Jan. 31, 1933. W. H. GRIMDITCH 1,895,989

NONMICROPHONIC RADIO APPARATUS

Filed June 26, 1931

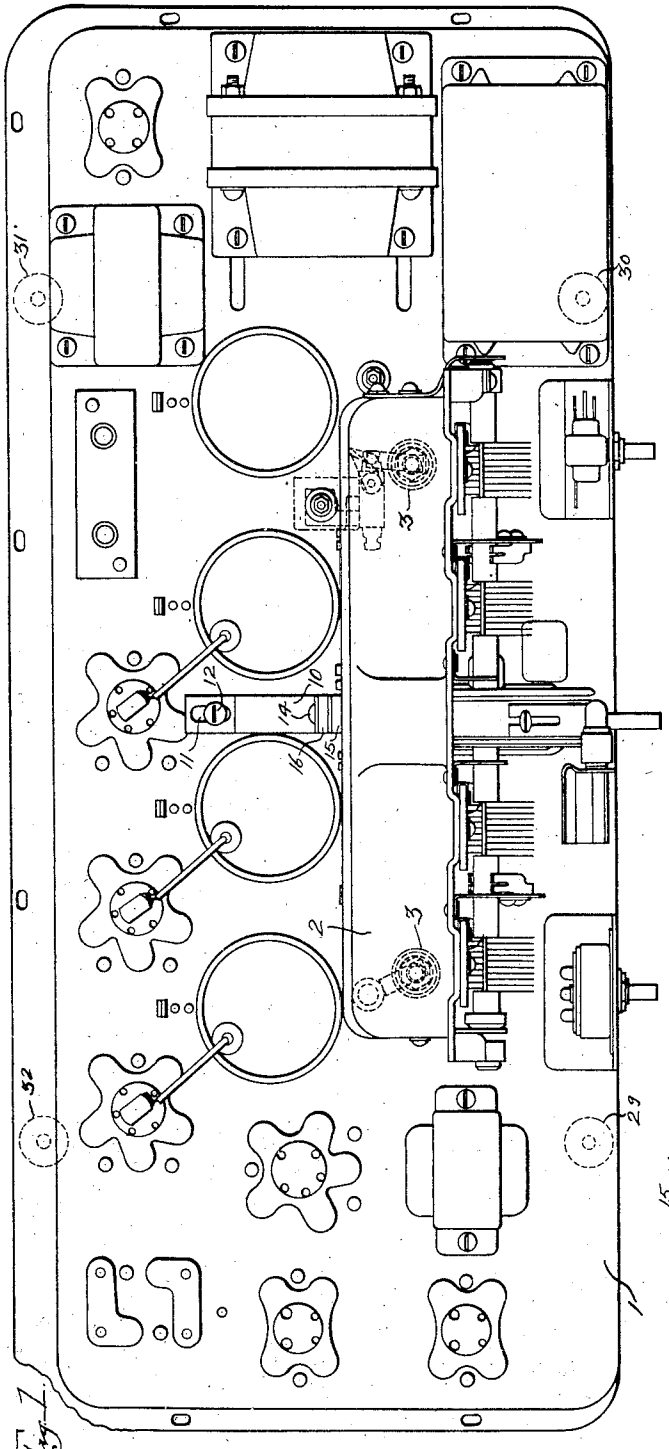


Fig. 1.

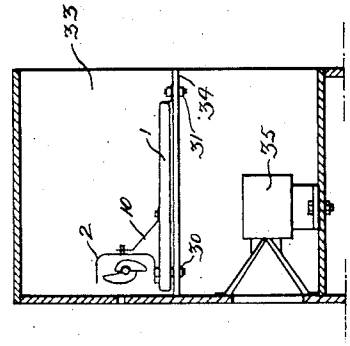


Fig. 4.

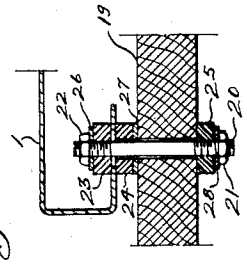


Fig. 3.

