

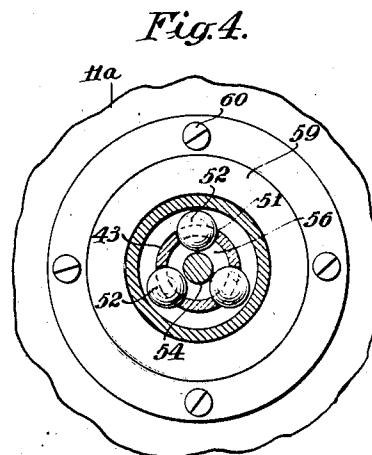
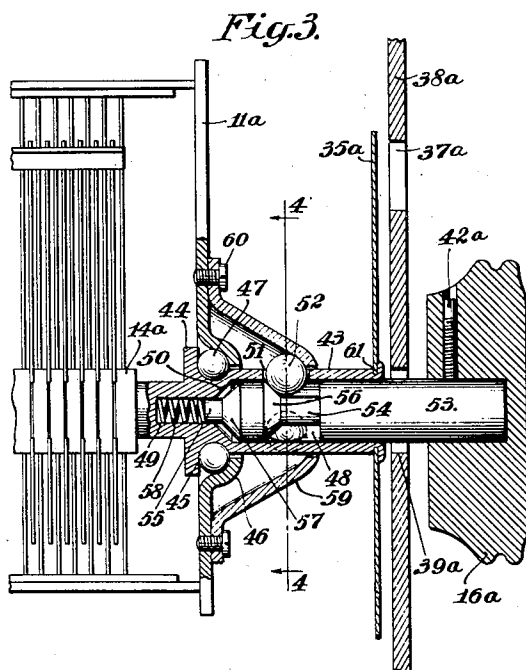
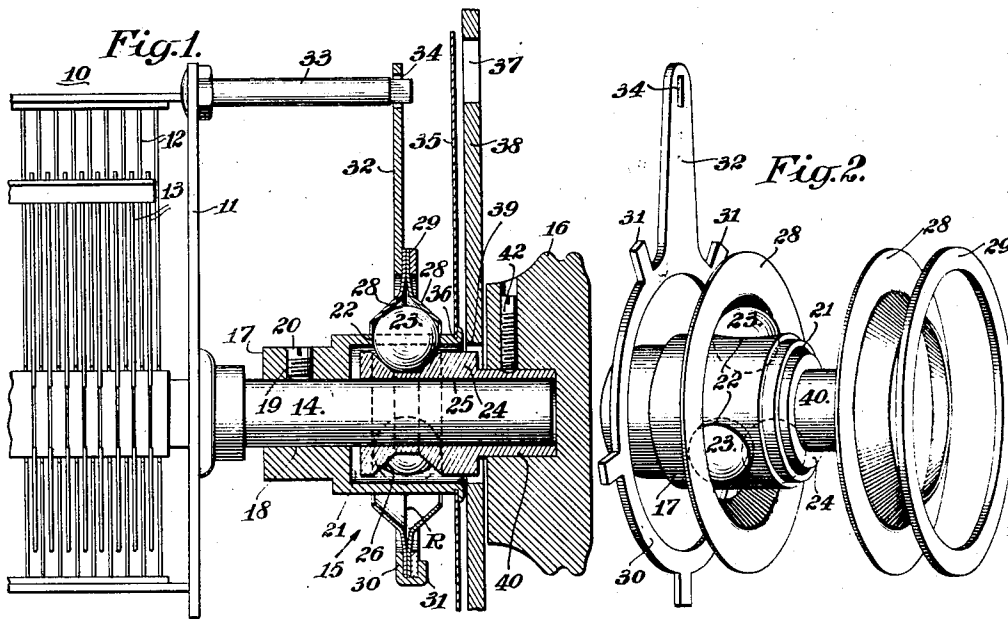
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MANUAL RADIO CONTROL MEANS

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MANUAL RADIO CONTROL MEANS

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The present invention relates to manual radio control means and more particularly to means for transmitting motion at a reduced speed to radio apparatus control elements, such as tuning control shafts and the like.

Speed reduction drive mechanisms adapted to be associated with tuning control shafts in the larger types of radio receivers are not fully adapted to be applied to smaller or midget receivers of the personal type, due to the comparatively large amount of space ordinarily required for such mechanisms. Moreover, such mechanisms are objectionable for various other reasons, chief among which is the presence of "back-lash" between the driving and driven elements thereof.

