Oct. 1, 1957 A. H. GERHARDT ET AL 2,807,951

WASHING MACHINE DRIVE MECHANISM

Filed Sept. 14, 1951 5 Sheets-Sheet 1

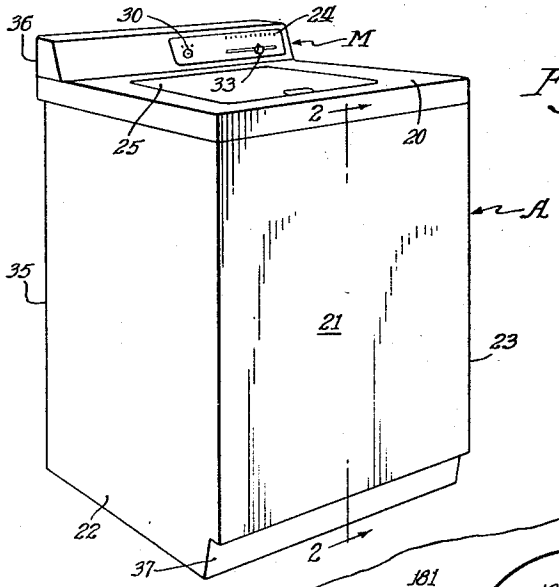


Fig. 1

Fig. 5

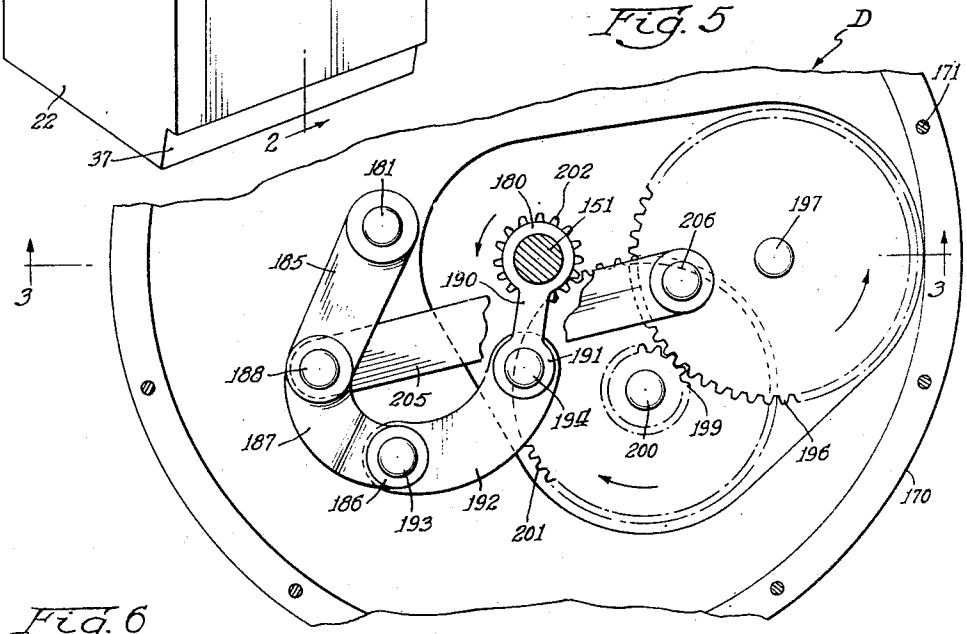
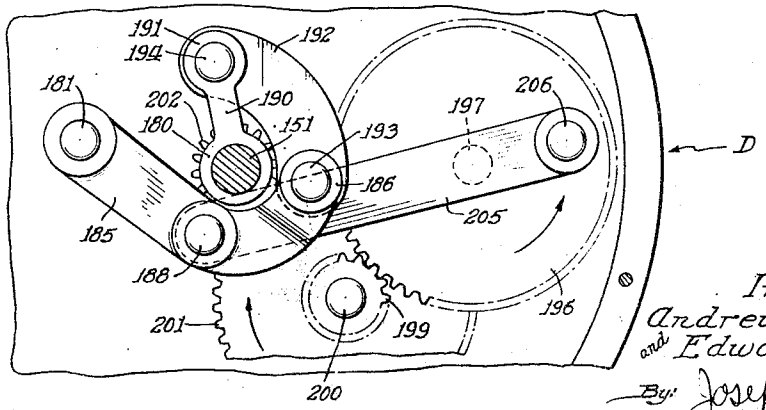


Fig. 6



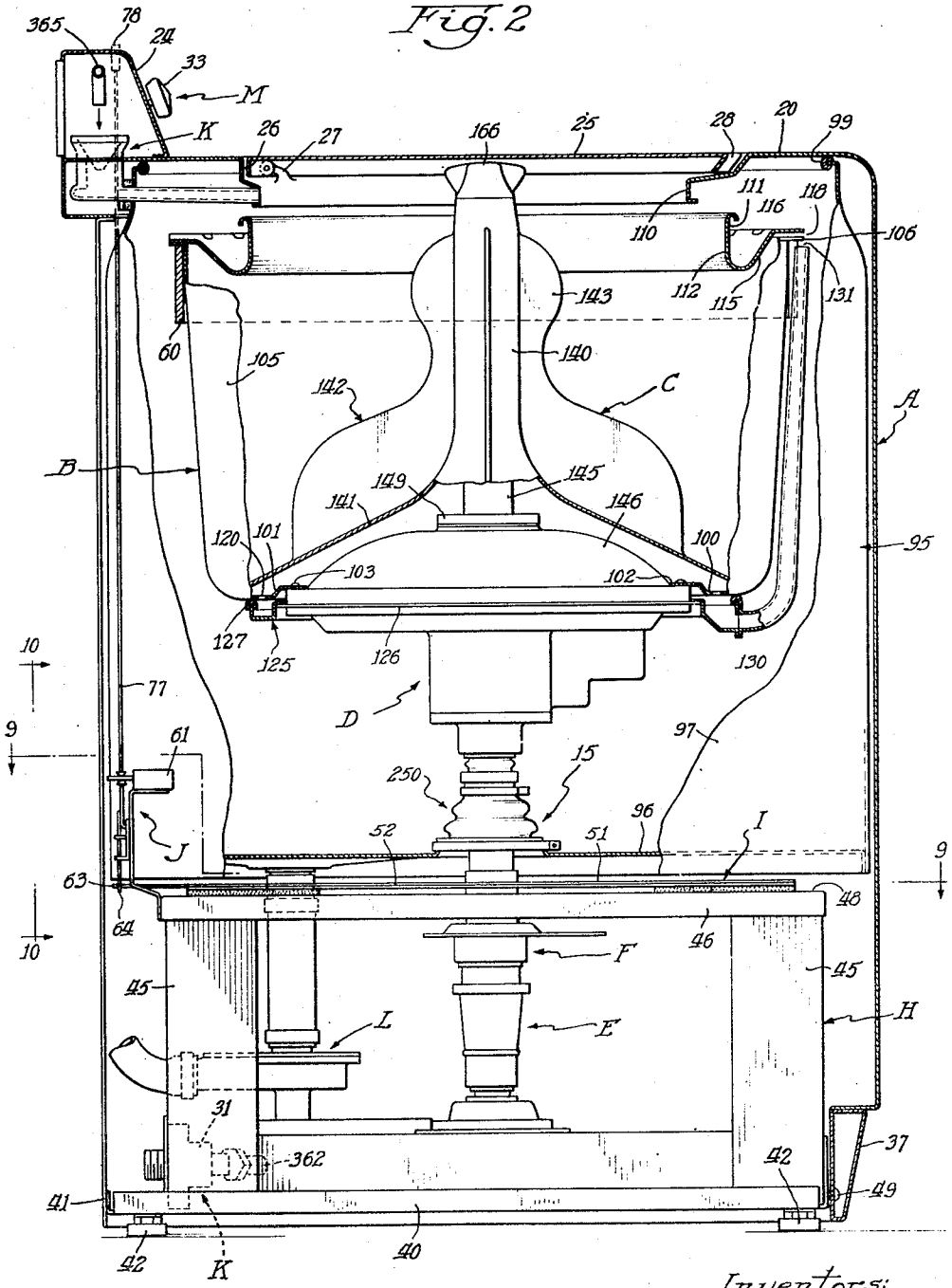
Inventors:
Andrew H. Gerhardt
and Edward J. Frey
By: Joseph M. Gartner
Atty.

Oct. 1, 1957 A. H. GERHARDT ET AL 2,807,951

WASHING MACHINE DRIVE MECHANISM

Filed Sept. 14, 1951 5 Sheets-Sheet 2

Fig. 2



Inventors:
Andrew H. Gerhardt
and Edward J. Frey
By: Joseph M. Gartner
Atty.

Oct. 1, 1957 A. H. GERHARDT ET AL 2,807,951

WASHING MACHINE DRIVE MECHANISM

Filed Sept. 14, 1951 5 Sheets-Sheet 3

Fig. 3

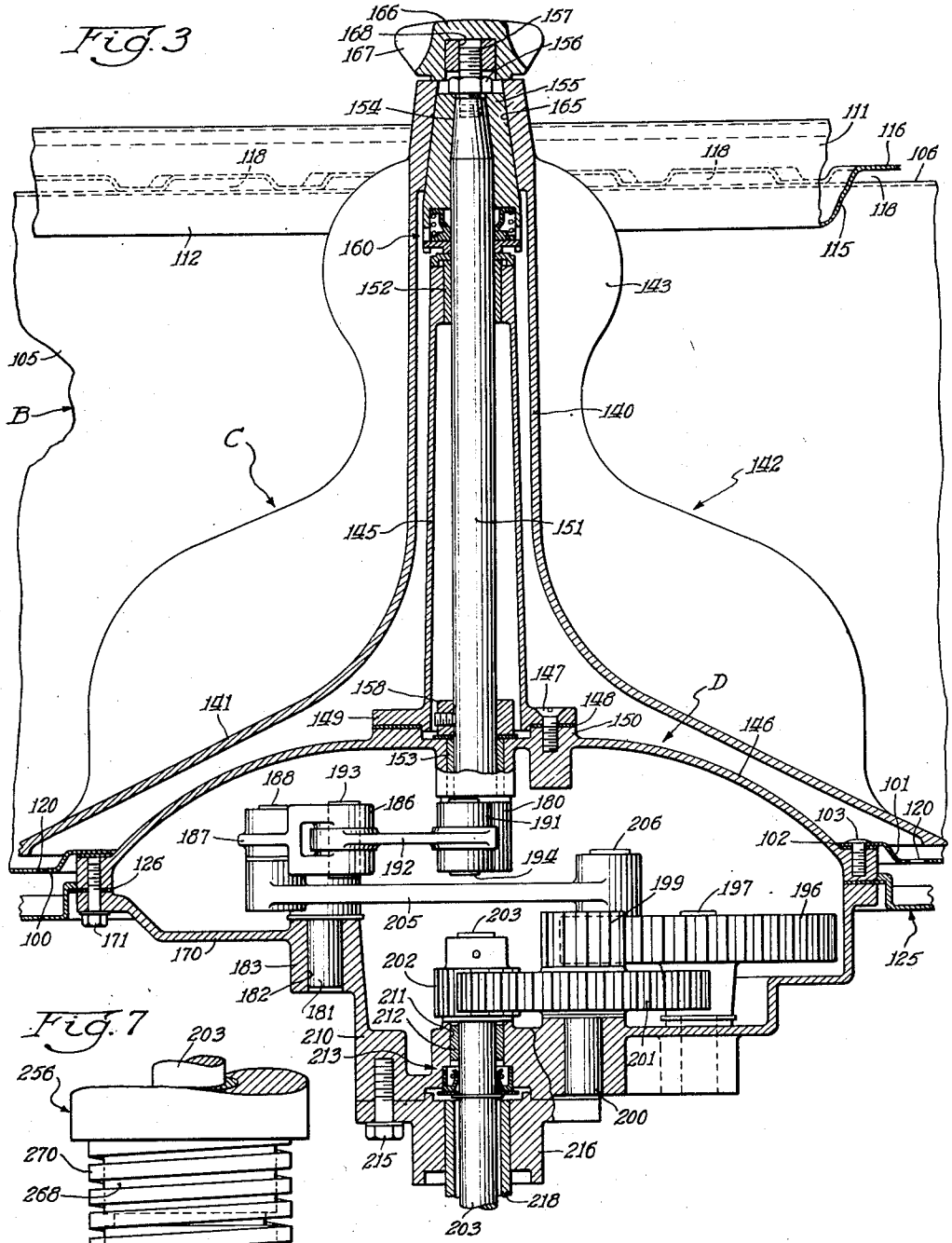


Fig. 7

Inventors:
Andrew H. Gerhardt
and Edward J. Frey
By: Joseph M. Gartner
Atty.

