March 6, 1951 G. F. BEHRINGER 2,544,127

TUNER LINKAGE

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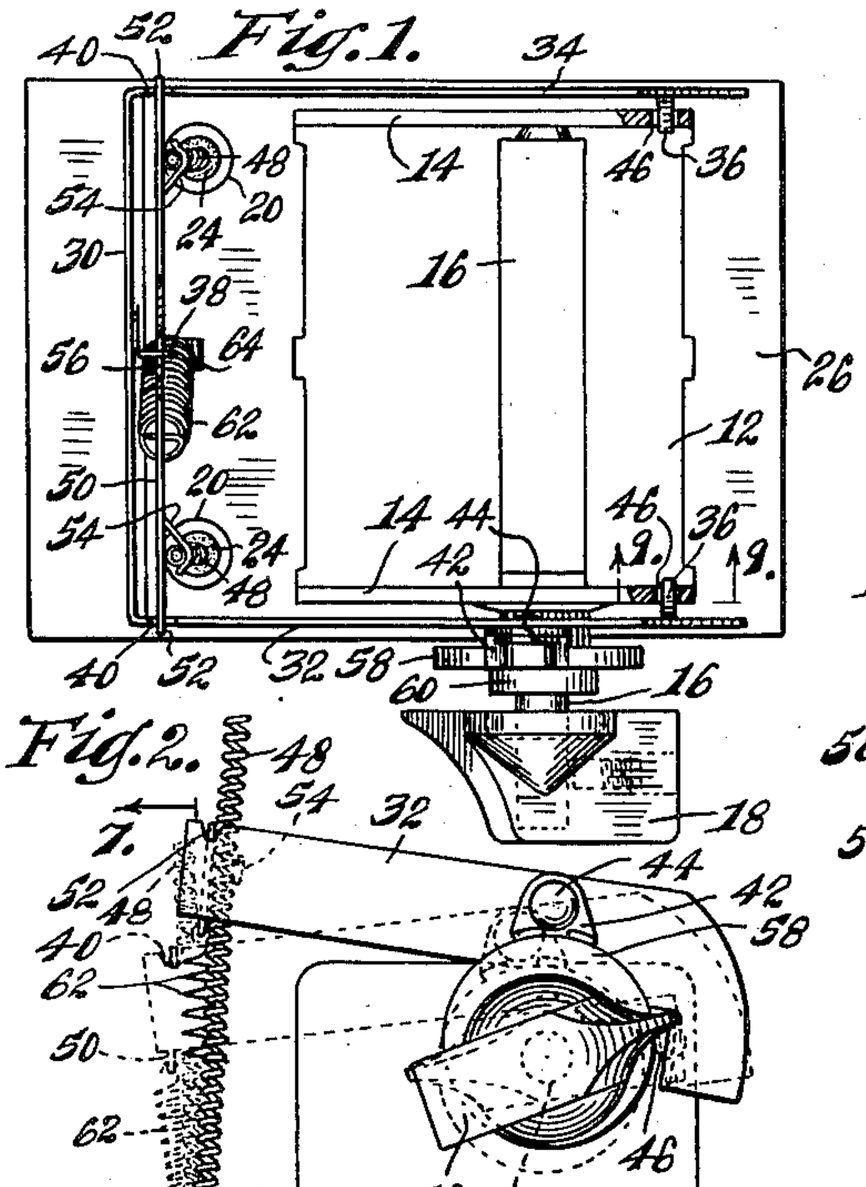

Fig. 1.

