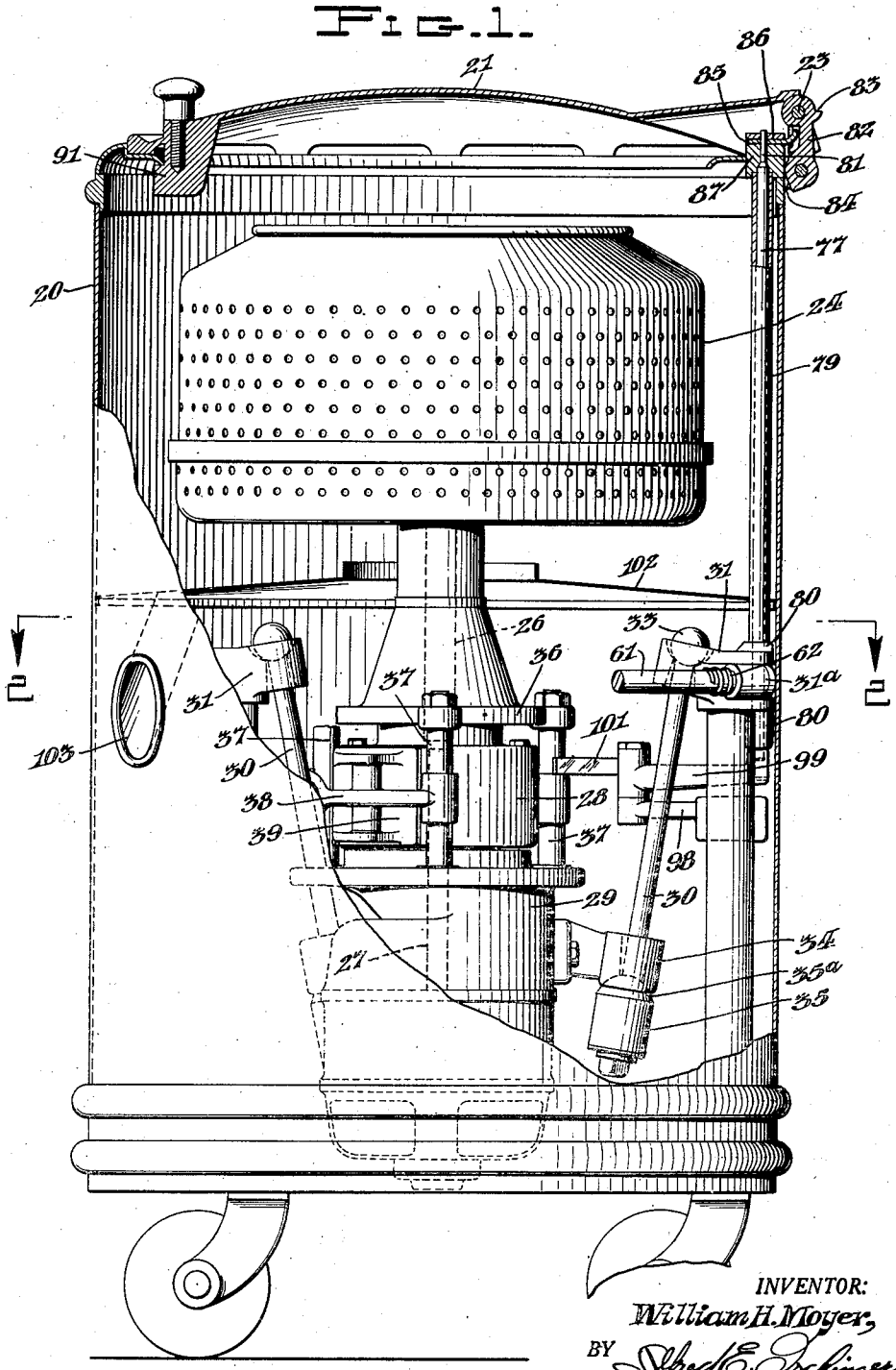
Dec. 31, 1935. W. H. MOYER 2,026,510

CENTRIFUGAL MACHINE AND THE LIKE

Filed April 26, 1934 5 Sheets-Sheet 1

Fig. 1.



INVENTOR:
William H. Moyer,
BY Alfred E. Eschinger,
ATTORNEY.

Dec. 31, 1935. W. H. MOYER 2,026,510

CENTRIFUGAL MACHINE AND THE LIKE

Filed April 26, 1934 5 Sheets-Sheet 2

Fig. 2.

