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VERNIER ADJUSTMENT MEANS FOR ELECTRICAL INSTRUMENTS

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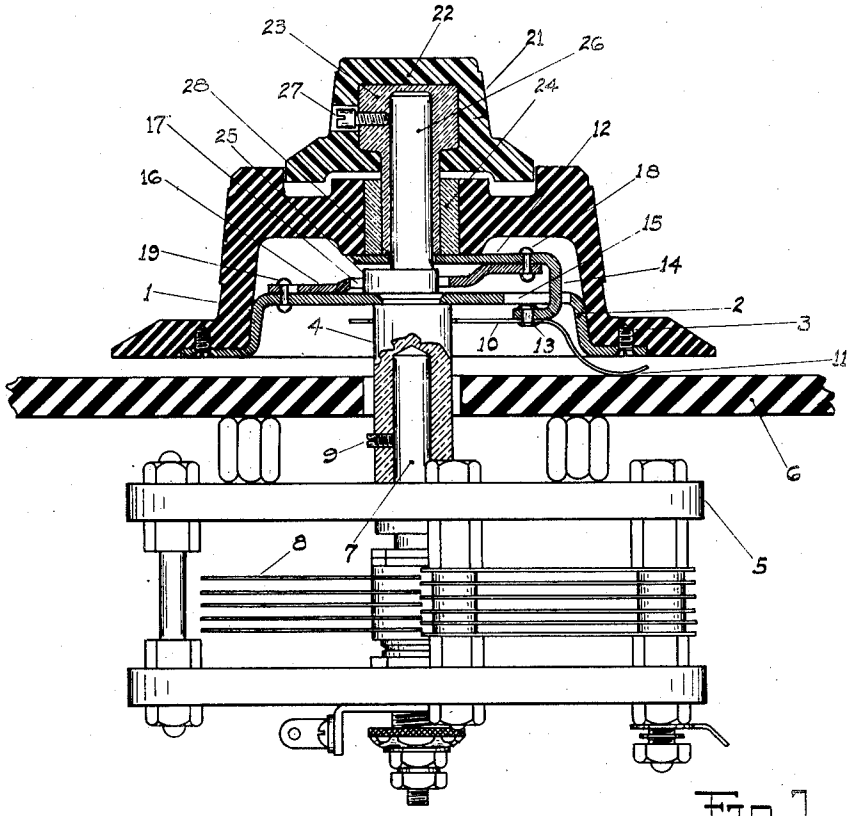


Fig 1

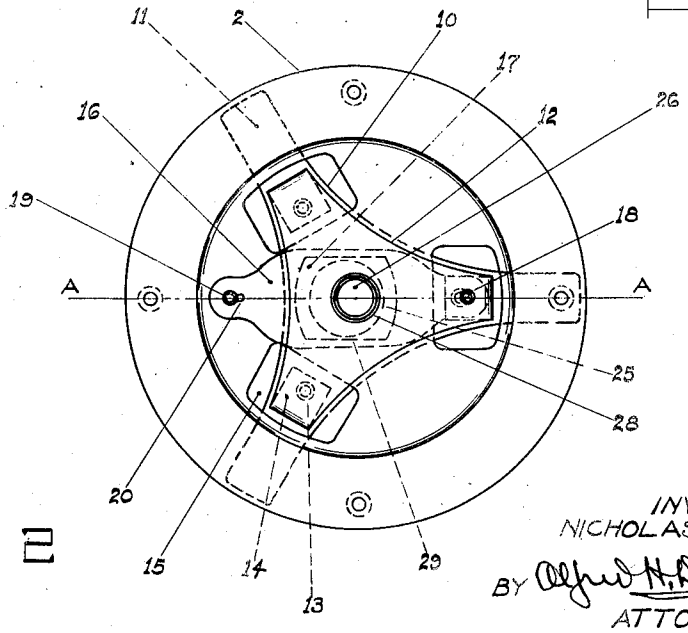


Fig 2

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VERNIER ADJUSTMENT MEANS FOR ELECTRICAL INSTRUMENTS.

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This invention relates to adjustment means for such electrical instruments as require for efficient operation the coarse and rapid adjustment of certain elements of the apparatus relatively to each other followed by a fine adjustment of said elements. More particularly the invention relates to adjustment means of this character adapted to use with variable condensers such as used in radio systems.

It is the object of the invention to provide an improved vernier adjustment means to be attached to a shaft such as that for example which actuates the movable plate assembly of a condenser, the adjustment means being so constructed that a rapid and coarse adjustment of the movable plates is made as usual by means of a dial or other control member, while a fine adjustment through a small number of degrees is made by means of a knob or other control member mounted upon the control dial and concentric therewith.

