Oct. 5, 1926. 1,601,968

W. H. HUTH

ADJUSTING HANDLE

Filed June 11, 1924

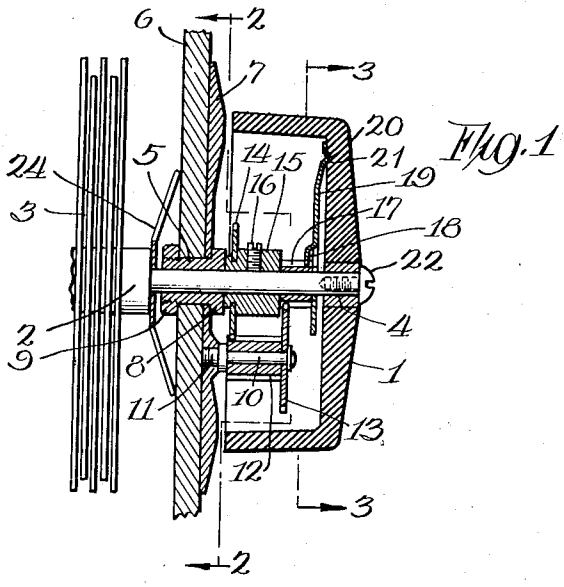

Fig. 1

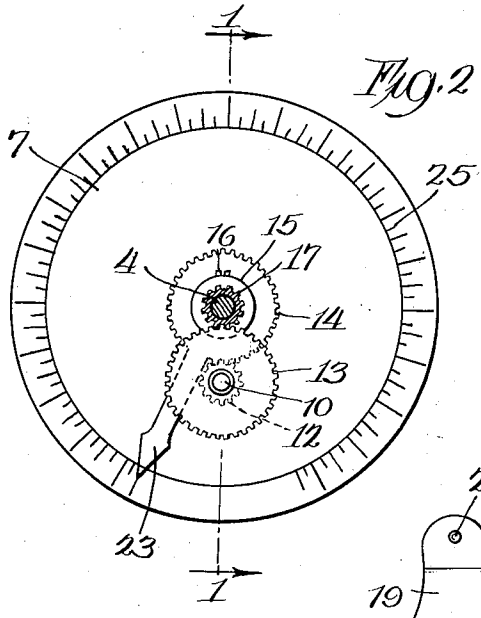

Fig. 2

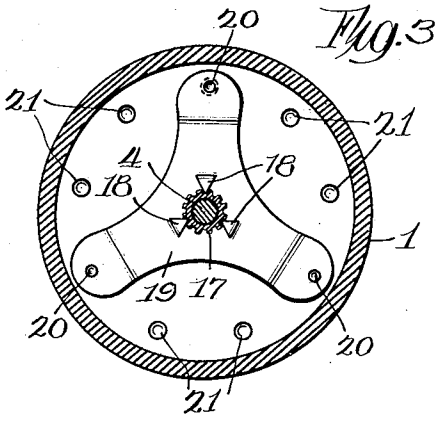

Fig. 3

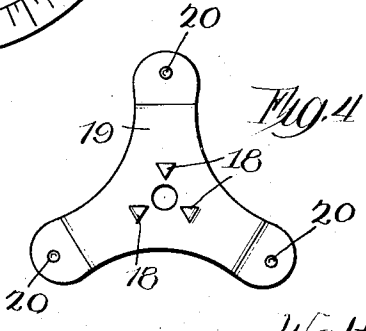

Fig. 4

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UNITED STATES PATENT OFFICE.

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ADJUSTING HANDLE.

Application filed June 11, 1924. Serial No. 719,238.

This invention relates to adjusting handles for accurately adjusting instruments or devices, and more particularly to handles for accurately and carefully adjusting radio or wireless apparatus, for tuning purposes. The invention relates more especially to adjusting handles of this kind in which means are provided for causing very slow rotation of the shaft of the condenser, variometer or other tuning instrument when the knob or handle is rotated quickly in either direction.

Generally stated, the object of the invention is to provide a novel and improved adjusting handle of the foregoing general character.

Special objects are to provide a yielding connection between the knob or handle and the gearing or transmission means, in combination with rotary means having a limited rotation, whereby the knob or handle may slip or turn without breaking anything, when forcibly turned after the rotary means has reached the limit of rotation in either direction; to provide an improved and novel construction whereby the rotary knob or handle and the step-down gearing or transmission means are all supported and mounted upon a dial plate disposed at the back of the knob or handle, and upon which dial plate there are preferably graduations or indications to co-operate with a revolving pointer to show the exact position of the condenser or variometer during the adjustment thereof; and to provide certain details and features of construction and combinations tending to increase the general efficiency and the desirability of an adjusting handle of this particular character.

