Oct. 19, 1937. P. B. REEVES 2,096,339

VARIABLE SPEED SPINNING FRAME DRIVE CONTROL

Filed Oct. 29, 1936 2 Sheets-Sheet 1

Fig. 1.

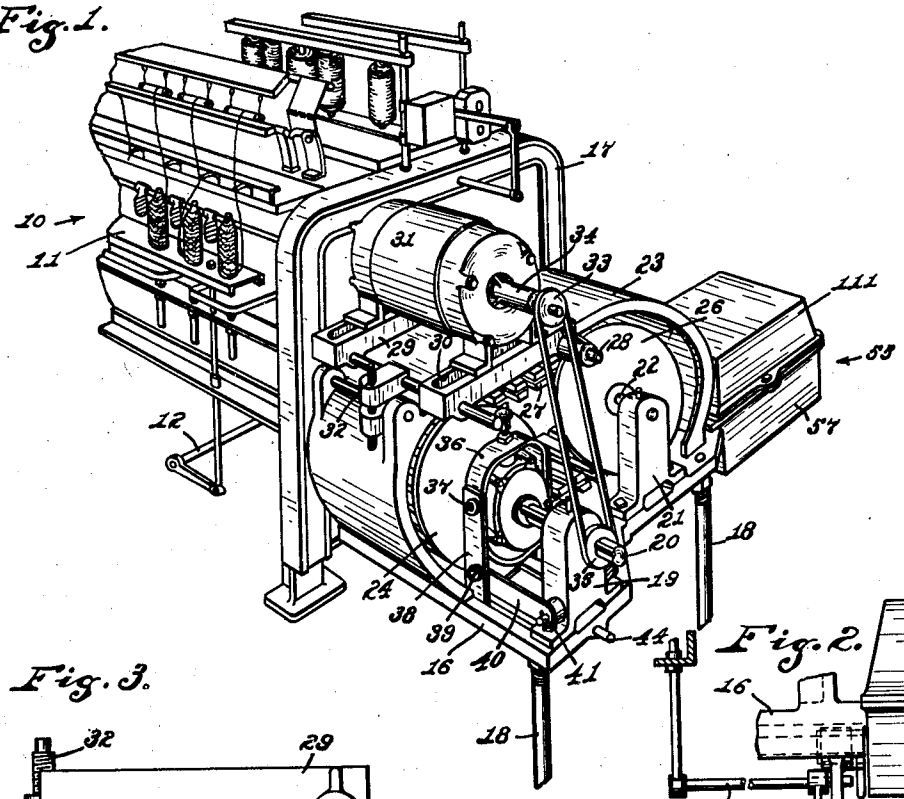

Fig. 2.

Fig. 3.