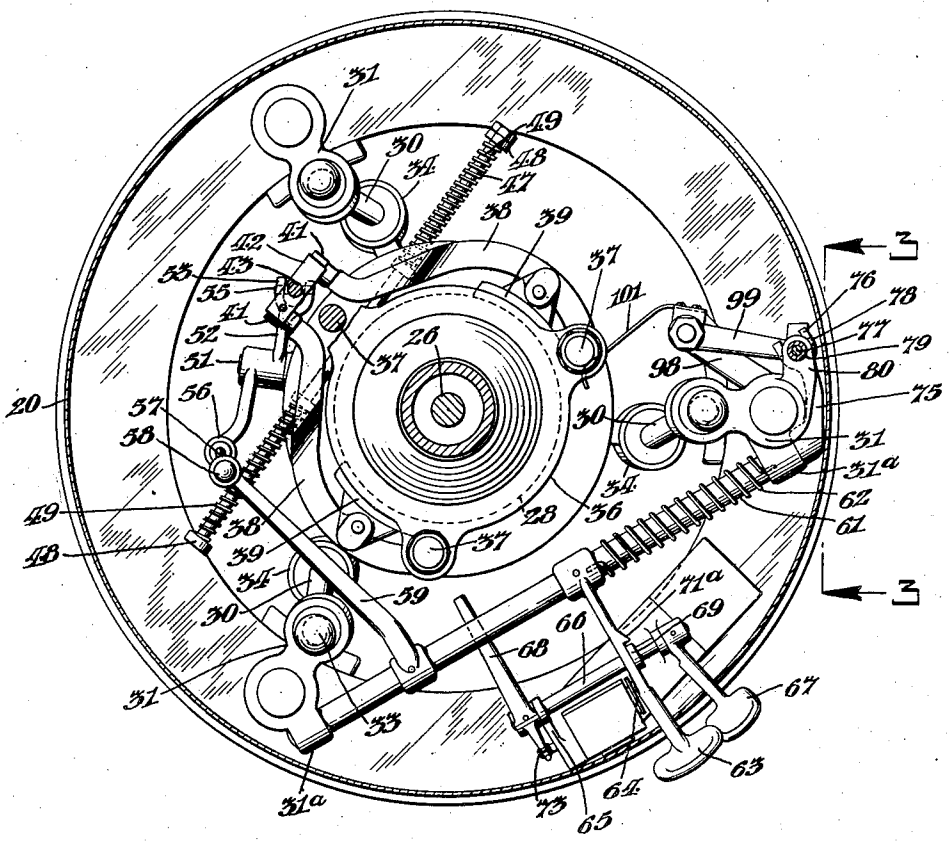


Fig. 4.

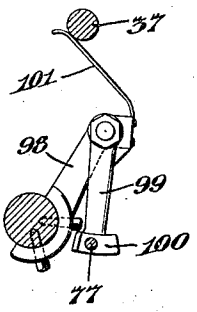
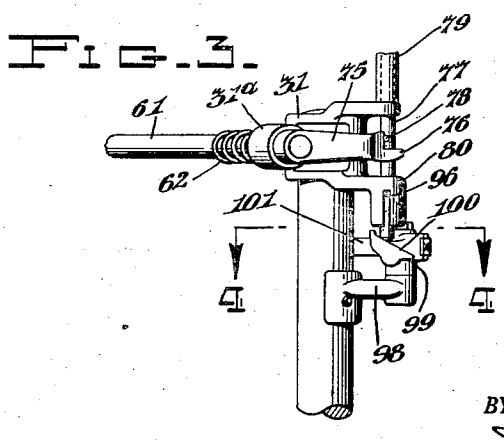


Fig. 3.



INVENTOR.
William H. Moyer,
BY Fred E. Tschinger,
ATTORNEY

Dec. 31, 1935. W. H. MOYER 2,026,510

CENTRIFUGAL MACHINE AND THE LIKE

Filed April 26, 1934 5 Sheets-Sheet 3

FIG. 5.

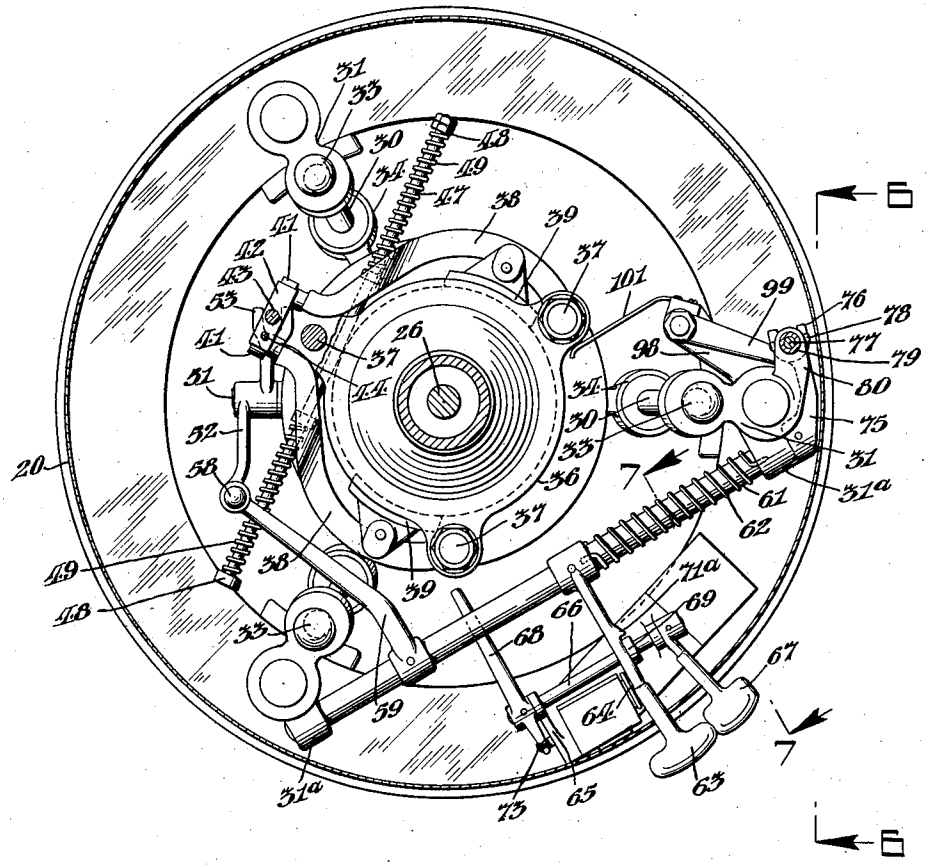


FIG. 6.

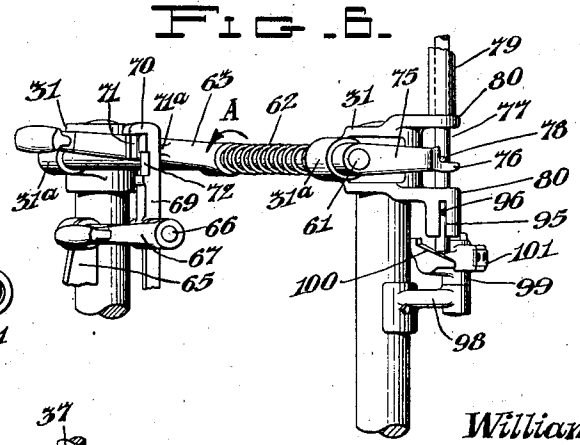
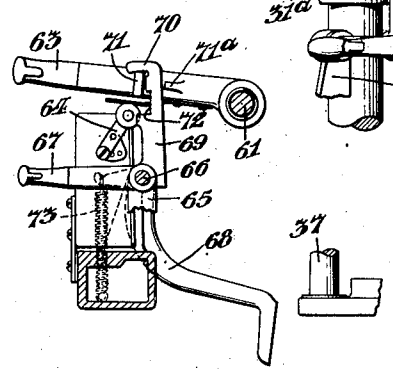


FIG. 7.



