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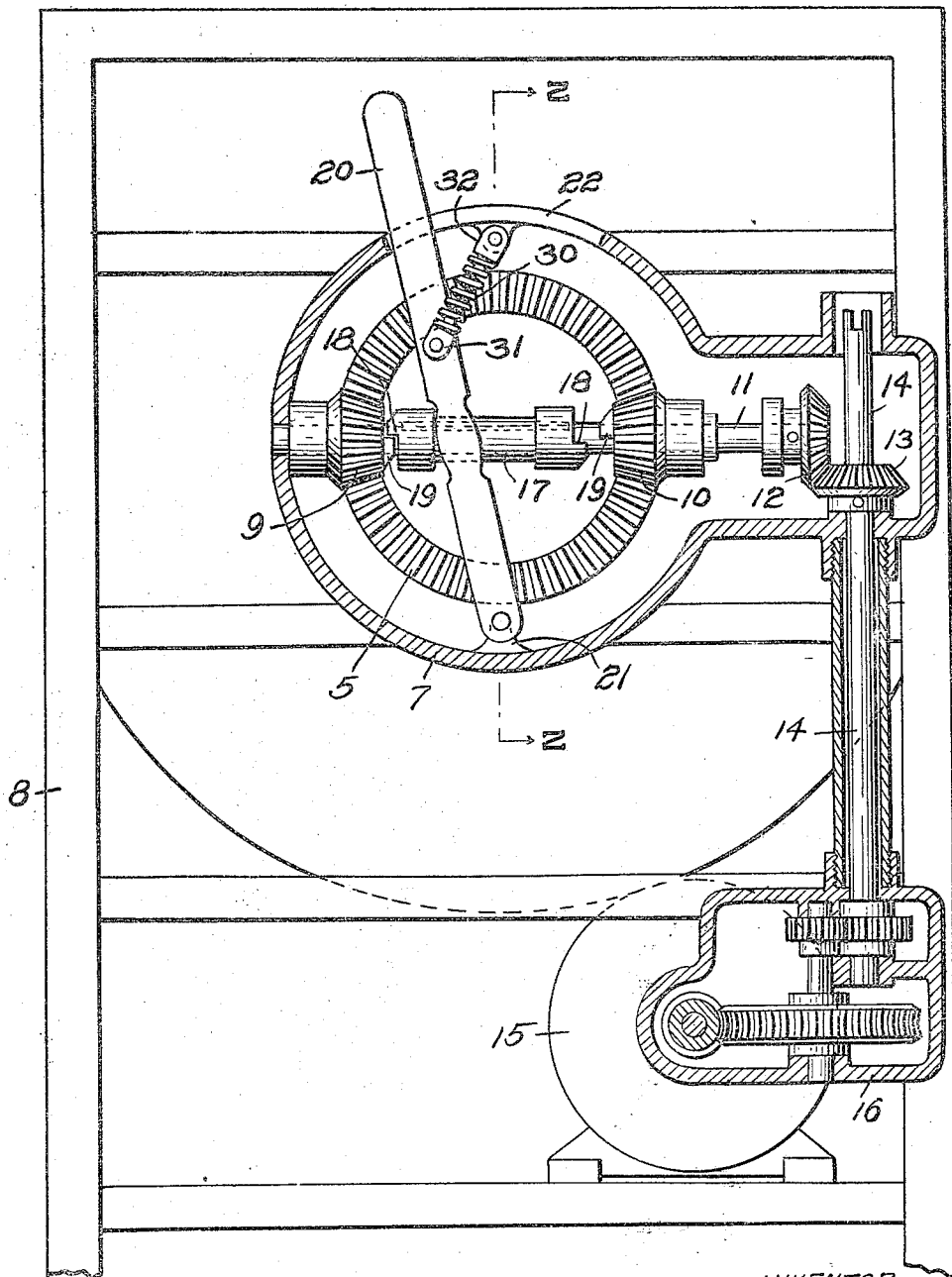
J. R. SPENCER

REVERSING MECHANISM FOR WASHING MACHINE DRIVES

Filed June 26, 1920

2 Sheets-Sheet 1

FIG. 1.



