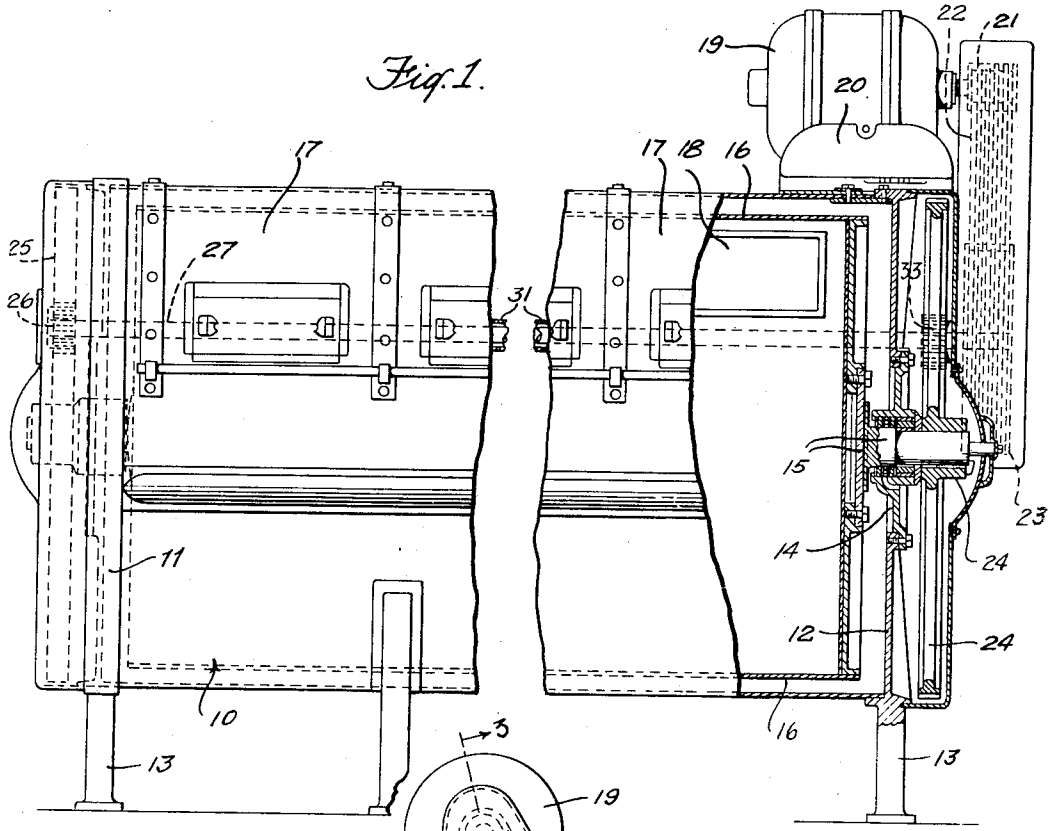
Feb. 20, 1934. H. H. HARLAN 1,947,985

WASHING MACHINE DIFFERENTIAL DRIVE UNIT

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Fig. 1.



