

March 14, 1939.

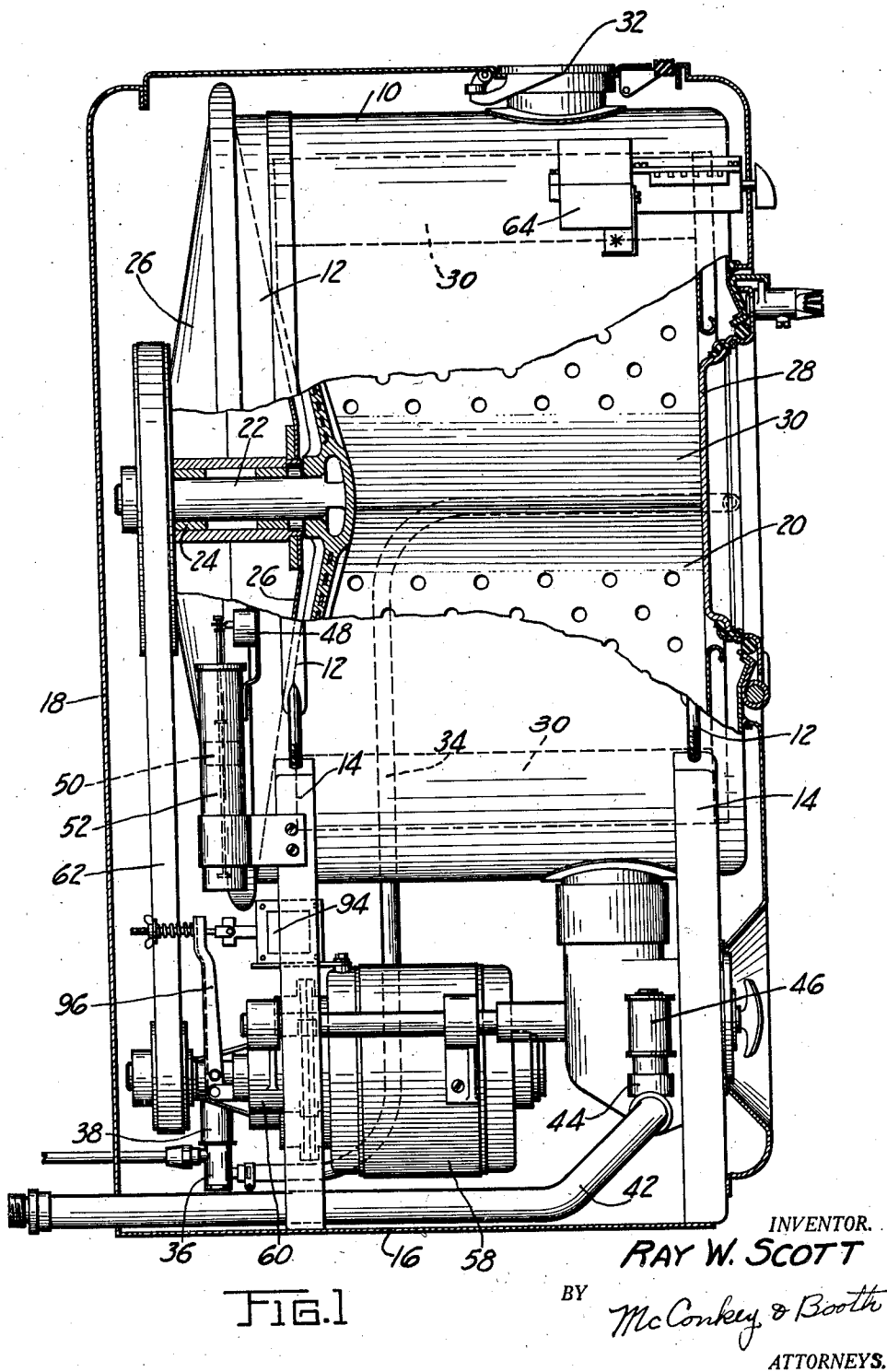
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WASHING MACHINE

