VIBRATO PRODUCING LOUD SPEAKER

Fig. 1

Fig. 2

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Fig. 3

Fig. 4

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This invention relates generally to loud speakers and more particularly to an improved loud speaker mounting for imposing a vibrato effect upon the reproduced sound.

Tone qualities may be substantially improved and rendered more pleasing by imposing a vibrato effect upon the sound, and for this reason many means have been devised for producing the vibrato effect. It may be produced mechanically by reproducing the sound in a loud speaker, and rotating the speaker or directing the sound from it into a rotating horn. Such an arrangement imposes the vibrato effect upon the sound to render it much more pleasing to the senses. However, for maximum tone quality, it has been found necessary to transmit the sound to two speakers, one a high frequency speaker and the other a low frequency speaker, and rotate both of the speakers or direct the sound emanating therefrom into suitable rotating horns. This requires a cumbersome and expensive apparatus.

It is therefore a general object of the present invention to provide an improved loud speaker mounting for producing a vibrato effect upon the sound being reproduced.

Another object of the present invention is to provide an improved loud speaker mounting for producing a vibrato effect of maximum quality on the sound being reproduced while utilizing only one loud speaker.

Another object is to provide a loud speaker system which improves the tone quality of the sound being reproduced.

Another object is to provide a rotating loud speaker mounted in a resonator to improve the tone quality of the sound being reproduced.

Another object is to provide a rotating loud speaker system in which the sound being reproduced is distributed evenly over a wide area.

A further object is to provide an improved loud speaker mounting for producing a vibrato effect upon sound which is efficient in operation but of sturdy and simple construction.

According to the present invention, the improved loud speaker comprises a cabinet having two bearings fixed therein for rotatably supporting a vertical shaft. The shaft in turn carried two oppositely disposed loud speakers, only one of which is operated at any one time for reproducing sound, the other serving as a spare speaker as well as to balance the shaft for smooth rotation. The shaft is rotated by an electric motor while the loud speaker is reproducing sound to produce a vibrato effect upon the sound. The speaker is connected to a standard amplifier through the bearings which are electrically conductive for transmitting the current to the shaft which is connected to the speaker coil to operate in the manner of a slip ring connection. The resonant mounting of the speaker includes a metal cowl completely surrounding the speaker, with a flanged disk supported concentrically with the cowl to the rear of the speaker and spaced slight-
lower bearing 13. However, in this instance, the shaft 14 is not in direct engagement with the recess 32, but is provided with an adapter 33 having a tapered end 34 opposite the recess 32 for engagement there with to rotateably support the upper end of the shaft 14. The adapter 33 is rigidly secured to the upper end of the shaft 14 to rotate with it, the end of the shaft being disposed within a bore 35 formed axially in the end of the adapter 33 opposite the tapered end 34. However, the shaft 14 is electrically insulated from the adapter 33 containing material 56 through the bore 35 for reasons to be subsequently described.

The spring 27 functions to yoldably urge the plug 28 into engagement with the adapter 33 to firmly support the shaft 14 against lateral displacement but leaves it free to rotate. To remove the shaft 14 from its supporting bearings 12 and 13, it is only necessary to raise it against the pressure of the spring 27 to disengage the tapered end 19 from the recess 18 and displace the shaft laterally to free it from the bearings and permit its removal. On the other hand, to replace it, it is only necessary to engage the tapered end 54 of the adapter 33 with the recess 32 and force the plug 28 upwardly against the pressure of the spring 27 to permit the tapered end 19 to be moved into engagement with the conical recess 18. The shaft 14 may then be released and the downward pressure of the spring 27 will serve to securely retain the shaft 14 and its adapter 32 within the recesses 18 and 32 respectively.

Two cone type loud speakers 40 are rigidly secured to the shaft 14 in opposed relationship to rotate with it for producing the vibrato effect, the speakers being disposed within a resonator mounting for enhancing the quality of the tone, and generally identified in the drawings by the reference numeral 41. The two speakers 40 and their resonant mounting 41 are identical in construction and therefore only one of them will be referred to, which will serve to describe both of them. In Figure 3 one of the speaker assemblies is shown in side elevation and a sectional view of the other is shown to illustrate the details of construction.

As shown, the speaker 40 is disposed within the resonator mounting 41 comprising a conical flange 42 of cylindrical shape for enclosing and supporting the speaker 40. The forward end of the conical flange 42 is bent inwardly to form an inwardly extending flange 43 to which a peripheral flange 44 of the conical of the speaker 40 is secured for rigidly supporting the speaker within the conical flange 42.

