April 5, 1960 B. L. HUBBARD 2,931,201

DRIVE COUPLING

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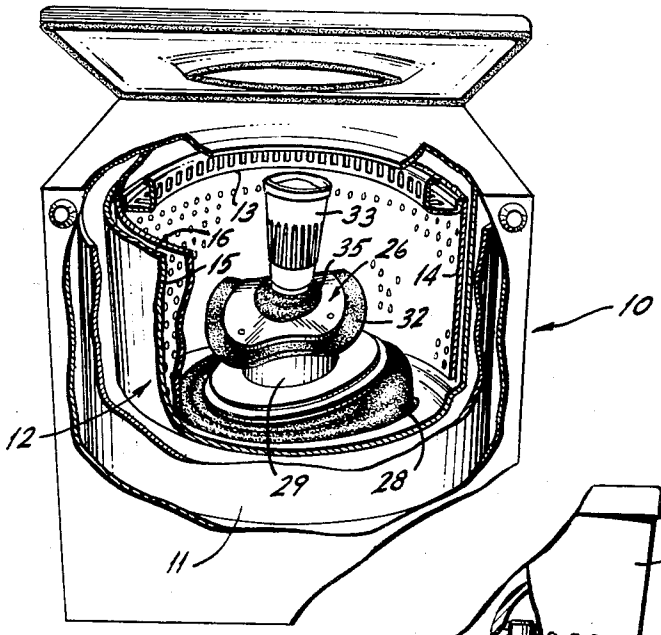


FIG. 1.