To these and other useful ends the invention consists in the matters hereinafter set forth and claimed, and shown in the accompanying drawings, in which,—

Fig. 1 is a vertical section of an adjusting handle embodying the principles of the invention, showing the same applied to the shaft of a radio condenser for tuning purposes.

Fig. 2 is a vertical section on line 2—2 in Fig. 1.

Fig. 3 is a vertical section on line 3—3 in Fig. 1.

Fig. 4 is a detail view of one of the parts of the mechanism.

As thus illustrated, the invention comprises a knob or handle 1 of any suitable material, such as rubber or fiber or bakelite, this handle being preferably cup-shaped.

The shaft 2 of the condenser 3, such as the ordinary tuning condenser of a radio apparatus, has a reduced portion 4 which extends through the bushing 5 in the panel or front wall 6 of the radio apparatus, this bushing forming a bearing for the shaft. A dial plate 7 in the form of a disk is applied to the front surface of the panel, and is mounted on the bushing 5, with the head 8 of this bushing bearing against the disk or dial plate, as shown. A nut 9 is applied to the threaded end of the bushing, so that the dial plate is clamped tightly against the panel. A stud 10 is fixed in the dial plate at 11, and a pinion 12 having a gear wheel 13 rigid therewith is mounted on this stud, as shown. A gear wheel 14 is fixed on a sleeve 15 and the latter is removably secured on the reduced end portion 4 of the shaft by a set screw 16 in the manner shown. A loose pinion 17 is mounted on the reduced end portion 4 of the shaft, and the teeth of this pinion are engaged by the teeth 18 of the spring plate 19, which is also mounted on the shaft. The outer end portions of this spring are provided with slight projections 20 for engagement with the small sockets or depressions 21 formed in the inner surface of the knob or handle. A screw 22 is applied to the outer end of the shaft to keep the handle or knob from axial displacement, whereby the handle or knob turns freely on the end portion of the shaft.

Rotation of the knob or handle, therefore, will rotate the pinion 17, and this will rotate the gear wheel 13 and the pinion 12, and thereby rotate the gear 14, which latter is fixed on the shaft 4, so that the gear 14 and the condenser shaft will rotate in unison. A pointer 23 is rigid with the gear wheel 14, and projects between the handle and the dial plate 7, in the manner shown, so that the exact position of the shaft 4 is shown by the position of this pointer.

A spring plate 24 may be inserted between the back of the panel 6 and the larger portion of the shaft 2, so that when the screw 22 is tightened this plate 24 will bear frictionally against the inner surface of the panel or front wall 6 of the radio apparatus, thus forming a means for frictionally hold-

ing the condenser in adjusted position, so that while it can be adjusted readily by rotation of the handle, there will be less danger of the condenser being jarred out of position after being accurately adjusted.

It will be seen that the dial plate 7 supports the entire device, and that merely by fastening this dial plate to the panel or front wall 6, it is possible to fasten the entire adjusting mechanism in position for operation. Of course, the dial plate must be fastened in position, and then the gear wheel 14 can be secured in place, by the set screw 16 and then the screw 22 can be inserted to hold the handle against displacement. The spring plate 24 can be omitted, of course, if the condenser or variometer, or other instrument, rotates with sufficient friction to hold it in any adjusted position. The stud 10 is preferably screwed into the dial plate 7, as shown at 11, and can be unscrewed when necessary. To detach the mechanism, the screw 22 is removed, and the screw 16 is then loosened, and the shaft portion 4 can then be pulled out backward. Then the nut 9 can be unscrewed and the bushing 5 can be removed from the front of the panel.

The pointer 23 has only a limited motion, as it can revolve until it strikes the pinion 12, in either direction, so that it has something less than a full rotation or revolution in either direction. If the operator should continue to twist the handle 1 after the pointer 23 strikes the pinion 12, no harm will be done, of course, inasmuch as the yielding, frictional connection provided by the spring 19 between the handle and the step-down gearing or transmission will permit rotation of the handle without rotating anything else. In other words, the projections 20 will slip out of the sockets or depressions 21 if the user twists the knob forcibly after the pointer has reached the limit of its rotation, and in this way no harm will be done.