Filed July 6, 1937

2 Sheets-Sheet 1



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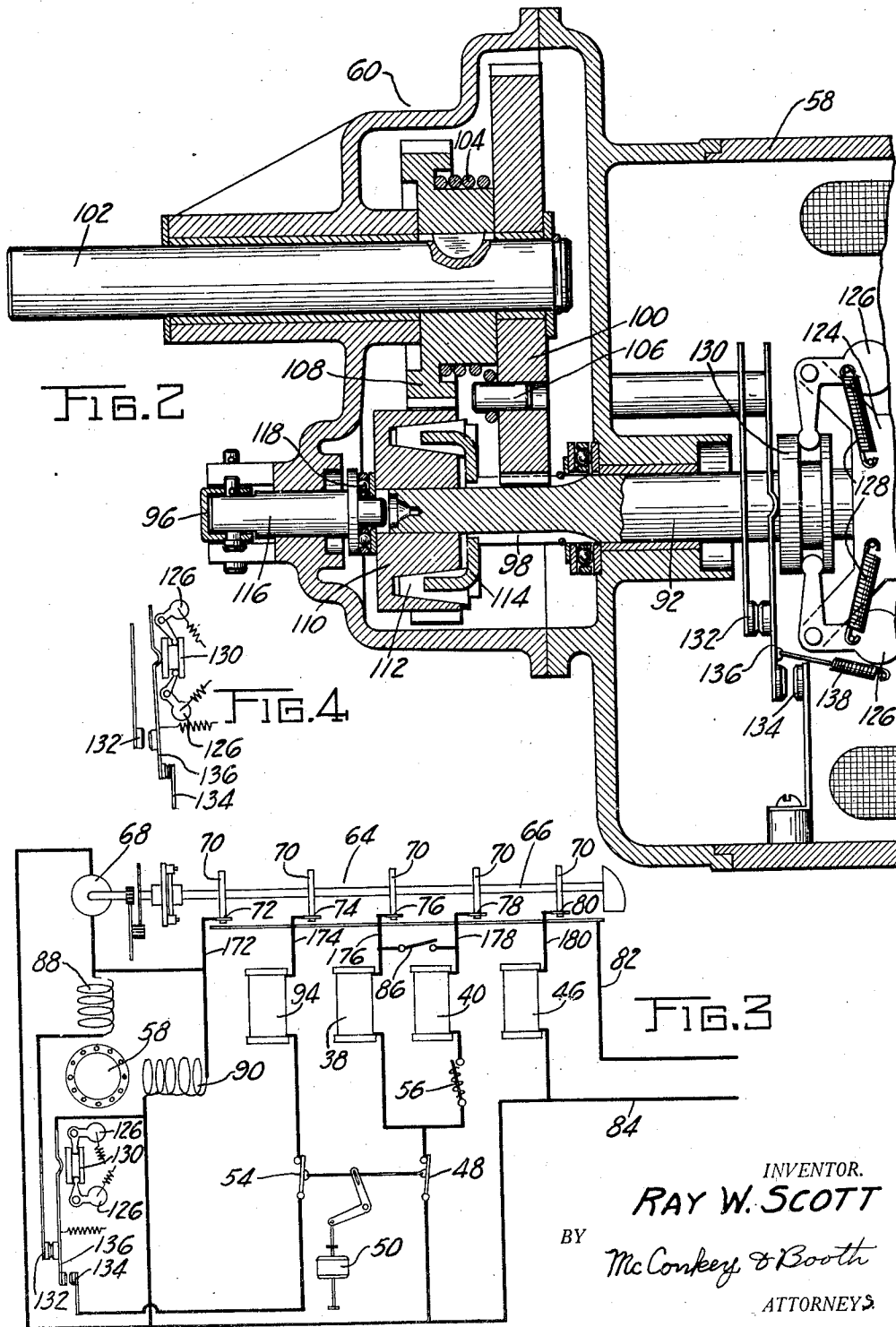
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,150,638

WASHING MACHINE

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Application July 6, 1937, Serial No. 152,114

15 Claims. (Cl. 68—12)

This invention relates to multiple-speed machines such as washing machines, and is illustrated as embodied in such a machine operated automatically according to a predetermined cycle to wash the clothes at a relatively low speed and then (after draining) to dry them by driving the work receptacle at a much higher speed to extract the water centrifugally.

