April 17, 1951 E. A. STROMMEN 2,549,259

RADIO TUNER FOR HEARING AID APPARATUS

Filed Jan. 10, 1948

FIG. 1.

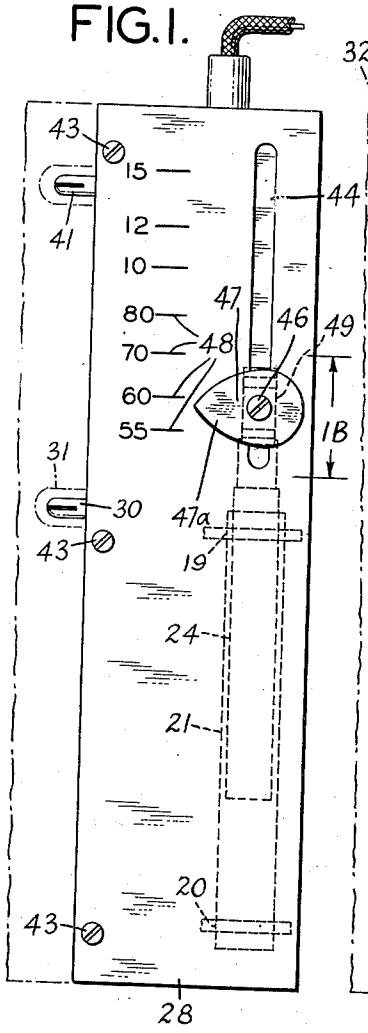



FIG. 2.

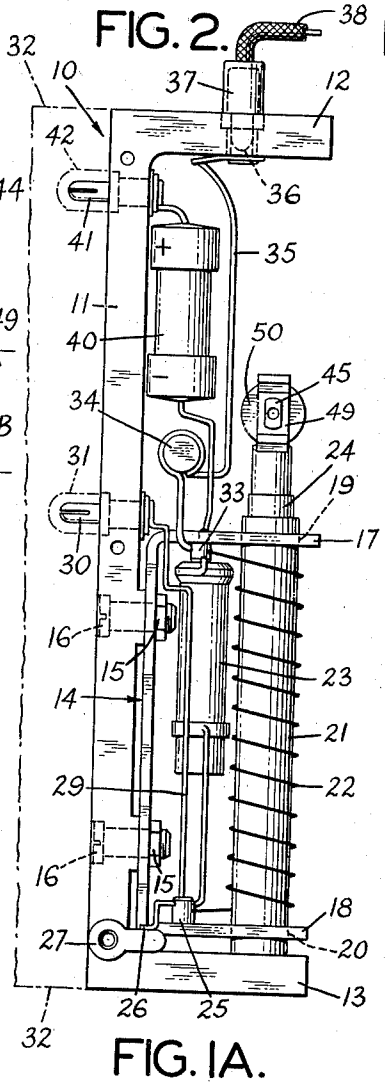



FIG. 3.

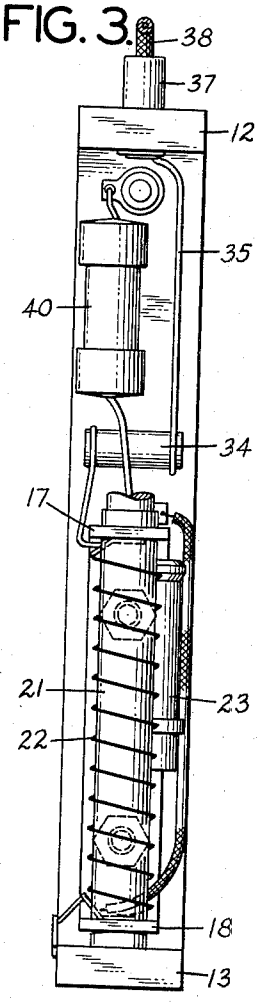



FIG. 1A.

