Nov. 29, 1949 H. C. HESSE 2,489,642

DRIVING UNIT

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Fig. 2

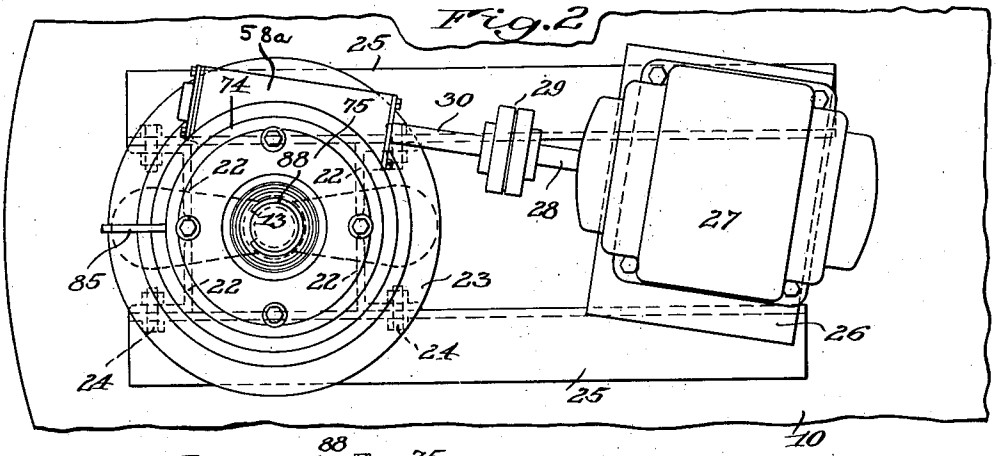
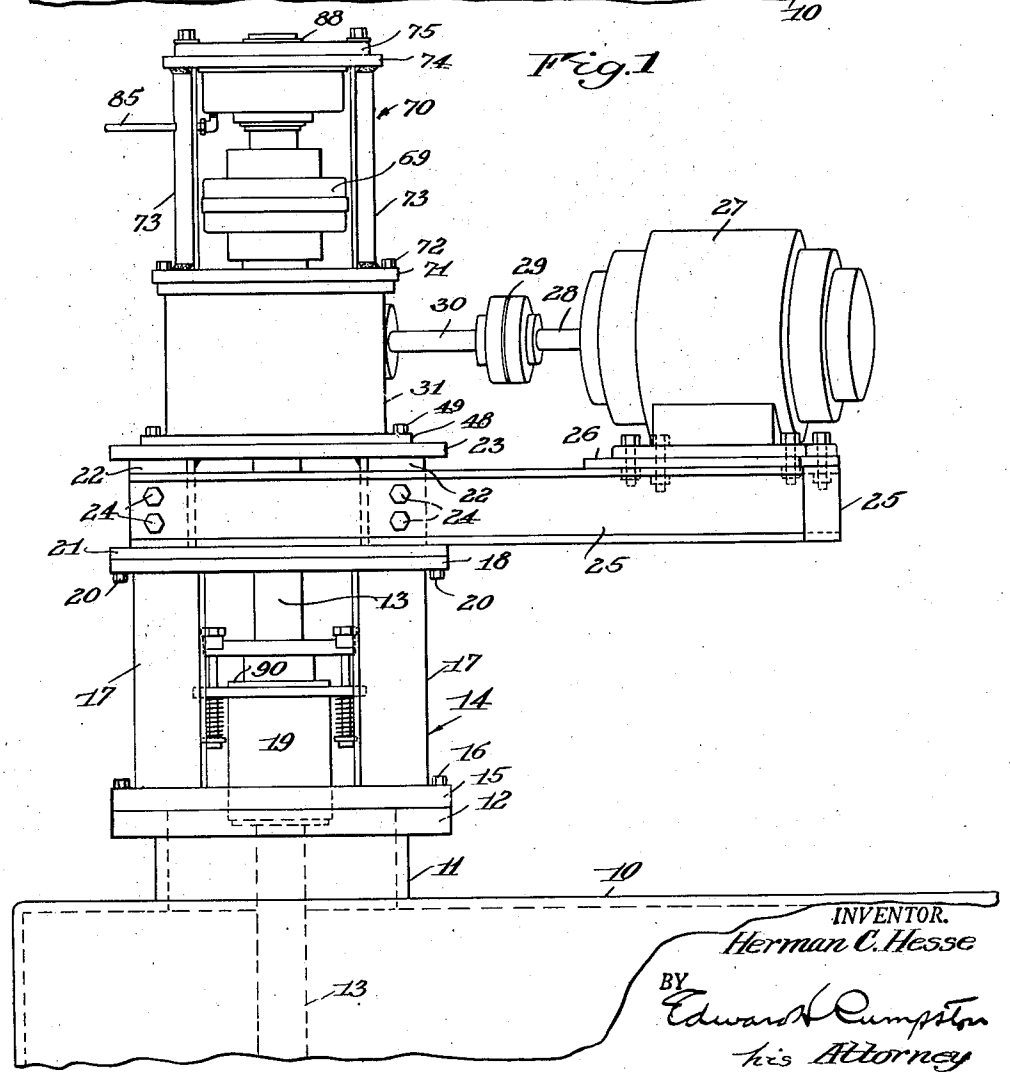