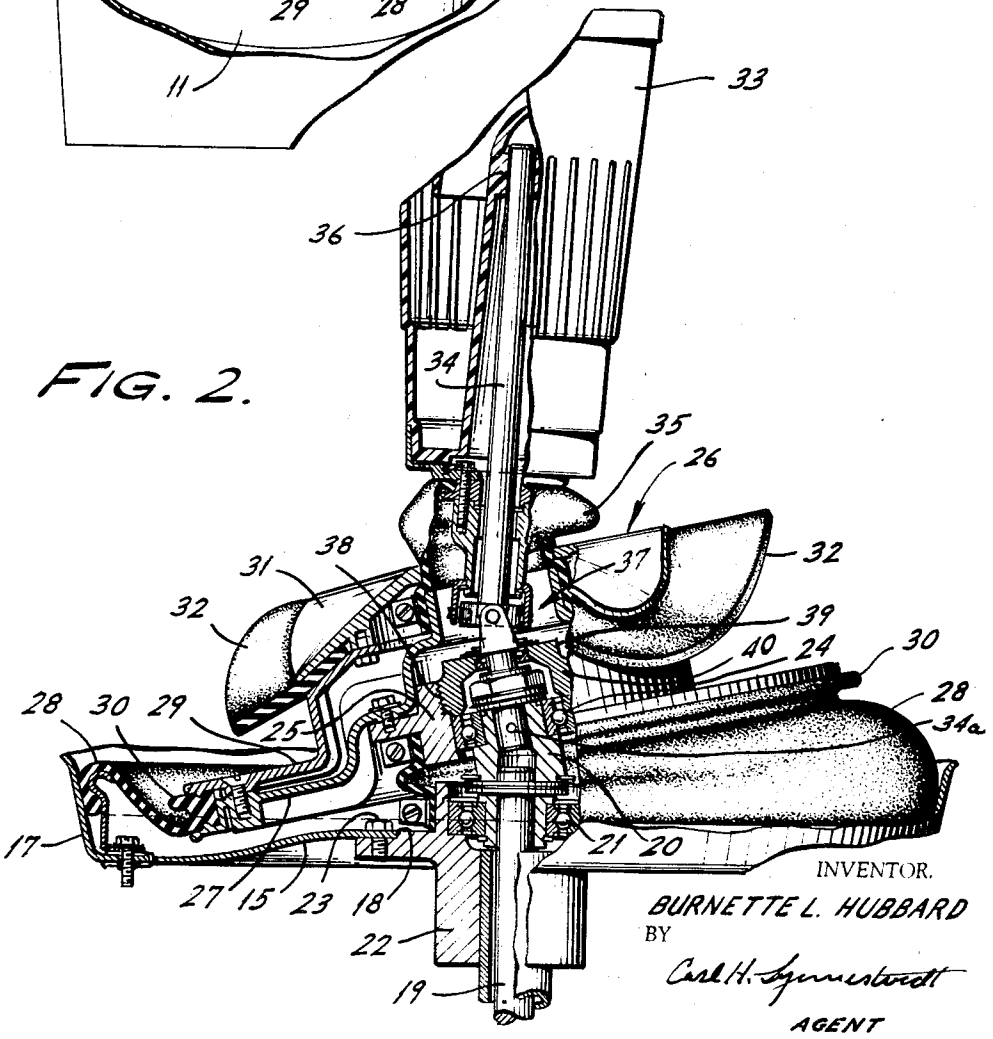


FIG. 2.

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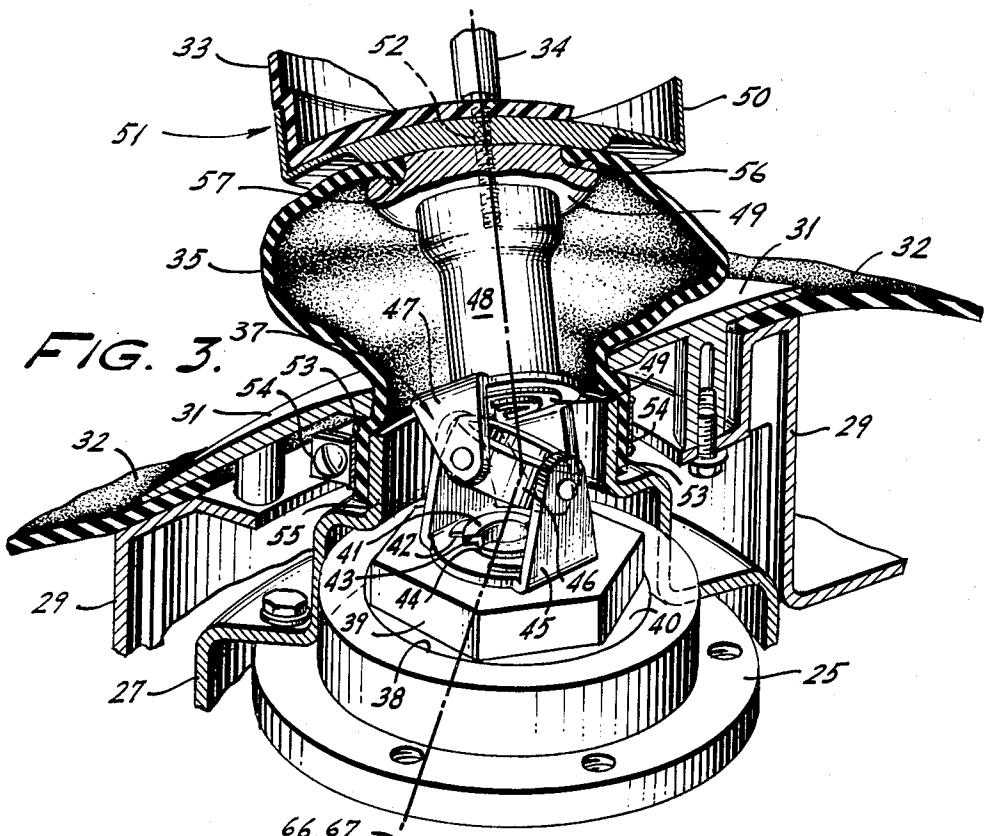


FIG. 3.