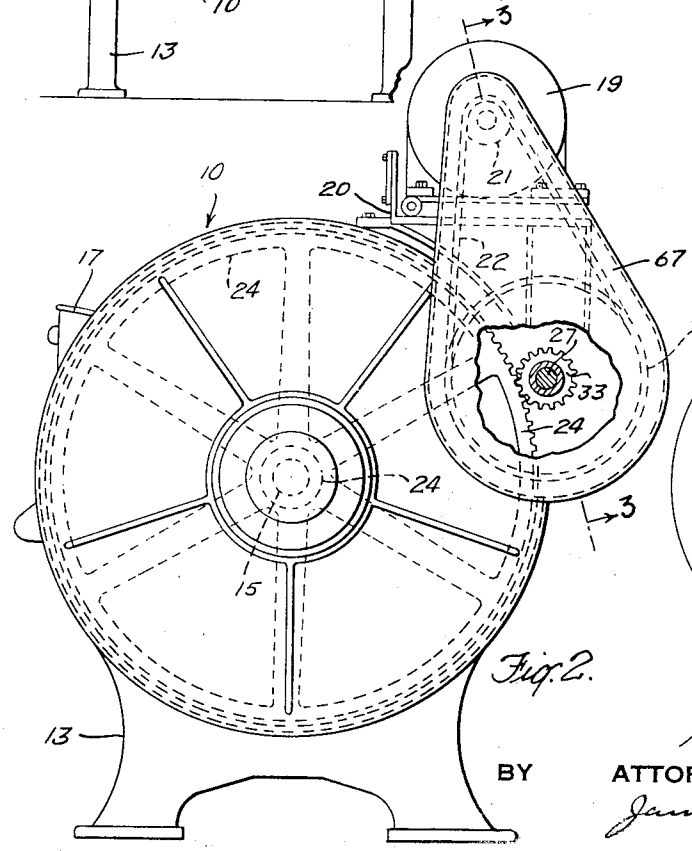
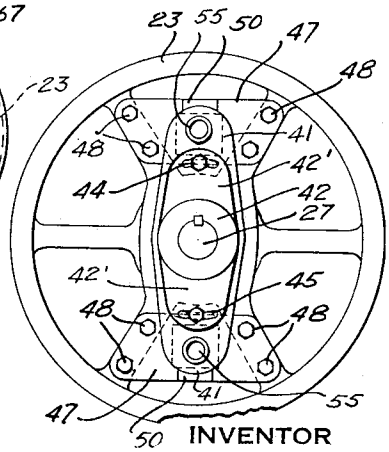


Fig. 2.

Fig. 6.



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Fig. 3.

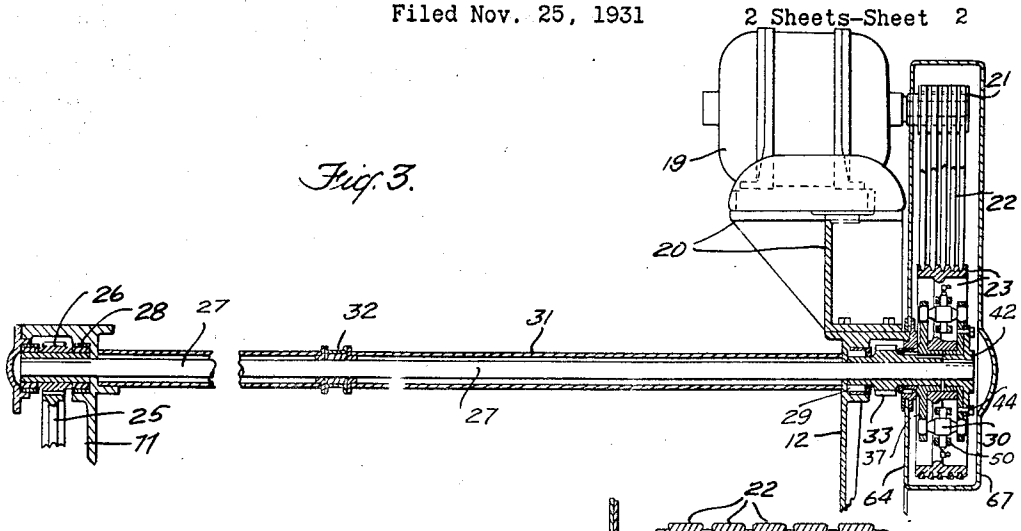


Fig. 4.

