Feb. 23, 1943. R. E. BASSETT, JR 2,311,924

CLEANING MACHINE

Filed April 19, 1937 2 Sheets-Sheet 1

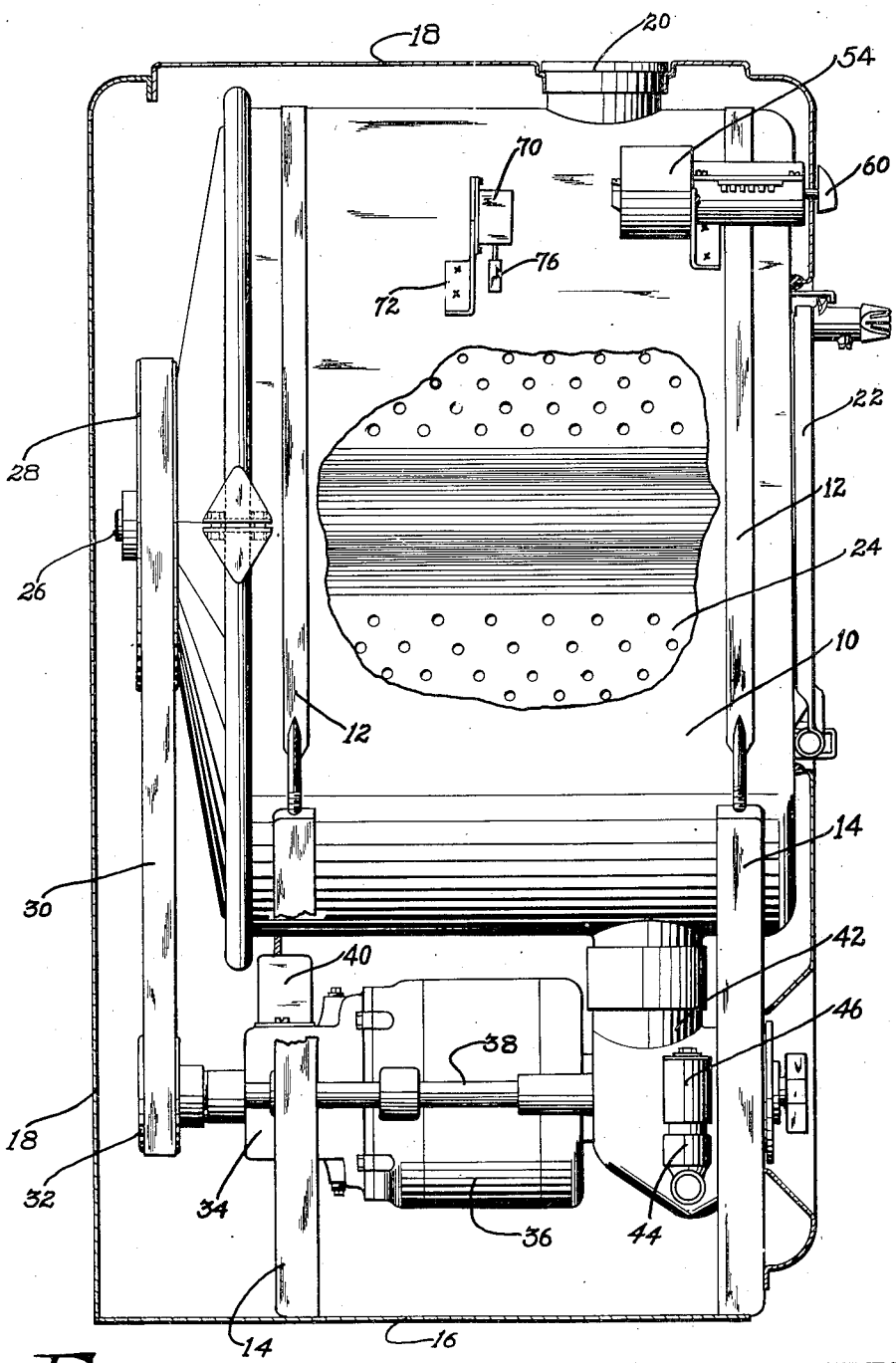


Fig. 1

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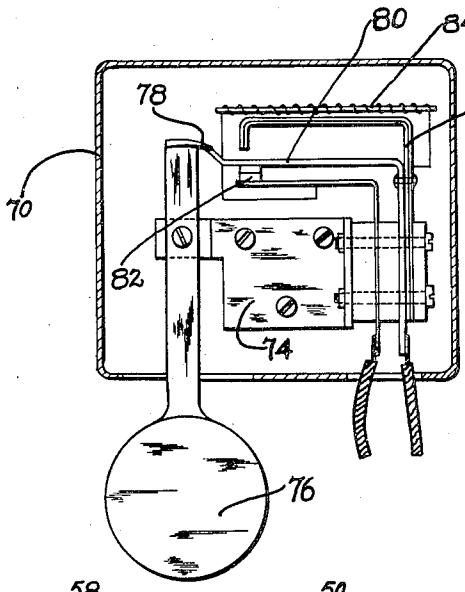


