June 24, 1930. M. S. HOWARD 1,765,587

TUNING DEVICE FOR RADIO APPARATUS

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Fig. 1

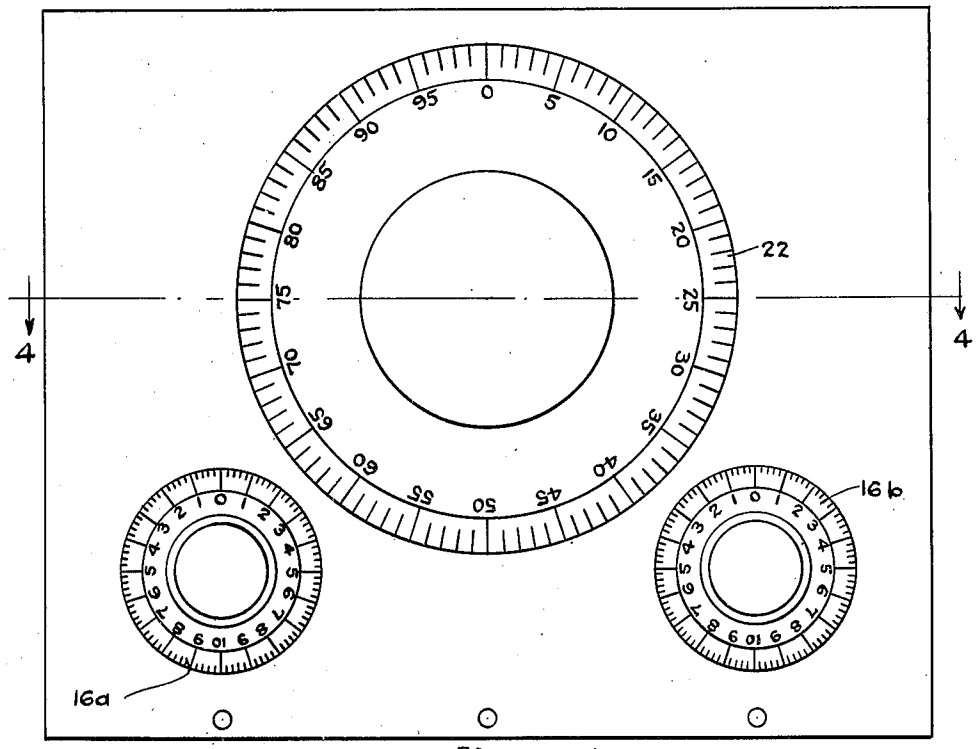
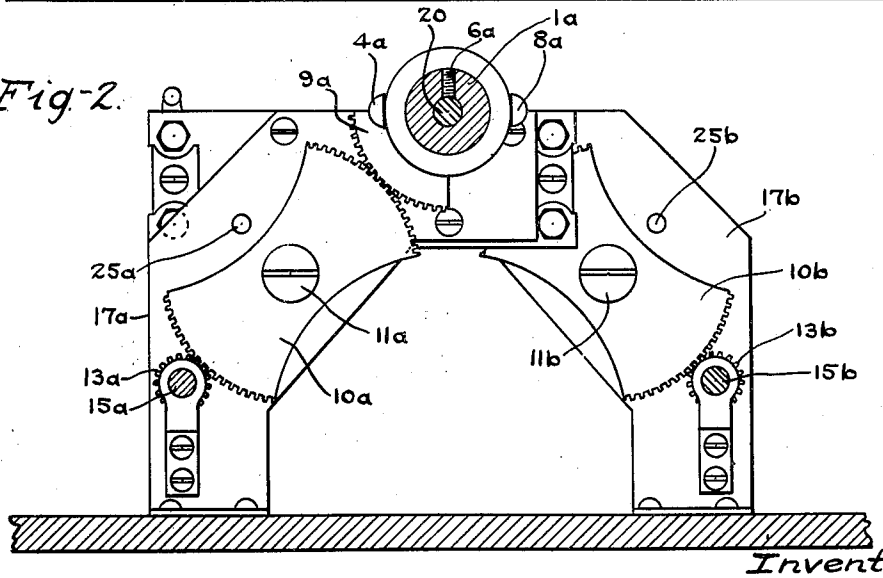


Fig. 2.



