May 12, 1931. W. S. WEBSTER 1,805,154

VERNIER

Filed Oct. 1, 1924

Fig. 1.

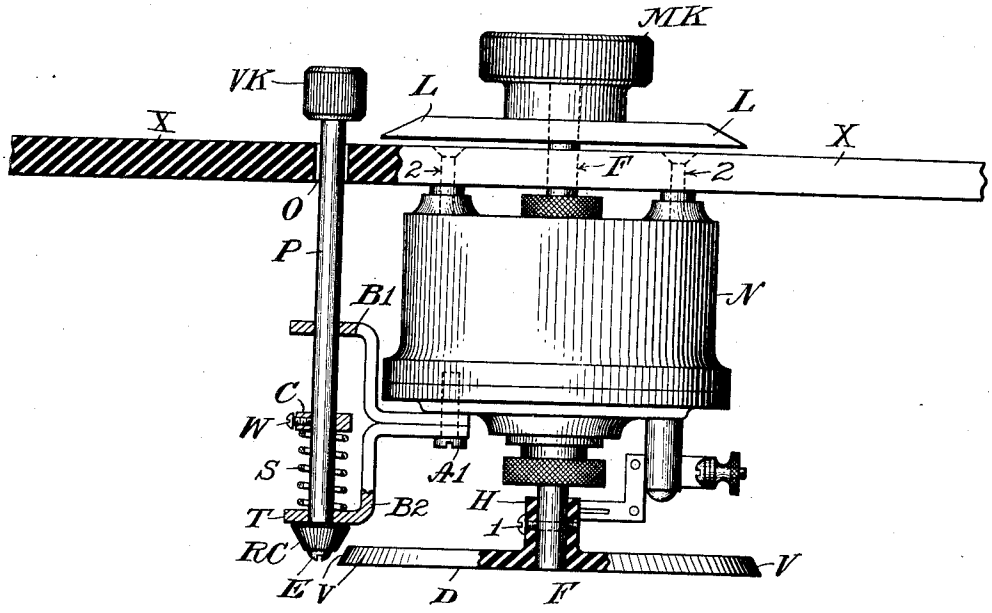
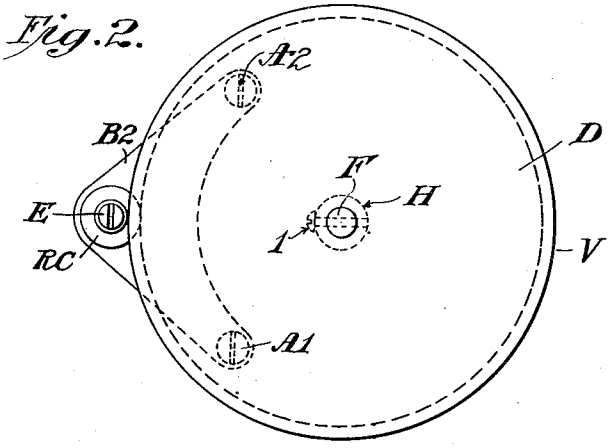


Fig. 2.



INVENTOR
W. Stuart Webster.
BY
Philip Barnsworth
ATTORNEY

Patented May 12, 1931 1,805,154

UNITED STATES PATENT OFFICE

WILLIAM STUART WEBSTER, OF ROSLINDALE, MASSACHUSETTS, ASSIGNOR TO WIRELESS SPECIALTY APPARATUS COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF NEW YORK

VERNIER

Application filed October 1, 1924. Serial No. 740,906.

This invention relates to so-called verniers for operation of control members by smaller degrees of motion in order to permit adjustment normally to more exact operating positions than is possible or easy or convenient in the absence of such vernier.

The objects of the invention include improvements of structure whereby wear of parts is reduced and whereby unlimited angular movement of the control member is obtained.

The invention is particularly adapted for operating electrical tuning devices such as condensers or the like for radio apparatus, in connection with which it is shown in the drawings, of which

Figure 1 is an elevation, partly in section; and

Fig. 2 a bottom plan of Fig. 1.

The vernier apparatus itself in general comprises spindle P, brackets B1, B2, friction cone RC, and friction disk D.

The electrical tuning device shown by way of example may be an electrical condenser arranged inside metal or other casing N, said casing being held by screws 2 to a wooden panel or other panel X, which may constitute the top of a box or cabinet containing other apparatus such as radio telephone receiving apparatus, including condenser N, the latter being provided with suitable circuit terminals to receive leads for connection with the rest of the electrical apparatus, if any. The condenser N may be assumed to be any form of the well-known variable air condenser type, comprising a set of fixed plates and a set of rotatable plates intermeshing with the fixed plates with air spaces between the two sets of plates. The shaft or spindle F extends vertically through the center of the condenser, and on this rotatable shaft are mounted the set of plates which moves therewith to control the capacity of the condenser. Shaft F may extend up through panel X. Around the upper end of the shaft is mounted a dial L. A knurled knob MK is provided for manual rotation of the shaft and the condenser plates mounted to rotate therewith. Knob MK as usual may carry a pointer operating over a scale on dial L.