WITNESSES

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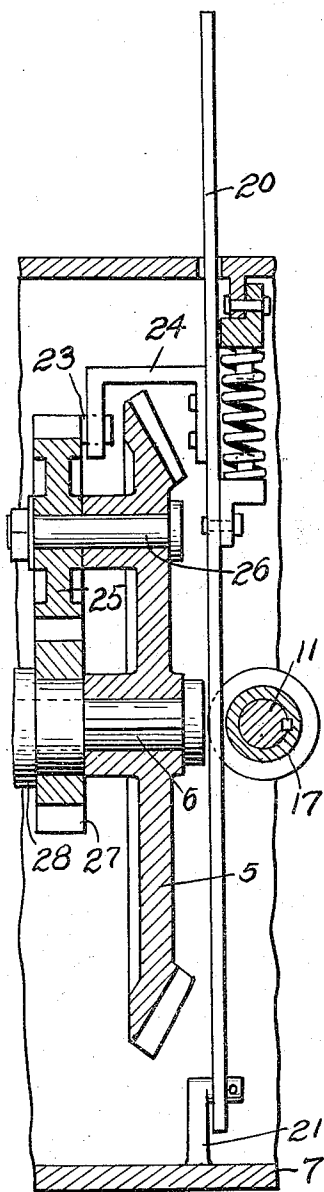
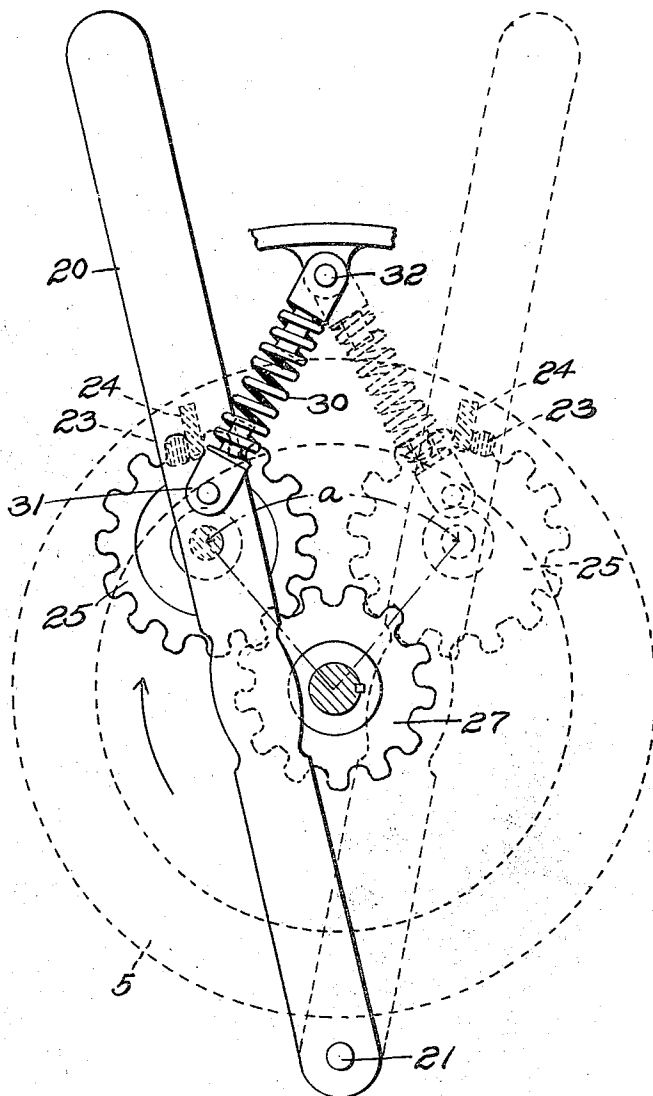
REVERSING MECHANISM FOR WASHING MACHINE DRIVES

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2 Sheets-Sheet 2

FIG. 2.

FIG. 3.



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UNITED STATES PATENT OFFICE.

JOHN R. SPENCER, OF ERIE, PENNSYLVANIA.

