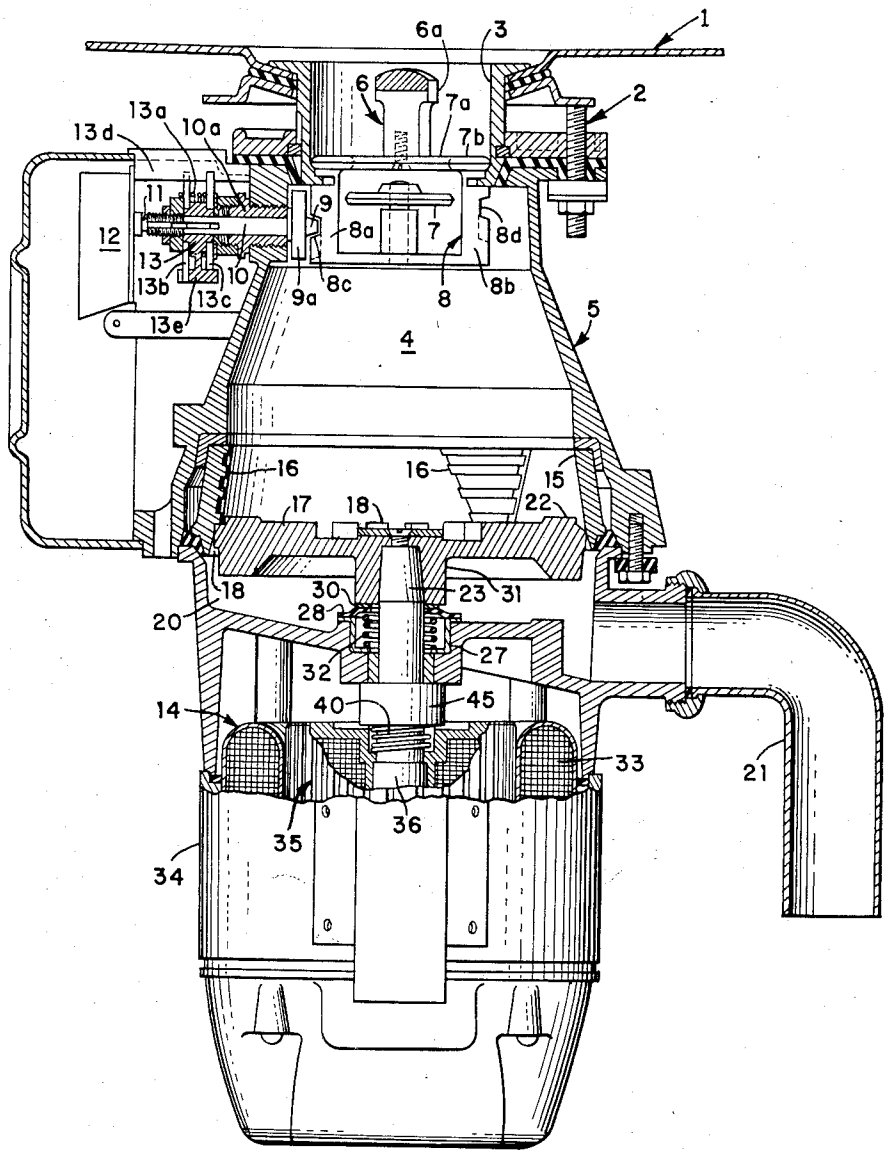
March 17, 1959 J. E. BEBINGER 2,877,955

WASTE DISPOSAL APPARATUS WITH SPRING CLUTCH ROTOR DRIVE

Filed May 28, 1954

2 Sheets-Sheet 1

FIG. 1.