The object of the vernier apparatus is to operate shaft F at a lower rate than the operation of the shaft by the knob MK so as to permit a more delicate adjustment and setting of the condenser capacity.

Spindle P of the vernier extends up through hole O in panel X, and is capped with the knurled knob VK for manual operation alternative with knob MK when more delicate adjustment is desired than can be had by operating knob MK.

Spindle P operates on an axis of rotation which is parallel to main shaft F. Spindle P is supported in brackets B1, B2 secured by screw A1 to condenser casing N. On the lower end of spindle P is mounted a cone RC secured on the spindle by a screw E. For co-operation with cone RC, a disk D is secured to shaft F by means of hub H and screw 1, the latter extending through shaft F (Fig. 2). Cone RC and disk D are shown in their normal positions out of engagement with one another. The co-operating surfaces of cone RC and disk D are beveled for co-operation as shown.

To operate the vernier, spindle P is depressed by knob VK until the beveled surface of cone RC comes into frictional engagement with the beveled surface V of disk D; then knob VK is rotated to rotate disk D, shaft F and the condenser plates which are rotatable with shaft F.

Cone RC and disk D may be made of hard rubber or other frictional material; and, if desired, the beveled surfaces of cone RC and disk D may be roughened more or less to improve the frictional operation.

Spindle P is held in its normal position shown (wherein cone RC is separated from or out of operative engagement with disk D) by suitable mechanism which, as shown for example, comprises a helical spring S around spindle P and supported on outer portion T of lower bracket B2, the upper end of spring S engaging against a collar C held to spindle P by set screw W. Spring S normally presses spindle P upward until

cone RC is stopped, the stop in the example shown, being bracket-portion T.

In respect of maintaining the vernier apparatus in condition for accurate adjustment of condenser N or other electrical tuning element, it will be clear from the above that the structure disclosed possesses the advantage of freedom from wear of operating parts during all times of operation by main or direct operating knob MK; the only wear on the vernier parts being when cone RC and disk D are in frictional operating engagement; and even in such operation the slight resulting wear is made immaterial by the lack of toothed gears, the latter fact contributing to beneficial operation in respect of the ease of the operation of engaging cone RC with disk D in any circumferential relation of said cone and disk. It will be seen also that this vernier has the advantage of unlimited angular motion of the adjustable tuning device N, which is not obtained by those types of verniers which permit only of a few degrees of motion.

It is to be understood that the invention is not limited to the embodiments and features specifically shown and described herein, but that such embodiments and features are subject to changes and modifications without any departure from the spirit of the invention.

I particularly point out and distinctly claim the part, improvement, or combination which I claim as my invention or discovery, as follows:—

1. In a radio tuning apparatus, the combination with the variable tuning element, of a rotatable operating member therefor, means for the direct manual rotation of said operating member, a dial surrounding said operating member, and a vernier comprising a rotatable member independent of said dial and secured to said rotatable operating member to rotate therewith and having a beveled friction surface, a second rotatable member having a beveled friction surface adapted to the beveled surface of said first vernier rotatable member; and a rotatable and reciprocable spindle on which said second beveled member is mounted.

2. A vernier for a variable electrical tuning element having a rotatable operating member, and a dial surrounding said member, said vernier comprising a disk independent of said dial and secured to said operating member to rotate therewith and having at its periphery a beveled friction surface; a rotatable cone also having a beveled friction surface shaped to cooperate with the beveled friction surface of said disk; and means holding said disk and cone normally out of operating engagement with one another.

3. A vernier for a variable electrical tuning element having a movable operating member, and a dial surrounding said member, said vernier comprising a member independent of said dial and secured to said operating member to move therewith and having a friction operating surface, a spindle mounted rotatably and reciprocally, and provided with a second friction surfaced member having its said friction surface shaped to co-operate with the friction surface of the first; and a manual operating device mounted on said spindle and operating independently of said dial.

4. A vernier for a movable electrical tuning element having a rotatable operating member, and a dial surrounding the latter, said vernier comprising a disk independent of said dial and secured to said operating member to rotate therewith and having a beveled friction operating surface, a cone having a friction operating surface shaped to co-operate therewith; a spindle mounted to rotate and on which said cone is mounted to be rotated thereby; said spindle being mounted reciprocably and provided with a spring normally holding it in position to hold said cone-surface out of operative engagement with said disk-surface, and a manual operating device mounted on said spindle and operating independently of said dial.

