June 9, 1959 F. BERLINGHOFF 2,890,450

RADIO RECEIVER ANTENNA SWITCHING DEVICE

Filed Dec. 11, 1953 2 Sheets-Sheet 1

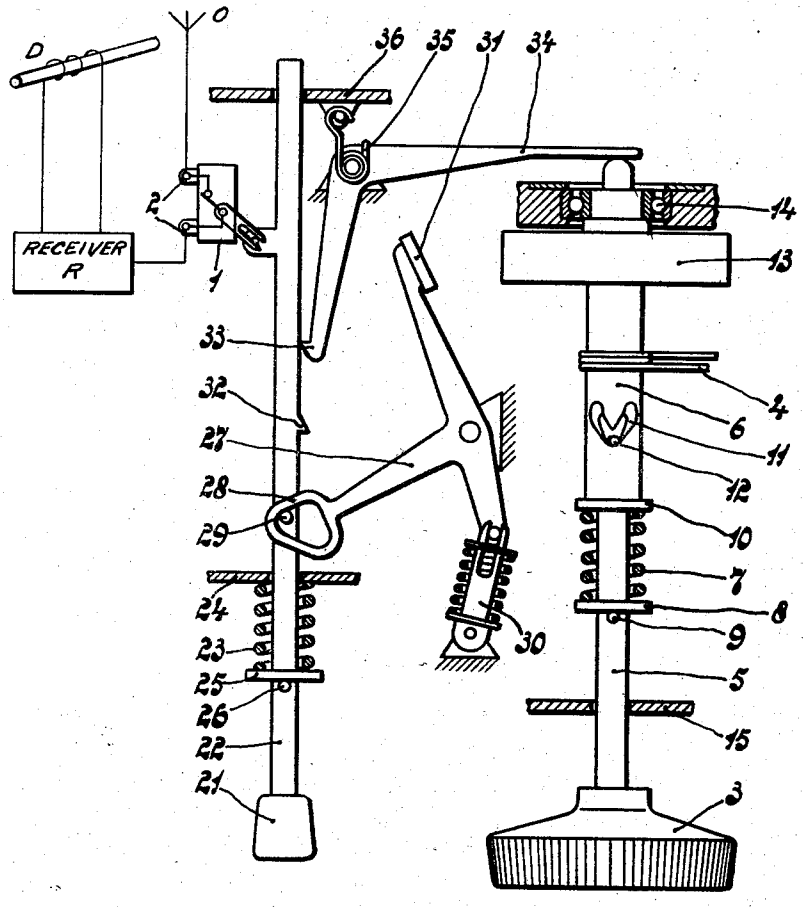

Fig. 1

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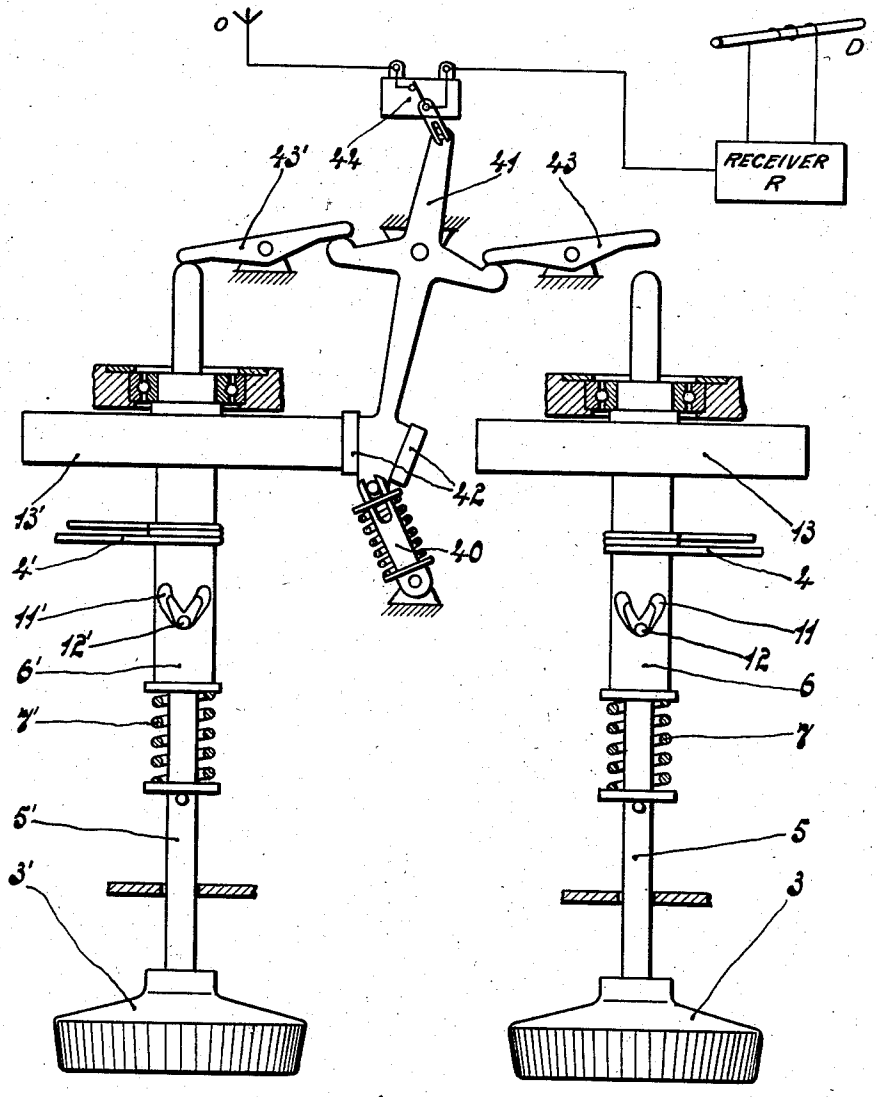