Oct. 1, 1957 A. H. GERHARDT ET AL 2,807,951

WASHING MACHINE DRIVE MECHANISM

Filed Sept. 14, 1951 5 Sheets-Sheet 4

Fig. 4

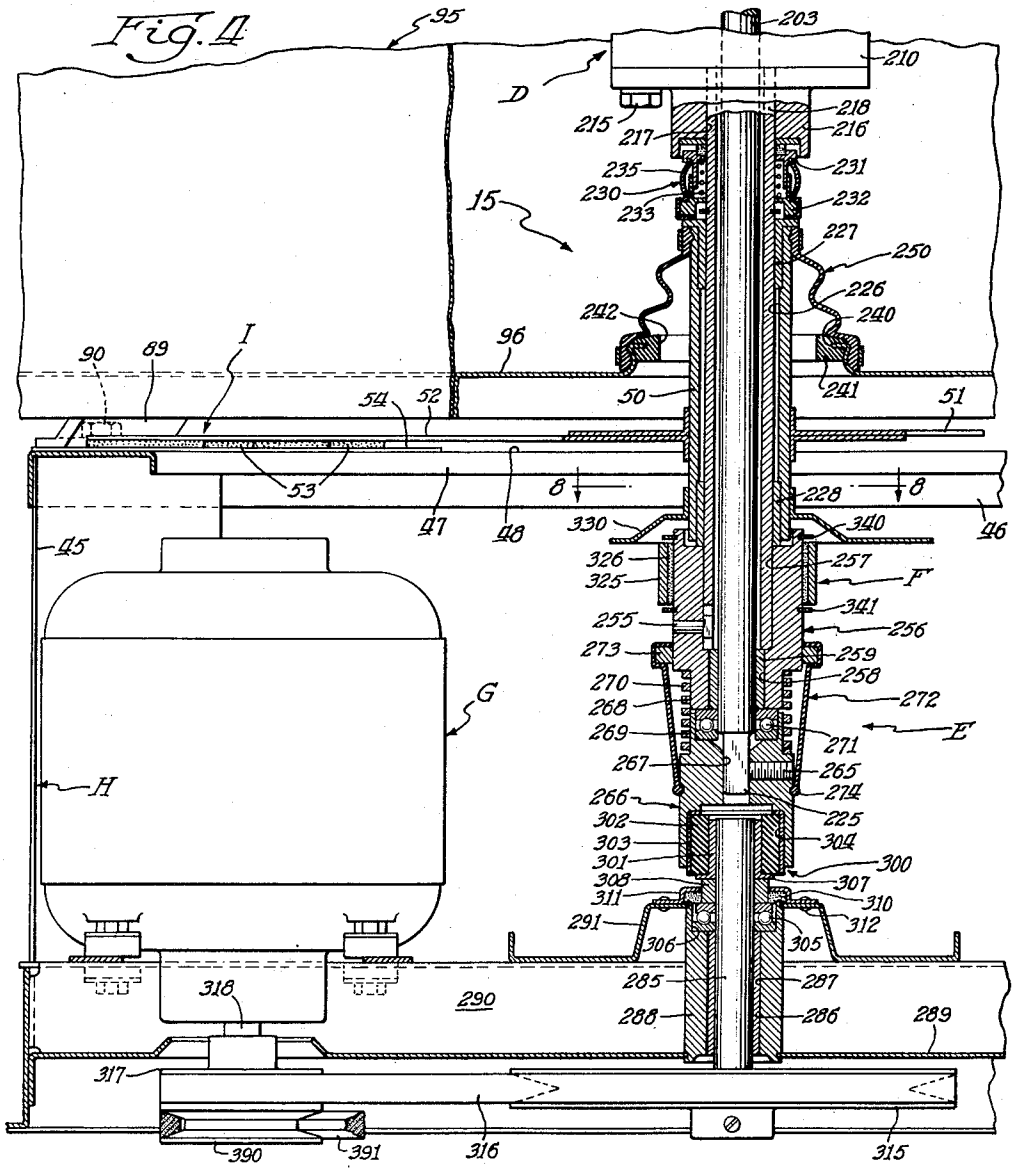
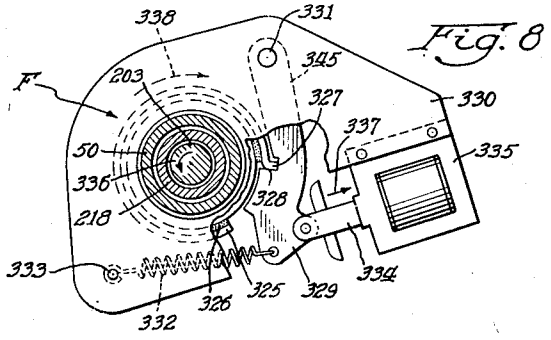


Fig. 8



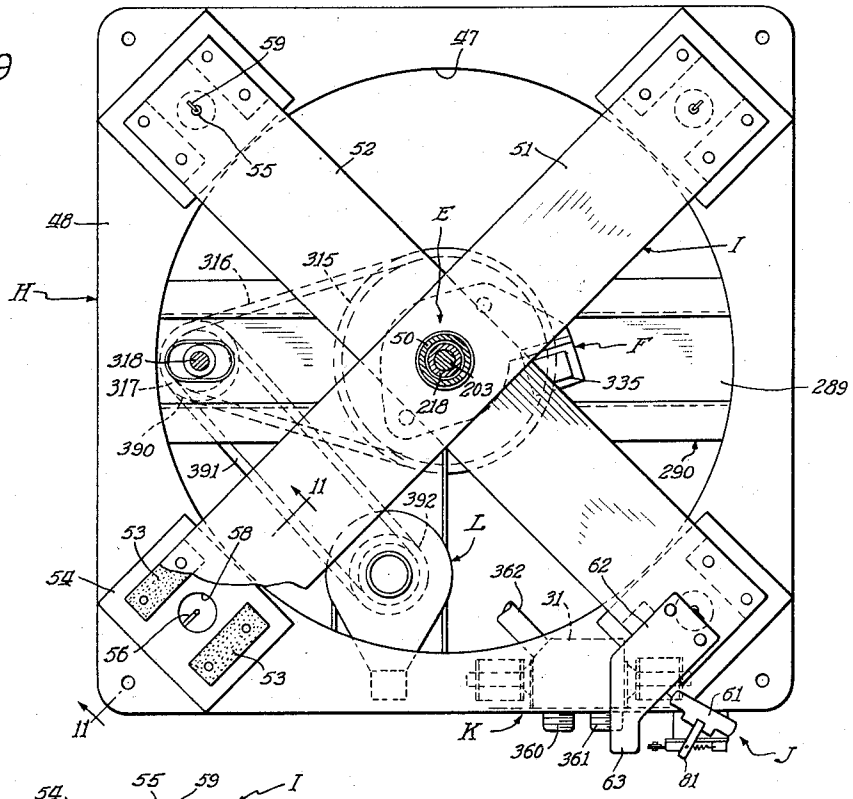
Inventors:
Andrew H. Gerhardt
and Edward J. Frey
By: Joseph M. Gartner
Atty.

Oct. 1, 1957 A. H. GERHARDT ET AL 2,807,951

WASHING MACHINE DRIVE MECHANISM

Filed Sept. 14, 1951 5 Sheets-Sheet 5

Fig. 9



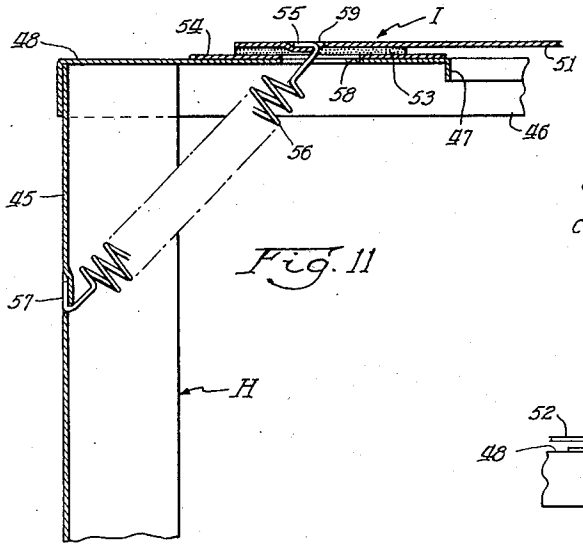
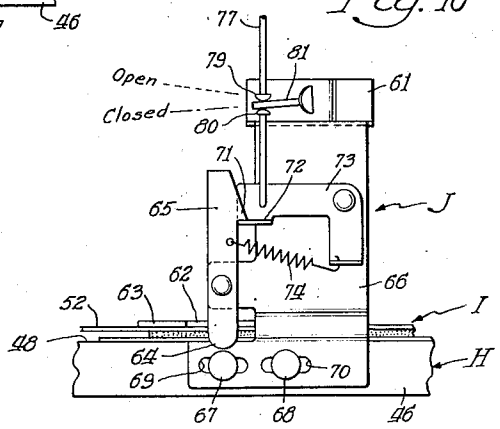


Fig. 11

Fig. 10



Inventors:
Andrew H. Gerhardt
and Edward J. Frey
By: Joseph M. Gartner
Atty.

United States Patent Office

2,807,951

Patented Oct. 1, 1957

2,807,951

WASHING MACHINE DRIVE MECHANISM

Andrew H. Gerhardt and Edward J. Frey, Herrin, Ill., assignors to Borg-Warner Corporation, Chicago, Ill., a corporation of Illinois

Application September 14, 1951, Serial No. 246,604

10 Claims. (Cl. 68—23)

This invention relates, in general, to improvements in washing machines and is particularly concerned with a drive mechanism especially adapted to washing machines for both washing and drying of textile fabrics.

Otherwise stated, the instant invention is concerned with a drive mechanism adapted for advantageous incorporation in a domestic or household washing machine of the character completely disclosed in our co-pending patent application, Serial No. 246,601, filed September 14, 1951, and entitled "Washing Machine," now abandoned, and which is designed for effective operation in the washing, rinsing and water extraction of clothing or other articles to be cleansed.

More specifically stated, this invention is embodied in a drive mechanism incorporated in an automatic clothes washing machine of the combination washer and extractor type wherein water is centrifugally extracted from the clothes in the same tub in which they are washed.

Automatic washing machines in which the drive mechanism contemplated by this invention may advantageously be employed embody the features prevalent in the general class wherein an oscillatable agitator is mounted with the basket for performing the washing operation upon the clothes, and wherein the basket in which the clothes are washed may be subsequently caused to rotate at a relatively high rate (600 to 615 R. P. M.) of speed, about an upright axis, for the purpose of extracting the water from the clothes. Machines of this type may also be constructed and arranged so as to permit performing a rinsing operation upon the clothes as part of a series of sequential operations, which by way of example, may be as follows: first filling the tub with water, then rinsing the clothes, then performing a water extracting operation upon the clothes, then performing one or more rinsing operations upon the clothes, and finally a water extracting operation upon the clothes.

Such machines may be constructed so as to perform the separate operations by manually operable controls, or wherein the operations are caused to be partially or completely performed automatically in a cyclic manner.

It is the primary purpose of such apparatus as that to which the present invention pertains to reduce the burdensomeness of laundry or cleaning processes and to obviate the necessity of constant attention on the part of the operator to the apparatus in the course of its operation. The machine is entirely automatic to the extent that the operator is enabled to set the controls therefor to instigate the filling and washing operation, leave the same and return at a later period with the clothing or the articles to be cleansed, completely washed, rinsed, and the water extracted from the clothes to leave the same in a semi-dry state.