In accomplishing this object, the dial or other main control member is fixed in any usual manner to the shaft element which actuates the movable plate assembly of the condenser. The vernier knob is rotatable in the dial member and carries an extension which is provided with an actuating member such as a cam at its inner end. The cam actuates a lever formed to act as a cam follower and pivoted at one end to the dial member. The other end of the lever is pivoted to resilient means with relation to which the dial and shaft are rotatable through a small angle and which is arranged to bear with considerable pressure on the surface of a fixed member, such as a panel on which the condenser may be mounted. The coarse adjustment is made by turning the dial with its attached shaft member and movable plates, the resilient means being carried around with the dial and sliding over the surface of the panel, while the fine adjustment is made by turning the vernier knob and its attached cam. The cam moves the pivoted lever, and since this lever is pivoted at one end to the resilient means, which bear strongly against the panels and which remain in place except when a turning force is exerted on the dial, as in the operation of coarse adjustment, the lever swings about its pivoted connection on the resilient means as the vernier knob is rotated and thereby moves the main dial, with its attached shaft and plates, through a small angle.

For a clearer understanding of the constructional features and mode of operation of the invention, reference is made to the following retailed description and to the accompanying drawings.

Fig. 1 is a view, partially in section, of an embodiment of the invention applied to a condenser of a radio system.

Fig. 2 is a plan view of certain operatively related parts of the embodiment shown in Fig. 1. The sectional view of these operating parts as shown in Fig. 1 is taken on line AA of Fig. 2.

The main control member comprises preferably a dial 1 of the form commonly used in radio receivers and a cup shaped member 2 to which the dial is secured, as by screws 3. A shaft member 4 is riveted or otherwise fixed to cup member 2. A condenser 5 is fastened in any preferred manner to a fixed member as panel 6. The shaft 7 which carries the movable plates 8 of the condenser is connected to the shaft member 4 as by set screw 9.

A resilient member 10 preferably in the form of a spring plate is located within cup shaped member 2, with contact faces 11 resting on the surface of panel 6. Spring plate 10 is rigidly fixed to a bracket member 12 as by rivets 13. The bracket member is placed on the opposite side of cup shaped member 2 from spring plate 10 and is provided with inwardly projecting arms 14 which pass through openings 15 in the cup member in order to make connection with the spring plate. A lever 16 having a centrally disposed opening 17 is pivoted as by rivet 18 to the inner side of bracket 12. The lever extends across the center of the apparatus and its other end is connected to the cup member 2 as by rivet 19, the form of connection being such that provision is made for a slight motion of the lever in the direction of its length, as by slot 20 in which rivet 19 bears.

A vernier control member or knob 21 comprises preferably a main portion 22 of insulating material and a metal insert 23. The metal insert 23 projects inwardly and has a bearing centrally in dial 1, preferably in a metal insert 24 moulded in the dial. An

extension of the vernier member or knob 21 is provided which comprises an actuating member such as a cam 25 at the inner end of a stub shaft 26. This stub shaft which carries the cam is centrally located in the knob and rigidly fastened therein as by set screw 27 which passes through the wall of insert 23. The stub shaft passes through a centrally disposed opening 28, in bracket 12. The cam 25 is located between bracket 12 and cup 2 and projects within the centrally disposed opening 17 formed in lever 16. The lateral edges 29 of opening 17 are preferably formed parallel to a line drawn between pivotal points 18 and 19 of the lever, although they may be formed with other contours if desired. Cam 25 and the edges 29 of the opening 17 are so disposed and dimensioned that said cam is maintained in close working contact with the lever at all positions of the cam.

It will be seen that Fig. 2 is a plan view of the operating parts of the dial and vernier knob assemblies with the knob 21 removed from shaft 26 and also with the dial 1 removed from cup 2. It is clear from this figure and also from Fig. 1 that the construction consists essentially of two distinct parts: the dial assembly and the vernier control assembly. The former comprises shaft 4, cup 2 and dial 1, when said dial is mounted on the cup. The latter comprises the rigidly connected spring plate 10 and spring bracket 12, vernier knob shaft 26 with its bearing in the bracket, and vernier knob 21 rigidly connected to its shaft 26. The connecting link between the dial assembly and the vernier knob assembly may be considered to be lever 16 pivoted at one end to the spring bracket 12 and at the other to the dial cup 2. The vernier knob assembly further comprises the actuating member or cam 25 which coacts with lever 16, and which also, since it is located between cup 2 and bracket 12 which are connected by lever 16, serves to hold the vernier knob assembly within the dial assembly.

In the operation of the invention, adapted, as in the construction described, to be employed as the adjustment means for a radio condenser, rotation of dial 1 effects the initial coarse adjustment of the apparatus in the usual manner, since the dial is rigidly connected through cup member 2 and shaft 4 to the movable plate assembly 8 of the condenser. In this tuning operation, the spring plate 10 and all other parts of the apparatus mounted within or on the dial move together with the dial, the contact faces 11 of the spring plate 10 sliding over the face of the panel 6 when the moderate amount of force required to turn the dial against this friction is applied. Further, during this operation of coarse adjustment, the vernier knob 21 maintains its relation to the dial 1 unchanged, since with the small throw of cam 25 required in practice, the pressure transmitted from the dial to lever 16 through cup 2 and pivot 19, and acting on a cam at an edge 29 of the opening 17, is not sufficient to turn the cam about its shaft, regardless of the position in which the cam may be with reference to the lever.