The rear end of the conical flange 42 is bent outwardly to form an outwardly extending flange 48 through which the conical flange 42 is attached to a disc 49 in spaced relationship by means of rivets 50 passing through spacers 51. The spacers 51 serve to position the disc 49, a slight distance from the rear opening of the conical flange 42. The disc 49 is shaped to form a flange 52 extending forwardly over the conical flange 42 a slight distance from the periphery of the flange 48 to provide an annular space 53 for the passage of sound reflected from the disc 49. Thus, the conical flange 42 and the disc 49 combine in the particular disclosed arrangement to form the resonator 41 for enhancing the quality of the sound, which is emitted from the forward opening of the conical flange 42 as well as from its rearward opening through the annular space 53.

The two speaker assemblies are supported on the shaft 14 by a pair of brackets 56, each comprising a sleeve 57 fixed to the shaft 14 by a set screw 58. A channel member 59 is secured to the sleeve 57 and its extending legs 60 are each attached to one of the discs 49 to thereby support the two speaker assemblies on the shaft 14 in opposed relationship to rotate with the shaft.

Although two speaker assemblies are illustrated in the drawings, they are utilized individually, the other serving as a spare speaker conveniently available for immediate use in the event of a failure of the other. In addition, it serves to balance the shaft for smooth and even rotation, eliminating the necessity of ballast to balance the rotating weight of the other speaker.

The speaker 40 is energized by a standard amplifier indicated diagrammatically in Figure 3 and identified by the reference numeral 64. The sound is received by the amplifier 64 from its source through a standard microphone (not shown) and transmitted to the speaker 40 by a pair of conductors 65 and 66. The conductor 65 is connected to the upper bearing 12 while the conductor 66 is connected to the lower bearing 13.

Since the bearing 12 is electrically conductive and has metal to metal contact with the adapter 33, the electric current travels from the bearing 12 to the adapter 33. A conductor 67 is connected to the adapter 33 and carries the current to a plug 68, the current being prevented from entering the shaft 14 from the adapter 33 by reason of the electrical insulation 36 separating the adapter from the shaft.

As previously stated, each of the two speaker assemblies are identical in construction, and therefore both are provided with a jack 72 adapted to receive the plug 68 and as a current source to the amplifier 64. However, since only one plug 68 is provided, only one speaker at a time can be connected, and either one may be selected with a minimum of effort, simply by transferring the plug 68 from one of the jacks 72 to the other.

From the jack 72 the current is carried to the speaker 40 by a conductor 73. The path of the current then continues from the speaker 40 through a conductor 74 to the shaft 14 which is separated from the other part of the circuit by the insulation 36 as previously described. Here again, by reason of the metal to metal contact 12 and 13, the current passes from the shaft 14 to the bearing 13, and thence is carried back to the amplifier 64 by the conductor 66 to complete the circuit. Thus, the specific bearing arrangement shown is particularly adaptable for the present application in that the bearings 12 and 13 efficiently support the shaft 14 and its associated speakers for rotational movement, and also serve to carry the energizing current to the rotating speakers.

In order to impose the pleasant vibrato effect on the sound emanating from the speakers 40 it is necessary to rotate the speakers while the sound is being reproduced as previously stated. Power for rotating the shaft 14 with its speakers 40 and their resonant mounting 41 is obtained from an electric motor 77. A vibration absorbing mounting 78 is provided for supporting the motor 77 on the floor of the cabinet 15 to eliminate any adverse effects on the speakers 40 from any vibration which may be created by the motor 77 when energized.

A pulley 79 is keyed to the drive shaft of the motor 77 and a similar pulley 80 is fixed to the shaft 14. The power from the motor 77 is transmitted to the shaft 14 by a V-belt 81 interconnecting the two pulleys 79 and 80. Thus, rotation of the speakers 40 is effected by energization of the motor 77 to produce the pleasant vibrato effect on the sound reproduced by the speakers 40, which is further enhanced by the resonator mounting 41.

From the foregoing description of the construction and operation of a practical embodiment of the improved vibrato producing loud speaker provided by the present invention, it will be apparent that the apparatus is especially adapted to improve the tone quality of sound reproduced by the energized speaker by reason of the combined effect of the rotational movement of the speaker with the resonator mounting in which the speaker is supported.

Although the illustrative embodiment of the invention
has been described in considerable detail for the purpose of setting forth an operative and practical exemplifying structure, it is to be understood that the structure shown and described is intended to be illustrative only, and that various characteristics of the invention may be incorporated in other structural forms without departing from the scope of the invention as defined in the subjoined claims.

The principles of the invention having now been fully explained in connection with the foregoing description of embodying structure, I hereby claim as my invention:

1. In an apparatus for enhancing the tone quality of reproduced sound, a cabinet, a shaft rotatably mounted in said cabinet, a pair of resonator mountings supported on said shaft in opposed relationship to rotate with it, a speaker supported within each of said resonator mountings so that the tone of the sound emanating from said speakers is enhanced by the sympathetic vibration of said resonator mountings, and an amplifier connectible to either one of said speakers selectively for individual energization, whereby the tone quality of the sound reproduced by either one of the speakers while they are rotating is enhanced by reason of the combined effect of the rotational movement of the speaker and the resonator mounting in which the speaker is supported.

