March 17, 1942. A. HOROWITZ ET AL 2,276,724

RADIO-RECEIVER

Filed May 2, 1940 2 Sheets-Sheet 1

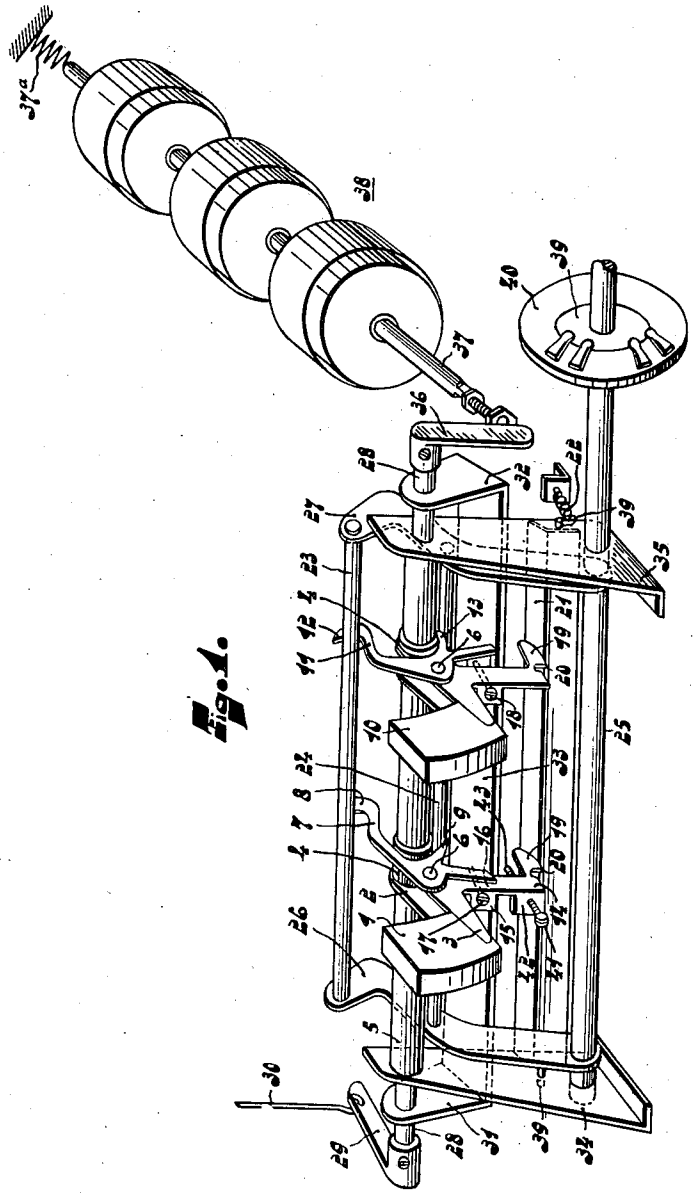

Fig. 1.

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Fig. 2.

