Oct. 31, 1961 K. O. SISSON ET AL 3,006,216

DOMESTIC APPLIANCE

Filed May 28, 1958 2 Sheets-Sheet 1

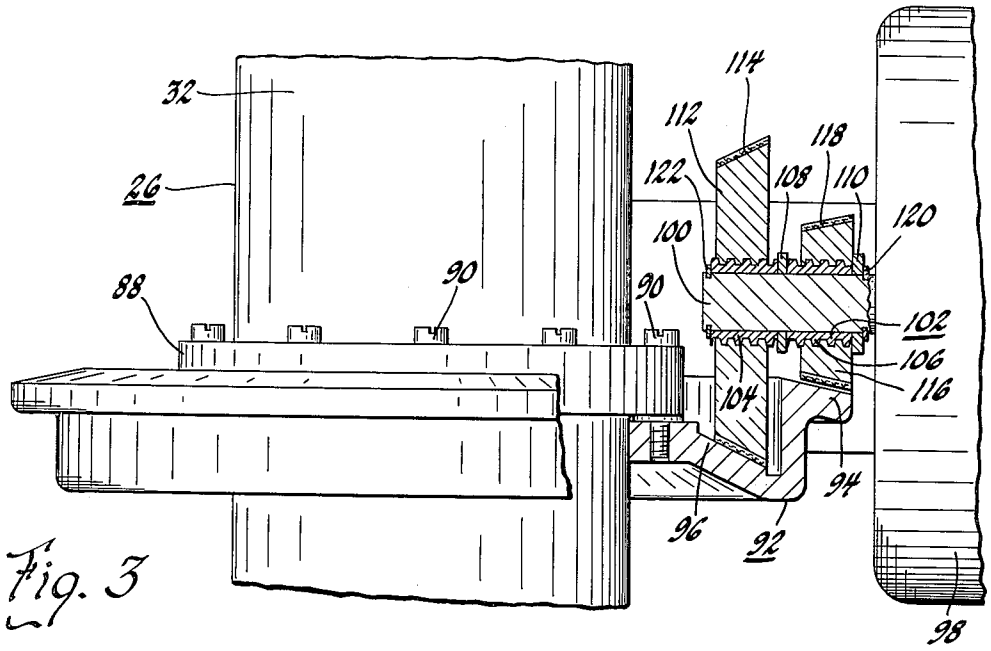


Fig. 3

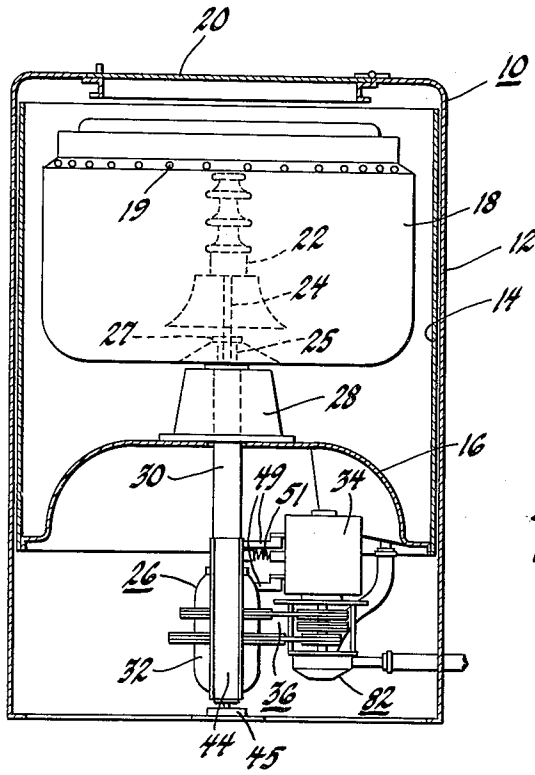


Fig. 1

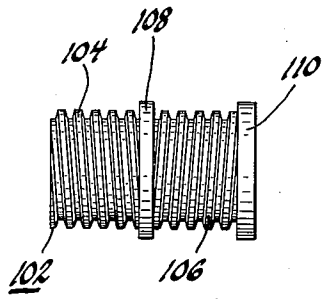


Fig. 4

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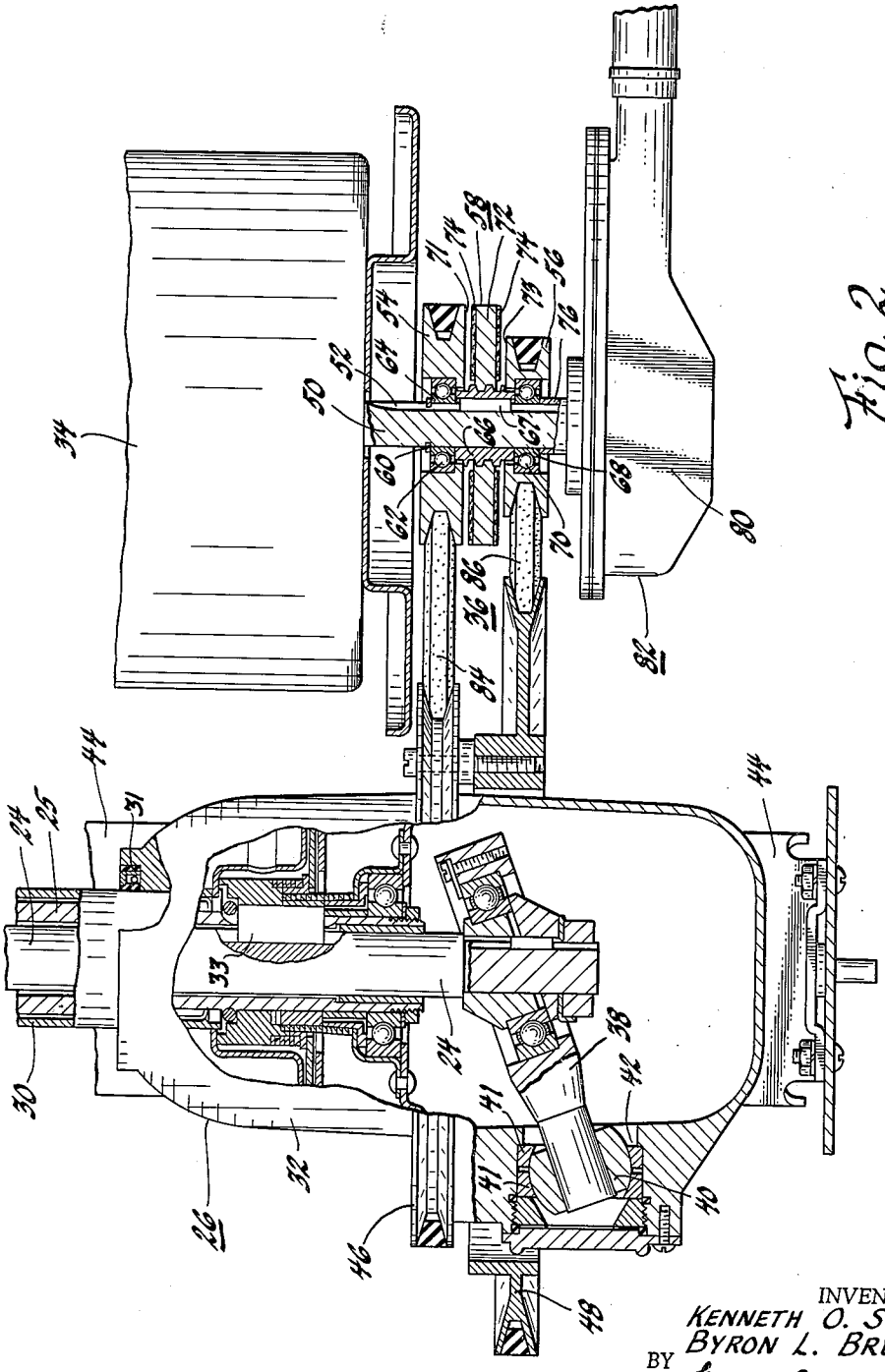


Fig. 2

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DOMESTIC APPLIANCE

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4 Claims. (Cl. 74—665)

This invention relates to a domestic appliance and more particularly to an improved transmission for a washing machine.

The continuing development in certain types of synthetic fabrics commonly referred to as wash and wear fabrics has necessitated changes in washing machine cycles to assure a satisfactory washing action for such fabrics. It has been determined that certain spin speeds are harmful to such fabrics and impart wrinkles thereto which are difficult to remove. Furthermore, severity of washing action also tends to increase wear on these fabrics. Copending application S.N. 738,330, now Patent No. 2,974,542, filed concurrently herewith shows one washer design wherein an agitating and spinning mechanism is provided for selectively obtaining two speed spin and two speed agitate from a single speed, reversible motor. In this application there is disclosed a low cost washer wherein a single spin speed and a single agitate speed of different value produces a satisfactory, clothes washer for the wash and wear fabrics. Where, in such a low cost washer, it is desired to use a single speed reversible motor to drive the washing machine mechanism for differing spin and agitate speeds, certain modifications are necessary to secure the optimum agitating and spinning speeds. If manufacturing costs are to be considered, these speeds must be obtained without further complicating the electrical control arrangements now used on conventional washers and without the addition of gear shifting speed changes. This invention sets forth an improvement for low cost washing machines wherein the desired operating speeds are obtainable without modifying the electrical control system.