2. In an apparatus for enhancing the tone quality of reproduced sound, a cabinet, a shaft rotatably mounted in said cabinet, a resonator mounting supported on said shaft to rotate with it, a speaker supported within said resonator mounting so that the tone of the sound emanating from said speaker is enhanced by the sympathetic vibration of said resonator mounting, and an amplifier connected to said speaker to energize it, whereby the tone quality of the sound reproduced by the speaker while it is rotated through a circle by revolving said shaft is enhanced by reason of the combined effect of the rotational movement of said speaker with the resonator mounting in which the speaker is supported.

3. In an apparatus for imposing a vibrato effect upon reproduced sound, a cabinet, an electrically conductive shaft, an electrically conductive adapter rigidly secured to one end of said shaft and electrically insulated therefrom, a bearing fixed to the top of said cabinet and adapted to receive said adapter for rotatably supporting one end of said shaft while maintaining electrical conductivity with it so that the shaft is rotatably supported by said bearings, a second bearing fixed to the bottom of said cabinet in alignment with said first bearing and adapted to receive the end of the shaft opposite the adapter for rotatably supporting it while maintaining electrical conductivity with it so that the shaft is rotatably supported by said bearings, a speaker mounted on said shaft to rotate with it, an electrical conductor connecting the adapter to the speaker for electrically connecting the speaker to the adapter, a second electrical conductor electrically connecting the speaker with the shaft, and an amplifier having one of its output terminals connected to said first bearing and the other to said second bearing, whereby one side of the circuit will be carried by one bearing and the adapter to the speaker, and the other side of the circuit will be carried by the shaft and the other bearing.

4. In an apparatus for imposing a vibrato effect upon reproduced sound, a cabinet, an electrically conductive shaft, an electrically conductive adapter rigidly secured to one end of said shaft and electrically insulated therefrom, a bearing fixed to one end of said cabinet and adapted to receive said adapter for rotatably supporting one end of said shaft while maintaining electrical conductivity with the rotating adapter, a second bearing fixed to the other end of said cabinet in alignment with said first bearing and adapted to receive the end of the shaft opposite the adapter for rotatably supporting it while maintaining electrical conductivity with it so that the shaft is rotatably supported by said bearings, a pair of speakers supported on said shaft in opposed relationship to rotate with it, an electrical conductor having one end connected to the adapter and the other end connectable to either one of the speakers selectively for electrically connecting either one of the speakers to the adapter, a pair of conductors, each electrically connecting one of the speakers with the rotating adapter, and an amplifier having one of its output terminals connected to said first bearing and the other to said second bearing, whereby either one of said speakers may be individually energized by the amplifier while it is rotating by connecting said conductor with either one of the speakers so that one side of the circuit will be carried by one bearing and the adapter to the speaker, and the other side of the circuit will be carried by the shaft and the other bearing.

5. In an apparatus for imposing a vibrato effect upon reproduced sound, a cabinet, an electrically conductive shaft, an electrically conductive adapter rigidly secured to one end of said shaft and electrically insulated therefrom, a bearing fixed to one end of said cabinet and adapted to receive said adapter for rotatably supporting one end of said shaft while maintaining electrical conductivity with the rotating adapter, a second bearing fixed to the other end of said cabinet in alignment with said first bearing and adapted to receive the end of the shaft opposite the adapter for rotatably supporting it while maintaining electrical conductivity with it so that the shaft is rotatably supported by said bearings, a speaker mounted on said shaft to rotate with it, an electrical conductor connecting the adapter to the speaker for electrically connecting the speaker to the adapter, a second electrical conductor electrically connecting the speaker with the shaft, and an amplifier having one of its output terminals connected to said first bearing and the other to said second bearing, whereby one side of the circuit will be carried by one bearing and the adapter to the speaker, and the other side of the circuit will be carried by the shaft and the other bearing so that the speaker may be energized by the amplifier while it is rotating with said shaft.

6. In an apparatus for enhancing the tone quality of reproduced sound, a cabinet, a shaft having its ends tapered into a conical configuration, a bearing fixed to the lower end of said cabinet and presenting a conical recess complementary to a tapered end of the shaft for receiving said tapered end to rotatably support one end of the shaft, a bearing member secured to the upper end of the cabinet and having a concentric bore in alignment with said lower bearing, a plug slidably disposed within said bore and presenting a conical recess complementary to a tapered end of the shaft for receiving said tapered end to rotatably support one end of the shaft, a spring disposed within said bore to yieldably urge said plug outwardly of said bore into contact with its cooperating tapered end of the shaft so that the shaft may be readily removed from or assembled into its position between said bearings by raising the shaft while in engagement with the conical recess of said plug against the force of said spring to raise the lower end of the shaft above the said lower bearing, the said upper bearing being displaced laterally into or out of engagement with the lower bearing, and a loud speaker mounted on said shaft to rotate with it and having electrical connection with an amplifier for energizing it, whereby the tone quality of the sound reproduced by the loud speaker may be enhanced by rotating the shaft to cause a corresponding rotation of the speaker while it is reproducing the sound.