Accordingly, it is an important object and accomplishment of the invention to provide a drive mechanism for a basket and agitator of a machine of the character indicated, wherein said mechanism is constructed and arranged as to lend itself to advantageous and convenient control by a suitable timing mechanism for performing washing operations in a cyclic manner.

Although the invention contemplates a completely automatic washing machine, it is another important object and accomplishment of the invention to provide a washing machine of the above character but also lending itself to advantageous and convenient manual control for selectively performing the various washing operations as desired by the operator.

In order to advantageously facilitate the aforementioned purposes and objects, it is an important feature of the invention to provide an improved drive mechanism for a machine of the character indicated, adapted to be driven by an electric motor, and where rotation of the motor in one direction causes oscillation of the agitator, and wherein rotation of the motor in the opposite direction causes rotation of the basket for performing a water extracting operation upon the clothes.

A feature of the invention is the provision of a washing machine of the spinner-extraction type which does not require bolting down and imparts smooth and quiet operating characteristics.

Difficulties in balancing the baskets of centrifugal extractors are caused primarily by the load being out of balance; that is to say, the center of mass of the rotating body does not coincide with the geometric axis of rotation. The machine, therefore, tends to rotate about its center of mass, generating a couple and tends to gyrate the entire machine about the said center of mass and causes the well-known vibration.

In general, two main methods have heretofore been proposed to overcome this serious problem. One method is to balance the basket itself in such a way as to overcome or minimize the effect of the unbalanced load. The second method is to accept the unbalanced condition of the basket and so construct the machine so as to permit the basket to rotate about its center of mass with a minimum of disturbance.

An example of the first and general method of overcoming vibration heretofore proposed is the use of a heavy basket or heavy balanced rings to provide a flywheel effect so that any unbalance due to uneven distribution of the clothes will be small compared to the mass of the balanced flywheel. Other examples involve movable balance devices including various liquid arrangements wherein the liquid shifts under centrifugal force to correct the unbalance.

An example of the second method of overcoming unbalance heretofore employed is the use of a flexible mounting between the rotating basket and the frame of the machine whereby the basket can rotate about its own center of mass without disturbing the rest of the machine. Another example is to permit the entire machine to dance or gyrate around the floor, flexible legs or caster cups being provided to limit the amount of dancing or gyration.

In this regard the present invention embodies features overcoming the deficiencies of the aforementioned methods in overcoming unbalanced conditions and constitutes an improvement over both of the general methods above mentioned by the provision of a balancing means associated with the basket of the machine and so arranged to cooperate with mechanical means and the drive mechanism contemplated by this invention so as to be effective to stop and overcome any undue unbalanced conditions.

Since the present invention relates to washing machines and like apparatus in general utilizing relatively high speed tubs or baskets paraticularly in the water extraction cycle thereof, there is provided a novel drive mechanism especially arranged to cooperate with a means for counterbalancing off center and unbalance loads which product vibration and structural strains which are both troublesome and annoying. Moreover, the combination

of structural elements of both the driving mechanism and counterbalancing means contemplated by this invention and arranged for cooperative effort therebetween facilitating advantageous adaptation thereof for relatively high speed rotation carrying mixed loads including fluids and wherein, because of the inherent characteristics of such fluids, the loads are capable of shifting to cause an unbalanced relationship introducing offset inertia stresses which introduce the unwanted vibration.

Accordingly, one of the main objects, therefore, is to provide a washing machine, preferably of the automatic cycle type having a high speed rotating tub or basket adapted for water extraction during a certain period of the cycle, and said washer having incorporated therein a drive mechanism having in itself a unique association of elements effective to provide an improved drive for both the agitation and extractor cycles and yet cooperating to particular advantage with mechanical means associated with the spinning basket to reduce the vibration in the main frame and cabinet of the machine to a minimum under loaded conditions during acceleration, full spinning speed, and during deceleration.

In this connection, it is an important feature of the invention to provide a means which is capable of counterbalancing varying off center loads up to the capacity of the load handled by the tub or basket of any type of spinner regardless of the kind of apparatus used for agitation or whether such apparatus is present or not.

The invention seeks to employ a novel disposition of the elements of the drive mechanism contemplated herein to cooperate with other mechanical means of the counterbalancing mechanism thereby adding substantially nothing to the total weight of the machine considering the entire weight of the unit as a whole in contrast to the addition of heavy weights and the like heretofore employed to accomplish the same purpose. With the means employed, the load on the motor and the unit is less during the acceleration of the rotating tub or basket in contrast with the use of the heavy balancing rings employed in some washers, and also the load upon the braking mechanism to slow down and stop the spinning tub or basket is also considerably less in that the rotational inertia is not as great in the present light-weight construction as it would be in machines using heavy rings or other additional shiftable weights for counterbalancing purposes. All this tends to reduce the time cycle since the acceleration to spinning speed is accomplished in less time and the deceleration of the rotating mechanism from spinning speed to a full stop is also accomplished in less time reducing this portion of the time cycle.

Another important feature of the present invention and forming a part of the drive mechanism contemplated herein and effectively cooperating with the hereinbefore described counterbalancing mechanism is to mount the basket structure upon a rotating shaft which is vertically disposed in suitable bearings of resilient types that will permit the shaft to wobble or move through a predetermined orbit.

Cooperating with the drive mechanism contemplated herein and in addition to the weight disposition there is provided a mechanical means forming a part of the counterbalancing device and including a snub mechanism which counteracts abrupt changes brought about through unbalanced loads to permit time for the balancing means to become thoroughly effective, said snubbing means operating to absorb energy to act effectively in counteracting any extreme orbital movements of the shaft and tub or basket.

Another important object and accomplishment of the invention is to provide an automatic washing machine which is economical to manufacture, simple to operate, substantially free from noise and vibration and yet rugged and reliable in use.

The present invention contemplates improvements in a mechanical movement for washing machines and the like by the provision of a drive mechanism and structure adapted to convert continuous driving motion into an oscillatory driven movement for agitation purposes.

In this connection, it is an object and accomplishment of this invention to provide a mechanism of the above character by which motion is transmitted from a continuously rotating member and is converted into oscillatory movement at a driven member, to thus oscillate a working part of the washing machine or other like mechanisms, together with control means for the oscillated parts.

Another object is to provide for a washing machine of the character hereinbefore described, a drive mechanism comprising a transmission which does not require the use of internal gear segments, gears and racks, shafts having special cranks formed thereon, or other complicated and expensive mechanical parts, but which is made up of parts simply and cheaply manufactured and assembled and adapted to be applied to and used with straight shafts to accomplish smooth, quiet and efficient operation to impart an oscillatory movement to an agitator or other driven member from a motor or other continuously rotating driving member.

A still further object and accomplishment of the invention is to so construct and mount the parts of the transmission so that long bearing surfaces are provided for all of the working elements, which bearings are set substantially in line in the direction of application of actuating forces, thus minimizing the possibility of strain or breakage of parts through overloading and substantially uneven or extensive wear of the parts through use.

Yet another object is to construct, arrange and mount the parts of the improved transmission so that the weight of the elements of the transmission can not only be employed in conjunction with counterbalancing of the spinner basket but also so that all operated portions and bearings of the transmission can be readily and efficiently housed within a casing to thus be packed in grease or operated in oil, further contributing to the long life and smooth and quiet operation of the mechanism.

An ancillary object and accomplishment of the invention is to provide a new and improved washing machine having incorporated therein an improved drive mechanism arranged not only to effectively accomplish efficient power transmission to agitate and to spin the basket but also arrange to cooperate with an improved gyration suppression control or counterbalancing means, all of which are adapted to be economically manufactured and which are so designed as to permit the manufacture and assembly thereof in accordance with present day large scale mass production manufacturing methods of construction and assembly.

The invention seeks, as a final object and accomplishment, to provide for an automatic washing machine of the character indicated an improved drive arrangement adapted for effective cooperation with a counterbalancing mechanism and which is particularly characterized by a design arrangement to more advantageously and satisfactorily perform the functions required of it and adapted to provide a compact unit which will successfully combine the factors of structural simplicity and durability and yet be economical to manufacture.

Additional objects, features and advantages of the invention disclosed herein will be apparent to persons skilled in the art after the construction and operation are understood from the within description.

It is preferred to accomplish the various objects of this invention and to practice the same in substantially the manner as hereinafter more fully described, and as more particularly pointed out in the appended claims.

Embodiments of the invention are illustrated in the accompanying drawings forming a part hereof and wherein:

Fig. 1 is an isometric view of the washing machine cabinet;

Fig. 2 is an elevational view of the washing machine depicted in Fig. 1 with parts thereof removed and shown in section to more clearly illustrate the construction thereof, this view being taken substantially on the plane of the line 2—2 in Fig. 1;

Fig. 3 is a sectional view of the agitator and transmission embodying the features of the present invention, this view being shown in section to more clearly illustrate the internal construction of the parts illustrated and being taken substantially on the plane of the line 3—3 in Fig. 5;

Fig. 4 is a sectional view of the drive mechanism embodying the features of the present invention;

Fig. 5 is a plan view of the transmission contemplated by this invention with the top cover housing removed to more clearly show the internal disposition of the parts thereof;

Fig. 6 is a fragmentary elevational view of a portion of the transmission depicted in Fig. 5 but showing the parts thereof moved to a different position;

Fig. 7 is an elevational view of the spring type clutch forming a part of the drive mechanism depicted in Fig. 4;

Fig. 8 is an elevational view of a brake mechanism effective to permit under certain conditions relative rotation of the agitator driving mechanism and the driving mechanism of the basket depicted in Fig. 2 and being taken substantially on the plane of the line 8—8 in Fig. 4;

Fig. 9 is a top plan view of the drive mechanism and gyration suppression means contemplated by this invention and being taken substantially on the plane of the line 9—9 in Fig. 2;

Fig. 10 is an enlarged elevational view of the gyration shut-off switch otherwise depicted in Figs. 2 and 9, this view being taken substantially on the plane of the line 10—10 in Fig. 2; and

Fig. 11 is an elevational view of a portion of the gyration suppression means and being taken substantially on the plane of the line 11—11 in Fig. 9.

The drawings are understood to be more or less of a schematic character for the purpose of illustrating and disclosing a typical or preferred form of the improvements contemplated herein and in the drawings like reference characters identify the same parts in the several views.

Attention is invited to the drawings, particularly Figs. 1, 2, 3 and 4, wherein the entire drive mechanism with which the present invention is particularly concerned is designated in its entirety by the numeral 15 and shown incorporated in a washing machine comprising, in general, the component part assemblies respectively indicated in their entirety by the letters A as follows: A cabinet A exemplifying the external appearance of the automatic washing, rinsing and water extracting machine as shown in Fig. 1 and being hereinafter referred to simply as a "washing machine"; a basket B of the centrifugal extracting type disposed within the cabinet A; an improved agitator C operatively disposed within the basket B and having as a part thereof the housing of the transmission forming a part of the drive mechanism 15, said housing being carried by the basket for rotation therewith when the basket is rotated for centrifugal water extracting operations and the bulk, mass and weight of which cooperates with a gyration suppression control means I which includes a control switch J; a reversable electric motor G to drive said agitator C and said basket B through the driving mechanism 15; a supporting structure H; water inlet and water drain assemblies respectively indicated as at K and L; and a sequential control M as disclosed in a co-pending patent application of Joseph M. Gartner, Serial Number 262,760, filed December 21, 1951, and entitled "Sequential Control," and which is adapted to regulate the operation of the various elements in proper sequence to perform the operations involving filling, washing, rinsing and water extraction.

Attention is directed to Fig. 1 wherein there is illustrated the cabinet A which houses the entire mechanism and control system therefor and which comprises a cover 20, a front panel 21, side panels respectively indicated at 22 and 23, and a control panel 24 forming a part of and projecting upwardly from the cover 20 as illustrated in Figs. 1 and 2.

In Figs. 1 and 2, it can be seen that the cover 20 is provided with a hinged lid 25 to form a closure member for an opening 26 through which clothes or other articles to be cleansed may be introduced to the machine. The hinged lid 25 is so disposed with respect to the opening 26 that it will be flush with the surface of the cover 20 when it is in its closed position. One or more metal straps 27 pivotally disposed in the mountings secured to the underside of the cover 20 serve to provide a hinged mounting for the lid 25 with respect to the cover 20. A depression formed in the surface of the hinged lid 25 provides access to a handgrip 28 disposed at one edge of the lid 25 opposite its hinged mounting.