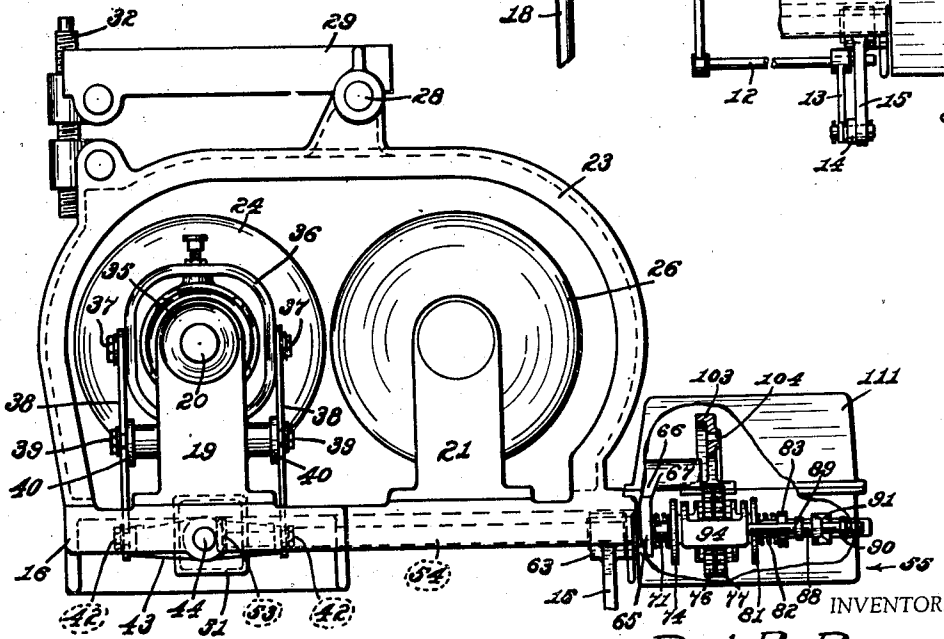

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Fig. 4.

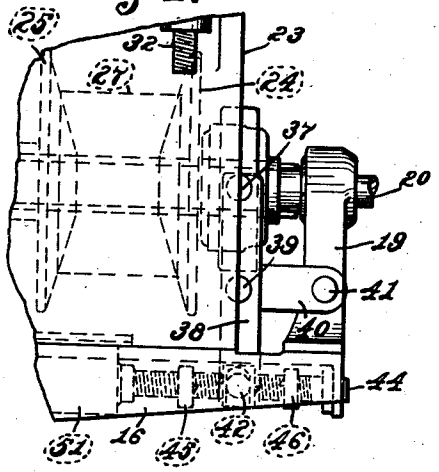


Fig. 5.

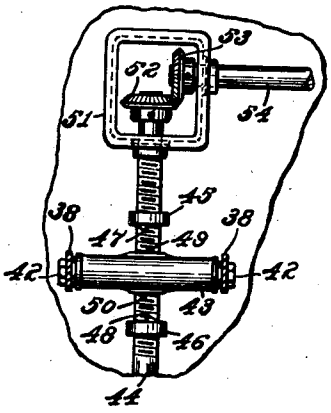


Fig. 6.

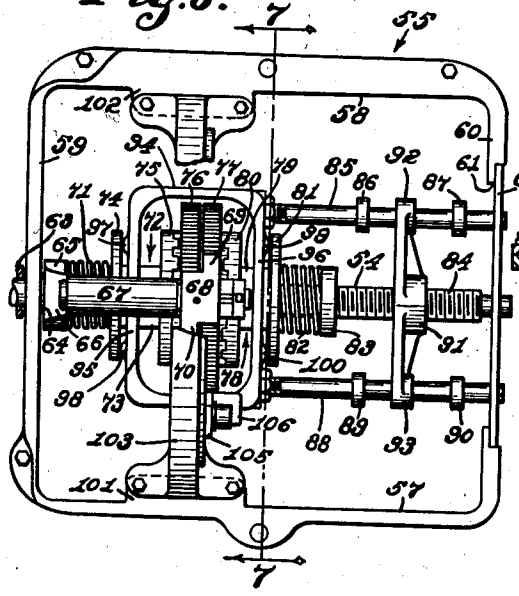
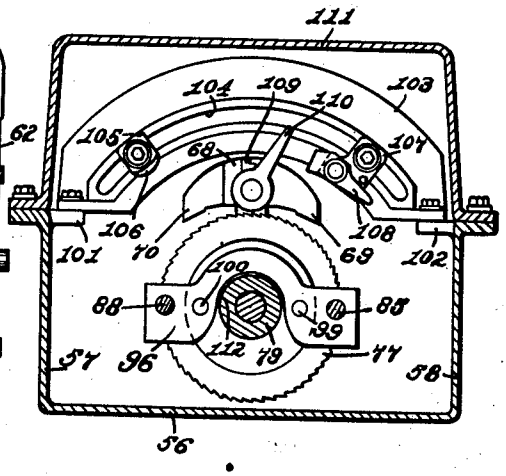


Fig. 7.