7. In an apparatus for enhancing the tone quality of
reproduced sound, a cabinet, a shaft having its ends tapered into a conical configuration, a bearing fixed to the lower end of said cabinet and presenting a conical recess complementary to a tapered end of said shaft for receiving said tapered end to rotatably support one end of the shaft, a bearing member secured to the upper end of the cabinet and having a concentric bore in alignment with said lower bearing, a plug slidably disposed within said bore and presenting a conical recess complementary to a tapered end of the shaft for receiving it to rotatably support the other end of said shaft, a spring disposed within said bore to yieldably urge the plug outwardly of said bore into contact with its cooperating tapered end of the shaft so that the shaft may be readily removed from said cabinet and assembled into its position between said bearings by raising the shaft while in engagement with the conical recess of said plug against the force of said spring to raise the lower end of the shaft above the lower bearing so that it may be displaced laterally into or out of engagement with the lower bearing, a pair of disks fixed to said shaft in opposed relationship, a peripheral flange fixed to each of said disks and extending from the disks in a direction away from said shaft, a pair of coulombs of substantially cylindrical configuration having a smaller diameter than the diameter of the circle defined by said flange and each coulomb having a front opening at one end and a rear opening at its opposite end, each of said coulombs being supported by one of said disks in concentric relationship therewith to extend outwardly from the disk with its rear opening being adjacent to said disk and spaced from the surface of said disk but being located within the area defined by said flange so that said flange surrounds the end of said coulomb that is adjacent to the surface of said disk to form an annular opening between a portion of the surface of said coulomb and said flange, a loud speaker mounted within each of said coulombs at the ends opposite the disks so that the sound emanating therefrom may pass through the front opening of the coulomb and through said annular opening, whereby the tone quality of the sound reproduced by said speaker is rendered more distinct and pronounced to the combined effect of the rotational movement of the speaker and the sympathetic vibration of said coulomb and flanged disk.

8. In an apparatus for enhancing the tone quality of reproduced sound, a cabinet, a shaft rotatably mounted in said cabinet, a pair of disks fixed to said shaft in opposed relationship, a peripheral flange fixed to each of said disks and extending from the disks in a direction away from said shaft, a cabinet having a front opening at one end and a rear opening at its opposite end, each of said coulombs being supported by one of said disks in concentric relationship therewith to extend outwardly from the disk with its rear opening being adjacent to said disk and spaced from the surface of said disk but being located within the area defined by said flange so that said flange surrounds the end of said coulomb that is adjacent to the surface of said disk to form an annular opening between a portion of the surface of said coulomb and said flange, a loud speaker mounted within each of said coulombs at the ends opposite the disks so that the sound emanating therefrom may pass through the front opening of the coulomb and through said annular opening, whereby the tone quality of the sound reproduced by either one of the speakers while they are rotating is enhanced by reason of the combined effect of the rotational movement of said speaker and the sympathetic vibration of said coulomb and flanged disk.

9. In an apparatus for enhancing the quality of reproduced sound, a cabinet, a shaft rotatably mounted in said cabinet, a pair of disks fixed to said shaft in opposed relationship, a peripheral flange fixed to each of said disks and extending from the disks in a direction away from said shaft, a pair of coulombs of substantially cylindrical configuration having a smaller diameter than the diameter of the circle defined by said flange with each coulomb having a front opening at one end and a rear opening at its opposite end, each of said coulombs being supported by one of said disks in concentric relationship therewith to extend outwardly from the disk with its rear opening being adjacent to said disk and spaced from the surface of said disk but being located within the area defined by said flange so that said flange surrounds the end of said coulomb that is adjacent to the surface of said disk to form an annular opening between a portion of the surface of said coulomb and said flange, and a loud speaker mounted within each of said coulombs at the ends opposite the disks so that the sound emanating therefrom may pass through the front opening of the coulomb and through said annular opening, whereby the tone quality of the sound reproduced by either one of the speakers while they are rotating is rendered more distinct and pronounced to the combined effect of the rotational movement of the speaker and the sympathetic vibration of said coulomb and flanged disk.
more pleasant to the ear by reason of the combined effect
of the rotational movement of the speaker and the resono-
nance produced by said cowl and flanged disk.

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