Fig. 1



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Fig. 3

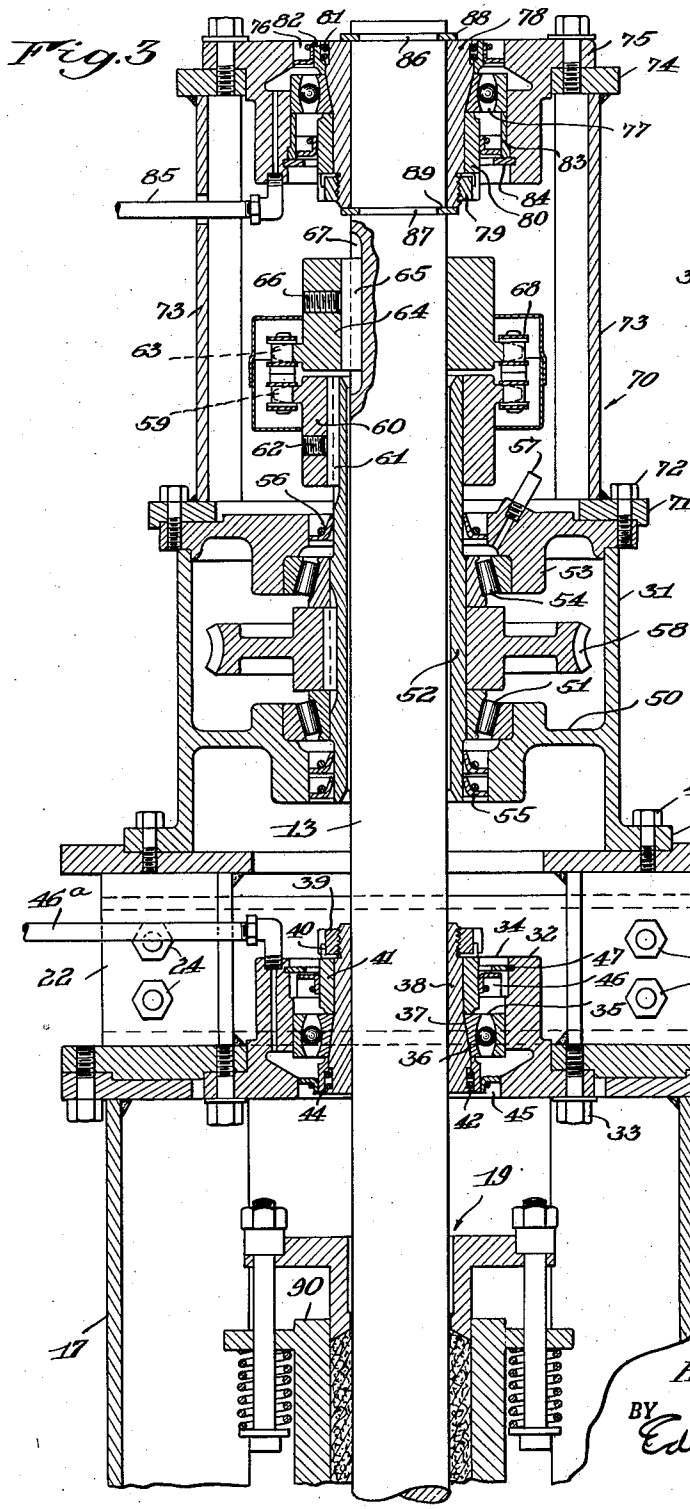
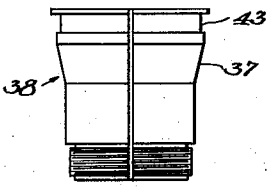


Fig. 4



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DRIVING UNIT

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11 Claims. (Cl. 74—425)

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This invention relates to driving units and, more particularly, to those of the motor driven, gear reducer type for rotating a driven shaft at reduced speed, one object of the invention being to provide an improved unit of the above character having a more simple, compact and practical type of construction.