After this coarse adjustment of the condenser the final critical adjustment is accomplished by turning the vernier knob rigidly connected to cam 25 which acts upon lever 16. The center of rotation of this lever 16 is pivot 18 which is located on the spring bracket 12. The bracket 12, spring plate 10 and pivot 18 remain fixed in position during the vernier adjustment operation because of the pressure exerted by the spring plate contact surfaces 11 against the panel 6. With one end of the lever pivoted at the fixed point 18, the other end of the lever swings about this fixed point as the cam is turned by the knob. As this free end is loosely coupled at rivet 19 to the cup 2 which is fastened to the dial and to the shaft 4, therefore, these latter parts, together with the movable condenser plate assembly 8 connected to shaft 4, are rotated through a small angle as knob 21 is turned. In Fig. 2 the cam is shown as turned half-way from the extreme throw in one direction to the extreme throw in the other direction. It is evident from the figure that a clockwise movement of the cam by knob 21 through approximately ninety degrees will result in a shift of the cup 2, dial 1, shaft 4 and condenser movable plate assembly 8, through a small angle in the clockwise direction, and that a counter-clockwise movement of the cam will likewise result in a corresponding counterclockwise movement of these adjustable parts. The adjustment means may be so proportioned as to produce any desired small degree of angular movement of the dial and condenser plates corresponding to the throw of the cam. For example, in the embodiment of the invention as applied to the vernier adjustment of a radio condenser, the cam and lever action may be proportioned to produce three degrees of dial movement corresponding to a rotation of the vernier knob of approximately one hundred and eighty degrees, or a reduction, for fine adjustment purposes, in the ratio of sixty to one.

What is claimed is:

1. In an adjustment control apparatus, a fixed member, a shaft rotatable relative thereto, a resilient member slidable on the fixed member, the shaft being rotatable relative to the resilient member, a main control member fixed to the shaft, a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second control member adapted to

coact with the lever to move the main control member and the shaft relative to the resilient member and the fixed member.

2. In an adjustment control apparatus, a fixed member, a shaft rotatable relative thereto, a resilient member slidable on the fixed member, the shaft being rotatable relative to the resilient member, a main control member fixed to the shaft, a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second control member comprising a cam coacting with the lever to move the main control member and the shaft member relative to the fixed member.

3. In an adjustment control apparatus, a fixed member, a shaft rotatable relative thereto, a resilient member slidable on said fixed member, the shaft being rotatable relative to the resilient member, a main control member fixed to the shaft, a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second control member concentric with the main control member and adapted to coact with the lever to move the main control member and the shaft relative to the resilient member and the fixed member.

4. In an adjustment control apparatus, a fixed member, a shaft rotatable relative thereto, a resilient member slidable on the fixed member, the shaft being rotatable relative to the resilient member, a main control member fixed to the shaft, a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second control member concentric with the main control member and comprising a cam coacting with the lever to move the main control member and the shaft member relative to the fixed member.

5. In an adjustment control apparatus comprising a fixed member and a main control member rotatable relative thereto, a resilient member adapted to be held stationary relative to the fixed member by frictional engagement therewith, means interconnecting said main control member and said resilient member, said means comprising a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second rotatable control member adapted to swing the lever about its pivoted connection with the stationary resilient member, whereby the main control member is rotated through a small angle relative to the fixed member as the second control member is rotated.

6. In an adjustment control apparatus comprising a fixed member and a main control member rotatable relative thereto, a resilient member adapted to be held stationary relative to the fixed member by frictional engagement therewith, means interconnecting said main control member and said resilient member, said means comprising a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second rotatable control member comprising a cam coacting with the lever, whereby the lever is swung about its pivoted connection with the stationary resilient member as the second control member is rotated and whereby the main control member is rotated through a small angle relative to the fixed member.

7. In an adjustment control apparatus comprising a fixed member and a main control member rotatable relative thereto, a resilient member adapted to be held stationary relative to the fixed member by frictional engagement therewith, means interconnecting said main control member and said resilient member, said means comprising a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second rotatable control member comprising an actuating member coacting with bearing faces formed in the lever, whereby the lever is swung about its pivoted connection with the stationary resilient member as the second control member is rotated and whereby the main control member is rotated through a small angle relative to the fixed member.

8. In an adjustment control apparatus comprising a fixed member and a main control member rotatable relative thereto, a resilient member adapted to be held stationary relative to the fixed member by frictional engagement therewith, means interconnecting said main control member and said resilient member, said means comprising a lever pivoted at its ends to the resilient member and to the main control member respectively, and a second rotatable control member concentric with the main control member and comprising a cam coacting with bearing faces formed in the lever, whereby the lever is swung about its pivoted connection with the stationary resilient member as the second control member is rotated and whereby the main control member is rotated through a small angle relative to the fixed member.

In witness whereof, I hereunto subscribe my name.

NICHOLAS HEYMAN.