The ratio of speed, it will be seen, is such that the shaft 2 will rotate very slowly and only partially while the handle or knob 1 is rotating several times, in either direction, so that fast rotation of the handle or knob in either direction will result in only very slow movement of the shaft, and such slow movement of the pointer 23 that the operator or user can accurately adjust the condenser or variometer, or other instrument, in a way that would not be possible if the handle or knob were rigid with the shaft. In other words, careless or nervous handling or touching of the knob would not be so liable to disturb the adjustment of the instrument, and such danger of disturbance will be minimized by reason of the fact that considerable rotation of the handle is required in order to substantially displace or rotate the shaft sufficiently to disturb the adjustment of the instrument. The rotation of the handle can be quite a little too much or quite a little too little, in one sense, when the desired adjustment is made, without seriously affecting the desired position of the shaft, inasmuch as considerable inaccuracy in the positioning of the handle becomes almost inappreciable when finally communicated to the shaft. Thus the knob or handle 1 is held against axial displacement, in either direction, and does not have any such displacement in the operation thereof, so that the edge of the cup-shaped handle is positioned a fixed distance from the dial plate 7, with just enough space between the two for the pointer 23, and the marks or graduations 24 on the dial plate 7 co-operate with said pointer to show the degree of rotation of the shafts 2 and 4. As shown, this shaft 4 is integral with the main body of the shaft 2, of course, but it is obvious that the portion 4 can be connected to the portion 2 in any suitable or desired manner, so that the two portions will rotate in unison, and whereby the portion 4 will support the handle and some of the gearing.

The adjusting handle mechanism thus shown and described, as illustrative of the invention, is simple and comparatively cheap to manufacture. The gear wheels and pinions are all of such character that they may be manufactured economically, and the plate 19 is of such form and character that it forms a slippage connection between the handle and the shaft of a very inexpensive form, as the plate can be stamped out of springy sheet metal in the manner shown and described. The points 20 are some distance from the shaft, of course, so that a considerable leverage is obtained to cause the teeth 18 to rotate the pinion 17, but continued twisting or rotation of the handle after the pointer 23 reaches the limit of its movement in either direction, will cause slippage between the handle and the outer end portions of the spring plate 19, thus preventing breakage or straining of the mechanism. Thus the handle 1 has a fixed position of rotation or operation, relatively to the shaft or other element to be adjusted, but by reason of the step-down gearing the handle may rotate several times in this position without producing more than a partial rotation of the shaft. In other words, the handle rotates in a fixed plane of rotation, and the step-down gearing is always the medium of connection between the handle and the shaft, so that never at any time can the shaft be rotated in unison with the handle. No matter at what speed the handle is rotated, the shaft will always rotate at a much slower speed, and so much more slowly that the positioning of the shaft for tuning purposes is made comparatively easy, even by a person with a careless or unsteady hand. The mechanism is all enclosed within the handle, of

course, and the handle can be of any suitable or desired size, but is ordinarily of such size as can be easily grasped in the hand and turned like an ordinary knob.

It will be seen that the main shaft section 2 stops short of the handle, while the extension section 4 extends through the plate 7 which supports the entire adjusting handle device, and into the handle itself. The plate 7 supports the shaft and supports the instrumentalities by which the handle operates the shaft in the desired manner. Thus all that is necessary is the provision of an opening in the panel 6 for the bushing 5, for by means of this bushing the plate 7 is sufficiently secured to the panel, and thus the plate 7 serves as the mounting for the entire device.

In the construction shown, which is illustrative of the invention, the indicating means serve to limit the rotation of the shaft, of course, but such limitation may be imposed upon the shaft, or might be imposed thereon, by any suitable means, or by any condition or arrangement. In any event, regardless of in what manner the shaft is held against further rotation, the yielding frictional connection which provides for slippage between the handle and the instrumentalities for operating the shaft will permit rotation of the handle after the shaft reaches the limit of its movement, thus guarding against breakage or straining of the mechanism. The gearing shown and described constitutes the instrumentalities which with the knob or handle form a device for slowly rotating the shaft in either direction, by comparatively quick rotation of the handle. This entire device, as shown and described, is mounted by the dial plate on a wall or panel, and hence only the dial plate and its bushing are necessary for the mounting of the entire device on the front panel of the radio apparatus. In other words, the dial plate 7 supports the shaft, supports the stud 10, and hence all the elements supported by said shaft and said stud are supported by the dial plate, the latter being clamped so tightly against the panel that it forms a support for the panel and mechanism operated thereby.

The foregoing construction is in the nature of an improvement on the construction shown and described and claimed in my prior applications, Serial No. 562,728, filed May 22, 1922, and Serial No. 675,829, filed November 20, 1923.