Accordingly, it is an object of this invention to provide a driving arrangement for a washing machine wherein a screw clutch is utilized to connect a driving pulley with the prime mover in accordance with the direction of rotation of said prime mover.

It is also an object of this invention to secure different spin and agitate speeds without electrically actuating a speed reducing means. A more specific advantage is to effect a driving arrangement wherein a single speed motor is adapted to drive a washing mechanism at one speed when rotating in one direction and at a second and different speed when rotating in the opposite direction.

It is a most specific object of this invention to include a screw clutch between a pair of relatively rotatably mounted driving pulleys on the shaft of a reversible single speed motor for obtaining multiple speed washing functions.

It is also an object of this invention to use a clutching arrangement in which a driving disc is selectively engaged with a driving pulley in accordance with the direction of rotation of a washing machine motor.

Another object of this invention is to obtain a beltless driving connection between the prime mover and the washing mechanism wherein a pair of conical rollers selectively drive the mechanism in accordance with the rotation of the prime mover.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is an elevational view of a washing machine with parts broken away showing the driving arrangement for a washing machine mechanism;

FIGURE 2 is an enlarged sectional view of the washing machine mechanism and driving arrangement therefor;

FIGURE 3 is a fragmentary sectional view of an other embodiment of the novel screw clutch washing machine driving arrangement; and

FIGURE 4 is an elevational view of a double-ended lead screw having oppositely directed leads for causing the selective engagement of the washing machine driving elements.

In accordance with this invention and with reference to FIGURE 1, a washing machine **10** is shown provided with the driving arrangement of this invention. The washing machine **10** includes an outer cabinet **12**, an inner casing **14** and a centrally located bulkhead **16**. Within the cabinet **12** is a rotatably mounted washing machine tub **18**. An access door **20** overlies the top of tub **18** to provide means for access in placing clothing within the tub **18**. An agitator **22** is disposed at the top of a shaft **24** which extends downwardly from tub **18** and through partition **16** into the washing machine agitate and spin mechanism shown generally at **26**. An annular flexible support or collar **28** serves indirectly to support the tub **18** a spaced distance above the partition **16** but is in no way connected to the tub itself. The shaft **24** is rotatably and relatively axially movable within a concentric tubular spin shaft **25** to which the tub **18** is affixed as at **27**. The support portion **28** flexibly supports a stationary outer tubular support housing **30** which encloses the agitate shaft **24** and spin shaft **25** and about which a washing machine drive housing **32** is rotatably mounted. Between the rotatable housing portion **32** and the fixed tubular support portion **30** is an annular seal **31** to effect a substantially sealed joint between the two portions. Relative rotation between the agitate shaft **24** and the spin shaft **25** is prevented by the action of a key **33** which still provides for a relatively vertically slidable connection between the shafts. The particular washing action produced by mechanism **26** is such that a rotation of housing **32** in one direction produces a vertical reciprocation of shaft **24** and agitator **22**. On the other hand, a rotation of the housing **32** in the opposite direction is adapted to spin the laundry tub **18** in a centrifuging or clothes wringing operation. This agitating and spinning mechanism is more clearly set forth in the patent to Sisson 2,758,685 issued August 14, 1956. As a prime mover for the agitate and spin mechanism **26**, a reversible single speed motor **34** is included. The motor **34** is arranged in parallel relationship to the agitate and spin mechanism **26** and adapted to rotate the drive housing portion **32** thereof by means of a drive belt arrangement shown generally at **36**.

