May 11, 1948. O. R. LAWRENCE 2,441,425

SOUND REPRODUCING SYSTEM

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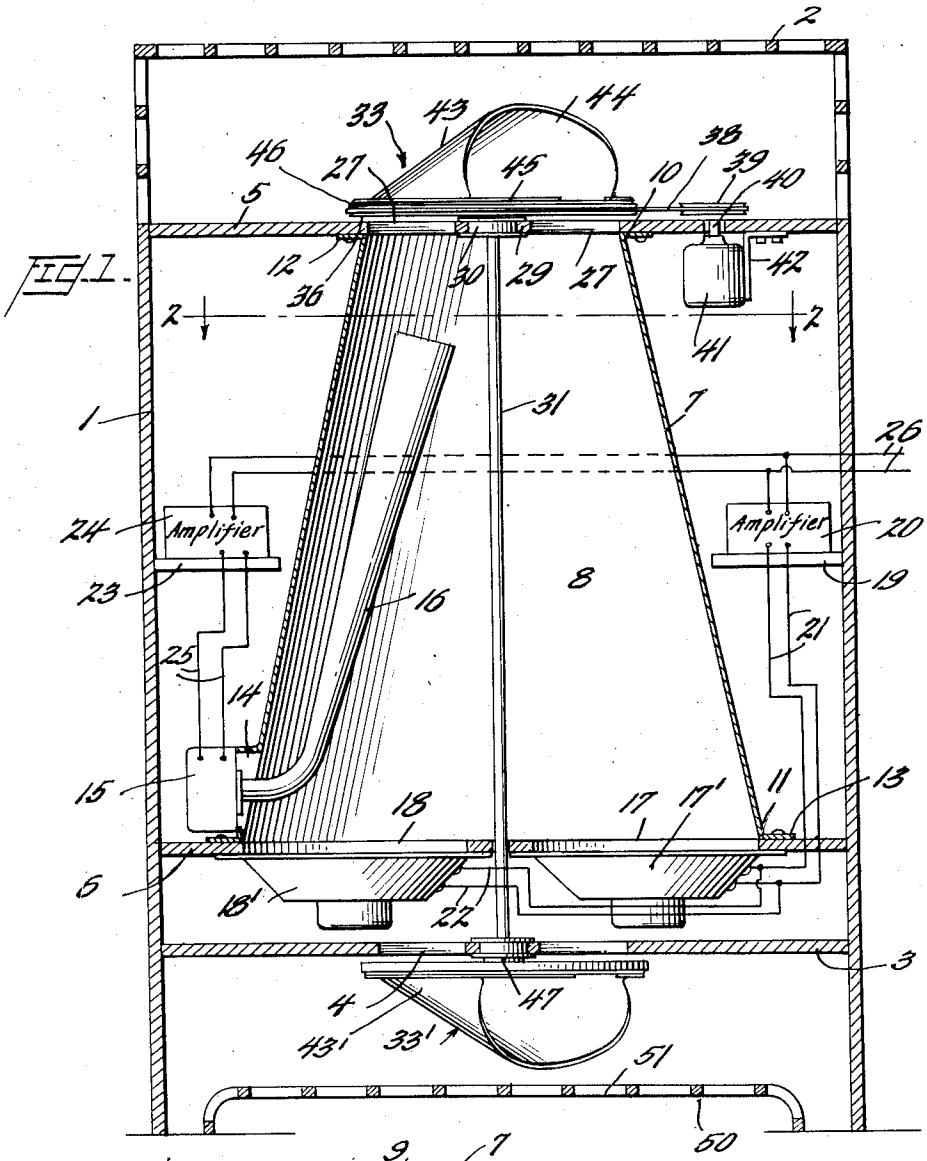


FIG. 1.

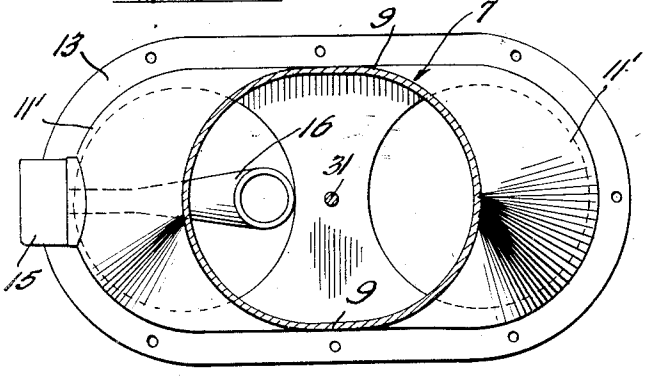


FIG. 2.

