Sept. 8, 1959 H. I. SHEFFER 2,902,850

SAFETY DOOR LOCK AND CONTROL FOR WASHING MACHINE

Filed July 8, 1953 4 Sheets-Sheet 1

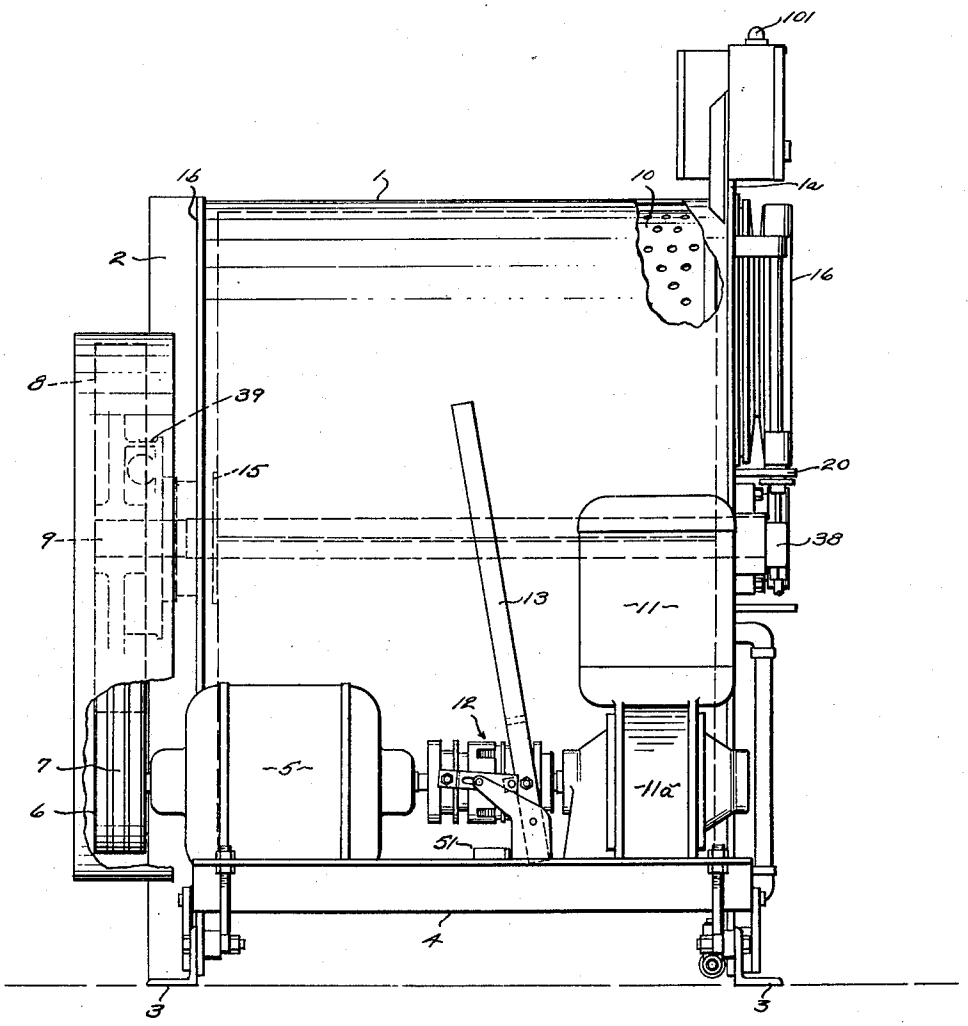


FIG. 1

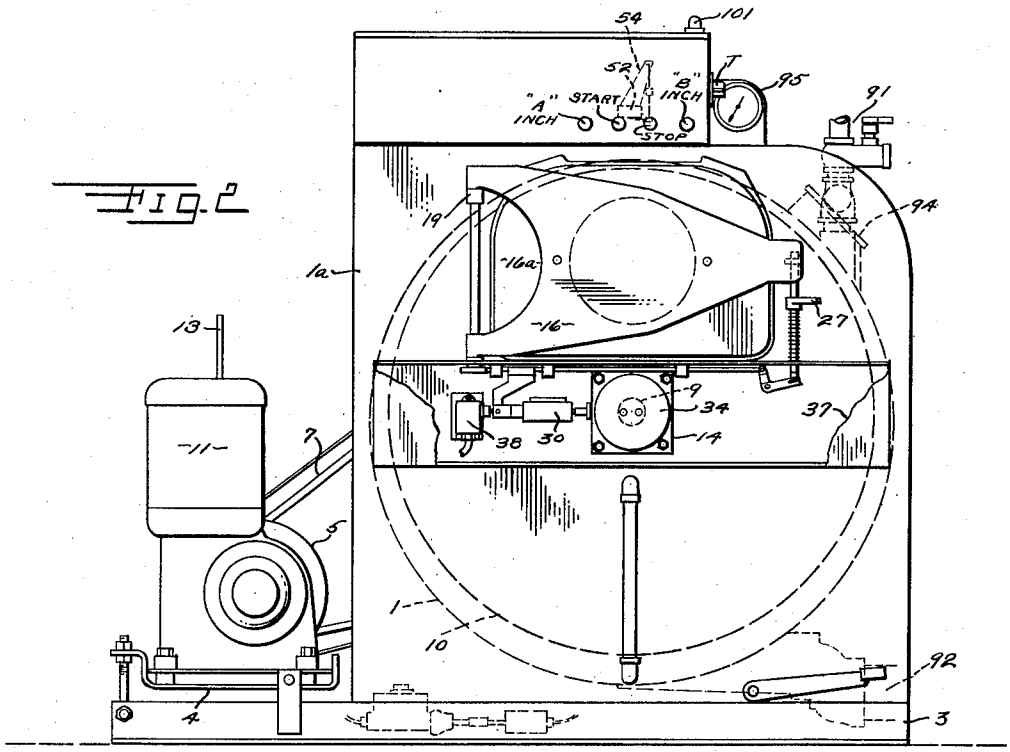
INVENTOR.
HARVEY I. SHEFFER
BY
Hyde, Myers, Baldwin & Doran
ATTORNEYS