Accordingly, it is an object of the present invention to provide an improved speed reduction drive mechanism for radio receiver control elements which is not subject to the above noted disadvantages and objections.

A further object of the invention is to provide an improved speed reduction drive mechanism for the control instrumentalities of compact, midget radio receivers which requires a minimum amount of space and which may readily be associated with the same without extensive changes therein.

A further object of the invention is to provide the tuning element of small, compact radio receivers with an improved speed reduction drive mechanism whereby a fine adjustment of said element may readily be made.

Another object of the invention is to provide the tuning element of small, compact radio receivers with an improved speed reduction drive mechanism whereby either a fine or a relatively coarse adjustment of said element may be selectively made at will.

A further object of the invention is to provide an improved speed reduction drive which is formed as a unit with the tuning element of a radio receiver and which may be of the planetary ball type.

A further object of the invention is to provide an improved speed reduction drive mechanism for the tuning element of a radio receiver which provides smooth control without back-lash, which is compact and neat in appearance, and which may readily be manufactured and assembled at low cost.

With the above and other objects in view, the invention resides in the novel construction, combination, and arrangement of parts, the novel features of which are set forth with particularity in the appended claims. The invention itself,

however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, when taken in connection with the accompanying drawing, in which:

Fig. 1 is an enlarged view, partly in section, of a manual radio control means embodying the invention.

Fig. 2 is a view in perspective, and on the same scale, of certain parts of said means arranged in exploded relation to each other.

Fig. 3 is a view, partly in section, and on the same scale, of a modified form of the invention, and

Fig. 4 is a sectional view taken on the line 4-4 of Fig. 3.

Referring to Figs. 1 and 2, a fragmentary portion of a conventional tuning element or variable gang condenser, generally indicated at 10, comprises a frame 11, a plurality of spaced stator plates 12 mounted in said frame, and a plurality of spaced rotor plates 13 carried by a shaft 14, the said shaft being journaled in said frame to position the rotor plates 13 in cooperative relation with said stator plates in a manner well known in the art.

In accordance with the invention, the free end of the shaft 14 is provided with a bearing assembly, generally indicated at 15, including a manually operable control knob 16, as clearly shown in Fig. 1, whereby the shaft 14 is adapted to be rotated relatively to the said control knob.

The bearing assembly 15 comprises a sleeve 17 having a bore 18 at one end thereof which is adapted to receive the free end of the shaft 14. A threaded opening 19 communicating with the bore 18 is also provided in the sleeve 17 for the reception of a set screw 20 whereby the sleeve 17 is secured to shaft 14 for rotation therewith. The opposite end of the sleeve 17 is provided with a relatively large bore 21 formed co-axially with the bore 18 and which terminates therein substantially intermediate the length of the sleeve 17.

The sleeve 17 is further provided with a plurality of annularly spaced clearance openings 22 which communicate with the relatively large bore 21, the said openings being adapted for the reception of a plurality of rollers or balls 23 as clearly shown in Fig. 1, whereby said balls are maintained in spaced relation about the shaft 14.

A second sleeve 24, having a bore 25 concentric therewith and an annular raceway 26 formed in the peripheral surface of one end thereof, is rotatably mounted on the free end portion of the

shaft 14 in end to end and co-axial relation with the sleeve 17. The sleeve 24 projects into the bore 21, as shown, to permit the raceway 26 to lie in registration with the openings 22 to permit the balls 23 to seat therein.

An outer raceway R for the balls 23 is provided by a pair of contacting rings or washers 28 of thin flexible material which are held together by a pair of clamping rings 29 and 30, the clamping ring 30 being provided with a plurality of radially projecting ears 31 together with a radially extending restraining arm 32, on the peripheral edge thereof, as clearly shown in Fig. 2. In the assembly of the washers 28 and the clamping rings 29 and 30, the radially projecting ears 31 are bent over the periphery of the opposite ring 29 to maintain the aforesaid elements in assembled relation. The inner peripheral edge portion of each of the washers 28 is flanged outwardly at an angle to the clamped outer edge portion thereof, as shown in Figs. 1 and 2, to form the annular recess or outer raceway for the balls 23, the outwardly flanged portion of the washers 28 being yieldable to the action of the balls 23 by reason of their flexibility. In other words, the balls are "over-size" with respect to the annular space between the inner and outer races, and the flanges of the washers are placed under radial stress thereby. The said flanged portions of the washers 28, accordingly, are automatically maintained in frictional engagement with the balls 23 at all times and under all conditions.