Fig. 2

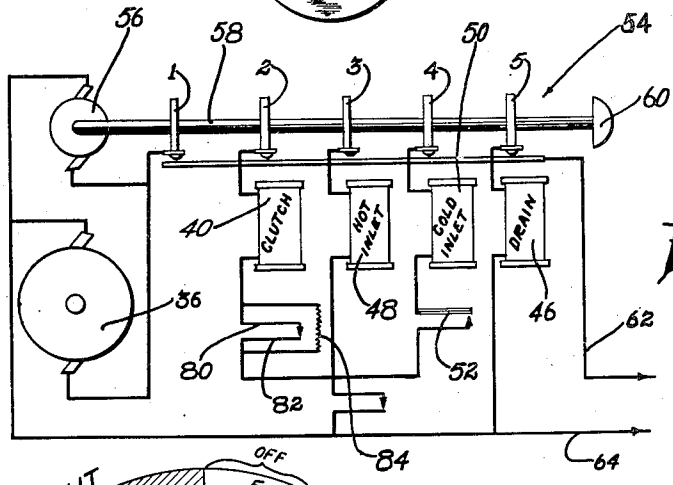


Fig. 3

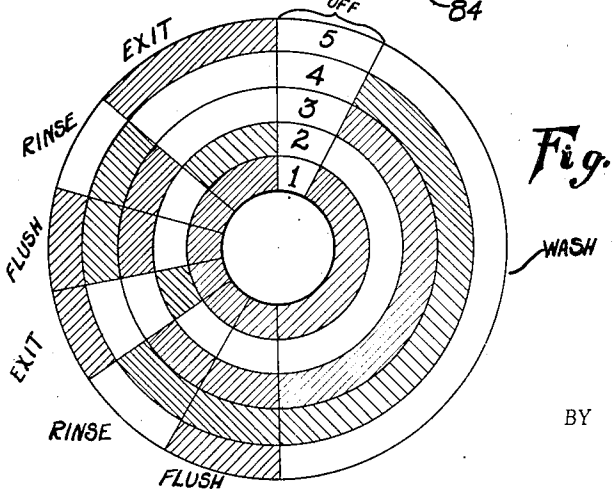
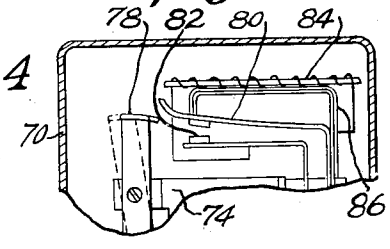


Fig. 4

Fig. 5



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UNITED STATES PATENT OFFICE

2,311,924

CLEANING MACHINE

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Application April 19, 1937, Serial No. 137,662

16 Claims. (Cl. 210—72)

This invention relates to the control of machines which are sometimes subject to excessive vibration, and is illustrated as embodied in an automatic machine for washing and rinsing and drying clothes.

An object of the invention is to insure against damage to such machines and to the work on which they operate, in case of excessive vibration, by preventing high-speed operation of the machine while the vibration continues. Preferably an inertia device is actuated directly by the vibration to affect a speed control in such a manner as to prevent high speed operation.

It is desirable to associate with the control time-delay means which locks the control against high speed operation for a predetermined time interval and then releases it again, whereupon if the vibration has ceased the machine can go into high speed. This is especially advantageous in the illustrated automatic washing machine, since this is a two-speed machine which when locked out of its high extracting speed, is driven at its low speed which is normal for washing and distributing the clothes. Thus the effect of excessive vibration due to uneven distribution of the clothes, on the first attempt to go into the high extracting speed, is to insure a further low-speed distribution interval which will almost always automatically correct the unbalance which caused the vibration.

The illustrated means for securing the desired effect in itself embodies substantial novelty, both in its construction and arrangement and in its relation to the control circuits of the machine.