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2 Sheets-Sheet 2

FIG. 2

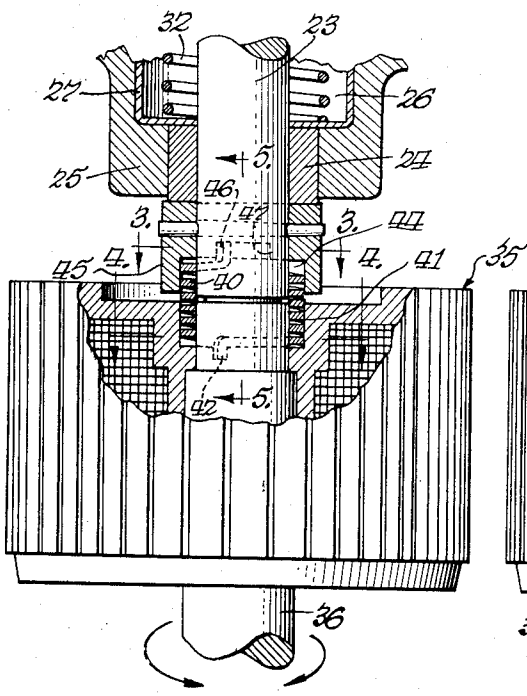


FIG. 6

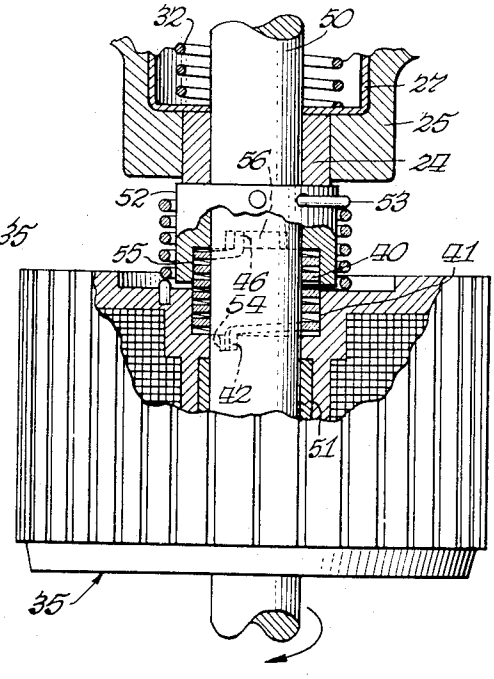


FIG. 3

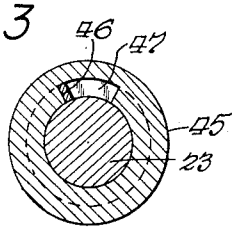


FIG. 5

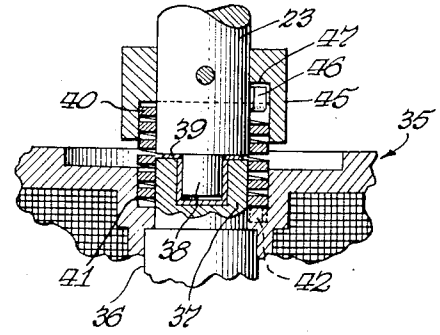
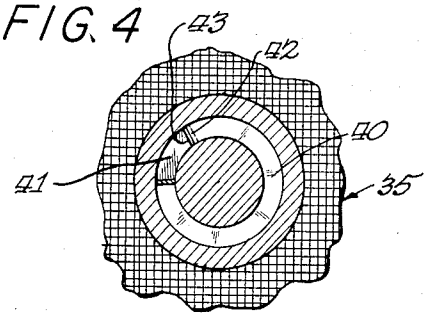


FIG. 4



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United States Patent Office 2,877,955
Patented Mar. 17, 1959

2,877,955

WASTE DISPOSAL APPARATUS WITH SPRING CLUTCH ROTOR DRIVE

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Application May 28, 1954, Serial No. 433,219

3 Claims. (Cl. 241—32.5)

This invention relates to waste food disposal devices, and, in particular, to devices in which a motor driven device disposed within a comminution chamber throws the contents of the chamber violently against stationary attrition elements disposed about the wall of the chamber. Ordinarily, the comminution of the waste within the chamber is carried on in the presence of water, whereupon the mixture of finely ground waste particles and water flows from the comminution chamber into a discharge chamber whence it passes to the waste piping of the plumbing system of the building.

Occasionally, a bone splinter or other hard and relatively unyielding object will become jammed between the attrition elements and the rotating device and stall the motor. Certain models of waste food disposers are provided with a reversible motor and means whereby the motor always starts in the opposite direction from that of its immediately previous run. Such machines will frequently clear a jam condition merely as the result of the reverse rotation of the motor. There are times, however, when the offending article becomes so wedged that the starting torque of the motor will not overcome the condition and the user finds it necessary to apply wrenches or other manual tools to restore the machine to operative condition.