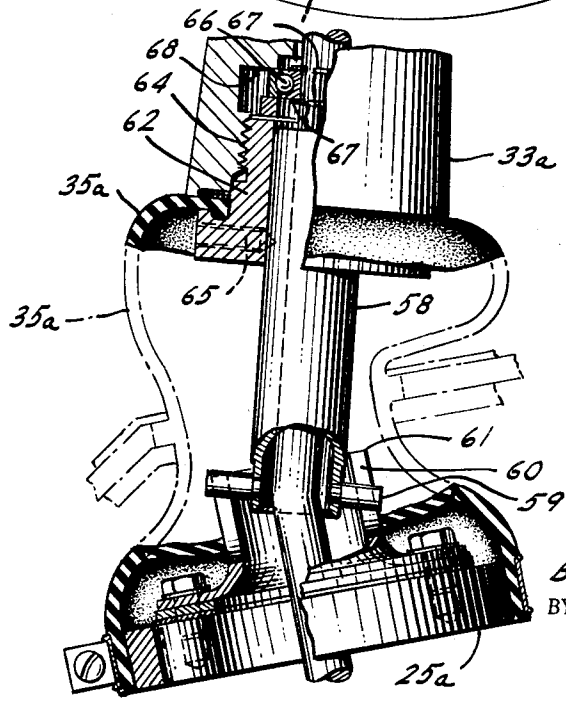


FIG. 4.

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DRIVE COUPLING

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Application August 5, 1958, Serial No. 753,328

3 Claims. (Cl. 68—131)

This invention relates generally to drive coupling arrangements.

While of broader applicability, the invention hereinafter described has especial utility when used in laundry equipment of the type characterized as mono-directional agitator, or "wobble type," washing machines. Accordingly, and with the foregoing qualification in mind, the invention will be described with specific reference to this particular field of application.

In washing machines generally, it is necessary, in order to accomplish effective washing, to impart vigorous laundering movements to the clothes being washed, a requirement which may result, in the case of conventional wobble type washers, in covering of the agitator by the clothes being washed and consequent smothering of the washing action. In the case of wobble type machines, the washing action is accomplished by freely journalling an agitator of suitable configuration, on an obliquely disposed member, such as an inclined bearing, coupled to a rotatable drive shaft, the agitator being held in non-rotatable, fluid-tight relation to the wash tub by a flexible interconnecting sleeve or "boot."

Continuous unidirectional rotation of the drive shaft, acting through the eccentric, imparts a wobbling or cyclically recurring tilting motion to the agitator, producing circulation of the washing fluid and causing articles being washed to be brought into intimate contact with the turbulent streams of water generated by the moving members.

Washers of the above mentioned type offer a number of advantages over more conventional machines in that the need for a complex and expensive transmission is eliminated, making for a less expensive and more easily maintained unit. Moreover this type of washing action results in more uniform loading of the drive motor since the periodically varying accelerations, found in more conventional machines, are minimized.

To gain fully the advantages accruing through the use of wobble-type machines it has been found necessary to provide means preventing the smothering of the agitator action by the clothes being washed, a condition which is particularly severe when washing articles of substantial size, such as shirts, towels, and the like. Moreover, once agitating action is suppressed, those clothes in direct contact with the agitator undergo excessive mechanical wear, often resulting in substantial damage to the articles being washed.

This problem has been effectively overcome by the addition of a generally vertically disposed, upwardly extending column, coupled to, and cyclically driven by, lower portions of the agitator, which development forms the subject matter of copending application entitled "Washing Machine" bearing Serial No. 702,362, filed December 12, 1957 and assigned to the assignee of the present invention and now Patent No. 2,902,851 issued September 8, 1959.

Machines incorporating this improvement, however, while having many advantages, frequently experience an accelerated deterioration of the flexible seal which connects this column in fluid-tight relation to the undulating agitator, a condition found to result principally from torsional stress of the sealing member produced by vagrant and unpredictable force factors inducing relative rotation of the interconnected members.

Accordingly it is an object of this invention to provide a unique coupling arrangement which will permit the free articulation of flexibly interconnected members executing distinct but cyclically related movements, while concurrently preventing relative rotative movement between such members.

The above mentioned and other objects within contemplation will be more readily understood by reference to the accompanying detailed description and drawings, in which:

Figure 1 is a cut away perspective view, showing a washing machine of the "wobble type" variety embodying the present invention;

Figure 2 is a sectionalized elevational view of the agitator mechanism shown in Figure 1;

Figure 3 is an enlarged perspective illustration of the unique coupling arrangement constituting a preferred embodiment of the invention; and

Figure 4 shows a modified version of the invention.