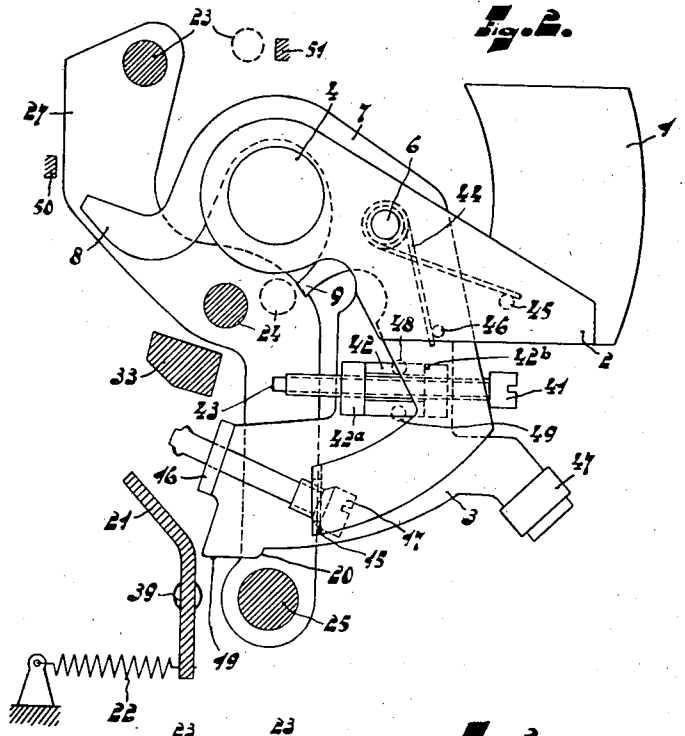
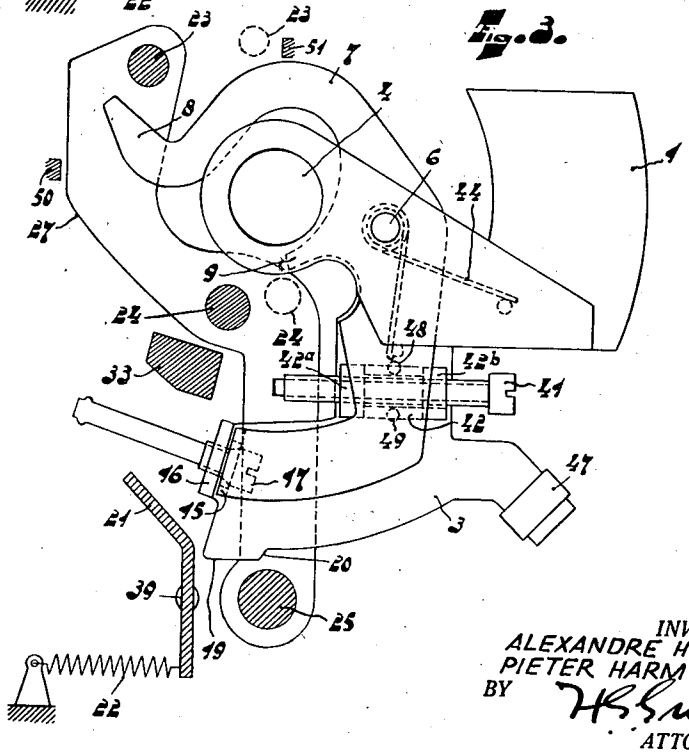


Fig. 3.



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UNITED STATES PATENT OFFICE

2,276,724

RADIO RECEIVER

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11 Claims. (Cl. 250—40)

Radio-receivers adapted to be automatically tuned to a plurality of pre-determined stations with the aid of a number of keys provided with adjustable stops or similar members are known in different constructions. The known constructions have, however, the drawback of being frequently very complicated whilst in other cases the keys have to be depressed over a rather large distance to obtain the desired tuning, which has to be regarded as a disadvantage for the operating person. These systems exhibit therefore the drawback that they must be rather bulky in order to be able to accommodate the stroke required for the keys in the casing, due to which they can be housed less conveniently in the casings of usual dimensions of radio-sets.

All these drawbacks are obviated in the radio-receiver according to the present invention. This receiver exhibits the feature that each station key present in the set is rotatably mounted on a shaft whilst the tuning condenser derives its motion from the rotatory motion of the key concerned and its final adjustment from the operative length of the stop with which this key is equipped.

Such a tuning system has, in addition to the small space required in the casing, the further advantage that owing to the rotary motion of the keys the friction in the mechanism is small.

According to the invention, it is advisable that the shafts about which the station keys are rotatable should be located in one line. By arranging this shaft, for example, immediately behind one of the walls of the set, it becomes possible to cause the keys to protrude, for example, from the front-wall, which greatly simplifies the operation of such a set, the more so if, as has been described above, the shafts of the keys are located in one line and these keys are consequently located in one row.

The assemblage of the tuning mechanism in the set according to the invention may be very compact when proceeding in accordance with one convenient embodiment of the invention wherein a bail which is common to all the keys and which transfers the motion of these keys to the tuning condenser is arranged so as to be rotatable, preferably, about the common geometrical axis of rotation of the keys or about a shaft in the immediate vicinity of the said axis.

If in the receiver according to the invention the tuning condenser is formed as a slidable-electrode condenser, it is advisable to arrange the shaft of the tuning condenser so as to be perpendicular to the shaft of the swing. This affords, on the one hand, the advantage that in the set but a very small space is occupied by the tuning mechanism and the tuning condenser whilst, on the other hand, the rotary motion of the shaft of the bail is converted in a most simple manner, without the use of complicated lever systems and the like which may give rise to a large friction in the mechanism and to inaccuracy in the tuning, into a reciprocating motion of the shaft of the condenser.