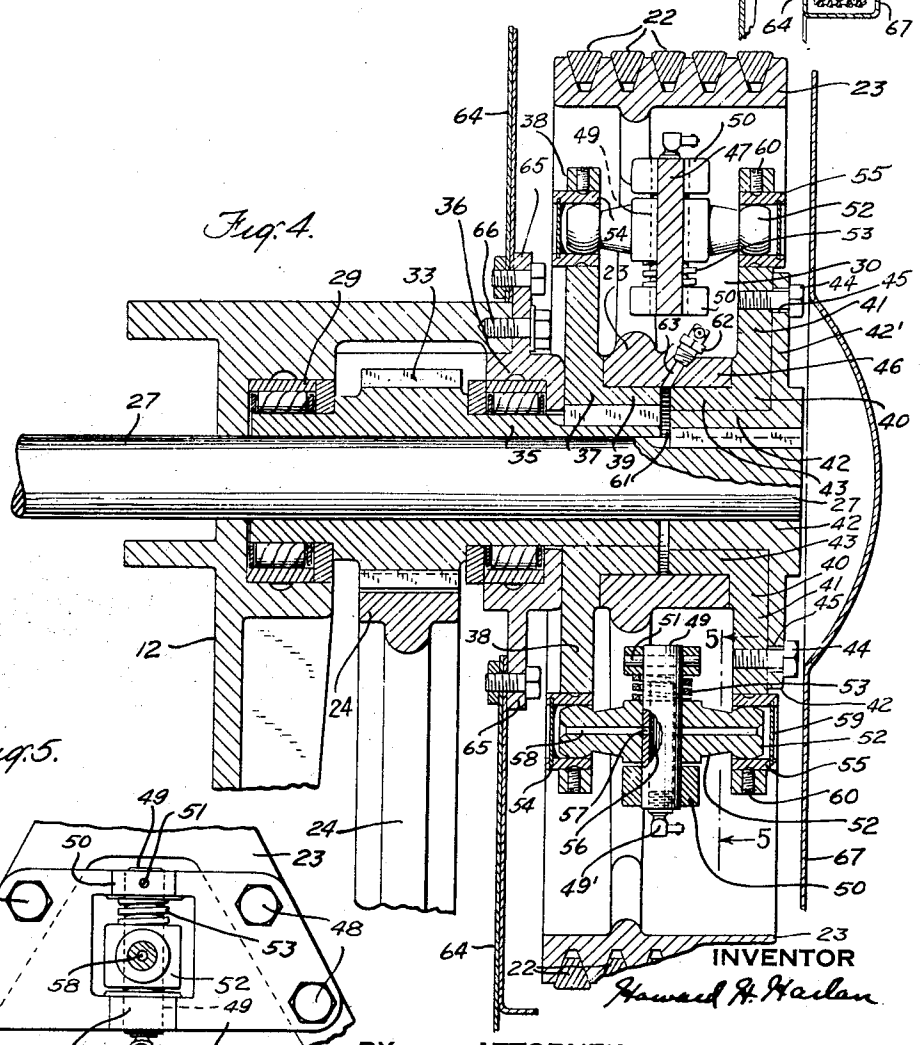


Fig. 5.

BY ATTORNEY

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UNITED STATES PATENT OFFICE

1,947,985

WASHING MACHINE DIFFERENTIAL DRIVE UNIT

Howard H. Harlan, East Moline, Ill., assignor to Troy Laundry Machinery Co., Inc., New York, N. Y., a corporation of Delaware

Application November 25, 1931
Serial No. 577,257

6 Claims. (Cl. 68—18)

This invention relates to torque transmission and more particularly to means for equalizing the torque applied at the ends of a long washing machine cylinder of the double gear type. One of the objects of the invention is to provide simple and practical means for applying equalized torque at the ends of a rotatably mounted member of the character described. Another object is to provide an efficient transmission device of the above character, when the power source for rotating the cylinder is mounted at one end of the machine. Another object is to provide a drive arrangement of the nature described, economical in respect to the space it occupies, and which may be economically manufactured and easily assembled for operation. A further object is to provide a simple, practical and economical limited differential device suitable for equalizing the drive to the ends of a double gear washing machine cylinder. Another object is to provide an equalizing device of the nature described of simple and rugged construction, easily adjustable to provide for proper alignment and disposition of parts, and having provision for effective lubrication throughout.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention:

Fig. 1 is in part a front elevation, and in part a longitudinal vertical cross section of a horizontal cylinder washing machine embodying my invention;

Fig. 2 is a right end elevation of the machine shown in Fig. 1, with the gear housing partially broken away;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 is a cross section similar to the right end portion of Fig. 3 but on an enlarged scale and in more detail;

Fig. 5 is an end elevation and section of a part of my equalizer device taken on line 5—5 of Fig. 4; and

Fig. 6 is an end view on a smaller scale of the pulley and equalizer as seen from the right of Fig. 4.