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FIG. 3.

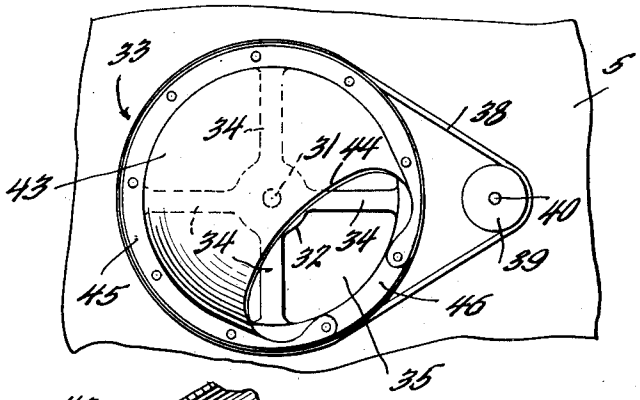


FIG. 4.

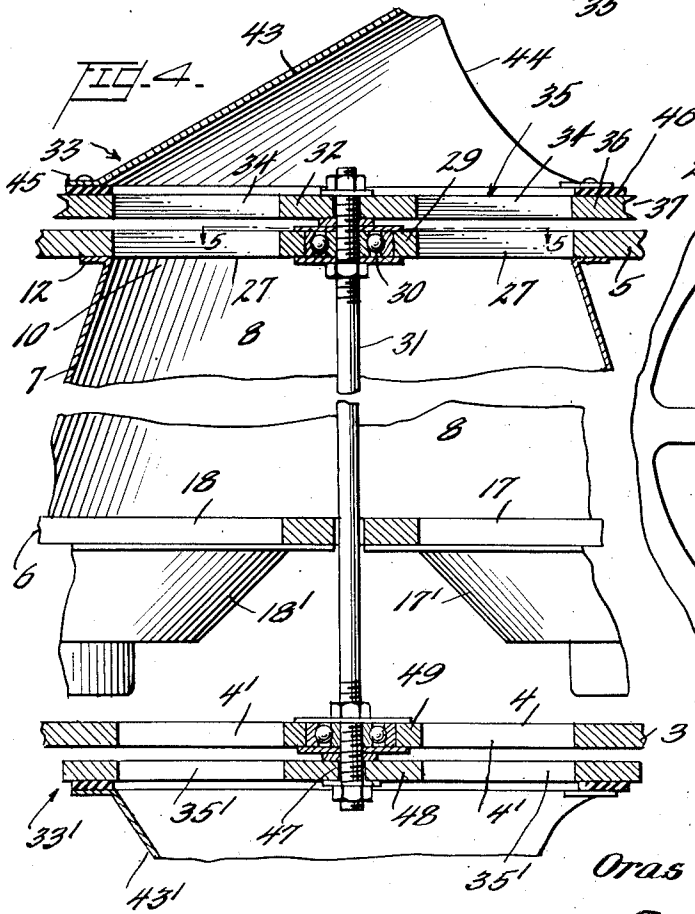
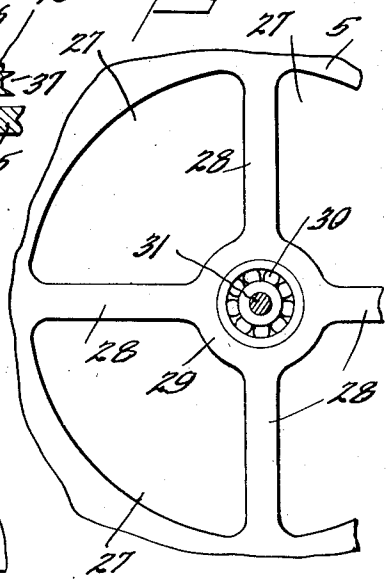


FIG. 5.



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SOUND REPRODUCING SYSTEM

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Application September 13, 1946, Serial No. 696,766

10 Claims. (Cl. 181—27)

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My invention relates to new and useful improvements in sound reproducing systems and has for an object to provide a sound reproducing system that is especially adaptable for use with electric organs, but may also be used with other musical instruments of a certain type that supply the necessary audio-frequency notes.

One of the objects of the invention is to provide a sound reproducing system to be used with an electric organ, that will faithfully reproduce the sound and also provide a pleasing tremolo effect not only for the notes in the upper frequency but also for the notes in the middle and lower or bass frequencies.

Still another object of the invention is to provide a system wherein the sound or tones from two dynamic cone speakers, as well as what is known as a dynamic driver type speaker, are directed upward through a reverberating chamber, and the sound then deflected outwardly by a rotor sound deflector in a lateral direction.