Sept. 8, 1959 H. I. SHEFFER 2,902,850

SAFETY DOOR LOCK AND CONTROL FOR WASHING MACHINE

Filed July 8, 1953 4 Sheets-Sheet 2

FIG. 2



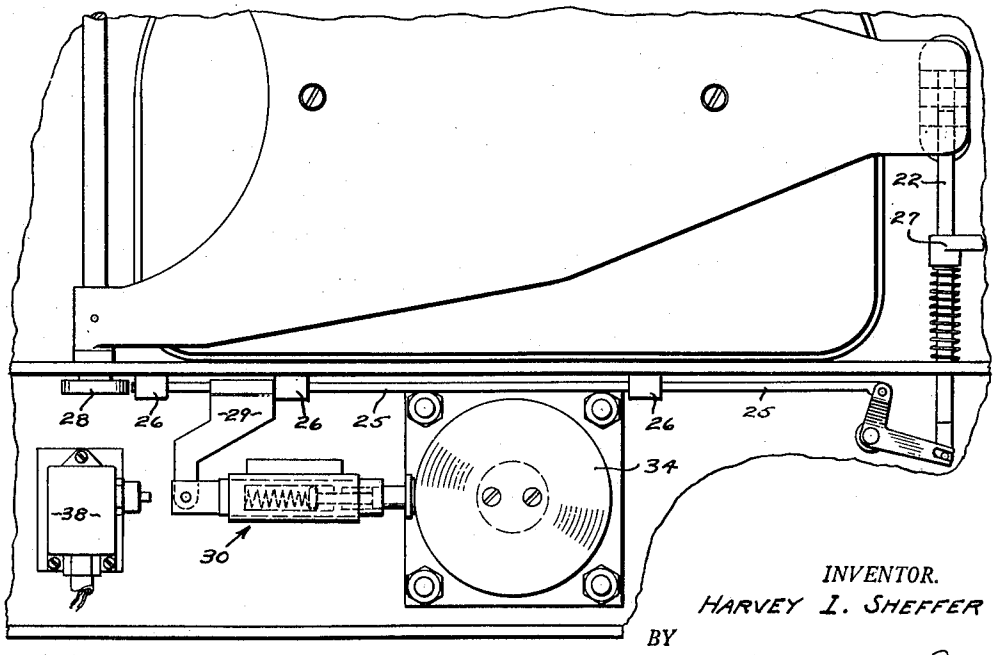


FIG. 3

INVENTOR.
HARVEY I. SHEFFER
BY
Hyde, Myers, Baldwin & Doran
ATTORNEYS

Sept. 8, 1959 H. I. SHEFFER 2,902,850

SAFETY DOOR LOCK AND CONTROL FOR WASHING MACHINE

Filed July 8, 1953 4 Sheets-Sheet 3

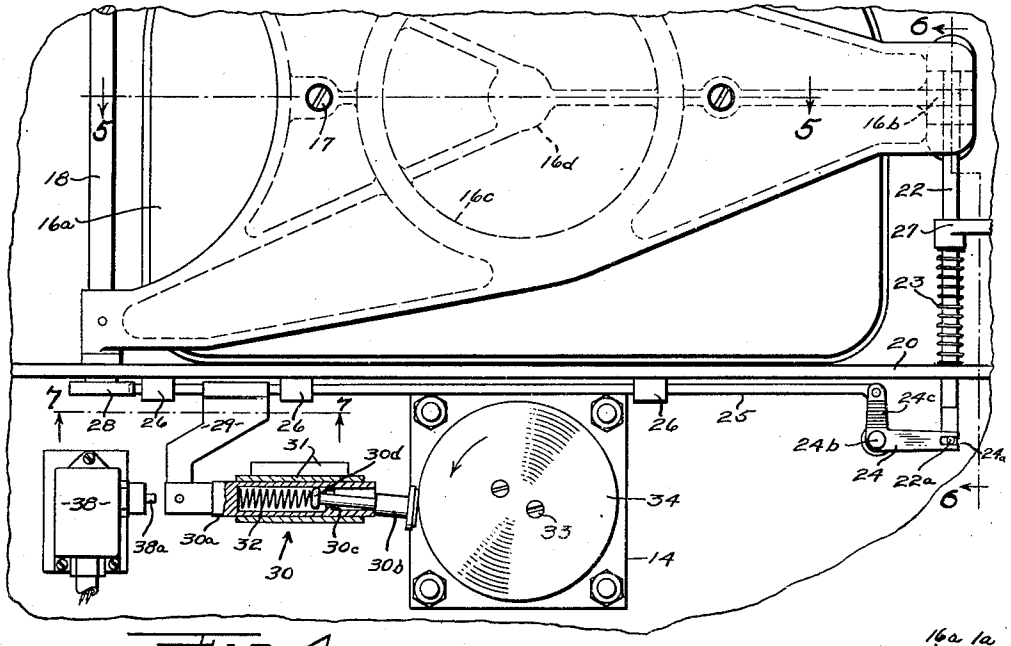


FIG. 4

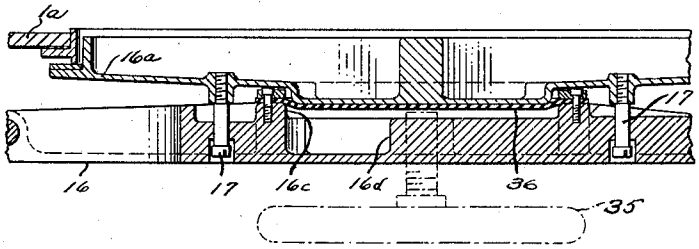


FIG. 5

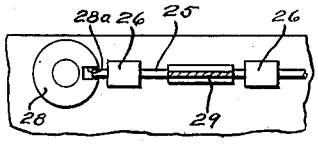


FIG. 7

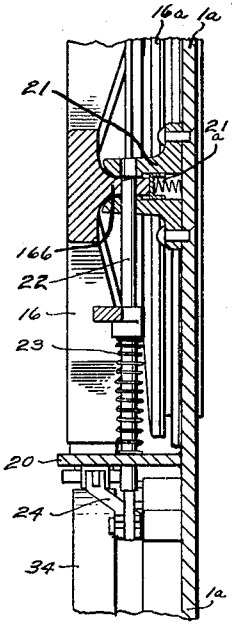


FIG. 6

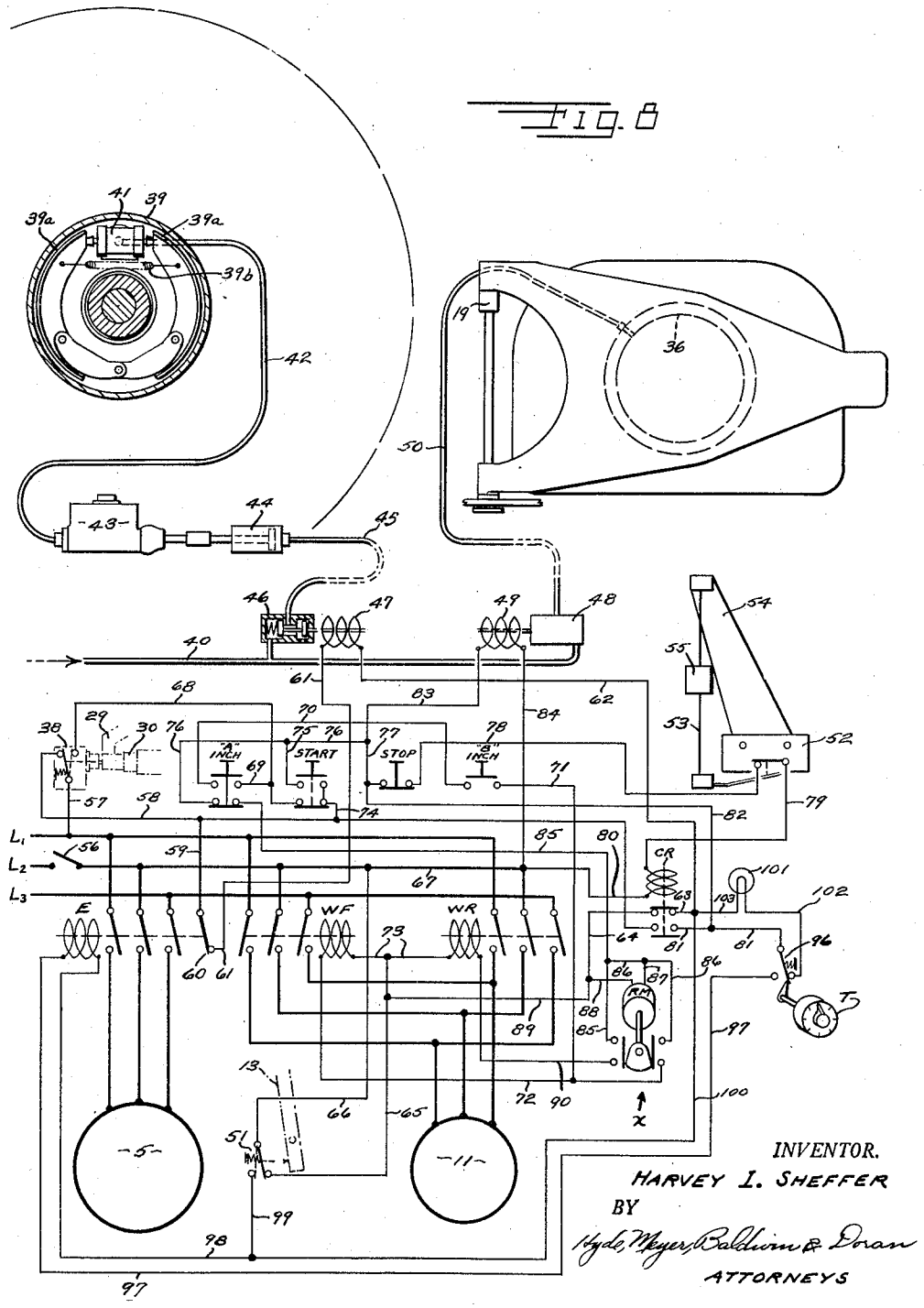
INVENTOR.
HARVEY I. SHEFFER
BY
Hyde, Meyer, Baldwin & Doran
ATTORNEYS

Sept. 8, 1959 H. I. SHEFFER 2,902,850

SAFETY DOOR LOCK AND CONTROL FOR WASHING MACHINE

Filed July 8, 1953 4 Sheets-Sheet 4

Fig. 8



INVENTOR.
HARVEY I. SHEFFER
BY
Hyde, Myers, Baldwin & Doran
ATTORNEYS

United States Patent Office

2,902,850

Patented Sept. 8, 1959

2,902,850

SAFETY DOOR LOCK AND CONTROL FOR WASHING MACHINE

Harvey I. Sheffer, Cincinnati, Ohio, assignor to The American Laundry Machinery Company, Cincinnati, Ohio, a corporation of Ohio

Application July 8, 1953, Serial No. 366,670

11 Claims. (Cl. 68—12)

This invention relates to improvements in a safety door lock and control for a washing machine of the drum type.

One of the objects of the present invention is to provide a novel control for a washing machine of the type in which a perforated drum is rotatably mounted in a frame for use both as a washer and as an extractor. A geared-down motor is utilized for driving the drum at a slower speed for washing and a higher speed motor is used for the higher rotational speeds necessary for extraction. In the present embodiment, the output shafts of these two motors are in axial alignment with clutch means for connecting or disconnecting them. In the control system, as will later appear, the control member is operatively connected with this clutch and movable when the clutch is engaged, to a position enabling the energizing of the washing machine motor but disabling the extractor motor. Conversely, when the clutch is disconnected the control member enables the operation of the extraction motor, while disabling the washing machine motor. This control member has other functions to perform in the control system as will later appear.