REVERSING MECHANISM FOR WASHING-MACHINE DRIVES.

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To all whom it may concern:

Be it known that I, JOHN R. SPENCER, a citizen of the United States, and a resident of Erie, in the county of Erie and State of Pennsylvania, have made a new and useful Invention in Reversing Mechanism for Washing-Machine Drives, of which the following is a specification.

This invention relates to driving mechanisms for washing machines or similar apparatus and has for an object to produce a driving mechanism which is simpler in construction and more positive and effective in operation than similar mechanisms now in use and known to me.

This and other objects which will be made apparent throughout the further description of my invention, are attained by means of a mechanism embodying the features herein described and illustrated in the drawings accompanying and forming a part hereof.

In the drawings Figure 1 is a side elevation of a washing machine shown in connection with a sectional view of a portion of a driving mechanism embodying my invention. Figure 2 is a sectional view along the line 2-2 of Figure 1 and Figure 3 is a diagrammatic view for graphically illustrating the principle of operation of the mechanism embodying my invention.

In washing machines employing a revolving clothes-carrying cylinder or drum it is desirable to periodically reverse the direction of rotation of the cylinder or drum and one of the objects of my invention is to produce means for effectively and positively accomplishing such reversals.

Another object is to produce a driving mechanism for such machines in which more effective means are employed for reversing the rotation of the cylinder or drum than are now employed and known to me.

A further object is to produce a driving mechanism for washing machines and similar apparatus employing a reversing mechanism so arranged that the clutch shifting device is moving at maximum speed at the time of releasing one driving mechanism and just prior to the engagement of the other driving mechanism.

The mechanism illustrated as an embodiment of my invention includes a driving gear 5 which is rigidly mounted on a shaft 6 secured or operatively coupled to the rotating cylinder or drum. As shown, the

gear 5 is a bevel gear and is located within a casing 7 which may be secured to the frame 8 of a washing machine. This gear is continuously in mesh with two gears 9 and 10 which are shown as bevel gears located at diametrically opposite points, with relation to the gear 5, and which are loosely mounted on a shaft 11. A bevel gear 12 is shown rigidly mounted on the shaft 11 and meshing with a bevel gear 13 mounted on a shaft 14. The shaft 14 may be driven by a motor 15 or any suitable driving mechanism, and as shown, a reduction gearing 16 is located between the motor and the shaft 14.

The gears 9 and 10 are adapted to be alternately coupled to the shaft 11 so that one or the other imparts rotation from the shaft 11 to the gear 5 and consequently to the rotating drum or cylinder. As illustrated, this is accomplished by means of a clutch member 17 which is splined or otherwise mounted on to the shaft 11 so that it is adapted to be moved into clutching engagement with either the gear 9 or the gear 10. As shown, the clutch member 17 is provided at each end with longitudinally projecting teeth 18, which are adapted to engage corresponding teeth 19 formed on the gears 9 and 10. It will, of course, be understood from the illustration that the teeth 18 at one end of the member 17 move out of engagement with the teeth 19 of one of the gears 9 and 10 as the teeth 18 at the other end of the member move into engagement with the teeth 19 of the other gear. With this arrangement one of the gears is operatively disconnected from the shaft 11 as the other is operatively coupled to it. It will also be understood from an inspection of the drawings that the gears 9 and 10 are so located with relation to the gear 5 that they will drive the gear 5 in opposite directions, assuming rotation in one direction of the shaft 11.

In the apparatus illustrated, the operation of the clutch member 17 is controlled by a clutch shifting lever 20, which may be fulcrumed on a stationary pin 21 located within the casing 7. As shown, the lever may project through a suitable slot 22 formed in the casing so that it may be employed in manually shifting the clutch 17.

This clutch shifting lever is controlled by a stop 23 through the agency of a finger 24 carried by the lever 20. As shown, the stop

23 is mounted on a gear 25 which is rotatively mounted on a short shaft 26 carried by the gear 5. The gear 25 meshes with a stationary gear 27, which in Figure 2 is shown rigidly mounted on a bearing housing 28 of the shaft 6. The stop 23 is preferably located near the periphery of the gear 25 and as illustrated, forms, in effect, a lateral extension of one of the teeth of that gear. It will, of course, be understood that this special arrangement of the stop is merely illustrative and is not an essential detail of the invention.