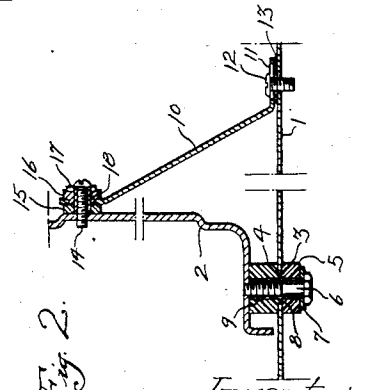


Fig. 2.

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1,895,989

UNITED STATES PATENT OFFICE

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NONMICROPHONIC RADIO APPARATUS

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This invention relates to improvements in means for mounting a device in a manner to effectively isolate it from extraneous vibrations. The invention has particular reference and applicability to the mounting of a radio set base or chassis and certain elements carried thereby, such as the tuner assembly.

It is commonly understood that the various elements of a radio receiver are more or less sensitive to mechanical vibrations, and in response thereto such elements cause the reproduction of undesirable audible notes or sounds. For example, if a vacuum tube is struck a light blow during operation of the receiver an audible ringing sound will be heard. I have discovered that the tuning elements are especially susceptible to vibrations. When the receiver is tuned to a particular carrier, any undesired vibrations imparted to the tuning elements will cause a variation in capacity thereof at an audible rate. This, of course, results in a similar variation of the frequency to which the tuned circuits are resonant and as a consequence low frequency amplitude modulation of the incoming carrier occurs. In other words the carrier is modulated at the same audible rate as the original undesired vibrations. This same action occurs when the electrical value of other elements of the tuned circuits is varied by vibration. It is important to note however that it only occurs when a carrier is present and it is most noticeable on a strong carrier.

I have discovered that mechanical vibrations of the supporting structure of a radio receiver are often times transmitted to and picked up by the tuning condenser plates, which act as microphones and cause the above-described carrier modulation to translate such undesired vibrations into low frequency modulations of radio frequency currents. These modulations are amplified by the successive amplifiers of the receiver and find their way in amplified form to the reproducer or loud speaker, which reproduces or translates them into undesired sounds. In the modern receiver employing a cabinet for housing the radio set and an electrodynamic speaker, for instance, the powerful vibrations of the speaker cone may impart vibrations to the cabinet panels, and unless precautionary measures are taken to prevent it, such vibrations will be conducted to the condenser plates and create undesirable sounds in the manner indicated above.

The purpose of the present invention is to provide means for mounting the tuning assembly of a radio receiver which will insure isolation of the tuning condenser plates from such extraneous vibrations as may be conducted by the supporting structure or cabinet. In accordance with the invention, a resilient supporting arrangement is used to mount the condenser housing or shell on the radio set base. This supporting arrangement may comprise a pair of resilient supporting devices disposed near each end of the condenser shell, and a centrally disposed bracing member attached to the set base and resiliently engaging the rear wall of the shell. The invention also contemplates the resilient mounting of the entire radio receiving set with respect to the horizontal supporting panel or shelf, and to this end, a plurality of resilient supporting devices are used to attach the set base to the panel or shelf. Such a mounting effectively isolates the entire radio set from vibrations conducted by the supporting structure or cabinet, and further assures that a minimum of such vibrations will reach the condenser plates and other microphonic elements of the set to be picked up thereby.

The above-stated purposes and objects of the invention as well as the manner by which it may be carried out in practical form, will be clearly understood from the following detailed description, together with the accompanying drawing, in which:

Fig. 1 is a plan view of a radio receiver assembly, with the cover removed, to which the features of my invention have been applied;

Fig. 2 is a sectional view showing in detail the novel resilient supporting means for the condenser assembly;

Fig. 3 is a sectional view showing in detail one of the supporting devices for the radio set base; and

Fig. 4 is a schematic elevational view of a

modern radio receiver which will greatly facilitate a clearer understanding of the manner in which the invention functions to eliminate the undesired vibrations.

