July 6, 1954 R. S. BLOUGH 2,682,935

INTERMITTENT WHEEL BRAKE

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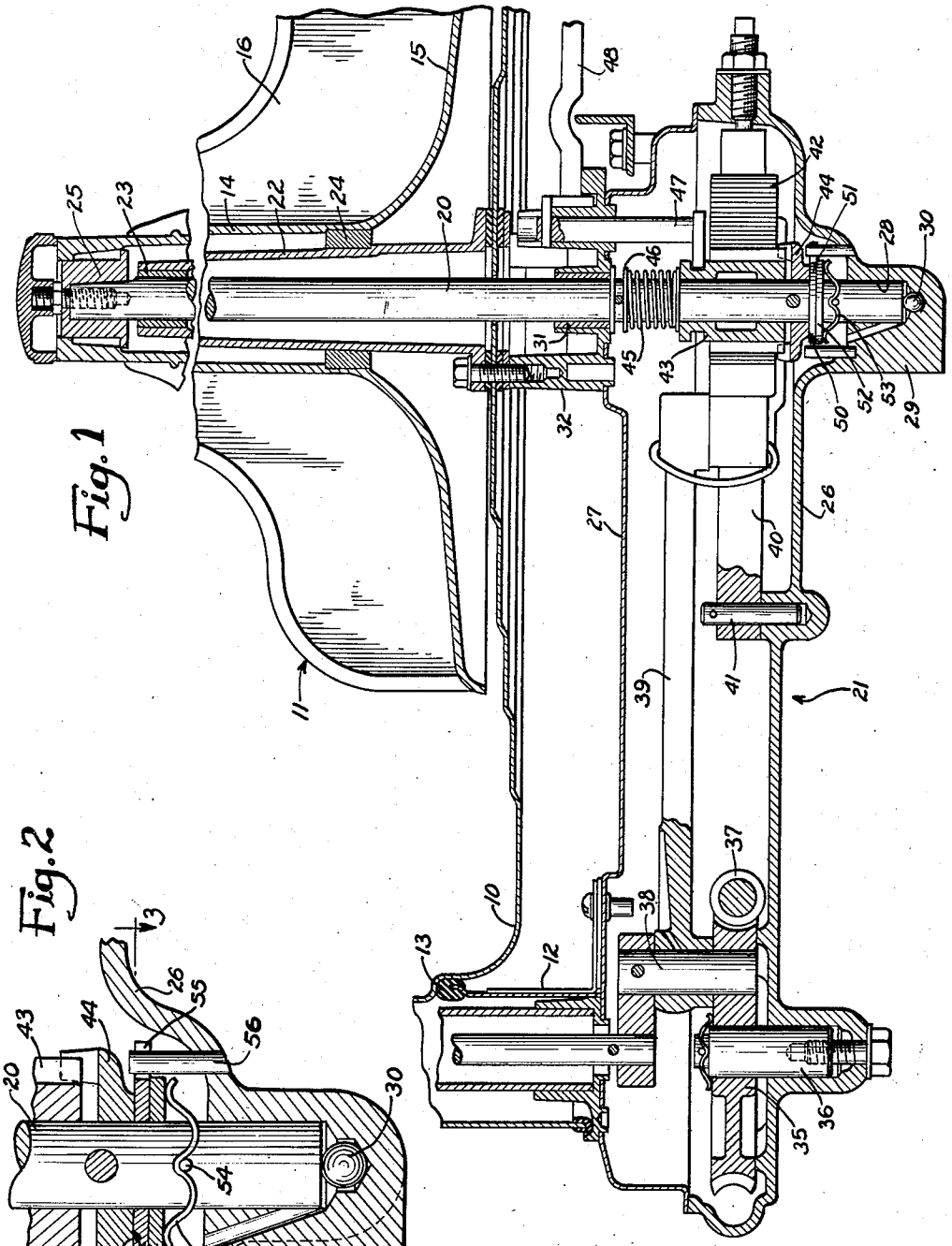