During the operation of the apparatus each of the gears 9 and 10 are periodically operatively coupled to the shaft 11 so as to impart rotation to the gear 5, first in one and then in the other direction. The gear 5 in rotating about its axis causes the gear 25 to roll around the gear 27 and at the same time rotate about its mounting shaft 26. This causes the stop 23 to occupy varying positions with relation to the gear 5 at the end of each revolution of the cylinder, but after a predetermined number of revolutions of the cylinder, the relative positions of the gears 5 and 25 are such that the stop 23 moves into engagement with the finger 24 and shifts the position of the lever 20 for the purpose of disengaging the clutch member from the operative gear and moving it into clutching engagement with the other gear 9 or 10.

It will, of course, be apparent that the stop 23 is effective as a positive power driven agent only so long as one or the other of the gears 9 and 10 is operatively coupled to the shaft 11, and that consequently some means must be employed for carrying the lever 20 past the neutral position, in which the clutch member 17 is out of engagement with both of the gears 9 and 10, and into coupling engagement with the other gear. As shown in the drawings, a snap spring 30 is employed for the purpose of continuing the motion of the lever initiated by the stop 23, so as to ensure a positive and effective operation of the clutch member 17.

The snap spring 30 is illustrated as a compression spring, one end of which is carried by a spring block 31 pivotally secured to the lever 20 and the other end of which is carried by a spring block 32 pivotally secured to the casing 7 at a point substantially midway between the extreme limits of travel of the lever 20. Assuming that the gear 5 is rotating in the direction of the arrow shown in Figure 3 and that the stop 23 has just encountered the finger 24 of the lever 20, it will be apparent that a further rotation of the gear 5 in the direction of the arrow will positively move the lever toward its intermediate position and that this motion of the lever will not only shift the position of the clutch member 17, but will also

compress the spring 30. It will also be apparent that the spring in being compressed will resist the compression movement of the lever until the lever has reached an intermediate position in which the pivot points of the spring blocks 31 and 32 lie in the same straight line with the pivot point of the lever 20. It will also be apparent that any further motion of the lever past this mid-position will cause the compressive force of the spring to exert itself in continuing the movement of the lever.

In the drawings, the arrangement of the lever 20, the snap spring 30 and the operative connection between the lever 20 and the clutch member 17 is somewhat diagrammatic, but illustrates the principle of operation of this portion of the apparatus. It will, of course, be apparent that the clutch member 17 and its operating mechanism must be so designed that one of the gears 9 and 10 is operatively disconnected from the shaft 11 before the other gear is operatively coupled to it. In order to accomplish this and at the same time reduce the shifting motion of the clutch member and, therefore, the range of neutral positions to a minimum, I employ a lost motion connection between the lever 20 and the clutch member. With this arrangement one of the gears 9 and 10 will be effective as a positive driving element of the gear 5 and consequently of the gear 25 until after the lever 20 has moved well past its mid position. This insures a positive and rapid operation of the clutch member 17 and effects a quick reversal of the gear 5 and consequently the clothes-carrying cylinder, since the clutch member is so designed that as soon as one of the gears 9 or 10 is rendered ineffective as the driving agent of the gear 5, the other gear is rendered effective. This is accomplished by so proportioning the clutch member 17 with relation to its travel and also with relation to the travel of the lever 20 that the teeth 18 at one end of this member engage the teeth 19 of the adjacent gear immediately after the teeth 18 at the other end of the member have disengaged the teeth 19 of the adjacent and co-operating gear.

One of the principal features of my invention is the mechanism disclosed for operating the lever 20. This mechanism is so arranged that the number of revolutions between each reversal of the gear 5 may be varied by merely varying the extreme positions or the limits of travel of the lever 20 or its stop engaging finger 24. It is also so arranged that the stop 23 engages the finger 24 while moving at substantially its greatest speed. This occasions a quick and positive operation of the clutch shifting mechanism, consequently renders the entire operating mechanism more effective in operation and reduces the length of time dur-

ing which the cylinder stands still between reversals.