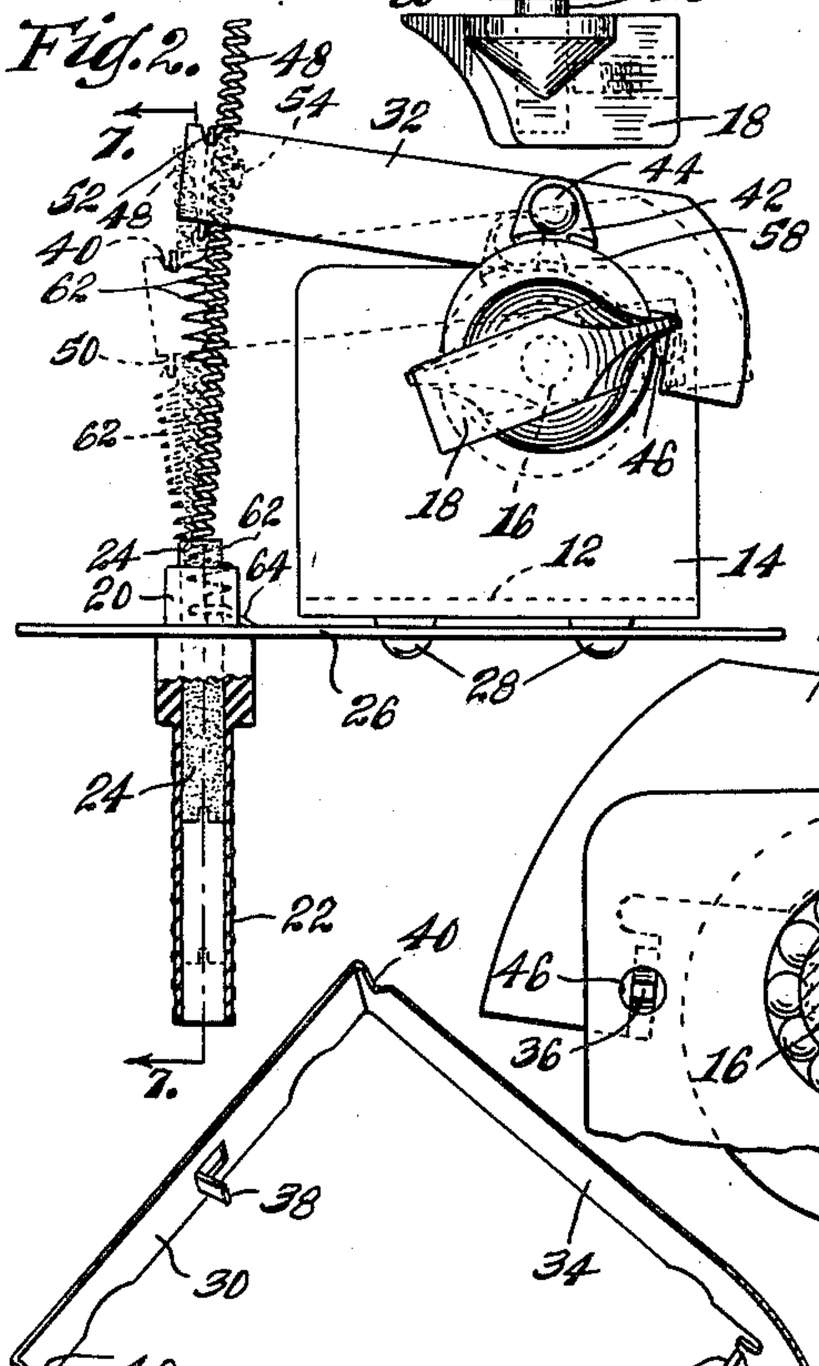

Fig. 2.