According to the invention, it is possible to cause the bail, which serves for all the station keys, to actuate at the same time the pointer of the scale.

Sets having automatic tuning by means of press-buttons or keys have in general to satisfy the requirement that simultaneously with the operation of a station key the wave-length switch is changed-over to the wave-length range to which belongs the station corresponding to the depressed key. With the radio-receiver according to the present application this may constructionally be effected in a very simple manner by equipping one or more of the station keys with a second adjustable stop or similar member, which stops co-operate with another swing which is common to the keys equipped with the said second stop and which operates the wave-length switch.

According to the invention, it is in this case advantageous to arrange the devices for adjusting the two adjustable stops provided on a key with respect to one another in such manner that in the non-depressed condition of a key the one adjusting device and in the depressed condition of this key the other adjusting device can be operated through the same aperture of the casing of the set. The adjusting devices may be adjusted, for example, with the aid of a screw-driver.

According to the invention, it is advisable to provide in the set a locking device common to all the keys, which device is slightly movable, for example rotatable, is subject to the action of a spring and maintains a depressed key in this position.

In the form of construction of the radio-receiver according to the present application, which comprises one common bail for the operation of the tuning condenser and a second bail for the operation of the wave-length switch, it is advisable, in accordance with the invention, to arrange on the geometric axis of rotation of the station keys a few other keys which co-operate exclusively with the bail of the wave-length switch. In constructional respect the advantage is thus obtained that for the wave-length switch use is made of the wave-length switch mechanism which is present already for the station keys whilst the outward appearance of the set is improved owing to the fact that the station keys and the keys of the wave-length switch all have the same aspect and, if desired, may all be arranged in one row.

The invention will be explained more fully

with reference to the accompanying drawings wherein,

Fig. 1 represents in perspective the tuning mechanism of a radio-receiver according to the invention whilst Figs. 2 and 3 show a modified form of the invention with mutually different positions of the operating member of the swing of the wave-length switch.

The tuning keys 1 and 10 in the set, the construction of which will hereinafter be explained more fully with reference to Figs. 2 and 3, are all of them adapted to turn on a hollow shaft 5 by means of bushes 4. For the sake of clearness the figure shows only two keys, viz. the key 1 which serves to tune the set to a determined station and the key 10 which serves exclusively to change-over the set to either of the two wave-lengths, which key is utilised, for example, in the case wherein a tuning condenser 38 is adjusted by means of a hand turning knob, that is to say in the usual manner. The hollow shaft 5 surrounds another shaft 28 which carries a tuning swing constituted by side-pieces 31 and 32 and a connecting piece 33. The hollow shaft 5 is rigidly mounted in supports 34 and 35 whereas the shaft 28 is adapted to turn in the hollow shaft 5 and carries at one of its ends an angle lever 29 which actuates the rod 30 of a pointer mechanism and at its other end an angle lever 36 which bears against the slidable shaft 37 of a slidable-electrode condenser 38. The shaft 37 is subject to the action of a spring 37*a* which always tends to push the sliding shaft forwards. The supports 34 and 35 have furthermore rotatably journalled in them the bail of the wave-length switch. This bail comprises a shaft 25 on which is mounted the rotor 39 of a wave-length switch the stator of which is denoted by 40. The shaft 25 carries two side-pieces 26 and 27 of the bail which are connected to one another by means of rods 23 and 24. Upon depressing the key 1 the tuning bail is pushed into a determined position by means of an adjusting screw 41 against the action of the spring 37*a* whilst a hook 8 or a stop 9, which are provided on the part 7 which is rotatably secured to the side-piece 3 of the key co-operate with the rod 23 or 24 of the bail for the wave-length switch. The key once depressed is retained by a locking device 21 which is constantly drawn upwards under the action of a spring 22; upon depressing the key the oblique portion 19 first slightly lowers the portion 21 of the locking device with the result that another depressed key is released whereas the key to be depressed is retained owing to the fact that the recess 20 is engaged by the portion 21 of the locking device.