Fig. 1

Fig. 2

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Fig. 3

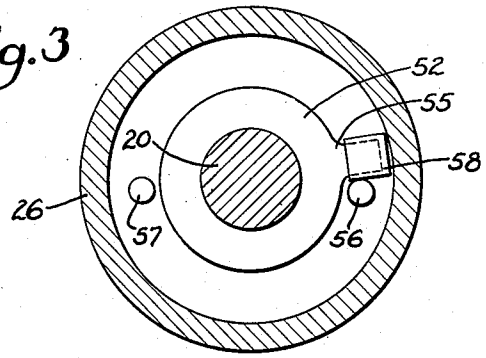


Fig. 4

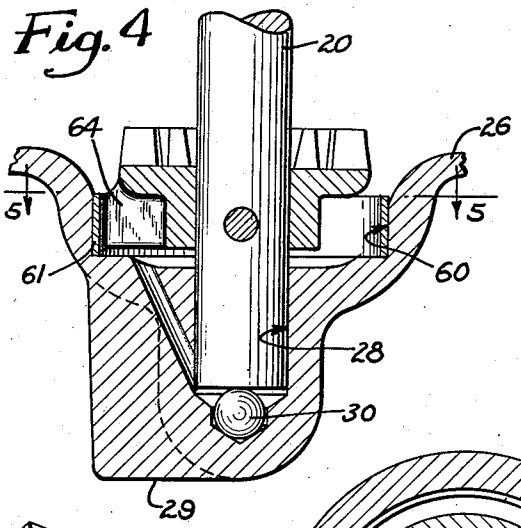


Fig. 5

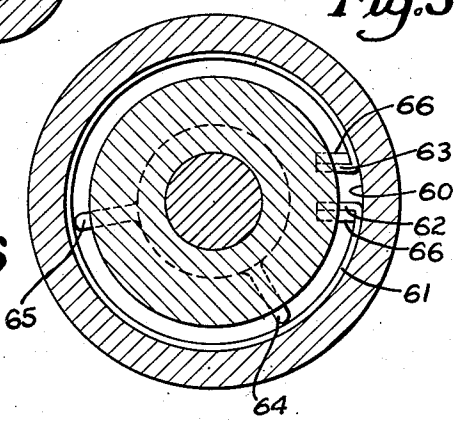
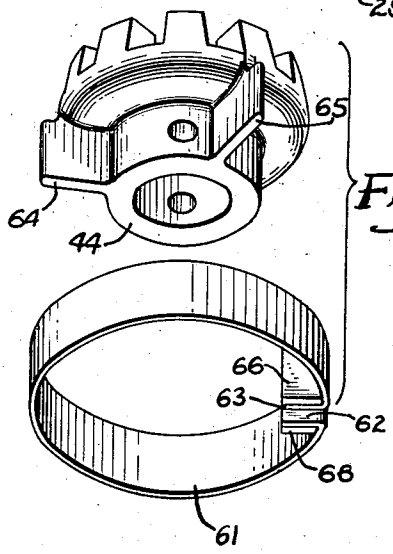


Fig. 6



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INTERMITTENT WHEEL BRAKE

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Application February 23, 1951, Serial No. 212,459

3 Claims. (Cl. 188—85)

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The invention relates to drive mechanisms for washing machines and more particularly to mechanisms of the type utilized to oscillate a washing element such, for example, as an agitator.

Drive mechanisms of the above general character are usually arranged to impart positive movements to the oscillating element, turning the element first in one direction through a predetermined angle and then reversing to turn it in the opposite direction through the same angle. As the washing element oscillates the washing load, that is, the mass of clothes and water acted on by the element, oscillate with it. However, when the movement of the element is interrupted prior to its change in direction at each end of the oscillatory stroke, the washing load continues to move along in the same direction and tends to carry the element with it. In other words, the inertia of the washing load exerts a force on the washing element tending to make the element overrun the mechanism which drives it. The result is that the backlash between the moving parts is suddenly taken up and a sharp knock or other objectionable noise is produced.