The drawings show a horizontal cylinder washing machine of a well known type, consisting of a long cylindrical shell 10 closed at its ends by head members 11 and 12, each of which is provided with a downwardly extending leg member 13. The head members provide bearing assemblies at their centers, as indicated generally by the numeral 14 in Fig. 1, which bearings rotatably support the trunnions 15 of an elongated metal washing cylinder 16, just enough smaller in diameter than the shell 10 to permit of practical operation of the machine. Doors 17 of any desired construction are located in the shell member at points convenient for admission to the interior thereof, when it is desired to load or unload the washing cylinder, which, it will be understood, is also provided with suitably covered openings, as indicated at 18 in Fig. 1, which openings may be brought into registry with the doors 17, and which give access to the interior of the washing cylinder.

Washers of this type have cylinders of great length, and as such cylinders are generally made of perforated metal and provided with numerous doorways, it will be readily understood that it is inadvisable to attempt to drive them from a single end because of the danger of producing distortion and strain, which is not only apt to cause permanent injury to the cylinder itself but which is likely to result in poor operation of the cylinder doors. In order to remedy this difficulty, it has been common practice to drive the washing cylinder at both ends and this type is known as a double drive washer. In driving at the ends, however, another difficulty is met with in that a longer jack shaft is needed and, should this jack shaft be driven from a source of power connected to but one end, the torsional deflection of the shaft will cause unequal torque to be applied to the two ends of the cylinder, so that the gearing, of whatever nature employed to transmit torque from the back shaft to the cylinder trunnions, has uneven force applied to it with respect to the two ends of the cylinder. Thus the gearing at the end where the power is applied does most of the work in driving the cylinder and consequently suffers more wear than the gearing at the distant end, and also the torsional deflection of the shaft is apt to cause torsional strains in the cylinder itself.

In order to overcome this tendency to deliver unequal torque to the ends of the cylinder, it has been the practice to mount the driving member above and rearwardly of the center of the shell at a point equidistant from the two ends, and to connect the driving member to the gearing at the ends of the washing cylinder through the

medium of equal lengths of jack shaft. This arrangement operates effectively but it necessitates supporting the central zone of the shell upon heavy brackets which extend upwardly above the shell and furnish support for the driving unit. The latter may be a motor and speed reducer or a pulley member. Such heavy bracket members add considerably to the expense of the washing machine and take up additional space as compared with a simple motor or pulley mounted at one end of the machine.

It should be noted, too, that a double drive washer having a driving unit disposed between the ends of the jack shaft must have its shafts and gears perfectly aligned and adjusted in order to transmit equal torque to the cylinder ends. Such adjustment is usually made at the factory with the washer standing in a carefully leveled position, both longitudinally and transversely. If when the later installed for use the tub or shell is not properly leveled, and one head member is canted with respect to the other, even a very slight amount, the gearing will be thrown out of adjustment, making it impossible to supply equal torque to the cylinder ends. This trouble may also arise after installation by the uneven settling of the machine foundation or support. The twisting of the washing machine due to an out of level position may be so slight as to produce no harmful effect upon either frame or cylinder, but still be sufficient to cause improper operation and uneven wear of the gearing at the respective ends. In carrying out my invention I provide for equalization of torque under all conditions of installment and use.