If a machine of this general character happens to stop, for example because of the blowing of a fuse or other current failure, when it is set for high speed operation, then ordinarily when the current comes on again the machine attempts to start up directly in high speed again. This not only throws a great strain on the drive mechanism, but where some kinds of motors are used it may throw a heavy current through the starting winding of the motor and severely damage the motor.

An object of the present invention is to prevent high-speed operation of such a machine from a standing start, preferably by providing means insuring that the machine must be operating substantially in its usual low-speed range before the transmission can be shifted into high gear, for example by providing the speed-change circuit with a safety device such as a centrifugal cutout switch or the like in series with the speed-change control device so that the latter cannot be operated below a predetermined speed.

This safety device, when used with a motor having starting and-running windings, may advantageously be utilized also to cut out the starting winding when the motor has attained a definite speed.

Another feature of the invention, when embodied in a washing machine, relates to combining such a safety device with means preventing accidental high-speed operation of the machine when it is full of water.

The above and other objects and features of the invention, including various novel combinations of parts and desirable particular constructions, will be apparent from the following description of the illustrative embodiment shown in the accompanying drawings, in which:

Figure 1 is a vertical section through the machine;

Figure 2 is a horizontal section through the motor-transmission drive unit of the machine;

Figure 3 is a wiring diagram of the machine in the starting position; and

Figure 4 is a fragmentary view of parts of Figure 3 in their running positions.

The machine illustrated in an automatic wash-

ing machine comprising a generally cylindrical tub 10 arranged with its axis horizontal, and secured by straps or the like 12 to saddles 14 mounted on a base 16. Panels 18 form an inclosing housing for the machine.

Rotatably journaled within the tub 10 is a perforated drum or clothes receptacle 20 having at one end a shaft 22 journaled in bearings 24 carried by two conical disks 26 arranged face to face and peripherally secured together to form one end of the tub 10. The clothes may be inserted through an opening in the end of the tub 10 and an aligned opening in the end of the receptacle 20, after opening a glazed door 28 pivoted on the tub 10. The receptacle 20 is provided with baffles 30 for tumbling the clothes during washing. A door 32 at the top of the machine is provided for the introduction of soap powder or the like into the machine.

Wash water is introduced into the machine 20 through an inlet line 34 from suitable hot and cold water lines provided with inlet valves 36 controlled by solenoids 38 and 40, and is drawn off through a drain 42 having a valve 44 controlled by a solenoid 46. The water being introduced is cut off at a predetermined level by introducing in the circuit of the inlet solenoids 38 and 40 a switch 48 (Figure 3) controlled by a float 50 in a float chamber 52 communicating with the tub 10.

Preferably the float 50 also controls a safety switch 54 connected, as described below, to prevent high-speed operation so long as the machine is full of water. The circuit for the cold water valve solenoid 40 contains a thermostatic switch 56 controlled by the temperature of the mixed water entering the machine.

The machine is driven, at low speed during washing and at high speed during extraction, by means shown as a motor 58 arranged in a unit with a two-speed transmission 60 connected by a belt 62 or otherwise to the shaft 22.

The machine, after once being set in operation, is driven automatically according to a predetermined cycle under the control of a multiple switch 64. This switch includes a shaft 66, driven through suitable reduction gears by a small constant-speed motor 68, and carrying a series of cams 70 arranged to open and close contacts or switches 72, 74, 76, 78, and 80, controlling parallel circuits 172, 174, 176, 178, and 180 between electric supply lines 82 and 84. By varying the shapes of the cams 70 the sequence of steps in, and the timing of, the cycle may be predetermined as desired.