Careful machining and fitting of the parts may reduce but does not completely eliminate the noises above referred to since some backlash is inherently present due to the necessity of providing a running fit between the parts. It has, therefore, become a common practice to provide some type of braking means acting on the oscillating element to prevent it from being carried along with the water and washing load. Such braking means effectively eliminate or substantially reduce the noise, but as heretofore constructed they exert a constant drag on the element which is objectionable for obvious reasons.

With the above in view, one object of the invention is to provide improved means for preventing overrun of the oscillating element at the ends of its oscillatory stroke without imposing a constant drag on either the element or the driving mechanism.

Another object is to provide braking mechanism for an oscillating element which leaves the element free of restraint during the major portion of its oscillatory stroke and exerts an effective braking force thereon as the element approaches either end of its stroke, thus effectively eliminating backlash between the parts and the objectionable noise resulting therefrom.

A more specific object is to provide knock eliminating means for washing machine drive mechanisms of the above general character which

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is simple in construction and inexpensive to manufacture, which is subject to a minimum of wear in use and which is efficient and reliable in operation.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiments illustrated in the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view of an agitator type washing machine equipped with knock eliminating means embodying the features of the invention.

Fig. 2 is a sectional view of the lower end of the agitator drive shaft taken in a vertical plane through the axis of the shaft.

Fig. 3 is a sectional view taken in a plane substantially on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view of the agitator drive shaft equipped with a modified form of the knock eliminator.

Fig. 5 is a sectional view taken in a plane substantially on the line 5—5 of Fig. 4.

Fig. 6 is an exploded perspective view showing details of the parts utilized in the knock eliminator shown in Figs. 4 and 5.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

For purposes of illustration, the invention has been shown as incorporated in a washing machine having a tub 10 with a centrally disposed agitator 11 mounted therein. The tub is enclosed in a housing 12 and, in this instance, is seated on a ring 13 of resilient material carried by a part of the housing. The agitator 11 as shown is of conventional construction comprising an upright tubular central portion 14 terminating at its lower end in an outwardly flaring skirt portion 15. A series of vanes 16 extend radially from the central portion and over the skirt portion of the agitator.

Oscillatory movements are imparted to the agitator 11 by a shaft 20 driven by suitable power drive means including a transmission 21 supported on the housing 12 below the tub 10. In the particular machine illustrated the shaft 20 extends upwardly from the transmission 21

through an opening in the bottom of the tub and through an upright hollow column 22 secured to the tub bottom. This column carries a bearing sleeve 23 at its upper end for journalling the shaft 20 adjacent its upper end and also has an external seat for a bearing 24 which guides the agitator 11 in its oscillatory movements. The shaft 20 is arranged to project from the upper end of the column 22 and is drivingly connected with the agitator 11 by a suitable coupling member 25.

As shown in Fig. 1 of the drawings, the transmission 21 is enclosed in a casing comprising a pan-like bottom member 26 in the form of a casting and a top member 27 which may conveniently comprise a sheet metal stamping. The shaft 20 extends through the top member 27 of the casing and its lower end is journaled in a bearing recess 28 formed in a boss 29 integral with the bottom member 26. A ball thrust bearing 30 seated in the bottom of the recess 28 supports the shaft and agitator assembly. In the present instance the shaft 20 is provided with an intermediate bearing 31 carried by a bracket 32 interposed between the bottom of the tub 10 and the top of the transmission casing and serving in this instance to support the casing from the tub.

The transmission 21 shown by way of illustration is generally similar to that disclosed in the Rizor Patent No. 2,267,577 issued December 23, 1941. Briefly, the transmission comprises a main driving element in the form of a gear 35 rotatably mounted on a vertical stud 36 supported by the bottom member 26 of the transmission casing. The gear 35 in this instance is in the form of a worm wheel adapted to be driven by a worm 37 which, in turn, is driven by an electric motor (not shown) mounted externally of the casing.

