Aug. 19, 1941. P. WHITTELL 2,252,796

CONTROL MECHANISM

Filed May 1, 1940

Fig. 1.

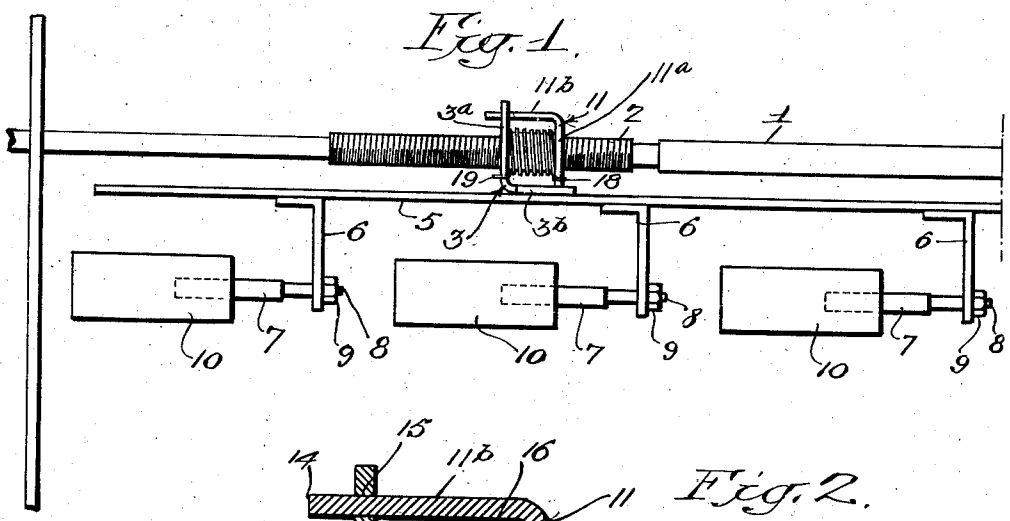


Fig. 2.

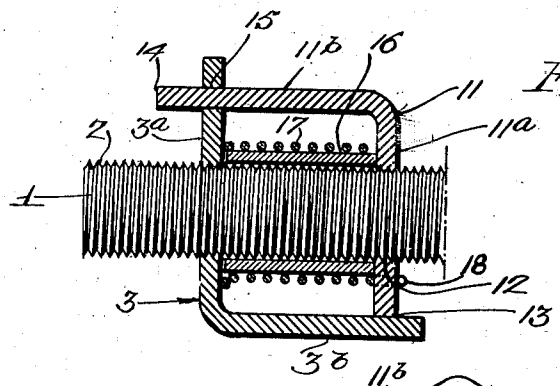
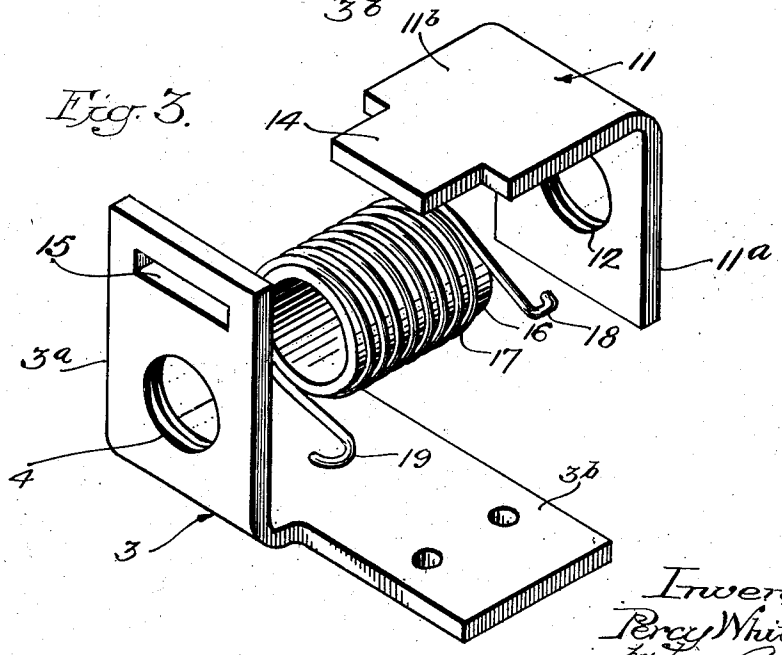


Fig. 3.



