June 30, 1936. W. A. FRANTZ ET AL 2,046,258

CLOTHES WASHER MECHANISM

Original Filed May 27, 1932 2 Sheets-Sheet 1

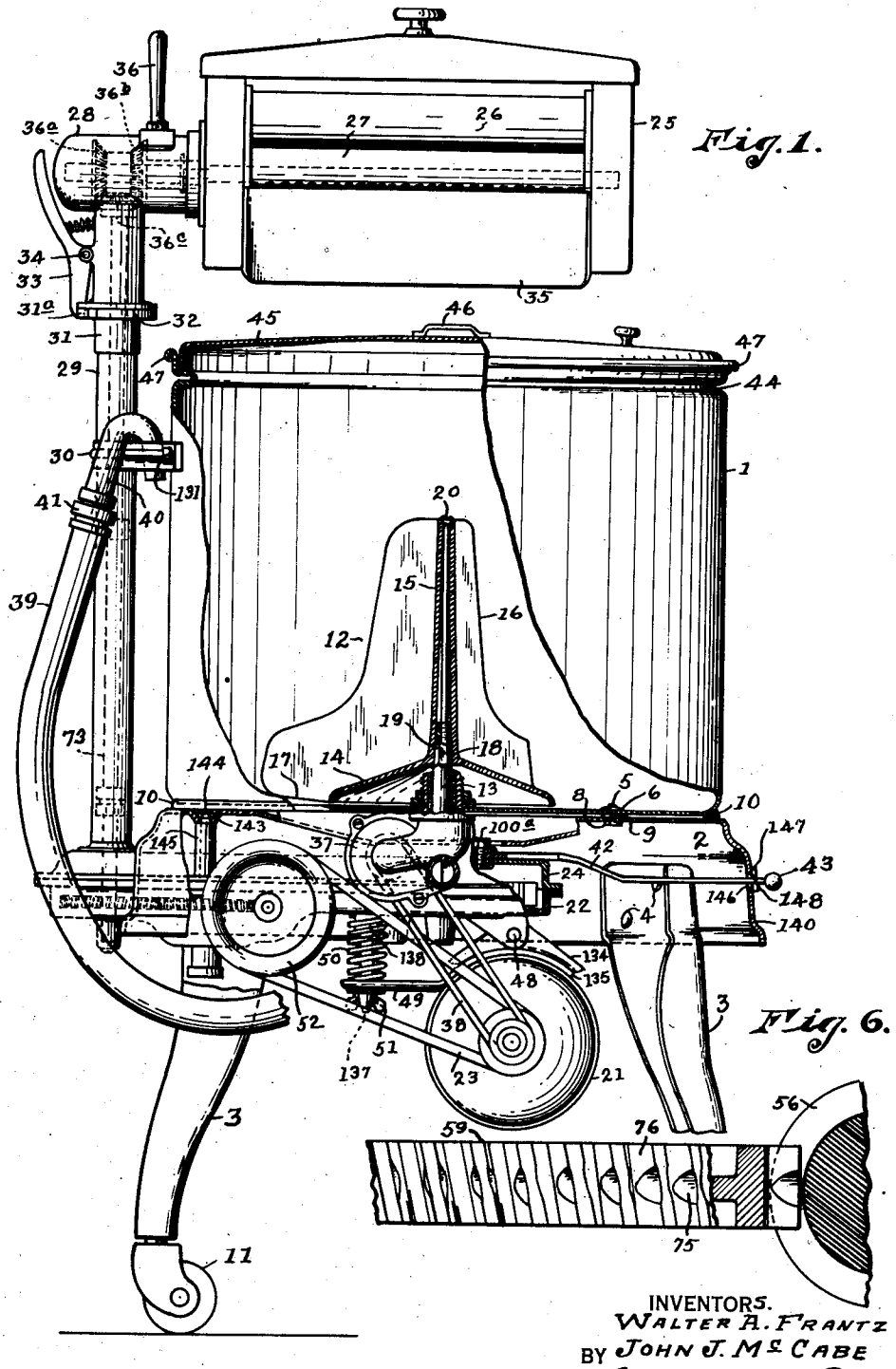

Fig. 1.

Fig. 6.

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Fig. 2.

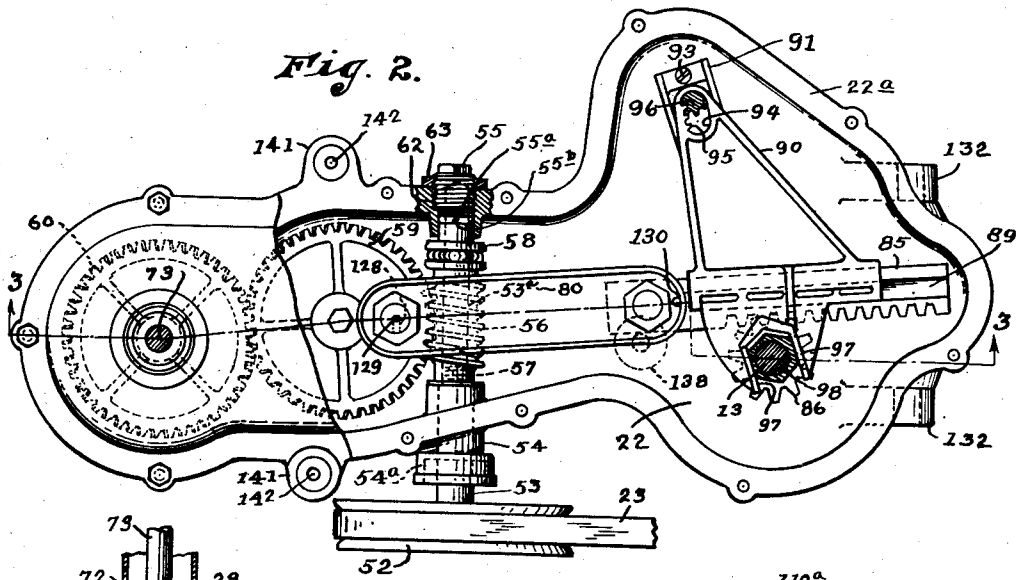


Fig. 3.