Another object is to provide a unit of the character described having such a construction that the driven shaft may be released and withdrawn longitudinally from the unit, for repair or replacement, without substantially affecting the adjustment of its supporting bearings or driving connections.

Another object is to provide a unit having the above advantages in which the driven shaft is rotated through a flexible coupling so that the driving gearing is protected against any vibration or shock to which the driven shaft may be subjected in use.

A further object is to provide such a unit for driving the agitator of a material mixing container requiring a minimum of head room and in which the driven shaft may be made in one piece of substantially uniform diameter or section requiring a minimum of machining and so associated with the unit as to be readily withdrawn and replaced at the place of installation and use.

Still a further object is the provision of such a driving unit adapted to be positioned vertically on the top of a material mixing container for driving an agitator shaft with the motor and speed reducing mechanism and shaft bearings compactly arranged to occupy a minimum head space above the container.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a side elevation of a driving unit embodying the present invention and shown as applied to a mixing container;

Fig. 2 is a top plan view of the same;

Fig. 3 is an enlarged central vertical section of the unit, and

Fig. 4 is a side elevation of a part or sleeve detached for better visibility.

The invention is herein disclosed, by way of illustration, as embodied in a unit adapted for driving the impeller or agitator shaft of mixing equipment comprising a liquid container 10 (Fig. 1) having a closed top provided with a nozzle 11

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terminating in a circular flange 12 for the reception of a vertical shaft 13 extending through the nozzle downwardly into the container and provided therein with one or more impellers or agitators (not shown) for mixing or otherwise conditioning the container contents, as well understood in the art.

The present embodiment comprises, preferably, a vertically extending frame composed of a number of superposed sections, including a lower supporting section or stool, indicated generally at 14, for supporting the unit on the tank nozzle flange 12, comprising a lower circular flange 15 secured to the flange 12, as by means of bolts 16. Stool 14 comprises several spaced upright plates 17, preferably welded at their lower ends to flange 15 and welded at their upper ends to a top, ring-shaped or annular flange 18, the plates 17, for example, being advantageously formed from longitudinal quarter sections of a steel tube or pipe of substantial diameter. Stool 14 is of such height as to suitably space the driving unit above the tank nozzle to provide room for a stuffing box indicated generally at 19, to which further reference will be made hereafter.

Secured to the upper flange 18 of the lower stool as by means of bolt 20 (Fig. 3) is an annular plate 21 to which are welded the lower ends of four uprights 22, of angular section, spaced in the generally rectangular arrangement shown in plan in Fig. 2. The upper ends of the uprights are welded to and support an annular plate 23. Fixed to the uprights 22, as by means of bolts 24, are a pair of spaced beams 25, of channel section, extended at one end and bridged by a base plate 26, forming a platform on which is bolted the electric driving motor 27. In the present instance the motor is arranged horizontally with its shaft 28 directly connected as by means of a coupling 29 with the high speed shaft 30 of the speed reducing gearing located in an intermediate section 31 of the frame, to which further reference will be made hereafter.

Shaft 13 is rotatably supported by spaced bearings one of which is mounted on the flange 21 and the other at the top of the frame, as hereafter described in more detail. These bearings are substantially alike and a description of the lower bearing on flange 21 will apply to both.

The lower shaft bearing comprises, preferably, a flanged head 32, the flanged lower end of which is fixed, as by means of bolts 33, to the inner periphery of the annular plate 21. The head is hollowed to provide a chamber 34 for receiving the lower shaft bearing and serving as a lubri-