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Patented Oct. 19, 1937

2,096,339

UNITED STATES PATENT OFFICE

2,096,339

VARIABLE SPEED SPINNING FRAME DRIVE CONTROL

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Application October 29, 1936, Serial No. 108,162

9 Claims. (Cl. 74—157)

The present application relates to variable speed drive controls for spinning frames, and the like; and the primary object of the invention is to improve controls of that general character in minor details. Particularly, the present invention has for its primary object to rearrange the elements of control mechanisms of the above general character for the purpose of reducing the floor space required to accommodate such a control. A further object of the invention is to simplify the various driving and controlling connections, whereby the efficiency of the organization as a whole is somewhat improved. Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a perspective view of one end of a conventional spinning frame, with which is operatively associated my improved drive and control;

Fig. 2 is a fragmental view, showing the drive connections between the spinning frame and the control;

Fig. 3 is an end elevation, upon an enlarged scale, of parts of the organization, certain parts being broken away for clarity of illustration;

Fig. 4 is a fragmentary end view of the organization illustrated in Fig. 3;

Fig. 5 is a fragmentary sectional plan of certain elements of the control;

Fig. 6 is a plan view of the control per se, parts being broken away for clarity of illustration; and

Fig. 7 is a transverse section taken substantially on the line 7—7 of Fig. 6, and looking in the direction of the arrows.

Referring more particularly to the drawings, it will be seen that I have illustrated a portion of a conventional spinning frame 10, including the usual ring rail 11 driven, as usual, from the oscillating shaft 12. As is clearly shown in Fig. 2, said shaft 12 carries an arm 13 which is connected, by a link 14, with an arm 15 which, as will appear from the following description, operates, upon oscillation, to drive the elements of the control to vary the speed at which the spinning frame is driven.

The entire control of the present application is assembled upon a table 16 which is secured to the end frame 17 of the driven machine, and which is further supported by legs 18. A standard 19 supported upon the table provides a support and bearing for one end of the input shaft 20 of a variable speed transmission. The other end of said shaft is suitably supported and journaled in a bearing (not shown). A second standard 21 provides a bearing for one end of the output shaft 22 of the transmission. Said shaft 22 may be the main shaft of the spinning frame 10, or it may be connected, in a suitable manner, to drive the main shaft of such frame 10. The transmission is preferably housed in a housing 23 of suitable characteristics.

Splined upon the shaft 20 is a coned disc 24; and a second coned disc 25 is fixedly mounted on said shaft 20 in facing relation to the disc 24, as is clearly shown in Fig. 4. It will be obvious that, as the disc 24 is shiftable axially of the shaft 20, said discs 24 and 25 cooperate to form an expansible V-pulley. Fixed on the shaft 22 is a coned disc 26 which cooperates with a similar coned disc (not shown) splined on the shaft 22 and resiliently urged toward the disc 26, to form a resiliently expansible V-pulley. An edge-active V-belt 27 provides a driving connection between the pulley formed by the discs 24 and 25 and the pulley formed by the disc 26 and its mate; whereby the shaft 22 is driven from the shaft 20, and whereby the speed of the shaft 22 may be varied by axial shifting of the disc 24 along the shaft 20.

If desired, either or both of the shiftable discs may be splined upon a projected hub of its associated fixed disc.

Suitably mounted upon the housing 23 is a shaft 28 which provides a pivotal mounting for a motor platform 29 which is formed with slideways 30. A motor 31 is adjustably mounted in the slideways 30; and the platform may be adjusted, about the axis of the shaft 28, to move the motor 31 toward or away from the shaft 20, by means of the screw 32. A suitable sheave 33 is carried on the motor spindle 34; and a suitable sheave 35 is carried on the shaft 20, whereby the motor 31 drives the shaft 20 through a connecting belt, as shown.

A yoke 36 is connected, through a suitable thrust bearing means which forms no part of the present invention, to the disc 24; whereby said disc 24 may be positively shifted in either direction axially of the shaft 20 by corresponding movement of the yoke 36. Pivotally connected to the yoke 36 at diametrically opposite points 37 are two straps 38 which, at the points 39, are pivotally connected intermediate their ends with links 40, pivoted at 41 on the standard 19. The

lower ends of the straps 38 are bifurcated, as is clearly shown in Fig. 4, to straddle the opposite ends of a nut 43, being held in place thereon by suitable fastening means 42. The nut 43 is threadedly mounted on a screw shaft 44 which is positioned in parallelism with the shafts 20 and 22.