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CONTROL MECHANISM

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7 Claims. (Cl. 74—441)

This invention relates to new and useful improvements in control or adjusting mechanisms of the screw type and more particularly to such mechanisms adapted for use in instances or with apparatus requiring precision control or adjustment.

In mechanisms of the type to which the present invention relates it has been found generally most convenient to obtain control or adjustment of a movable member by means of a low pitch rotatable screw element having a collar or the like threaded thereon and connected through suitable linkages to the member to be controlled or adjusted so that the movement of said collar along the screw element is imparted to said member.

An illustration of the type or kind of use to which mechanisms of the foregoing character may be put is the adjustment and control of the tuning unit or units of radio receiving sets wherein, for example, it may be desired to effect the adjustment of an axially movable member such as the iron core of a tuned coupling transformer.

Now in instances such as this, and particularly in the tuning of short wave radio receiving apparatus, the adjustment of such a core or other member is extremely critical, and furthermore, when once adjusted it is important that the member be held in that adjusted position against displacement as the result of reasonable vibration. Also, to obtain a critical setting or adjustment the control mechanism must have a smooth, positive drive.

However, control and adjusting mechanisms of the present type heretofore produced have been manufactured with regard only to close tolerances in respect to each element or part with the result that there exists some play or lost motion between the driving and driven members of such mechanism and it is impossible to obtain positive, immediate axial advance of the driven member or collar upon rotation of the driving member or screw regardless of the direction of rotation thereof with the result that critical adjustment is a matter of chance and the play or lost motion existing between the driven and driving members eliminates all assurance that the adjusted member will remain in the position to which adjusted if subjected to the usual vibration of the immediate or surrounding environment.

Bearing the foregoing comments in mind, the principal object of the present invention is to provide an adjustment and control mechanism of the screw type which is characterized by its smooth, positive drive and wherein axial movement or advance of the driven member of the mechanism upon rotation of the driving screw in either direction is positive and immediate.

Another and equally important object of the invention is to provide an adjusting or control mechanism of the character set forth wherein novel means is provided for eliminating back lash or lost motion between the driving screw and driven members of the mechanism.

Still another object of the invention is to provide a control and adjusting mechanism embodying the characteristics and properties set forth which is capable of being readily and inexpensively manufactured in large quantities.

These and other objects and features of the invention as well as the various details of the construction, arrangement and operation thereof are hereinafter fully set forth and described and shown in the accompanying drawing, in which:

Figure 1 is a diagrammatic view of a radio tuner including a control mechanism made in accordance with the present invention.

Figure 2 is an enlarged view partially in section through the driven member of the mechanism and showing the back lash or lost motion eliminator which constitutes a novel feature of the invention; and

Figure 3 is an exploded view in perspective of the component parts of the device illustrated in Figure 2.

Referring now more particularly to the drawing, the control or adjusting mechanism of the present invention may be stated generally to comprise a manually rotatable drive shaft 1 having a screw section 2 thereon on which there is threaded an angular driven member or collar 3.

The screw section 2 of the shaft 1 is preferably located along the mid-section of said shaft and the threads of said screw section usually are of relatively low pitch. The driven or collar member 3 in the form of the invention shown is angular in shape and in one leg 3*a* thereof is provided a tapped aperture 4 for threaded engagement with the screw section 2 of the shaft 1 which passes through said aperture. The other leg 3*b* of the collar 3 may extend parallel to the shaft 1 and is secured in a suitable manner to a longitudinally movable bar 5. Both this bar 5 and the shaft 1, of course, are mounted in suitable bearing members (not shown), and it will be seen that when the shaft 1 is rotated, the connecting collar member 3 is caused to move axially along the threaded or screw section 2 of said shaft carrying with it the longitudinally movable bar 5.

In the illustrated application of the present invention to radio tuning units, the longitudinally movable bar 5 may carry a number of brackets 6 to which may be adjustably connected a number of iron cores 7 or other members by means of screws 8 and lock nuts 9. As shown, these cores or members 7 are arranged for movement, in the usual manner, axially within the

tuned coupling transformers of a radio receiver, and in the drawing such transformers are diagrammatically represented by the coil forms 10. This type of tuning is so critical that even micrometer adjustment of cores 7 within the coil forms 10 will change the tuning of the transformers and hence the radio receiver, and it follows, therefore, that adjustment of these core members 7 must be effected with precision and by means of a positive mechanical drive or adjusting mechanism.