INVENTOR:
William H. Moyer,
BY Alfred E. Ischinger,
ATTORNEY.

Dec. 31, 1935. W. H. MOYER 2,026,510

CENTRIFUGAL MACHINE AND THE LIKE

Filed April 26, 1934 5 Sheets-Sheet 4

FIG. 8.

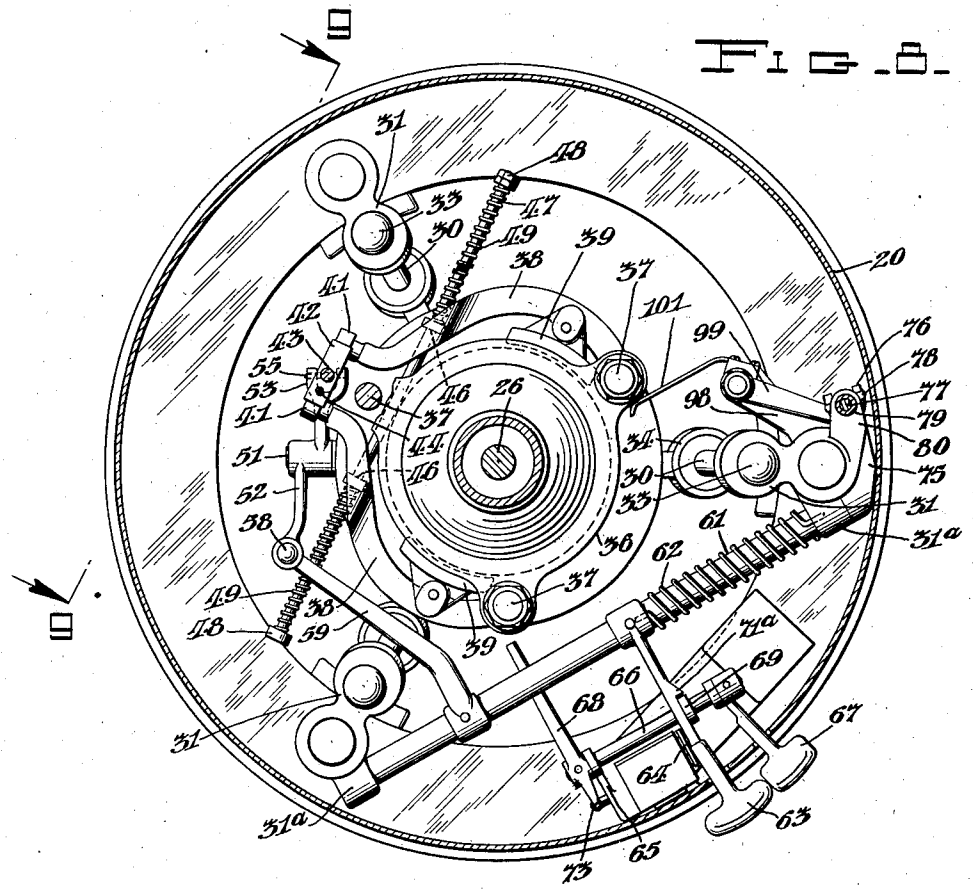
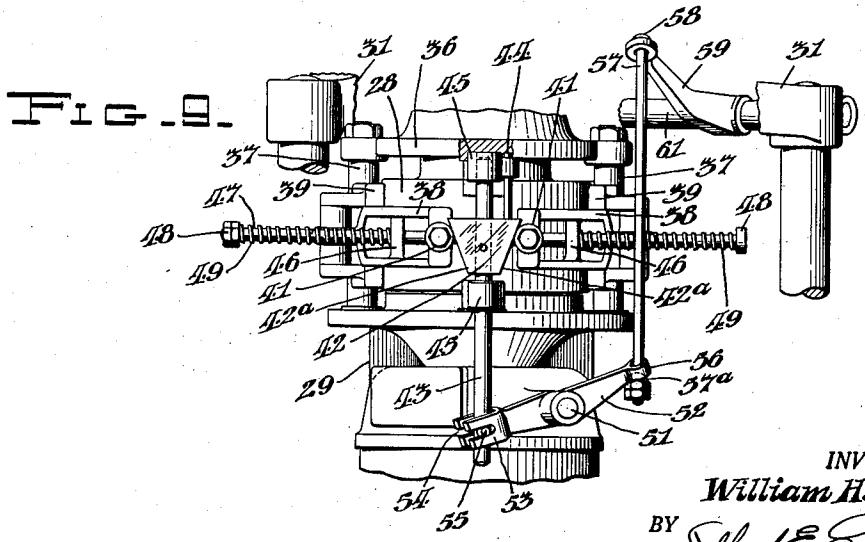


FIG. 9.



INVENTOR:
William H. Moyer,
BY Alfred E. Ischinger,
ATTORNEY.

Dec. 31, 1935. W. H. MOYER 2,026,510

CENTRIFUGAL MACHINE AND THE LIKE

Filed April 26, 1934 5 Sheets-Sheet 5

Fig. 10.