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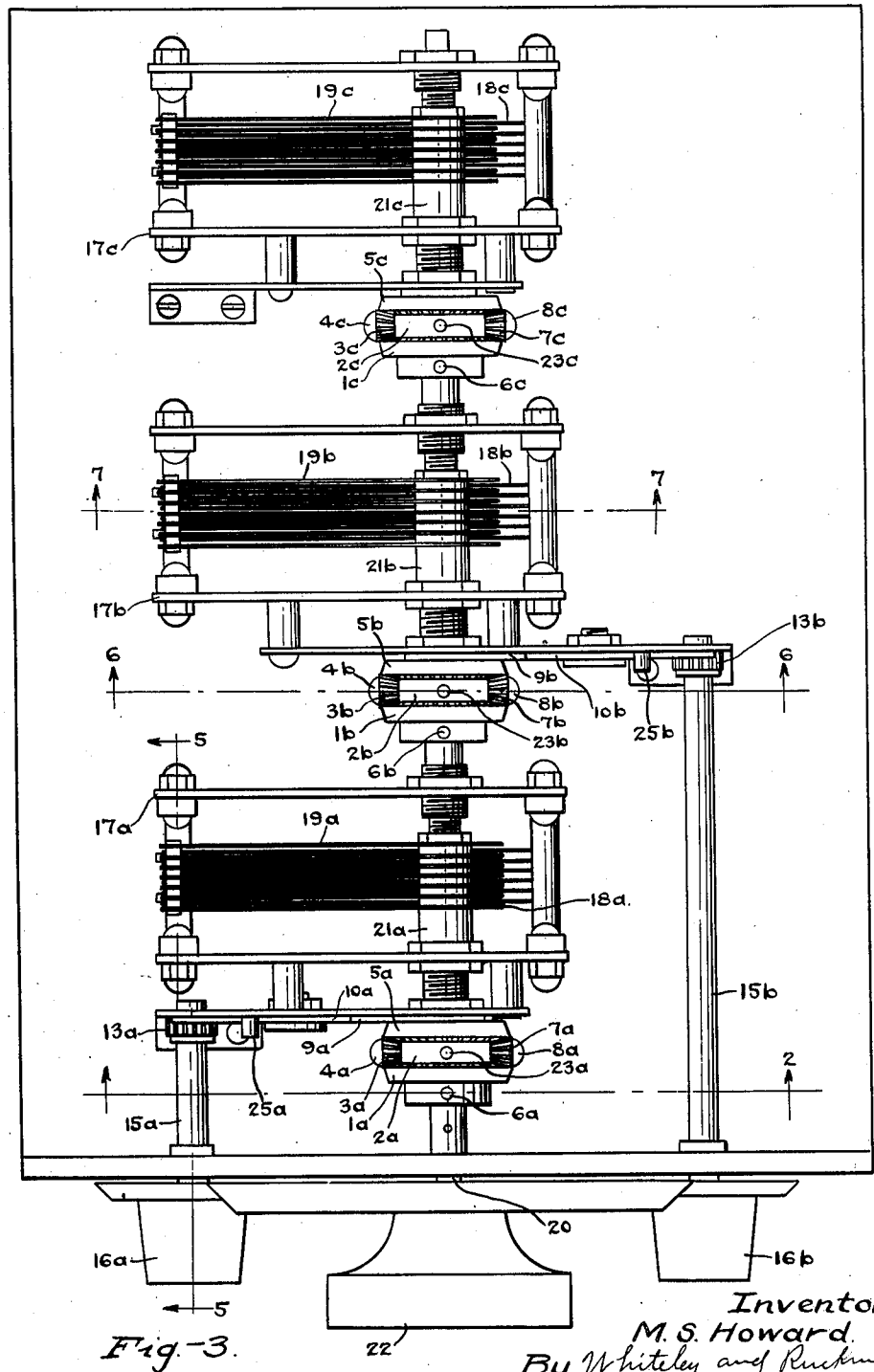


Fig. -3.

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TUNING DEVICE FOR RADIO APPARATUS