On the left-hand side of the control panel 24 there is disposed a control switch 30 which provides a means for manually selectively presenting the operation of an automatic temperature control mixing valve 31 forming a part of the water inlet assembly K. This mixing valve 31, which will be described in greater detail hereinafter, serves to provide for the introduction of cleaning fluids, in this case, water, at a proper temperature to insure proper cleansing of the articles to be laundered.

On the right-hand side of the control panel 24 there is disposed a control knob 33 which provides a means for manually operating the sequential control M. The length of the washing cycle may be predetermined and set within certain limits by the manual adjustment of the control knob 33 in a manner to be described in detail hereinafter.

It is notable that both the control switch 30 and the control knob 33 are shown as being disposed on the panelled surface 24 so that they provide no obstruction to the operator in the introduction of the articles to be laundered to the machine, or their removal therefrom.

Particular attention is directed to Fig. 1 wherein there is clearly illustrated a recess 35 arranged adjacent the back portions of the washing machine cabinet, this recess being adaptable for convenient receipt of pipes, wiring cables and the like so that the rear portions 36 of the top of the cabinet may be positioned so as to be in engagement with a wall or the like to provide continuity when the washer is disposed in a kitchen and/or laundry cabinet arrangement and yet provide, by means of the recess 35, for accommodation of obstruction running horizontally along the wall which could be supply pipes and/or electrical conduits and the like.

A recessed toe plate 37 is provided in the lower front portions of the cabinet as shown. This also is to provide obvious advantages of utility and giving design considerations to uniformity when the washing machine is disposed in a kitchen and/or laundry cabinet arrangement.

Attention is now directed to Fig. 2 wherein there is clearly shown the structural support H which comprises a base formed of structural angle members as at 40 and 41 to define a substantially square box-like base having disposed in the four corners thereof suitable adjustable legs 42 adaptable to provide a levelling means for the washer when placed in operative position on a floor or the like, a super structure formed of bent steel elements 45 as shown with an encircling cover-like member 46 having a relatively large central aperture 47 and presenting a relatively flat working surface 48 upon which portions of the gyration suppression means I are operatively disposed.

It can be seen in Fig. 2 that the lower portions of the cabinet A are secured to and supported by the angle members 40 and 41 of the base by virtue of suitable securing means as at 49. Thus, it can be seen that the supporting structure H is a self-contained unit and is constructed so as to place the center of gravity in the lower portions of

the washing machine which is effective to provide advantageous stabilization of the washing machine in operation thereby to reduce noise and objectionable vibration to the minimum.

Disposed within the cabinet A and mounted on the supporting structure H, by virtue of a plurality of legs as at **89** and which are in engagement with and secured to portions of the working surface **48**, is a water-tight outer tub designated in its entirety by the numeral **95** (Fig. 2). It can be seen in Fig. 2 that the outer tub **95** comprises a bottom wall **96** and upstanding side walls as at **97** terminating in an open top **98** providing an annular opening, the periphery of which is disposed within the confines of the cabinet top **20** and the peripheral edge of which is provided with an annular shape seal **99** adapted to engage portions of the inside surface of the cover **20** in order to prevent water from splashing out of the tub **95** and between the outer surface of the tub **95** and the interior of the cabinet A.

Disposed within the tub **95** and arranged for relative rotation therebetween and spaced from the wall **97** of the tub **95**, there is provided the combination washing tub and water extracting basket B. As will best be seen in Fig. 2, the combination washing tub and water extracting basket comprises an imperforate bottom wall **100** having an annular offset **101** projecting inwardly of the tub and terminating in an annular inwardly projecting flange **102**, the periphery of which defines a centrally disposed annular opening.

Integrally formed with the cover **20** of the cabinet A and projecting inwardly thereof substantially coaxially with the geometrical axis of rotation of the tub B there is provided an annular flange **110** adapted to present a relatively smooth surface to define a throat through which the fabrics and other materials to be washed may be introduced to the combination washing tub and water extracting basket B without danger of the fingers of the operator being injured or caught between the adjacent operating parts of the washer.

In order to provide further for the advantageous insertion of the clothes into the combination washing tub and water extracting basket B there is provided an annular flange **111** defining an annular opening **112** forming a continuation of the aforementioned throat for the purpose of directing the passage of the clothes or other material to be washed into the combination washing tub and water extracting basket B to perform washing actions thereon. It it notable that the annular flange **111** is formed so that portions thereof will project downwardly within the confines of the combination tub and basket B to present an oblique wall **115** and thereafter terminate in an annular flange **116** which is formed to define a corrugated-like shape so as to provide between these corrugated formations a series of apertures as at **118** through which fluid may pass.

Obviously, the flanged throat element **111** may be suitably supported by any convenient means to the peripheral flange **106** of the combination washing tub and water extraction basket B. Moreover, it can be seen that the peripheral flange **106** and the corrugated like formations on the flange **116** forming therebetween a series of apertures **118** hereinbefore mentioned and through which water may pass into the outer tub **95** for retention or removal therefrom.

In operation, the rotation of the combination washing tub and water extracting basket B at extremely high speeds during the extraction operation will cause centrifugal forces to move the mass of water outwardly from the geometrical center of rotation and, by virtue of the inclined upstanding annular wall **105** of the combination washing tub and water extracting basket B, the water will tend to flow upwardly through the passage defined by the oblique wall **115** and the adjacent portion of the wall **105**, and thereafter, through the apertures **118** formed by the corrugated-like formations on the annular flange **116**, whereupon the water will be discharged into the confines of the outer tub **95** for disposal. It is important to understand centrifuge action of the basket B will empty the water disposed therein in a matter of a few seconds thus presenting a substantial saving of time in the wash cycle and yet performing a better job than prior art models employing time consuming pumping operations and the like.

One of the principal features of the washing machine is the provision of novel means associated with and forming a part of the combination washing tub and water extracting basket B for the purpose of completely emptying out the basket during the extracting cycle, thereby to prevent objectionable and undesirable scum and other foreign matter to remain in the basket B during subsequent operations in the washing cycle.

In centrifuge type extractors as contemplated by this invention it has been found that during the extracting operation the fabrics contained in the basket B, by virtue of their mass and bulk, will sometimes entrap water and other foreign material in the lower portions of the basket B thereby to prevent the desired removal of such entrapped water from the basket B which will cause an undesirable accumulation of sediment and other foreign matter. In this connection, it is notable that it is desirable to have this objectionable sediment and foreign matter removed to provide a clear rinsing cycle and prevent the sediment laden water from being strained through the fabrics being washed during any of the water extracting cycles.

In order to advantageously accomplish the removal of the entrapped objectionable scum containing fluid there is provided a series of apertures, as at **120**, disposed beneath the agitation in an annular array adjacent to the offset **101** of the bottom wall **100** of the basket B. Operatively disposed below the aforementioned series of apertures **120** there is provided an annular cup-shaped structure indicated in its entirety by the numeral **125** (Fig. 2) and being supported in the position as shown by welding portions thereof to a flange **126** being secured between the two plates forming the housing of the transmission D (see Fig. 3). An important feature in this construction is that the inner wall of the annular cup-shaped structure **125** has as its central axis the central axis of the tub while the outer wall thereof is eccentric and with the largest space being adjacent the conduit **130**. In order to provide a water-tight annular chamber disposed below the annular array of apertures **120**, there is provided a seal **127** carried by the cup-like structure **125** and adapted for engagement with outer portions of the bottom wall of the basket B.

Thus, it can be seen that the sediment contained water and other foreign matter may pass through the apertures **120** and into the annular cup-like structure **125** and by virtue of a centrifuge action similar to that hereinbefore described with respect to the emptying of the basket B, the sediment contained water will becaused to flow from the annular cup-shaped structure into the conduit **130** which extends upwardly adjacent the exterior of the wall **105** of the basket B and terminates with an open end **131** and through this conduit **130** and by virtue of the centrifuge action imparted by rotation of the basket B at relatively high speed, the sediment contained water will rise in the conduit **130** and be discharged from the open end **131** thereof and into the confines of the outer tub **95** for disposal with the other water being caused to be extracted from the inner portions of the tub B through apertures **118** formed of the corrugated shaped formations on the flange **116**.

It is well known that a relatively heavy mass or weight should be provided in the centrifuge operation of the basket B. In order to overcome normal unbalance conditions in the basket B caused by uneven distribution of the fabrics contained therein, it has been found desirable to provide centrifugal forces assisted by mass or weight to facilitate the rotation of the basket B coincident, as nearly as possible, with the normal geometrical axis of rotation.

In order to provide the necessary mass or weight, the weighted mass **60** is secured, by any conventional manner, to the exterior of the wall **105** of the basket B in the upper portions thereof adjacent the annular flange **106** (see Fig. 2). It is notable that this weighted mass **60** is of such character as to cooperate with the gyration suppression means I, hereinafter described, the cooperation of these elements being effective to overcome, in normal operations, any unbalanced conditions and cause the centrifuge or basket B to assume a position, during rotation thereof, coincident with the normal geometrical axis of rotation thereby to substantially minimize noise and vibration during operation of the washing machine, particularly during the spinning or extraction periods.

The invention contemplates the novel disposition of the housing of the transmission D as a part of the lower wall **100** of the basket B at the flange **102** by means of the bolts **103**. Thus, top plate **146** completes the enclosure of the opening in the basket B defined by the inner marginal edge of the flange **102**.

The agitator C comprises a central post **140** with the lower portions **141** formed to define an inverted funnel shape, said central post and said funnel shape portions **141** thereof having integrally formed therewith a plurality of vanes generally indicated as at **142**. Particular attention is directed to the unique shape of these vanes which have been found advantageous in providing an improved washing action. The fishtail segment **143** cooperating in its action with the remainder of the vane to promote highly desirable and advantageous agitation at the surface of the water, thereby to substantially increase the effects of agitation upon the water and the fabrics contained in the basket B.

In Fig. 3 it can be seen that the agitator C is supported for its operation by a hollow standard **145**, the lower portion of which is fixedly secured to the top cover plate **146** of the transmission D, this being accomplished by virtue of suitable screws as at **147**. A conventional seal **148** is disposed between the flange **149** of the standard **145** and the annular boss **150** of the cover plate **146**. Disposed within the standard **145** for relative rotation therebetween is a shaft **151**, the standard **145** in its upper portions being provided with a sleeve bearing **152** adapted to support the upper portions of the shaft **151**, and the cover plate **146** being provided with a sleeve bearing **153** adapted to support the lower portions of the shaft **151**. In Fig. 2 it can be seen that the top portions of the shaft **151** are tapered as at **154** in order to wedgingly engage a hexagonal shaped member **155** and is held in this wedged position by a double ended stud **156** having threaded formations **157** projecting outwardly from the upper portions of the shaft **151** as shown. Thus, it can be seen that the hexagonal shaped member **155** will rotate with the shaft **151** while portions of the standard **145** will be stationary. A thrust collar **158** is provided to prevent relative axial movement of the shaft **151**. In order to prevent water from passing up through the hollow portions of the central post **140** and into the confines of the standard **145**, there is disposed suitable seals **160**.

The central post **140**, in its upper portions thereof, being provided with a hexagonal bore **165** corresponding to and matching the hexagonal member **155**, will advantageously permit the agitator C to be supported thereby for rotation in unison therewith. A cap nut **166** having wings **167** and a central through bore **168** adapted to receive portions of the stud **157**, is provided to advantageously hold the agitator in its operative position. Thus, it can be seen, that by removing the cap nut **166** the agitator may be removed from its position on the hexagonal shaped member **155**, the removal of the agitator being for the purpose of repair or for convenient cleaning.

It is notable that the agitator C is mounted on the basket B, as hereinbefore described, for the purpose of imparting an oscillatory movement to accomplish advantageous agitation of the water and the fabrics contained in the basket B.