Another object of the present invention is to provide a novel combination between a safety device which prevents unlatching of the door leading into the drum until after the drum has stopped rotating, together with a pressure fluid diaphragm utilized to control the door and tied in with the control circuit so that air pressure is available on the door closing diaphragm only when the door is completely closed and locked.

Another object of the present invention is to maintain a brake applied to the drum at all times except when the door is closed and locked and the starting switch has been actuated. Another object of the present invention is to provide a novel mechanism for controlling the latch bolt which locks the door closed which gives access to the drum.

Further objects of this invention reside in the control system whereby all of the parts are readily and efficiently controlled and whereby maximum safety is obtained.

In the drawings, Fig. 1 is a side elevational view of a machine embodying my invention, certain parts being broken away to more clearly show the construction.

Fig. 2 is an end elevational view of the same.

Fig. 3 is a fragmental view enlarged of the central portion of Fig. 2.

Fig. 4 is a view similar to Fig. 3, but showing the parts in another position.

Fig. 5 is a fragmental sectional view taken along the line 5—5 of Fig. 4 and showing how a hand wheel might be utilized for pressure closing the door if the advantages of my pressure closing diaphragm are done away with.

Fig. 6 is a fragmental sectional view taken along the line 6—6 of Fig. 4.

Fig. 7 is a fragmental sectional view taken along the line 7—7 of Fig. 4, while

Fig. 8 is a diagrammatic view showing the control system for my improved machine.

The washer-extractor machine proper is of generally conventional design having an outer housing or tub **1** with vertically extending front and back walls **1***a* and **1***b* which, together with rear braces **2** and base members **3** comprise a supporting frame. At one side of the tub, on a base **4**, two electrical motors **5** and **11** are mounted as a group. The output shaft of motor **5** drives a pulley **6** which by means of V belts **7** drives a larger pulley **8** on a shaft **9** which is rotatably mounted in the frame and carries the drum **10** which is commonly perforated. The motor **11** is operatively connected with a geared down unit **11***a* whose output shaft is axially aligned with the output shaft of motor **5**. These output shafts are connected or disconnected by means of clutch means **12**, the clutch here shown being of a standard multiple disc type. The clutch may be shifted into or out of coupling engagement of the axially aligned shafts by means of a lever **13**, the clutch being engaged when the lever is at the left as shown in Fig. 1.

The shaft **9** extends entirely through the drum **10** and is journalled at both ends in bearings **14** and **15** on the front and back heads of the tub respectively. The drum is divided into two compartments by a horizontal partition and as usual with this type of machine, each half of the drum has a door opening in the front vertical head, and these openings may be successively brought into registry with an access door **16***a* in the front tub head.

The tub door **16***a* is carried by stud bolts **17** (Fig. 5) which fit in suitable bores in a supporting member or arm **16**, so that a limited movement of the door is permitted toward or away from the arm **16**. This arm is secured to a hinge shaft **18** which is journalled in a hinge lug **19** at the top and journalled in a horizontal plate section **20** of the tub head at the bottom. The door supporting arm **16** at its free end is narrow and is provided with an inwardly extending horizontally arranged section of rib **16***b*, which fits in a horizontally extending slot of a keeper member **21** secured to the tub head **1***a* (Fig. 6). Axially aligned holes are provided in the keeper **21** and the rib **16***b* when the door is completely closed, so as to receive a vertically slidable latch bolt **22**. An operating handle **27** is fixed on the bolt **22** and a helical spring surrounds the bolt and is held between member **27** and a portion of the frame so as to urge the latch bolt upwardly toward locking position. In full locked position, the bolt **22** extends through both the upper and lower ears of the keeper **21** as well as through the door tab section **16***b*. Referring to Fig. 6, it will be noted that the rear of the keeper **21** is bored to receive a spring pressed cup member **21***a* which helps to start the door open when the latch bolt is released. The bolt **22** passes downwardly through a suitable opening in the frame section **20** and has its lower end flattened and provided with a pin **22***a* which fits into a slotted clevis **24***a* on the end of one of the arms of bell crank member **24**. This member is pivotally mounted on the front tub head at **24***b*, and has a shorter leg **24***c* which is pivotally connected to a horizontal link **25**. Bored lugs **26** on the frame guide the link **25** for horizontal sliding movement.

Referring to Figs. 4 and 7, opposite the left-hand end of link **25** is a circular disk **28** fixed on the hinge pin **18**. A radially extending slot **28***a* in this disk registers with the end of link **25** and receives this link when the door is locked as shown in Figs. 4 and 7. When the door is unlocked by pulling the bolt downwardly by means of handle **27** as shown in Fig. 3, the end of link **25** is pulled out of slot **28***a* as shown in Fig. 3 so that in any open position of the door, the handle **27** may be released and spring **23** will be unable to throw the latch bolt upwardly because the left-hand end of link **25** will engage the periphery of disc **28**. There is sufficient

looseness in the guiding means and connecting means for link **25** so as to prevent binding of this rod as it moves from the positions of Figs. 4 and 7 to the position of Fig. 3. When the door is fully unlocked as shown in Fig. 3 the upper end of bolt **22** still remains in the lower ear of the keeper **21**, but is clear of the upper ear of this keeper and of course clear of the member **16***b*. When the door is open and the left-hand end of link **25** rests against the disk **28**, as previously described, the arrangement is such that a slight initial return movement has allowed the upper end of bolt **22** to move upward to where its inclined top end (see Fig. 6) will be somewhat lower than shown in Fig. 6 and will just protrude into the slotted part of keeper member **21**. Then, when the door is swung shut, the memer **16***b* will cam bolt **22** downwardly slightly, after which spring **23** will force the bolt upwardly to fully locked position. When the door is fully unlocked, movement of the link **25** farther toward the right than the position shown in Fig. 3 is impossible because bracket **29** fastened to link **25** engages one of the lugs **26**.