The above and other objects and features of the invention 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, just inside the casing wall and showing the washing apparatus in side elevation;

Figure 2 is a section through the casing of the inertia means, showing the operating parts thereof in side elevation;

Figure 3 is a wiring diagram;

Figure 4 is a diagram of the normal cycle of the machine; and

Figure 5 is a partial view similar to Figure 2 showing the circuit breaker in circuit open position.

The machine illustrated in Figure 1 is of the type described and claimed in application No. 129,429, filed March 6, 1937, by John W. Chamberlin and Rex Earl Bassett, Jr. (now Patent No. 2,165,884), the tub structure and mounting being as described and claimed in application No. 129,412, filed March 6, 1937, by Adiel Y. Dodge (now Patent No. 2,173,603).

The machine includes a horizontal cylindrical tub 10 secured, by straps 12 or other means, to saddles 14 mounted on a base 16. Suitable side and top panels 18 form a casing for the machine. The top panel 18 is provided with a door 20 opening into the tub 10, for the insertion of soap powder or the like while the machine is running, and there is a door 22 at the front of the machine for inserting the clothes through an opening in the end of the tub 10.

Within the tub 10 is a horizontal perforated rotatable clothes drum or cylinder 24, provided with suitable internal ribs or baffles, and which has an opening at the end adjacent the door 22 through which it is loaded and unloaded. The cylinder 24 is mounted on a shaft 26 journaled in bearings carried by the end of the tub 10, and provided with a pulley 28 drivably connected by means such as a belt 30 to a drive pulley 32 operated by a two-speed transmission 34.

The transmission 34, and an electric motor 36 which drives it, form a rigid unit pivoted on and at one side of a supporting shaft 38, to keep the belt 30 tight by their weight.

The transmission 34 is shifted from low to high speed by energizing a solenoid 40. The tub 10 has a drain 42 controlled by a valve 44 operated by a solenoid 46. There are also hot and cold water inlet valves (not shown) controlled by solenoids 48 and 50 (Figure 3), the cold water solenoid 50 having in series therewith a thermostatic switch 52 controlled by the temperature of the water entering the tub 10.

The machine is controlled by a multiple cyclic switch 54, which may be of the construction described in application No. 137,661, filed April 19, 1937, by Rex Earl Bassett, Jr. (now Patent No. 2,176,195), and which is shown diagrammatically in Figure 3. This switch includes a self-starting substantially constant speed motor, such as a synchronous motor 56, driving a shaft 58 carrying a bank of cams 1, 2, 3, 4, and 5, operating a corresponding series of switch contacts.

Shaft 58 has a handle 60, by which it can be advanced manually to close contacts 1, thereby closing a circuit between line wires 62 and 64 through the two motors 36 and 56. This puts the machine in operation for the cycle indicated in Figure 4.

The machine as thus far described is substantially as disclosed in the above-identified Chamberlin and Bassett application (now Patent No.

2,165,884) and in the above-identified Dodge application (now Patent No. 2,173,603), except that the exact construction of the cyclic switch 54 is as disclosed in the above-identified Bassett appliation now Patent No. 2,176,195). It will be appreciated, however, that this machine is merely illustrative, and that the invention herein described may be embodied with advantage in many other types of machines.

From the diagram of Figure 4 it will be noted that twice during the cycle the machine goes from a low-speed period, during which the clothes distribute themselves substantially uniformly about the cylinder 24, to a high-speed extraction period of centrifugal drying, the change in speed being brought about by energizing the solenoid 40. The present invention, as embodied in this particular machine, relates to preventing continued high-speed operation if for any reason the clothes are sufficiently out of balance to cause excessive vibration. Preferably, when this happens, there is a substantial further period of low-speed operation to permit further distribution of the load, and then the machine automatically tries high speed again.

The novel control provided for this purpose is shown supported within a casing 70 mounted on a bracket 72 secured to the periphery of the tub 10. The casing 70 contains a supporting block 74, on which is pivoted an inertia device such as a vertical weighted pendulum 76 swinging through a slot in the bottom of the casing 70. The top of the pendulum 76 is provided with holding means, such as a latch 78, adapted to snap over and hold the beveled end of a spring contact 80 forming part of a switch the other contact 82 of which is resilient but stationary.