Referring to the drawings, Figure 1 shows a wobble type washing machine including an outer casing or cabinet 10 housing a fixed tub 11, this latter member forming an enclosure for the dual walled rotatable cylinder or wash tub 12 which member is of cylindrical shape with inclined walls expanding to increased cross sectional area at the top and having an inwardly extending peripheral wall portion 13 preventing escape of clothing over the top edge of the wash tub. Clothes cylinder 12 is preferably comprised of a foraminous inner porcelain shell 14 back by a spaced imperforate casing 15, the porcelain shell 14 permitting sediment carried by the water to pass behind the clothes and through the space 16 between members. This arrangement permits sediment to drain from the top edge of the cylinder without redepositing on the articles during the extraction cycle.

Referring to Figure 2 the clothes cylinder 12 conveniently, although not necessarily, contains a depressed bottom portion 17 provided with a centrally disposed aperture 18 through which the drive shaft 19 extends. This shaft terminates in an obliquely mounted crank head 20 to which it is rigidly secured in driving relation. The crank head 20 is rotatably journalled on the inner race of bearing 21 seated within drive hub 22 which member is securely mounted to the casing 15 as by cap screws 23.

To provide the characteristic wobble action, a ball bearing 24 is interposed between the crank head 20 and the agitator support 25, the latter member forming a mount for the entire agitator assembly. This arrangement, on rotation of shaft 19, produces oscillatory or gyrating motion of the crank head 20 which in turn imparts a progressive, substantially non-rotative wobbling or undulatory motion to the agitator support 25 and the agitator assembly 26 mounted thereon.

Rigidly secured to the support 25, by conventional means, is agitator base plate 27, this latter member being maintained in fluid-tight relation with the casing 15 as by means of the interconnecting flexible diaphragm 28, which serves also to prevent relative rotation between the tub and agitator assembly 26. The diaphragm 28, along its inner periphery, is clamped between the base plate 27 and the upper retaining plate 29, the terminal portion of the diaphragm being molded to contain an outwardly extending flipper 30. Sandwiched between the retain-

ing plate 29 and cap 31, and completing the lower portion of the agitator assembly, is the flexible agitator disc 32.

To insure effective operation of the agitator assembly, it is necessary to provide means preventing smothering of the agitating action by the clothes being washed. This is desirably accomplished, as shown in the illustrated embodiment, by providing a generally vertically disposed, upwardly extending column or agitator post 33, which physically prevents clothes from covering the agitator assembly. To prevent interference during normal agitator action, it is necessary that the motion of this column be distinct but cyclically related to that of the lower agitator assembly, it being found that movement of the column rigidly mounted to the agitator tends to set up currents counter to those produced by the agitator assembly, the gyratory movements of such a column producing circulating currents lying in planes transverse the path of normal clothes circulation which currents act to nullify the main washing action materially impairing washing efficiency.

The embodiment shown in Figure 2 provides a solution to this problem (see the copending disclosure referred to above) and comprises effectively extending the drive shaft 19, by means of shaft 34, through a centrally located aperture in the agitator assembly, one end of the shaft 34 being seated within the crank head 20 and rigidly secured thereto by pin 34*a*. To prevent knotting and entanglement of the clothes by the rotating shaft 34, a condition interfering with effective washing, the agitator post 33 encases and is freely journalled on shaft 34, thereby effectively insulating the clothes being washed from the rotating shaft 34.

The preferred arrangement here shown permits the column and agitator to be individually driven by common drive means, a method insuring the desired correlative function of these members. Rotation of shaft 19 results in a radially progressing undulation of each point of the agitator while simultaneously, and in predetermined synchronism therewith, column 33, impelled by movement of shaft 34, gyrates about a nodal point defined by the intersection of the longitudinal axis of the column 33 with the principal axis of tub rotation.

To effect operation of the type described it is necessary that a fluid-tight seal 35 be maintained between the agitator column 33 and the lower agitator assembly 26 in order to prevent contamination of internal mechanism such as the bearing 24 and drive shaft 34. Moreover, it has been found that if continuing effective operation of this seal over an extend dperiod of time is to be insured, it must be free of torsional loading. When flexible materials, such as the rubber and plastic seals conventionally employed, undergo torsion, they rapidly deteriorate and fracture. This problem is particularly acute in wobble-type machines of the kind illustrated in that there are at least three distinct, uncontrollable ocnditions arising during normal operation of the machine tending to induce twist of the seal of boot 35.