It has been proposed to provide "impact start" food waste disposers in which the rotatable comminution device is mounted for free rotation on the drive shaft and is driven by means of a drive arm on the drive shaft which, after a brief interval of free movement, engages a shoulder on the comminution device. Although such an arrangement is mechanically sound and has performed satisfactorily in operation, it is relatively expensive to manufacture because of the severe operating conditions to which the driving arm is subject, and the necessity of providing an adequate bearing surface between the comminution device and the shaft. I have discovered that a highly satisfactory free-start waste food disposer may be constructed by using a spring clutch of the positive engagement type and locating said clutch entirely within the motor compartment where it is protected against damage or fouling by the food waste being ground in the comminution chamber. A feature of my invention resides in the ease of adaptation to disposers of both the one direction and the reversible types. A further feature resides in the fact that the spring clutch transmits torque by frictional engagement with the driving and driven elements and there is an almost complete absence of impact which would require careful selection of materials or the heat treatment thereof to obtain a proper balance between toughness and hardness of the associated parts.

Other features and advantages of the invention will be apparent from the following detailed description of a presently preferred form thereof, read in the light of the accompanying drawings in which:

Fig. 1 is a side elevation partly in section of a food waste disposer embodying one form of the present invention;

Fig. 2 is a fragmentary side elevation partly in section showing the drive clutch arrangement for a two direction waste disposer;

Fig. 3 is a plan section on lines 3—3 of Fig. 2;

Fig. 4 is a plan section on lines 4—4 of Fig. 2;

Fig. 5 is a vertical section taken on lines 5—5 of Fig. 2; and

Fig. 6 is a view similar to Fig. 2 showing the invention as applied to a uni-directional disposer.

In Fig. 1, I have illustrated my invention as applied to a domestic type waste food disposer such as manufactured and sold by my assignee herein under the trademark "Disposall." Such disposers are ordinarily attached to a kitchen sink **1** by a suitable mounting assembly **2**. Such assembly may include the sink flange **3** which seats within the drainage opening of the sink and provides an entrance into the comminution chamber **4** of the food waste disposer **5**. A combination switch actuator and sink stopper **6** may be inserted into the sink flange in the position shown in which a valve member **7** opens by gravity to permit water to flow from the sink into the chamber **4**. The construction of the stopper and switch actuator element **6** is as shown in Swisher U. S. Patent 2,669,395, granted February 16, 1954, for "Kitchen Waste Disposer Apparatus With Reversing Means," and assigned to my present assignee. Briefly stated, the element **6** is removably associated with the sink flange **3**; in one operative position, it may be placed within the sink flange in the manner illustrated in Fig. 1 in which it permits normal sink drainage into the disposer chamber **4**, as well understood in the art. By manual rotation by means of the handle **6***a*, the structure will operate a switch controlling the disposer motor, as presently explained. Optionally, the structure **6** may be removed from the sink flange, inverted and replaced therein, whereupon the valve disk **7** will drop into closing relation with respect to opening **7***a* in the annular base **7***b* of the element **6**. This manner of use provides a sink stopper for the sink drainage outlet. The element **6** has a depending cam structure **8** comprising diametrically opposite legs **8***a* and **8***b* which are respectively provided with cam grooves **8***c* and **8***d*. The element **6** may be optionally placed within the sink flange **3** so that either the cam **8***c* or the cam **8***d* comes into operative relationship with a lug **9** projecting from a crank arm **9***a* fixed to the end of a shaft **10**. Said shaft is rotatably mounted in a gland **10***a*, whereupon when either of the cams **8***c* and **8***d* is brought into operative relationship with the lug **9**, and the structure **6** rotated to a prescribed "on" position, the shaft **10** will be rotated through a brief arc in one or the other of two directions. The shaft **10** has a forked end which receives the flattened end portion of a shaft **11** which operates a switch **12** controlling the motor **14** of the disposer. The switch **12** is of the motor reversing type and will connect the start and running windings of the motor to electric power so as to cause the motor to run in either a forward or a reversing direction. For example, with the element **6** in the Fig. 1 position, the manual rotation of said element may operate the switch **12** so as to energize the motor **14** for rotation in a clockwise direction, whereupon when the element **6** is removed from the sink flange **3** and replaced so that its cam **8***d* is in operative relationship with the lug **9**, the manual operation of the element **6** to its "on" position will rotate shaft **10** in the direction which will operate switch **12** to energize the motor to run in the counterclockwise direction. A collar **13** keyed to the shaft **10** carries a coil spring **13***a* and also mounts a pair of fingers **13***b* and **13***c* which, respectively, straddle a fixed bar **13***d* and a member **13***e* extending from the collar **13**. As more fully explained in the said Swisher patent, the rotation of the shaft **10** will tension the spring

13*a* because of the operation of one of the fingers 13*b* or 13*c* against the lug 13*d* and member 13*e*, whereupon when the member 6 is returned to its "off" position, the switch shaft 10 returns the motor 12 to an open circuit position to stop the operation of the motor 14.