Stop nuts 45 and 46 are adjustably mounted on the shaft 44 on opposite sides of the nut 43; and said stop nuts 45 and 46 are provided respectively with cam elements 47 and 48 adapted, at times, to engage respectively the cam elements 49 and 50 on the nut 43 to prevent jamming of the nut 43 against either of said stop nuts. At its inner end, the shaft 44 is journaled in, and projects into, a gear box 51 which is preferably filled with grease. Within said box, the shaft 44 carries a beveled gear 52 meshing with a second beveled gear 53 carried on a shaft 54 which likewise projects into the box 51.

Secured to, and carried by, the table 16 is a casing indicated generally at 55 and comprising a bottom 56, upwardly projecting side walls 57 and 58, and upwardly projecting end walls 59 and 60. The end wall 60 is cut away, as at 61, and there is provided a closure 62 suitably secured in place to cover the cutaway portion of the wall 60.

As is clearly to be seen in Figs. 3 and 6, the arm 15 merges into a hub 63 which is loosely mounted on the shaft 54, and which is provided with a reduced portion 64 journaled in the wall 59 of the casing 55. Said reduced portion 64 carries the hub 65 of an arm 66 which, at its free end, supports a cylinder 67 in which is mounted a rock shaft carrying a double-ended pawl 68 having the arms 69 and 70. Sleeved on the shaft 54, and abutting the hub 65, is a spring 71. Keyed to the shaft 54 is a clutch member, indicated generally at 72, and comprising a hub 73 carrying at one end a pressure plate 74 which abuts the opposite end of the spring 71. At the other end of the hub, and longitudinally spaced from the pressure plate 74, is a clutch disc 75 provided with crown teeth adapted to mesh with crown teeth formed on the adjacent surface of a ratchet wheel 76 loosely mounted on the shaft 54, and registering with the arm 70 of the pawl 68. A second ratchet wheel 77, oppositely pitched with respect to the ratchet wheel 76, is loosely mounted on the shaft 54 in registry with the arm 69 of the pawl 68; and said ratchet wheel 77 is provided on one face with crown teeth adapted to mesh with the crown teeth of a clutch disc 80 forming a part of a clutch element, indicated generally at 78. Said clutch element 78 is keyed on the shaft 54 and comprises a hub 79 carrying the clutch disc 80 and, axially spaced from the clutch disc 80, a pressure plate 81.

One end of a spring 82, sleeved on the shaft 54, bears against the pressure plate 81; while the other end of said spring abuts a stop collar 83 fixed on the shaft 54. That end of the shaft 54 adjacent the closure plate 62 is threaded, as at 84.

A rod 85 carries two stop collars 86 and 87, longitudinally spaced along said rod, and adjustably fixed to said rod. A second, parallel, rod 88 carries two stop collars 89 and 90, likewise adjustably fixed thereon. A nut 91 is threadedly mounted on the threaded portion 84 of the shaft 54, and is provided with oppositely extending arms 92 and 93, respectively slidably mounted on the rods 85 and 88 between the stop collars on said rods.

A yoke member 94, comprising a solid casting made up of side elements and end elements 95 and 96, is partially supported by said rods 85 and 88, which are secured to said yoke member. The end elements 95 and 96 of the yoke member 94 are formed to provide semi-annular portions, forming what may be termed notches 112; and said semi-annular portions of the end elements 95 and 96 are respectively received between the pressure plate 74 and the clutch disc 75 and the pressure plate 81 and the clutch disc 80, resting upon the hubs 73 and 79. The element 95 carries two studs 97 and 98 which form friction reducing contacts with the pressure plate 74, said studs being symmetrically arranged with respect to the axis of the shaft 74; and the element 96 carries similar studs 99 and 100, for engagement with the pressure plate 81.