One such condition is present during the agitation or wash cycle during which time the agitator assembly is held from rotative movement by diaphragm 28 secured to the braked tub or drum 15. The shaft 34 during this period of operation is continuously rotating within the center post bearing 36 and imposes a frictional drag, though bearing 36 on column 33, which rotative moment is reflected as a continuing torsional stress on boot 35. Furthermore, normal washing action produces, among other motions, circulation of a portion of the wash water and articles entrained therein in a plane generally transverse the axis of tub rotation, the clothes and water constituting the circulating stream tending to impress a rotative thrust on column 33 thereby placing the boot 35 in torsion.

The third torsion-inducing conditions occurs on initiation of the extraction cycle, at which time power transmitted through the rapidly rotating input shaft 19 is instantoneously coupled to both the agitator and tub assemblies the assemblies thereby being clutched for synchronous rotation. (For details of the drive and clutching mechanism reference may be made to copending application entitled "Drive Mechanism" bearing Serial No. 740,157, filed June 5, 1958 and assigned to the assignee of the present invention.) The inertia of post or column 33, however, resulting from its own mass and the somewhat viscous media in which it is immersed, causes the column to initially lag behind the main driving thrust, placing the boot 35 under severe torsional stress.

To prevent twisting of the interconnecting boot 35, there is fixedly secured to, and interposed between, the agitator post 33 and lower agitator assembly 26, the articulate linkage arrangement 37, the embodiment constituting a preferred arrangement of the present invention. This linkage, in order to prevent torsion of boot 35, is designed to prevent relative rotation of the members to which the boot is fixedly secured while concurrently permitting the otherwise distinct and individual movements of the column 33 and lower agitator 26, which movements are necessary to effect proper functioning of the washing machine.

Referring now to Figure 3 there is shown an enlarged, sectionalized perspective view of the preferred form of the invention. The agitator support 25, in order to accommodate attachment of coupling 37, is provided with an internally threaded aperture 38 which receives a nut 39, bearing a threaded plug or extension 40. Nut 39 is further provided with a centrally apertured, upwardly presented annulus 41, grooved to receive a snap ring 42, wall portions of the neck 41 being radially slotted at 43 to receive orienting tangs 44 of a bracket 45. The bracket 45 pivotally supports the gimbel ring 46 to which a bracket 47 is pivotally attached. These brackets may be and preferably are identical, the upper bracket 47 being secured to the tube-like extension 48 by means of snap ring 49 seated in a suitably provided groove in tube 48. The extension 48 is needed because of dimensional considerations and is additionally provided with an enlarged disc-like plate 49 to which the agitator post or column 33 is secured. To facilitate attachment of column 33 to this extension there is included a metallic disc-like member 50 into which column 33 lockingly seats as shown at 51, the assembly comprising column 33 and retainer 50 being firmly anchored to extension 48 by means of machine screws 52, only one of which is shown.

The linkage denominated generally by the number 37 prevents any relative rotation between column 33 and the lower agitator assembly 26 while at the same time accommodating their otherwise distinct and individual movements. The seal member or boot 35 in order to provide a fluid-tight seal is interposed in a connection between the column and lower agitator assembly, the lower end or skirt 53 of the boot being secured by clamp 54 to upwardly presented wall portions 55 of base plate 27 which member is rigidly secured to support plate 25. The upper neck portion of boot 35 is provided with a peripheral bead 56 which is firmly seated in a mating groove 57 provided in plate 49, the boot being locked in place when the retainer 50 is mounted.

Extending through this assembly, as indicated by its center line in Figure 3, is the crooked shaft 34 the bend of the shaft being maintained in substantially the plane of linkage pivotation. As indicated previously, the synchronous rotation of shafts 34 and 19 causes column 33 and the lower agitator assembly 26 to execute distinct but cyclically related movements, their correlative functioning being insured through the simple expedient of effectively powering both systems by common drive means. The linkage, essentially consisting of brackets 45 and 47 and gimbel ring 46, is designed to accommodate the predictable and uniform motion thereby impressed on these systems while concurrently constraining the motion

of column 33 to two degrees of freedom and preventing its rotation relative to the agitator assembly 26.