Fig. 2

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RADIO RECEIVER ANTENNA SWITCHING DEVICE

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6 Claims. (Cl. 343—100)

The present invention relates to a radio receiver antenna switching device. More particularly, the invention relates to a radio receiver of the type comprising a directional antenna and an omnidirectional antenna and to a switching device therefor.

It has proved advantageous to operate radio apparatus with a directional antenna, preferably in the form of a ferrite-rod antenna. This is due to the fact that particularly the frequencies of the medium wave-range are occupied by stations which, although they may be widely remote from one another geographically, nevertheless tend to interfere with each other especially in intermediate ranges in the evening hours. The use of a preferably rotary directional antenna often permits an interfering station to be strongly suppressed so that the desired station is better received.

When searching for a station with the directional antenna operated, it will often be impossible to receive stations in the direction of minimum reception of the antenna. A technically unskilled listener will not be able to trace a desired station or will be able to do so only with difficulty. This is annoying and may even give rise to complete dissatisfaction with the directional antenna and the receiving apparatus.

The disadvantages discussed are obviated and full use is made of the advantages accruing from a receiver with a directional antenna if, according to the invention, an omnidirectional antenna is operated for tracing a station on tuning (choice of station).

The omnidirectional antenna, may be for example, a supply line antenna, an auxiliary antenna incorporated in the receiver, an indoor antenna or an outdoor antenna. To operate the omnidirectional antenna it is not absolutely necessary to disconnect the directional antenna. With the omnidirectional antenna on it will often do to connect the directional antenna, for example capacitatively, to the grid of the input tube, the energy thus received from a station in the minimum direction of the directional antenna being sufficient to make it perceptible. Hence, it is not necessary to obtain an exactly omnidirectional receiving characteristic with additional operation of the omnidirectional antenna. That is, it is not necessary to receive equally well from all directions, it being sufficient to avoid a marked minimum.

When disconnecting the omnidirectional antenna a tuned directional antenna may remain operative as an input circuit and, for example, a tapping or an additional winding on the directional antenna, permits impedance matching of the omnidirectional antenna.

A rotary ferrite-rod antenna is usually incorporated in a radio receiver as a directional antenna. The advantages accruing from the invention are, however, also obtained with an apparatus which comprises a fixed directional antenna in its cabinet and consequently must be turned as a whole for direction finding, for example, in the case of portable receivers.

Changing over of the antenna is preferably effected automatically by operating a member for tuning and/or

adjusting the directional antenna, the tuning member preferably being stopped with operative directional antenna. The stopping may, for example, result from braking a flywheel or the like.

The force exerted in the stopped condition on the tuning member (tuning knob) on operating the latter may serve to change over to the omnidirectional antenna and to release. The release is preferably effected by axial displacement of the tuning member.