My invention, which will now be described in one of its many possible embodiments, furnishes a drive device or transmission, and arrangement thereof with respect to the shell of a washing machine of the type disclosed, which permits mounting the driving member at one end of the machine with transmission to both ends of the cylinder, in an efficient and practical manner. Referring to the drawings, there is shown a motor 19 mounted upon a suitable bracket member 20, carried by the head member 12. The shaft of this motor carries a V-groove pulley 21 connected by means of V-belts 22 to a V-pulley 23, hereinafter referred to as the power pulley or member. Upon the right-hand trunnion of the cylinder, as viewed in Fig. 1, there is mounted a large spur gear 24 and upon the lefthand trunnion of the cylinder is mounted a similar spur gear 25. Meshing with gear 25 is a spur pinion 26 mounted upon a shaft 27 which is suitably journaled as by means of roller bearings 28 upon the head member 11. This shaft is also rotatably mounted as by means of roller bearings 29 upon head member 12 and extends outwardly beyond head member 12 a suitable distance, as shown in Fig. 4, to enable it to support the equalizer assembly of my invention, which is indicated generally by the reference numeral 30 and which includes in its construction the power pulley 23.

Shaft 27 is housed within a tubular housing 31 extending along the side of the shell, which may be furnished with suitable roller bearing members 32 to support the shaft intermediate its ends. At the right end of the machine a pinion 33 meshes with the spur gear 24 and this spur gear is carried by a sleeve 35, which is mounted rotatably on shaft 27 and is supported by means of a roller bearing assembly 36, supported by the head member 12. This sleeve also extends beyond the end of the shell but terminates at a point short of the end of the shaft 27. Keyed to sleeve 35 is a crank member 37 which may comprise one or more crank arms 38, in the present instance two, and which is provided with a laterally extending hub 39. Keyed to the end of shaft 27 is a similar crank member, indicated generally by the numeral 40 and provided with a pair of crank arms 41 and an inturned hub. The crank member 40 preferably consists of two concentric members 42 and 43, the member 43 rotatably mounted upon a shoulder of hub 42, and these two members are secured together by means of bolts 44 which threadedly engage the arms 41 and pass through arcuate slots 45 formed in a flange 42' of member 42, as is clearly shown in Figs. 4 and 6. The opposing hubs of crank members 37 and 40 provide a seat or journal for the hub 46 of the power pulley 23.

The latter is provided at equal distances from its center with plates 47 which are secured to spokes of the pulley, as by bolts 48, see Figs. 5 and 6. Each of these plates carries a pin 49 radially disposed with respect to the center of the pulley, which pin is seated within bosses 50 formed in the plate 47, to one of which it is secured as by means of crosspin 51. Rotatably and slidably mounted upon pin 49 is an equalizer lever 52, which is freely rotatable about the pin and which is slidable thereon between limits, as may be clearly seen in the lower part of Fig. 4, and which is normally pressed away from the center or axis of the power pulley 23 by means of a spring 53. Each end of the lever 52 is shaped to have substantially universal connection with socket members 54 and 55 secured respectively and at the same distance from the axis of rotation within crank arms 38 and 41. It will be noted that pin 49 is hollow and is provided at its outer end with an Alemite fitting 49' for admitting lubricant to the interior. The hollow or grease space 56 is connected by lateral openings 57 with grease or oil passages 58 formed in the lever 52. Stops 59 are inserted in the outer ends of the socket members 54 and 55 to retain the grease and keep the parts free from dirt. Socket members 54 and 55 are held in place by means of set screws 60. It will also be noted that the hubs 39 and 42 do not meet but provide a space 61 to which grease may be supplied by means of an Alemite fitting or grease cup 62 mounted in a passage 63 passing through the hub of the pulley 23. Grease applied to the space 61 will work into the contact surfaces of the pulley member 23 with the crank arm hubs 39 and 43, and will also work down to the shaft 27 to furnish lubrication for sleeve 35.

It will be noted by reference to Fig. 4 that the head-casting 12 furnishes the inner side of the housing of gear members 24 and 33 while the outer wall is provided by sheets 64 secured to the flange 65 of bearing assembly member 36, the latter being bolted to the head member, as by bolts 66. A housing 67 covers and protects pulleys 21 and 23 and belting 22.