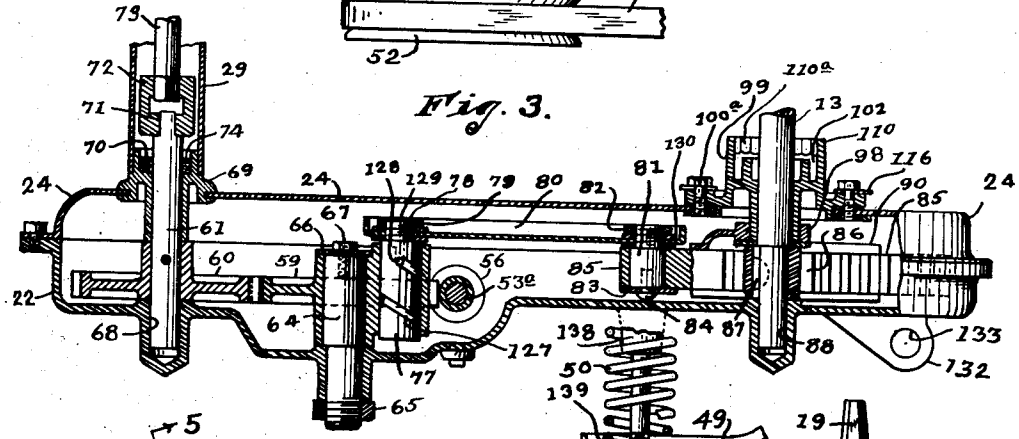


Fig. 4.

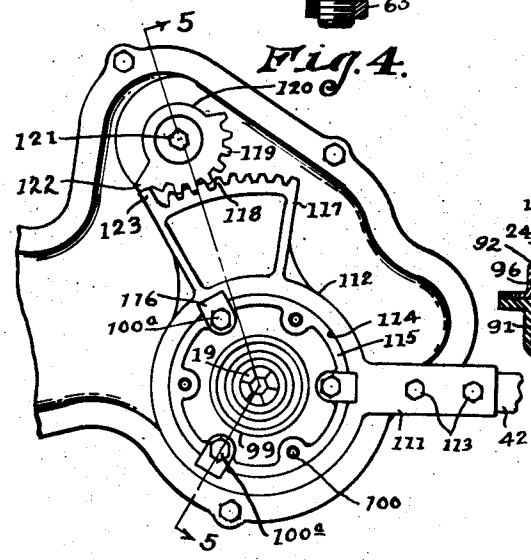
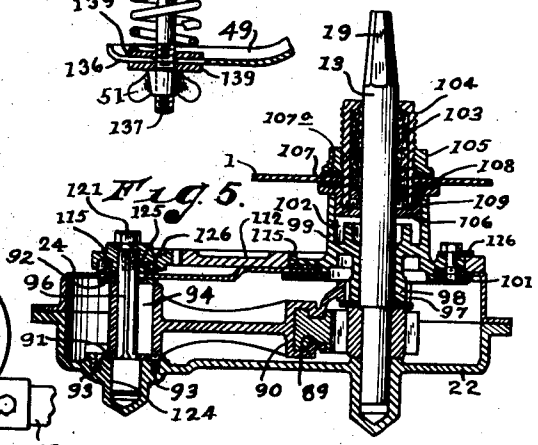


Fig. 5.



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2,046,258

CLOTHES WASHER MECHANISM

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Original application May 27, 1932, Serial No. 613,999. Divided and this application August 8, 1933, Serial No. 684,202

24 Claims. (Cl. 74—77)

This invention relates to combined clothes washing and drying machines, and in particular machines of the so-called gyrator type in which a vertically oscillatable dasher or agitator is employed to effect the washing operation and a wringer is employed to effect the drying operation. This application is a division of copending application for U. S. Letters Patent, Serial No. 613,999, filed May 27, 1932 for Clothes washer.

One of the objects of this invention is to provide in a washing machine of the type disclosed, a generally simplified and improved gearing or operating mechanism.

Another object of this invention is to provide an improved unitary washing machine gear mechanism which can be constructed, assembled and tested as an operative unit, separate from the machine.

Another object of this invention is to provide an improved and simplified gear train for driving both a washing device and a wringing device.

Another object of this invention is to provide in a gearing of the type disclosed, an efficient and simple lubrication system of the force feed type.

Another object of this invention is to provide in a washing machine of the type disclosed, an improved control mechanism for starting and stopping the operation of the washing device.

Another object of this invention is to provide in a washing machine, an improved and adjustable mounting for the motor which operates the machine.

Another object of this invention is to provide an improved movement translating mechanism for changing rotating to oscillating movement.

Another object is to provide an improved form of gear case construction.

A further object of this invention relates to the design, construction and arrangement of the operating element of a washing machine, whereby such elements may be quickly and inexpensively produced and assembled into a finished machine by modern factory production methods.

With these and other objects in view, the invention consists of the novel construction, arrangement and combination of parts, hereinafter described and illustrated in some of its embodiments, in the accompanying drawings and particularly pointed out in the appended claims.