The lower portion of the comminution chamber is fitted with a shredding ring 15 which may also be of any conventional design. For example, the ring may be of hardened stainless steel formed with a plurality of grooved bosses 16 against which the contents of the comminution chamber are hurled by the rotation of the rotatable comminution device 17. Because the device 17 comprises a relatively heavy disc, it has a flywheel effect, and is referred to in the art as a "flywheel." The shredding ring also has a series of edged passages 18 disposed about the bottom of the ring.

In operation, the user loads the chamber 4 with a quantity of waste and starts the motor, having previously opened the cold water tap (not shown) of the sink so that the comminution is effected in the presence of a continuous flow of water, as is now well known in the art. The comminution device or flywheel 17, rotating at a speed of the order of 1750 R. P. M., throws the material against the shredding ring elements, and there is soon formed a mixture of water and small particles of waste which flows through the openings 18 into the drainage chamber 20 from which it passes through the waste connection 21 to the plumbing trap (not shown) of the building plumbing waste system.

It has previously been mentioned that small, hard pieces of bone may jam the flywheel 17 and stall the motor. This occurs when such pieces become lodged between the tumbling lugs 22 of the flywheel and the edges of the bosses 16 or the passages 18. In a reversible motor type of disposer, a reversal of the direction of rotation of the motor will sometimes back the flywheel away from the object whereupon the comminution operation may be continued with the flywheel rotating in the opposite direction. Occasionally, however, the offending object will have become so tightly wedged that the motor cannot start in either direction and the user must resort to wrenches or other manual tools to clear the situation.

It has been found that if the motor is permitted a free start of only a relatively small fraction of a rotation, the inertia developed by the motor rotor will cause the flywheel to drive through the jammed object and the apparatus will be restored to use. The present invention provides an efficient lost motion clutch to transmit motor torque to the flywheel 17 following a brief interval of free rotation.

Fig. 2 shows the invention as applied to a reversing type with disposer and Fig. 2 should be considered in association of Fig. 1. The flywheel 17 is firmly fixed to a shaft 23 by any suitable means. Said shaft is journalled in a suitable bearing 24 secured within an annular boss 25 forming part of the lower wall of the drainage chamber 20. The boss forms a pocket 26 within which may be mounted a water seal of any suitable pattern. Such a seal, for example, may include the cup 27 fixed within the pocket 26, the flexible watertight membrane 28, the sealing ring 30 bearing against the bottom of the flywheel hub 31, and the spring 32 urging said sealing ring against said hub.

Drive motor 14 includes a stator 33 fixed within a housing 34 in any suitable manner, and a rotor 35 fixed to the shaft 36. A suitable lower bearing (not shown) secured with respect to the stator supports the rotor shaft 36 in precise concentric alignment with shaft 23. Further to insure such alignment, shaft 36 may be provided with a bearing 37 (Fig. 5) to rotatably receive a pilot extension 38 of shaft 23. As will later appear, there is little relative movement between shafts 23 and 36 and the lubrication of bearing 37 is not a serious problem. It will also be noted from Fig. 5 that the facing surfaces of the shafts 23 and 36 are square being without appreciable chamfer or fillet and that they are axially separated by a thin bearing washer 39. It is obvious from Fig. 5 that at their respective end portions, shafts 23 and 36 are of the same diameter.

The driving connection between shaft 23 and 36 is of the positive engagement spring coil type, best shown in Figs. 2 and 5. The coil spring 40 is of construction now well known in the art. The convolutions are rectangular in cross section with the radially outer and inner walls ground to establish mutually parallel outer and inner cylindrical surfaces. The spring coil is substantially evenly divided between the shafts 23 and 36. The lower portion of the spring coil is disposed within a cavity 41 in the rotor 35 and the tip end 42 of the spring is turned down to seat snugly within a pocket 43 at the base of the cavity.