Still another object of the invention is to provide an improved means for creating not only a tremolo effect for the notes from an electric organ, but to cause a reverberation of the music to simulate the tones from a pipe organ, and to slightly reduce the reverberation of the high frequency notes but at the same time increase their brilliancy.

Still another object of the invention is to provide a cabinet in which there is a reverberating metal chamber in which the sound, or in other words, the music, is directed from two dynamic cone speakers as well as a speaker of the high frequency type.

Still another object of the invention is to provide a reverberating chamber with its speakers, while at the top of the chamber there is mounted a rotor in the form of a sound deflector to create a novel tremolo effect; while behind the dynamic speakers in turn there is a baffle board with the necessary openings and a second or lower rotating sound deflector, so that a tremolo effect can be given to sound or music that is issued from the back of the dynamic cone speakers but has not passed up in to the reverberating chamber.

Still another object of the invention is to produce a sound reproducing system that will lend brilliance to the tones and over-tones that issue from the sound cabinet, and will reproduce with high fidelity the notes in the high, low and lower frequencies; and will also produce a tremolo effect and a reverberation that is not possible, so far as I am aware, with other sound reproducing cabinets.

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Still another object of the invention is to provide a simple mechanism for carrying out the reproduction, which consists primarily of a cabinet with two amplifying cone speakers, a dynamic driver type speaker, a reverberating chamber and two rotors, through which the music passes, so that not only are the tonal qualities of the instrument played improved and faithfully reproduced, but the music or notes may be heard equally as well anywhere within a 360° radius.

With these and other objects in view the invention consists in certain new and novel arrangements and combination of parts as will be hereinafter more fully described and pointed out in the claims.

Referring now to the drawings, showing a preferred embodiment,

Fig. 1 is a vertical, sectional view of a cabinet with my improved mechanism therein,

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1,

Fig. 3 is an enlarged, fragmentary, detailed view, showing the upper rotor and the means for revolving the same,

Fig. 4 is an enlarged, fragmentary, vertical, sectional view, showing the manner of mounting the rotor sound deflectors, and

Fig. 5 is a fragmentary, sectional view taken on line 5—5 of Fig. 4.

Referring now to the several views, and for the moment, to Fig. 1, there is shown a cabinet 1, which is provided with lattice or grille work 2 about its upper end so that the sound may pass therethrough, while near the bottom of the cabinet 1 is a baffle board 3, which is provided centrally with the openings 4, and under these openings 4 is positioned the bottom rotor sound deflector, as will later be described.

Likewise, just beneath the lattice work 2, extending across the cabinet 1, there is a supporting board 5, and a lower supporting board 6, which is slightly spaced above the baffle board 3. Securely mounted between these boards 5 and 6 is a metal housing 7 that forms what I term the reverberating chamber 8. This housing 7 might be described as conical in shape through its greater dimension and having flatted sides 9 (see Fig. 2).

The apex 10 is nearly circular in top plan while the bottom 11 has parallel sides 9, and rounded semi-circular ends 11'.

This housing 7 is open at its top and at its bottom, as in the bottom are to be fitted two speakers that will be mentioned shortly, while

over the top is mounted an upper rotor sound deflector also to be mentioned shortly.

This housing 7, that forms the reverberating chamber 8, is formed of copper or brass, or even tin; and is supported to reverberate from the sound that is admitted to the chamber 8, to thus more closely simulate the hollowness or timbre of the reverberating pipes of a pipe organ.

It will be noticed that there is a flange 12 for conveniently securing the upper part of the housing 7 to the board 5, and a flange 13 at the lower end of the housing 7 to likewise secure this metal housing 7 to the two boards 5 and 6 heretofore mentioned.

It may also be noticed, from Fig. 1, I cut an opening 14 in the side of and near the bottom of the housing 7, so that there can be conveniently mounted a dynamic driver type speaker 15 with its horn 16 that extends upwardly in the reverberating chamber 8. It will be noticed that the horn 16 is of the long, narrow type so that the high audio-frequency notes are faithfully reproduced.

It will also be noticed that the sound passing through the horn 16 is led into the upper part of the reverberating chamber 8, thus slightly reducing the effect of the reverberating chamber 8 on the high frequency notes; while, of course, the rather long horn 16 will add brilliancy to these high frequency notes. Also, the sound released from the horn 16 is blended, at the top of the reverberating chamber 8, with the sound and output of two dynamic cone speakers, next to be mentioned.

Mounted on the under surface of the board 6, in which there are formed the openings 17 and 18, are the two dynamic type cone speakers 17' and 18'.