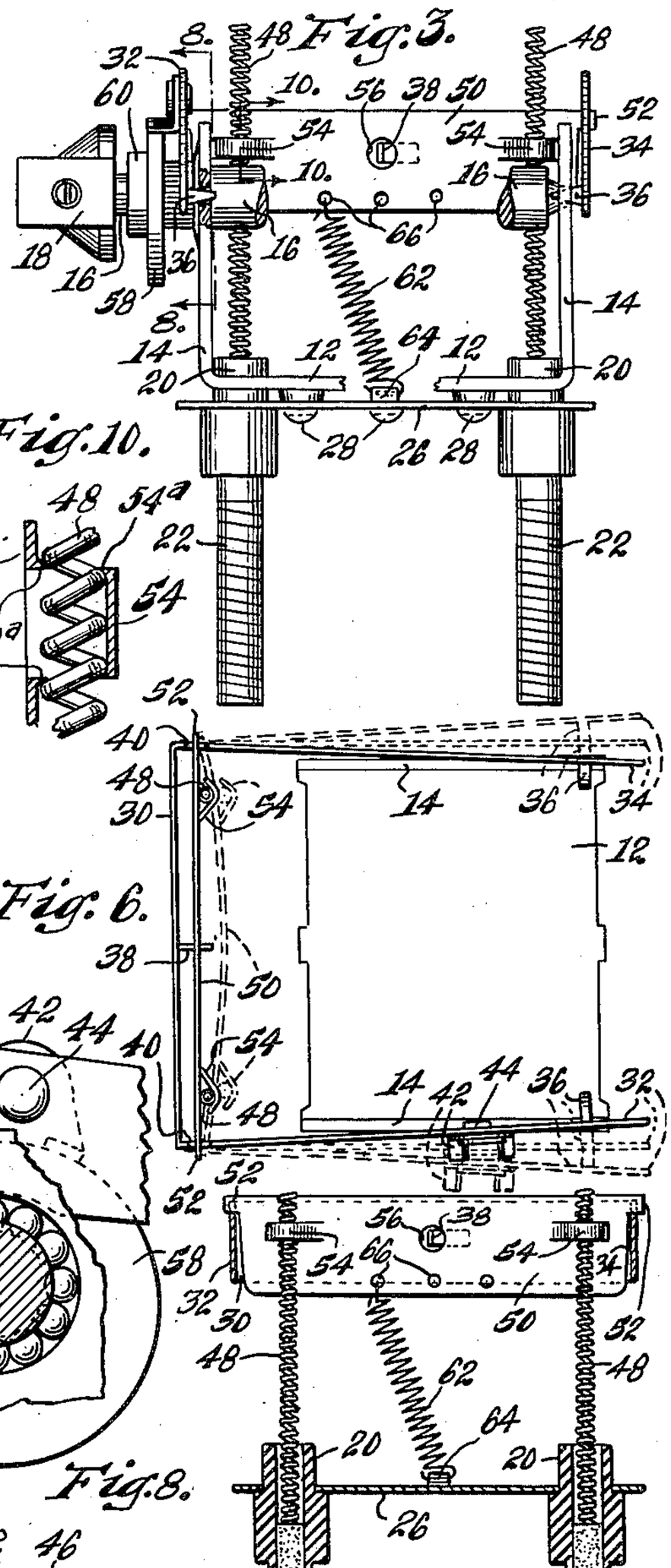

Fig. 3.

Fig. 6.

Fig. 8.

Fig. 4.

Fig. 5.

Fig. 9.

Fig. 7.

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TUNER LINKAGE

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This invention relates to mechanical linkage particularly for an inductive-type tuner wherein it is desirable to slide a powdered iron core in a tube by rotation of a tuning knob or the like.

One object of the invention is to provide linkage between the powdered iron core and the shaft of a tuner which is comparatively simple and very inexpensive to manufacture so that the linkage can be made for a few cents, the parts being so designed that accuracy of movement of the core in relation to rotation of the shaft is had even though the parts are made by a stamping process which eliminates all machining operations.

Another object is to provide a tuner linkage which can be added to a standard plate-type variable condenser or similar tuner and which linkage includes a minimum of parts; mainly a yoke that can be sprung on to the frame of the plate-type condenser, a cam to be secured to the condenser shaft and a connector plate from which coil springs extend to the iron cores in a simple manner, a single spring being used to hold the parts in proper operative position and return the yoke in one direction for holding a cam follower of the yoke against a cam that is used to operate the linkage.

Still another object is to provide a yoke with a pair of pivot points bent therefrom, the yoke being arranged to spring over a plate-type condenser frame and the pivot points to enter drilled or punched openings therein, the yoke having V-notches in which a connecting plate is engaged by a return spring and the connecting plate having a pair of fingers sheared therefrom and bent to a position permitting a coil spring to be interposed between the fingers and the plate in such manner that the spring is held against longitudinal movement but may be rotated for adjusting the slug toward or away from the yoke.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my tuner linkage, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, wherein:

Figure 1 is a plan view showing (in light lines) parts of a standard variable plate-type tuner or condenser and showing in shaded lines an inductance-type tuner added thereto and my tuner linkage for connecting the cores of the inductance-type tuner for operation from the shaft of the plate-type condenser.

Figure 2 is a front elevation thereof looking

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upwardly at Figure 9, a portion of the one of the inductance tuner units being shown in section.

Figure 3 is an end elevation looking toward the left at Figure 2.

Figure 4 is a perspective view of a yoke of my tuner linkage.