Referring to Fig. 1 of the drawing, there is shown in plan a radio receiving set having its various elements mounted upon a set base 1. Such mounting of the elements on a common base is conventional and is employed by practically all set manufacturers. The base is usually made of rigid metallic material. The variable tuning condensers of the set are partially enclosed within a shell 2, which serves as a shield for these elements and also functions to support them upon the set base. Since the present invention is concerned only with elimination of the above-referred to objectionable microphonic action of the condenser plates in picking up extraneous vibrations, the remaining elements shown in Fig. 1 are merely incidental and require no description. Furthermore, such other elements are intended to be conventional elements provided and mounted in the customary manner.

In accordance with the present invention, I propose to mount the condenser shell 2 upon the set base in a resilient manner to prevent transmission of vibrations through the set base to the shell. I also propose to mount the set base upon its supporting shelf in a resilient manner to effectively isolate the entire receiving set from undesired vibrations. Fig. 2 shows in detail the novel mounting of the condenser shell embodying the main principle of the invention. Adjacent each end of shell 2, I provide a resilient seat or support designated generally by reference character 3. As will be seen from Fig. 2, such supporting device is resiliently attached to the set base and functions to maintain the condenser shell in the proper position relative thereto. The supporting device may comprise a pair of resilient spacers 4 and 5, which may be composed of rubber or any other suitable vibration-absorbing material. These spacers may be disposed on opposite sides of the set base 1, and are centrally perforated to receive a threaded bolt 6. The bolt passes through the spacers and an opening in the set base, and threadedly engages an opening in the underside of the condenser shell. A metal washer 7 may be interposed between the lower spacer 3 and the head of bolt 6.

In order to assure that there will be no lateral contact of the supporting structure against the set base, I prefer to make the opening in the set base considerably larger than the diameter of the fastening bolt. The lower end of spacer 4 may then be provided with a reduced extension 8 which is adapted to seat firmly within the opening in the set base, as shown clearly in Fig. 2. I also prefer to use a hard sleeve 9 which may be formed of fibre or like material. This sleeve surrounds the shank of the bolt, and its ends engage the lower surface of shell 2 and the upper surface of washer 7 respectively. The purpose of this sleeve is to insure that the resilient characteristics of spacers 3 and 4 will be maintained at all times. For example, in assembling the device, in the absence of sleeve 9, the fastening bolt might be tightened excessively, thereby compressing spacers 3 and 4 and destroying their desired resilient characteristic. By employing the sleeve, however, it will be obvious that the amount which the fastening bolt may be turned is limited and undue compression of the spacer members is prevented.

In conjunction with the spaced supporting devices near each end of the condenser shell, I provide a centrally disposed brace 10 having its lower end attached to the set base and its upper end attached resiliently to the rear wall of the condenser shell. This brace may take the form of a strip of metal bent in the manner shown clearly in Fig. 2. The lower end of the brace member may be provided with an elongated slot 11 through which a screw 12 is adapted to be inserted. The screw may threadedly engage an opening in base 1 to securely attach the end of the brace member to the base. A metallic washer 13 may, if desired, be interposed between the end of the brace and the set base. It will be apparent that the elongated slot affords adjustable movement of the end of the brace member with respect to the set base.

The other end of the brace member is also apertured for the reception of screw 14, which threadedly engages an opening in the rear wall of shell 2. The connecting elements, which resiliently connect brace 10 to the rear wall of the shell, may be similar to those of the supporting seats previously described. In this case also, a pair of resilient spacers 15 and 16 are provided and may be composed of material similar to that of spacers 4 and 5. The opening in the brace member may also be enlarged and adapted to receive a reduced extending portion of spacer 16 for the purpose set forth above. A metallic washer 17 may be interposed between spacer 16 and the head of the screw, and a fibre sleeve 18 or the like may be used for the same purpose as described above in connection with sleeve 9. It will be apparent that a resilient connection between the wall of housing 2 and brace 10 is at all times maintained, and that any vibrations conducted by the brace member will be largely absorbed by the resilient spacers and will only be transmitted to the condenser shell to a negligible degree.