In the apparatus illustrated the stationary gear 27 is provided with 13 teeth, whereas the gear 25, which meshes with it, is provided with 15 teeth. As shown in Figure 3, the extreme positions of the lever 20 are such that the arc a , subtended by the extreme positions of the lever and measured from the center of the gear 5 at its extreme positions in which the stop 23 engages the finger 24, is 3 tooth spaces measured on the gear 27. Every revolution of the gear 5 will cause the stop 23, carried by the gear 25 to fall back 2 tooth spaces with relation to the gear 27. Consequently with a continuous rotation in one direction of the gear 5, the stop 23 will return to its finger engaging position every 15th revolution. The reversal of the gear 5 and the operation of the clutch shifting mechanism, however, occasions a shifting of the position of the finger 24 and also causes the stop 23 to move back through the finger engaging position after each such reversal. As shown, the shifting of the lever 20 causes the finger 24 to occupy a position 3 tooth spaces (measured on gear 27) ahead of its original position when the reversal in rotation of the gear 5 is taken into account. At the time of reversal the shifting of the finger 24 causes the stop 23 to occupy a position, with relation to the new position of the finger 24, that it would have occupied after 10 revolutions, assuming that the count began with the stop 23 in a finger engaging position corresponding to the new position of the finger 24. Under such conditions, five revolutions of the gear 5 will bring the stop into engagement with the finger 24 in its new position. In other words an operation of the mechanism which causes the lever 20 to move from the full line to the dotted line position in Figure 3, will cause a reversal of the gear 5, assuming that the gear 5 is moving in the direction of the arrow in Figure 3. This reversal causes the stop 23 to move back through the position indicated in full lines in Figure 3, and a continuation of the rotation of the gear 5 in a direction opposite than that indicated by the arrow would cause the stop to again occupy this position after 15 revolutions. The finger 24 occupies the dotted line position, and will, therefore, prevent a continuation of the reversed rotation of the gear 5, since it will intercept the stop 23 and thereby cause a second reversal of the gear 5 before the stop has completed 15 revolutions and before it has again occupied the full line position in Figure 3. The stop 23 in the full line position occupies a position with relation to the finger 24 in the dotted line position that it would have occupied after 10 revolutions, assum-

ing that the count began with the stop 23 in the new or dotted line position and with the gear 5 rotating in a direction opposite to that indicated by the arrow. Consequently 5 revolutions of the gear 5 will bring the stop to the dotted line finger engaging position. Inasmuch as the reversal does not take place until the clutch member 17 is actually disconnected from one of the gears 9 and 10 and is moved into engagement with the other gear, the gear 5 will make 5 and a fraction revolutions between each reversal. From the foregoing, it will be apparent that the number of reversals between revolutions may be varied by changing the ratios of the gears 25 and 27 or by changing the extreme limits of travel of the finger 24. Either of these changes may be made without great expense and without necessitating a redesigning of other parts, consequently apparatus embodying my invention may be reconstructed to suit operating conditions with a minimum amount of expense and labor.

It will be apparent that the curve generated by the stop 23 is an epicycloid and that the stop is moving through the flat portion of this curve and at substantially its greatest relative speed with relation to the finger 24 at the time it engages the finger. It will also be apparent that the speed of the stop is not appreciably diminished until after it has moved the finger 24 well past the mid position. With this arrangement, the finger will be carried past the mid or neutral position while the stop is moving at its greatest finger displacing speed and as a result the inertia of the moving lever and the impelling force of the spring 30 will positively and quickly shift the clutch member 17. This is a material advantage, since a slow shifting of the clutch mechanism, which permits a dwell of the edges of the clutch teeth for an appreciable period is objectional because it is liable to break the clutch teeth and damage other portions of the driving mechanism.

While I have illustrated and described but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, additions and omissions in the operating mechanism may be made without departing from the spirit and scope of my invention as set forth by the appended claims.