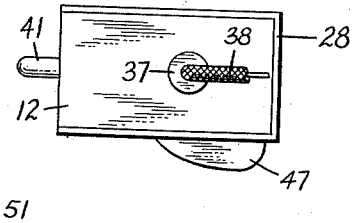



FIG. 1B.

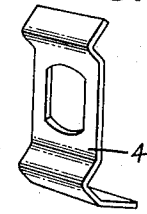



FIG. 4.




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## RADIO TUNER FOR HEARING AID APPARATUS

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4 Claims. (Cl. 250—40)

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The present invention relates to hearing aid apparatus and more particularly, to novel radio tuner apparatus for adapting a conventional hearing aid device to radio broadcast reception, although it is not limited to such use.

Heretofore, satisfactory radio broadcast reception has been difficult of accomplishment by the wearer of a hearing aid device. If broadcast reception is achieved through the hearing aid transmitter and amplifier from the audible output of a radio loudspeaker, the quality is liable to be poor, since the distortion in the overall system will be a function of the product of the distortion in the radio amplifier and the distortion in the hearing aid amplifier. On the other hand, if the hearing aid device is directly connected to the audio amplifier of the radio receiver, special connections must be made and the wearer of the hearing aid device cannot move about freely but must keep himself within the limits imposed by the conductors connecting his hearing aid device to the radio receiver.

The primary purpose of the present invention is to enable the wearer of a hearing aid device to avail himself of radio broadcast reception in a simple and highly effective manner without resorting to either of the expedients noted above. This is accomplished in accordance with the invention, by providing novel radio tuner apparatus for hearing aid devices which is adjustable over a predetermined range to enable the wearer of a hearing aid to select any one of a group of radio broadcast stations. The novel tuner apparatus is small and slightly in appearance, in conformity with the requirements of hearing aid apparatuses, and is adapted to be assembled detachably in operative relation to a conventional hearing aid with ease.

It will be understood that the invention enables the wearer of a hearing aid to enjoy the advantages of radio reception with much greater freedom than has been possible heretofore. By virtue of the novel tuner apparatus of the invention, the wearer can select any particular station of the group of stations receivable and can listen to a program without disturbing other persons in the room with him. Further, since the signals being received pass only through his hearing aid amplifier, the reception may be accomplished with relatively high quality.

Additional objects and advantages of the invention will be apparent from the following detailed description of a representative embodiment taken in conjunction with the accompanying drawings, in which:

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Fig. 1 is a view in front elevation of radio tuner apparatus constructed in accordance with the invention;

Fig. 1A is a top view of the apparatus shown in Fig. 1;

Fig. 1B is a view in perspective of a friction element used in the apparatus of Fig. 1;

Fig. 2 is a view in elevation of the radio tuner apparatus shown in Fig. 1 with the outer shield removed;

Fig. 3 is a side view of the apparatus shown in Fig. 2; and

Fig. 4 is a schematic diagram of a hearing aid circuit including the radio tuner apparatus of the invention.

Referring now to Figs. 2 and 3, typical radio tuner apparatus constructed according to the invention may comprise, for example, a frame 10 having an upright member 11 and top and bottom arms 12 and 13, respectively. Preferably, the frame 10 should be made of a low loss, nonconducting, nonmagnetic material such as a phenol formaldehyde resin, solid, filled or laminated, as desired. Secured to the upright member 11 in any suitable manner as by means of the nuts 15 and bolts 16, for example, is a substantially U-shaped bracket 14. The upper and lower arms 17 and 18 of the U member 14 may be provided with apertures 19 and 20 within which is carried a coil form 21. Preferably, the U-shaped brackets 14 and the coil form 21 should be made of a suitable dielectric material having low losses at radio frequencies such as Steatite, for example.

Wound on the coil form 21 is an inductance coil 22 which is connected in parallel with a condenser 23 supported on the bracket 14, as shown. The winding 22 and the condenser 23 form a tuned circuit, the resonance frequency of which can be adjusted over a predetermined range by means of a permeable rod member 24 which is slidably mounted within the coil form 21. The rod member 24 is preferably made of magnetic material and it should be designed in the conventional manner for minimum eddy current losses. By way of example, it may be formed by pressing powdered magnetic metal mixed with a suitable binder in a suitable mold.

