Aug. 25, 1936. R. GOLDBERG 2,051,842

SPEED REDUCING MECHANISM

Filed June 24, 1935

Fig. 1

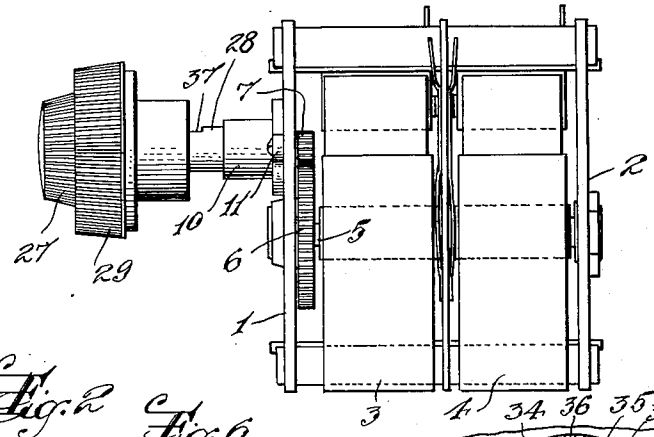


Fig. 2

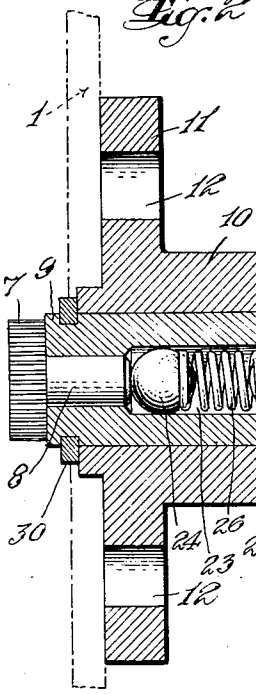


Fig. 6

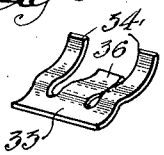


Fig. 5

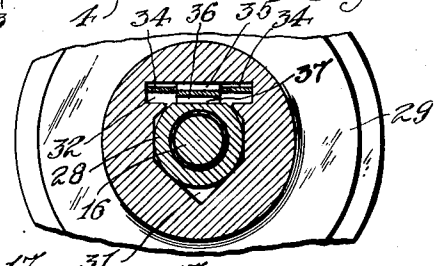


Fig. 4

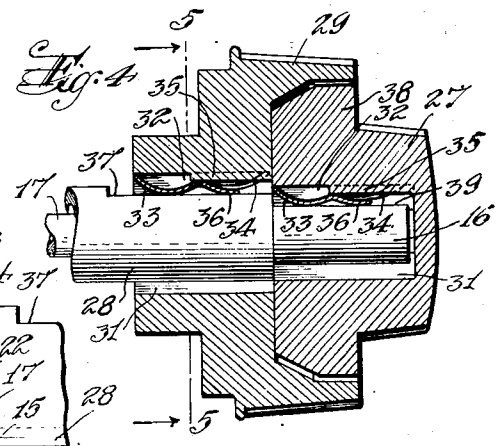
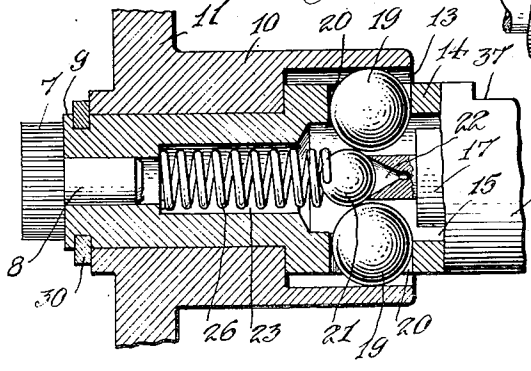


Fig. 3



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SPEED REDUCING MECHANISM

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Application June 24, 1935, Serial No. 28,092

12 Claims. (Cl. 74—10)

This invention relates to a speed-reducing or vernier drive mechanism which may be used with different devices, especially those used in the electrical art, and particularly variable condensers used in the tuning circuits of radio receiving sets where coarse and fine adjustments are utilized.

The advantages of a device of this kind, which will give coarse and fine adjustment, are well recognized, so they need not be gone into at length in this specification.

It is one of the objects of my invention to provide a new type of vernier drive mechanism which can be manufactured and used or sold as a unitary structure independent of the apparatus with which it is to be used.