What I claim is:

1. In combination with the rotatable element of a washing machine, a driving shaft, means between said shaft and said element for imparting rotation to the element first in one and then in the other direction, a stationary member, a rotatable member revoluble with said element and continually meshing with said stationary member, and a device actuated by said rotatable member

for controlling the operation of said means.

2. In combination with the rotatable element of a washing machine, a constantly rotating driving shaft, means between said shaft and said element for alternately driving said element in opposite directions, a rotatable member revoluble with said element, a stationary member continually engaged by said rotatable member and around which said rotatable member rolls, and a device periodically operated by said rotatable member for controlling the operation of said means in reversing the direction of rotation of said element.

3. In combination with a rotatable element of a washing machine, a drive shaft rotatable in one direction only, gearing between said shaft and said element for driving the element first in one direction and then the other, a stationary gear, a rotatable gear revoluble with said element and meshing with and revoluble around said stationary gear, and means actuated through the agency of the rotatable gear for controlling the operation of said gearing.

4. In combination with a rotatable element of a washing machine, a drive shaft rotatable in one direction only, gearing between said shaft and said element, comprising continually meshing gears and a clutch mechanism for rendering one or another of said gears effective in transmitting power to said element, a rotatively mounted gear revoluble with said element, a stationary gear with which said rotatively mounted gear meshes and around which it rolls, and means periodically actuated by said rotatively mounted gear for periodically shifting said clutch mechanism into operative engagement with one or another of said first mentioned gears.

5. A driving mechanism for apparatus of the character described, comprising a driving shaft, a driven element, and means between said shaft and said element for transmitting rotation from the shaft first in one and then in the other direction, in combination with a controlling mechanism for said means, comprising a stationary gear, a second gear rotatively mounted on said driven element and meshing with and adapted to revolve around the stationary gear, and means actuated by said second gear for actuating said first mentioned means to periodically reverse the rotation of said element.

6. A motion reversing mechanism for apparatus of the character described, comprising a driving shaft, a driven gear, two driving pinions meshing therewith, a clutch mechanism for operatively coupling one or the other of said pinions to the driving shaft, in combination with an operating mechanism for said clutch mechanism comprising a stationary gear, a stop carrying gear meshing therewith and rotatively

mounted on said driven gear, a stop carried by said stop carrying gear, and means actuated by the stop for actuating said clutch member.

7. A driving mechanism for apparatus of the character described, comprising a driving shaft, a driven gear, two pinions loosely mounted on the driving shaft and meshing with said gear at substantially diametrically opposite points, and a clutch mechanism for operatively coupling one or the other of said pinions to said shaft, in combination with a clutch operating mechanism comprising a gear rotatably mounted on the driven gear, a stationary gear with which said gear meshes and about which it revolves, a stop carried by said rotatively mounted gear and means actuated thereby for shifting said clutch mechanism.

8. A driving mechanism for apparatus of the character described, comprising a driving shaft, a driven element, means between the element and the shaft for alternately driving the element in opposite directions, a stop movable with the driven element along an epicycloidal curve, and means for controlling the operation of said first mentioned means and engaged by said stop while it is moving at substantially its maximum absolute velocity.

9. A driving mechanism for an apparatus of the character described, comprising a driving shaft, a driven element, gearing between said element and said shaft, means for controlling the operation of said gearing to drive the element alternately in opposite directions, and a stop movable with said element but adapted to periodically travel at greater speeds than said element and to actuate said means while traveling at substantially its greatest speed.

10. A driving mechanism for apparatus of the character described, comprising a driving shaft, a driven shaft, a driven element operatively connected to said driven shaft, a driven member rigidly mounted on said driven shaft, means between said driving shaft and said member for imparting rotation to the member, first in one and then in the other direction, and a device for controlling the operation of said means, in combination with a mechanism for controlling the operation of said device comprising a lug carried by said member but movable at varying velocities relative thereto during the rotation of said member, for shifting the position of said device while moving at substantially its maximum speed, yielding means for completing the motion of said device and a lost motion connection between said device and said first-mentioned means.

In testimony whereof, I have hereunto subscribed my name this 23rd day of June, 1920.

JOHN R. SPENCER.