The upper portion of the spring fits within the cavity 44 of a drive collar 45 pinned or otherwise rigidly affixed to shaft 23; and the tip end 46 of the spring extends into the arcuate pocket 47 formed in collar 45, as best shown in Fig. 3.

The spring coil is sized so that with all elements of the mechanism at rest, the inner wall of the spring coil is spaced about four thousandths of an inch (.004 inch) from the surface of the shafts 23 and 36 and the outer wall of the spring coil is spaced approximately the same distance from the wall of the cavity 41 and the collar 45. The tip 42 of the spring coil is relatively immovable within the pocket 43 of rotor 35, and the tip 46 of the spring coil is free to move within the arcuate slot or groove 47 of the drive collar 45.

Now, if at the commencent of operation of the device, the rotor 35 of the reversible motor 14 starts in the clockwise direction, as viewed in Fig. 3, spring coil 40 will rotate in the same direction and its tip 46 will engage the right-hand end of groove 47. During the interval in which tip 46 is traversing the arcuate groove, there is almost literally no load on the motor, bearing friction excepted. When tip 46 strikes the right end of the arcuate groove, the coil spring will expand and in very rapid succession the convolutions of the spring will engage the wall of drive collar 45 and rotor cavity 41, whereupon there will be established a positive drive in connection between the rotor and the comminution flywheel 17.

When the rotor 35 comes to rest, either as the result of normal operation or because the motor has been stalled during operation, tip 46 will obviously remain adjacent the right end of said arcuate groove 47. When the motor is de-energized at the end of a normal run, or in preparation for immediate subsequent operation in an effort to clear a jam, the spring will relax to assume its normal clearance with respect to the cavities 41 and 44 and the shafts 23 and 36, whereupon the tip 46 will withdraw only slightly from the end of the slot 47. When the motor is de-energized for rotation in the opposite direction, the coil spring will rotate relative to shaft 23 until its tip 46 strikes the opposite end of groove 47, whereupon the coil will be contracted. Its convolutions will in rapid succession engage the surface of shafts 23 and 36 and driving connection will be established between the rotor and the comminution element shaft 23. For either direction of operation of the motor therefor, the rotor will have a substantially free start.

In the embodiment of Fig. 6, the invention has been applied to a disposer of the uni-directional type. Accordingly, I provide means whereby when the motor is de-energized, the rotor takes a final position which establishes the spring clutch element in proper relationship for a succeeding load-free start of the motor. In this embodiment a single shaft 50 is used; it will be understood that a comminution element such as that shown at 17, Fig. 1, is affixed to the upper end of the shaft, as described with respect to shaft 23 of Fig. 2, and that the

lower end of the shaft will be journalled in a suitable bearing (not shown), as described with respect to shaft **36** of Fig. 2. The rotor **35**, however, is free to rotate on shaft **50** and a suitable bearing **51** is provided for the reduction of friction between the rotor and the shaft. The rotor has a concentric cavity **41**, as previously described, for the reception of the lower portion of the coil spring clutch **40**, and as before there is an aperture in the bottom of the cavity to securely receive the end **42** of the coil spring. Shaft **50** has securely affixed thereto the drive collar **52** which may be similar in all respects to collar **45** except for means for the attachment of an end of a light coil spring **53** as shown in Fig. 6. The other end **42** of said coil spring enters an aperture **54** in the rotor **35**. The axial cavity **55** of drive collar **52** is in precise vertical alignment with cavity **41** of the rotor and is of the same diameter as said cavity **41**. The upper portion of the coil spring clutch **40** is accommodated within the cavity **55** and the end **46** of said clutch is free to ride within the arcuate groove **56** at the base of the cavity **55** of collar **52**.

As in the Fig. 2 embodiment, the spring clutch **40** has a small clearance—of the order of .004 inch—between it and the shaft **50** and a similar clearance with respect to the inside wall of cavities **41** and **55**. In view of this clearance, there is no restraint on spring **53** except the friction between the rotor and shaft **50** and when the motor is deenergized at the end of a comminution operation said spring will rotate the unenergized rotor in reverse direction related to shaft **50** until the tip **46** of the spring clutch **40** engages the left-hand end of the slot **56** as viewed in Fig. 6. It will be appreciated, therefore, that the spring **53** is required to exert only a very small torque.