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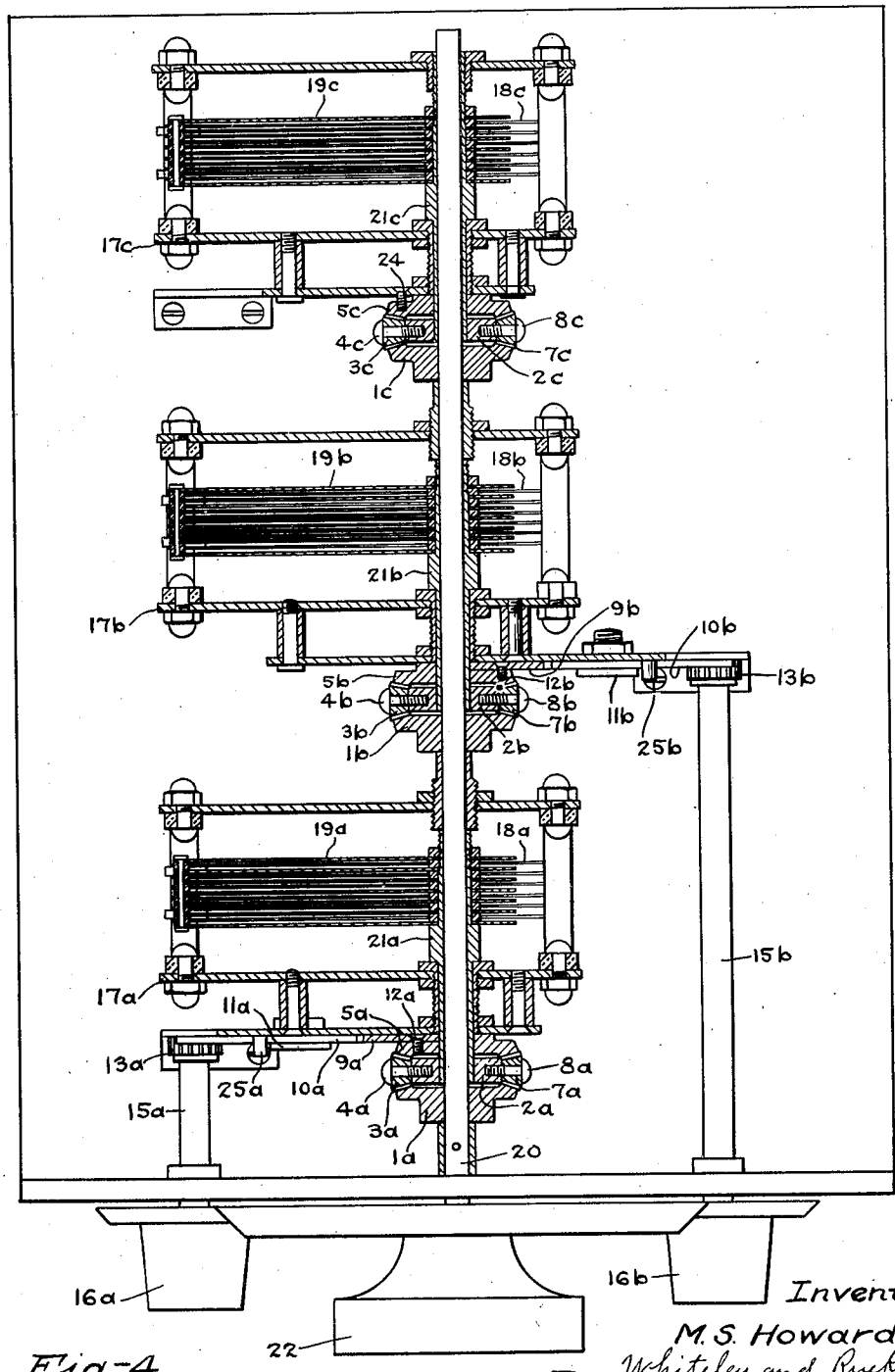


Fig. 4.

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TUNING DEVICE FOR RADIO APPARATUS

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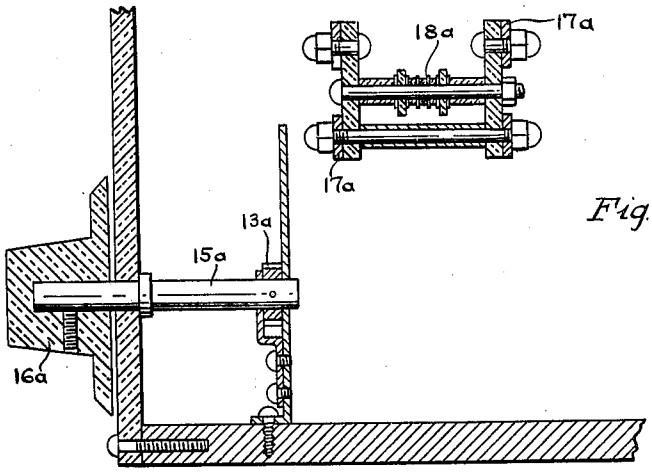


Fig.-5.