For washing some fabrics such as cottons, a

cycle in which all hot water is admitted at some times and mixed water at other times is desirable and to obtain this cycle the hot and cold water inlet valves are controlled independently by the switches 76 and 78. However, for washing fabrics such as woollens it is desirable to have mixed water at all times so a switch 86 is provided between the circuits 176 and 178 so that when it is closed the cold water valve solenoid 40 is energized whenever the hot water valve solenoid 38 is energized regardless of whether switch 78 is closed or open.

Except as further described below, the above-described machine may be substantially as fully described, and as claimed, in application No. 129,429, filed March 6, 1937, by Rex Earl Bassett, Jr., and John W. Chamberlin, and in application No. 129,412, filed March 6, 1937, by Adiel Y. Dodge.

The particular motor 58 shown is a split phase induction motor. It is provided with a starting winding 88 and a running winding 90, arranged in parallel as branches of the circuit 172 which is closed throughout the cycle of operations of the machine. It has its armature shaft 92 arranged to drive the two-speed transmission 60, the particular speed being determined by the energization or de-energization of a solenoid 94 having its core yieldingly connected to a gear-shift lever 96.

The particular transmission illustrated is fully described, and is claimed, in application No. 144,998, filed May 27, 1937, by myself jointly with Andrew O. McCollum. The armature shaft 92 has pinion teeth 98 driving at low speed through a large gear 100 a countershaft 102 which carries a pulley driving the belt 62. The gear 100 has a one-way drive to the shaft 102, so the shaft may over-run the gear in high speed drive. The one-way drive shown includes a clutch spring 104 anchored to a pin 106 carried by gear 100, and encircling a cylindrical boss on one side of a smaller gear 108 keyed to the shaft 102.

The gear 108 meshes with a gear 110 loose on the shaft 98, and formed in one face with an annular double-cone recess for clutch shoes 112 keyed to a clutch member 114 keyed to the shaft 92 and backed up by the end of the pinion teeth 98. The gear-shift lever 96 operates an axially movable plunger 116 slidable in a bearing in the transmission housing in alignment with the shaft 92, and provided with a thrust ball bearing 118 engaging the face of gear 110 opposite the clutch member 114.

Thus energization of solenoid 94 shifts the plunger 116 to clutch the gear 110 to the shaft 92, giving high-speed drive, with the shaft 102 over-running the gear 100.

If the machine as so far described should stop with the cam 70 of the circuit 174 in a position closing the contacts 74 (i. e. in high speed position), due for example to current failure, whether due to blowing a fuse or other cause, it might cause a great deal of damage by starting up again (when the current comes on) from a standing start in high gear. It is an important object of the present invention to prevent this.

In one desirable arrangement for achieving this object, the armature shaft 92 has keyed thereto a carrier 124 for pivoted weights 126, which at a predetermined motor speed swing radially outward against the resistance of springs 128. The weights 126 have extensions with rounded ends seated in a groove formed peripherally in an operating part 130 sleeved on the armature shaft 92, whereby part 130 is moved

axially of the armature shaft by radial movement of the weights 126.

The motor is provided with axially spaced stationary switches such as resilient contacts 132 and 134, the former being connected in series with the starting winding 88, and the latter being connected in series with the safety switch 54, and the speed-control solenoid 94 in the circuit 174.

Between these stationary contacts is mounted a resilient movable double contact 136 connected to the line 84, and which engages the part 130 and is held by the latter, when the motor is at rest, against the resistance of a spring 138, against the contact 132.

When the motor starts up, at the proper speed the weights 126 shift the part 130 far enough to permit the spring 138 to break the contacts 132—136, thereby de-energizing the starting winding 88. When the motor attains substantially, or at least is not much below, normal speed, contact 136 engages the contact 134. If at this time all the water is out of the tub and switch 54 is consequently closed, as soon as the switch 74 is closed the solenoid 94 is energized, causing high-speed operation.