Reference may now be had to FIGURE 2 wherein a more complete understanding of the novel driving

arrangement of this invention will be set forth. The drive mechanism **26** is shown comprised of a rotatable drive housing **32** and a fixed tubular support housing **30**. Disposed within the housing **32** is the agitating shaft **24** at the lower end of which is rotatably and drivingly attached a reciprocating arm **38**. The arm **38** terminates in a spherical bearing member **40** retained by complementary spherical socket members **41** within a recess **42** in rotatable housing **32**. The arm **38** thus becomes a rocking means for reciprocating shaft **24** when housing **32** is rotated in one direction. As set forth in the cited patent to Sisson, a rotation of housing **32** in the opposite direction acts to rotate the laundry tub **18** while agitator **22** ceases to agitate. To improve the stability of the washing machine mechanism **26** at the lower end thereof, a snubbing bracket **44** resiliently grips the support shaft **30** and transmits mechanism vibrations to a snubbing cup **45** on the bottom of the washing machine **10** (FIGURE 1).

The patent to Sisson shows but one pulley attached to the rotatable housing **32**. The disadvantage of this arrangement lies in the fact that both agitation and spinning must be accomplished at the same motor speed. As aforesaid, this is not always desirable where the newer fabrics are involved. For example, it may be desirable to spin the fabrics in the wringing or centrifuging process at a high speed of approximately 800 r.p.m. whereas an agitating action at this speed would produce unduly severe wear upon the fabrics. This invention then contemplates the inclusion of means for securing the most desirable single speed for agitation and the most desirable speed for spinning. To accomplish these results, it is necessary to include two pulleys on the rotatable housing **32** of the agitating and spinning mechanism **26**. Formed on the housing and integral therewith is a driven spin pulley **46**, from which depends in a fixed relationship also to housing **32**, a driven agitate pulley **48**. Disposed adjacent the agitating and spinning mechanism **26** and pivotally mounted on brackets **49** is a single speed reversible motor **34** having a shaft **50** in parallel relationship to tubular support housing **30**. A spring **51** serves to bias the motor **34** away from support shaft **30**, thereby to maintain tension on the belts of the pulley system **36**, FIGURE 1. The motor **34** is supported from the tubular housing **30** and stabilized by the action of snubbing bracket **44**. The shaft **50** is formed with a key slot **52** and is adapted to receive a driving spin pulley **54**, a driving agitate pulley **56** and a screw clutch shown generally at **58**. Locating the pulley **54** on shaft **50** is a snap ring **60**. The pulley **54** is rotatably mounted relative to motor shaft **50** on a bearing **62**, the inner race **64** of which is keyed to shaft **50**. Immediately below pulley **54** and abutting against the inner race **64** of bearing **62** is a clutch screw portion **66** secured against rotation relative to motor shaft **50** by a key **67**. Abutting the bottom of clutch screw **66** is an inner race **68** of a bearing **70** which serves to carry agitate driving pulley **56**. The screw clutch **58** includes also a nut portion **72** having internal threads adapted to cooperate with the external threads of clutch screw **66**. The clutch screw **66** has a single thread, leading in one direction, on which nut portion **72** is adapted to turn. Thus, the rotation of motor shaft **50** in one direction will cause the nut member **72** to rise against the bottom of pulley **54** and a rotation of shaft **50** in the opposite direction will cause this same nut member to move downwardly into engagement with the top surface of pulley **56**. Friction material **74** is bonded to both the top and bottom of the nut member **72** to facilitate a driving relationship between the screw clutch **58** and the selected driving pulley. Positively securing the driving pulleys and screw clutch to shaft **50** is a collar **76** of a pump housing **80**. The pump housing **80** encloses an impeller (not shown) which is attached at one end of the motor shaft **50**. Thus, a dual operating function for motor shaft **50** is established—driving the agitating and spinning mechanism **26** and serving as the prime mover for pump **82**. In this arrangement, spin driving pulley **54** is in juxtaposition to spin driven pulley **46** while agitate driving pulley **56** is in juxtaposition to agitate driven pulley **48**. Completing this driving relationship are a pair of flexible V-belts **84**, **86**.