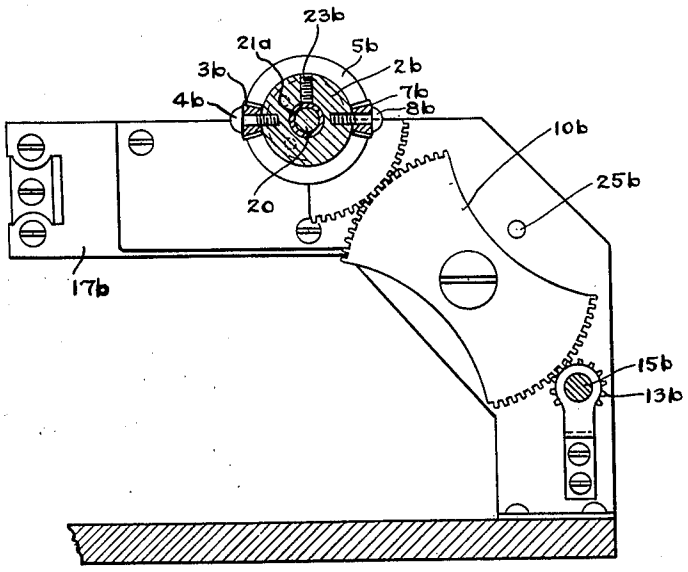


Fig.-6.

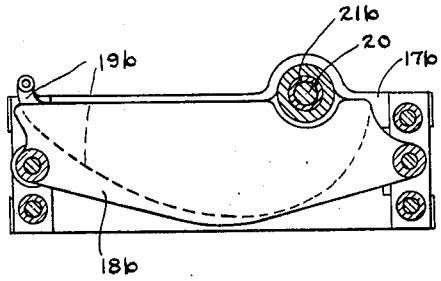


Fig.-7.

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UNITED STATES PATENT OFFICE

MONROE S. HOWARD, OF HASTINGS, MINNESOTA

TUNING DEVICE FOR RADIO APPARATUS

Application filed October 4, 1926. Serial No. 139,386.

My invention relates to tuning devices for radio apparatus, and particularly to such apparatus in which two or more elements, usually variable condensers, are required to be adjusted simultaneously for which purpose they may be rotated synchronously or approximately so. In radio receiving sets, there are usually three of these tuning units generally involving variable condensers each fitted with a dial and requiring separate manual adjustment on account of which the tuning is awkward and cumbersome. In some sets, the three condenser rotors are mounted on the same shaft so that they can be operated from a single dial. This arrangement, however, is not satisfactory since, in order to secure close tuning, the different condensers generally require slightly difference settings. It is the purpose of this invention to provide means for separately adjusting the individual condensers of a set of the type operated from a single dial. I accomplish this result by the use of differential gearing as will be hereinafter set forth.

The full objects and advantages of my invention will appear in connection with the detailed description thereof, and the novel features of my inventive idea will be particularly pointed out in the claims.

In the accompanying drawings which illustrate one form in which my invention may be embodied,—

Fig. 1 is a front elevational view of the apparatus. Fig. 2 is a view in section on the line 2—2 of Fig. 3. Fig. 3 is a top plan view. Fig. 4 is a view in section on the line 4—4 of Fig. 1. Fig. 5 is a view in section on the line 5—5 of Fig. 3. Fig. 6 is a view in section on the line 6—6 of Fig. 3. Fig. 7 is a view in section on the line 7—7 of Fig. 3.

In the accompanying drawings, similar parts are designated by the same numerals accompanied by the letters *a*, *b*, and *c* to designate the parts belonging to the three different units. As shown in Fig. 3, three frames 17^a, 17^b, and 17^c support three fixed condenser members 18^a, 18^b, and 18^c. These condenser members and the connections for the device are of well known construction and hence are not described in detail. The device includes a main shaft 20 to the forward end of which a combined knob and dial 22 is secured. The rotors 19^a, 19^b, and 19^c of the condensers are mounted on sleeves 21^a, 21^b, and 21^c, instead of being mounted directly on the shaft 20, and these sleeves rotate freely on the shaft 20. On these sleeves are mounted hubs 2^a, 2^b and 2^c secured to the same by set screws 23^a, 23^b and 23^c as shown in Fig. 3. The hubs carry pairs of bevel pinions 3^a and 7^a, 3^b and 7^b, and 3^c and 7^c journalled on screws 4^a and 8^a, 4^b and 8^b, 4^c and 8^c. These hubs with the two pinions are placed between two bevel gears 1^a and 5^a, 1^b and 5^b, 1^c and 5^c so that both pinions mesh with both large gear wheels. The bevel gears 1^a, 1^b and 1^c are fixed to the shaft 20 by set screws 6^a, 6^b and 6^c as shown in Fig. 3 so that they rotate with it and with the dial and knob 22 attached to the same shaft. The gear 5^c is attached to a frame 17^c by a screw 24 so that is is held in a fixed position and the sleeve 21^c rotates within it. The gears 5^a and 5^b are free to rotate on sleeves 21^a and 21^b. These two bevel gears however each carry sectors of spur gears 9^a and 9^b attached by screws 12^a and 12^b which engage spur gear segments 10^a and 10^b mounted on pivots 11^a and 11^b. The gear segments 10^a and 10^b also mesh with pinions 13^a and 13^b mounted on shafts 15^a and 15^b which are controlled by knobs and dials 16^a and 16^b, the extent of movement of the gear segments 10^a and 10^b in both directions being limited by stops 25^a and 25^b carried by the frame members.