If there is a stoppage of the machine with switches 74 and 54 closed, upon the current coming on again the transmission has to remain in low until the motor has speeded the load up enough to close the contacts 136—134, whereupon the transmission automatically shifts back into high again.

While one illustrative embodiment has been described in detail, it is not my intention to limit the scope of the invention to that particular embodiment, or otherwise than by the terms of the appended claims.

I claim:

1. A washing machine or the like having a work receptacle and a motor and connections from the motor for driving the receptacle either at low or at high speed, and electrical control means for automatically causing said machine to operate according to a predetermined cycle and including means for controlling said connections to cause the driving of said receptacle at different times in said cycle at said different speeds, said last-named means including a device preventing operation of said connections at high speed unless the receptacle is already being driven by said motor through said connections at said low speed.

2. A washing machine or the like having a work receptacle and a motor and connections from the motor for driving the receptacle either at low or at high speed, and means for controlling said connections to cause the driving of said receptacle at different times at said different speeds, said means including a device preventing operation of said connections at high speed unless the receptacle is already being driven by said motor through said connections at said low speed.

3. A washing machine or the like having a work receptacle and a motor and connections from the motor for driving the receptacle either at low or at high speed, and electrical control means for automatically causing said machine to operate according to a predetermined cycle and including means for controlling said connections to cause the driving of said receptacle at different times in said cycle at said different speeds, said connections including a transmission normally in low-speed position and having an electrical device for shifting it into high speed position, and said electrical control means including a control circuit having interposed therein in series

said electrical device and a centrifugal switch closed by the motor when it reaches a predetermined speed.

4. A washing machine or the like having a work receptacle and a motor and connections from the motor for driving the receptacle either at low or at high speed, and means for controlling said connections to cause the driving of said receptacle at different times at said different speeds, 5
10 said connections including a transmission normally in low-speed position and having an electrical device for shifting it into high speed position, and said means including a control circuit having interposed therein in series said electrical 15
15 device and a centrifugal switch closed by the motor when it reaches a predetermined speed.

5. A washing machine or the like comprising a tub, a work receptacle in the tub, a float controlled by the level of the liquid in the tub, a 20
20 motor, connections including a multiple-speed transmission for driving the receptacle from said motor, liquid supplying and withdrawing means having control valves provided with electrical operating devices, an electrical operating device 25
25 for shifting said transmission from low to high speed, and a cyclic multiple switch for causing automatic operation of the machine and having associated therewith and automatically opened and closed thereby control circuits through said 30
30 electrical operating devices, the control circuit through the transmission-shifting operating device having interposed therein a switch automatically closed when the motor is at or above a pre- 35
35 determined speed, and said float having operatively connected thereto and open when said tub is full, switches interposed respectively in said last-named control circuit and in the circuit for the liquid-supplying valve operating device.

6. A washing machine or the like comprising a 40
40 tub, a work receptacle in the tub, a float controlled by the level of the liquid in the tub, a motor, connections including a multiple-speed transmission for driving the receptacle from said motor, liquid supplying and withdrawing means 45
45 having control valves provided with electrical operating devices, an electrical operating device for shifting said transmission from low to high speed, and a cyclic multiple switch for causing automatic operation of the machine and having 50
50 associated therewith and automatically opened and closed thereby control circuits through said electrical operating devices, the control circuit through the transmission-shifting operating device having interposed therein in series a switch 55
55 automatically closed when the motor is at or above a predetermined speed and a switch opened by said float when the tub contains liquid.

7. A washing machine or the like comprising a work receptacle, connections including a multiple- 60
60 speed transmission for driving the receptacle, a motor for driving said connections having a starting winding and a running winding, a control circuit including an electrical device for shifting the transmission from low to high speed and including a switch device in series therewith, a circuit for said motor, and a device including speed- 65
65 responsive means for closing the motor circuit through both windings and for opening the switch device when the motor is below a predetermined speed and for opening the motor circuit through the starting winding while leaving it closed 70
70 through the running winding and for closing the switch device when the motor is above said speed.