To further assure that undesired vibrations will not reach the condenser plates, and also to prevent transmission of such vibrations to any other elements of the receiving set which might also act in a manner similar to the

condenser plates, I provide a plurality of supporting devices for the set base with respect to the supporting panel or shelf. Such a device is shown in detail in Fig. 3, wherein the horizontal supporting panel or shelf 19 is apertured to receive a bolt shank 20 which extends therethrough. I prefer to have this shank threaded at each end and provided with separate nuts 21 and 22 so that adjustment at each end of the shank is provided. The set base may have its edges bent downwardly and inwardly, as shown in Fig. 3, to provide a rigid supporting structure. The inwardly-bent portion is apertured at the desired locations to receive shank 20. A pair of resilient spacers 23 and 24 are likewise apertured to receive shank 20, and are disposed on opposite sides of the inwardly-extending portion of base 1. Spacer 24 serves to mechanically insulate base 1 directly from the supporting panel 19 with respect to any undesired vibrations that might be conducted by the panel. A third resilient spacer 25 may be disposed on the underside of the supporting panel. Metallic washers 26, 27 and 28 may be used in the positions shown. It will be apparent that by means of this structure, a resilient seat is given the set base at each of the points where such a supporting device is provided. The resilient spacers will effectively insulate the set base from the supporting panel to substantially reduce any undesired vibrations which might otherwise be transmitted to the elements of the set. Countersunk openings may be provided in shelf 19 to reduce the space required by the shanks 20 and their associated resilient assemblies. While any desired number of supporting devices of the type described may be used to resiliently attach the set base to the supporting panel, I have shown four such devices in the positions clearly indicated in Fig. 1 and designated respectively by reference characters 29, 30, 31 and 32.

To more clearly illustrate the undesired action in the modern radio receiver, which the present invention is designed to eliminate, I have shown in Fig. 4, a schematic illustration of a modern receiver of the cabinet type. In such receivers, it is common practice to provide a cabinet 33 having a horizontal supporting shelf 34 disposed about midway of the vertical height. The upper compartment houses the radio receiving set such as that of Fig. 1, while the lower compartment houses the electrodynamic speaker 35. The speaker has its vibrating cone adjacent to the front wall of the cabinet which is used as a sound baffle, as indicated in the figure. Vibrations will necessarily be set up in the cabinet structure, particularly in such instruments which use a powerful electrodynamic speaker. It is, therefore, readily apparent that such vibrations may be transmitted through the walls of the cabinet and the supporting shelf 34 to the radio receiving set, and that the undesired microphonic action of the condenser plates previously referred to may take place due to the vibration of the base 1 and the condenser shell 2. It is thus apparent that the provision of the features contemplated by my invention will eliminate this undesired action, and will prevent reproduction of sounds caused by the extraneous vibrations.

It is important to note that the present invention is extremely useful in the modern radio receiver which has high amplification and selectivity characteristics. The previously discussed carrier wave modulation by variation of the frequency to which the receiver is tuned will obviously be more noticeable and undesirable with increased amplification. High amplification renders the precautions of the present invention imperative. The present day highly selective receiver is also more susceptible to the undesirable action, since it is quite apparent that high selectivity will render it more noticeable.

While I have disclosed herein specific structural details of the features of my invention, it will be apparent that various changes in such details may be made without departing from the spirit and scope of the invention. Obviously, the number of supporting devices used in any particular instance may be varied, and the devices may even be used to support elements other than the condenser assembly or housing if necessary. It is, therefore, to be understood that only such limitations as are imposed by the appended claims are to be placed upon the invention.