The door **16***a* is mounted for a small amount of movement relative to the supporting arm **16**, as previously described. This is for the usual purpose of applying additional closing pressure after the door is preliminarily latched, to thereby seat the door firmly and avoid leakage of the cleaning liquor. A conventional way of applying this pressure is by means of a screw and handwheel, as indicated by broken lines at **35** in Fig. 5, and the present machine may be so equipped in some cases, an inside boss **16***d* being provided on the arm **16** which can be drilled and threaded when used for this purpose. As particularly disclosed, however, and to obtain additional advantages of the present invention, the final closing pressure is applied by means of compressed air acting against a flexible diaphragm **36** which is fastened in a fluid tight manner to a circular rib section **16***c* on the inside face of the door supporting arm **16**, the space within this circular rib acting as an air chamber. As shown in Fig. 5, screws and a metal ring hold the diaphragm snugly against the chamber wall edge or section **16***c*. The diaphragm lies against a dished portion of the door **16***a*, and when the diaphragm is deflated, it allows easy closing and latching of the carrier arm **16**. A source of fluid under pressure is supplied to the pipe **40** and the control of this fluid is automatically determined by operation of the control system later described. Another interrelated control element is a switch **38** mounted on the tub near the door **16***a* for operation by the door locking control mechanism as will be presently described.

A bracket or arm **29** was previously mentioned as connected rigidly to the link **25** which operates the latch bolt **22**. The lower end of this bracket connects to a movement-sensitive locking device **30**. This comprises a body portion **30***a* slidable in a bracket or guide **31** which is fixed to the tub front and inside of which is mounted a plunger **30***b*. This plunger has a head behind which is a front portion adapted to slide in mating bore at the outer end of the body **30***a*. The rear stem section of the plunger is movable through an aperture in a transverse wall section **30***c* inside of the body **30***a*. The inner end of the plunger terminates in a small seating member **30***d* which is normally pressed against the transverse wall by a spring **32** held within the hollow body **30***a*. This position of the parts is shown in Fig. 2. The outer end of the drum shaft **9** has secured to it by screws **33**, a cap **34** having a concentric rim of sufficient width to afford a contacting surface for the head of the plunger **30***b*. When the drum **10** is stationary, the door may be locked as shown in Fig. 2 or it may be unlocked as previously described. During this unlocking operation the device **30** is moved to the right as a unit as seen in Fig. 3 until the plunger contacts the cap **34**, after which the continued movement of the body portion **30***a* causes the front bore thereof to slide over the front portion of the plunger **30***b*, spring **32** being thereby compressed. The edges of the plunger and of the bore where the shoulder on the plunger engages the front end of the bore (as seen in Fig. 4) are slightly rounded to avoid catching when the parts are operated as just described with the drum stationary.

Fig. 4 shows the operation of the device **30** when an attempt is made to unlock the door while the cylinder or drum **10** is still rotating. The parts can be moved slightly from the position of Fig. 2, but then the plunger head contacts the rotating cap **34** and is tipped down out of alignment with the hollow body **30***a*. Any further attempt at movement causes the front edge of the body **30***a* to abut the shoulder on the plunger as shown in Fig. 4, thereby preventing further movement of the door unlocking linkage. At this point, the lock bolt **22** has moved out of the bore of the upper half of the keeper **21**, but is still in full locking relation between the door tab **16***b* and the lower half of the keeper as shown in Figs. 5 and 6. Also, the end of the link **25** is still inside of the slot **28***a* in the hinge disc **28** as previously described. Even a slow rotation of the container will prevent unlocking of the door since only a slight tipping of the plunger **30***b* is necessary to bind the parts in the position of Fig. 4. Since the shoulder portion of the plunger **30***b* is normally a short distance out in front of the leading edge of the body **30***a*, there is always time for the plunger to tip to the position of Fig. 4 while the body portion is approaching. A cover **37** encloses this mechanism.

The switch **38** is mounted on the front of the tub with the actuator **38***a* in line with a portion of the parts **29** and **30** so that movement of these parts toward the left corresponding to fully locked position of the door **16***a* as shown in Fig. 2 will push the actuator **38***a* toward the left and move the switch **38** to its left-hand position as shown in full lines in Fig. 8. In any other position of the parts **29** and **30** except fully locked position of the door, the same parts do not contact the actuator **38***a* and the switch **38** is normally in its right-hand position impelled thereto by a spring to the dot-dash position shown in Fig. 8.

A brake is provided for normally resisting rotation of the drum **10**, and for efficiency and adaptability to automatic control, a standard hydraulic automobile type brake has been shown as employed for this purpose. This brake **39***a* is mounted on the rear tub head **1***b* and these brake shoes **39***a* act against a brake drum **39** on the driven pulley **8**. A spring **39***b* normally retracts the shoes from contact with the drum **39**. A shoe operating cylinder **41** is provided for applying pressure of the brake shoes against the drum. This cylinder is connected by tubing **42** to the master cylinder **43**. The operating plunger of this cylinder is in turn connected to a small air cylinder **44** fixed on the main frame and connected by pipe **45** to the outlet of a standard combination air valve **46** which is normally exhausted in its unactuated position as shown in Fig. 8. This valve **46** as shown is actuated by a solenoid **47**. The inlet of the valve **46** connects to the pressure fluid supply **40** as previously mentioned. A similar solenoid-controlled valve **48**, normally in exhaust position, and controlled by solenoid **49**, supplies air to the air pressure chamber of the door sealing diaphragm **36** through a tube **50** as shown in Fig. 8.

Referring to Figs. 1 and 8, a two-position switch **51** is shown operatively connected with the clutch shifting lever **13**. This switch is shown in Figs. 1 and 8 in the position corresponding to the clutch **12** engaged in connecting the shafts between the motors **11** and **5**. Movement of lever **13** toward the right in Fig. 1 to disconnect the clutch moves the switch **51** of Fig. 8 toward its left-hand or dot-dash position. Another control element is a vibration responsive switch **52**, shown in Fig. 8, which is normally closed type of switch having its operating arm

connected to a cord or wire 53 which is connected at its other end to the upper end of a bracket 54. This bracket is mounted near the top of the machine frame as shown in Fig. 2. A weight 55 on this cord tends, by inertia, to remain stationary. Since the device is mounted near the top of the machine, it is subjected to the maximum amplitude of vibration from unbalanced loads occurring during the extraction cycle, and the relative lateral motion between the weight 55 and the bracket and switch will, at a known value of vibration, pull the switch arm enough to open the normally closed contacts. This breaks the motor control circuit for maintaining the operating circuit for extractor motor 5 as will later appear.