8. A washing machine or the like comprising a 75
75 work receptacle, connections including a multiple-

speed transmission for driving the receptacle, a motor for driving said connections having a starting winding and a running winding and having a circuit closed through said windings in parallel 5
5 when the machine is running, a control circuit including an electrical device for shifting the transmission from low to high speed and including a pair of separable contacts in series therewith, and a centrifugal cut-out device for separating said contacts when the motor is below a 10
10 predetermined speed and for opening the motor circuit through the starting winding while leaving it closed through the running winding and for closing said contacts when the motor is above 15
15 said speed.

9. A machine such as a washing machine comprising a motor having associated running and starting circuits and machine-driving connections driven by the motor and including a multiple- 20
20 speed transmission, means for shifting the transmission from low to a higher speed, and speed-controlled means preventing the operation of the shifting means below a predetermined motor speed, said starting circuit including a switch 25
25 closed by said means below said predetermined speed and opened by said means above said predetermined speed.

10. A machine such as a washing machine comprising a motor having associated running and starting circuits and machine-driving connections 30
30 driven by the motor and including a multiple-speed transmission, means for shifting the transmission from low to a higher speed, and speed-controlled means driven by said connections and preventing the operation of the shifting means 35
35 associated with the motor and below a predetermined speed, said starting circuit including a switch closed by said means below said predetermined speed and opened by said means above 40
40 said predetermined speed.

11. A machine such as a washing machine comprising a motor and machine-driving connections driven by the motor and including a multiple- 45
45 speed transmission, a control circuit having associated therewith and energized thereby means for shifting the transmission from low to a higher speed, and a centrifugal switch interposed in said circuit and holding it open below a predetermined 50
50 speed.

12. A drive unit comprising a motor having 50
50 starting and running windings and a multiple-speed transmission driven by said motor, parallel circuits through said windings with a normally-closed switch in the starting-winding circuit, means for shifting the transmission from low to 55
55 high speed and having an electrical control and a normally-open switch in series therewith, and speed-controlled means effective as the speed increases to open the first switch and close the second switch. 60
60

13. A drive unit comprising a motor having starting and running windings and a multiple- 65
65 speed transmission driven by said motor, parallel circuits through said windings with normally-closed spring contacts in the starting-winding circuit, means for shifting the transmission from low to high speed and having an electrical control and normally-open spring contacts in series therewith, and speed-controlled means effective 70
70 as the speed increases to separate the first contacts and force the second contacts together.

14. A machine such as a washing machine comprising a motor and machine-driving connections driven by the motor and including a multiple- 75
75 speed transmission, a control circuit having as-

sociated therewith and energized thereby means for shifting the transmission from low to a higher speed, and a centrifugal switch interposed in said circuit and holding it open below a predetermined speed, said means comprising a centrifugal cutout driven by the armature shaft of the motor.

15. A drive unit comprising a motor having starting and running windings and a multiple-speed transmission driven by said motor, parallel

10 circuits through said windings with a normally-

closed switch in the starting-winding circuit, means for shifting the transmission from low to high speed and having an electrical control and a normally-open switch in series therewith, and speed-controlled means effective as the speed increases to open the first switch and close the second switch, said means comprising a centrifugal cutout driven by the armature shaft of the motor.

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CERTIFICATE OF CORRECTION.

Patent No. 2,150,638.

March 14, 1939.

RAY W. SCOTT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 22, claim 9, after the word "means" insert associated with the motor and; line 36, claim 10, strike out "associated with the motor and" and insert the same after "means", line 34, same claim; 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 9th day of May, A. D. 1939.

(Seal)

Henry Van Arsedale
Acting Commissioner of Patents.