Figs. 2 and 3 represent the key construction more clearly. These figures show the side-pieces 2 and 3 of the key which are connected to one another by means of pins 6 and 45 whilst the bush 4 acts at the same time as a connecting piece between the said side-pieces. The latter may be made, for example, of plate-shaped material. Between the side-pieces is secured the body 1 of the button. To the side-piece 3 is secured, with the aid of rivets 48 and 49, a guide-piece 42 provided, in two raised tags 42*a* and 42*b*, with a screw-thread in which the adjusting screw 41 can be screwed to and fro. The end 43 of this screw co-operates with the tuning bail 33 which is shown here in transverse section.

The pin 6 has pivotally mounted on it a member 7 which is located between the side-pieces 2 and 3. Owing to the action of a spring 44 which surrounds the pin 46 and bears against the pins 45 and 46, the member 7 is constantly pressed into the position shown in Fig. 2 so that, upon depressing the key, the hook 8 is inoperative whereas when the key is depressed the stop 9, which is also located on the member 7, functions.

The figure further shows the bail for the wave-length switch, of which bail the connecting rods 23 and 24 and the shaft 25 are represented in cross-section and the side-piece 27 in lateral elevation. Upon depressing the key, when the member 7 occupies the position according to Fig. 2 and consequently the stop 9 is operative, the latter butts against the connecting rod 24 with the result that the bail of the wave-length switch moves from the dotted position, in which solely the position of the connecting rods 23 and 24 is shown, into the position shown in full lines until the said bail engages a fixed stop 50. Owing to this, the shaft 25 has turned through a certain angle with the result that, as has appeared already from Fig. 1, the rotor 39 of the wave-length switch is turned. When being depressed the key 1 has a limited motion since at a given moment the stop 47, which is rigidly secured to the side-piece 3 of the key, butts against the shaft 25. Upon depression the part 19 of the side-piece 33 has pressed downwards the part 21 of the locking device about the shaft 59 against the action of a spring 22; as soon as the part 19 has passed the edge of the part 21 this edge engages the recess 20 and thus maintains the key 1 in the depressed position.

The member 7 may be brought in its other position by screwing a stud bolt 17 in the turned-over part 16 of the side-piece 3 with the result that the shoulder 15 against which bears the head of the stud bolt 17 engages the part 16. Owing to this motion the spring 44 is stretched, the stop 9 leaves the path of the connecting rod 24 whilst the path of the hook 8 comes to lie in the path of the connecting rod 23. When the key 1 is depressed the bail for the wave-length switch is brought from the drawn position into the dotted position until the side-piece 27 engages the stop 51. With this motion of the key the bail 33 for the tuning mechanism is displaced in a similar manner as described with reference to Fig. 2 owing to the action of the adjusting screw 41. The distance over which the adjusting screw is screwed into the member 42 determines the length of the motion of the tuning bail 33.

It will be evident that in the above-described manner each key may be appropriated in the set for each station. To that end it is only necessary to determine the wave-range to which belongs the station concerned with the aid of the screw 17 and, by means of the screw 41, the displacement which the tuning condenser has to undergo. Furthermore, by removing the member 42, which may be effected in a simple manner by removing the rivets 48 and 49, the same key may be appropriated exclusively for adjusting the set to a determined wave-range. If, for some reason or other, it is desired or necessary that the key can only operate on the wave-range which corresponds to the left-hand position of the bail for the wave-length switch the part 7, which is rotatable with respect to the key, may be omitted; one of the side-pieces 2 or 3 acts in this case, by means of a part which is rigid with respect to these side-pieces, on the rod 24 of the bail for the wave-length switch. It may be

noted that for the sake of simplicity the keys of Fig. 1 are shown in the drawing slightly different from the keys of Figs. 2 and 3. For example, with the key 1 of Fig. 1 the adjusting mechanism for the wave-length switch is located above the adjusting mechanism for the wave-length, which is exactly the reverse in Figs. 2 and 3 although the principle is the same.

What we claim is:

1. In a radio tuning instrumentality, a fixed hollow shaft; a tuning shaft rotatably mounted within said fixed hollow shaft; a member rotatably mounted on said fixed hollow shaft and comprising a bushing surrounding said fixed hollow shaft, an arm integral with said bushing and extending in a plane normal to the axis of said shaft; a lever operable in a plane normal to said axis; a rocker mounted on said tuning shaft; an adjustable stop on said arm adapted to engage said rocker upon depression of said lever; and means for holding said rocker in contact with said stop when said lever is depressed, whereby said rocker is rotated to a predetermined angular position.