At the right of the cabinet 1 (Fig. 1) there will be seen a small shelf 19, on which is mounted an amplifier 20 with the lead wires 21 which are connected with the dynamic speaker 17', while from these lead wires 21 are the further lead wires 22 connected with the dynamic speaker 18'.

Likewise, to the left of the cabinet 1 is a small shelf 23, on which is mounted the amplifier 24, with its lead wires 25 which are connected to the driver type speaker 15.

Leading from the playing instrument, such as an electric organ, are the lead wires 26 that are in turn connected to the amplifiers 20 and 24. Thus the electrical impulses from the playing instrument (not shown) are amplified and passed through the dynamic cone speakers 17' and 18', and also are amplified and pass through the dynamic driver type unit 15 which has its horn 16, it will be remembered, mounted within the reverberating chamber 8 and which horn extends to nearly the top of the reverberating chamber 8.

Glancing at Fig. 5, for the moment, it will be noticed that the board 5 directly over the apex 10 of the housing 7 has a plurality of openings 27 with radiating spokes 28 and a central hub 29. Thus the sound that passes through the upper end of the reverberating chamber 8 will also pass out of these openings 27.

Mounted in the hub 29 may be seen the ball bearing 30, so that a drive shaft 31 may be mounted therein, and the upper end of this shaft 31 is secured in the hub 32 of what I term a rotor sound deflector 33.

From the hub 32 radiate the spokes 34 and between which are the openings 35, there also being the outside rim 36 to which the spokes lead, and this rim 36 forms the periphery of the rotor sound deflector 33, which is notched on its outer surface as at 37, so that a belt 38 may be passed around the same and extend to a drive wheel 39 which is secured on the end of a shaft 40 of a motor 41 which is secured as at 42 to the under surface of the supporting board 5.

Securely fastened to the rim 36 of the rotor sound deflector 33 is an angular disposed metal hood 43 which is cut out across the face to form a mouth 44, which is only slightly less than the diameter of the rim 36, as may be seen in Figs. 1 and 3.

As will be noticed in Fig. 3, the hood 43 has a rim 45 around its base so that it may be conveniently fastened to the rim 36 of the rotor sound deflector 33, and I preferably put a rubber cushion 46 beneath the rim 45 and on the upper surface of the rotor 33 to thus deaden any noise that might be caused by the mechanical rotating of the wheel 39 or any metallic sound that might be caused by the joining of the hood 43 with the rotor 33.

Thus it will be seen that the sound passing through the upper end of the reverberating chamber 8 passes through the openings 27 in the board 5, and also between the openings 35, or in other words, between the spokes 34 of the rotor sound deflector 33; and from these openings 35 the sound will impinge against the inner surface of the metal hood 43 and be emitted from the mouth 44 of the rotor sound deflector 33 in a lateral direction.

It will be understood that as the sound deflector 33 is rotated by the motor 41 the sound emanating from the reverberating chamber 8 is deflected and projected in a lateral direction. Furthermore, a tremolo effect is obtained, as if a person were listening at any one point about the cabinet 1, the sound will be the loudest when the opening 44 in the hood 43 of the sound deflector 33 is pointed directly towards him; and the sound will then diminish as the opening recedes to its minimum at a point directly opposite him. The sound will then increase as the deflector opening 44 approaches him, until it reaches its maximum at the start of the cycle. Thus the sound tends to rise and fall at each revolution of the sound deflector 33, thus creating a very smooth and even and pleasing tremolo effect.

Of course, the speed of rotation of the sound deflector 33 regulates the beat or frequency of the tremolo effect; and this in turn is controlled by the speed of the motor 41 and the ratio of the pulley wheel 39 on the motor 41 attached to the sides of the notched rim 36 of the sound deflector 33.

As is well known, there is always a certain amount of sound that escapes from the back of a dynamic cone speaker, and so that the tremolo effect will be added to any sound that is emitted from the back of the dynamic speakers 17' and 18', I utilize a second rotor sound deflector 33'.

This deflector 33' is similar in construction to the rotor sound deflector 33 with the exception that the periphery is not grooved as it is rotated by the shaft 31 which is also secured at its lower end as at 47 to the hub 48 of this deflector 33'.

There is a similar metal hood 43' secured over this rotor sound deflector 33'. Also, the openings 4 heretofore mentioned in the board 3 are provided with spokes 4', so as to support the hub 49 in the board 3; and there are openings 35' in the rotor sound deflector 33' that are iden-

tical with the openings 35 in the rotor sound deflector 33.