Another embodiment of a screw clutch arrangement for driving an agitating and spinning mechanism **26** is shown in FIGURES 3 and 4. In this embodiment, the rotatable housing **32** is formed with a shoulder or flange **88** instead of the pulley **46** of the FIGURE 2 embodiment, and to this flange is attached, by any suitable fastening means such as bolts **90**, a driven annular flange or track **92**. The annular track **92** is formed with a radially outer agitating driven portion or agitate track **94** and a radially inner spinning driven portion or spin track **96**. Again, a single speed reversible motor **98** is used in which a motor shaft **100** is placed perpendicular to the axial direction of the agitating and spinning mechanism **26** and to the rotatable housing portion **32**. Keyed to motor shaft **100** is a double-ended clutch screw assembly shown generally at **102**. The clutch screw assembly **102** includes a right hand spin thread member **104** and a left hand agitate thread member **106**. Interposed between thread members **104** and **106** is a stop or washer **108**. A similar stop or washer **110** is placed at one end of the clutch screw assembly **102**. Arranged to cooperate with the spin thread **104** is a frusto-conical nut or spin drive roller **112**, the radially outer driving surface of which carries an annular facing of any suitable friction material **114**. A second nut or agitate drive roller **116** is formed with internal threads which cooperate with and are complementary to the thread **106**. Again, an annular friction surface **118** overlies the outer peripheral edge of this frusto-conical roller **116**. To assemble this embodiment, the stop or washer **110** is placed on motor shaft **100** and located at the motor end of the shaft by means of a snap ring **120**. Abutting against stop **110** and keyed to shaft **100** is agitate thread member **106** on which the roller **116** is screwed. Next, the center stop or washer **108** is placed on shaft **100** followed by spin thread member **104**. The completed assembly is held in place on motor shaft **100** by a second snap ring **122**. Since the leads of thread portions **104** and **106** are reversed, the rotation of motor shaft **100** is effective to cause drive rollers **112** and **116** to approach each other when the motor **98** is turning in one direction and to move apart when the motor is reversed. By way of example only, consider the particular arrangement of FIGURE 3 wherein the rotation of motor **98** will be given as though viewing the motor from the position of housing **32**. With the motor **98** rotating clockwise, screw clutch or spin drive roller **112** will thread itself toward annular track **96** and into driving engagement therewith. At the same time, the reverse lead of thread **106** will cause agitate drive roller **116** to move away from annular track **94** and into abutting engagement with stop **110**. In this regard, the motor **98** now serves to rotate housing **32** in a manner to cause laundry tub **18** to spin rapidly in centrifuging water from the clothes. A counterclockwise rotation of motor **98** will move agitate drive roller **116** into engagement with annular track **94** and spin drive roller **112** out of engagement with annular track **96** and into abutment with stop **108**. Powered in this fashion, the rotatable housing **32** will initiate a vertical reciprocation of agitator **22**.

With reference to the preferred embodiment of FIGURES 1 and 2, the operation of this novel washing machine driving arrangement will be set forth. A load of clothing is placed within laundry tub **18** through access opening **20** and a washing action started by means of any conventional washer timer (not shown). Water will be admitted to tub **18** and motor **34** will be energized to rotate in a direction to produce a vertical reciprocation of agitator **22**. In particular, motor shaft **50** will

be rotating in a manner to cause nut portion 72 of screw clutch 58 to move axially downwardly in accordance with the lead of clutch screw 66 into engagement with the top surface 73 of agitate driving pulley 56. The inertia or resistance to rotate of nut 72 is sufficiently great to retard the nut's assuming the rotational speed of shaft 50. Since motor 34 accelerates quickly, the shaft 50 and clutch screw 66 rotate relatively to the nut member 72, thereby producing an axial travel of nut 72 along the screw 66. This relative motion is substantially instantaneous and places the screw clutch nut member 72 into frictional engagement with pulley 56. In this fashion, pulley 56 is driven by means of motor shaft 50, clutch screw 66, nut member 72 and frictional material 74.

After a predetermined period the washing or agitation action will be terminated and a timer switching action will occur to reverse the rotation of motor 34. Motor shaft 50 and clutch screw 66 will again accelerate more rapidly than nut member 72 of clutch 58 which consequently will move axially upwardly into engagement with a bottom surface 71 of spin driving pulley 54. The reversal in rotation of agitating and spinning mechanism housing 32 effects a rotation of laundry tub 18 as taught more fully in the cited patent to Sisson. Water is centrifugally thrown from tub 18 through openings 19 and falls by gravity into the collecting basin immediately above the central partition or bulkhead 16. At the desired point, in the washing cycle, and in accordance with the operation of any conventional valving means, pump 82 discharges the water from the washing machine 10 to drain.

It should now be clear that an improved driving arrangement has been provided for the agitating and spinning mechanism of the type taught in the Sisson patent which will give different speeds without additional controls or modifications to the wiring arrangements of washing machines employing this mechanism.