Means for anchoring the restraining arm 32 of the outer raceway assembly comprises a suitable stud or pin 33 which is secured, at one end to the adjacent condenser frame 11 and projects therefrom, as shown, into a suitable opening 34 formed in the free end portion of the restraining arm 32 whereby the aforesaid outer raceway assembly R is held against rotation when the sleeve 24 is rotated to move the condenser shaft 14 relatively thereto or at a speed slower than that of the rotatable sleeve 24. A conventional form of dial or scale, indicated at 35, is suitably stacked or otherwise attached to the forwardly disposed end of the sleeve 17, as indicated at 36, whereby the scale 35 is positioned in co-operative relation with a sight opening or the like 37, formed in a cabinet control panel 38, in a manner and for a purpose well understood in the art.

The cabinet control panel 38 is also provided with another opening 39 through which the reduced end portion 40 of the rotatable sleeve 24 is adapted to extend, upon the assembly of a radio receiver chassis and a cabinet therefor. The manually operable control knob 16 is secured, as shown, to the reduced outer free end portion 40 of the sleeve 24, projecting through the panel opening 39, by means of a suitable set screw 42, or the like, carried by said knob.

In a modified form of my invention, illustrated in Figs. 3 and 4, wherein like parts bear the same reference numerals as in Figs. 1 and 2, there is shown a selection type two-speed manually operable tuning control means associated with a variable gang radio tuning condenser. As here shown, the condenser shaft 14a terminates in an extended free end portion 43 having an annular flange or shoulder 44 adjacent to its free end. One side of the shoulder 44 is formed with a radius to provide an annular recess 45, which, together with an annular recess or de-

pression 46 formed in the condenser frame 11a, form a raceway for a plurality of balls 47 whereby a ball bearing for one end portion of the shaft 14a is provided in one end of the condenser frame 11a.

The free end portion of the shaft 14a is further provided with a concentric counter-bore 48 which opens into a relatively small bore 49 concentric therewith, the shoulder 50 formed thereby and therebetween being formed in the shape of a cone for a purpose hereinafter described.

A plurality of annularly spaced clearance openings 51 are formed in the periphery of the extended free end portion 43 of the shaft 14a, substantially intermediate the length of and in communication with the bore 48, for the reception of a plurality of rollers or balls 52, as clearly shown in Fig. 3.

A control shaft 53 freely rotatable in the bore 48 relatively to the condenser shaft 14a is provided, adjacent its inner end, with a section 54 of reduced diameter and a reduced end portion 55, the opposite sides of a central shoulder portion therebetween being inclined or tapered to provide an inner raceway 56 for the balls 52 and a clutch face 57 adapted for engagement with the conical shoulder 50, as shown in Fig. 3. The reduced inner end portion 55 of the control shaft 53 extends partway into the small bore 49 and into engagement with a small coiled spring 58 disposed in the small bore 49, whereby the clutch face 57 is normally maintained out of contact with the conical shoulder 50 and the inner raceway 56 in contacting engagement with the balls 52.

The outer raceway for the balls 52 consists of a fixed cup-shape member 59 having a central shaft clearance opening therein and a flanged peripheral edge portion whereby said member is secured to the condenser frame 11a, by means of the screws 60, with its inner surface, adjacent the central opening therein, normally in contacting engagement with the balls 52 as clearly shown in Fig. 3.

A dial or scale 35a is also suitably staked or otherwise secured to the outer free end 43 of the condenser shaft 14a as indicated at 61 and in co-operative relation with a sight opening 37a or the like formed in a cabinet control panel 38a.

The control panel 38a is also provided with another opening 39a through which the control shaft 53 is adapted to extend upon the assembly of a radio receiver chassis and a cabinet therefor. A manually operable control knob 16a is finally secured to the free end portion of the control shaft 53, projecting through the panel opening 39a, by means of a suitable set screw 42a, or the like, carried by the knob 16a.

In connection with Fig. 3, it is to be understood that the conical clutch faces 50 and 57, formed with the bore 48 and adjacent the inner end of the shaft 53 respectively, may be faced with any suitable friction material, if it is so desired.