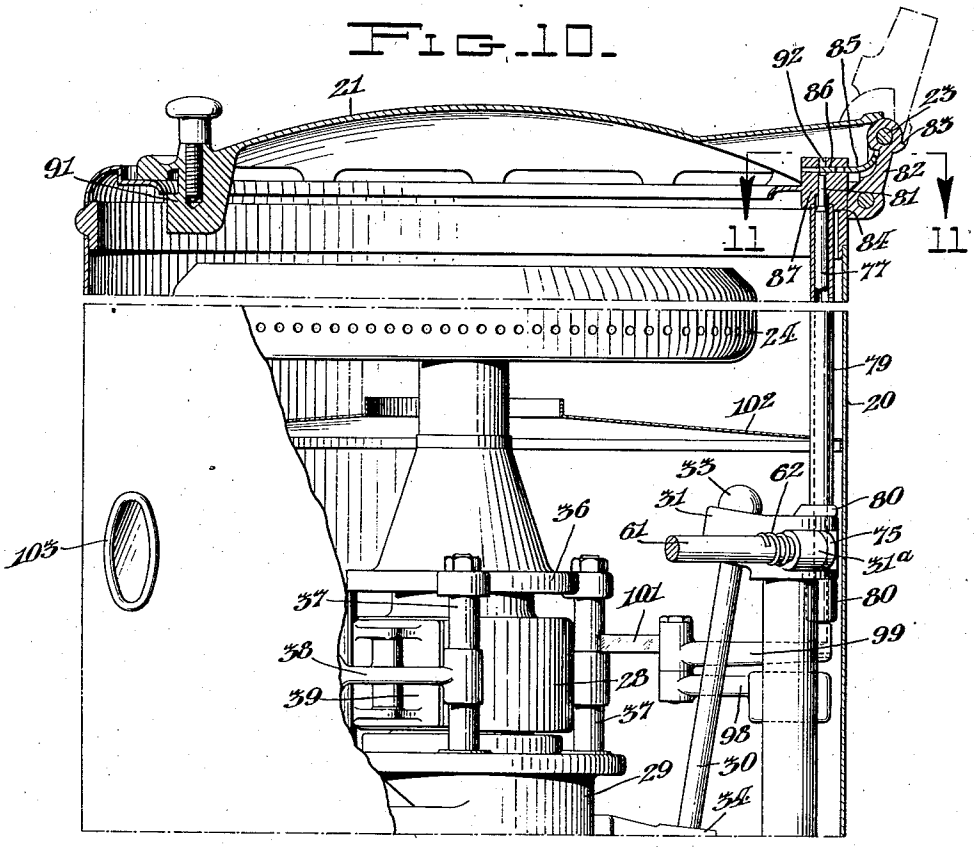
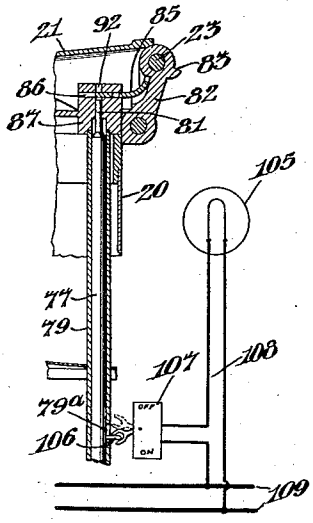


Fig. 12.



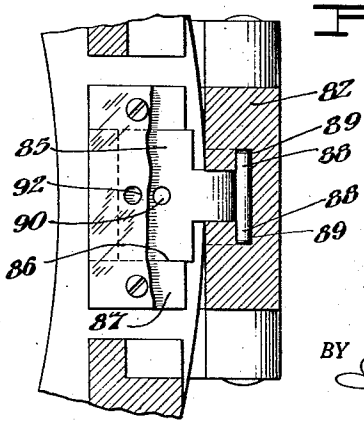


Fig. 11.

INVENTOR:
William H. Moyer,
BY Fred E. Schinger.
ATTORNEY.

Patented Dec. 31, 1935

2,026,510

UNITED STATES PATENT OFFICE

2,026,510

CENTRIFUGAL MACHINE AND THE LIKE

William H. Moyer, West Lawn, Pa., assignor to Textile Machine Works, Wyomissing, Pa., a corporation of Pennsylvania

Application April 26, 1934, Serial No. 722,412

10 Claims. (Cl. 210—72)

This invention relates generally to rotary and centrifugal machines, and particularly to safety mechanism for machines of the type disclosed in Meyer Patent No. 1,750,016, issued March 11, 1930, and in a pending application of Christian F. Meyer, Serial No. 476,360, filed August 19, 1930, which application is assigned to the assignee of the present application.

In machines of various types, having units or parts thereof rotating at high speeds, especially in centrifugal machines, such as hydro-extractors, accidents frequently occur, when the hands or clothing of the operator come into contact with the revolving parts, and it is therefore important to prevent access to the machine while the unit is revolving. Usually, such machines are completely encased in a suitable housing, and heretofore it has been proposed to maintain the cover of the housing locked while the driving power is being supplied to the machine. In the case of high-speed machines, however, the machine may continue to run for a considerable period of time after the power has been discontinued, and the risk of injury is present until the parts come to a full stop.

One of the objects of my invention is to provide novel means for maintaining the cover closure of the machine housing positively locked at all times, when the revolving unit is in motion, and to automatically release said locking means when the unit has come to a full stop.

Another object is to provide, in a machine of the foregoing character, an actuating member movable or oscillatable between two positions for controlling the condition of a device responsive thereto in accordance with the operating condition of the rotatable unit of the machine, the actuating member being operatively connected to the unit at predetermined times during the rotation thereof, and moved to said second position by the moment of rotation of the rotating unit, or the action created by the operative connection of the actuating member to the rotatable unit. Specifically, and by way of example only, a motor-driven centrifugal extractor has a rod member associated with the machine brake, and movable, from an unlocking position to a locking position, for locking the cover of the housing in which the machine is enclosed, the cover being locked by the rod when the unit is rotating, by reason of its momentum after the switch, which controls the current supply to the driving motor, has been opened. At this time, the brake engages the rotating unit, and the unit, by reason of its moment of rotation, exerts a torque on the brake, which action is transmitted to the rod member for moving it to locking position, in which position it is maintained until the rotating unit comes to a full stop, after which the rod member is returned to unlocking position.