The cleaning of textiles is effected by a combination of the action of the detergent liquid through the pores or interstices of the fabrics, flexure of the fabrics caused by agitation and the chemical action of the detergent thereon as controlled by the strength and temperature of the detergent fluid. These several actions must be properly coordinated and must be limited so that they will not damage the fabrics, either by tearing or undue wear from violent agitation or by chemical action of the detergent thereon. It is further apparent that the treatment necessary to clean fabrics of different kinds and the violence of the permissible cleaning action vary substantially with the type and soil conditions of the fabrics.

The agitator C of the present invention has been given design considerations to provide proper flexure and agitation of the fabrics without danger thereto and to provide an improved washing action, this improved washing action being accomplished by the cooperative efforts of the fishtail-like segment **143** to cause advantageous and effective agitation at the surface of the water, and the balance of the vanes **142** to cause effective agitation of the water adjacent the central and lower portions of the basket B.

Attention is now directed to Figs. 2, 4 and 9 wherein there is clearly disclosed the structural support H which comprises a base formed of structural angle members as at **40** and **41** to define a substantially square box-like base having disposed at the four corners thereof suitable adjustable legs **42** adaptable to provide a leveling means for the washer when placed in operative position on a floor or the like, a super structure formed of bent steel elements **45** as shown with an encircling cover-like member **46** having a relatively large central aperture **47** and presenting a relatively flat working surface **48** upon which portions of the gyration suppression means I are operatively disposed.

It can be seen in Fig. 2 that the lower portions of the cabinet A are secured to and supported by the angle members **40** and **41** of the base by virtue of suitable securing means as at **49**. Thus, it can be seen that the supporting structure H is a self-contained unit and is constructed so as to place the center of gravity in the lower portions of the washing machine which is effective to provide advantageous stabilization of the washing machine in operation thereby to reduce noise and objectionable vibration to the minimum.

Particular attention is directed to Figs. 2, 4, 9 and 11 wherein there is illustrated specific details of construction of the gyration suppression means I forming an important feature of the present invention and which comprises an elongated stationary sleeve **50** (Fig. 4) which also forms a part of the driving mechanism E and whose function in this connection will be hereinafter described in detail, said sleeve **50** having fixedly secured thereto and extending outwardly therefrom a pair of arms **51** and **52** disposed in crisscross fashion as shown in Fig. 9 and formed of plate metal to impart a spring-like action to be hereinafter described in the operation of the device. In Fig. 9 it can be seen that the arms **51** and **52** extend in each direction from the center of the machine to the relatively flat working surface **48** forming a part of the support structure H. Since the outer end portions of the arms **51** and **52** are of similar construction, it is deemed sufficient for all intentions and purposes herein contained to describe only one of them. Accordingly, in Fig. 9 the outer end portion of the arm **51** comprises friction means **53** disposed on the underside of the arm and which may be formed of material similar to the conventional automotive brake lining, the friction means **53** being adapted for frictional sliding engagement with a plate **54** (Figs. 9 and 11) suitably secured to the working surface **48**.

Adjacent the end portions of the arm there is provided a recess **59** adapted to receive end portions **55** of a tension spring **56**, the other end **57** of which is secured as shown to the bent steel elements **45** forming a part of the supporting structure H. Of course, it can be seen in Fig. 11 that a suitable aperture **58** is provided in the plate **54** and the working surface **48** in order to accommodate the upper end portions of the spring **56** so that these portions may be in operative engagement with the arm **51**. It is notable that the aperture **58** should be of a size to permit relative movement of the arm **51** with respect to the plate **54**. A further function of the springs as at **56** is to provide a means for preventing rotary movement of the arms **51** and **52** and yet permit relative transverse or off-center movement of the driving mechanism E under certain conditions.

In reviewing Fig. 9 it can be seen that a spring as at **56** is provided at both end portions of the arms **51** and **52**. These springs have a tendency to centralize the driving mechanism E and yet provide a resilient control to permit off-center movement of the driving mechanism in certain unbalanced operations of the tub B and the agitator C, thus insuring virtually complete elimination of vibration in the cabinet A. In addition to the function and operation of the gyration suppression means I hereinbefore described, it is notable that this structure effectively cooperates with the weighted balancing means **60** forming a part of the tub B and which will be described more in detail hereinafter, this cooperation between these elements being effective to provide proper balance to the system, particularly in spinning operations which aggravate the centrifugal forces emanating from the rapidly spinning tub and this aggravation being further emphasized by an unbalanced load caused by uneven distribution of the clothes in the basket.

Although the cooperative effort of the gyration suppression means I with the weighted balancing means **60** is effective to overcome unbalanced conditions in the majority of the operations, there may be such uneven distribution of the clothes in the basket, particularly in the case of heavy fabrics such as chenille robes or chenille rugs or such fabrics having great mass such as a blanket to cause an unbalanced condition of such magnitude that cannot be operatively overcome by these elements.

In order to provide safety in such conditions there is provided a gyration suppression control switch generally indicated by the letter J and shown in detail in Figs. 2, 9 and 10. The gyration suppression control J comprises an electric switch **61** disposed in the main electrical supply line and effective to cut off the electric supply to the washing machine, thereby to stop all operations. The operation of the switch is advantageously accomplished by the provision of a plate **62** (Fig. 9) secured to an end portion of the arm **52** of the gyration suppression means I, said plate **62** having an arm **63** adapted for engagement with end portions **64** of a latch **65** (Figs. 9 and 10) carried for pivotal motion by a bracket **66** adjustably carried by side portions of the supporting frame H by virtue of the adjusting screws as at **67** and **68** which are adapted to be received respectively in slotted apertures **69** and **70** disposed in the bracket **66**, said latch **65** having a lip **71** adapted for engagement with a flange **72** forming a part of a dog **73** mounted for pivotal motion on the support **66**, there being a tension spring **74** operatively disposed between the latch **65** and the dog **73**, as shown, and effective to urge engagement of the lip **71** with the flange **72**. Secured to the dog **73** is a rod **77** which projects upwardly in the rear portions of the cabinet (Fig. 2) and has disposed on its upper end portion a button **78**, said rod being provided with stops **79**, **80** disposed in operative engagement with the operating arm **81** of the switch **61**.

The device as shown in Figs. 2, 9 and 10 is in its normal operating position and the washer will operate through the predetermined cycles; however, in the event that an extreme unbalanced condition becomes present the arm **63** of the plate **62** will become engaged with end portions **64** of the latch **65** thereby to cause the latch **65** to pivot which will effect disengagement of the lip **71** from the flange **72**, and by virtue of the force of the spring **74**, the dog **73** will pivot causing the rod **77** to move upwardly, and by virtue of the stops **79** and **80** which are in engagement with the arm **81** of the switch **61**, the circuit will be opened and stop all operations of the washing machine. It is then necessary for the operator to investigate the unbalanced condition and correct the same. This may be accomplished by giving a more even distribution of the clothes in the tub B. After this is accomplished the operator may reset the mechanism for a continuation of the washing operations by merely depressing the button **78** which projects upwardly and outwardly from the top portions of the control panel **24** for convenience in accessibility by the operator. The depression of the button **78** is effective to urge downward movement of the rod **77** which will close the switch and cause re-engagement of the lip **71** with the flange **72**. Of course, it is obvious that the mechanism can only be reset after the arm **63** is in such a position so as not to engage the end portion **64** of the latch **65**. This feature facilitates safety in that it is impossible to reset the mechanism for continuance of washing operations without first giving consideration to rectifying the extreme unbalanced condition and/or by manually repositioning the tub B so that its axis of rotation will more clearly coincide with the normal geometrical axis of rotation.

Suffice it to say, since the invention is not particularly concerned with the precise construction of the complete automatic washing machine hereinbefore described generally, and/or its associated parts, they will not be further described in detail, and it is deemed sufficient for all intentions and purposes herein contained to show only portions thereof adjacent to and cooperating with the washing machine drive mechanism **15** with which the invention is particularly concerned. It is to be understood that details of construction of such automatic washing machines, and/or their associated parts, may be modified to suit particular conditions or to satisfy the engineering genius of various competitive manufacturers, and we do not wish to be limited to the construction of these elements as set forth except where such construction particularly concerns the invention contemplated herein.

Having thus described, by way of example, a possible adaptation of the washing machine drive mechanism **15** and having described the general environment surrounding the adaptation, the specific construction and function of the parts of said drive mechanism **15** when disposed in an automatic washing machine as hereinbefore disclosed, will now be described in detail.

The transmission D

Particular attention is invited to the transmission D which is arranged to translate an oscillatory motion to the agitator from a constant rotating drive mechanism to be hereinafter described in detail, the structural details of the transmission D being shown to best advantage in Figs. 2, 3, 5 and 6.

In general, it may be stated that poweroperated washing machines having an agitator as at C operating with an oscillatory movement and in other machines of this character, the rotary movement of the motor or other power unit is customarily translated or transmitted into oscillatory movement by means of gears and racks. It has been found that when gears and racks and the like are employed to impart an oscillatory movement certain deficiencies in the operation characteristics appear to present themselves, that is to say, the gears and racks cause considerable noise. In some instances attempts have been made to overcome these deficiencies and objections by replacing the rack elements with internal gear segments, and this has been found helpful in that the noise is ma-

terially reduced; however, inclusion of the internal gear segment materially increases the cost of manufacture.

Moreover, further attempts have been made to accomplish oscillatory movement by the employment of cranks and links. It has been found that this can be done satisfactorily only if a special shaft is employed, because in washing machines and the like, a proper circulation and water action in the washing machine tub is accomplished only when the agitator has an oscillatory movement greater than 180 degrees, for example, from 180 degrees to 220 degrees.

Exhaustive experiments have proven that if the degree of oscillation of the agitator is less than the amount above indicated, a proper circulation and agitation of the water in the machine will not be obtained and consequently an incomplete cleansing action results. This definiency can only be overcome by operating the machine for an excessively long period which, in most cases, is not feasible particularly when the machines are automatic and controlled by a timer having certain limited range of adjustment to vary the sequential operations found in the washing cycle.

Giving full attention and significance to the aforementioned deficiencies and objections, it is one of the purposes of this invention to provide a mechanical movement for washing machines and the like that will permit the employment of a straight agitator shaft. Moreover, the instant transmission will translate and transmit the desired oscillatory movement through cycles greater than 180 degrees, and will be extremely smooth and quiet in operation and yet be inexpensive to manufacture and assemble.

Since the present invention contemplates the provision of an oscillating agitator as at C disposed within a centrifuge basket as at B, each requiring specific mechanical movements from a single drive source to accomplish their respective purposes, it is desirable that means be provided for efficiently and positively controlling the operation of the oscillated agitator or other elements, while not interfering with the continuous operation of the motor G so that it may be employed in connection with driving operations for other elements.

Specific attention is invited to Figs. 2 and 3 which show that the transmission D is provided with a housing comprising the top plate **146** and the bottom shell **170**, the top plate **146** and the bottom shell **170** being secured together at their respective marginal flanges by means of bolts as at **171**.

The invention contemplates the novel disposition of the housing of the transmission D as a part of the lower wall **100** of the basket B at the flange **102** by means of the bolts **103**. Thus, top plate **146** completes the enclosure of the opening in the basket B defined by the inner marginal edge of the flange **102**.

It is recalled that a necessary weight or mass should be given to the centrifuge or basket B in order to provide proper centralizing characteristics in its high speed rotation. It is important to understand that the relatively heavy mass or bulk of the transmission D when disposed in the manner taught by this invention will be effective to contribute to the weight and bulk necessary in the centrifuge or basket B for it to advantageously perform the functions required of it. Thus, it can be seen that the housing of the transmission D is fixedly secured to the centrifuge or basket B and because of this will rotate in its entirety with the centrifuge or basket B in the extracting operations of the washing cycle. This is an advantageous feature of the invention and an important contribution to the art.