5. A radio apparatus vernier which comprises a friction member secured one end of to a movable control element of the tuning element, and a direct operating device secured to the other end of said control element in combination with the second friction member co-operating with the first, the first friction member being mounted normally out of operative engagement with the second; and an operating device secured to the second friction member and located at the same end of the tuning element as the direct operating device therefor and means for causing the two friction members to be brought into operative engagement with one another.

6. A radio apparatus vernier comprising a rotatable and reciprocable spindle mounted in parallel with a rotatable control member of the tuning element, a cone secured thereto to be rotated thereby; and a friction driven member secured to said rotatable control member in operative relation to said cone; said driven member having a beveled friction surface shaped for adaptation to the lateral surface of said cone and an indicating dial surrounding said rotating control member of the tuning element and indicating the degree of rotation of said control member by said friction member, said dial being independent of the friction drive.

7. A radio apparatus vernier comprising a rotatable and reciprocable spindle, a friction surfaced cone thereon; a beveled friction-surfaced disk rotatable by said cone; a rotatable element of a tuning device to

which said disk is fixed; a dial indicating the degree of rotation of said spindle and a spring holding said cone and disk normally out of co-operative relation.

8. A variable air condenser having operating projections from opposite ends of its structure, a manual operating member fixed on one said projection, an intermediate operating member mounted on the opposite projection; a rotatable reciprocable spindle co-operating with said intermediate member and extending parallel with the structure from one end thereof to the other and to the vicinity of the manual operating member on the first opposite projection; and a manual operating member mounted on the extended end of said rotatable spindle.

9. A variable electrical tuning device comprising an electrical reactance having a rotatable element, a casing enclosing said reactance, the reactance and its enclosing casing being mounted within a box, a rotatable operating spindle connected with the rotatable element of the reactance and extending thru the box to the exterior thereof; an indicating dial surrounding said rotatable operating spindle; a rotatable intermediate operating member located inside the casing and fixedly secured to the rotatable element of the reactance; a second rotatable operating member in the form of a reciprocable spindle which is located inside the box and parallel to the rotatable element of the inductance and which co-operates with said intermediate operating member and extends thru the same side of the box as the first spindle.

10. An electrical tuning reactance having a rotatable element, an enclosing box therefor adjacent one side of which said reactance as a whole is supported, the rotatable element of the reactance having opposite projections from its two ends one of which projections extends thru the side of the box adjacent which the reactance as a whole is supported; an operating member inside the box and mounted on the opposite projection from the rotatable element of the reactance; and a rotatable and reciprocable spindle mounted inside the box and co-operating with said intermediate operating member and extending thru the side of the box adjacent which the reactance is supported and thru which one of its said rotatable projections extends.

11. A variable air condenser comprising a movable set of plates and an external casing enclosing the plates; two main operating elements mounted on a unitary spindle connected with the movable set of plates and located outside the casing at opposite ends thereof; an auxiliary operating spindle located outside said casing and paralleling said first spindle; means supporting said auxiliary spindle on said casing; a reciprocable friction cone mounted on one end of said auxiliary spindle; a friction disk mounted on the adjacent one of the said first spindle, co-operating with the said friction cone, and having a substantially larger diameter than said cone; and operating handles mounted respectively on the other end of said auxiliary spindle and on the adjacent main spindle.

12. A variable encased air condenser having operating projections from opposite ends of its rotatable set of plates and casing; an auxiliary operating spindle located outside of the casing of the condenser, supported thereby and extending alongside said opposite projections; manually operable devices respectively on one end of said auxiliary spindle and on the adjacent one of said operating projections; co-operating transmitting devices respectively on the other of said opposite projections and the other end of said auxiliary spindle, whereby the manual device on one end of the auxiliary spindle can move the rotatable condenser plates; and means normally maintaining said transmitting devices out of co-operative engagement with one another, whereby the manual device on one of said opposite projections can move the rotatable condenser plates without rotating said auxiliary spindle.

13. The combination with a rotatable tuning element of a supporting shaft journalled in said support and on which said element is mounted, actuating means on said shaft, a beveled friction disk also on said shaft, a cooperative beveled friction disk of substantially smaller diameter than the first mentioned disk, a shaft on which said smaller disk is mounted, an actuating means on said last mentioned shaft adjacent the actuating means on the first shaft and yieldable means normally holding said second shaft in a position with said smaller disk out of engagement with the first disk, said second shaft, its actuating means and smaller disk all being shiftable to have the smaller disk engage the larger and rotate the first shaft at a slow rate.

W. STUART WEBSTER.