2. A radio tuning device according to claim 1 including a second arm integral with said bushing having an adjustable stop adapted to contact a second rocker mounted on a third shaft to actuate wave band switching mechanism when said lever is depressed.

3. A radio tuning device according to claim 1 including a releasable lock to hold said member in its depressed position.

4. In a radio tuning instrumentality, the combination of a fixed hollow shaft; a plurality of members rotatably mounted on said fixed hollow shaft, and comprising bushings surrounding said fixed hollow shaft, a plurality of arms, one for each bushing and integral therewith extending in a plane normal to the axis of said fixed hollow shaft and a plurality of levers, one for each of said bushings, extending in a plane normal to the axis of said fixed hollow shaft; a tuning shaft rotatably mounted within said fixed hollow shaft having a rocker mounted thereon; adjustable stops on each of said arms adapted to engage said rocker upon the depression of any one of said levers; and means for holding said rocker in contact with the corresponding adjustable stop when any one of said levers is in its depressed position, whereby said tuning shaft is rotated to a predetermined position.

5. A radio tuning device according to claim 4 including a releasable latch to hold one of said levers in its depressed position.

6. A radio tuning device according to claim 4 including a plurality of additional arms having adjustable stops, one for each of said bushings and integral therewith, adapted to contact a second rocker mounted on a third shaft whereby when one of said levers is depressed said third shaft is rotated to a predetermined angular position, and wave band switching mechanism fixed to said third shaft.

7. In a radio tuning instrumentality, a plurality of push button devices adapted to rotate about a given axis, said devices being mounted in a row along said axis, a tuning shaft concentric with said axis, a rocker on said tuning shaft, a plurality of arms, one for each of said push button devices and integral therewith, and adjustable stop means on said arms adapted to contact said rocker whereby said tuning shaft is rotated to a predetermined angular position by the operation of one of said push button devices.

8. In radio controlling apparatus in combination a rotatable shaft, a member rotatably mounted on said shaft, said member including an arm extending in a plane substantially normal to the axis of the shaft, a bail fixedly mounted on said shaft for rotating the shaft, an adjustable stop means mounted on said arm and positioned so as to engage and operate said bail upon rotation of said member, a second rotatable shaft and adjustable means mounted on said member independent of said stop means for rotating said second shaft to a predetermined position upon rotation of said member.

9. In a control device, a fixed hollow shaft, a control shaft rotatably mounted within said fixed hollow shaft, an operable member rotatably mounted on said fixed hollow shaft and operable between two angular positions, said member including an arm extending in a plane substantially normal to the axis of said shafts, a rocker bar mounted on said control shaft, an adjustable stop member on said arm adapted to engage said rocker bar upon operation of said member and effect the rotation of said rocker bar to a predetermined angular position, a second member rotatably mounted on said fixed hollow shaft, a second control shaft rotatably mounted a predetermined distance from said first named control shaft so that its axis is parallel with the axis of the first named control shaft, a hook member mounted on said second member and means mounted on said second control shaft cooperating with said hook member for rotating said second control shaft upon rotation of said second member.

10. The arrangement described in the next preceding claim characterized by that additional means is mounted on said second member cooperating with said rocker bar, said additional means including an adjustable stop adapted to engage said rocker bar upon rotation of said lever and means for holding said rocker bar in contact with said last named stop when said second lever is rotated whereby said rocker bar is rotated to a predetermined angular position.

11. In combination with an adjustable controlling element, a fixed hollow shaft, a control shaft rotatably mounted within said fixed hollow shaft, connections between said control shaft and said adjustable controlling element adjusting said controlling element in accordance with operations of said rotatable shaft, a member rotatably mounted on said hollow shaft and including an arm integral therewith and extending in a plane substantially normal to the axis of the control shaft, a lever adapted to be depressed from a released position and acting upon depression to rotate said arm about the axis of said control shaft, a bail mounted on said control shaft, a stop mounted on said arm adapted to engage said bail upon depression of said lever and thereby effect rotation of the control shaft, said stop being adjustable with respect to said bail whereby the amount of movement of the bail for a given movement of the lever may be adjustably predetermined.

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