Certain control buttons, such as the "inching" buttons A and B and the start and stop switch buttons are mounted near the top of the machine as shown in Fig. 2. A timer T is also mounted here and a warning light 101. Since this machine may be employed according to any desired washing sequence or formula, such as one or more suds baths, extraction, rinse and extraction, etc., there being the usual liquid supply means 91, drain valve 92 and supplies door 94, as well as other supplementary formula control, thermometer 95 and other equipment are provided as desired.

The control system of this machine is shown diagrammatically in Fig. 8 and starting with the machine idle, the operation thereof is as follows:

With the electrical supply for the electrical system of Fig. 8 cut off at a main switch or, as here shown, with the circuit open at a switch such as that shown at 56, the control elements are in the condition indicated in Fig. 8 in full lines. Closing of the switch 56 to put the machine into preliminary condition for operation would set the brake 39*a* by energizing the solenoid 47 of the air valve 46. This is true whether the door 16*a* is open or closed, and with the clutch 12 in either engaged or disengaged position. With the parts as here shown, there is with the door closed and the clutch engaged, circuit from L1, line 57, left contact of door switch 38, lines 58, 59, a normally closed contact or 60 in the extractor motor contactor E, line 61 solenoid 47, lines 62, 63, normally closed upper contact of relay CR, lines 64, 65, right-hand contact of clutch switch 51, and lines 66, 67 to L2.

The door pressure control air solenoid 49 is not energized at this time, so that there is no air pressure on the door diaphragm 36 as yet. The operator would now open the door 16*a* and, if one of the drum compartments did not already have its door in registry with the tub door 16*a*, the operator would "inch" the container or drum 9 to such a position. This is done by depressing both of the push buttons A and B, making a circuit from L1, line 57, right-hand contact of door switch 38, line 68, 69, upper contacts of inching switch A, line 70, inching switch B, line 71, 72, the coil of washer motor "forward" contactor WF, lines 73, 65, clutch switch 51, and lines 66 and 67 to L2. This actuates the motor contactor switch controlled by the solenoid WF and closes the three wire circuit to the washer motor 11 so long as the inch buttons A and B are held depressed. The brake 39*a* remains set during the inching operation.

With the compartments of the drum 10 loaded, the operator closes the tub door 16*a*, and the safety device 30 moves the switch 38 back to its left contact or to the full line position shown in Fig. 8. The machine is next set into operation by depressing the "start" switch button. This completes a circuit from L1, line 57, door switch 38, lines 58, 74 upper contacts of the "start" switch, lines 75, 76, 77, stop switch, line 78, vibration switch 52, line 79, the coil of the relay CR, and lines 80 and 67 to L2. Energization of the relay CR closes the normally open bottom contacts thereof and opens the normally closed upper contacts thereof. This completes a holding circuit from L1, switch 38, line 58, lower contacts of relay CR, lines 81, 82, stop switch, line 78, vibration switch 52, line 79, controlling coil of relay CR, and lines 80 and 67 to L2. The opening of the normally closed upper contacts of the relay CR breaks the previously described circuit to the brake control solenoid 47, releasing the brake. Closing of the lower contacts of the relay CR energizes the solenoid 49 of air valve 48, admitting compressed air to the door closing diaphragm 36. This circuit is from L1, line 57, switch 38, line 58, lower contacts of relay CR, lines 81, 82, 77, 83, solenoid 49, and lines 84 and 67 to L2.

The washing motor 11 is also started by this closing of the lower contacts of the relay CR. This circuit runs from L1, line 57, door switch 38, line 58, lower relay contacts of CR, lines 81, 82, 77, 76, lower contacts of inch switch A, lines 85, 86 to reverse and forward control contacts, respectively, of a reversing control X (see Fig. 8), and line 87 to the small reversal control motor RM. In the position shown in Fig. 8, the operating cam of this reversing control is in its neutral position, but when the motor RM starts, it closes one or the other of the two sets of contacts, say, in this instance, the left-hand set. The reversal control motor circuit is completed by lines 88, 89, 65, clutch switch 51 and lines 66 and 67 to L2. The circuit through the left-hand contacts of the reversal control continues by line 90 to the washer motor "reverse" contactor coil WR, then by lines 73, 65, clutch switch 51 and line 66 and 67 to L2. This causes the motor contactor controlled by coil WR to close a three wire circuit to the washing motor 11 to cause "reverse" rotation. The reversing control will of course subsequently break that circuit and complete one through its right-hand contacts to line 72, forward contactor coil WF, line 73, 65, clutch switch 51 and line 66 and 67 to L2.

Thus, it will be readily seen that operating the starting switch button, releases the brake 39*a*, actuates the door pressure diaphragm 36, and starts the drum 10 in reversing washing rotation.

Upon completion of the washing operation, it is assumed that the machine will next go into an extraction operation. The drum may be stopped first or it may go directly to extraction. In the latter case, with the machine still operating at washing speed, the operator sets a clock type timer T for the desired extraction time. This timer is normally at zero position as shown in Fig. 8, holding a two-position switch 96 on its right-hand contact. Now the setting of the timer indicator counterclockwise in Fig. 8 will allow the switch 96 to move to its left-hand contact. This makes a partial circuit from L1, line 57, door switch 38, line 58, lower contacts of relay CR, line 81, switch 96, line 97 to coil E of extractor motor contactor switch which is normally open, lines 98 and 99 to the left-hand contact (still open) of clutch switch 51. Now when the clutch 12 is shifted by means of its lever 13 to disconnect the washing and extraction motors, the above circuit is completed through switch 51 (in its left-hand or dot-dash position of Fig. 8) and line 66 to L2, the contactor switch controlled by coil E thereby closing the normally open three wire circuit to the extractor motor 5. Also, the shifting of the clutch 12 breaks the washer motor control circuit at the right-hand contact of switch 51.