A further object is to utilize, in a machine of the type disclosed in the above-mentioned patent and copending application, a displacing movement of the rotating unit relative to a fixed housing, which movement is the result of a torque developed by the reaction between the rotating unit and a member operatively associated therewith, such, for example, as the torque action set up by the application of a brake to the rotating unit, the displacing movement of the unit controlling a locking or other responsive means, and automatically causing the release or other operation of the responsive means by return of the unit, upon cessation of rotation thereof, to a position determined by its static axis.

A further object is to provide a brake mechanism coacting with the housing locking mechanism, whereby unlocking and opening of the housing closure member is prevented, when the operating parts are in motion, notwithstanding that the brake is applied, and unlocking of the locking mechanism is possible only when the operating parts have come to a full stop.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, my invention resides in the novel elements of construction, mechanisms, and combination of parts in cooperative relationship, as hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is a side elevation of a centrifugal drying machine embodying my invention, part of the casing being broken away to more clearly show the drying mechanism proper, and having certain other parts in section;

Fig. 2 is a sectional plan view taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary detail, in elevation, of latch mechanism for controlling the lock for the cover guard of the machine, looking in the direction of the arrows 3—3, Fig. 2, the machine housing having been removed;

Fig. 4 is a horizontal section, taken on the line 4—4 of Fig. 3, viewed in the direction of the arrows;

Fig. 5 is a sectional plan similar to Fig. 2, showing the several parts in another operating position;

Fig. 6 is a fragmentary detail in elevation, similar to Fig. 3, looking in the direction of the arrows 6—6 in Fig. 5, the housing having been removed;

Fig. 7 is a fragmentary detail taken on line 7—7 of Fig. 5;

Fig. 8 is a horizontal section, similar to Figs. 2 and 5, illustrating the several parts in another operative position;

Fig. 9 is a fragmentary detail view, in elevation, looking in the direction of the arrows 9—9, Fig. 8, the housing having been removed;

Fig. 10 is a view, in partial elevation, of the parts illustrated in Fig. 1, showing them in different positions;

Fig. 11 is an enlarged fragmentary sectional plan view taken on the line 11—11 of Fig. 10, and

Fig. 12 is a diagram of a modified form of the invention.

A practical application of my invention is to centrifugal extractors (shown in the present instance as of the portable type) used in dyehouses, laundries and homes for extracting water or other fluids from fabrics, during or after the process of dyeing or laundering.

Referring to the drawings, the machine, as shown, comprises a housing 20 of suitable design having a hinged safety cover or guard device 21, and a hinged mounting 23, and which cover, when raised, provides access to a container or basket 24 for receiving the fabrics to be dried, the container having its side walls perforated, as shown, to permit the passing therethrough of water or other fluid.

The container 24 is part of a gyrating unit, which further comprises a driven shaft 26, to which the basket is attached, a driving shaft 27, a centrifugal clutch mechanism 28, interposed between the driving and driven shafts, and attached to the former, and an electric driving motor 29, all suitably housed and suspended within the machine housing 20, by a plurality of rods 30 suspended from stationary supporting members 31. The rods are provided with universal bearings 33 and 35 at the upper and lower ends thereof, respectively, the lower ends carrying yielding pads 35*a*, of live rubber, cooperating with brackets 34 that are attached to the housing of the gyrating unit, the pads 35*a* absorbing or damping out vibrations set up in the gyrating unit.

The detail construction of the centrifugal clutch 28 is not illustrated in the drawings, but any clutch suitable for the purpose may be employed as, for example, the clutch disclosed in my Patent No. 1,910,352, issued May 23, 1933.

The gyrating unit is enclosed in a housing 36, on which are carried a pair of stanchions 37 providing pivots for arms 38. Each arm 38 has pivotally connected thereto, a brake shoe member 39 for engagement with the rotatable face of the clutch mechanism 28, and, when in the positions indicated in Figs. 2 and 5, to hold it against rotation. The arms 38 are conformingly curved about the housing, and the outer free ends thereof are disposed adjacent to each other at a position 43 substantially equidistant between the respective pivots 37.

The outer free ends of the arms are each provided with a roller 41 for coaction with the inclined faces 42*a*, Fig. 9, of a cam block 42 fixed to a vertically-reciprccable shaft 43. The shaft 43 is reciprocated in bearings 45, and cam 42 is maintained in a proper plane by a guide pin 44 fixed to the cam and slidable in the top bearing 45. Close to the outer free end of each of the arms 38, is an apertured lug 46, through which a guide rod 47 extends. The outer ends of this rod are provided with stops 48, and, mounted upon the rod 47 between the stops 46 and 48, are expansion springs 49 of equal strength. This structure forms an equalizing device, which tends to hold the rollers 41 in continuous contact with the faces 42*a* of the cam block 42.

Vertical movement of the shaft 43 causes the cam block 42 to either permit the arms 38, and therewith the brake shoes 39, to come closer together to stop the clutch housing 28 from rotating, or to move them apart, and permit the clutch to operate to rotate the container 24. The normal tendency of the springs 49 is to cause the cam block 42 and the shaft 43 to rise, thus facilitating application of the brake.

Mounted upon the housing wall 36 of the gyrating unit, is a pivot pin 51, upon which is mounted a lever 52. One end of the lever 52 has a yoke 53 embracing the vertically reciprocable shaft 43, and the yoke has a bifurcated portion 54 embracing a pin 55, which extends through the shaft 43. Turning the arm 52 in either direction imparts motion to the shaft 43 to operate the brake shoes 39. The opposite end of the arm 52 is provided with an open boss 56 providing a socket seat for the ball end 57*a* of a link rod 57. The opposite end of the rod 57 is provided with a ball 58 seated loosely in a socket on the outer free end of a rocker arm 59. The lower end of rod 57 is further provided with nuts for adjusting the rod relative to the arms 52 and 59.