I claim:

1. Non-microphonic radio apparatus, comprising a radio receiver device, a tuning element for said receiver device, a sound reproducer for said receiver device, common supporting means for the aforesaid elements, and means for resiliently mounting said tuning element with respect to said receiver device and said reproducer, whereby said tuning element is substantially isolated from extraneous vibrations including those caused by said reproducer.

2. Non-microphonic radio apparatus, comprising a radio receiver having a tuned circuit including a tuning condenser, a sound reproducer for said receiver, common supporting means for the aforesaid elements, and means for resiliently mounting said tuning condenser with respect to the rest of said receiver and said reproducer, whereby said tuning condenser is substantially isolated from extraneous vibrations including those caused by said reproducer.

3. Non-microphonic radio apparatus, comprising a radio receiver device, a tuning element for said receiver device, a sound reproducer for said receiver device, common supporting means for the aforesaid elements,

and means for resiliently mounting said receiver device, said tuning elements, and said reproducer with respect to each other, whereby said tuning element is substantially isolated from extraneous vibrations including those caused by said reproducer.

4. Means for non-microphonically mounting a radio tuning element assembly, comprising three resilient members for supporting said assembly.

5. Means for non-microphonically mounting a radio tuning element assembly, comprising a pair of resilient supporting members disposed adjacent the ends of said assembly, and a centrally disposed brace resiliently engaging a side of said assembly.

6. Means for non-microphonically mounting a radio tuning element assembly on a supporting base, comprising a pair of spaced resilient supporting devices attaching said assembly to said base, a centrally disposed brace having its lower end attached to said base, and means for resiliently attaching the upper end of said brace to said assembly.

7. In a radio receiver comprising a horizontal panel for supporting a radio set base, means for non-microphonically mounting a tuning element assembly, comprising resilient supporting means for attaching said base to said panel, resilient supporting means for attaching said assembly to said base, and means for resiliently bracing a side of said assembly with respect to said base.

8. In a radio receiver comprising a horizontal panel for supporting a radio set base, means for non-microphonically mounting a tuning element assembly, comprising a plurality of spaced resilient supporting members for attaching said base to said panel, a pair of spaced resilient supporting members for attaching said assembly to said base, and a brace attached to said base and resiliently engaging a side of said assembly.

9. In a radio receiver comprising a cabinet adapted to house a radio set and having a horizontal shelf for supporting the set base, means for non-microphonically mounting a tuning element assembly, comprising resilient supporting means for attaching said base to said shelf, resilient supporting means for attaching said assembly to said base, and means for resiliently bracing a side of said assembly with respect to said base.

10. In a radio receiver comprising a cabinet adapted to house a radio set and having a horizontal shelf for supporting the set base, means for non-microphonically mounting a tuning element assembly, comprising a plurality of spaced resilient supporting members for attaching said base to said shelf, a pair of spaced resilient supporting members for attaching said assembly to said base, and a brace attached to said base and resiliently engaging a side of said assembly.

11. In the assembly and mounting of radio receiving apparatus on common supporting means, the step of avoiding microhphonic tendency in a radio receiver which consists in resiliently isolating the tuning element of the receiver, the rest of the receiver, and the sound reproducer from each other.

12. In the assembly and mounting of radio receiving apparatus on common supporting means, the method of avoiding microphonic tendency in a radio receiver which consists in mounting the tuner of the receiver resiliently with respect to the rest of the receiver and the sound reproducer.

13. Non-microphonic radio apparatus, comprising a radio receiver device, a tuning element for said receiver device, a sound reproducer for said receiver device, common supporting means for the aforesaid elements, and vibration insulating means for isolating said tuning element from the rest of the aforesaid elements.

14. Non-microphonic radio apparatus, comprising a radio receiver device, a tuning element for said receiver device, a sound reproducer for said receiver device, common supporting means for the aforesaid elements, and vibration insulating means for isolating said receiver device, said tuning element, and said reproducer from each other.

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