Ledges 101 and 102 project inwardly from the side walls 57 and 58 of the casing 55 and support the opposite ends of a segment 103 which is formed with an arcuate slideway 104 in which are adjustably fixed a stop element 105 having a projection 106 and a second stop element 107 provided with a pivoted latch member 108. The rock shaft which carries the pawl 68 carries also a finger 109 for cooperation with the latch 108, and a finger 110 for cooperation with the projection 106. A cover 111 is provided for the casing 55.

The operation of the organization will be clear from the above description, but may be briefly reviewed. When the motor 31 is energized, it drives the shaft 20 which, through the discs 24 and 25 and the belt 27, drives the discs mounted on the shaft 22 to drive said shaft 22 at a speed determined by the setting of the nut 43. As the machine 10 operates, the shaft 12 is oscillated to oscillate, through the arm 13 and link 14, the arm 15; thereby oscillating the element 67 and the pawl 68 carried thereon. Assuming that the machine 10 is being used for filling wind operations, in which the arm 12 oscillates through a stroke of substantially constant length but of varying position, and assuming that the arm 69 of the pawl 68 is in cooperative relation with the ratchet wheel 77, it will be seen that such oscillation of the element 67 will result in clockwise step-by-step rotation of the ratchet wheel 77, as viewed in Fig. 7. Both of the clutch discs 75 and 80 being engaged with the respective ratchet wheels 76 and 77, such movement of the ratchet wheel 77 will be transmitted through the clutch element 78 to the shaft 54. So long as these conditions remain constant, the ratchet wheel 76 will likewise be driven in a clockwise direction, through the clutch element 72.

Clockwise rotation of the shaft 54 causes movement of the nut 91 toward the right, as viewed in Fig. 6. It also causes movement of the nut 43 downwardly as viewed in Fig. 5, to shift the disc 24 toward the disc 25 to increase the effective diameter of the pulley formed by said discs. The belt 27 is thus moved outward, between said discs and is forced more deeply into the V formed by the disc 26 and its mate, the mate of the disc 26 being forced away from the disc 26 against the pressure of the spring (not shown) associated therewith. This change in the relative positions of the discs increases the speed of the shaft 22.

After a predetermined period, the ends 92 and 93 of the nut 91 will engage the stop collars 87 and 90, and further movement of said nut 91

toward the right, as viewed in Fig. 6, will cause the element 96 to force the clutch element 78 toward the right, as viewed in Fig. 6, against the pressure of the spring 82, to disengage the clutch disc 80 from the ratchet 77.

At some time thereafter, the finger 109 will strike the latch 108, to throw the pawl arm 70 into engagement with the ratchet wheel 76; whereafter, oscillation of the element 67 will result in counterclockwise rotation of the ratchet wheel 76. That rotation will be transmitted, through the clutch element 72, to the shaft 54; whereby the nut 91 will be moved gradually toward the left, thus permitting the clutch disc 80 again to engage the ratchet wheel 77. Such rotation will also cause clockwise rotation of the shaft 44, as viewed in Fig. 3, to move the nut 43 upwardly, as viewed in Fig. 5; thereby moving the disc 24 away from the disc 25 to reduce the speed of the shaft 22. After a predetermined period of operation, the ends 92 and 93 of the nut 91 will engage and move the stop collars 86 and 89 to disengage the clutch disc 75 from the ratchet wheel 76.

I claim as my invention:

1. A control for a variable speed transmission having an element shiftable in opposite directions to vary oppositely the speed differential effected by said transmission, comprising an oscillating arm driven by said transmission about a substantially horizontal axis, a double-ended pawl carried on said arm, a substantially horizontal shaft coaxial with said arm, a first ratchet loosely mounted on said shaft and having teeth engageable by one end of said pawl, clutch means resiliently urged to clutch said first ratchet to said shaft, a second ratchet loosely mounted on said shaft and having teeth engageable by the other end of said pawl, the teeth of said second ratchet being oppositely pitched with respect to the teeth of said first ratchet, clutch means resiliently urged to clutch said second ratchet to said shaft, means connecting said shaft to drive said shiftable element in either direction, means actuated by rotation of said shaft in one direction to disengage said first clutch means, means actuated by continued oscillation of said arm to shift said pawl out of engagement with said first ratchet and into engagement with said second ratchet, and means actuated by rotation of said shaft in the opposite direction to disengage said second clutch means.