In the drawings: Figure 1 is a side elevational view, partly in section, of a washing machine disclosing one mode of practicing our invention.

Figure 2 is an enlarged plan view, partly in section, of the washer mechanism gearing, showing the agitator driving rack bar in mesh with its pinion.

Figure 3 is a sectional view of the gearing, taken on line 3—3, Figure 2.

Figure 4 is an enlarged plan view of the upper side of one end of the gear case, illustrating certain details of the mechanism provided for the starting and stopping of the washing machine agitator.

Figure 5 is a sectional view taken on line 5—5 of Figure 4, showing the agitator shaft seal and certain details of the agitator driving mechanism; and

Figure 6 is a developed view of the worm driven reduction gear of the mechanism.

Referring to the complete washing machine illustrated by Figure 1 of the drawings, the numeral 1 indicates a washing container or tub, which is carried on a stamped metal base 2. The base is provided with a plurality of supporting legs 3, secured thereto in any suitable manner such as by the rivets 4. The tub 1, is secured to base 2, by means of four circumferentially spaced screws or bolts 5.

The head of the screw 5 engages a rust-proof washer 6 of mushroom shape, beneath which there is provided a rubber washer (not shown), to prevent the leakage of water through the holes in the tub provided for receiving the screws. The screws are held in place by means of the cooperating nuts 8 which engage the underside of the base 2.

A pad or washer 9, of rubber or other suitable material is inserted between the tub and the base at each of the points where the screws or bolts 5 pass through the tub and the base, for the purpose of providing a slightly yielding securement for the tub. This arrangement is particularly desirable when a porcelain enameled tub is used, as is done in the present case.

A band 10, formed of rubber or any other suitable material, is provided adjacent the bottom of the tub to give a finished appearance to the machine, and at the same time to prevent the ingress of water and other undesirable materials between the tub and the base at this point. The supporting legs 3 are provided with casters 11, for facilitating the handling of the machine in moving it about from place to place.

The washing operation of the machine is effected by means of a dasher or agitator 12 which extends upwardly from the bottom of the tub and which is supported upon the shaft 13. During the operation of the machine, the shaft 13 im-

parts a reversely rotating or oscillatory movement to the dasher 12 about its vertical axis.

The dasher or agitator 12 is provided with a conical base plate 14, which merges into a center post 15. Vertical radially arranged agitator vanes 16 extend from the base plate and center post. These vanes are three in number and are equally spaced about the agitator. The vanes extend for some distance beyond the edge of the base plate, and the edge of the vane which faces the tub bottom is upwardly slanted as at 17.

The purpose of extending the vanes beyond the edge of the base plate is twofold. In the first instance, a lesser amount of material is required for making the agitator by reason of using a smaller base plate and secondly, the tendency of the clothes being washed, to work under the edge of the base plate is lessened by reason of the vanes projecting therefrom, as the extending portion of the vanes operate to throw the clothes away from the base and to sweep a circular clothes-free path of some width about the marginal edge of the base plate.

The underside of the agitator is provided with a tapered central opening or socket 18, having a plurality of flat sides which engage with the sides of the prismatic end 19, of the agitator shaft 13. The agitator is removably secured in position on the agitator shaft by means of an elongated screw 20.

The machine is driven by means of an electric motor 21. The motor 21 is adjustably and flexibly secured to the base portion 22, of the gear case, which houses the operating mechanism of the machine. The transmission of power between the motor and the mechanism in the gear case is accomplished by means of a V-shaped belt 23. The gear case base 22 is provided with a cover 24 which may be formed from a metal stamping, as is done in the present case.

A suitable wringer 25, having upper and lower rolls 26 and 27 respectively, is provided for the purpose of extracting the water from the clothes after the washing or rinsing operation has been completed. The wringer is carried by and secured to a wringer gear case 28, which is journaled in the wringer column 29, so that the wringer may be swung to various adjusted positions about the axis of the wringer column. The wringer column is secured at its lower end to the gear case cover 24, and at its upper end it is secured to the tub 1 by means of a bracket 30, which is die cast about the tube forming the wringer column.

A second die casting 31 is cast about the upper end of the tube of the wringer column and it is fashioned with a flange or shoulder 31a at its upper end to provide a rest or bearing for the wringer and its associated gear case 28. The flange 31a is provided with a number of notches 32 about its periphery. A locking lever 33, is pivotally secured at 34, to the gear case 28 for engaging the notches 32, to lock the swinging wringer in the position selected.

By means of the construction just described the wringer may be swung about its axis and locked in several positions permitting the wringing of the clothes from the washer tub to a rinse tub, or from one rinse tub to another, or vice-versa. The wringer is provided with a combined clothes chute and drain 35, for guiding the clothes from one tub and delivering them to another, and for returning the water extracted from the clothes to the tub from which the clothes were taken.

The control of the wringer is accomplished through the operation of a shiftable control lever 36, by means of which the reversing gears 36a and 36b are selectively shifted into mesh with a driving pinion 36c or held in a neutral position whereby the wringer rolls may be caused to rotate in one direction or the other, or may be maintained stationary at the will of the operator. The mechanism for actuating the wringer is described in detail in the specification of our earlier referred to copending application.

A water pump 37, driven by the motor 21, through a V-shaped belt 38, is provided for the purpose of facilitating the operation of emptying the liquid contents of the tub. The inlet side of the pump is in communication with the interior of the tub and a drain hose 39 is connected at one end to the outlet side of the pump. The other end of the drain hose is provided with a gooseneck 40, which is secured to the hose by means of a swivel connection 41.