It should be recognized that the lead of the threads on clutch screw 66 of the first embodiment and those screw members 104, 106 on the second embodiment must be such that the clutch or nut members 72, 112 and 116 respectively will readily disengage from their respective driven surfaces upon reversal of the motor. Note also that the assembly 102 could be made as one part instead of the built-up arrangement as shown.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, two shaft means concentrically arranged, an enclosing housing completely enclosing the one adjacent end of each of the shaft means, the opposite adjacent ends of each of said shaft means protruding out of said housing, means preventing relative rotation of said two shaft means, said housing including a relatively stationary portion enclosing said shaft means and a rotatable portion rotatable with respect to the normally stationary portion and said shaft means, means responsive to said rotatable portion for reciprocating one of said shafts or rotating the other of said shafts, a driven flange on said rotatable portion having a non-horizontal agitate section for reciprocating one of said shafts and a non-horizontal spin section for rotating the other of said shafts, a reversible, single speed motor for rotating said rotatable portion, said motor having a shaft substantially normal to said rotatable portion, and means responsive to the operation of said motor for varying the speed of said rotatable portion, said responsive means including an agitate drive member having a driving surface parallel to said agitate section, an agitate screw member keyed to said shaft for directing said agitate drive member into engagement with said agitate section, when said motor is rotated in one direction, a spin drive member having a driving surface parallel to said spin section, and a spin screw member keyed to said shaft for directing said spin drive member into engagement with said spin section when said motor is rotated in another direction.

2. In combination, two shaft means concentrically arranged, an enclosing housing completely enclosing the one adjacent end of each of the shaft means, the opposite adjacent ends of each of said shaft means protruding out of said housing, means preventing relative rotation of said two shaft means, said housing including a relatively stationary portion enclosing said shaft means and a rotatable portion rotatable with respect to the normally stationary portion and said shaft means, means responsive to said rotatable portion for reciprocating one of said shafts or rotating the other of said shafts, a driven flange on said rotatable portion having a conical agitate surface for reciprocating one of said shafts and a conical spin surface for rotating the other of said shafts, a reversible, a single speed motor for rotating said rotatable portion, said motor having a shaft substantially perpendicular to said rotatable portion, and means responsive to the operation of said motor for varying the speed of said rotatable portion, said responsive means including a conical agitate drive member, an agitate screw member keyed to said shaft for directing said agitate drive member into engagement with said agitate surface, when said motor is rotated in one direction, a conical spin drive member, a spin screw member keyed to said shaft for directing said spin drive member into engagement with said spin surface, when said motor is rotated in another direction.

3. In combination with a vertically reciprocating type washing machine, two shaft means concentrically arranged, an enclosing housing completely enclosing the one adjacent end of each of the shaft means, the opposite adjacent ends of each of said shaft means protruding out of said housing, means preventing relative rotation of said two shaft means, said housing including a relatively stationary portion enclosing said shaft means and a rotatable portion rotatable with respect to the normally stationary portion, said housing being provided with a substantially sealed joint between the two portions, both of said shaft means being rotatably mounted with respect to both of said portions of said housing, and means for rotating said rotatable portion in one direction at one speed to reciprocate one of said shafts and to rotate said rotatable portion in another direction at another speed to rotate the other of said shafts, said last-named means including a reversible single-speed motor having a shaft axially parallel to said rotatable portion, said shaft supporting a first pulley relatively rotatably mounted on said shaft, a second pulley smaller than said first pulley relatively rotatably mounted on said shaft, a screw keyed to said shaft between said pulleys and a nut relatively rotatably carried on said screw, said nut having a frictional material on its upper surface for drivingly engaging said first pulley when said shaft is rotated in one direction to rotate said rotatable portion at one speed and said nut having a frictional material on its lower surface for drivingly engaging said second pulley when said shaft is rotated in another direction to rotate said rotatable portion at said other speed.

4. In combination, two shaft means concentrically arranged, an enclosing housing completely enclosing the one adjacent end of each of the shaft means, the opposite adjacent ends of each of said shaft means protruding out of said housing, means preventing relative rotation of said two shaft means, said housing including a relatively stationary portion enclosing said shaft means and a rotatable portion rotatable with respect to the normally stationary portion and said shaft means, reversible single speed means for rotating said rotatable portion and having its axis at an angle to the axis of said rotatable portion, means responsive to said rotatable portion for either reciprocating one of said shaft means

or rotating the other of said shaft means, and means responsive to the operation of said reversible single speed means for varying the speed of said rotatable portion, said rotatable portion including an annular flange having a biased agitate track and a biased spin track and said last-named means including a conical agitate drive member, an agitate screw member attached to said reversible single speed means for directing said agitate drive member into engagement with said agitate track, a conical spin drive member, and a spin screw member attached to said reversible single speed means for directing said spin drive member into engagement with said spin track.

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