In order that the invention may be readily carried into effect, it will now be described with reference to the accompanying drawing, in which:

Fig. 1 is a schematic diagram of an embodiment of the antenna switching device of the present invention; and

Fig. 2 is a schematic diagram of another embodiment of the antenna switching device of the present invention.

Fig. 1 shows a device for a radio receiver with a directional antenna. According to the invention an omnidirectional antenna is connected automatically by operating the tuning knob, and a separate switch, for example a press-button, is used for changing over from omnidirectional to directional reception. The directional antenna connected to the tuning member is stopped by means of braking a flywheel or the like. Fig. 1 illustrates the condition in which the omnidirectional antenna (not shown) is connected via soldered joints 2 by means of a diagrammatically represented switch 1 and the tuning element, for example a rotary capacitor, is freely controllable by means of a knob 3 and a cord 4. A radio receiver R has a rotatable ferromagnetic rod directional antenna D and an omnidirectional antenna O which is connected automatically to the tuning mechanism of the receiver. The knob 3 is mounted on a solid shaft 5 which passes through a hollow shaft 6. A spring 7 engages at one end a ring 8 resting on a pin 9 fitted in the shaft 5, and at its other end the hollow shaft 6 via another ring 10. A stud 12 fitted secured to the shaft 5 is guided in a substantially V-shaped slot 11 and maintained at the point of the V by the force of spring 7 in the rest position and also during normal tuning. Besides the cord 4 the hollow shaft 6 carries a flywheel 13. By means of a ball-bearing 14 provided close to the flywheel said shaft is mounted to the cabinet so as to have the weight of the flywheel mainly supported by said ball bearing. At the end carrying the knob 3, the shaft 5 is guided in a hole of the front plate 15 or the like.

After adjustment to the desired station by means of the omnidirectional antenna, the directional antenna is connected for direct communication. To this end a press-button 21 is operated (Fig. 1) by pushing a rod 22 against the force of a spring 23 resting at one end on the plate 24 and at its other end on a ring 25 and a pin 26 secured to the rod 22. The toggle lever 27 is then carried along with the pin 29, secured to rod 22, by means of the eye 28, the spring-loaded tipping device 30 finally being tripped and the upper end of the lever 27, which end is furnished with a brake lining 31, engaging the flywheel 13. Due to the shape of the eye 28 the tilting of the lever 27 is abruptly effected independently of the degree or rate of pressing the button 21.

After the button 21 has been fully depressed, the lug 32 snaps under the projection 33 of the stopping lever 34 which is pivotally supported in its fulcrum where it is subjected to the action of a spiral spring 35. The antenna switch 1 is operated by pushing the rod 22. Said rod also passes through a chassis plate 36 or the like.

After the aforesaid operations are executed, the directional antenna is operative and the flywheel of the tuning member 5, 6 has been braked via the lever 27 with lining 31, thus incapacitating the tuning element, for example, a rotary capacitor, during any rotation of the directional antenna.

When a different station is chosen the tuning knob 3 is turned, as usual, in one or in the other direction. Since the hollow shaft 6 is stopped as a result of the braking of the wheel 13, the stud 12 moves into the V-shaped slot 11, thus axially displacing the rotating shaft 5 in the direction of its flywheel end. In this manner, the lever 34 is actuated and the rod 22 is released. The rod 22 moves downwardly and carries along the lever 27 by means of the pin 29, thus releasing the tuning member to permit free tuning. The rod 22 in its downward movement along with the press-button 21 also operates the switch 1 which, in turn, connects the omnidirectional antenna.

In the device described, axial displacement occurs automatically on operating the mechanical tuning member in the stopped condition, so that the antenna is changed over and the wheel 13 is no longer braked. The tipping device 30 causes the engagement and lifting of the brake lever 27, 31 to occur abruptly, thus avoiding in operativeness of tuning and ensuring reliable operation of the device.

Fig. 2 shows a device for a receiver comprising a directional antenna, in which on the one hand engagement of the omnidirectional antenna is effected automatically on operating the tuning member and on the other hand changing over to the directional reception is effected automatically on operating the member for rotating the directional antenna.