When the timer T has gone back to zero position, it opens up the left-hand contact of switch 96 and thus breaks the extractor contactor switch circuit through coil E, deenergizing motor 5. At the same time, a circuit is completed to set the brake shoes 39*a* independently of the relay CR, due to the closing of normally closed contact 60 in the extractor contactor. This circuit goes from L1, line 57, door switch 38, lines 58, 59, switch contact 60, line 61, brake valve solenoid 47, lines 62, 100 and 99 to clutch switch 51, through left-hand contact and line 66 and 67 to L2.

At the same time, a signal lamp 101 lights, the circuit being from L1, line 57, switch 38, line 58, lower contacts

of relay CR, line 81, timer switch 96, line 102, lamp 101, lines 103, 100, 99, clutch switch 51 and lines 66, 67 to L2.

The drum 10 may then be allowed to come to rest, or if another washing or rinsing step follows, the clutch 12 may be shifted to engage the washing motor output shaft after the drum has slowed down sufficiently. In this latter case, the shifting of the clutch causes switch 51 to move back to its right-hand contact, while breaking the left-hand contact. This opening of the left-hand contact breaks the previously traced circuit to the brake solenoid 47 and to the signal light 101, and the closing of the right-hand contact of switch 51 reestablishes the previously described washer motor control circuit.

If the extraction operation was the end of the cycle, the cylinder brakes to a stop. Now, although there is no rotation of safety device cap 34, it is still not possible for the operator to move the door handle 27 downwardly so as to unlatch the door lock bolt 22, because the air pressure in the door diaphragm chamber acting on diaphragm 36 is pressing the door support frame 16 outwardly and this binds the latching projection 16*b* and the latch bolt 22 in the keeper 21. It is first necessary to release the air pressure back of diaphragm 36 by operating the stop button switch. This breaks the previously traced holding circuit for relay CR, and the opening of the lower contacts of this relay breaks the previously traced circuit to the air valve solenoid 49. It also turns off the signal lamp 101, but the brake 39*a* remains applied or set. The door 16*a* can now be opened.

If, after the extraction was terminated by the timer T, the machine was once again put into washing speed by shifting the clutch 12, the signal lamp 101 would go out as the clutch switch 51 moved away from its left-hand contact and, the original wash motor circuits being reestablished, the machine would, if desired, be stopped and opened after this step although this would not be a usual sequence. In this case, the rotation of the drum 10 would be stopped by operating the stop switch button, which breaks the holding circuit for relay CR whereupon the lower contacts of that relay would open, breaking the wash motor control circuit. The closing of the upper relay contacts of CR again completes a circuit as before traced through the normally closed contact 60 of the contactor controlled by the solenoid E, the air brake solenoid 47, line 62, line 63, the normally closed upper contacts of CR, lines 64, 65, right-hand contact of clutch switch 51, and line 66, 67 to L2. Also, opening of the relay CR releases the door diaphragm 36 as previously described.

It has been noted that the pressure diaphragm 36 on the door acts as another lock in that it binds the latch bolt in position so that the same cannot be withdrawn. This provides a supplementary safety feature. To allow the door handle 27 to be moved at all, the locking pressure must first be relieved on diaphragm 36 by operating the stop button and this, additionally, applies the brake shoes 39*a*. Thus, the safety device 30 has the associated features of not even being subject to manipulation unless the drum 10 is being braked at the same time.

Referring back to the vibration switch 52, it will be noted that the maintaining circuit for holding relay CR in its actuated position by its maintaining coil includes switch 52 in its closed position as shown in Fig. 8. It will have been noted that the circuit for energizing the contactor E for motor 5 includes the lower contacts of relay CR in its actuated position. When the extractor motor 5 is rotating the drum at high speed, unbalanced loads will cause excessive vibrations. If the vibration is sufficiently great, it breaks the connection through switch 52 to momentarily open the maintaining circuit for the relay CR which will thus open the relay energizing motor 5 and cause this motor to coast to a stop unless it is restarted immediately. The opening of the relay contacts CR, also causes the brake to be applied through a circuit from L1, line 57, door switch 38, lines 58 and 59, contact 60, line 61, air valve solenoid 47, lines 62, 100, 99, clutch switch 51 and lines 66, 67 to L2. The operator must then push the start button to restart the extractor motor 5. Obviously, if the materials in the drum do not rearrange themselves upon restarting, the excessive vibration will occur again until the operator does something about it.

What I claim is:

1. In a washing machine including, a frame, a perforated drum rotatably mounted in said frame for use as a washer and as an extractor, first motor means having a first output shaft for driving said drum at a lower speed for washing, and second motor means having a second output shaft for driving said drum at a higher speed for extracting; the combination therewith of means drivingly connecting said second output shaft and said drum, clutch means having first and second positions connecting and disconnecting said first and second output shafts respectively, and circuit means for energizing said first and second motor means including a control member operatively connected with said clutch means and movable thereby to first and second positions corresponding respectively to first and second positions of said clutch means, said member in first position enabling said energizing circuit for said first motor means and disabling said energizing circuit for said second motor means, and said member in second position enabling said energizing circuit for said second motor means and disabling said energizing circuit for said first motor means.

2. In a rotatable drum device including a frame, a hollow drum rotatably mounted in said frame and adapted to work upon objects placed within said drum, a door mounted on said frame and providing access to the hollow of said drum, means for rotating said drum, a latch bolt movably mounted on said frame between door holding and release positions and coacting with said door in closed position to hold said door closed; the combination therewith of fluid pressure responsive means positioned between said frame and the outside of said door for holding said door tightly closed, a source of pressure fluid having communication with said pressure responsive means, a control device for opening and closing said communication, and means operatively connected with said control device and with said latch bolt for opening said communication only when said latch bolt is in door holding position.