Another object of my invention is to provide a device of the character described involving what I believe to be new and novel features in construction, whereby the cost of manufacture is low, yet one in which the efficiency is high; that is to say, a device which has smooth and easy but effective operating characteristics.

My improved form of device will be readily understood by reference to the annexed drawing wherein:

Figure 1 illustrates a two-gang condenser with my drive mechanism applied thereto.

Figure 2 is a sectional view on an enlarged scale through the device, the operating knobs being removed from the drive spindles.

Figure 3 is a sectional view similar to Figure 2 but of a modified form.

Figure 4 is an enlarged sectional view through the control knobs shown in Figure 1, the spindles being shown in elevation.

Figures 5 is a partial and sectional end view on the line 5—5 of Figure 4.

Figure 6 is a perspective view of the friction control knob mounting spring used for mounting the knobs on the operating spindles.

In the various views, wherein like numbers refer to corresponding parts, 1 and 2 are the end plates of a gang condenser, two units 3 and 4 being more or less diagrammatically indicated in Figure 1. The main operating shaft 5 of the condenser carries a gear or gear segment 6 which may be of any satisfactory type and which is adapted to be operated by a pinion 7 carried on a stud 8 that is force-fitted or otherwise securely anchored to a stub shaft 9. The stub shaft 9 is carried in a collar 10 having a flange 11 which is adapted for mounting the vernier drive unit to the condenser plate 1. As shown in Figure 2, the flange 11 is provided with two holes 12 through which screws or rivets may be passed for mounting the flange 11 to the condenser plate 1. The collar 10 has a counter-bore 13 at its outer end, in which is positioned an enlargement 14 of the stub shaft 9. The stub shaft 9 has a series of bores of different diameters. The outer or larger bore 15 is adapted to receive a spindle or shaft 16, the inner end 17 of which is of reduced diameter and is adapted to be located in a bore 18 somewhat smaller than the bore 15, but large enough to pass the balls 19, each one of which is positioned in an orifice 20 in the portion 14. While Figure 2 shows two of the balls 19, I prefer to use three spaced 120° apart.

The inner end 17 of the spindle 16 is formed in a manner so that it may be fastened to a ball 21. In the arrangement shown, I prefer to provide a formation somewhat as indicated, whereby a circumferential edge 22 is formed on the end 17 of the spindle 16, and then spot-weld this edge either entirely around or at spaced points to the ball 21 which, as indicated, is of a different size than the balls 19. The stub shaft 9 has an inner bore 23 smaller than the bores 15 and 18, and located in this bore are two balls 24 and 25 seated in opposite ends of a spring member 26 which, acting against the ball 21, provides a definite amount of frictional contact between the ball 21 and the balls 19, so that as the spindle 16 is turned by its control knob 27, the balls 19 are rotated, and since they are in engagement with the bore 13 in the collar 10, a reduced movement of the stub shaft 9 carrying the gear 7 is obtained, this radio reduction depending of course directly on the diameter of the balls 19 and 21.

Mounted directly on the end 28 of the stub shaft 9 is a knob or control member 29. Turning the knob 29 gives a direct action on the gear 7; in other words, provides coarse adjustment, while turning the knob 27 provides the fine adjustment as described. It may be noted that the stub shaft 9 is held in place in the collar 10 by any satisfactory manner as by a snap lock washer 30. The knobs 27 and 29 may be fastened to their respective shaft ends in any satisfactory manner, but I have indicated what I think to be a new and novel way of doing this, whereby set screws are eliminated.

Referring to the knob 29, this is provided with a non-circular hole 31 therethrough and a recess 32 of a form to receive a spring 33. The spring 33 has two arms 34 adapted to fit in opposite sides of the recess 32, being guidingly held in position by a boss 35. The spring 33 is provided with a tongue 36 which is adapted to engage a flat surface 37 on the end 28 of the stub shaft 9. The

spring 33 is first pushed into the recess 32 and then the knob 29 is pushed into position on the end 28 of the stub shaft 9. The outer end of the knob 29 is recessed to receive a portion 38 of the control knob 27 which has a formation similar to that shown in Figure 5 for knob 29, but on somewhat smaller dimensions. The ends of the tongues 36 are formed so as to provide considerable frictional grip on the flat surfaces 37 and 39, so that a considerable pull is required on the knobs to withdraw them from their respective shafts. This construction lends itself to very easy and quick assembly, no screw bushings being required in the knobs or set screws for fastening them to their respective shafts.

In the modification shown in Figure 3, the balls 23 and 25 are dispensed with; otherwise the construction is very much the same as described with respect to Figure 2.