It can be seen in Fig. 3 that the agitator shaft **151** projects downwardly into the confines of the housing of the transmission, and the agitator shaft at this projection has secured thereto an oscillatable driven member **180** which is in axial alignment with the agitator shaft **151**. A stub shaft **181** mounted in the aperture **182** formed in the boss **183** of the bottom plate **170** adjacent the shaft **151** has an arcuate rocking link **185** (Figs. 3, 5 and 6) mounted thereon, this link **185** being provided at one end with a bifurcated bearing **186** and having a rocking arm **187** extending at its other end on the opposite side of the stub shaft **181**. A bearing **188** is disposed on the arcuate rocking link **185** intermediate the stub shaft **181** mounting and the bifurcated bearing **186**. Integrally formed with and extending from the oscillatable driven member **180** there is provided a rocking arm **190** with a bearing **191** at its end. A curved link **192** is connected for pivotal movement at its end in the bearings **186** and **191** by pins **193** and **194**.

It is notable that in a linkage arrangement constructed and mounted in the manner set forth, all of the bearings are substantially in the same horizontal plane and are of substantially equal length, thus giving a very rigid structure which will have long life in use.

A drive gear **196** is mounted on a stub shaft **197** and forms one member of a speed reduction gear train comprising a pinion **199** in engagement with the drive gear **196** and mounted on the stub shaft **200** which also carries a drive gear **201** in engagement with a pinion **202** pinned to and mounted on a drive shaft **203** forming part of the driving mechanism E to be hereinafter described.

A pitman rod **205** is connected at one end, eccentrically, as at **206**, with the drive gear **196** and at the other end thereof, it is journaled in the bearing **188** on the rocking arm **185**.

In accordance with the construction contemplated by this invention, the rotating drive shaft **203** driving through the hereinbefore described gear train comprising the pinion **202**, drive gear **201**, pinion **199** and drive gear **196**, will impart continuous rotation to the drive gear **196** to turn the same in one direction.

The pitman rod **205**, through its eccentric mounting on the drive gear **196**, will cause rocking arm **187** to oscillate about stub shaft **181** which will impart a similar rocking or oscillatory movement to link **185**. The rocking end of the link **185** connected by curved link **192** with the outer end of arm **190** will cause the oscillatable member **180** to rock about its axis which is defined by the agitator drive shaft **151**, and the parts will be continuously swung backward and forward between the two extremes of position as best illustrated in Figs. 5 and 6, thereby to impart to the agitator C the desired oscillatory motion in certain of the sequential operations of the washing cycle.

As will be seen best in Fig. 3, the bottom plate **170** of the transmission housing is provided with an annular boss **210** having a central through bore **211** adapted to provide a seat for a bearing **212** in which the upper portions of the shaft **203** are advantageously journaled. Adjacent the bearing **212** there is provided a suitable seal **213** effective to retain lubricant within the housing of the transmission. Removably secured to the boss **210** by means of bolts as at **215**, there is provided a cap **216** having a central bore **217** adapted to receive for fixed securement thereto the upper portions of a tubular drive shaft **218** which forms a part of the driving mechanism E, to be hereinafter described in detail, and which is adapted to receive for relative rotation therebetween, the drive shaft **203**. As will be hereinafter described in detail, the drive shaft **203** is effective to drive parts of the transmission thereby to impart an oscillatory motion to the agitator C while the tubular drive shaft **218**, by virtue of its fixed mounting and connection to the housing of the transmission D which is fixedly secured to bottom portions of the centrifuge or basket B, is effective to cause rotation of the entire assembly comprising the transmission D and the centrifuge or basket B and including the agitator C, this rotation of the aforementioned elements being accomplished during the extraction operations of the washing cycle.

Thus, it is apparent that the transmission not only possesses the utilitarian features of translating oscillatory movement to the agitator from a continuously rotating

shaft disposed in axial alignment with the axis of the agitator but also is effective, in its housing and novel disposition thereof, to provide necessary weight and bulk to the centrifuge thereby to effectively cooperate with the gyration suppression means I and the weighted mass **60** and assist these elements in performing their function to overcome unbalanced conditions in the centrifuge or basket B caused by uneven distribution of fabrics and/or other causes by facilitating movement of the centrifuge during its high speed rotation so that its axis of rotation will be more nearly coincident with the normal geometric axis of rotation.

The drive mechanism E

Attention is now directed to the structural details of the driving mechanism E forming an important feature of the present invention and which can be seen best in Fig. 2 and particularly Fig. 4 which is a continuation of Fig. 3 and wherein the driving mechanism is shown in section to more clearly illustrate the internal structure thereof and to show the relative disposition of the various parts.

In accordance with the construction of the present invention depicted in Fig. 4, the agitator drive shaft **203** projects downwardly within the tubular shaft **218** to terminate in a stud **225** of lesser diameter than the shaft **203** but projecting axially outwardly therefrom. As was hereinbefore stated, the tubular shaft **218** is fixedly secured to the cap **216** of the housing of the transmission D. The tubular shaft **218** projects downwardly from the cap **216** and is journaled within the bore **226** of the elongated stationary sleeve **50**, hereinbefore described and forming a part of the gyration suppression means I. Thus, it can be seen that, by virtue of bearings **227** and **228** respectively disposed adjacent the upper and lower portions of the elongated stationary sleeve **50**, between the tubular shaft **218** and the sleeve **50**, so as to permit relative rotation of the shaft **218** with respect to the elongated stationary sleeve **50**, the tubular shaft **218** may be rotated to cause rotation of the centrifuge while the elongated sleeve **50** will remain stationary.

Since the construction and operation of the centrifuge B facilitates a relatively fast dumping of the detergent fluid in the extracting operations, this extracting and dumping operation being accomplished in a matter of a few seconds, and because of this, it is obvious that the pump L would not be of sufficient capacity to dispose of such a quantity of water as rapidly as it is being dumped; therefore, it is necessary for the dumped water ot accumulate in the outer tube **95** in the area below the centrifuge until the pump L can dispose of same in its normal pumping operation. Thus, it is apparent that the mechanical elements disposed in this area must of necessity be of water tight construction.

This is advantageously accomplished in the present invention by the provision of a seal indicated in its entirety by the numeral **230** and comprising two segments **231**, **232** arranged in telescoping association and provided with spring means **233** arranged to urge the telescoping segments **231** and **232** into operative engagement with adjacent portions of the cap **216** and the bearing **227**. A flexible cover **235**, preferably made of rubber or the like, is arranged to enclose the joint between the telescoping segments **231** and **232**. Thus, it is apparent that this seal is effective to exclude water and other foreign matter from access to the bearings **227** and adjacent working surfaces.

As can be best seen in Fig. 4, the bottom wall **96** of the outer tub **95** at the central regions thereof is provided with a flanged opening **240**, said flanged opening being arranged to operatively carry a bumper **241**, preferably formed of rubber or the like to define a substantially circular shape having a central through bore **242** arranged to receive and encircle the elongated stationary sleeve **50** and the parts contained therein. It is notable that the bore **242** is of such a diameter as to permit relative transverse movement of the elongated sleeve **50** but must be limited in its diameter so as to operate as a bumper or guide to limit the relative transverse movement of the stationary sleeve **50** in order to prevent peripheral portions of the basket B from engaging or striking the inner walls of the outer tub **95** during rotation of the basket B in extracting operations.

Resiliently carried by upper portions of the elongated stationary sleeve **50** and by portions of the flange **240** there is provided a flexible encircling rubber boot indicated in its entirety by the numeral **250**, this boot being effective to prevent water from seeping out of the confines of the outer tub **95** and through the bore **242** to the lower portions of the washing machine.

By virtue of the key **255**, a brake drum, generally indicated as at **256** and forming a part of the brake assembly F to be hereinafter described in detail, is disposed at the lower portions of the tubular shaft **218** for rotation in unison therewith. The brake drum **256** is provided with a through bore **257** adapted to receive lower end portions of the tubular shaft **218** and is further provided with a central through bore **258** adapted to receive a sleeve bearing **259** through which the lower portions of the agitator drive shaft **203** are effectively journaled. Thus, it can be seen that the brake drum **256** will rotate with the tubular shaft **218** while the agitator shaft **203** is arranged for relative rotation within the bearing **259** disposed in the through bore **258** of the brake drum **256**.

At the lower portions of the agitator drive shaft **203** and removably connected thereto for rotation in unison therewith by virtue of a set screw **265** adapted to engage the projecting portion **225** of the shaft **203**, there is provided a clutch hub indicated generally at **266** and having a central through bore **267** adapted to receive said projecting end portion **225** of the agitator drive shaft **203**. The peripheral surface **268** of the brake drum **256** and the peripheral surface **269** of the clutch hub **266** together define a coaxially arranged clutching suface having a one-way clutch spring **270** in encircling arrangement therewith so that if the clutch hub **266** is rotating in one direction the spring will tend to grip and wrap itself about the peripheral surfaces **268** and **269** so as to cause rotation in unison of the clutch hub **266** and the brake drum **256**.

When the clutch hub **266** is rotated in the opposite direction the spring **270** is effective to unwrap itself from its engagement with the peripheral surfaces **268** and **269** thereby disengaging these two elements whereupon the clutch hub **266** will continue its rotation and the brake drum **256** will remain stationary. The importance of the operation of this clutch will be discussed more in detail as the description proceeds.

Disposed between the lower end portions of the brake drum **256** and the upper end portions of the clutch hub **266** there is an anti-friction thrust bearing generally indicated by the numeral **271**, this bearing also being effective to permit relative rotation between the clutch hub **266** and the brake drum **256**.

Thus, it is apparent that the main purpose of the spring clutch **270** is to permit, from a single drive source, the operation of the agitator C independently of the centrifuge or basket B and during the operation of the centrifuge or basket B, the agitator drive mechanism may be neutralized and rotated with the centrifuge.

In order to prevent water and/or objectionable foreign matter from contact with the parts of the spring clutch **70**, there is disposed an encircling boot generally indicated by the numeral **272** and preferably made of rubber or the like, the rubber boot **272** being held in its position by means of a ring **273** carried by the periphery of the brake drum **256** for sliding engagement therebetween in order for the boot **272** to rotate with the clutch hub **266** in certain operations while the brake drum **256** may be stationary, and said boot **272** at its lower end portions being provided with a lip **274** adapted to encircle and

snugingly engage the outer periphery of the clutch hub **266**.

As can be seen best in Fig. 4, a stub drive shaft **285** is journaled in a sleeve bearing **286** disposed in a through aperture **287** of a hub **288**, the lower portion of which is supported on a plate **289** of a transversely extending structural steel support member **290** (Figs. 4 and 9) and the upper portion of the hub **288** being supported by a bent plate support member **291** also carried by the transversely extending structural steel support member **290**.

It is notable that the stub drive shaft **285** is rotatable in the sleeve bearing **286** and that, by virtue of the hub **288** being fixed to the plates **291** and **289**, the shaft **285** will rotate on a fixed vertical axis. Because the shaft **285** rotates on a fixed vertical axis, and the structure hereinbefore described and located above the shaft **285** is arranged to provide limited transverse or lateral movement, it is obvious that some means must be employed in the connection between the laterally movable elements and the fixed axis drive shaft **285**.

This is advantageously accomplished in the present invention by the provision of a flexible coupling indicated in its entirely by the numeral **300** and comprising a sleeve **301** press fitted to the upper portions of the drive shaft **285**, a rubber bushing **302** mounted on the sleeve **301**, and a cover **303** encircling the rubber bushing **302** and adapted to be received into a counterbore **304** in the lower portions of the clutch hub **266**.

In order to prevent axial movement of the shaft **285** with respect to the hub **288** there is provided an antifriction thrust bearing **305** received into a counterbore **306** in the hub **288**. Disposed between the bearing **305** and the lower annular flange **307** of the sleeve **301** there is a spacer collar **308** effective to maintain the adjacent elements in their proper operating position. To prevent foreign matter from entering the bearing **305** and the sleeve bearing **286**, there is provided a felt washer seal **310** maintained in its position by an annular metal cap **311** removably secured to the bent plate support **291** by screws as at **312**.

Thus, by virtue of the function and operation of the flexible coupling **300**, the parts of the washer above the clutch hub **266** are effectively driven by the drive shaft **285** rotating on a fixed vertical axis and yet permitting lateral or transverse movement of the driving elements thereabove with the pivot thereof being the central axis of the flexible coupling **300**.