Operation

In the operation of the speed reduction drive mechanism illustrated in Fig. 1, it is to be noted that the manually operable knob 16 constitutes the driving member; the condenser shaft 14 is, of course, the driven member, while motion is transmitted from the driving member to the driven member by the co-operation of the outer raceway R, the balls 23, and the sleeve 17, which latter three are associated with the shaft 14

in the manner heretofore described and constitute the motion transmitting mechanism.

Assuming, now, that the knob 16 is being rotated, the outer raceway R being held against rotation by the restraining arm 32, which engages the pin 33 secured to the condenser frame 11, the shaft 14 will rotate relatively to the knob 16 by reason of the fact that the shaft 14 is driven by the balls 23 operating through the sleeve 17 while the balls 23 are rotated by the inner raceway 26 formed with the sleeve 24. It should also be noted that the dial or scale 35 rotates with the shaft 14 and the sleeve 17 relatively to the sleeve 24 and the knob 41.

In the modification shown in Fig. 3, the condenser shaft 14a is selectively operable either at a reduced speed relatively to the control knob 16a or at the same speed as that at which the said knob may be rotated. In this example, the control shaft 53 is movable longitudinally in the bore 48 to compress the spring 58 to bring the conical clutch surfaces 50 and 57 into contacting engagement whereby to effect a direct drive between the control knob 16a and the condenser shaft 14a. Normally, however, the spring 58 maintains the clutch surfaces 50 and 57 apart and the inner ball raceway 56 in contact with the balls 52 and the said balls in contact with the outer raceway provided by the cup-shape cap 59. Assume, now, that the control shaft 53 is in normal, or the position shown in Fig. 3, and it is desired that the shaft 14a rotate at the same speed as that of the control knob 16a, the said knob is pushed and held inwardly and rotated whereby the drive through the balls 52 is released and effected directly between the control knob shaft 53 and the condenser shaft 14a by the engagement of the conical clutch surfaces 50 57. In the normal position of the control knob shaft 53 (Fig. 3) the shaft 14a is rotatable relatively to the control knob 16a upon manual rotation thereof. In the latter case, the shaft 14a is driven by the balls 52 operating through the inner raceway 56 and the outer raceway 59 in substantially the same manner as described in connection with the preferred form shown in Fig. 1.

Although I have shown and described certain embodiments of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In a tuning condenser, a rotor shaft, a sleeve constituting a ball cage secured on said rotor shaft, a second sleeve providing an inner ball

race revolutely mounted on said rotor shaft in co-operative relation with said ball cage, an outer ball race of resilient material encircling said ball cage, a plurality of balls disposed in said ball cage and in contacting engagement with said inner and outer ball raceways. Said outer race being so constructed and located relatively to the balls as to exert a force thereon having both radial and axial components with respect to the inner race, means for restraining said outer ball race against rotation, and a control knob secured to said second sleeve.

2. The combination with a radio control shaft, of a concentric sleeve mounted thereon, said sleeve having a plurality of peripheral openings, a ball in each of said openings, means providing a rotatable inner raceway for said balls, means including complementary flexible ball contacting surfaces providing a fixed outer raceway for said balls, and a control knob connected to said first named means to rotate it.

3. The combination with a radio control shaft, of a concentric sleeve mounted thereon, said sleeve having a plurality of peripheral openings, a ball in each of said openings, means providing a rotatable inner raceway for said balls, said means including a second sleeve rotatably mounted on said shaft, a plurality of resilient means providing a fixed outer raceway for said balls, and a control knob connected to said first named means to rotate it.

4. The combination with a radio control shaft, of a concentric sleeve mounted thereon, said sleeve having a plurality of peripheral openings, a ball in each of said openings, means providing a rotatable inner raceway for said balls, said means including a second sleeve rotatably mounted on said shaft, a plurality of resilient means providing a fixed outer raceway for said balls, and a control knob connected to said second sleeve to rotate it.

5. In speed reduction apparatus of the ball bearing planetary type, an inner ball race, two outwardly flanged washers of resilient material encircling the inner race, means for holding the peripheral edges of the washers together to define an outer ball race, a plurality of balls interposed between the inner and outer ball races and a retainer member for the balls.

6. The invention set forth in claim 5 characterized in that the balls are "over-size" with respect to the annular space between the inner and outer races whereby the flanges of the outer race resiliently urge the said balls toward the inner race.

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