The operation of the agitator or dasher 12, is controlled by means of a lever 42, having a handgrip or knob 43 at its outer end. A combined cover seat and splash ring 44, is rolled in the upper end of the tub to furnish a seat for the tub cover 45 and to prevent the escape of washing fluid from the tub during the time the dasher is working. A handle 46 is provided for the tub cover.

The ring 44 is integrally formed with the tub and it serves to stiffen the tub and prevent distortion of the tub when heated during the enameling operation. The upper edge of the tub is rolled or turned over at 47 to give a smooth and finished appearance to the tub. The rolled edge 47 is better adapted to take a porcelain enamel finish than is a straight edge as the enamel tends to run from a sharp edge and leave it with a very thin coating. The rolled edge also strengthens the tub and prevents distortion in the same manner as does the ring 44.

The electric motor 21 is pivotally secured to the gear case base 22 by means of the shaft 48. The motor mounting includes an extended arm 49, which at its end, remote from the motor, is held between a spring 50 and a wing nut 51. The arm 49 is rigid with the motor and the tension of the belts 23 and 38 may be easily adjusted by simply turning the wing nut 51, which operation serves to swing the motor about its pivotal support.

The spring 50 is so positioned with respect to the arm 49 that it opposes the torque of the motor or the tractive effort of the belts and thus provides a resilient and yielding drive for the mechanism. This arrangement tends to relieve the belts of undue strain and at the same time serves to quiet the operation of the machine.

By referring to Figure 2 it will be seen that the gearing of the machine is of simple construction, the essential elements of which comprise but four gears and a rack bar. This gearing or mechanism is driven by the motor 21, through the belt 23, which engages a pulley 52. The pulley 52 is rigidly secured to a worm shaft 53, which extends into the gear case base 22 and is supported therein by the gear case bearing 54 and the adjustable bearing 55. The bearing 54 is provided with a suitable seal 54a to prevent the escape of oil from the gear case at this point.

A worm 56 is closely fitted to the reduced portion 53a of the shaft 53 and it is threaded at one end for driving engagement with the threaded portion 57 of the said shaft. An antifriction thrust bearing 58 is carried on the shaft 53, to take the thrust of the worm 56. The worm engages a worm gear 59, to reduce the speed of

the motor to a suitable speed for driving the dasher 12. The worm gear 59 is a hobbed helical gear and it meshes in driving relation with a standard helical gear 60. The gear 60 is fixedly connected to and rotatable with a stub shaft 61.

The worm shaft bearing 55 is externally threaded over a portion of its length and it is adjustably carried in the partially threaded opening 62 of the gear case. A jam-nut 63 serves to hold this bearing in its adjusted position. The end of the bearing 55 abuts against the thrust bearing 58 and thus provides a means for adjusting the worm 56 in an axial direction.

The outer surface of the adjustable worm shaft bearing 55 is unthreaded at the inner portion of its length and this part of the bearing is accurately machined so as to be concentric with the shaft receiving portion of the bearing. The unthreaded portion of the gear case opening 62 is provided for receiving the smoothly finished portion of the bearing. The bore of the opening 62 is in axial alignment with the bearing 54, and thus there is provided a means for piloting and maintaining the bearing 55 in axial alignment with the bearing 54.

The outer surface of the bearing 55 is annularly grooved at 55[a] and has one or more communicating holes 55[b] between the said groove and the interior of the bearing. The portion of the gear case which is broken away in Figure 2 to illustrate the details of the bearing, is provided with an oil hole which communicates with the annular groove 55[a] and thus supplies lubricant to the portion of the worm shaft that is journaled in the bearing 55.

The wringer drive gearing constitutes one of the novel features of our invention, in that we have dispensed with one of the gears customarily employed in driving the wringer shaft, by driving the wringer shaft gear directly off of the worm gear. This result is accomplished by using two standard helical gears 59 and 60 and by hobbing the central portion 75 of the faces of the teeth 76, of the gear 59, so that it may be efficiently driven by the worm 56.

By this arrangement an efficient drive is provided between a worm, a worm gear and helical gear. The helical gears 59 and 60 are of such width so that the surface of tooth contact between the worm and the hobbed portion of the gear 59 is comparable to that between the worm and a conventional worm gear, while the unhobbed portion of the gear teeth 76 is of sufficient area to efficiently drive the gear 60 without undue wear on the teeth of the hobbed gear 59.

The worm gear 59 is provided with an eccentrically located vertical bearing for the reception of the pin 77. This pin is formed with a threaded upper end 78, which is arranged to receive a nut 79, by means of which one end of a channeled stamped metal connecting rod 80 is rigidly secured to the pin 77. A similarly formed pin 81 is secured to the other end of the rod 80 by means of a nut 82. The pin 81 is provided at its lower end with a retaining washer or disc 83, which is held in place by means of a drive screw 84.

The pin 81 is journaled in the end of a rack bar 85, which is provided to drive a pinion 86, fixedly secured to the agitator drive shaft 13 by means of a key 87. The lower end of the agitator drive shaft 13 is journaled in a bearing 88, formed in the gear case base 22.

The rack bar 85 is longitudinally channeled at 89 and is received in a guideway of complementary form, provided by the die-cast rack guide 90. The rack guide 90 serves as a means for shifting the rack bar into and out of engagement with the agitator shaft pinion as will be explained presently.

The rack guide 90 is supported at one end between a pair of horizontally arranged plates 91 and 92, which abut against the gear case base 22 and the gear case cover 24 respectively. The lower plate 91 is of channeled construction and it is held in place by means of a pair of drive screws 93.

