thereto, and said driver is so supported that the plate portion 26 in the movement of the shaft 13 clears the bottom of the tub. In connection with water seals and bearing lubrication, et cetera, various forms thereof may be incorporated. It will be noted in this embodiment of the invention the driving power is applied centrally to the driver element and is transmitted to the driving rim 27.

The agitator element selected for illustration and exemplification of the invention is a glass, inwardly and upwardly tapered tube 30 closed at its upper end 31 in the particular illustration. This end, however, may be open for certain applications of the invention, since it is well above the normal water line of the tub, the same being indicated by the letter W, and dotted line in

Fig. 1. The lower end of this closed tube 30 is flared outwardly and downwardly as at 32, forming a laterally and outwardly extending portion 33 that terminates in a downwardly directed skirt portion 34. The lower face 35 of this downwardly directed portion when the agitator is associated with the driver has clearance of the desired minimum amount between it and the tub bottom 10.

Adjacent the portion 34-35 and appreciably remote from the central axis of the agitator and on the underface of the portion 33 is a peripheral collar or flange portion 36, herein shown extending downwardly from said portion 33 and terminating in a face 37, that, relative to the face 35, is at a higher elevation. The exterior of this portion 36 is polygonally outlined as at 38 and has the same number of side faces as the rim 27, and is engaged by the interior surface of said rim when the agitator is seated on the driver. For production purposes, the interior surface of the driven flange 36 is circular, as indicated as at 39.

The agitator is provided with a plurality, and usually three, outwardly and radially directed vanes 40 that have upwardly directed extensions 41. Between these three vanes may be positioned subsidiary vanes and the external surface of the tube 30 and portions 33-32 may also be suitably formed. The interior, however, is preferably smooth.

When the agitator is of glass, the same is formed by press molding and inherent in such molding the agitator has set up therein compression strains, various parts of the agitator being held together by skin tension in the form of such compressive strains. An article of this character has, comparatively speaking, a very low tensile strain accommodation. Hence, a centrally positioned drive applied at or near the axis of such an article imparts its driving force in a direction to tear apart the article and this is intensified by the effect of centrifugal force set up in the article incident to its rotation.

The foregoing is inherent, whether the drive be applied at the top of the agitator near the middle thereof or near the base thereof, the more critical conditions being in the order named.

The present invention, it will be quite apparent, as exemplified by Fig. 1, applies power near the base of the agitator and at or considerably below the horizontal plane through the center of gravity of said agitator. It also will be apparent that the entire weight of the agitator is carried by the driver and the face 37 resting on the upper face of the base 26 constitutes the support; such clothes or the like, that may be supported by the agitator also have their weight imposed and supported as aforesaid. Inasmuch as the rim 27 is of metal and has considerable tensile strength, it has a tendency to resist any tendency of the portion 36 to expand outwardly under the action of centrifugal force exerted upon all parts of the agitator. The comparative spacing distance between the face 37 and the face 35 of the agitator is relatively close but this may be varied as may be found expedient or desirable. For clearness in illustration, however, herein some distance or spacing is illustrated.

The driving force, it will be quite apparent, by reason of the telescopic association with the agitator being nested in the driver and the telescopic association being adjacent the periphery of the agitator and being immediately adjacent the base thereof and hence at or below the center of gravity of the agitator, has a resulting effect such that the forces applied in driving oppose centrifugally

forces set up in the agitator and hence, compensate therefor so that destruction of the agitator due to driving strains or centrifugal strains is eliminated and reduced.

This constitutes the positive solution of a problem that has been before the washing machine industry by way of example for more than ten years and which is now solved by this construction.

Reference now will be had to Fig. 4 wherein a modified form of drive is illustrated solely for the purpose of illustrating a second application of the invention, it being understood the essential features of the basic invention are retained in this embodiment and as will be apparent from a comparison of Figs. 1 and 4 for the agitator elements may be identical. The drive element is slightly modified and the drive shaft and its support are also modified.

Specifically, the driver has an upwardly directed tubular extension, herein indicated by the numeral 50, and the same terminates in an inwardly directed portion 51 topped by the frusto polygonal portion 28. A corresponding exteriorly surfaced member 21 is keyed as at 25 to a shaft 113 at the upper end 113a thereof, herein shown slightly reduced in diameter. The tub bottom 10 has, in this form of the invention, attached thereto as aforesaid, the collar portion 114 and rigid therewith is the tube 60 that extends upwardly and envelopes the elongated portion of the shaft 113. This tube, as shown at its upper end, terminates above the water level W and the shaft also extends thereabove.

At the upper end of the tube 60 and between it and the shaft, is a suitable bearing 61. At the lower end of the tube and between it and the shaft is another bearing 62, hence the shaft 113 is supported in fixed vertical relation. If desired, there may be interposed between the tubular portion 50 and the tube 60 what is called a soap and water bearing 70. Any other desired kind or number of bearings may be included.