In accordance with the construction of the present invention and as will be best seen in Figs. 4 and 5, the drive shaft **285** has mounted thereon at the lower portions thereof a driven pulley **315** adapted to carry in driving relation therewith a V-belt **316** also in driving relation with a driving pulley **317** carried by the drive shaft **318** of the reversible motor G.

Having thus described the general operative relationship of the parts of the driving mechanism E, the driving path followed in the various operations will now be described in detail.

As was hereinbefore stated, the motor G is in the reversible type and will transmit power in either direction of rotation to the drive shaft **285** by means of the V-belt **316** drive connection therebetween. When the drive shaft **285** is rotating in one direction, that is to say, to drive the agitator C, power will flow through the flexible coupling **300** to cause rotation of the clutch hub **266** which, by virtue of the set screw **265** is connected to the projecting stud end portions **225** of the shaft **203**, will cause the shaft **203** to rotate thereby to transmit power through the speed reduction gear train of the transmission D where the power is translated into oscillatory motion by virtue of the linkage interconnected between the gear train and the agitator drive shaft **151**, thereby to impart to the agitator the desired oscillatory motion necessary to advantageously cause agitation of the detergent fluid and the fabrics contained in the basket B. The drive path just described is followed during the washing and rinsing operations. Moreover, it is important to understand, that by virtue of the spring clutch arrangement **270** that the brake drum **256** will remain stationary during this operation and direction of rotation of the shaft **285**. The stationary position of the brake hub **256** is maintained by virtue of the action of the brake F to be hereinafter described in detail.

After the washing operation is completed, the extracting operations will begin. By operations preformed by the sequential control M, current to the motor G will be interrupted momentarily and this motor will be stopped whereupon the motor reversing mechanism will become operative and, thereafter, current is again applied to the motor G to cause the drive shaft **318** to rotate in a direction opposite to that hereinbefore described. Thus, it is apparent that the drive shaft **285** will now be operating in the opposite direction and the rotation in this direction will be effective to cause operation of the spring type clutch mechanism **270** to couple the clutch hub **266** with the brake drum **256** for rotation in unison whereupon, by virtue of the coupling action of the key **255**, the tubular shaft **218** will rotate. Because of the fixed connection between the upper portions of the tubular shaft **218** and the cap **216** forming a part of the housing of the transmission D, the entire assembly comprising the transmission D and the centrifuge or basket B will rotate, thereby to perform the extracting operation hereinbefore described, the rotation of the centrifuge or basket B being effective to empty the basket B of the detergent fluid through the apertures **118** defined by the corrugated-like shape of the flange **116** disposed adjacent the top peripheral edge of the centrifuge whereupon the detergent fluid is disposed in the lower portions of the outer tub **95** for accumulation and disposal by means of the operation of the pump L.

Thus it becomes apparent that when the motor is rotated in one direction the driving means E is effective to drive the agitator and when the motor is rotated in the opposite direction the driving means E is effective to rotate the centrifuge for water extracting operations.

The brake mechanism F

Attention is invited to the structural details of the brake mechanism F forming an important feature of the present invention and which can be seen best in Fig. 4 and particularly in Fig. 8 wherein the elements of the brake mechanism are shown in elevation to more clearly illustrate the construction thereof and to show the relative disposition of the various parts.

In accordance with the construction of the present invention, the brake mechanism F comprises the brake drum **256** hereinbefore described, an annular brake band **325** having suitably secured thereto on the inside surfaces thereof conventional frictional brake band material **326** disposed in frictional engagement with the peripheral surface of the brake drum **256**, said brake band having at one end thereof a lip **327** adapted to become engaged, under certain conditions hereinafter to be described in a slot **328** disposed in a latch **329** mounted, by virtue of pivot pin **331**, for pivotal movement on a bracket **330** which is fixedly secured to the elongated stationary sleeve **50** (Fig. 4), said latch being provided with a spring **332** having one end engaged with the latch body **329** and the other end thereof being suitably secured to the bracket **330** as at **333**, said spring being effective to urge the latch in one direction of pivotal movement, and said latch having fixedly secured thereto an arm **334** of a solenoid **335** adapted, under certain conditions, to overcome the forces of the spring **332** and cause pivotal movement of the latch body **329** in the opposite direction of pivotal movement.

When the motor G is operating in a direction to cause the agitator shaft to rotate in the direction indicated by

the arrow 336 (Fig. 8) the relative disposition of the parts will be as indicated. In this condition, it can be seen that the brake band 325 is in operative encircling engagement with the brake drum 256 thereby to prevent the tubular shaft 218 from rotating. This action, by virtue of the connection of the tubular shaft 218 to the housing of the transmission D, will hold the basket B from rotating thereby effective agitating operations may be accomplished. Since the solenoid is not energized the spring 332 will be effective to hold the latch 329 in its latched position as shown.

After the agitation cycle has been completed the sequential control M will be effective to cause reversal of the motor G for the purpose of performing water extracting operations which is accomplished by rotating the basket B. Since the solenoid 335 is properly connected in circuit, the solenoid will become energized to overcome the forces of the spring 332 and move the latch 329 in the direction indicated by the arrow 337 which will cause disengagement of the lip 327 from the slot 328 and permit the brake band to rotate with the brake drum 256 in the direction indicated by the arrow 338. Thus, it can be seen that the tubular shaft 218 is now free to rotate to cause rotation of the basket B. Moreover, it should be understood that the main purpose of this brake is only to prevent relative rotation of the basket B in either direction whenever the agitator C is in operation.

In order to prevent relative axial movement of the brake band 325 with respect to the brake drum 256, there is provided ring collars respectively indicated at 340 and 341 and which are carried by the periphery of the brake drum 256. As was hereinbefore stated, the brake band 325 is free to rotate with the brake drum 256 when the elements of the brake are in their unapplied position and, because of the ring collars 340 and 341, relative axial movement of the brake band 325 with respect to the brake drum 256 is prevented.

When the sequential control calls for operation of the agitator and extracting operations are completed, the solenoid 335 will become deenergized and the motor G will be conditioned for reverse operation, whereupon the forces of the spring 332 will become effective to urge the latch 329 toward its latch position whereupon the brake band 325 rotating with the brake drum 256 in the direction of the arrow 338, will cause engagement of the lip 327 with surface 345 (Fig. 8) of the latch 329 which will be effective to guide the lip 327 home to its position in the slot 328 where it will be maintained until the solenoid 335 is again energized to cause the latch to move in the direction indicated by the arrow 337. After lip 327 has been effectively positioned in the slot 328, the brake elements are again in their applied position effective to hold the brake drum 256 from relative rotation in either direction.

Summary of operation

In Figs. 2 and 9 there can be seen to best advantage the tub filling mechanism K which forms another important feature of the present invention.

The cleansing fluid, in this case, water, is supplied the basket B under ordinary city main pressure through a temperature control mixing valve 31 which is supported on the supporting means H adjacent the rear portions of the washer (see Figs. 2 and 9). It will be understood that the temperature mixing valve is adapted to receive hot and cold water through intakes 360 and 361, respectively, and to automatically control the relative amount of each so that water of the desired temperature passes through a flexible hose 362 (Fig. 9) operatively connected to the outlet of the valve 31 and the other end of which is connected to a water discharge pipe 365 (Fig. 2) disposed within the confines of the control panel 24. The hot and/or mixed water, as the case may be, will be discharged from the water discharge pipe 365 and into our novel cleansing fluid distributing means less than ten minutes. This can be accomplished by simply pulling out the timer control knob 33 thereby to permit linear movement in either direction of said knob to any selected position with respect to the washing cycle indicators disposed on the panel 24, whereupon the control knob 33 is pushed inwardly thereby to cause operation of the timer and, thereafter, the washer will then perform all operations of the washing cycle following that point at which the control knob 33 is set by the operator for the start of the cycle. Thus, the washing cycle can be varied from one to ten minutes depending on where the operator sets the control knob 33. The drying and rinsing cycles, however, cannot be shortened except by interrupting the normally continuous cycle of operation. This feature has been found desirable since it takes a certain definite period of time to remove all of the soap or other alkaline solutions employed as a detergent in the cleansing medium out of the clothes, and for the reason that the ordinary user of the machine should not, therefore, be given an opportunity to shorten the rinse cycle. It has similarly been found to be unnecessary to provide any adjustment in the drying time.

The complete operation of the automatic washing machine representing the illustrated embodiment of the invention and described herein in detail may be briefly summarized as follows:

Clothes or other articles to be laundered are inserted into the basket B of the automatic washing machine through the hinged lid 25 of the cabinet A and a small amount of soap or other suitable detergent is then sprinkled on the top of the clothes or articles to be laundered. The water temperature control switch 30 is now set for the desired water temperature at which the clothes or other articles are to be laundered. The timer control knob 33 is pulled outwardly and moved in its horizontal linear path to the extreme left-hand position (Fig. 1) and when the control knob 33 is pushed inwardly it will set the timing mechanism in motion to perform the various sequential operations of the washing cycle.

As was hereinbefore stated, the instant washer has an adjustable fill from one to six minutes, and since the water valve 31 is set to provide 2 and ⅔ gallons of water per minute regardless of city main pressures, the amount of water disposed into the tub is controlled by time as distinguished from conventional prior art float mechanisms. It has been found practical for all intentions herein contained to have a fill period of approximately four minutes under average conditions. Accordingly, if the timer control knob 33 is set at 0, the mechanism will become operative to permit filling of the basket B for a period of four minutes and as the timer control knob passes through this four minute cycle, the electrical contacts (not shown) in the timer will be actuated by the engagement of a suitable linear profile to shut off the water supply and simultaneously therewith start the washing phase of the cycle. The motor will be set in a direction of rotation to cause the agitator to oscillate to perform its washing function upon the clothes and/or other articles being laundered.

For all practical intents and purposes herein contained and based upon experience as to the length of time desirable for the washing phase of the cycle, it has been found that a ten minute period is most practical under average conditions. It is notable that if the timer control knob 33 is set at the 0 position (Fig. 1) and left undisturbed, there will be a four minute fill period followed by a ten minute wash period in which the agitator performs its oscillating motion. However, it is important to understand that, in certain instances, it may be desirable to vary the wash period. This may advantageously be accomplished by setting the timer control knob 33 at 0 (Fig. 1) and permitting this control knob to pass through the four minute fill period, whereupon the knob may be pulled outwardly and reset at any point between numbers 4 and

14 and pushed inwardly whereupon the timer will continue from that point to complete the washing cycle. The apparatus is thereafter adapted to operate without further attention, all of the remaining operations taking place automatically and proceeding to the completion of the last drying operation.

After the wash period has been completed the electrical contacts of the sequential control, by virtue of the linear profile, will be set to provide a thirty second pause permitting the motor to completely stop and be set for reverse operation to accomplish water extraction operations in the manner hereinbefore described. When the timer control knob **33** has passed through this thirty second pause, the electrical contacts will be set to cause rotation of the basket B for water extracting operations. In this operation, the rotation of the combination washing tub and water extracting basket B at extremely high speeds during the extraction operation will cause centrifugal forces to move the mass of water outwardly from the geometrical center of rotation and, by virtue of the inclined upstanding annular wall **105** of the combination washing tub and water extracting basket B, the water will tend to flow upwardly through the passage defined by the oblique wall **115** and the adjacent portion of the wall **105** and thereafter, through the apertures **118** formed by the corrugated-like formations on the annular flange **116**, whereupon the water will be discharged into the confines of the outer tub **95** for disposal. It is important to understand that this centrifuge action of the basket B will empty the water disposed therein in a matter of a few seconds thus presenting a substantial saving of time in the wash cycle and yet performing a better job than prior art models employing time consuming pumping operations and the like.

In centrifuge type extractors, it has been found that during the extracting operation the fabrics contained in the basket B, by virtue of their mass and bulk, will sometimes entrap water and other foreign material in the lower portions of the basket B thereby to prevent the desired removal of such entrapped water from the basket B which will cause an undesirable accumulation of such sediment and other foreign matter. In this connection, it is notable that it is desirable to have this objectionable sediment and foreign matter removed to provide a clear rinsing cycle and prevent the sediment laden water from being strained through the fabrics being washed during any of the water extracting cycles.