An oval shaped opening 94 is provided in the end of the rack guide just considered. Vertical rack teeth 95 are provided on one of the side faces of this opening. These rack teeth are engaged by an elongated mutilated pinion gear 96, by means of which the guide 90 is shifted toward and away from the agitator shaft 13 and in this manner the engagement and disengagement of the gear teeth of the rack bar 85 with the gear teeth of the agitator shaft pinion 86 is effected.

The rack guide 90 extends to a point adjacent to the agitator shaft and terminates thereat in a forked end 97, which embraces and slidably engages with the bearing surfaces formed on the downwardly extending portion 98, of the die-cast bearing member 99. By means of the arrangement just described, the rack guide 90 is slidably supported in the gear case, and it provides a relatively rigid guide-way for the rack bar 85, for its various adjusted positions.

The agitator shaft bearing member 99 is bolted to the gear case cover 24, by means of six bolts 100[a] three of which are shown in Figure 4. An annular ring 101 is welded or otherwise secured to the under side of the gear case cover about an opening which is provided for reception of the bearing member 99. The annular ring and gear case cover have drilled and tapped holes 100 for receiving the bolts 100[a]. The bearing member 99 is provided with an annular cup 102, for catching and retaining the small amount of oil or grease which may escape from either the packing material 103 provided to seal the shaft 13, or from the gear case itself, by way of the agitator shaft bearing.

Should an unusual amount of oil collect in the cup 102, the capillary attraction of the packing 103 will tend to take up some of it, while gravity also acts to return such oil to the gear case. If desired, the cup 102 may be packed with hard grease to better insure the lubrication of the shaft packing and the shaft bearing over an extended period of time and thus at the same time to assist in preventing the escape of water from the tub and oil from the gear case.

The packing material 103 is automatically maintained in fluid tight adjustment about the shaft 13, by means of a slidably fitted packing gland 108 and a flat spiral spring 109, which is interposed between the nut 106 and the gland 108.

The lower nut 106 and the inner face of the upwardly extending sleeve or collar 110 of the bearing member 99, are formed with a plurality of complementary flat sides, those of the bearing member being referred to by the numeral 110[a]. The nut 106 is loosely fitted in the sleeve 110 of the bearing member 99. The complementary flat sides of the nut 106 and the sleeve 110, cooperate with each other to prevent the nut from unthreading itself from the cup 104 and they also serve to hold the nut from turning, thus facilitating the application or removal of the upper nut

105. The packing means just described, is supported entirely by the tub bottom and is free to move on the shaft which it seals to take care of irregularities in the fitting of the parts of the machine and to permit relative movement between the tub and the operating mechanism.

A plurality of small retainer plates 116 are secured to the bearing member by certain of the retaining bolts 100a, to retain the quadrant 112 in a rotatable manner on the bearing member 99. A gear sector 117 is integrally formed with the quadrant 112. The gear teeth 118 of the sector, mesh with the gear teeth 119 of a die-cast segmental gear 120. The segmental gear has a toothed socket for receiving the upper end of the rack shifting pinion 96 and it is securely held in place thereon by means of the bolt 121.

The segmental gear 120 is provided with a stop 122, which cooperates with a stop 123 formed on the gear sector 117. These stops are fitted with respect to each other so that the rack bar 85 and pinion 86 are in proper driving relation when the stops are in engagement with each other. In the event of wear taking place between the pinion 86 and the rack bar 85, a small amount of material is filed or otherwise removed from the contacting portions of the stops 122 and 123 to compensate for such wear and thus a very fine adjustment can be obtained between the rack bar and the pinion of the agitator shaft.

The rack bar shifting pinion 96 is provided with an enlarged portion at its lower end which is received in a bearing socket 124, formed in the gear case base 22. An upwardly flanged ring 115 is pressed out of the gear case cover to receive the bearing portion 125 of the segmental gear 120. A packing washer 126 of cork or other suitable material, is engaged between a downwardly extending annular flange of the gear 120 and the ring 115 of the gear case cover to prevent the escape of oil from the gear case at this point.

Special provision is made for the lubrication of the rack bar, its guideway, the agitator shaft and pinion and the bearing pins 77 and 81. This is accomplished in the following manner: A spiral groove 127 is cut in the face of the pin 77. The groove starts from the bottom of the pin and terminates in a laterally drilled port 128, located a slight distance from the top of the bearing portion of the pin. The port 128 communicates with a centrally drilled hole 129 in the top of the pin. The channeled connecting rod 80 has a hole 130, located adjacent to the pin 81 and above the end of the rack bar 85 for the escape of the oil supplied to the rod.

During the operation of the motor 21, oil from the lowest part of the gear case, into which the pin 77 dips, is forced up the spiral groove 127 to the port 128 and delivered out of the hole 129 to the channel of the rod 80. The oil received in the channeled rod 80, escapes by way of the hole 130, from where it is delivered to the top of the end of the rack bar. From this point the oil flows over the rack bar and effectively lubricates the pin 81, the rack bar 85, the pinion 86 and its shaft 13.

The wringer column supporting die casting 30 is provided with an aperture or slot, between the wringer column and the washing machine tub. This slot provides an opening for the reception of the gooseneck 40 of the drain hose which is conveniently located for use by the operator of the machine. The die casting 30 is secured to the tub by means of the bolts 131.