3. In a rotatable drum device including a frame, a hollow drum rotatably mounted in said frame and adapted to work upon objects placed within said drum, a door mounted on said frame and providing access to the hollow of said drum, means for rotating said drum, a latch bolt movably mounted on said frame between door holding and release positions and coacting with said door in closed position to hold said door closed; the combination therewith of fluid pressure responsive means positioned between said frame and the outside of said door for holding said door tightly closed, a source of pressure fluid having communication with said pressure responsive means, a control device for opening and closing said communication, a control member controlling energization of said drum rotating means, and means operatively connected with said control member and said control device for opening said communication only when said control member is in drum rotation means energizing position.

4. In a rotatable drum device including a frame, a hollow drum rotatably mounted in said frame and adapted to work upon objects placed within said drum, a door mounted on said frame and providing access to the hollow of said drum, means for rotating said drum, a latch bolt movably mounted on said frame between door holding and release positions and coacting with said door in closed position to hold said door closed; the combination therewith of fluid pressure responsive means positioned between said frame and the outside of said door for holding said door tightly closed, a source of pressure fluid having communication with said pressure respon-

sive means, a control device for opening and closing said communication, a control member controlling energization of said drum rotating means, a brake operatively associated with said drum to resist rotation thereof and having set and released positions, means operatively connected with said control device and with said latch bolt for opening said communication to inflate said pressure responsive means only when said latch bolt is in door holding position, said pressure responsive means then binding said latch bolt against release, and control means for simultaneously causing movement of said control member to rotating means deenergizing position and for causing closing of said communication and deflation of said pressure responsive means.

5. The combination of claim 1 wherein both of said motor means are electrically energized, electrical relay means having normal and actuated positions, an electrical circuit for causing initial energization of said first motor means and including a coil of said relay means, an electrical circuit for holding said first named circuit and including the contacts of said relay means in actuated position, a first motor means operating circuit including the contacts of said relay means in actuated position and said control member in said first position, and a second motor means operating circuit including the contacts of said relay means in actuated position and said control member in said second position.

6. The combination of claim 5 including a brake operatively associated with said drum to resist rotation thereof and having set and released positions, and electrical circuit means for causing movement of said brake to set and to released position including the contacts of said relay means in normal and actuated positions respectively.

7. The combination of claim 6 including electrical circuit means independent of said relay means for causing movement of said brake to set position including said control member in said second position and switch means responsive to deenergization of said second motor means.

8. The combination of claim 1 including a door safety control member operatively connected in both of said energizing circuits, said safety control member having a position corresponding to the door closed wherein it enables energization of both of said circuits, and said safety control member having another position corresponding to the door open wherein it prevents energization of both of said circuits.

9. In a rotatable drum device including a frame, a hollow drum rotatably mounted in said frame and adapted to work upon objects placed within said drum, a door mounted on said frame and providing access to the hollow of said drum, means for rotating said drum, a latch bolt movably mounted on said frame between door holding and release positions and coacting with said door in closed position to hold said door closed; the combination therewith of safety means comprising a disc operatively connected with said drum for rotation by drum rotation, a feeler mounted on said frame for movement between a free position and a disc-engaging position, said feeler being operatively connected with said latch bolt for movement to an extended position when said door is held and to a retracted position when said door is released, said operative connection moving said feeler into engagement with a rotatable portion of said disc as said bolt is moved toward door release position, said feeler having parts carried by disc rotation into position preventing movement of said feeler to its retracted position, fluid pressure responsive means positioned between said frame and the outside of said door for holding said door tightly closed, a source of pressure fluid having communication with said pressure responsive means, a control device for opening and closing said communication, a control member controlling energization of said drum rotating means, a brake operatively associated with said drum to resist rotation thereof and having set and released positions, means operatively connected with said control device and with said latch bolt for opening said communication to inflate said pressure responsive means only when said latch bolt is in door holding position, said pressure responsive means then binding said latch bolt against release, and control means for simultaneously causing movement of said control member to rotating means deenergizing position and for causing closing of said communication and deflation of said pressure responsive means and for causing actuation of said brake to set position.

10. In a washing machine including a frame, a hollow drum rotatably mounted in said frame and adapted to work upon objects placed within said drum, a door mounted on said frame and providing access to the hollow of said drum, means for rotating said drum, a latch bolt movably mounted on said frame between door holding and release positions and coacting with said door in closed position to hold said door closed; the combination therewith of safety means comprising a disk operatively connected with said drum for rotation by drum rotation, a feeler mounted on said frame for movement between a free position and a disk-engaging position, said feeler being operatively connected with said latch bolt for movement to an extended position when said door is held and to a retracted position when said door is released, said operative connection moving said feeler into engagement with a rotatable portion of said disk as said bolt is moved toward door release position, and said feeler having parts carried by disk rotation into position preventing movement of said feeler to its retracted position.

11. In a washing machine including a frame, a hollow drum rotatably mounted in said frame and adapted to work upon objects placed within said drum, a door mounted on said frame and providing access to the hollow of said drum, means for rotating said drum, a latch bolt movably mounted on said frame between door holding and release positions and coacting with said door in closed position to hold said door closed, safety means operatively connected with said drum and responsive to drum rotation for preventing withdrawal of said bolt from door holding position while said drum is rotating, and including fluid pressure responsive means positioned between said frame and the outside of said door for holding said door tightly closed; the combination therewith of a source of pressure fluid having communication with said pressure responsive means, a control device for opening and closing said communication, and means operatively connected with said control device and with said latch bolt for opening said communication only when said latch bolt is in door holding position.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 15,125	Lindquist et al.	June 14, 1921
1,236,530	Balzer	Aug. 14, 1917
2,135,685	Wells	Nov. 8, 1938
2,176,954	Clark	Oct. 24, 1939
2,261,936	Johnson	Nov. 11, 1941
2,283,612	Perry	May 19, 1942
2,321,641	Andersen	June 15, 1943
2,325,406	Johnson	July 27, 1943
2,511,793	Telbizoff	June 13, 1950
2,540,168	Kahn	Feb. 6, 1951
2,561,119	Horvath	July 17, 1951
2,574,251	Dinley	Nov. 6, 1951
2,655,241	Hultberg	Oct. 13, 1953