The contacts 80 and 82 are normally held in engagement by the latch 78, in series with the clutch solenoid 40, as shown in Figure 3, to permit the transmission to shift into high speed when the cam 2 closes its contact at the proper points in the cycle. If the machine should be too far out of balance, high-speed operation would cause such excessive vibration as to act on the pendulum 76 to release the catch 78, whereupon the contact 80 springs upwardly to break the circuit and cause the transmission to shift back into low again.

When this happens, the current passes through a heating device, such as a resistance wire 84 arranged to short-circuit the contacts 80—82. Not enough current passes by this high-resistance path to operate the solenoid 40, and when the contacts 80 and 82 are closed not enough current passes to heat the wire 84. When the contact at 80—82 is broken, however, the entire load comes on the wire 84, thereby heating it up enough to affect a bimetallic thermostatic element 86, shown mounted by means of insulating material, with the contact 80, on the block 74. This causes the element 86 to deflect downwardly, whereby after a time interval determined by the rate of heating of resistor 84 the contact 80 again closes against the contact 82, and at substantially the same time the latch 78 re-engages.

This causes the machine to try high speed again. If the unbalance has been corrected, the machine then goes on through its cycle. If not, vibration is again set up and the contacts 80—82 again separated, throwing the machine back into low speed 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 machine comprising means for operation at a low speed and for extracting at a high speed, said means being constructed and arranged so that the contents of the machine are normally distributed evenly therein in balanced relationship while the machine is operating at said low speed and prior to high speed operation, two-speed driving means therefor, and means for preventing the operation of the driving means at high speed during excessive vibration of the machine while causing it to continue further operation at said low speed for a substantial time to permit further distribution to take place and thereby obviate said vibration.

2. A machine comprising a container rotatable about a generally horizontal axis for extracting clothes or the like at a high speed and also rotatable at a low speed such that clothes will normally distribute themselves uniformly therein, driving means for rotating said container at said low speed and then at said high speed, and means for preventing the operation of said driving means at said high speed during excessive vibration of the machine while causing it to operate at low speed, said clothes distributing themselves during low speed operation to reduce vibration.

3. A machine comprising a container normally rotatable about a generally horizontal axis at a low speed and for extracting at a high speed, the low speed being such that clothes will distribute themselves substantially evenly in the container ready for high speed extraction, two-speed driving means therefor, and vibration-operated inertia means for preventing the operation of the driving means at high speed during excessive vibration of the machine while causing it to containue operation at said low speed for a substantial time to cause more complete distribution.

4. A machine comprising a container normally rotatable about a generally horizontal axis at a low speed such that clothes will distribute themselves evenly therein and also rotatable for extracting clothes or the like at a high speed, driving means comprising a low and high speed for said machine, and vibration-operated inertia means for preventing the operation of said driving means at said high speed during excessive vibration of the machine while causing it to operate at low speed, said clothes distributing themselves during low speed operation to reduce vibration.

5. A machine comprising a device operable at one speed such that clothes will distribute themselves in balanced relationship therein and at a higher speed for an extracting operation, motor driven means for operating said device at either of said speeds, an electric control for selecting the speed of said means, and means operated by vibration of the machine and acting on said control to prevent high-speed operation when the machine is vibrating excessively while causing it to continue operation at low speed.

6. A machine comprising means for operating at a low speed such that clothes will distribute themselves in balanced relationship therein and for extracting at a high speed, two-speed driving means therefor, and vibration-operated inertia means for preventing the operation of the driving means at high speed during exces-

sive vibration of the machine while causing it to continue operation at low speed, in combination with time-delay means for causing the driving means to operate at high speed regardless of the vibration-operated means a substantial time interval after its operation.

7. A machine comprising means for extracting clothes or the like at a high speed, driving means therefor, and normally locked inertia means automatically unlocked by excessive vibration for preventing the operation of said driving means at said high speed during excessive vibration of the machine, in combination with time-delay means for re-locking the vibration-operated means a substantial time interval after it has been unlocked.

8. A machine comprising a device operable at one speed for distributing a load substantially evenly therein and at a higher speed for an extracting operation, motor-driven means for operating said device at either of said speeds, an electric control for selecting the speed of said means, and normally-locked means unlocked and rendered operative by vibration of the machine and acting on said control to prevent high-speed operation when the machine is vibrating excessively, in combination with time-delay means for re-locking the vibration-operated means a substantial time interval after it has been unlocked.