What I claim as my invention is:

1. An adjusting handle mechanism comprising a shaft to be rotatively adjusted, a rotary knob or handle for manually adjusting the shaft, means adapted to limit the rotation of the shaft, and a yielding frictional connection between the handle and the shaft, comprising one part frictionally engaging another part to normally prevent relative movement between them, but having stoppage whereby forcible rotation of the knob or handle after the shaft has reached the limit of its rotation is prevented from injuring the mechanism, said frictional connection comprising a spring plate bearing against the inner side of the handle or knob, there being interengaging projections and depressions between the spring and handle, for causing rotation of the shaft, but permitting slippage when the handle is rotated forcibly after said limit of rotation of the shaft is reached.

2. An adjusting handle mechanism comprising a shaft to be rotatively adjusted, a rotary knob or handle for manually adjusting the shaft, means adapted to limit the rotation of the shaft, and a yielding frictional connection between the handle and the shaft, comprising one part frictionally engaging another part to normally prevent relative movement between them, but having stoppage whereby forcible rotation of the knob or handle after the shaft has reached the limit of its rotation is prevented from injuring the mechanism, said means for limiting the rotation of the shaft comprising a pointer rigid with the shaft, and gearing between the handle and the shaft, some portion of said gearing forming a stop for said pointer in either direction of rotation thereof.

3. An adjusting handle mechanism comprising a dial plate, means for securing the dial plate to a panel or wall, a shaft extending centrally through said dial plate, a tuning instrument operable by and in unison with said shaft, gearing supported by the shaft and said dial plate to cause slow rotation of the shaft, and a handle mounted on said shaft, adapted for rotation relatively to the shaft to operate said gearing, whereby relatively fast rotation of the handle will produce slow rotation of the shaft and said instrument, said means for securing the dial plate in place comprising a central bushing forming a bearing for said shaft.

4. An adjusting handle mechanism comprising a dial plate, means for securing the dial plate to a panel or wall, a shaft extending centrally through said dial plate, a tuning instrument operable by and in unison with said shaft, gearing supported by the shaft and said dial plate to cause slow rotation of the shaft, and a handle mounted on said shaft, adapted for rotation relatively to the shaft to operate said gearing, whereby relatively fast rotation of the handle wi l produce slow rotation of the shaft and said instrument, said gearing comprising a stud on said dial plate, comprising a pinion and a gear wheel on said stud, together with a loose pinion on said shaft to engage said gear wheel, and a gear wheel rigid with said shaft to engage said first mentioned pinion,

in combination with a pointer rigid with said shaft, said first mentioned pinion forming a stop to limit the movement of said pointer in either direction of rotation thereof.

5. An adjusting handle mechanism comprising a rotary handle or knob, a shaft to be rotated, and power transmission means between said handle and said shaft, comprising a pinion on the shaft, and a spring plate forming a frictional connection between said pinion and said handle, said plate having teeth for engaging the teeth of the pinion, said handle having means for frictionally engaging the outer end portions of said plate, whereby slippage between the handle and plate will stop the rotation of said pinion, in combination with means adapted to limit the rotation of said shaft.

6. A structure as specified in claim 5, said means for limiting the rotation comprising a pointer rigid with the shaft, a portion of said mechanism forming a stop to limit the movement of the pointer in either direction.

7. In radio tuning apparatus, the combination of a radio front panel, a gear wheel adjacent said panel for rotation, a dial plate on said panel, a pinion supported by said plate for rotation, engaging said gear wheel, a gear wheel rigid with said pinion, a handle having a pinion axially alined therewith for engaging said last mentioned gear wheel, and a shaft axially alined and rigid with said first mentioned gear wheel, the shaft and last mentioned pinion having relative rotation, said last mentioned pinion having rotation on an extension of said shaft, so that said shaft and handle always rotate in the same direction, means forming a bearing for said shaft and whereby said dial plate and the entire adjusting handle device are supported on the panel, and a pointer disposed between said last mentioned gear wheel and the dial plate and rigid with said shaft to co-operate with said dial plate.

8. A structure as specified in claim 7, said gearing being adapted to rotate said shaft at a slower speed than said handle, with such ratio that several rotations of the handle are necessary for partial rotation of the shaft.

9. A structure as specified in claim 7, said handle being made hollow to form a housing for all of said gearing, with said plate exposed to the interior of said handle.

10. In radio tuning apparatus, the combination of a front wall, a plate on said wall, a gear wheel supported adjacent said plate for rotation, a pinion supported by said plate for rotation, said pinion engaging said gear wheel, a gear wheel rigid with said pinion, a handle disposed in front of and close to said wall and having a pinion axially alined therewith for engaging said last mentioned gear wheel, a shaft axially alined and rigid with said first mentioned gear wheel, whereby said shaft and handle always rotate in the same direction, and a bushing in said plate to secure the plate to said wall and to form a bearing for said shaft, said handle being made hollow to form a gear housing, and said plate being exposed to the interior of said handle.