This is advantageously accomplished in the present invention by the provision of the auxiliary sump adapted to facilitate removal of the entrapped objectionable sediment contained fluid by passing the same through the apertures **120** and into the annular cup-like structure **125** and, by virtue of a centrifuge action similar to that hereinbefore described with respect to the emptying of the basket B, the sediment contained water will be caused to flow from the annular cup-shaped structure into the conduit **130** which extends upwardly adjacent the exterior of the wall **105** of the basket B and terminates with an open end **131** and through this conduit **130** and, by virtue of the centrifuge action imparted by rotation of the basket B at relatively high speed, the sediment contained water will rise in the conduit **130** and be discharged from the open end **131** thereof and into the confines of the outer tub **95** for disposal with the other water being caused to be extracted from the inner portions of the tub B through apertures **118** formed of the corrugated-shaped formations on the flange **116**.

Since the construction and operation of the centrifuge B facilitates a relatively fast dumping of the detergent fluid in the extracting operations, this extracting and dumping operation being accomplished in a matter of a few seconds, and because of this, it is obvious that the pump L would not be of sufficient capacity to dispose of such a quantity of water as rapidly as it is being dumped; therefore, it is necessary for the dumped water to accumulate in the outer tub **95** in the area below the centrifuge until the pump L can dispose of same in its normal pumping operation. It is recalled that the motor will operate in two directions of rotation, that is to say, in one direction when it is desired that the agitator be operated and in another direction when it is desired that the extracting operations be performed. Thus, by virtue of the pump drive arrangement, it can be seen that the pump will operate in both directions of rotation and at all times when the motor G is in operation.

At this point (beginning of the first spin operation) it is deemed important to discuss the functional operation of the gyration suppression control switch J. Although the instant washing machine provides effective means to overcome unbalanced conditions or uneven distribution of the clothes in the basket, particularly in the case of heavy fabrics such as chenille robes or chenille rugs or such fabrics having great mass such as a blanket, the invention contemplates the provision of an additional safety feature in such conditions by the effective operation of the gyration suppression control switch J hereinbefore described in detail. It is recalled that in such extreme conditions the gyration suppression control switch J will stop all operations of the machine and it is then necessary for the operator to investigate the unbalance condition and correct the same. This may be accomplished by giving a more even distribution of the clothes in the tub B. After this is done the operator may reset the mechanism for a continuation of the washing operations by merely depressing the button **78** which projects upwardly and outwardly from the top portion of the control panel **24**. After the mechanism has been reset and the unbalance conditions are overcome the washing machine will continue through the remainder of the washing cycle.

Attention is again referred to Fig. 1 and it is notable that the timer mechanism, for purposes of this description of operation of the washing machine, has now moved to the extract spin position and will continue for one minute to perform the water extraction spin operation as hereinbefore described and after the timer has passed through this minute period the electrical contacts will be set in a manner to provide a thirty second spin rinse of warm water. This spin rinse is effective to remove extraneous scum and other detergent fluid remaining in the basket B after the first water extraction spin operation has been completed.

After the timer has passed through the aforementioned thirty second spin rinse, the electrical contacts thereof will be set to shut off the current supply to the motor thereby to stop the spinning of the basket B, but the electrical contacts are now set to permit a three and one-half minute fill period, in which period the basket is again supplied with warm rinse water.

After the timer has passed through this three and one-half minute fill period, the electrical contacts thereof will be set so as to cause reverse rotation of the motor thereby to provide an agitator drive and since the contacts are set for continuous supply of water to the basket B there is provided a four minute agitated overflow rinse which has been found particularly desirable to advantageously clear the clothes and the basket B of all scum, sediment and detergent fluid. It is obvious that if the water supply is continuous as hereinbefore suggested that the water will fill the basket B and thereafter overflow through the apertures **118** and into the outer tub **95** for disposal by the pump **1** as hereinbefore described.

A one minute agitated rinse period without overflow is provided, this being accomplished by positioning of the electrical contacts so as to cause the water to be shut off at the mixing valve **31**. After the one minute agitated rinse without overflow there is provided a thirty second pause in order to permit the motor to be stopped and the controls be set for reverse operation of the motor for the purpose of water extraction operations to follow. After a one minute water extraction spin operation there is provided a one-half minute spin rinse followed by a

six minute water extraction period, making a total washing cycle of thirty-two and one-half minutes.

The instant drive mechanism for a washing machine being formed of simple parts and readily available materials lends itself to mass production manufacturing principles, thus affording a substantial saving in the manufacturing costs.

From the foregoing disclosure, it may be observed that we have provided an improved drive mechanism for a washing machine which efficiently fulfills the objects thereof as hereinbefore stated; and which provides numerous advantages which may be summarized as follows:

1. Structurally simple, efficient and durable;

2. Economical to manufacture and readily adaptable to mass production manufacturing principles; and

3. The provision of a washing machine preferably of the automatic cycle type having a high speed rotating tub or basket adapted for water extraction during a certain period of the cycle, and said washer having incorporated therein a drive mechanism having in itself a unique association of elements effective to provide an improved drive for both the agitation and extractor cycles and yet cooperating to particular advantage with mechanical means associated with the spinning basket to reduce the vibration in the main frame and cabinet of the machine to a minimum under loaded conditions during acceleration, full spinning speed, and during deceleration.

While we have illustrated preferred embodiments of our invention, many modifications may be made without departing from the spirit of the invention, and we do not wish to be limited to the precise details of construction set forth but wish to avail ourselves of all changes within the scope of the appended claims.

We claim:

1. In a combined washing and extracting machine including an upwardly open receptacle, an upwardly open basket mounted for rotation within the receptacle, and an oscillatable agitator mounted within the basket: mechanism for driving the basket; separate mechanism for driving the agitator; a reversibly driven electric motor; means operable responsive to rotation of the motor in one direction for actuating the agitator driving mechanism; means including a spring clutch operable responsive to rotation of the motor in the opposite direction for actuating the basket driving mechanism; brake means interposed in the basket driving mechanism; spring means for yieldingly maintaining the brake means in operative position; and means rendered operable when the motor is driven in said opposite direction for disengaging said brake means.

2. In a combined washing and extracting machine including an upwardly open receptacle, an upwardly open basket mounted for rotation within the receptacle, and an oscillatable agitator mounted within the basket: mechanism for driving the basket; separate mechanism for driving the agitator; a reversibly driven electric motor; means responsive to rotation of the motor in one direction for actuating the agitator driving mechanism; means responsive incident to rotation of the motor in the opposite direction, for actuating the basket driving mechanism; in combination with brake means interposed in the basket driving mechanism; spring means for yieldingly maintaining the brake means in operative position; and a solenoid connected in the motor circuit and adapted to be energized when the motor is driven in one of its two directions for moving said last-mentioned brake means to its inoperative position.

3. In a combined washing and extracting machine including an upwardly open receptacle, an upwardly open basket mounted for rotation within the receptacle, and an oscillatable agitator mounted within the basket, the combination of mechanism for driving the basket; separate mechanism for driving the agitator; a reversible driven electric motor; means operable incident to rotation of the motor in one direction, for actuating the agitator driving mechanism; means, operable incident to rotation of the motor in the opposite direction, for actuating the basket driving mechanism; brake means interposed in the basket driving mechanism and movable into and out of operative positions of adjustment; spring means for yieldingly urging said last-mentioned brake means to one position of adjustment; and means operable when the motor is driven in one of its two directions for moving said last-mentioned brake means to its other position of adjustment.

4. In a combination washing and extracting machine of the type comprising an upwardly open receptacle, a basket mounted for rotation in the receptacle, an oscillatable agitator mounted in the basket: power transmission means in a housing secured to and forming the bottom wall of said basket; an upright drive tube connected to said transmission housing; a shaft disposed within the tube and operatively connected through the transmission means to the agitator; means for actuating said shaft to drive said agitator; means for actuating said upright drive tube for driving the basket; brake means engageable with portions of said upright drive tube; spring means for yieldingly urging said brake means to one position of adjustment; and means operable for moving said brake means to its other position of adjustment.

5. In a combination washing and extracting machine of the type comprising an upwardly open receptacle, a basket mounted for rotation in the receptacle, an oscillatable agitator mounted in the basket: power transmission means in a housing secured to and forming the bottom wall of said basket; an upright drive tube connected to said transmission housing; a shaft disposed within the tube and operatively connected through the transmission means to the agitator; a reversibly driven electric motor; means operable incident to rotation of the motor in one direction for actuating said shaft to drive said agitator; means operable incident to rotation of the motor in the opposite direction for actuating said upright drive tube for driving the basket; brake means engageable with portions of said upright drive tube; spring means for yieldingly urging said last-mentioned brake means to one position of adjustment; and means operable when the motor is driven in one of its two directions for moving said last-mentioned brake means to its other position of adjustment.

6. In a combination washing and extracting machine of the type comprising an upwardly open receptacle, a basket mounted for rotation in the receptacle, an oscillatable agitator mounted in the basket, power transmission means in a housing secured to and forming the bottom wall of said basket, an upright drive tube connected to said transmission housing, a shaft disposed within the tube and operatively connected through the transmission means to the agitator, means for actuating said shaft to drive said agitator, and means for actuating said upright drive tube for driving the basket: brake means engageable with portions of said upright drive tube; spring means for yieldingly urging said brake means to one position of adjustment; and means operable for moving said brake means to its other position of adjustment.

7. In a combination washing and extracting machine of the type comprising an upwardly open receptacle, a basket mounted for rotation in the receptacle, an oscillatable agitator mounted in the basket, and power transmission means in a housing secured to and forming the bottom wall of said basket: a drive mechanism for said power transmission means comprising an upright drive tube connected to said transmission housing, a shaft disposed within the tube and operatively connected through the transmisison means to the agitator, a reversibly driven electric motor, means operable incident to rotation of the motor in one direction for actuating said shaft to drive said agitator, means operable incident to rotation of the motor in the opposite direction for actuating said upright drive tube for driving the basket, brake means

engageable with portions of said upright drive tube, spring means for yieldingly urging said last-mentioned brake means to one position of adjustment, and means operable when the motor is driven in one of its two directions for moving said last-mentioned brake means to its other position of adjustment.

8. For a combination washing and extracting machine of the type comprising a rotatable basket, and agitation means mounted in said basket: a drive shaft and a driven shaft disposed in axial alignment, said driven shaft being connected to said basket, means including reversible power means for driving the drive shaft in either direction of rotation, and spring clutch means surrounding adjacent end portions of each of said shafts and operable to couple said drive and driven shafts for rotation in unison responsive to one direction of rotation of said drive shaft and operable to uncouple said drive and driven shafts responsive to the other direction of rotation of said drive shaft.

9. For a combination washing and extracting machine of the type comprising a rotatable basket, and agitation means mounted in said basket: a drive shaft and a driven shaft disposed in axial alignment, said driven shaft being connected to said basket, means including reversible power means for driving the drive shaft in either direction of rotation, spring clutch means surrounding adjacent end portions of each of said shafts and operable to couple said drive and driven shafts for rotation in unison responsive to one direction of rotation of said drive shaft and operable to uncouple said drive and driven shafts responsive to the other direction of

rotation of said drive shaft, and means defining a brake engageable with portions of said driven shaft to restrict relative rotation of said driven shaft and including means for effecting operation of said brake means only incident to the direction of rotation of said drive shaft wherein said drive shaft and driven shaft are in respective uncoupled relationship.

10. For a combination washing and extracting machine of the type comprising an upwardly open receptacle, a basket mounted for rotation in said receptacle, and agitation means mounted in said basket: the combination with power transmission means comprising gearing mechanism in a housing directly secured to said basket, of an upright drive tube connected to said housing, a shaft disposed within the tube and operatively connected through the gearing mechanism to the agitation means, means for actuating said shaft to drive said agitation means, and means for actuating said upright drive tube for driving the basket, both said actuating means having a drive shaft common thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

1,964,440	Patch	June 26, 1934
2,161,604	Watts	June 6, 1939
2,356,817	Breckenridge et al.	Aug. 29, 1944
2,403,233	Patch	July 2, 1946
2,424,385	Cook	July 22, 1947
2,511,681	Young et al.	June 13, 1950
2,561,257	Woodson	July 17, 1951
2,645,108	Smith	July 14, 1953