2. In a device of the class described for use in driving a machine at variable speeds, a table, a variable speed transmission supported upon said table and comprising an input shaft, an output shaft, means providing a driving connection between said shafts, and an element shiftable in opposite directions to vary oppositely the speed differential between said shafts, a casing supported on said table, a horizontal shaft perpendicular to the vertical axial planes of said transmission shafts and operatively connected to shift said shiftable element, a portion of said shaft being journaled within said casing, two oppositely-pitched ratchets loosely mounted on said shaft within said casing, an arm mounted for oscillation about the axis of said shaft within said casing and carrying a double-ended pawl adapted for alternative cooperation with said respective ratchets, two clutch elements slidably mounted on said shaft within said casing and spring pressed toward engagement with said respective ratchets, an element cooperable with both of said clutch members and adapted, upon movement to a predetermined degree in one direction, to disengage one of said clutch members, and, upon movement to a predetermined degree in the opposite direction, to disengage the other of said clutch members, a portion of said shaft within said casing being threaded, a member threadedly mounted on said threaded shaft portion and having a lost-motion two-way connection with said last-mentioned element, means for driving said transmission input shaft, said transmission output shaft being connected to drive such machine, and means connecting said machine to transmit an oscillating movement to said arm.

3. In a device of the class described for use in driving a machine at variable speeds, a table, a variable speed transmission supported upon said table and comprising an input shaft, an output shaft, means providing a driving connection between said shafts, and an element shiftable in opposite directions to vary oppositely the speed differential between said shafts, a casing supported on said table, a horizontal shaft perpendicular to the vertical axial planes of said transmission shafts and operatively connected to shift said shiftable element, a portion of said shaft being journaled within said casing, two oppositely-pitched ratchets loosely mounted on said shaft within said casing, an arm mounted for oscillation about the axis of said shaft within said casing and carrying a double-ended pawl adapted for alternative cooperation with said respective ratchets, two clutch elements fast on said shaft within said casing and spring pressed toward engagement with said respective ratchets, an element cooperable with both of said clutch members and adapted upon movement to a predetermined degree in one direction, to disengage one of said clutch members, and, upon movement to a predetermined degree in the opposite direction, to disengage the other of said clutch members, a portion of said shaft within said casing being threaded, a member threadedly mounted on said threaded shaft portion and connected to move said last-mentioned element, means for driving said transmission input shaft, said transmission output shaft being connected to drive such machine, and means connecting said machine to transmit an oscillating movement to said arm.

4. Control mechanism for a variable speed transmission having an element shiftable oppositely to vary the output speed thereof, comprising a casing, a shaft journalled on said casing and projecting therefrom, said shaft being operatively connected to shift said element oppositely upon rotation of said shaft in opposite directions, two oppositely pitched ratchets loosely mounted on said shaft within said casing, two clutch members keyed on said shaft and resiliently urged toward engagement with said respective ratchets, a double-ended pawl mounted within said casing for oscillation about the axis of said shaft, and selectively operatively engageable with said respective ratchets, means driven by said transmission for oscillating said pawl, a member having lost-motion connection with both of said clutch members, a portion of said shaft within said casing being threaded, and means threadedly associated with said threaded shaft portion and operable, upon rotation of said shaft in one direction to a predetermined degree, to shift said last-mentioned member to disengage one of said clutch members, and, upon rotation of said shaft in the opposite direction to a pre-

determined degree, to shift said last-mentioned member to disengage the other of said clutch members.