Figure 5 is a perspective view of a connection plate thereof.

Figure 6 is a plan view of a plate-type condenser frame and the yoke and plate of Figures 4 and 5 to show the association of the yoke with the condenser frame.

Figure 7 is a vertical sectional view on the line 7—7 of Figure 2.

Figure 8 is an enlarged sectional view on the line 8—8 of Figure 3.

Figure 9 is a further enlarged detail view on the line 9—9 of Figure 1; and

Figure 10 is an enlarged sectional view on the line 10—10 of Figure 3.

On the accompanying drawing I have used the reference numerals 12 and 14 to indicate the base and end flanges of a standard plate-type variable condenser and 16 the shaft thereof. The shaft 16 is usually provided with some suitable type of control knob such as 18 and, as well known, this knob coacts with a dial indicating frequencies or wave lengths for an AM type of radio tuner. The stationary condenser plates supported in the frame 12—14 and the movable condenser plates supported by the shaft 16 have been omitted as they form no part of my present invention.

When a radio set is designed for FM also, or when an AM radio is converted to include FM, usually inductance-type tuners or variable capacitors are added which are of the powdered iron core type as inductive tuning is better for audio frequencies because there is less electrical loss. These inductive tuners are usually in the form of a tube 20 of insulating material wound with a metal ribbon 22 and having therein a slidable powdered iron core or core 24. To support the tubes 20, I provide a supporting plate 26 which may be secured to the condenser frame 12—14 by screws 28 and which is provided with openings through which the tubes 20 extend as shown in Figure 7, the tubes being suitably secured therein in any desired manner.

For sliding the cores 24 in the tubes 20, I provide my tuner linkage which will now be described. It comprises a yoke formed of sheet metal and having a cross-piece 30 and a pair of arms 32 and 34. These arms are provided with pivot points 36 bent from the plane thereof in an obvious manner. The cross-piece 30

is provided with a finger 38, the arms are provided with V-notches 40 and a cam follower 42 is pivoted at 44 to the arm 32 all as clearly shown in Figure 4.

The yoke 30—32—34 has an initial shape shown particularly in Figure 6 (solid lines), the arms 32 and 34 being bent to a position where they converge. The right-hand ends of the arms, it is noted, are closer together than the outer surfaces of the flanges 14 of the condenser frame. These flanges are provided with openings 46 punched or drilled therein (punching of course being a more economical operation to perform) and during assembly the arms are merely sprung apart to the dash-line position shown in Figure 6 so that the pivot points 36 clear the flanges 14 whereupon the yoke may be lowered until the pivot points register with the openings and then permitted to spring inwardly to the dotted line position which is the finally assembled position shown also in Figure 1. The resiliency of the arms 32 and 34 thereupon causes the points 36 to snugly engage in the openings 46 with three or four-point contact so that all sloppiness or lost motion of the pivot joints is entirely eliminated.

I provide the cores of iron 24 with coil springs 48 which may be molded in the upper ends of the cores during their formation to provide a secure connection between each core and its spring. These springs are made of approximately the proportions shown in Figure 10 so that they are open between the coils approximately the diameter of the spring wire used to form them and I provide a connection from the springs to the yoke in the form of a connection plate 50.

The connection plate 50 has a pair of fingers 52 to engage in the notches 40 of the yoke 30—32—34 and a pair of fingers 54 sheared and bent therefrom to resiliently coact with the springs 48 in the manner best shown in Figure 10 so that an effective connection is had which serves also as a screw threaded connection for adjustment purposes as rotation of the spring will adjust it upwardly or downwardly relative to the plate 50 depending on the direction of rotation. Since the finger 54 is sheared from the plate 50, there will be slight edges 50*a* and 54*a* drawn oppositely on the opening from which the fingers are cut and on the fingers themselves as shown in Figure 10 and these edges are sufficient to engage between the coils of the spring without the necessity of providing a special nut or the like as a connecting means. This of course contributes to economy of manufacture.

The connection plate 50 is provided with a perforation 56 adapted to loosely receive the finger 38 of the yoke cross-piece 30 to retain the plate in position once it is assembled. To accomplish assembly, the plate is bowed to the dotted position shown in Figure 6 whereupon the fingers 52 may be engaged in the notches 40 and then the plate 50 may be released. It thereupon straightens to its full line position due to its inherent tendency to remain straight whereupon the plate 50 is retained against dislodgment of its fingers 52 from the notches 40 except when the plate is purposely sprung again for removal purposes.