cating oil reservoir therefor. Slidably fitted in chamber 34 is a roller bearing 35, of any known or suitable construction, having a tapered internal opening 36 engaging the correspondingly tapered outer surface portion 37 of a sleeve 38 fitted to the driven shaft 13. Sleeve 38 is of resilient metal split longitudinally and so capable of being contracted and releasably clamped to the shaft. For this purpose, one end of the sleeve has threadedly engaged therewith a thrust means or lock nut 39 carrying a washer 40 bearing against one end of a ring 41 slidable longitudinally on a cylindrical portion of the outer surface of sleeve 38. The opposite end of sleeve 41 bears against roller bearing 15 for moving the same longitudinally to oppose the tapered surfaces 36 and 37 of the bearing and sleeve and so contract and clamp the split sleeve 38 on the shaft. The bearing is urged in the opposite direction to release the sleeve from the shaft by a coiled compression spring 42 located in a circumferential groove 43 (Fig. 4) adjacent the lower end of the sleeve. One end of the spring bears against one side of the groove while the other end bears against a shoulder on a ring 44 abutting at one end against the bearing 35 and tending to effect relative movement between the sleeve and bearing, to relieve the sleeve for expansion to release it from the shaft. The bottom of chamber 34 is closed by an oil seal 45, while its top is closed by a seal 46 bearing against a split ring 47 snapped in a groove in head 32 and partially closing the top of the chamber. Oil is supplied to the chamber to lubricate the bearing through a pipe 46a. Lock nut 39 is accessible through the space between the plate 23 and the channels 25 and may be turned to clamp sleeve 38 to the shaft or to release it for detachment of the shaft longitudinally from the unit.

The intermediate compartment 31 of the frame has a bottom flange 48 secured by bolts 49 to annular plate 23. This compartment has a transverse partition 50 formed with a central opening in which is a roller bearing 51 tapered to afford support in thrust and radial load. The bearing is fitted internally to a quill 52, the bore of which is somewhat larger in diameter than shaft 13 so as to freely surround the shaft without contact therewith. The upper end of compartment 31 is closed by a head 53 detachably mounted thereon and closing the top thereof and having a central opening in which is seated a tapered bearing 54 similar to and spaced from bearing 51 and similarly fitted to the quill. The opening in partition 50 is closed by an oil seal 55 and the opening in head 53 by an oil seal 56, so that the space within the compartment forms an oil reservoir to which oil is supplied through a pipe 57. Keyed to the quill is a worm wheel 58 meshing with a worm (not shown) on driving shaft 30, the worm being located in an extension 58a of the compartment (Fig. 2). This speed reducing gearing and the bearings 51 and 54 are thus continuously supplied with lubricant. It will be seen that the quill is firmly supported for rotation by spaced bearings with the driving element or gear 58 compactly located between the bearings which serve to hold it against longitudinal movement on the quill.

The means for coupling the quill to the shaft is preferably located at the upper end of the quill above head 53 of the intermediate or gear compartment 31. Such coupling means comprises, preferably, a spur gear, 59, on a hub 60 fixed to the quill by a key 61 and a set screw 62. An adjacent spur gear 63 is carried by a hub 64 releasably fixed to the shaft by a key 65 and set screw 66, the key seat 67 being extended through the upper end of the shaft, as shown, for a purpose hereafter described. A single, roller type chain 68, of any known or suitable construction, is meshed with both of the gears 59 and 63, so as to flexibly couple them together, as well understood in the art, the chain having its ends detachably coupled together by any known or suitable means. The coupling is preferably enclosed in a housing 69 which may contain a suitable lubricant.

The upper end of driven shaft 13 is supported by bearing means on the upper end of an upper section or stool, indicated generally at 70, and comprising an annular bottom plate 71 secured by bolts 72 to head 53 of the intermediate section 31 of the frame. Welded at their lower ends to the plate 71 are four spaced upright plates 73, such as described in connection with the lower stool 14, the upper ends of these plates being welded to an upper ring 74. Mounted on ring 74 is a head 75 formed with a chamber 76 slidably receiving a roller bearing 77, the tapered inner opening of which opposes a tapered surface portion on a sleeve 78, fitted to shaft 13, these parts being substantially the same as the corresponding parts in the lower shaft bearing described above. A thrust means or lock nut 79, threaded on the sleeve, bears against a ring 80 which bears, in turn, against the bearing 77 to effect relative movement of the sleeve and bearing for contracting and clamping the sleeve to the shaft. The bearing is urged in the opposite direction to release the sleeve by a spring 81 and ring 82, as described in connection with the lower bearing. A ring 83, supported by a split ring 84, mounted in a groove in head 75, serves to limit the downward or releasing movement of the bearing. The chamber 76 is closed at top and bottom with oil seals, as described for the lower bearing. A pipe 85 supplies oil to the bearing and other parts in the chamber to lubricate the same.

To positively position the shaft vertically, the upper end of the shaft is preferably provided with circumferential grooves 86 and 87 located at the ends of sleeve 78. Split rings 88 and 89 are detachably snapped in these grooves so as to positively prevent longitudinal movement between the shaft and sleeve and supplement the supporting function of the sleeves 38 and 78 on their respective bearings.

The lock nut 79 of the upper bearing and the coupling between the quill and shaft are both accessible through the spaces between the plates 73 for releasing the shaft from the bearing and coupling for removal of the shaft.

