H. H. SANTI

ROTATABLE ACOUSTICAL APPARATUS

Filed May 28, 1959

2 Sheets-Sheet 2

Fig. 3

Fig. 4

Fig. 5

Harris H. Santi
INVENTOR.

BY: James A. Heiler
Jefferson O. Gillar
William G. Stout
ATTORNEYS
ROTATABLE ACOUSTICAL APPARATUS

Harris Hermann Santi, La Porte, Tex., assignor to Roto-tone, Inc., Houston, Tex., a corporation of Texas

Filed May 28, 1959, Ser. No. 816,699

3 Claims. (Cl. 161—27)

The present invention relates to a rotatable acoustical apparatus and, more particularly, relates to such an apparatus which is useful in radiating and dispersing the sound from a loudspeaker and adding a tremolo or vibrato to the sound.

Generally, the radiation and dispersion of sound from a speaker is highly directive in the direction of the horn opening. There have been in use various devices such as rotating a horn about one end or rotating a blade in front of the speaker which have been used to increase the radiation pattern of a loud speaker and at the same time to add tremolo to the sound output. The present invention is directed toward improvements in the distribution pattern of sound from a speaker and the addition of vibrato or tremulant to the sound output by providing a rotatable sound channel which improves the sound output from a speaker.

It is an object of the present invention to provide an improved rotatable sound channel and one that has improved tonal qualities and tremolo effects.

It is a further object of the present invention to provide a rotatable sound channel which increases the volume of sound output as compared to a conventional horn.

A further object of the present invention is the provision of an improved rotatable sound channel which produces less sound distortion than a conventional horn.

A still further object of the present invention is the provision of an improved rotatable sound directing channel which when rotated creates a suction in the channel and forces air through the channel.

Yet a further object of the present invention is the provision of a rotatable sound channel which is provided with a deflecting side which is adapted to be positioned in front of and at a critical angle of approximately 15° to a speaker and adapted to be rotated about the axis of said speaker.

Yet a further object of the present invention is the provision of a rotatable sound channel open at both ends and diverging from one end to the other and adapted to be rotated in front of and about the axis of a sound opening at an eccentric point in the sound channel thereby pumping air through the sound channel and across the sound opening.

Other and further objects, features and advantages will be apparent from the following description of a presently preferred embodiment of the invention, given for the purpose of disclosure, and taken in conjunction with the accompanying drawings, where like character references designate like parts throughout the several views, and where

FIGURE 1 is a perspective view illustrating a rotatable sound channel of the present invention used in conjunction with a conventional speaker and enclosure.

FIGURE 2 is an enlarged top elevational view of the device of FIGURE 1 with the top of the acoustical enclosure removed.

FIGURE 3 is a view taken along the line 3—3 of FIGURE 2.

FIGURE 4 is an enlarged side elevational view, in cross-section, illustrating one type of connection for rotatably mounting the sound channel of the present invention, and

FIGURE 5 is an enlarged side elevational view of the rotatable sound channel of the present invention.

Referring now to the drawings, and particularly to FIGURES 1, 2 and 3, the reference numeral 10 generally designates the rotatable sound channel of the present invention which may be used with any acoustical enclosure or cabinet, one type of which is illustrated here, as cabinet 12 which includes preferably at least two openings 14 disposed at opposite sides of the cabinet thereby providing a stereophonic sound effect as the heater is given the effect of hearing sound from more than one source.

Referring now to FIGURE 3, the cabinet also includes a conventional driver 16 and horn 18 for the sound input and output which may be fixedly secured in the cabinet by being connected to partition 20 in the cabinet 12. This speaker and cabinet arrangement is conventional and no further explanation is required as it is not part of the present invention and in view of the fact that the rotatable sound channel 10 of the present invention may be used with various other arrangements of speakers and enclosures. For instance the sound channel of the present invention could be used without a cabinet enclosure.

The rotatable sound channel 10 of the present invention is positioned in front of the speaker 18 and mounted for rotation about the axis of the speaker. In order to provide a rotatable support for the sound channel 10 a shaft 20 is secured to the top 13 of the acoustical enclosure 12 axially of the speaker 18 and rotatably supports sound channel 10 by means of a rotatable connection 22 rotatably secured to the shaft 20. A pulley 24 and belt 26 arrangement (FIGURE 2) which is driven by suitable electric motor 28 is provided to rotate the sound channel 10 at the desired speed. Of course, other means for supporting and rotating the sound channel 10 may be used.

The sound channel 10 of the present invention includes a flat deflector 30 which is mounted in front of the speaker 18 and at an angle 32. The angle 32 has been found to be critical in order to produce the desired sound output with increased volume, little distortion, and the desired tremolo. This angle 32 should be substantially 15° although satisfactory effects will be produced within the 10° to 20° range. However, outside of this range the effects produced by this sound channel are unsatisfactory.