Horizontally mounted in suitable bosses 31*a* fixed to supports 31, is a shaft 61 adapted to be turned in the direction of arrow A, Fig. 6, for starting the motor, this shaft being turnable in its bearings and normally urged in a direction opposite to that indicated by the arrow A, Fig. 6, by a coiled spring 62 surrounding it and having anchorage, at one end, in the fixed support 31*a* and, at its opposite end, in a lever 63 that is fixed to the shaft 61.

The lever 63 is the starting lever, which controls the clutch operation, and thereby, the rotation of the basket 24, and, when in the position, indicated in Figs. 6 and 7, is inoperative, the normal tendency of the spring 62 being to hold it thus. The lever 63 has attached thereto a suitable connection to an electric switch 64 whereby, when the lever is partially depressed, and prior to attaining its latched position, an electric circuit is completed to start the motor.

An auxiliary or stopping lever unit, in cooperation with the lever 63, comprises a frame support 65, supporting a short shaft 66, on one end of which is secured a lever 67, and, on the other end of which is secured a substantially bell crank structure 68, Fig. 7. A latch lever 69, secured to the shaft 66, is provided, at its upper free end, with an overhanging finger 70, which coacts with a lug portion 71 of the lever 63. A second lug portion 71*a* of the lever 63, limits the movement of lever 69 to prevent the finger 70 from moving out of the path of the lug 71.

The lever 67, the bell crank 68 and the latch lever 69 are all held in the positions shown in Fig. 7, by a spring 73, one end of which is attached to one arm of bell crank structure 68, and the other end of which is attached to a fixed stud on the stationary frame of the unit 65.

The shaft 61 extends beyond one of its supports 31*a*, on which extension it carries an arm 75 fixed thereto for movement with the shaft.

The outer free end 76 of the arm 75 is forked to embrace a vertically reciprocable shaft 77, the tines of which engage a pin 78 extending transversely through the shaft 77, as indicated in Fig. 6. Rocking motion, which is imparted to the shaft 61 through the lever 63, causes the arm 75 to engage the pin 78, and to thereby move the shaft 77 upwardly. The shaft 77 is maintained in its vertical path by means of a fixed cylindrical guide 79, supported, at its lower end, by a bracket structure 80, and terminating, at its upper end, in a shoulder-and-pin structure 81, the function of which is, like that of the "slide rod 49" in said pending application, i. e., to lock the cover or guard 21 in its closed position.

The cover 21 is connected to the housing 20, by the hinge mounting 23, comprising a link member 82, the ends of which are pivotally connected, respectively, to the cover and to the housing, as shown in Figs. 1 and 10, to permit the cover to be shifted horizontally a limited distance, while closed, and swung into open position, as indicated by the dot-and-dash lines in Fig. 10. A projection 83, on the upper end of the link 82, serves as a stop for the cover, when the latter is in its raised or open position, and a flat face 84, on the lower end thereof, acts as a stop against the face of the housing 20, when the cover is shifted horizontally for unlatching.

A slide plate 85 is movably mounted in a guide slot 86 of a bearing member 87 (see Figs. 1 and 11) and connected, for movement with the link 82, by projections 88 fixed to the plate and extending into grooves 89 in the link 85. An aperture 90 is provided in the plate 85 for permitting the upper reduced end 81 of the shaft 77 to pass therethrough, when the cover 21 is in the properly closed position, as clearly illustrated in Fig. 1. In this position, a latch member 91, at the left-hand side of the cover 21, as viewed in Figs. 1 and 10, engages a flange portion of the housing 20, and prevents the cover from being raised to open position.

In order to open the cover, it is necessary to first permit the withdrawal of the pin 81 from the aperture 90 in the slide plate 85, and then shift the cover horizontally until the latch member 91 disengages the housing flange, before the cover can be raised for access to the container 24. In order that the pin 81 may be positively positioned in the aperture 90, an opening 92 is provided, in the bearing member 87, which extends entirely therethrough and permits the pin 81 to pass entirely through the aperture 90 and into the portion of the opening 92 above the sliding plate 85, thereby providing a positive lock against the shifting of the cover.

When the lever 63 is unlatched, and in its inoperative position, the shaft 77 will have dropped by its own weight to the position shown in Fig. 6. The bracket 80 further provides a slot 95 which cooperates with a pin 96, in the shaft 77, to insure proper alignment between the pin 78 and the fork 76.

The shaft 77 is free to be raised independently of the lever mechanism, above described, through the movement of a cam surface 100, Figs. 3 and 4, that is operated by a torsional movement of the gyrating unit, as the unit moves upon its supporting rods 30 under the influence of the braking action.

Referring to Figs. 2, 3, 4, 5, 6 and 8, a bracket 98 is attached to the same support that carries the bracket 80. The free end of the bracket 98 pivotally supports an arm 99, the outer free end of which carries the cam face 100 for cooperation with the lower end of rod 77. Fast to the arm 99, adjacent to its pivot, is a spring contact finger 101 projecting from the pivot substantially oppositely to the direction of projection of the arm 99 to a position normally opposite or engaging a portion of the gyrating unit support for movement thereby, as indicated in Fig. 8. Upon electrically disconnecting the motor and applying the brake shoes 39, the inertia of the basket causes torsional movement of the basket support against the spring finger 101. This action causes the arm 99 to move about its pivot, on the bracket 98, to thereby move the cam face 100 from the position, shown in Fig. 6, to the position, shown in Fig. 3, whereby the rod 77 is actuated, and the pin 81 is raised within the aperture 90 to lock the cover 21 in closed position.

As soon as the brake is applied, the resultant torque acts, as above indicated, to keep the cover locked, whereby access to the basket 24 cannot be had until it has come to a dead stop.