On the shaft 16 of the condenser, I provide an eccentric-shaped cam 58 having a hub. For economy of manufacture this hub may be a press fit, thus eliminating a set screw or other additional fastening device and the shaft may be fluted to eliminate all possibility of rotation of the cam relative to the shaft once it is pressed in position.

The yoke is designed to be operated by the cam 58 for which purpose, of course, the follower 42 engages the periphery of the cam. To insure such engagement I provide a spring 62 connected to a finger 64 sheared and bent upwardly from the supporting plate 62 and a series of openings 66 in the connection plate 50. This single spring accomplishes, in addition to holding the follower 42 against the cam 58, the function of holding the fingers 52 in the notches 40 without any lost play and the further function of swinging the plate to its best aligned position with respect to the tubes 20 by always tending to line up the plate with the finger 64 as shown in the two positions illustrated in Figure 2. This arrangement provides for a minimum of bending in the springs 48 at the upper end of the cores 24 and at the connection plate 50 and its fingers 54.

At the same time, the springs 48 (being formed of open coils) are sufficiently flexible to permit proper sliding of the cores 24 in the tubes 20 without binding and thus accuracy of longitudinal position of the core in the tube with respect to the rotary position of the knob 18 is assured. Of course there is some longitudinal flexing of the springs which is greater the more friction there is between the cores and the tubes, but I have found this negligible in a tuner of the kind disclosed where a dial is associated with the knob 18 and any off-tuning condition can be readily corrected by the operator without a too-critical necessity of matching the knob pointer with the markings on the dial.

Where my tuner linkage is provided in connection with an AM–FM radio set, the disclosed arrangement is suitable whereas it is obvious that in a strictly FM receiver, a suitable shaft, particularly for the FM tuner may be provided as the tuner linkage is adaptable for general application as well as a combination application with an AM radio. Usually in a combination radio, separate AM and FM dials are provided for the single knob 18 and a suitable switch used to connect either the plate-type condenser in the AM circuit or the inductance-type tuner in the FM circuit.

Due to the follower 42 being on only one of the arms of the yoke 30—32—34, there is some slight twisting of the yoke 30 but I have found this negligible and that it can be compensated for to some extent by connecting the spring 62 at an angle as shown so that it has more effect on the arm 32 than on the arm 34. At the same time the parts can be inexpensively stamped from relatively light sheet metal without prohibitively sacrificing accuracy of core position in relation to knob position.

Some changes may be made in the construction and arrangement of the parts of my tuner linkage without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. In a tuner linkage of the character disclosed, a yoke, each arm thereof having a pivot point, said pivot points being directed toward each other, said yoke being adapted for pivotal connection to a pair of spaced elements having perforations therein, said arms being outside said spaced elements and biased toward each other to

resiliently engage said pivot points in said perforations, a follower pivoted to said yoke, a cam for coaction therewith, spring means to urge said yoke in a direction for said follower to engage said cam, and means for connecting said yoke to coil springs extending from tuner cores or the like.

2. In a tuner linkage, a yoke, each arm thereof having a V-shaped pivot point, said yoke being adapted for pivotal connection to a pair of spaced elements having perforations therein, said arms being under tension to enter said points in said perforations as far as they will go in response to such tension to eliminate play in the pivots for the yoke, a follower on said yoke, a cam for coaction therewith, spring means to urge said yoke in a direction for said follower to engage said cam, and means for connecting said yoke to coil springs extending from tuner cores or the like.

3. Tuner linkage of the character disclosed comprising a yoke, a pair of spaced elements to which the arms of said yoke are pivoted, a follower carried by said yoke, a cam for coaction therewith, spring means to urge said yoke in a direction for said follower to engage said cam, and means of connection between said yoke and tuner cores or the like, said means of connection comprising fingers extending from the cross piece of said yoke and springs screw-threadedly engaged between said fingers and said cross piece for axial adjustment of said springs relative to said cross piece by rotation of said springs relative to said fingers.