The gear case base 22, has a pair of downwardly extending ears 132, providing a pair of aligned openings 133, for the reception of the motor supporting shaft 48. The shaft 48 is surrounded by a rubber sleeve (not shown). A pair of stamped plates 134 and 135 receive the rubber sleeve in matched channels formed in the opposite plates. The plates are further provided with matched openings for the reception of the bolts, by means of which the plates are secured in assembled relation and fastened to the motor frame.

The lower plate 135 is provided with an extending arm 49, which has a slot 136 at its outer end. This slot is provided for the reception of a threaded rod 137, which is surrounded by the spring 50. The rod 137 at its upper end is threaded into a tapped hole formed in the boss 138 of the gear case base and at its lower end it carries the wing nut 51.

A pair of electrically insulating washers 139, separate the spring 50 and nut 51 from the arm 49, so that the motor is electrically insulated from the rest of the machine by such washers and the aforesaid rubber sleeve. As an added precaution to insure the insulation of the motor from the rest of the machine, the sleeve is provided with flanged ends, so that the motor cannot slip sideways on the sleeve and thus become grounded. These features of construction are illustrated and described in detail in our earlier referred to co-pending application.

The tub supporting frame or base 2, as shown in Figure 1, is formed from a single stamped metal piece with a depending skirt 140 at its marginal edge to give it strength and rigidity. A triangular piece is punched out of the central portion of the base to provide an opening for the accommodation of the bearing member 99 and the three bolts 100a shown in Figure 4 which are used initially to secure the bearing member to the gear case cover 24 and to hold the plates 116 in place. Three bolts (not shown), are used to secure the agitator shaft bearing of the gear case to the base 2. These bolts extend through the holes pierced in the base and are received in threaded holes 100 of the gear case cover.

Adjacent to the opposite end of the gear case, there is provided a pair of ears 141, which extend out beyond the edge of the gear case cover 24. The gear case at these points has threaded holes 142, which line up with the holes which are pierced in the depressed cups 143 of the base when the gear case is in position on the base. The stated holes are provided for receiving suitable bolts 144 for securing the wringer shaft end of the gear case to the base. Accurately fitted spacer tubes 145 surround the bolts 144 and bridge the space between the base 2 and ears 141 of the gear case.

The base 2 is pierced with a hole for permitting the connection of the pump to the drain opening of the tub. A hole is provided in the base for facilitating the adjusting of the rack shifting gearing after the gear case has been secured to the base and before the tub has been installed. Four holes are pierced in the top of the base for receiving the tub holding bolts 5. The skirt of the base is pierced for receiving the rivets 4, which hold the legs 3 in place.

The skirt 140 of the base is cut away to accommodate the wringer shaft end of the gear case upon which the wringer column 29 is supported. On the side of the base opposite to the cut-away portion an elongated slot 146 is punched

out of the skirt to provide an aperture for the accommodation of the rack shifting lever 42.

A locking plate 147, for the control lever 42 is secured over the slot 146 by means of a pair of bolts (not shown), which extend through narrowed end portions of the slot 146. The plate 147, has a slot 148 which registers with the slot 146 of the base. Each end of the slot 148 is notched to provide a catch for the lever 42 for the purpose of holding the rack bar and its control elements in either an operative or inoperative position. The lever 42 is slightly sprung in a downward direction for the purpose of maintaining it in either one of the aforesaid notches. The plate 147 may be laterally adjusted to shift the position of its control lever notches so that the stops 122 and 123 are in contact with each other when the control lever is in its "on" position. This adjustment is of considerable utility when assembling the machine or for effecting the proper relation of the control elements after the pinion and segment stops 122 and 123 have been adjusted to compensate for wear between the rack bar 85 and its pinion 86.

As a means for reducing the manufacturing cost of the machine, the use of stampings and die castings is resorted to wherever possible. Such products can be held very closely to a uniform size, and in addition to a lower piece cost the generous use of stampings and die castings also makes it possible to lower assembly costs on account of the uniformity of the individual pieces which are used to make up the complete machine.

The stamped metal elements used in the construction of this machine comprise the tub 1, the base 2, the legs 3, the gear case cover 24, the motor supporting plates 134 and 135 and a large number of such smaller pieces as are customarily formed from stampings.

The die cast parts of the machine comprise the agitator 12, the wringer gear case 28, the wringer column supporting member 30, and collar 31, the bearing members 69 and 99, the rack bar guide, the pump base 131, the pump 37, and a number of smaller parts which are of such shape as to be most economically formed from die castings.

The operating unit comprising motor and gear case, is arranged to be assembled and tested as a unit separate from the rest of the machine. After test this unit is secured to the base of the machine in the manner previously described. The three centrally located base engaging bolts 100a and the two bolts 144, securing the spaced ears 141 to the base, provide in effect a substantially three-point suspension for the operating unit.

The surfaces of the ears 141 are ground level with the top of the gear case 22 thus providing a ground surface from which to work in assembling the operating elements of the machine. The other point of contact between the base 2 and the gear case is by way of the die casting 99, which is supported by the stamped cover 24, which in turn rests on the ground surface 22a of the top of the gear case base 22. Most of the machining operations performed on the gear case are made with reference to the ground surface 22a, referred to.

By building the machine from a ground surface as described, and by the use of stampings and die casings, very close limits of tolerance can be maintained with ease, resulting in a uniformity of product in which the spacing and alignment of the various operating elements easily can be held within the permissible limits of accuracy.

Cracking and chipping of the porcelain enameled tub is greatly reduced, if not entirely prevented, by the use of a floating seal for the agitator shaft. This construction takes care of the slight differences in level between the gear case and tub bottom and at the same time allows the tub to freely expand and contract under the large temperature changes to which it is subjected.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and that various modifications of said apparatus and procedure can be made without departing from this invention as described in the appended claims.