The width of the deflecting wall 30 is made sufficient to cover the diameter of the speaker 18 and preferably at a length about twice the diameter of the speaker. Sidewalls 34 and 36 are connected to the deflecting wall 30 on either side of the speaker 18 and thus serve to confine the sound emitted from the speaker 18 between the walls 30, 34 and 36 and the speaker itself and direct the sound outwardly through the opening 40 which the sides 34 and 36 and the top 30 enclose at the diverging end. A passageway 42 at the end 52 of the sound channel 10 is provided for reasons which will be more fully discussed hereinafter by spacing the end 52 from the partition 20. Of course, this passageway 42 may be provided in other ways. Preferably the sides 30, 34 and 36 of the rotating channel deflector 10 are made of a nonresonant material which is non-sound absorbent and a material such as fir plywood has been found satisfactory.

Preferably the sides 34 and 36 are diverged outwardly from end 52 to end 50 which aids in dispersing the sound. Also, preferably the sound channel 10 is mounted for off-center rotation about the axis of the speaker 18. That is, the axis of rotation of the sound channel 10 is nearer its converging end 52 than the diverging end 50. Therefore, when rotated, the end 50 moves at a greater centrifugal speed than the end 52. This creates a pumping effect through the sound chan-
nel 10 caused by the greater pressure drop across the end opening 40 and air is pumped through the sound channel 30 from the end 52 to the end 50. This effect is further accentuated by the fact that the end 50 is wider than the converging end 52 and therefore the opening 40 is larger than the passageway 42. Thus the air passing over the speaker 18 affects the tonal qualities and volume output of the speaker 18.

The distance at which the sound channel 10 is spaced from the partition 20 may be varied depending on the tonal qualities desired from the sound input.

In use, the rotatable sound channel 10 is continuously rotated by the electric motor 28 at a speed of 360–400 r.p.m. depending upon the input electrical signal fed to the driver 16 of the speaker 18 by an electrical circuit, not shown. As the sound is being directed from the end 50 of the sound channel 10, a vibrato or tremulant effect is produced caused by the rotation of the opening 40 of the sound channel toward and away from the listener and also a stereophonic effect is created. Since the sound channel 10 has a small passageway 42 at the back of the sound channel than the front opening 40 and the end 50 travels at a greater speed than the end 52, air is pumped from the back of the sound channel through the passageway 42, through the body, and out the front opening 40 as the sound channel 10 is rotated. This feature provides an increase in the volume of the sound channel as compared to a horn. Furthermore, this unique sound channel reproduces true sound input to the speaker, provides low distortion, and provides multiples of overtones. A pitch change may be effected by changing the speed of rotation as the faster the speed of rotation the more air passes through the sound channel.

The present invention, therefore, is well adapted to carry out the object and attain the ends and advantages mentioned as well as others inherent therein. While presently preferred embodiments of the invention are given for the purpose of disclosure, numerous changes in the details of construction and arrangement of parts may be made which will readily suggest themselves to those skilled in the art and which are encompassed within the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In an acoustical enclosure, having a stationary speaker, the improvement comprising a rotatable sound channel means having sides and ends, one side of said sound channel means positioned in front of said speaker and at an angle thereto of approximately 15°, second and third sides connected to said front side and disposed on opposite sides of said sound opening thereby defining a sound channel means having first and second ends, and means connected to said first side adapted to rotate said sound channel means about the axis of the sound opening at a point on said sound channel means nearer the first end than the said second end.

2. A rotatable acoustical sound channel means for producing tremolo from a sound opening comprising, a speaker having a sound opening, a first side positioned in front of said sound opening and at an angle thereto of approximately 15°, second and third sides connected to said first side and disposed on opposite sides of said sound opening thereby defining a sound channel means having first and second ends, and means connected to said first side adapted to rotate said sound channel means about the axis of the sound opening at a point on said sound channel means nearer the first end than the said second end.

3. A rotatable acoustical sound channel means for producing tremolo from a sound opening comprising, a speaker having a sound opening, a first flat side positioned in front of said sound opening and at an angle thereto of approximately 15°, second and third sides attached to said first side and positioned to enclose the sound opening thereby defining a sound channel means having first and second ends, said sound channel means having openings at each end, said second and third sides diverging outwardly from each other at one end and converging toward each other at the second end, and means connected to the first side adapted to rotate said sound channel means about the axis of the sound opening at a point on the sound channel means nearer the converging end than the diverging end.

References Cited in the file of this patent

UNITED STATES PATENTS

2,441,425 Lawrence ------------ May 11, 1948
2,618,352 Leslie ------------ Nov. 18, 1952
2,622,692 Leslie ------------ Dec. 23, 1952
2,727,583 Leslie ------------- Dec. 20, 1955
2,869,667 Leslie ------------ Jan. 20, 1959