Where it is desired to incorporate within the column 33 a filter, soap dispenser or other washing aid removable by the operator, the coupling or linkage 37 shown in Figure 3 has further and particular utility. The linkage imposes a positive restraint on column 33 thereby preventing its vertical dislocation or retraction along the axis of shaft 34 through handling by the operator, which movement would subject the boot to damaging, uncontrollable flexural stresses.

An alternative coupling arrangement is shown in Figure 4, and comprises a sleeve or tube-like member 58, one end of which is provided with radially presented pins 59 slidably movable within slots 60 provided in the side wall of collar 61. This linkage while restraining the rotation of the column relative to the agitator base plate 25*a* does not, in contradistiction to the coupling previously described, restrain vertical movement of column 33*a*. The boot 35*a* in this embodiment is anchored to the agitator base plate 25*a* in a manner similar to that already described, the upper beaded neck portion of the boot being secured to an appropriately recessed nut 62 containing the externally threaded extension 64 to which column 33*a* is secured, the nut being fixedly mounted to sleeve 58 by means of set screw 65.

One technique for preventing vertical dislocation of column 33*a*, when employing a coupling of this type is to confine a bearing 66 between appropriately spaced snap rings 67 carried by shaft 34*a*, and to bring the outer race of this bearing into restraining contact with a suitable abutment 68 provided in column 33*a*. As will be apparent, the simplified and less expensive arrangement shown in Figure 3 eliminates the need for the more costly and complex securing arrangement required by the embodiment shown in Figure 4.

The invention, restated, resides in providing a unique coupling arrangement which will permit the free articulation of flexibly interconnected members executing distinct but cyclically related movements, while concurrently preventing relative rotative movement between such members. More particularly the invention when employed in so-called wobble-type washing machines of the kind illustrated, provides a unique combination for non-rotatively interconnecting otherwise relatively moving members, materially extending the life expectancy and efficiency of such machines.

Coupling arrangements of the kind described have proven highly effective in achieving the advantages inherent in wobble-type machines, and have entirely eliminated the difficulty of effecting a fluid-tight elastic seal between relatively moving parts subject to vagrant and unpredictable forces tending to induce relative rotative movement therebetween.

While specific embodiments illustrative of the present invention have been depicted and described, modifications may be made therein without departing from the spirit and scope of the present invention. It will be understood, therefore, that such changes and modifications are contemplated as come within the scope of the appended claims.

I claim:

1. In a washing machine, the combination comprising: a composite agitator having a first portion adapted to extend generally horizontally within said washing machine for wobbling movements therein and a second columnar portion, mounted independently of said first portion, and extending generally vertically thereabove; drive means common to each of said portions for concurrently imparting gyratory movement to said columnar portion and wobbling movement to said first portion; sealing means flexibly interconnecting said first and second agitator portions in fluid-tight relation; and articulate means including a gimbal joint coupling said first and second portions to prevent torsional loading of said sealing means while accommodating the otherwise individual and distinct movements of said composite agitator.

2. In a washing machine, the combination comprising: a composite agitator having a first portion adapted to extend generally horizontally within said washing machine for wobbling movements therein, and a second columnar portion mounted independently of said first portion and extending generally vertically thereabove; drive means common to each of said portions for concurrently imparting gyratory movement to said columnar portion and wobbling movement to said first portion; sealing means flexibly interconnecting said first and second agitator portions in fluid tight relation; and a universal joint coupling said first and second portions to prevent torsional loading of said sealing means while accommodating the otherwise individual and distinct movements of said composite agitator.

3. In a washing machine, the combination comprising: a vertical axis clothes tub having an apertured bottom; a composite agitator mounted within said tub having a first portion adapted to extend generally horizontally within said washing machine for wobbling movements therein and a second, a columnar portion mounted independently of said first portion and extending generally vertically thereabove having an upper portion centered on the tub axis and lower portions disposed eccentrically thereto; rotatable drive means common to each of said portions for concurrently imparting gyratory movement to said columnar portion and wobbling movement to said first portion; a flexible boot interconnecting said first and second agitator portions in fluid tight relation; and a universal joint coupling said first and second portions to prevent torsional loading of said boot while accommodating the otherwise individual and distinct movement of said composite agitator.

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