The bell crank structure 68, Fig. 7, operates to trip the latch lever 69 when the basket is unevenly loaded, or when the load shifts, to prevent excessive vibration, which is sometimes set up, and is objectionable not only in its noise but as detrimental to the life of the machine. The longer arm of the bell crank 68 is constructed and positioned to lie close to the face of the gyrating unit support, with sufficient clearance to avoid contact therewith under normal operation but to engage the same should excessive vibration occur, whereupon the shaft 66, upon which the arm is mounted, will be rocked to cause the latch lever 69 to move, to release the starting lever 63, and to operate electric switch 64, and thereby move the brake shoes to brake the clutch 28.

A drip shelf or trough 102 is arranged within the casing 20, beneath the container 24 and above the operating mechanisms, for catching the liquid as it is forced out of the fabric and through the perforations in the side wall of the container to an outlet 103 in the wall of the housing 20.

In operation, with the cover 21 raised, the fabrics to be dried are placed in the container 24. At this time, the vertical-shaft latching member 77 rests in its lowermost position and is blocked against upward movement by the slide plate 85 of the hinge structure 23. The lower end of the shaft 77 occupies the position, as illustrated in Fig. 6, and the pin 78 cooperates with the forked end 76 of the lever 75 to hold the shaft 61, and to thereby hold the starting lever 63 in inoperative position, in which the brake shoes 39 are in holding engagement with the drum of the clutch mechanism 28, and rotation of the container 24 is prevented (see Fig. 5). Manipulation of the starting lever 63, at this time, is thus obstructed, and rotation of the container 24 rendered impossible.

When the container has been loaded, the cover is lowered and drawn into the latched position, shown in Fig. 1, at which time the openings 90 and 92 are aligned to permit the free passage of the restricted upper end 81 of shaft 77.

With the machine thus ready for power application, the lever 63 is depressed to engage the notch 72 in the lever 69, during which lowering movement and prior to latching in the notch, it engages the arm of the electric switch 64, thereby closing the circuit of the motor 29. The motor drive shaft 27 rotates to turn the attached elements of the centrifugal clutch 28, which, when

sufficient momentum is obtained, grips the inner walls of that portion of the clutch attached to the driven shaft 26.

When the lever 63 is depressed to the limit of its movement, against the action of spring 62, it rocks the shaft 61, and the lug 71 is then engaged, and held in the notch 72 of lever 69. Movement of shaft 61 has a dual result. The arm 75, at one end of the shaft, engages the pin 78 in the latching shaft 77 to lift the latter and cause its restricted upper end 81 to enter the aligned openings 90 and 92 of the hinge structure 23 of cover 21, thereby locking the shaft 77 in its latched position. At the same time, the arm 59, at the opposite end of the shaft 61, is raised (see Figs. 8 and 9) to exert a pull on the rod 57, thereby rocking the arm 52 on its pivot 51 and, through the connection with the shaft 43, causing the latter to move downwardly to lower the cam block 42. This action moves the arms 38, and moves the brake shoes 39 away from the drum of the clutch mechanism 28, against the action of the springs 49, to release the brakes.

With the brakes released, the centrifugal clutch 28 imparts motion to the driven shaft 26, and to the container 24 to expel the liquid from the fabric.

Gyrating motion of the unit causes it to gradually depart from its static axis, and as the maximum speed is approached to seek a balance about a definite dynamic axis, which is maintained throughout the normal operation of the unit.

The relative positions assumed by the various parts when the brakes are first applied, and prior to the cessation of rotation of the container, and the resultant position of the supporting rods 30 and other elements are illustrated in Fig. 2.

The spring finger 101, that is supported from one of the relatively fixed elements is moved at this time by the torque action causing the arm 99 to swing on its pivot, and carry its cam face 100 into contact with the bottom of locking shaft 77, (see Fig. 3), thereby holding the upper end of the shaft in position in the openings 90 and 92 to prevent unlatching of the cover 21.

Assuming the unit in operation, when the switch is opened, to stop the unit, the brakes are instantaneously applied to the centrifugal unit. By reason of the moment of rotation of the centrifugal unit when the brakes are applied, a reaction occurs between the centrifugal unit and its stationary support through the flexible mounting such that the mounting is rotated, in a clockwise direction, as viewed in Fig. 2, to the position there shown, which action through the cam face 100 actuates and maintains the shaft 77 in locking position, which position is maintained until the centrifugal unit comes to a dead stop, at which time the flexible mounting and the centrifugal unit return to their normal static positions (Fig. 5), and the pressure on the spring finger 101 is released. The weight of the rod 77 causes it to act against the cam face 100 on the arm 99 and, as the spring finger 101 releases its pressure on the latter, the arm moves away, causing the rod 77 to slide down the cam face 100, and out of the aperture 90 in the slide plate 85. The several parts then have relative positions, as indicated in Fig. 6. With the rotations of the basket completely stopped, the restricted portion 81 has automatically disengaged the slide plate 85, and it is possible to slide the cover laterally from its latched position, in order that it may be raised to its open position, indicated in Fig. 10. Access to the open top of container 24 is now possible for the removal of the treated fabrics, and releading the container for a subsequent operation.

If during the rotation of the container, excessive vibrations be set up, by the shifting of the load therein, from initial faulty loading, or from other cause, the gyrating unit will engage and move the bell crank lever 68, to cause it to rock the shaft 66, thereby moving the arm 69 to release the starting lever 63, to interrupt the motor circuit, and to apply the brakes, thus causing the machine to stop.

The bell crank lever 68 operates in unison with the release lever 67, since both are fixedly mounted on the shaft 66, and the crank is held in normal position by the spring 73. Movement of the crank in the opposite direction is limited by engagement of the lever 68 with the stop 71 (see Fig. 7).

Whether the machine is stopped by vibration, or by manual manipulation, the torque action of the gyrating unit is the same, and the cover 21 may not be opened, by reason of the actions of the finger 101, the arm 99 and cam face 100, which act upon the vertical latching shaft 77, to maintain it in its raised, locked position until the basket 24 has come to a complete stop.