When the motor is energized, assuming that the rotor operates in the clockwise direction, there will be an interval of rotation restrained only by the light spring **53** until the end **46** of spring **40** engages the opposite end of slot **56**, whereupon the spring **40** will expand into engagement with the drive collar and rotor, thus obtaining the impact start of the comminution device. When the rotor has come to rest following de-energization, the light spring **53** reverses the direction of rotation of the rotor, whereupon it attains the Fig. 6 position in readiness for the next operation.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. In a waste disposer, the combination of a housing, a comminution chamber therein, a comminution device disposed within said chamber, a shaft for rotatably mounting said comminution device, a reversible electric motor for operating said device, said motor having a rotor, a shaft for said rotor concentric with said first-named shaft, means including a pilot portion of one shaft extending into a bearing cavity in the other shaft for maintaining said shafts in coaxial alignment with one shaft rotatable relative to the other, said shafts being in relatively close end-to-end relationship and of equal diameter for a substantial distance on each side of the point of separation thereof, a coil spring clutch of the positive engagement type disposed about the said equal diameter portions of said shafts and having substantially uniform clearance with respect to said shafts, means for anchoring one end of said spring clutch in the motor rotor, power switching means for automatically operating said rotor in a direction opposite to the immediately preceding direction of rotation, and means fixed to said comminution device shaft to engage the opposite end of said spring clutch following a brief but substantially uniform interval of rotation of said rotor in said reverse direction to cause said spring clutch frictionally to engage the surface of said shafts for transmission of motor power to said comminuting device shaft.

2. In a waste disposer, the combination of a housing, a comminution chamber therein, a comminution device disposed in said chamber, a shaft for rotatably mounting said comminution device, a reversible electric motor for operating said device, said motor having a rotor, a shaft for said rotor concentric with and of the same diameter as said first-named shaft, said shafts being in relatively close end-to-end relationship, a coil spring clutch of the positive engagement type disposed about the facing end-portions of said shafts with small but finite clearance between said shafts and said spring clutch, one end portion of said spring clutch being disposed within a cylindrical cavity in said rotor coaxial with said rotor shaft, there being small but finite clearance between said spring clutch and said rotor cavity and between said spring clutch and said shaft, a drive collar fixed to said comminuting device shaft and extending over and about the opposite end portion of said spring clutch with substantially identical clearance between said spring clutch and the wall of said drive collar and between said spring clutch and said shaft, means on said spring clutch for securing one end thereof to said rotor, power switching means for automatically reversing said rotor following interruption of an immediately previous rotation thereof, means in said collar to engage the opposite end of said spring clutch to actuate the same into driving engagement with said shafts following an interval of rotation of said rotor in said reverse direction.

3. In a waste disposer, the combination of a housing; a comminution chamber therein; a comminution device disposed within said chamber; a shaft fixed to said comminution device for rotatably mounting said device within said chamber; a reversible electric motor for rotating said shaft, said motor having rotor means including a shaft; power switching means for rotating said rotor in a direction opposite to the immediately preceding direction of rotation; means for maintaining the respective shafts in close end-to-end relationship and in axial alignment; a cylindrical clutch element formed about said rotor shaft to provide an annular cavity therewith; a cylindrical clutch element secured to said first-named shaft and forming therewith a second annular cavity, said last-named clutch element having an arcuate groove facing into said cavity, said groove being of uniform width and depth and extending in a plane perpendicular to the associated shaft, the open ends of said cavities facing each other and the respective walls thereof being in mutual alignment; a cylindrical coil spring clutch disposed about said shafts and occupying the respective cavities, the side walls of said spring clutch, when the clutch is relaxed, being in non-drive relation to the side walls of the said cavities; a projection at one end of said clutch extending into fixed relation with said rotor means; a projection on the opposite end of said clutch extending freely into said arcuate groove and being of substantially less angular width than the angular lenth of said groove, whereby during the initial reverse-directional movement of said rotor means relative to said first-named shaft the spring clutch will remain in non-driving relation to the side walls of said cavities until the last-named projection engages an end wall of said groove and upon continued rotation in said direction will distort said spring clutch to bring a wall thereof into driving relation with a wall of the respective cavities.

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