9. A machine comprising a device operable at a relatively high speed for an extracting operation, motor-driven means for operating said device at said speed, an electric control for said means, and normally-locked means unlocked and rendered operative by vibration of the machine and acting on said control to prevent high-speed operation when the machine is vibrating excessively, in combination with time-delay means for re-locking the vibration-operated means a substantial time interval after it has been unlocked.

10. A machine of the class described having a work-holding member rotatable under load, said machine being subject to vibration when the load is out of balance, electrically-controlled driving means for said member, and a circuit for said driving means including normally closed contacts which are yieldingly urged apart, holding means for retaining the contacts in engagement, inertia means for releasing the holding means in case of excessive vibration, the machine operating when said contacts are separated in a manner tending to cause the load to become balanced, and means for thereafter re-engaging said holding means.

11. A machine of the class described having a work-holding member rotatable under load, said machine being subject to vibration when the load is out of balance, driving means for operating said member at low and at high speeds, the low-speed being such that normally the load will distribute itself in balanced relationship, a control circuit for said driving means including an electrical device which when energized shifts said driving means from low to high speed and also including in series therewith normally closed contacts which are yieldingly urged apart, holding means for retaining the contacts in engagement, inertia means for releasing the holding means in case of excessive vibration permitting low-speed drive, and means for thereafter re-engaging said holding means permitting high speed drive.

12. A machine of the class described having a work-holding member rotatable under load, said machine being subject to vibration when the load is out of balance, driving means for operating said member at low and at high speeds, the low speed being such that normally the load will distribute itself in balanced relationship, a control circuit for said driving means including an electrical device which when energized shifts said driving means from low to high speed and also including in series therewith normally closed contacts which are yieldingly urged apart, holding means for retaining the contacts in engagement at said high speed, and inertia means for releasing the holding means prohibiting said high speed in case of excessive vibration so that said member will be operated at low speed.

13. A machine of the class described having a work-holding member rotatable under load, said machine being subject to vibration when the load is out of balance, driving means for operating said member at low and at high speeds, a control circuit for said driving means including an electrical device which when energized shifts said driving means from low to high speed and also including in series therewith normally closed contacts which are yieldingly urged apart, holding means for retaining the contacts in engagement, inertia means for releasing the holding means in case of excessive vibration, an auxiliary circuit energized by the release of the holding means and which includes a heating device, and a thermally-responsive member deflected by heat from said device to re-engage said holding means.

14. A washing machine having a cylinder driven at a low speed for distributing clothes therein prior to extraction and then driven at a high speed for extraction, in combination with speed-control means affected by excessive vibration at the beginning of high speed operation to insure a further period of low speed operation to permit further distribution to take place to correct the unbalanced condition of the cylinder causing the vibration, and heat responsive means to again begin operation at said second speed and heating means controlled by the vibration affected means to heat said heat-responsive means.

15. A washing machine having a cylinder driven at a low speed about a generally horizontal axis for distributing clothes therein prior to extraction and then driven at a high speed for extraction, in combination with speed-control means so mounted as to be affected by excessive vibration of said cylinder at the beginning of high speed operation, means connected to said cylinder and to said control means for communicating vibrations therebetween, high and low speed drives for said cylinder, means for shifting from high to low speed drive under the influence of said speed control means when the same is vibrated by an unbalanced condition of said cylinder, whereby to insure a further period of low speed operation to permit further distribution to take place to correct the unbalanced condition of the cylinder causing the vibration, and time-delay means connected to said shifting means for neutralizing the effect of the vibration-affected means at the end of said further period and automatically causing the same to effect shifting to high speed drive, thereby causing a second beginning of high speed operation.

16. A washing machine having a cylinder driven at a low speed about a generally horizontal axis for distributing clothes therein prior to

extraction and then driven at a high speed for extraction, in combination with a speed control means so mounted as to be affected by excessive vibration of said cylinder at the beginning of each high speed operation, means connected to said cylinder and to said control means for communicating vibrations therebetween, high and low speed drives for said cylinder, means for shifting from high to low speed drive under influence of said speed control means when the same is vibrated by an unbalanced condition of said cylinder, to provide further periods of low speed operation to permit further distribution to take place to correct the unbalanced condition within the cylinder causing the vibration, and time-delay means connected to said shifting means and operating after each excessive vibration for neutralizing the effect of the vibration-affected means at the end of each low speed period at which operation reverts from an unbalanced high speed operation, and for automatically causing said speed control means to effect shifting of said cylinder drive for successive commencements of high speed operation until a high speed operation continues without excessive vibration.

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