As indicated in Fig. 12, the movement of the shaft 77 may be utilized to operate any other suitable safety device, control means or indicator, such as a lamp 105, by suitable means such as a pin 106 projecting laterally from the shaft, thru a slotted portion 79a of the guide member 79, and cooperating with an electric switch 107 controlling a circuit 108 for the lamp, energized from a source of current supply 109, in accordance with the operation of the device as above set forth. Preferably, and as shown, when the shaft 77 is in unlocking position, the lamp is lighted, thus indicating that the centrifugal unit has come to a complete stop, at which time the cover 21 may be opened.

Of course, the improvements specifically shown and described, by which I obtain the above results, can be changed and modified in various ways without departing from the scope of the invention herein disclosed and hereinafter claimed.

I claim:

1. A centrifuge comprising a housing, a basket therein, a cover for the housing, means for locking the cover, a motor for rotating the basket, elements for mounting the basket to shift laterally of its rotative axis, by which shifting movement it may move between positions of static and dynamic balance, and means responsive to a predetermined degree of said shifting movement of the basket for controlling the motor and releasing the locking means.

2. In combination, a rotatable unit, driving means therefor, elements for mounting the unit to have movement other than movement about a fixed axis, a safety device for the unit, means for braking the rotative movement of the unit, means for preventing operation of the unit when the safety device is inoperative, said means providing for operation of the unit when the safety device is operating and said last means maintaining the safety device in operation when the unit is being driven, and resilient means responsive to operation of said braking means to maintain the safety device in operation after the drive is discontinued from the unit and until the unit has come substantially to rest.

3. In combination, a rotatable unit, actuating means therefor, a safety device for the unit, ele-

ments for mounting the unit to have movement other than about a fixed axis, means for preventing operation of the unit when the safety device is inoperative, said preventing means providing for operation of the unit when the safety device is operating and said last means maintaining the safety device in operation when the unit is being actuated, and means responsive to said other movement of the unit to maintain the safety device in operation after discontinuance of actuation of the unit by said actuating means and until the unit has come substantially to rest, said last means being operable independently of said preventing means.

4. In combination, a rotatable unit, driving means, a safety device for the unit, elements for mounting the unit to have movement other than movement about a fixed axis, means for preventing operation of the unit when the safety device is inoperative, said preventing means providing for operation of the unit when the safety device is operating and said last means maintaining the safety device in operation when the unit is being driven, and means including an element movable by the unit for maintaining the safety device in operation after discontinuance of operation of the unit by said driving means and until the unit has come substantially to rest.

5. In combination, a rotatable unit, driving and safety elements for the unit, means for mounting the unit to have movement other than rotative movement about a fixed axis, means for preventing rotation of the unit when the safety element is inoperative, said preventing means providing for operation of the unit when the safety element is operating and maintaining the safety element in operation when the unit is being driven, means responsive to said other movement for controlling one of said elements, and resilient means operative after the drive is discontinued from the unit to maintain the safety element in operation and until the unit has come substantially to rest.

6. In combination, a rotatable unit, driving means, a safety device for the unit, elements for mounting the unit to shift laterally of its axis, by which movement it may move between positions of static and dynamic balance, a brake for the unit, means for preventing operation of the unit when the safety device is inoperative, said means providing for operation of the unit when the safety device is operating and maintaining the safety device in operation when the unit is operating, means responsive to a predetermined degree of said shifting movement of the unit adapted to provide a supplemental control for the safety device, and resilient means responsive to operation of the brake and cooperative with said last means to maintain the safety device in operation after the discontinuance of the unit drive and until the unit has come substantially to rest.

7. In combination, in a centrifuge, a housing, a unit including a support shiftably mounted in the housing and carrying a motor, a motor-driven load element, a brake element rotatable with the load element and a brake shoe on said support, a cover for the housing, a lock on the housing for the cover, control means operable when the cover is closed to energize and deenergize the motor, said control means operating to apply the brake shoe to said brake element when the motor is deenergized to cause shifting movement of said unit, and mechanism operating between the lock and the control means for biasing the lock to locking position when the motor is energized and between the lock and said unit to bias the lock to locking position in response to said shifting movement.

8. In combination, in a centrifuge, a structure including a main base and a housing, a unit in the housing comprising a support floatingly mounted on the base by suspended rods spaced about the vertical axis of the housing and connected between the main base and the unit support, said unit comprising a rotary element on said support including a motor, a motor-operated load member and a brake member, a cooperating brake element on the unit support, a cover for the housing, a latch for holding the cover to the housing, means for mounting the cover on the housing to have opening and closing movement relative thereto and having shifting movement relative thereto to release said latch, a lock element movable with the opening and closing movements of the cover, a lock rod for locking cooperation with said lock element when the cover is closed, a motor switch, operating means for closing the switch and moving the lock rod to locking position, a lock-control device operating between the lock rod and a portion of said unit, and means for opening the switch and applying the brakes, causing floating movement of said unit support affecting said brake-control device to bias the brake rod to locking position and to maintain the rod in locking position until the load member has come to rest.

9. In combination, a housing, a cover therefor, a hinge for pivotally mounting said cover on said housing, a rotatable unit in the housing, a drive motor for the unit, a brake for the unit, means operable upon relative pivotal conditions of said hinge for preventing operation of the unit when the cover is open, means associated with said first means providing for the operation of the unit when the cover is closed, said several means cooperating to lock said cover closed when said unit is being driven, and additional means responsive to the operation of the brake while the unit is rotating for maintaining the cover in locked condition.

10. In combination, a rotatable unit, driving means therefor, a safety device, a brake for the unit, means for preventing operation of the unit when the safety device is inoperative, said preventing means providing for operation of the unit when the safety device is operating, and said means maintaining the safety device in operation during operation of the unit, and means responsive to operation of the brake while the unit is rotating for controlling the operation of said safety device independently of said preventing means.

WILLIAM H. MOYER.