In order to obtain positive micrometer precision adjustment of such members as the cores 7, it is necessary that all back lash or play be eliminated between the coupling collar 3 and the screw section 2 of the shaft 1 which exists as the result of normal manufacturing tolerances and the methods of manufacture necessarily employed to obtain commercial production of such mechanisms on an economical basis.

According to this invention back lash or play between the screw section 2 of shaft 1 and the coupling collar 3 is eliminated by effectively maintaining the threads of the driven collar 3 at all times against one face of the threads of said shaft screw section 2 regardless of the direction or speed of rotation of said shaft 1, thereby positively fixing the position of said collar 3 and adjustable member 7 and resulting in immediate positive micrometric adjustment of the collar and tuning unit upon rotation of the shaft 1 in either direction.

Toward accomplishment of the foregoing results, there is provided an angular stabilizing member 11 positioned complementary to the coupling or collar member 3 upon the screw section 2 of the shaft 1. One leg 11*a* of this complementary member 11 has an aperture 12 therein suitably tapped for threaded engagement with the shaft screw section 2 as best shown in Figure 2 of the drawing. This aperture 12 in the leg 11*a* of said complementary member 11 is located in said leg 11*a* so that the free or outer end edge thereof engages and seats upon the inner surface of the leg 3*b* of the coupling or collar 3 as indicated at 13 and thereby prevents relative rotation of said collar 3 and member 11 with respect to one another about the shaft 1. In addition, the complementary member 11 is interlocked with the coupling or collar member 3 by providing an extension or lug 14 at the free end of the leg 11*b* of the former which normally projects through suitable aperture 15 formed in the leg 3*a* of the latter.

A sleeve or like element 16 may be loosely mounted upon the shaft screw section 2 and interposed between the legs 3*a* and 11*a* respectively of the coupling or collar 3 and its complementary member 11. Also interposed between these same leg portions of the members 3 and 11 and surrounding the loose sleeve 16 is a coiled spring 17 which is under compression and tends to move the members 3 and 11 in respectively opposite directions axially along the shaft screw section 2. The spring 17 also has its end portions 18 and 19 respectively hooked over oppositely disposed edge portions of said members 3 and 11 as shown in Figures 1 and 2 and should be torsionally stressed to create forces urging the members 3 and 11 to rotate in opposite directions on and about the shaft screw section 2.

It is pointed out that compression of the spring 17, as aforesaid, should be sufficient to force and maintain the member 3 continuously against one face of the threads of the shaft screw section 2 regardless of the direction of rotation of the latter and regardless of the resistance to such motion afforded by the longitudinally movable bar 5. An effect of this compression of the spring 17 will be the tendency of the members 3 and 11 to rotate relative to each other as the said spring 17 urges these members against the threads of the shaft screw section 2, but as previously stated, this action is prevented by the fact that the leg 11*a* of member 11 seats upon the inner surface of the leg 3*b* of the said member 3. Relative rotation of the members 3 and 11 is prevented also by the interlock afforded between them by the projection or lug 14 of the latter which is fitted into the aperture 15 in the former. Elimination of any possible play at this interlock is effected by the torsional forces in the spring 17 which maintain the relative angular positions of the members 3 and 11 fixed with respect to each other.

It is pointed out that the inclusion of torsional stresses in the spring member 17 enables the device or mechanism to function properly with but a small degree of compression therein, and consequently the mechanism as a whole does not bind or frictionally resist rotation of the shaft 1 to any noticeable degree. Thus these forces in the spring 17 cause the members 3 and 11 to operate and function as a unit, sliding or telescoping longitudinally of the shaft screw section 2 and eliminating all play or back lash normally or otherwise existing between said screw 2 and the member 3.

From the foregoing it will be seen that the present invention provides an adjusting or control mechanism wherein two easily manufacturable stampings 3 and 11 may be threaded in interlocked relation upon the threaded portion 2 of a shaft 1 in such manner that the driven member 3 is continuously maintained against one face of the threads of said screw 2 regardless of the direction and rate of rotation thereof. Thus the position of the driven member 3 is positively fixed and axial advance of said member 3 upon rotation of the shaft 1 is positive and immediate with the result that precision micrometric adjustment and control of the member 3 and a tuning or other unit connected thereto is obtained, enabling very critical adjustment of such a unit and as well insuring that it will remain at that critical adjustment when subjected to the reasonable vibrations of the environment.