The junction 25 of the winding 22 and the condenser 23 is preferably grounded to the casing of the apparatus by a conductor 26 which is electrically connected to a lug 27 maintained in engagement with a covering shield 28 which surrounds the frame 10 as shown in greater detail in Figs. 1 and 1A. The junction 25 is also con-

nected by a conductor 29 to a jack-plug 30 mounted in the upright member 11 of the frame 10 which may be adapted to be inserted in a registering jack 31 formed in the side of a conventional hearing aid 32.

The other junction 33 of the winding 22 and the condenser 23 is connected in series with a condenser 34 and a conductor 35 to a jack 36 mounted in the upper arm 12 of the frame 10. The jack 36 is adapted to receive a plug 37 connected to a conductor 38 which may form an antenna lead for the radio tuner apparatus. The junction 33 is also connected by a conductor 39 to a conventional diode rectifier 40, the other terminal of which is connected to a second jack-plug 41 mounted in the upright member 11 of the frame 10 above the jack-plug 31. The jack-plug 41 may be adapted to be received within a jack 42 formed in the hearing aid 32, as shown in Fig. 2.

As shown in greater detail in Figs. 1 and 1A, the radio tuner apparatus is enclosed within a covering shield 28 which may be secured to the frame 10 in any suitable manner as by the screws 43, for example. The front face of the covering shield 28 is provided with a longitudinal slot 44 through which extends a shaft 45 (Fig. 2) on a member 50 mounted on the permeable rod 24. Secured to the shaft 45 by means of a screw 46, for example, is an actuator member 47. The actuator member 47 may have a pointer 47a adapted to register with a plurality of markings 48 formed on the front face of the covering shield 28, corresponding to the band of frequencies to which the tuner is tunable.

Suitable means such as a Phosphor bronze spring 49 (Fig. 1B), for example, may be interposed between the inner face of the covering shield 28 and the member 50 on which the shaft 45 is mounted, to prevent the rod 24 from moving relatively to the winding 22 after it has been set to a particular position by manipulation of the actuator member 47.

When the radio tuner apparatus is assembled to a conventional hearing aid device 32 by insertion of the jack-plugs 30 and 41 in the jacks 31 and 42, respectively, the tuner output is fed to the hearing aid amplifier 51 which energizes the hearing aid receiver 52 (Fig. 4). In practice, insertion of the jack-plugs 30 and 41 in the jacks 31 and 42 may connect the tuner in shunt with the hearing aid transmitter (not shown) if desired.

In a typical radio tuner apparatus constructed according to the invention and responsive to the standard broadcast band (550–1500 kc. per second), the winding 22 may comprise, for example, several hundred turns of Number 36 wire having an inductance of approximately 65.5 $\mu$h. without the rod 24; and the condensers 23 and 40 may have values of 130 $\mu\mu$f. and 30 $\mu\mu$f., respectively. The diode rectifier 40 may be a No. IN34 Sylvania type. With these values in the circuit, the Q of the winding 22 will be approximately 75 at a resonant frequency of about 1600 kc. without the rod 24. By moving the pointer 47 downwardly from its uppermost position to insert the rod 24 into the coil form 21, the tuner can be tuned selectively to frequencies in the range from 1500 kc. per second to 550 kc. per second.

In an area where the signal strength of the local broadcast station is relatively strong, the antenna 38 may be a relatively short length of wire. At greater distances from broadcast stations, better results will be obtained if the lead 38 is connected to a standard broadcast antenna or to a conductor such as might be afforded by an electric light circuit or a telephone system, for example. In the latter case, the condenser 34 prevents any D. C. from getting into the resonant circuit formed by the condenser 23 and the winding 22.