The operation of the apparatus is as follows: When the dial 22 is turned, it rotates the three bevel gears 1^a, 1^b and 1^c and, since these gears engage the pinions 3^a and 7^a, and 3^b and 7^b, and 3^c and 7^c, they are carried forward in the same direction and with them the hubs 2^a, 2^b and 2^c to which they are attached. As the three bevel gears 5^a, 5^b and 5^c which also mesh with the pinions 3^a and 7^a, 3^b and 7^b, and 3^c and 7^c, are stationary, the pinions and consequently the hubs 2^a, 2^b

and 2^c travel only half as fast as the gears 1^a, 1^b and 1^c, and the knob 22, and therefore the knob and dial will make a complete revolution while the hubs 2^a, 2^b and 2^c, and the condenser rotors 19^a, 19^b and 19^c which are mounted on the sleeves 21^a, 21^b and 21^c are making a half revolution. If now the knob 22 with shaft 20 and bevel gears 1^a, 1^b and 1^c remain stationary and the knob 16^a is rotated it carries with it the shaft 15^a and the pinion 13^a and through the gear segment 10^a and sector 9^a rotates the bevel gear 5^a in the same direction. This in turn rotates the hub 2^a and condenser rotor 19^a also in the same direction but only half as fast, and shifts the position of the rotor 19^a with reference to the other rotors 19^b and 19^c either forward or backward depending on the direction in which the knob is turned, and the rotor retains this position relative to the other rotors for all positions of the knob 22 and until knob 16^a is turned again. In like manner the rotor 19^b may be shifted about the axis 20 independently of the others by turning the knob 16^b. The graduations on the small dials indicate the amount of the deflection forward or backward of the rotors in terms of divisions and fractions of divisions of the main dial 22, and at any position of the dial 22, the rotors can all be brought in alignment by setting dials 16^a and 16^b at zero.

It is obvious that the hubs 2^a, 2^b, and 2^c may be made the adjustable and stationary elements and that the gears 5^a, 5^b, and 5^c may be attached to the sleeves 21^a, 21^b and 21^c. The rotors would then move through the same angular distance as the dial 22 but in the opposite direction, and with this arrangement, the gearing on unit *c* may be omitted, the rotor being connected directly to the shaft 20. It is obvious that the form of differential gearing may be varied without departing from the principle of my invention.

I claim:

1. A tuning device for radio apparatus comprising a plurality of stationary condenser members, a plurality of movable condenser members cooperating respectively with said stationary members, sleeves to which said movable members are secured, a shaft passing through said sleeves, means for causing the rotation of said shaft to be imparted to said sleeves in unison, and means for independently turning said sleeves.

2. A tuning device for radio apparatus comprising a plurality of stationary condenser members, a plurality of movable condenser members cooperating respectively with said stationary members, sleeves to which said movable members are secured, a shaft passing through said sleeves, means for causing the rotation of said shaft to be imparted to said sleeves in unison, secondary shafts, and gearing between said secondary shafts and sleeves for independently turning the latter.

3. A tuning device for radio apparatus comprising a plurality of stationary condenser members, a plurality of movable condenser members cooperating respectively with said stationary members, a shaft upon which said movable members are supported, sets of differential gears carried by said shaft for moving said movable members in unison by rotation of said shaft, and means for turning one of the gears of said sets for independently adjusting the movable member associated therewith.

4. A tuning device for radio apparatus comprising a plurality of stationary condenser members, a plurality of movable condenser members cooperating respectively with said stationary members, sleeves to which said movable members are secured, a shaft passing through said sleeves, sets of differential gears between said sleeves and said shaft whereby the rotation of the latter is imparted to said sleeves in unison, and means for turning one of the gears of said sets for independently adjusting the movable member associated therewith.

In testimony whereof I hereunto affix my signature.

MONROE S. HOWARD.