It will be understood that the knobs may be made to be fastened to their respective shaft ends by the usual screw means. While I have shown the ball 21 as a separate device welded or otherwise attached to the slow speed spindle, the end of the spindle may be formed ball-shaped to give the same result, but I prefer to use a separate ball as described as these balls usually come all hardened and the spot-welding of the ball to the spindle takes place so rapidly and at localized points as not to affect the hardened surface where the ball 21 engages the balls 19, or the ball 25, it being understood that the line of engagement of the ball 21 on the end of the spindle is spaced a distance away from the line of engagement of the ball 21 with the balls 19.

From what has been said, it will be seen that the unitary structure may be made and sold as a unit for application to an existing device, or it may be readily applied thereto or built in as a part of the device with which it is to operate.

What I claim is:

1. A speed reducing mechanism including, a collar having mounting means at one end and an inner ball race at the other end, a hollow stub shaft carried by said collar, a stud positioned in one end of the stub shaft and carrying a pinion thereon, a spindle carried within a portion of the hollow stub shaft, a ball fastened to the inner extremity of said spindle, said stub shaft having openings therein, balls positioned in said openings and held by the spindle ball in engagement with said collar race, resilient means for ensuring that the frictional engagement between said spindle ball and the other balls will be positive.

2. A speed reducing mechanism as set forth in claim 1, characterized in that said resilient means includes a spring located in the stub shaft in alignment with said gear stud and engaging the ball spindle.

3. A speed reducing mechanism as set forth in claim 1, characterized in that said resilient means includes a pair of balls with a spring interposed therebetween, one of the pair being in engagement with the spindle ball.

4. A speed reducing mechanism as set forth in claim 1, characterized in that the ball on the end of the spindle is welded thereto.

5. A unitary speed reducing mechanism as set forth in claim 1, further characterized in that the inner end of the spindle is counter-sunk at an angle such that the edges of the counter-sink engage the ball on a line spaced from the line of contact of the ball with said race balls.

6. A unitary speed reducing mechanism as set forth in claim 1, characterized in that the stub shaft and spindle each have flat portions to receive control knobs, said knobs having springs seated therein and shaped to provide sufficient friction to hold the knobs in position after they have been slidingly mounted on said shaft and spindle.

7. A unitary speed reducing mechanism as set forth in claim 1, characterized in that the stub shaft and spindle each have flat portions to receive control knobs, said knobs having springs seated therein and shaped to provide sufficient friction to hold the knobs in position after they have have been slidingly mounted on said shaft and spindle, and further characterized in that the stub shaft knob is larger in diameter than the spindle knob and has a bore within which the spindle knob is nested.

8. A unitary speed reducing mechanism including, a collar having mounting means therefor, said collar having a bore therethrough and a larger bore at one end to form a raceway, a stub shaft carried by said collar and having a plurality of bores each of progressively larger diameter from one end, a stud positioned in the smaller of said bores and carrying a drive pinion, a spindle having its body portion positioned in the larger of said bores and having a reduced end extending into the next larger bore, a ball terminating the end of said spindle, said stub shaft having openings therein from said second larger bore to the collar raceway, balls in said openings contacting with the raceway and the spindle ball, and spring means located in the third smallest bore for ensuring that the frictional engagement between the spindle ball and the other balls will be positive.

9. A unitary speed reducing mechanism as set forth in claim 8, characterized in that said spring means includes; a ball resting against said pinion stud, a ball engaging the spindle ball with the spring seated on and between said balls.

10. In a speed reducing mechanism of the class described wherein two concentrically arranged shafts are used, a control knob for each shaft, the knobs having only sliding frictional engagement with their respective shaft, said frictional engagement being obtained by a spring suitably formed and positioned within each knob.

11. A speed reducing mechanism as set forth in claim 10, further characterized in that the knobs are of different diameters, the smaller knob being nested in the larger, and the springs engage flat portions on their respective shafts substantially as described.

12. A speed reducing mechanism including, a collar having mounting means at one end and an inner ball race at the other end, a hollow stub shaft carried by the collar, a gear carried at one end of said stub shaft, a spindle carried within a portion of the hollow stub shaft, means for driving said gear at a plurality of speeds, one means comprising a direct drive by the stub shaft to said gear independently of the spindle, and the other drive comprising ball bearings forming with said race the full and only driving connection between the spindle and said stub shaft, and means for insuring that the driving connection will be positive.

RAYMOND GOLDBERG.