5. A control for a shiftable member, comprising a casing, a shaft journaled in said casing and projecting therefrom, a portion of said shaft within said casing being threaded, a collar fixed on said shaft adjacent one end of said casing, a spring sleeved on said shaft and bearing against said collar, a clutch member keyed on said shaft and comprising a hub, a pressure plate adjacent one end of said hub and bearing against said spring, and a clutch disc longitudinally spaced from said pressure plate, a toothed member loosely mounted on said shaft and formed for clutching cooperation with said clutch disc, a second toothed member loosely mounted on said shaft adjacent said first toothed member, a second clutch member keyed on said shaft and comprising a clutch disc, a hub, and a pressure plate longitudinally spaced from said last-named clutch disc, said last-named clutch disc and said second toothed member being formed for mutual clutching cooperation, a second spring sleeved on said shaft and bearing against said last-named pressure plate, a second collar fixed to said shaft and forming an abutment for said second spring, a solid yoke member seating on the hubs of said two clutch members between the clutch discs and pressure plates thereof, two rods secured to said yoke at one end and slidably mounted in a wall of said casing adjacent the opposite end, two collars fixed to each of said rods in longitudinally spaced relation, a nut threadedly mounted on the threaded portion of said shaft and having arms respectively slidably mounted on said two rods between said stop collars, and means selectively engageable with said respective toothed members for rotating the same.

6. A control for a shiftable member, comprising a casing having a bottom, upstanding side and end walls, and a cover, one of said end walls being cut away, a closure element for closing the cut-away portion of said one end wall, a shaft journaled in the solid end wall and projecting outwardly therefrom, said closure element being formed to provide a bearing for one end of said shaft, said shaft being threaded adjacent said one end, a collar sleeved on said shaft and fixed thereto adjacent the solid end wall of said casing, a spring sleeved on said shaft and bearing against said collar, a clutch member keyed on said shaft and comprising a hub, a pressure plate adjacent one end of said hub and bearing against said spring, and a clutch disc longitudinally spaced from said pressure plate, a toothed member loosely mounted on said shaft and formed for clutching cooperation with said clutch disc, a second toothed member loosely mounted on said shaft adjacent said first toothed member, a second clutch member keyed on said shaft and comprising a clutch disc, a hub, and a pressure plate longitudinally spaced from said last-named clutch disc, said last-named clutch disc and said second toothed member being formed for mutual clutching cooperation, a second spring sleeved on said shaft and bearing against said last-named pressure plate, a second collar fixed to said shaft and forming an abutment for said second spring, a yoke member comprising spaced side elements and spaced end elements integrally united into a substantially rectangular frame, each of said end elements including a substantially semi-annular portion, said semi-annular portions being respectively received between the pressure plates and clutch discs of said respective clutch members and resting upon the hubs thereof, two parallel rods secured to that end of said yoke member adjacent the cut-away end wall of said casing, two collars fixed to each of said rods in longitudinally spaced relation, a nut threadedly mounted on the threaded portion of said shaft and having arms respectively slidably mounted on said two rods between said stop collars, said closure element being formed to provide sliding bearings for the free ends of said rods, means for securing said closure member in place on said cut-away end wall, and means selectively engageable with said respective toothed members for rotating the same.

7. A control for a shiftable member, comprising a casing having a bottom, upstanding side and end walls, and a cover, one of said end walls being cut away, a closure element for closing the cut-away portion of said one end wall, a shaft journaled in the solid end wall and projecting outwardly therefrom, said closure element being formed to provide a bearing for one end of said shaft, said shaft being threaded adjacent said one end, a collar sleeved on said shaft and fixed thereto adjacent the solid end wall of said casing, a spring sleeved on said shaft and bearing against said collar, a clutch member keyed on said shaft and comprising a hub, a pressure plate adjacent one end of said hub and bearing against said spring, and a clutch disc longitudinally spaced from said pressure plate, a toothed member loosely mounted on said shaft and formed for clutching cooperation with said clutch disc, a second toothed member loosely mounted on said shaft adjacent said first toothed member, a second clutch member keyed on said shaft and comprising a clutch disc, a hub, and a pressure plate longitudinally spaced from said last-named clutch disc, said last-named clutch disc and said second toothed member being formed for mutual clutching cooperation, a second spring sleeved on said shaft and bearing against said last-named pressure plate, a second collar fixed to said shaft and forming an abutment for said second spring, a yoke member comprising spaced side elements and spaced end elements integrally united into a substantially rectangular frame, each of said end elements including a substantially semi-annular portion, said semi-annular portions being respectively received between the pressure plates and clutch discs of said respective clutch members and resting upon the hubs thereof, each of said semi-annular portions being provided with two protuberances, symmetrically arranged with respect to the axis of said shaft and adapted to engage the associated pressure plate, two parallel rods secured to that end of said yoke member adjacent the cut-away end wall of said casing, two collars fixed to each of said rods in longitudinally spaced relation, a nut threadedly mounted on the threaded portion of said shaft and having arms respectively slidably mounted on said two rods between said stop collars, said closure element being formed to provide sliding bearings for the free ends of said rods, means for securing said closure member in place on said cut-away end wall, and means selectively engageable with said respective toothed members for rotating the same.