Having thus described our invention what we claim is:

1. A gear mechanism for laundry machines and the like comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, a single worm gear in mesh therewith, motion converting means for connecting said worm gear to said oscillatory driven shaft, and a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft.

2. A gear mechanism for laundry machines and the like comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, an associated helical gear in mesh therewith the opposite faces of the teeth of which have hobbed and unhobbed portions, motion converting means for connecting said helical gear to said oscillatory driven shaft, and a gear meshing with the unhobbed portion of said hobbed helical gear for connecting said rotatory driven shaft with said rotatory driving shaft.

3. A gear mechanism for laundry machines and the like comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, a single worm gear in mesh therewith, a pitman driven by said worm gear, a rack bar driven by said pitman, a pinion fixed on said oscillatory shaft and meshing with said rack bar, and a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft.

4. A gear mechanism for laundry machines and the like comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said last named shaft, a single worm gear in mesh therewith, a pitman driven by said worm gear, a rack bar driven by said pitman, a pinion fixed on said oscillatory shaft and meshing with said rack bar, a bearing and guideway for said rack bar, and a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft.

5. A gear mechanism for laundry machines and the like comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said last named shaft, a single worm in mesh therewith, a pitman driven by said worm gear, a reciprocating rack bar driven by said pitman, a pinion fixed on said oscillatory shaft and meshing with said rack bar, a bearing member for supporting and guid-

ing said rack bar for rectilinear reciprocating movement, and a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft.

6. A gear mechanism comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, a single worm gear in mesh therewith, motion converting means associated with said gears for connecting said oscillatory driven shaft with said rotatory driving shaft, a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft, a gear case for receiving the aforesaid elements, bearings formed in said gear case for said driving and said driven shafts, a cover for said gear case, and bearings carried by said cover for said driven shafts.

7. A gear mechanism comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, a single worm gear in mesh therewith, motion converting means associated with said gears for connecting said oscillatory driven shaft with said rotatory driving shaft, a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft, a gear case for receiving the aforesaid elements, bearings formed in said gear case for said driving and said driven shafts, a stamped metal cover for said gear case, and die cast bearings carried by said cover for said driven shafts.

8. A gear mechanism comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, a single worm gear in mesh therewith motion converting means associated with said gears for connecting said oscillatory driven shaft with said rotatory driving shaft, a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft, a gear case for receiving the aforesaid elements, bearings formed in said gear case for said driving and said driven shafts, a stamped metal cover for said gear case, and die cast bearings carried by said cover for said driven shafts, one at least of said die cast bearings being cast in an opening of the cover so as to form an integral part of the cover.

9. A gear mechanism comprising, an oscillatory driven shaft, a rotatory driven shaft, a rotatory driving shaft, a single worm driven by said driving shaft, a single worm gear in mesh therewith, motion converting means associated with said gears for connecting said oscillatory driven shaft with said rotatory driving shaft, a gear meshing with said worm gear for connecting said rotatory driven shaft with said rotatory driving shaft, a gear case for receiving the aforesaid elements, bearings formed in said gear case for said driving and said driven shafts, a stamped metal cover for said gear case, and die cast bearings carried by said cover for said driven shafts, one of said die cast bearings being cast in an opening of the cover so as to form an integral part of the cover, the other of said die cast bearings being removably secured to said cover.

10. A gearing for converting rotary motion into oscillatory motion comprising, a driving worm, a gear in mesh therewith, a pin journaled eccentrically in said gear and removably received therein, a pitman fixedly engaged at one end by said pin, a second pin fixedly secured to the other end of said pitman, a rack bar having a bearing for receiving said second pin, means for securing said second pin and said rack bar against relative axial movements, a pinion meshing with the teeth of said rack bar, a guideway for supporting said rack bar for rectilinear movement, and means for supporting said guideway for rectilinear movement.

11. A gearing for converting rotary motion into oscillatory motion comprising, a driving worm, a gear in mesh therewith, a pin journaled eccentrically in said gear, a pitman engaged at one end by said pin, a second pin secured to the other end of said pitman, a channeled rack bar having a bearing for receiving said second pin and permitting movement of said pitman with respect to said rack bar about the axis of said second pin, a pinion meshing with the teeth of said rack bar, a guideway having channels of substantial length complementary to the channels of said rack bar for receiving and supporting said rack bar for reciprocating movement in the path formed by the channels of the guideway, and means for shifting said guideway to effect the engagement and disengagement of the gear teeth of said rack bar and pinion.

12. A combined force feed and gravity lubrication system for washing machine gear mechanism comprising, an oil retaining gear case having a depressed and a raised part, rotating and oscillating mechanism having bearing surfaces and mounted respectively in the depressed and raised parts of said gear case, means in the lower part of said gear case including one of the essential elements of said rotating mechanism for pumping oil above the level of the raised part of said gear case, and means including one of the essential elements of said oscillating mechanism for conveying such oil to the bearing surfaces of the oscillating mechanism of said gear case.

13. A combined force feed and gravity lubrication system for washing machine gear mechanisms comprising, an oil retaining gear case having a depressed and a raised part, rotating and oscillating mechanism having bearing surfaces and mounted respectively in the depressed and raised parts of said gear case, said rotating mechanism including a grooved shaft and its bearing dipping into the oil of the depressed part of said gear case whereby the relative rotation of said shaft and bearing forces the oil upwardly in the groove of said shaft to a higher point and there discharges it, and means including said oscillating mechanism for conveying such oil to the bearing surfaces of the oscillating mechanism of said gear case.