The stuffing box 19, of any known or suitable construction, has its sleeve 90 mounted in an opening in the bottom flange 15 of the frame, so as to seal the nozzle of the container on which the unit is mounted, the parts being accessible through the openings between the uprights 17.

In operation, the motor 27, through the speed reducing gearing, including gear 58, rotates quill 52 on its bearings 51 and 54 on the frame. The quill, through the flexible coupling at its upper end, rotates the driven shaft which is securely mounted for rotation in its upper and lower bearings also supported on the frame. The quill and its gearing are thus free from direct contact with the shaft and protected through the flexible coupling against any vibration or shocks to which the shaft may be subjected in use. At the same

time the driven shaft 13 may be readily removed from the unit without substantially disturbing the adjustments of the bearings, coupling and quill. This may be accomplished by unbolting and raising the unit, if necessary, to obtain clearance between the lower end of the shaft and the bottom of the container, after which set screw 66 is backed off to release the shaft from the quill coupling. Lock nuts 39 and 79 are unscrewed to release the sleeves 38 and 78 so that the sleeves may move longitudinally a sufficient amount to expand and release the shaft. Removal of the rings 88 and 89 then frees the shaft so that it can be lowered longitudinally and removed from the unit and then from the container. The same shaft after repair, or a new shaft, may then be inserted longitudinally in the unit and secured in place, without substantially disturbing the shaft supporting and driving parts.

It will be noted that these shaft supporting and driving means are so constructed as to enable the use of a driven shaft of substantially uniform diameter or section, requiring a minimum of special machining, to facilitate removal and replacement as described above and to simplify replacement of one shaft by another provided from a stock of standard shafting, with a minimum of machining operations.

The driving motor and high speed shaft are arranged horizontally in the space above the container and connected to the speed reducing gearing which is located in the space between the quill bearings. These parts, in turn, are located between the spaced bearings of the shaft, so as to require a minimum of head room and provide an exceedingly compact construction, with substantial spacing of the bearings longitudinally of the shaft and quill, respectively, for supporting them more firmly in the frame. The construction, as a whole, is simple and practical in character, comprising relatively few parts, conveniently arranged for ready access as occasion may require.

It will thus be seen that the invention accomplishes its objects and while it has been herein disclosed by reference to the details of preferred embodiments, it is to be understood that such disclosure is intended in an illustrative, rather than a limiting sense, as it is contemplated that various modifications in the construction and arrangement of the parts will readily occur to those skilled in the art, within the spirit of the invention and the scope of the appended claims.

I claim:

1. A gear unit for supporting and driving the end of a shaft, said unit comprising a supporting frame, a shaft extending through said frame, bearing means on said frame for rotatably supporting said shaft, said bearing means having a member detachably fixed to said shaft to release the same for withdrawal longitudinally from said bearing means, a quill detachably surrounding said shaft, bearing means on said frame supporting said quill independently of bearing engagement with said shaft and of the vibrations thereof, means for rotating said quill, and a detachable flexible connection between said quill and said shaft for rotating said shaft.

2. A gear unit for supporting and driving the end of a shaft, said unit comprising a supporting frame, a shaft extending through said frame, spaced bearings on said frame for rotatably supporting said shaft, each of said bearings having a member detachably fixed to said shaft to release the same for withdrawal longitudinally from said bearings, a quill detachably surrounding said shaft between said bearings, spaced bearing means on said frame supporting said quill independently of bearing engagement with said shaft and of the vibrations thereof, means for rotating said quill having a connection therewith intermediate said bearing means therefor, and a detachable flexible connection between said quill and said shaft for rotating said shaft.

3. A gear unit for supporting and driving the upper end of a vertically extending shaft, said unit comprising a supporting frame, a shaft extending vertically through said frame, spaced bearings on said frame for rotatably supporting said shaft, one of said bearings being located adjacent the upper end thereof, each of said bearings having a member detachably fixed to said shaft to release the same for withdrawal longitudinally from said bearings, a quill detachably surrounding said shaft between said bearings, spaced bearing means on said frame supporting said quill independently of bearing engagement with said shaft and of the vibrations thereof, means for rotating said quill having a connection therewith intermediate said bearing means therefor, and a detachable connection between said shaft and an end of said quill located between said quill bearing means and one of said shaft bearings.