The purpose of illustrating the embodiment represented by Fig. 4 is to show the application of the basic invention to a second generally well known type of washing machine drive structure.

It is to be noted that in both forms of the invention the drive connection between the power or driver and the agitator element is immediately adjacent the periphery of the latter so that should there be slight inequalities between the rim 27 and the flange 36 at the face 35 and end 34 of the agitator, such inequalities are not unduly multiplied or emphasized as is apparent will be the case if the drive were close to the axis of rotation of the agitator. Herein for purpose of illustration, the complementary polygonal formations are shown hexagonal in outline. They may be of any other desired outline and not necessarily confined to a regular polygonal outline, although the latter is preferred because of the inherent balance relation that thus results.

The purpose of either embodiment is to take advantage of the principle that glass items are set up under a compression strain and in driving from near the external edge of the agitator, the driving force is encouraging and helping this compression strain rather than attempting to destroy it by applying the pressure torque and strain in the interior of the agitator near the center thereof. When this strain is applied at the interior near the center, regardless of whether it is through the top or the bottom of the shaft, the driving force is working directly against

the natural tendency of a piece of glass, because it is set up under such a compression strain. Hence, the driving force is not only working against this strain, but in working against it, is dissipating a large amount of the real strength to the glass article by helping to relieve or eliminate this surface compression strain that strengthens the piece of glass itself. The outward thrust of the centrifugal action of any agitator has a tendency to work against and fight this surface compression strain. Hence, this present driving force opposes and partially neutralizes this centrifugal force which normally helps to break down a lot of the strength of the glass agitator.

While the invention has been illustrated and described in great detail in the drawing and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. An agitator of molded frangible material such as glass and the like, including an upwardly extending central tubular portion and an outwardly directed continuing flange portion at the tubular portion lower end, the outer surface having suitable vanes and the like, a downwardly directed skirt portion at the periphery of the flange portion and forming therewith a lower chamber, and a driving portion extending into said chamber and downwardly from the lower face of the flange portion adjacent the skirt portion and having an external polygonal-like outer face spaced from the interior surface of the skirt, the skirt and driving portions having centers substantially coincident with the central axis of the tubular portion, all portions being integral.

2. An agitator as defined by claim 1, characterized by the lower face of the driving portion lying above the plane of the lower face of the skirt portion.

3. A combination drive arrangement for an agitator including an agitator element of frangible material and having a rim and provided with a driving flange adjacent said rim and spaced therefrom and forming therewith a groove in the base of the element, a driver and agitator element support positioned centrally within the element and including an outwardly directed plate portion with an upwardly directed rim adjacent its outer periphery and seatable in the groove, the inner face of the driver rim and the outer peripheral face of the driving flange having complementary, noncircular interfitting conformations for driving purposes, the element being operatively supported by said driver, a driving shaft extending upwardly above the lowest plane of the driver and having an axis coincident with

the longitudinal centers of the element and driver, and a driving connection coaxial with and adjacent said axis and between said driver and shaft.

4. A combination as defined by claim 3, characterized by the agitator having an elongated, upwardly directed imperforate tubular central portion with a closed upper end and the driver including an upwardly directed shorter tubular central portion nestable therein, the driving connection between the shaft and driver being at the upper end of the shaft within the tubular portion.

5. A combination as defined by claim 3, characterized by the agitator having an elongated, upwardly directed imperforate tubular central portion with a closed upper end and the driver including an upwardly directed shorter tubular central portion nestable therein, the driving connection between the shaft and driver being at the upper end of the shaft within the tubular portion and immediately adjacent the lower end of the agitator element central tubular portion.

6. A combination as defined by claim 3, characterized by the agitator having an elongated, upwardly directed imperforate tubular central portion with a closed upper end and the driver including an upwardly directed shorter tubular central portion nestable therein, the driving connection between the shaft and driver being at the upper end of the shaft within the tubular portion and immediately adjacent the upper end of the agitator element central tubular portion.

7. A container bottom having an aperture therein, defined by an upwardly extending tubular portion of appreciable length and a combination as defined by claim 3, the agitator thereof having an elongated upwardly directed imperforate tubular central portion with a closed end, the driver including an upwardly directed shorter tubular central portion nestable therein, the driving connection of said combination being at the upper end of the driver tubular portion and within the agitator central tubular portion, the shaft extending upwardly through said aperture and container bottom tubular portion, the top of the latter being positioned within the agitator element central tubular portion, a soap, and water bearing between the driver tubular portion and container bottom tubular portion, and a shaft bearing between the shaft and the container bottom tubular portion.

8. In combination a centrally supported rotatable driver having an upwardly directed rim-like perimeter of polygonal-like outline, and an agitator element of frangible material and including means forming a groove in its lower face to receive said rim, the innermost wall of said groove conforming to the rim interior outline and engageable by the inner face of the rim, the element resting upon said driver adjacent the rim and being rotatable through the aforesaid engageable face and wall.

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