14. In a laundry machine, a supporting structure, a self contained operating unit for said machine adapted for operation and test under its own power prior to its installation in the machine, said unit comprising a gear case having an oscillatory driven shaft and a rotatory driving shaft traversing a wall of said case and extending therefrom, mechanism in said gear case connecting said driving shaft to said driven shaft, a motor supported by said gear case and a belt connecting said motor to said driving shaft, and means for detachably securing said unit to said supporting structure.

15. In a laundry machine, a supporting structure, self-contained operating unit for said machine adapted for operation and test under its own power prior to its installation in the machine, said unit comprising a gear case having an oscillatory driven shaft and a rotatory driving shaft traversing a wall of said case and extending therefrom, mechanism in said gear case connect-

ing said driving shaft to said driven shaft, a motor adjustably supported by said gear case, a power transmission belt connecting said motor to said driving shaft and means for adjusting the position of said motor and thus adjusting the tension of said belt being adjusted by moving said motor, and means for detachably securing said unit to said supporting structure.

16. An operating mechanism for a washing machine comprising, a driven shaft, a pinion fixed on said shaft, a rack bar for oscillating said pinion and shaft, power means for reciprocating said rack bar, a guide for said rack bar, means for mounting said guide for movement in a straight line perpendicular to the axis of said shaft, rack teeth formed on said guide, a pinion engaging said rack teeth, and a control lever for rotating said pinion whereby to throw the gear teeth of said pinion and rack bar into and out of mesh for the purpose of connecting and disconnecting said driving shaft to said power means.

17. An operating mechanism for a washing machine comprising, a driving shaft, a pinion fixed on said shaft, a rack bar for oscillating said pinion and shaft, power means for reciprocating said rack bar, a guide for said rack bar, means for mounting said guide for movement in a straight line perpendicular to the axis of said shaft, a gear case for the aforesaid elements, a support for said gear case, rack teeth formed on said guide, a pinion engaging said rack teeth and projecting from said gear case, a second pinion secured to said first pinion, an enlarged gear meshing with said second pinion, and a control lever engaging said enlarged gear for rotating the same to connect and disconnect said driving shaft to said power means.

18. In a gear mechanism, an oil-retaining gear case, a rotatory driven shaft traversing a wall of said gear case, and a speed reducing gear train for driving said driven shaft comprising, a driving shaft extending through said gear case, a single worm inside said gear case driven by said driving shaft, a single reduction gear meshing with said worm and a driven gear meshing with said reduction gear and operably connected to said driven shaft.

19. A gearing for washing machines and the like comprising an oil-retaining gear case having a base member with a plane finished top surface and bearing apertures machined in said base member with reference to said top surface, gearing including shafts in said apertures, and motor means for driving certain of said shafts having a motor supporting shaft received in certain of said apertures.

20. A gearing for washing machines and the like comprising an oil-retaining gear case having a base member with a plane finished top surface, a stamped metal cover for said base member, bearing members carried by said cover, and bearings, bearing receiving openings and openings for a motor supporting means, all machined in said base member with reference to its top surface, gearing including shafts journaled in said bearings and bearing members and projecting from said cover and base member, and motor means for driving the shaft of said gearing which projects from said base member, said motor means having a supporting shaft received in the stated openings provided therefor.

21. A gearing for converting rotary motion into oscillatory motion comprising, a driving worm, a gear in mesh therewith, a pin journaled eccentrically in said gear, a pitman engaged at one end by said pin, a second pin secured to the other end of said pitman, a channeled rack bar having a bearing for receiving said second pin, a pinion meshing with the teeth of said rack bar, a guideway for supporting said rack bar for rectilinear movement, means for supporting said guideway for rectilinear movement at right angles to the axis of said pinion, and means for shifting said guideway to effect the engagement and disengagement of the gear teeth of said rack bar and pinion.

22. A gearing for converting rotary motion into oscillatory motion comprising, a driving worm, a gear in mesh therewith, a pin journaled eccentrically in said gear, a pitman engaged at one end by said pin, a second pin secured to the other end of said pitman, a channeled rack bar having a bearing for receiving said second pin, a pinion meshing with the teeth of said rack bar, a guideway for supporting said rack bar for rectilinear movement, and means including an operating member movable about the axis of said pinion for shifting said guideway to effect the engagement and disengagement of the gear teeth of said rack bar and pinion.

23. In a mechanism of the type described, a gear case, and gearing in said gear case including a shaft traversing a wall of the gear case; said gear case being formed in part by a relatively heavy, relatively rigid casting, a relatively light, stamped metal cover for said gear case, means for securing said cover to said casting whereby the relatively rigid casting reinforces the relatively more flexible cover, and a die-cast bearing for said shaft at the place where the shaft traverses the gear case, said bearing being cast about an opening in said cover and forming an integral part of the cover.

24. In a mechanism of the type described, a gear case, and gearing in said gear case including a shaft traversing a wall of the gear case; said gear case being formed in part by a relatively heavy, relatively rigid casting having a bearing rigid therewith for said shaft, a relatively light, stamped metal cover for said gear case, means for securing said cover to said casting whereby the relatively rigid casting reinforces the relatively more flexible cover, and a bearing for said shaft secured to said cover in substantial alignment with said first named bearing.

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CERTIFICATE OF CORRECTION.

Patent No. 2,046,258. June 30, 1936.

WALTER A. FRANTZ, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, second column, line 71, claim 5, after the word "worm" insert gear; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of September, A. D. 1936.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.