From the foregoing, it will be understood that the invention enables the wearer of a hearing aid to enjoy the benefits of radio broadcast reception without having to listen to a standard radio receiver through his hearing aid device and without having to connect his hearing aid amplifier directly to such a receiver. By virtue of the novel radio tuner apparatus described above, the wearer of a hearing aid device can select the particular station to which he wishes to listen without disturbing other persons in the same room. Further, the radio tuner apparatus is easily attachable to a conventional hearing aid and is small and sightly in appearance.

While a specific form of radio tuner apparatus has been described above, the invention is obviously not limited thereto. Both the values of the components and the arrangement thereof can be modified as is well known to those skilled in the art. Also, the novel radio tuner of the invention is not limited to use with hearing aid devices but can be readily adapted for use with any conventional audio amplifier system. The representative embodiment chosen for purposes of illustration is not intended to be restrictive in any way but is susceptible of numerous changes in form and detail within the scope of the appended claims.

I claim:

1. Radio tuner apparatus comprising an insulating support having an upright member and top and bottom side members extending substantially perpendicularly thereto, a tuned circuit including a capacitance and an inductance in parallel carried by said support between said top and bottom side members, and a substantially U-shaped shield having parallel portions secured at opposite sides of said support to form front and rear sides of said apparatus and having another portion forming one other side of said apparatus, said upright and top and bottom side members forming top and bottom sides and another side of said apparatus.

2. Radio tuner apparatus comprising an insulating support having an upright member and top and bottom side members extending substantially perpendicularly thereto, a tuned circuit including a capacitance and an inductance in parallel carried by said support between said top and bottom side members, a magnetic core for said inductance, a substantially U-shaped shield having parallel portions secured on opposite sides of said support to form front and rear sides of said apparatus and having another portion forming another side of said apparatus, said upright and top and bottom side members forming top and bottom sides and another side of said apparatus, means forming a slot in said shield, and actuator means carried by the core and having a portion extending through said slot.

3. Radio tuner apparatus comprising an insulating support having an upright member and top and bottom side members extending substantially perpendicularly thereto, a tuned circuit including a capacitance and an inductance in parallel carried by said support between said top and bottom side members, a magnetic core for said inductance, a substantially U-shaped shield

having parallel portions secured on opposite sides of said support to form front and rear sides of said apparatus and having another portion forming another side of said apparatus, said upright and top and bottom side members forming top and bottom sides and another side of said apparatus, means forming a slot in the front side of said shield, core actuator means disposed externally of said shield and having indexing means thereon, means forming markings on said shield adapted to cooperate with said indexing means to indicate generally the frequency to which said tuned circuit is tuned, means extending through said slot and connecting said core actuator means to said core, and resilient means interposed between said core and the interior of said shield for rendering said core relatively difficultly movable.

4. Radio tuner apparatus comprising an insulating support having an upright member and top and bottom side members extending substantially perpendicularly thereto, a pair of electrical connectors mounted in said upright member, an electrical connector mounted in said top side member, a tuned circuit including a capacitance and an inductance carried by said support between said top and bottom side members, unilaterally conductive means connected to one terminal of said tuned circuit and to one of the electrical connectors in said upright member, a second capacitance connected to said one terminal of the tuned circuit and to said electrical connector in the top side member of the support, an electrical connection between the other terminal of said tuned circuit and another electrical connector in said upright support member, a substantially U-shaped shield having parallel portions secured on opposite sides of the support to form front and rear sides of the apparatus and having another portion forming another side of the apparatus, said upright and top and bottom side members forming top and bottom sides and another side of said apparatus an electrical connection between the shield and said another terminal of the tuned circuit, means forming a guide slot in the front side of said shield, a member carried by said core and slidable in said guide slot, core actuator means disposed externally of said shield and secured to said last named member, indexing means on said core actuator means, means forming markings on the shield in the vicinity of said slot adapted to cooperate with said indexing means to indicate generally the frequency to which the tuned circuit is tuned, and resilient means between said member on the core and the adjacent portion of the shield for rendering said core relatively difficultly movable.



EINAR A. STROMMEN.


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