MOTOR REVERSING MECHANISM

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1 Claim. (Cl. 200—27)

This invention relates to motor reversing devices, and particularly to such mechanism for use in the reversal of relatively small capacity motors utilized to drive parts first in one direction and then in the other, such as the drum or cylinder of a washing machine, drying tumbler, or the like.

The invention has for its object to provide improved motor reversing mechanism including a switch operating device of simple character so arranged as to provide a delay or lag between opening of the circuit for motion in one direction and closing of the circuit for motion in the other direction, to compel the motor and driven parts to coast and partially come to rest before reversal is effected. A further object of the invention is to provide simple and improved switch mechanism capable of use in motor reversing as described, and in which the circuit is both made and broken with a sudden or snap action with the obvious advantages thereof.

A further object of the invention is to provide mechanism of this kind which avoids any dead center effect as is possible when the reversing mechanism is driven directly from the part to be driven.

Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

In the drawing, Fig. 1 illustrates an end elevation, partly broken out to expose interior parts, of one form of mechanism embodying the invention; Fig. 2 is a plan view; somewhat enlarged, of the pilot motor and mechanism driven thereby; Fig. 3 is a detail cross section, on a larger scale; on approximately the line 3—3; Fig. 2; Fig. 4 is a corresponding view, but looking directly at the end of the cam shaft; Figs. 5 and 6 are views corresponding to Figs. 3 and 4 and illustrating the cam shaft in another position; and Fig. 7 is a diagrammatic view, illustrating the electrical circuits.

The invention may be applied for use in the operation of any kind of mechanism utilizing a part whose motion is to be reversed by an electric motor. It may be used, for example, on dry room tumblers, washing machines or the like and for convenience, but not in any sense of limitation, is shown as applied to a washing machine including an outer stationary casing or tub 1 having end frames 2 and in which casing rotates the drum 3 having the usual end trunnions or shafts 4 extending out through the end frames, one thereof being equipped with a large gear 5 driven by a small pinion 6 on a shaft 7 carrying a worm wheel 8 driven by a worm 9 on a shaft 10 connected by the flexible coupling 11 to the shaft 12 of a motor 13. 14 is a hand wheel, normally disconnected from the mechanism but capable of connection at will thereto for the purpose of manually rotating the drum for registering its door with the casing or tub door, as will be readily understood.

The motor 13 is of the reversing type and its direction of rotation is periodically reversed by manipulation of switches in its circuits and in controlling circuits, which switches are actuated automatically by a pilot motor marked generally 14. The circuits and switches are conventionally shown in Fig. 7.

Motor 13 is an A. C. motor, three-phase, which is reversed by reversing two of its leads. The circuits to said motor come from the source 15 by way of a manual main switch 16 and two sets of normally open contactors, marked respectively 17, 18, actuated respectively by relays 19, 20 in the two branches 21, 22 of a control circuit including a switch 23 connected to the outer casing door in such manner as to be open when said door is open and closed when the door is closed, and also by way of an overload throw-out switch 24, which is normally closed but which is adapted to open upon an abnormal rush of current to the motor for any cause. The motor 13 is in a circuit across two of the leads, as shown.

In operation of the system one or the other of the relays 19, 20, is energized to close its set of contactors 17 or 18, as the case may be, by closing of one or the other of the branch circuits 21, 22, which is effected by manipulation of the pairs of switch members 25, 26 in one pair and 27, 28 in the other pair. These switch members, paired as stated, are of long leaf spring form and are mounted as shown in Figs. 3 and 4 on an insulating support 29. One of the members of each pair, such as the members 25, 27, is equipped with a laterally offset arm, as 30, carrying a contact cooperating with a registering contact on the other switch arm, as shown in Figs. 2 and 3. The ends of all of said switch arms are provided with down turned feet which travel on cam members marked respectively 31, 32, 33, 34, one each for the several switch members 25, 26, 27 and 28.

In the drawing the cams and switch members are in corresponding positions in Figs. 3 and 4, and they are also in corresponding positions in Figs. 5 and 6. Fig. 3 shows the switch members just after the circuit through them has been broken. The foot on arm 26 has just dropped off from the top point of its cam 32 and the switch arm 26 has dropped
farther than the arm 25, so that the switch is open. As to switches 27, 28, the former is still travelling on the high part of its cam and the latter on the low part of its cam, and the circuit through them is open. Both relays 17, 18 are therefore deenergized and all circuits to motor 13 are open and the drum 3 is coasting. The speed of the coasting drum gradually reduces until finally the foot of arm 27 drops off from the high part of its cam and the contacts on the arms 27, 28 meet and close this switch so that the relay 28 is energized and the motor circuit is connected in the reverse direction.

During the next half of the cycle the closed switch members 21, 22 are flexed upwardly, because the foot of the arm 22 travels upwardly on its cam, carrying the arm 27 with it, as shown in Fig. 6. As to arms 25, 26, they remain open, the arm 25 traveling upwardly on its cam 31 until the parts have rotated a little less than 180°, whereupon the arms 27, 28 (still closed) drop off from the high part of the cam 34 to a position corresponding to that in Fig. 3, opening the circuit through them, and a short time later the arms 25, 26, still open, are closed by the arm 25 dropping off from the high part of its cam 31, as before.

It will be noted that the cams for a pair of contacts are so arranged that at one time the lesser spaced contact is dropped farther than the greater spaced contact (as in Fig. 3 to break the contact between arms 25 and 26), and alternately the greater spaced contact is dropped a distance adapted to complete a circuit with the lesser spaced contact (which occurs between the positions of Figs. 4 and 6, when arm 27 drops upon arm 26 to make a snap contact therewith).

Preferably, the motor 14 is so arranged as to operate at a uniform speed, to insure proper and uniform timing. For this purpose and because the load of the cams and switches is negligible, I preferably couple to the shaft of motor 14 a small fan or the like, marked 40, which creates a constant and uniform load for the purpose stated.

As shown in Fig. 1 the motor 14, contactors 17, 18, etc., may be mounted in a small enclosing casing 41 fastened to one of the end frames, the switch 16 having its operating lever or handle extending through an opening in said casing for manual actuation when desired.

The several cams 31, 32, 33, 34 are, of course, made of insulating material and necessarily are mounted on their driving shaft in definite timed relation to each other in pairs, as well as between the cams of each pair. A convenient arrangement for the purpose is to form the four cams as parts of a single integral member made of suitable insulating material such as fibre, bakelite or the like, which may be molded, pressed or otherwise shaped and may be fastened to its driving shaft in any suitable manner, such as by a small set screw 42.

What I claim is:

Make and break mechanism for the purpose described comprising, a pair of continuously rotating cams, a contact arm for each cam spring-pressed theretoward, a pair of coacting contacts, one carried by each arm in spaced relation to its cam, the spacing of one contact being greater than the spacing of the other, means on the cams for raising the greater spaced contact and dropping it upon the lesser spaced contact, means on one of said cams for thereafter raising the lesser spaced contact, interlocking means between the arms for raising the greater spaced contact as the lesser spaced contact is raised, and means on the cams for thereafter dropping the lesser spaced contact farther than the greater spaced contact.

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