A consideration of the foregoing will render the mode of operation obvious but that operation will now be referred to briefly. Upon rotation of the motor pulley 21, motion is transmitted to power pulley 23 and this rotation is further transmitted to each of the crank members 38 and 41 by means of the equalizer lever 52. As one crank member is keyed to the shaft 27 and the other to the sleeve 35, it will be understood that pinions 26 and 33 are set in motion to drive through gears 24 and 25 the two ends of the cylinder 16, and it will be appreciated that as the equalizer lever is

free to rotate about the pins 49 the cranks 38 and 41 may shift angularly with respect to each other a sufficient distance to insure equal torque being delivered to both ends of the cylinder. Of course, as the two cranks become separated angularly the lever 52 will be forced toward the axis of the pulley against the reaction of spring 53. Any variation in the speed of rotation of the motor and deflection of shaft 27 will be compensated for in the varying angularity of the cranks, thus enabling equal torque to be applied to the ends of the cylinder under all conditions of use.

From the foregoing it will be seen that my invention is one well adapted to attain all of the ends and objects hereinbefore set forth, together with other advantages which are obvious and which are inherent in the structure of the device.

As many possible embodiments may be made of the above invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In apparatus of the character described, in combination, a shell, a cylinder having end trunnions rotatably mounted in bearings in said shell and extending through the ends of said shell, a pair of driven members rigidly mounted respectively upon each of said trunnions exteriorly of said shell, a shaft mounted in bearings exteriorly of said shell, a driving member rigidly mounted on said shaft in cooperative relation with one of said driven members, a driving member rotatably mounted on said shaft in cooperative relation with the other of said driven members, a rotatable power member, and equalizer means mounted on said shaft and adjacent said loose driving member and connecting said power member to said shaft and to said loose driving member, to thereby transmit power to both ends of said cylinder with equal torque, said power member and said equalizer means being positioned to overhang an end of said shell.

2. An equalized drive for washing machines, having a horizontal cylinder with rigid head ends, both of which are driven, comprising in combination, a shaft connected to exert a torsional force upon one of said head members, a sleeve loosely mounted on said shaft and connected to exert a torsional force upon said other head member, a pair of transmission members fixedly mounted respectively upon said shaft and said sleeve, a rotatable power member, means connecting said power member with both of said transmission members and capable of limited movement relatively to said power member and said transmission members for equalizing the torque applied to said cylinder head members, said power member and said equalizing means being disposed at one end of said cylinder and outside of the transmission member at the end.

3. An equalized drive for washing machines, having a horizontal cylinder with head ends, both of which are driven, comprising in combination, a power transmission unit mounted adjacent but overhung with respect to one end of said cylinder, and means comprising concentric shafts operatively connected respectively to the opposite ends of said cylinder and to relatively movable parts of said transmission unit for equalizing the torque exerted upon the ends of said cylinder.

4. An equalized drive for washing machines, having a horizontal cylinder with head ends, both of which are driven, comprising in combination, a shaft geared to said cylinder beyond an end thereof, a loose sleeve on said shaft geared to said cylinder beyond the other end thereof, and a drive member overhanging said other end of said cylinder and having relatively movable parts mounted respectively upon said shaft and said sleeve and adapted to apply equal torque to the ends of said cylinder.

5. In laundry apparatus, in combination, a differential means for applying equal torque to a pair of relatively rotatable concentric shafts, comprising a pair of cranks rigidly connected respectively to each of said shafts, a power member freely rotatable about the axis of said shafts, a lever pivotally and slidably mounted between its ends upon a radial part of said power member, means universally connecting respectively the ends of said lever to said cranks, and means for resiliently opposing a sliding movement of said lever toward said axis.

6. In laundry apparatus, in combination, a differential means for applying equal torque to a pair of relatively rotatable concentric shafts, comprising a pair of cranks rigidly connected respectively to each of said shafts, a power member freely rotatable about the axis of said shafts, a lever pivotally and slidably mounted between its ends upon a radial part of said power member, means universally connecting respectively the ends of said lever to said cranks, and means for limiting sliding movements of said lever toward said axis.

HOWARD H. HARLAN.