The drive gear 35 is provided with a crank pin 38 upon which is journalled one end of a pitman 39. The other end of the pitman is pivotally connected to an intermediate drive member 40 pivoted at one end by a pin 41 on the bottom member 26 of the casing. At its other end the intermediate drive member 40 is formed with teeth defining a segmental rack 42 adapted to mesh with the teeth of a pinion 43 rotatably mounted on the lower end of the agitator shaft 20. The pinion 43 is also slidable axially of the shaft into or out of engaging relation with teeth formed on a clutch member or collar 44 pinned or otherwise non-rotatably fixed to the shaft. A spring 45 interposed between a collar 46 on the shaft and the upper end of the pinion 43 urges the latter downwardly to engage the clutch and thus effect a driving connection between the transmission and the agitator shaft. This connection may be interrupted by shifting the pinion upwardly, the shifting being effected through the medium of a vertically slidable shifter arm 47 actuated by a rotatable operating member 48 accessible from the exterior of the machine.

It will be apparent that with the above construction rotation of the main drive gear 35 will impart a rocking or oscillating movement to the intermediate drive member 40 and such movement will be imparted to the shaft 20 through the rack 42, pinion 43 and clutch member 44. The amplitude of the oscillating movements is determined, of course, by the throw of the crank pin 38 and the driving ratio provided by the rack and pinion connection. While the oscillation may be of any desired amplitude, it is usually greater than 180° but less than 360°. At

the beginning of a stroke in either direction the rotational speed of the agitator shaft gradually increases and through the action of the agitator the washing load is started to rotate in the same direction. After passing the midpoint of its stroke, the speed of rotation of the shaft gradually decreases preparatory to reversal in the direction of rotation.

During the decreasing speed of rotation and particularly as the end of the oscillatory stroke is approached, the inertia of the washing load exerts a force on the agitator tending to drive the pinion 43 faster than the rack 42. The backlash between the rack and pinion as well as play between other parts of the mechanism is thus taken up while the parts are moving relatively rapidly with the production of an objectionable knock.

In accordance with the invention the tendency of the pinion 43 to overrun and the knock resulting therefrom is eliminated by applying to the oscillating element a braking force of sufficient amplitude to prevent continued movement of the element independently of the drive mechanism as the element approaches opposite ends of its stroke. More particularly the braking force is applied through only a small portion of the stroke adjacent each end thereof, leaving the element free of restraint throughout the major portion of its stroke, to the end that, smooth and silent running of the machine is insured and at the same time waste of power is avoided and wear on the cooperating parts of the braking means is substantially reduced.

One arrangement for applying the braking force in the novel manner above referred to is shown in Figs. 1–3 of the drawings. In the construction there shown a part fixed to the shaft 20, in this instance the clutch member 44, is formed to provide an axially facing braking surface 50 against which a friction member 51 is continuously yieldably pressed as by a washer 52 and spring 53. The friction member 51 may be in the form of an annulus of suitable friction material and is mounted on the shaft between the braking surface 50 and the washer 52. In the particular embodiment illustrated the spring 53 is interposed between the lower face of the washer 52 and a pin 54 anchored in the shaft 20.

Due to the continuous frictional engagement between the member 51 and braking surface 50, the friction member 51 tends to oscillate with the shaft 20. To apply the braking force to the shaft as it approaches opposite ends of its oscillatory stroke, provision is made for interrupting the movement of the friction member 51 before the shaft reaches the end of its stroke so as to produce relative movement between the frictionally engaged members. For this purpose the friction member 51 is formed with a radially projecting finger 55 engageable alternately with pins 56 and 57 anchored to the casing 26 in predetermined angular spaced relation with respect to the axis of the shaft 20. In the particular embodiment illustrated in which the agitator is oscillated through a stroke of something less than 360°, the pins 56 and 57 are located at diametrically opposite sides of the shaft, thus allowing the friction member 51 to swing through an arc of 180°. To minimize wear the finger 55 may be conveniently fitted with a metal bushing 58 for engagement with the pins, as shown in Fig. 3.