Although the invention is illustrated and described in conjunction with the tuning unit of a radio receiver it will be obvious that said invention may be otherwise employed as desired where precision micrometric adjustment and control of an immediate positive nature is required, and while a particular embodiment of the invention has been herein illustrated and described, it is not intended that said invention be limited to such disclosure, but that changes and modifications may be made and embodied therein within the scope of the annexed claims.

I claim:

1. A precision control mechanism of the character described including a rotatable drive screw, a driven member threaded on said screw, a stabilizing member threaded on the screw, said members having a portion of each thereof extending at right angles to each other in abutting relation for preventing relative rotation of the members with respect to each other, and an axially expansible spring interposed between

said driven and stabilizing members tending to effect the axial separation thereof thereby to maintain the driven member firmly in engagement with one face of the threads on said drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

2. A precision control mechanism of the character described including a rotatable drive screw, a driven member threaded on said screw, a stabilizing member threaded on the screw, said members having a portion of each thereof extending at right angles to each other in interlocked relation with each other for preventing relative rotation of the members with respect to each other, and an axially expansible spring interposed between said driven and stabilizing members tending to effect the axial separation thereof thereby to maintain the driven member firmly in engagement with one face of the threads on said drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

3. A precision control mechanism of the character described including a rotatable drive screw, a driven member threaded on said screw, a stabilizing member threaded on the screw, one of said members having a tongue interlocked with a slot in the other of said members for preventing relative rotation of the members with respect to each other, and an axially expansible spring interposed between said driven and stabilizing members tending to effect the axial separation thereof thereby to maintain the driven member firmly in engagement with one face of the threads on said drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

4. A precision control mechanism of the character described including a rotatable drive screw, a driven member threaded on said screw, a stabilizing member threaded on the screw, one of said members having a tongue interlocked with a slot in the other of said members, and an axially expansible coil spring surrounding said drive screw and interposed between said driven and stabilizing members tending to effect axial separation thereof and with the opposite end portions of said spring engaging said driven and stabilizing members respectively and tending to rotate the same in opposite directions, the construction and arrangement of said spring and the driven and stabilizing members being such that the said driven member is maintained at all times firmly in engagement with one face of the threads on the drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

5. A precision control mechanism of the character described including a rotatable drive screw, a driven member threaded on said screw, a stabilizing member threaded on the screw, said driven and stabilizing members having a portion of each thereof in abutting relation with the other and one of said members having a tongue interlocked with a slot in the other of said members, and an axially expansible coil spring surrounding said drive screw and interposed between said driven and stabilizing members tending to effect axial separation thereof and with the opposite end portions of said spring engaging said driven and stabilizing members respectively and tending to rotate the same in opposite directions, the construction and arrangement of said spring and the driven and stabilizing members being such that the said driven member is maintained at all times firmly in engagement with one face of the threads on the drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

6. A precision control mechanism of the character described including a rotatable drive screw, a driven member of thin sheet material threaded on said screw, a stabilizing member of thin sheet material threaded on said screw, said members having a portion of each thereof extending at right angles to each other in abutting relation for preventing relative rotation of the members with respect to each other, said abutting portions being constructed and arranged to maintain the thread engaging portions of said members perpendicular to the axis of said drive screw, and an axially expansible spring interposed between said driven and stabilizing members tending to effect the axial separation thereof thereby to maintain the driven member firmly in engagement with one face of the threads on said drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

7. A precision control mechanism of the character described including a rotatable drive screw, a driven member of thin sheet material threaded on said screw, a stabilizing member of thin sheet material threaded on said screw, one of said members having a portion interlocked with a portion on the other of said members for preventing relative rotation of the members with respect to each other, said interlocked portions being constructed and arranged to maintain the thread engaging portions of said members perpendicular to the axis of said drive screw, and an axially expansible spring interposed between said driven and stabilizing members tending to effect the axial separation thereof thereby to maintain the driven member firmly in engagement with one face of the threads on said drive screw so that lost motion and play between said driven member and said drive screw is eliminated and adjustment of the driven member axially of the drive screw takes place immediately upon rotation of said drive screw in either direction.

PERCY WHITTELL.