4. Tuner linkage of the character disclosed comprising a yoke, the arms thereof being pivotally mounted, a cam follower pivoted to one arm of said yoke, a cam engaged thereby, a support, tuner sleeves supported thereby, cores slidable in said sleeves, the arms of said yoke being provided with V-notches, a connection plate having fingers pivoted therein, a finger extending from the cross piece of said yoke, said connection plate having an opening loosely receiving said finger, said connection plate having fingers, coil springs screw-threadedly engaged between said last fingers and said connection plate and extending to said cores, and a spring connection between said plate and said support to align the plate with said sleeves, to keep said fingers in said notches and to retain such cam follower against said cam.

5. Tuner linkage of the character disclosed comprising a yoke, the arms thereof being pivotally mounted, a cam follower pivoted to one arm of said yoke, a cam engaged thereby, a support, tuner sleeves supported thereby, cores slidable in said sleeves, the arms of said yoke being provided with V-notches, a connection plate having fingers pivoted therein, said connection plate having fingers extending therefrom, coil springs screw-threadedly engaged with said last fingers located between them and said connection plate and extending to said cores and a spring connection with said plate to align it with said sleeves, to keep said fingers in said notches and to retain such cam follower against said cam.

6. In a tuner linkage, a yoke, one arm thereof having a cam follower, a cam coacting therewith, each arm of said yoke having a pivot point, said yoke being adapted for pivotal connection to a pair of spaced elements having perforations therein, said arms being under tension to engage said pivot points in said perforations, the arms of said yoke being provided with V-notches,

a connection plate having fingers pivoted therein, a finger extending from the cross piece of said yoke, said connection plate having an opening loosely receiving said finger, said connection plate being provided with fingers, coil springs screw-threadedly engaged between said last fingers and said connection plate and extending to inductance tuner cores or the like, and a spring connection with said plate to align it with the sleeves that slidably receive said cores, to keep said fingers in said notches, and to retain such cam follower against said cam.

7. In a tuner linkage, a yoke, one arm thereof having a cam follower, a cam coacting therewith, each arm of said yoke having a pivot point, said yoke being adapted for pivotal connection to a pair of spaced elements having perforations therein, the arms of said yoke being provided with V-notches, a connection plate having fingers pivoted therein, said connection plate having other fingers extending therefrom, coil springs screw-threadedly mounted between said last fingers and said connection plate and extending to inductance tuner cores or the like, and a spring connection with said plate to align it with the sleeves that slidably receive said cores, to keep said fingers in said notches, and to retain such cam follower against said cam.

8. In a tuner linkage, a yoke, each arm thereof having a pivot point, said yoke being adapted for pivotal connection to a pair of spaced elements having perforations therein, said arms being biased toward each other with said pivot points entered in said perforations, a follower on said yoke, a cam for coaction therewith, and means of connection between said yoke and the cores of an inductance tuner comprising coil springs extending from said cores, a connection plate with which said springs are adjustably screw-threadedly connected, notch and finger engagement between said connection plate and said yoke, and a spring connected with said connection plate substantially in alignment with sleeves for said cores.

9. Tuner linkage of the character disclosed comprising a yoke, each arm thereof having a pivot point, said yoke being adapted for pivotal connection to a pair of spaced elements, a cam follower mounted on said yoke, a cam for coaction therewith, spring means to urge said yoke in a direction for said follower to engage said cam, and means of connection between said yoke and the cores of an inductance tuner comprising coil springs extending from said cores, a connection plate with which said springs are connected, and notch and finger engagement between said connection plate and said yoke, said spring means being connected with said connection plate to retain said notch and finger engagement in proper coacting relation.

10. In a tuner linkage, a pivotally mounted yoke, a follower thereon, a cam for coaction with said follower, and means of connection between said yoke and the cores of an inductance tuner or the like comprising coil springs extending from said cores, a connection plate with which said springs are screw-threadedly connected, notch and finger engagement between said connection plate and said yoke, and a spring connected with said connection plate to retain such engagement and engage said follower with said cam.

11. In a tuner linkage of the character disclosed, a yoke, each arm thereof being pivoted to a support, a follower pivoted to said yoke, a cam for coaction therewith, spring means to

urge said yoke in a direction for said follower to engage said cam, and means of connection between said yoke and the cores of a tuner comprising coil springs and a connection plate connected with them and pivoted to said yoke.

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