4. A gear unit for supporting and driving the upper end of a vertically extending shaft, said unit comprising a supporting frame, a shaft extending vertically through said frame, spaced bearings on said frame for rotatably supporting said shaft, one of said bearings being located adjacent the upper end thereof, each of said bearings having a member detachably fixed to said shaft to release the same for withdrawal longitudinally from said bearings, a quill detachably surrounding said shaft between said bearings, spaced bearing means on said frame supporting said quill independently of bearing engagement with said shaft and of the vibrations thereof, means for rotating said quill having a connection therewith intermediate said bearing means therefor, said frame having a compartment enclosing said quill bearing and rotating means and said quill having an end thereof extended above said compartment, and a detachable connection between said shaft and said quill end for rotating said shaft.

5. A driving unit comprising a supporting frame, bearing means on said frame, a quill rotatably supported by said bearing means, means for rotating said quill, a driven shaft detachably received in said quill, means for releasably coupling said quill and shaft for rotating said shaft, split sleeves on said shaft at opposite ends of said quill and provided with means for releasably clamping the same to said shaft, and bearings on said frame for rotatably supporting said sleeves and shaft, said shaft being longitudinally detachable from said unit on release from said coupling means and sleeves.

6. A driving unit comprising a supporting frame adapted to be mounted on a container, spaced bearings on said frame, a quill rotatably mounted in said bearings, a driving element fixed to said quill between said bearings, an agitator shaft freely received in said quill, means for releasably coupling said quill and shaft to rotate said shaft, detachable shaft supporting members on said shaft at opposite ends of said quill and coupling means, and bearings on said frame rotatably supporting said members, said quill and members being releasable from said shaft for

withdrawing said shaft longitudinally from said unit.

7. A driving unit comprising a supporting frame, spaced bearings on said frame, a quill rotatably mounted in said bearings, a driving element fixed to said quill between said bearings, an agitator shaft freely and releasably received in said quill, means for releasably coupling said quill and shaft to rotate said shaft, split sleeves on said shaft at opposite ends of said quill and provided with means for releasably clamping the same to said shaft, and bearings on said frame for rotatably supporting said sleeves and shaft, said coupling means and sleeves being releasable from said shaft for withdrawing said shaft longitudinally from said unit.

8. A driving unit comprising a supporting frame, spaced bearings on said frame, a quill rotatably mounted in said bearings, a driving element fixed to said quill between said bearings, an agitator shaft of substantially uniform diameter freely and releasably received in said quill, flexible means for releasably coupling said quill and shaft to rotate said shaft, split sleeves on said shaft at opposite ends of said quill and provided with means for releasably clamping the same to said shaft, and bearings on said frame for rotatably supporting said sleeves and shaft.

9. A driving unit comprising a supporting frame adapted to be mounted on a container and having therein three vertically spaced oil reservoir compartments, bearing means in the intermediate one of said compartments, a quill rotatably supported by said bearing means, a driving gear on said quill in said intermediate compartment, a driven shaft extending freely through said quill, bearing means for said shaft in the upper and lower of said compartments, said bearing means being releasably associated with said shaft, and a releasable connection between said quill and shaft for rotating said shaft.

10. An agitator driving unit for a container having an upwardly extending flanged nozzle, said unit comprising a frame adapted to be mounted on said nozzle flange in upwardly extending position, an agitator shaft extending upwardly through said frame, spaced members on said shaft provided with means for releasably clamping the same thereto, bearings on said frame for rotatably supporting said members and shaft, a quill freely surrounding said shaft between said shaft bearings, bearing means on said frame for rotatably supporting said quill, speed reducing means on said frame for rotating said quill, and means for connecting said quill and shaft for rotating said shaft.

11. An agitator driving unit for a container having an upwardly extending flanged nozzle, said unit comprising a frame adapted to be mounted on said nozzle flange in upwardly extending position and formed with spaced oil reservoir chambers, an agitator shaft of substantially uniform diameter extending upwardly through said chambers, a split sleeve on said shaft in each of said chambers and formed with an outer longitudinally tapered surface portion, a tapered bore bearing in each of said chambers having its tapered surface in opposing engagement with the tapered portion of said sleeve, means for effecting relative movement between said sleeves and bearings to releasably contract and clamp said sleeves on said shaft, an intermediate oil reservoir chamber, a quill extending through said intermediate chamber and freely surrounding said shaft, bearing means in said intermediate chamber rotatably supporting said quill, speed reducing gears in said intermediate chamber for rotating said quill, and a releasable flexible coupling between said quill and shaft for rotating said shaft, said shaft being longitudinally detachable from said unit upon release thereof from said coupling and sleeves.

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