8. A control for a shiftable member, comprising a casing, a shaft journaled in said casing and projecting therefrom, a portion of said shaft within said casing being threaded, a collar fixed

on said shaft adjacent one end of said casing, a spring sleeved on said shaft and bearing against said collar, a clutch member keyed on said shaft and comprising a hub, a pressure plate adjacent one end of said hub and bearing against said spring, and a clutch disc longitudinally spaced from said pressure plate, a toothed member loosely mounted on said shaft and formed for clutching cooperation with said clutch disc, a second toothed member loosely mounted on said shaft adjacent said first toothed member, a second clutch member keyed on said shaft and comprising a clutch disc, a hub, and a pressure plate longitudinally spaced from said last-named clutch disc, said last-named clutch disc and said second toothed member being formed for mutual clutching cooperation, a second spring sleeved on said shaft and bearing against said last-named pressure plate, a second collar fixed to said shaft and forming an abutment for said second spring, a solid yoke member seating on the hubs of said two clutch members between the clutch discs and pressure plates thereof, two rods secured to said yoke at one end and slidably mounted in a wall of said casing adjacent the opposite end, two collars fixed to each of said rods in longitudinally spaced relation, a nut threadedly mounted on the threaded portion of said shaft and having arms respectively slidably mounted on said two rods between said stop collars, a double-ended pawl oscillable within said casing about the axis of said shaft and selectively engageable with said respective toothed members, means in said casing automatically cooperable with said pawl at times to vary its cooperative relation with said toothed members, and means for oscillating said pawl.

9. A control for a shiftable member, comprising a casing having a bottom, upstanding side and end walls, and a cover, one of said end walls being cut away, a closure element for closing the cut-away portion of said one end wall, a shaft journaled in the solid end wall and projecting outwardly therefrom, said closure element being formed to provide a bearing for one end of said shaft, said shaft being threaded adjacent said one end, a collar sleeved on said shaft and fixed thereto adjacent the solid end wall of said casing, a spring sleeved on said shaft and bearing against said collar, a clutch member keyed on said shaft and comprising a hub, a pressure plate adjacent one end of said hub and bearing against said spring, and a clutch disc longitudinally spaced from said pressure plate, a toothed member loosely mounted on said shaft and formed for clutching cooperation with said clutch disc, a second toothed member loosely mounted on said shaft adjacent said first toothed member, a second clutch member keyed on said shaft and comprising a clutch disc, a hub, and a pressure plate longitudinally spaced from said last-named clutch disc, said last-named clutch disc and said second toothed member being formed for mutual clutching cooperation, a second spring sleeved on said shaft and bearing against said last-named pressure plate, a second collar fixed to said shaft and forming an abutment for said second spring, a solid yoke member seating on the hubs of said two clutch members between the clutch discs and pressure plates thereof, two rods secured to said yoke at one end and slidably mounted in said closure member, two collars fixed to each of said rods in longitudinally spaced relation, a nut threadedly mounted on the threaded portion of said shaft and having arms respectively slidably mounted on said two rods between said stop collars, a double-ended pawl oscillable within said casing about the axis of said shaft and selectively engageable with said respective toothed members, a segment mounted in said casing and secured to the opposite side walls thereof, at least one stop mounted on said segment and adjustable therealong, said stop being disposed in the path of said pawl to vary, upon engagement therewith, its cooperative relation with said toothed members, and means for oscillating said pawl.

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