With the above arrangement washing element 11 is left free of restraint throughout 180° of its oscillatory stroke and, at each end of the stroke,

interruption of the rotation of the friction member 52 applies a braking force opposing continued movement of the element in the same direction. The drive mechanism, of course, continues to positively turn the shaft 20 to carry the washing element to the end of its oscillatory stroke but movement beyond that limiting position independently of the drive mechanism is prevented by the frictional resistance between the members 51, 52 and 44. Accordingly, the inertia of the washing load is ineffective to advance the washing element faster than the element is moved by the drive mechanism or, in other words, overrunning of the rack 42 by the pinion 43 is precluded.

In the modified construction shown in Figs. 4–6, a braking force is likewise applied to the shaft 20 as the washing element approaches opposite ends of its stroke by the relative movement of two continuously engaged friction elements, one associated with the shaft and the other with a stationary part of the machine. In this instance the bottom member 26 of the casing is formed with a counterbore disposed coaxially of the bearing recess 23 for the shaft and defining a cylindrical braking surface 60. Confined within the counterbore and in frictional engagement with the braking surface 60 is a resilient band 61 of steel or other suitable material. Opposite end portions of the band are bent inwardly to form radially disposed abutments 62 and 63 engageable alternately with spaced abutments in the form of lugs 64 and 65 formed on or rigidly secured to the clutch member 44. The bent ends 62 and 63 of the band 61 may be reinforced by relatively heavy strips 66 of metal welded or otherwise suitably attached to the ends.

In practice the lugs 64 and 65 are spaced apart circumferentially of the clutch member 44 so as to engage the abutments 62 and 63 as the washing element 11 approaches opposite ends of its oscillatory stroke. The arrangement is such that during the latter portion of the stroke the band is carried along with the shaft and due to its frictional engagement with the braking surface 60 it opposes the movement of the shaft with a force of sufficient amplitude to prevent the shaft from being advanced by the action of the washing load on the washing element. Reverse movement of the shaft is unrestrained until it again approaches the end of its oscillatory stroke, whereupon the other lug on the collar engages the companion abutment on the band 61 to again produce a relative movement between the band and the cooperating braking surface 60. Thus the braking force is applied at each end of the oscillatory stroke of the washing element, yet the element is free of restraint throughout the major portion of its stroke.

It will be apparent from the foregoing that the invention provides knock eliminating means of novel and advantageous construction for washing machines of the type equipped with an oscillating washing element. The braking force for attaining this result, that is, for preventing the oscillating element from overrunning the drive mechanism is applied in a novel manner only at

the ends of the oscillatory stroke, leaving the element free of restraint throughout the major portion of its stroke. Smooth, quiet operation is thus obtained without waste of power and with a minimum of wear on the moving parts of the machine.

I claim as my invention:

1. In a washing machine having an element supported for oscillation, drive mechanism connected to and operative to oscillate said element through an angle of predetermined amplitude, means defining a stationary braking surface, a member in frictional engagement with said surface, and abutment means oscillatable with said element positioned to engage said member and shift it relative to said braking surface as said element approaches either end of its oscillatory stroke, the frictional resistance between said member and said braking surface being of sufficient magnitude to prevent the element from being carried along by the inertia of the load acting on the element.

2. The combination with a shaft and means for rotating it alternately in opposite directions through an angle of less than 360°, a collar fixed to and rotatable with said shaft, a stationary member presenting a braking surface concentric with said shaft, a movable member having a braking surface in frictional engagement with the surface of said stationary member, abutment means on said movable member, and abutment means on said collar cooperating with the abutment means on said movable member to shift the same relative to said stationary member, said abutment means being positioned so as to leave the shaft free of restraint throughout the major portion of its rotational movement in either direction.

3. In a washing machine, in combination, a shaft, a casing having a bearing journaling said shaft, drive mechanism in said casing operative to rotate the shaft alternately in opposite directions through an angle of less than 360°, a collar mounted on and rotatable with said shaft, said casing having a counterbore positioned to receive said collar and defining a cylindrical braking surface concentric with said shaft, a resilient band confined in said counterbore in frictional engagement with said braking surface, said band having opposite end portions bent inwardly to form radially disposed abutments, and lugs formed on said collar defining spaced abutments engageable alternately with the abutments on said band as the shaft approaches its limit positions of rotation.

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