11. In radio apparatus tuning mechanism, an element to be adjusted to obtain the desired tuning effect, an adjusting knob or handle manually operable to move the element from one position to another, means whereby the handle has a fixed position of operation relatively to said element, instrumentalities forming with said handle a device operative by quick rotation of said knob to very slowly rotate said element, in either direction at will, whereby said knob and element always rotate in the same direction, but with such fixed and unchangeable ratio of speed that the knob can rotate a plurality of times in said position thereof while said element is making only a partial rotation, and whereby quick rotation of the knob will turn said element so slowly that it can be stopped at will in any position thereof necessary for accurately tuning said apparatus, and a single plate having axial means to mount the entire device on a wall.

12. A structure as specified in claim 11, said element to be adjusted comprising a radio instrument shaft supported in said axial means, and means whereby said shaft is limited to less than a complete rotation in either direction, but said knob or handle being capable of several rotations in either direction about the axis of said shaft, and being capable of stopping in different positions with practically an imperceptible variation in the predetermined position in which it is desired to stop said shaft, so that stopping of said knob or handle in exact position is not necessary.

13. Radio apparatus as set forth in claim 11, comprising indicating means operable in a fixed plane between said axial means and of said knob, adapted to rotate in unison with the element to be adjusted, to provide visible indicating means for enabling the operator to stop the motion of said element at will in any position thereof.

14. An adjusting knob, as set forth in claim 11, in which said element is rotatable about the axis of said handle or knob, upon an integral reduced end portion thereof, and including means whereby axial displacement of the handle or knob from said extension of the shaft is possible when necessary.

15. An adjusting knob or handle, as set forth in claim 11, in which said knob or handle, rotatable relatively to said element, is hollow and has said instrumentalities en-

closed therein for operating the element to be adjusted.

16. In radio apparatus tuning mechanism, an element to be adjusted to obtain the desired tuning effect, an adjusting knob or handle manually operable to move the element from one position to another, instrumentalities entirely concealed in said handle and operative by quick rotation thereof to very slowly rotate said element, in either direction at will, said knob and element always rotating in the same direction, but with such ratio of speed that the knob can rotate a plurality of times while said element is making only a partial rotation, whereby quick rotation of the knob will turn said element so slowly that it can be stopped at will in any position thereof necessary for accurately tuning said apparatus, means forming a stop to limit the rotation of said element, and a frictional connection between said handle and instrumentalities, comprising one part frictionally engaging another part to normally present relative movement between them, but having stoppage to permit rotation of the handle without breakage after said element reaches the limit of its movement.

17. A structure as specified in claim 16, said element to be adjusted comprising a radio instrument shaft extending into the interior of said handle, and means whereby said shaft is limited to less than a complete rotation in either direction, but said knob or handle being capable of several rotations in either direction and being capable of stopping in different positions with practically an imperceptible variation in the predetermined position in which it is desired to stop said shaft, so that stopping of said knob or handle in exact position is not necessary.

18. Radio apparatus as set forth in claim 16, comprising indicating means operable in a fixed plane back of said knob, adapted to rotate in unison with the element to be adjusted, to provide visible indicating means for enabling the operator to stop the motion of said element at will in any position thereof, means to form a surface immediately back of said indicating means, with said handle close to said surface to conceal said instrumentalities, but leaving said indicating means exposed to view.

19. An adjusting knob, as set forth in claim 16, in which said element is rotatable about the axis of said handle or knob, and including means whereby axial displacement of the handle or knob is possible, when necessary, by removal thereof alone from said instrumentalities therein.

20. An adjusting knob or handle, as set forth in claim 16, in which said knob or handle encloses said frictional connections.

21. In radio apparatus, the combination of the following five elements, to-wit:—(1) a radio instrument shaft to be adjusted for tuning purposes; (2) a rotary knob or handle for manual rotation to rotate said shaft, held against axial displacement relatively to said shaft; (3) intermediate instrumentalities forming with said handle a device whereby said shaft will always rotate slower than the knob or handle, whereby the handle may rotate freely and quickly in either direction several times, while the shaft is rotating only partially very slowly; (4) a dial plate to mount the entire device on a wall or panel, and (5) a frictional connection between the handle and said instrumentalities, whereby the handle may rotate after said shaft reaches the limit of its movement.

22. A structure as specified in claim 21, in combination with (6) indicating means always movable slower than the handle to show the speed and direction of rotation and the exact position of said shaft.

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