At the right in Fig. 2, similarly to Fig. 1, the mechanical control member 3, 5, 6 for a tuning element (for example, a rotary capacitor, not shown) is depicted whose rotation is transmitted by means of a cord 4. At the left a similar contact member 3', 5', 6' is shown, thus permitting a directional receiving antenna (not shown) to be turned by means of a cord 4'. Secured to the hollow shafts 6 and 6' are brake wheels 13 and 13', respectively, of which at least one may be a flywheel. By means of the spring-loaded tipping device 40 a brake lever 41 with brake lining 42 is urged against the wheel 13 or the wheel 13'. By means of the mechanism 7, 11, 12 and 7', 11', 12', respectively, described with reference to Fig. 1, for the axial displacement, the brake lever 41 is actuated via intermediate levers 43 and 43' to stop each time the inoperative adjusting devices 6, 4 and 6', 4', respectively.

In the condition shown in the drawing, the omnidirectional antenna is connected by a diagrammatically represented antenna switch 44, the directional antenna being connected in the opposite condition.

Instead of using the mechanical changing over device shown in the drawing it is alternatively possible to employ contact-controlled relays or other electromagnetic or electronic switching elements. This may be particularly advisable in transmission systems where, for example, the operating member (knob) and the directional antenna are spaced widely apart or heavy and bulky antenna systems must be rotated which while adopting the aforesaid principle, may not only be used for directional reception but also for directional transmission. In this instance, for example an omnidirectional signal may be transmitted by means of an omnidirectional antenna, the intelligence traffic proper then taking place via a directive connection to secure a higher degree of freedom.

While the invention has been described by means of specific examples and in specific embodiments, I do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. A switching device for selectively connecting an omnidirectional antenna to a radio receiver connected to a directional antenna and having tuning means for selecting a desired frequency, comprising means operated by said tuning means for automatically connecting said omnidirectional antenna to said radio receiver and means for disconnecting said omnidirectional antenna from said radio receiver.

2. A switching device for selectively connecting an omnidirectional antenna to a radio receiver connected to a directional antenna and having tuning means for selecting a desired frequency, comprising means operated by said tuning means for automatically connecting said omnidirectional antenna to said radio receiver, means for disconnecting said omnidirectional antenna from said radio receiver, and means operated by said disconnecting means for stopping said tuning means when said disconnecting means is operated to disconnect said omnidirectional antenna from said radio receiver.

3. A switching device for selectively connecting an omnidirectional antenna to a radio receiver connected to a directional antenna and having tuning means for selecting a desired frequency, said tuning means comprising a rotary member having a flywheel affixed thereto, comprising means operated by said tuning means for automatically connecting said omnidirectional antenna to said radio receiver, means for disconnecting said omnidirectional antenna from said radio receiver, and braking means adapted to coact with said flywheel and operated by said disconnecting means to contact the said flywheel when said disconnecting means is operated to disconnect said omnidirectional antenna from said radio receiver.

4. A switching device for selectively connecting an omnidirectional antenna to a radio receiver connected to a directional antenna and having tuning means for selecting a desired frequency, said tuning means comprising a rotary member, comprising means operated by said tuning means for automatically connecting said omnidirectional antenna to said radio receiver, means for disconnecting said omnidirectional antenna from said radio receiver, and means operated by said disconnecting means for stopping said tuning means when said disconnecting means is operated to disconnect said omnidirectional antenna from said radio receiver, said rotary member being mounted in cooperating relationship with said means for stopping said tuning means in a manner whereby a force applied to said rotary member in the stopped condition of said tuning means causes said stopping means to become inoperative and operates said means for connecting said omnidirectional antenna to said radio receiver.

5. A switching device for selectively connecting an omnidirectional antenna to a radio receiver connected to a directional antenna and having tuning means for selecting a desired frequency, comprising means operated by said tuning means for automatically connecting said omnidirectional antenna to said radio receiver and push-button switching means for disconnecting said omnidirectional antenna from said radio receiver.

6. A switching device for selectively connecting an omnidirectional antenna to a radio receiver connected to a directional antenna and having means for rotating said directional antenna and tuning means for selecting a desired frequency, comprising means operated by said tuning means for automatically connecting said omnidirectional antenna to said radio receiver and means operated by said directional antenna rotating means for automatically disconnecting said omnidirectional antenna from said radio receiver.

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