The bottom of the cabinet 1 is provided with a sound board 50 in which there is a lattice or grille work 51 so that the sound emanating from the mouth 52 of the rotor sound deflector 33' will pass through the openings 51 in the board 50.

Thus all the sound that emanates or passes through the upper end of the reverberating chamber 8, through the rotor sound deflector 33, will be given a tremolo effect; and in the same manner, the sound that passes through the back of the dynamic speakers 17' and 18' will strike the baffle board 3, then pass out of the openings 4, and through the hooded sound deflector 33' and will also have the tremelo effect similar to that emanating from the upper rotor sound deflector 33.

I have found in actual practice that if the two sound deflectors 33 and 33' are rotated at about 350 R. P. M. the tremolo effect is very pleasing.

It is also to be appreciated that by providing a hooded deflector 33 at the top the sound is transmitted in a lateral direction and without increasing the volume of the amplifiers the music can be heard throughout a large room in a complete circle of 360°.

It might be mentioned that the tremolo effect is very pronounced, which can readily be ascertained by playing the organ (not shown) before starting the motor 41 to first let the sound simply pass through the reverberating chamber 8 and the deflectors 33 and 33' without rotating them; and then as soon as the motor 41 is started and the deflectors 33 and 33' start to rotate, the great difference in tremolo can instantly be noted, while the fullness and the richness of the notes, or the timbre, seems to be much improved.

I have also found in actual practice that the tremolo effect is smooth and even at all the frequencies, that is, in the middle, the high, and the low.

If just a small horn is revolved in a horizontal plane, it will faithfully reproduce the high frequency and provide a tremolo, but has no effect on the middle or bass frequencies; whereas, if just a dynamic cone type speaker is used with a revolving drum, then there is a drop in the tremolo effect on the middle frequency range.

However, by using the various parts outlined and having two rotor sound deflectors locked on the shaft so that they rotate in unison, the tremolo effect is heard over the entire range of audio-frequencies, and the tremolo effect from the top of the cabinet is in perfect unison with the tremolo effect from the bottom of the cabinet.

Again, by using the reverberating chamber 8, the notes from an electric organ simulate those of the pipe organ tones; and the brilliancy of the music seems to be greatly enhanced.

By using the two cone speakers and the driver type of unit and having the combined sounds pass through these two rotating sound deflectors, I can provide a tremolo effect that is always desirable in organ music, and I can simulate the music from a pipe organ.

It might be mentioned in passing that I have tried just baffling the sound in the lower end of the cabinet, but the effect was far inferior to using a second rotor sound deflector at the bottom of the reverberating chamber as above illustrated and described.

Finally, it will also be appreciated that these sound deflectors are not in a true sense a horn, but a means of breaking up the sound to give the tremolo effect and to emit the sound in a full circle of of 360°.

Many slight changes might be made without in any way departing from the spirit and scope of the invention.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent is:

1. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal housing within the cabinet forming a reverberating chamber, a dynamic cone speaker mounted in the lower end of the chamber, a dynamic driver type speaker also leading into said reverberating chamber, a sound deflector rotor operably mounted at the upper end of the reverberating chamber, and an electric amplifying circuit for operating the speakers.

2. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal housing within the cabinet forming a reverberating chamber, a dynamic cone speaker mounted in the lower end of the chamber, a dynamic speaker type speaker having a relatively long horn extending within the reverberating chamber and to a point near the top thereof, a rotary sound deflector operably mounted at the upper end of the reverberating chamber, and an electric amplifying circuit for operating the speakers.

3. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal housing open at its opposite ends within the cabinet and forming a reverberating chamber, two dynamic cone speakers mounted in the lower end of the chamber, a dynamic driver type speaker having a relatively long narrow horn extending within the reverberating chamber and to a point near the top thereof to blend the sounds therefrom with the sounds from the dynamic cone speakers, a rotary sound deflector operably mounted over the upper end of the reverberating chamber to deflect the sounds from the reverberating chamber in a lateral direction, and an electric amplifying circuit for operating the said three speakers.

4. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal housing within the cabinet forming a reverberating chamber, a dynamic cone speaker mounted in the lower end of the chamber, a dynamic driver type speaker also leading into said reverberating chamber, a sound deflector operably mounted at the upper end of the reverberating chamber, a second rotary sound deflector mounted to the rear of said dynamic cone speaker and operating in unison with said first mentioned sound deflector, and an electric amplifying circuit for operating the speakers.

5. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal housing within the cabinet forming a reverberating chamber, two dynamic cone speakers mounted in the lower end of the chamber, a dynamic driver type speaker having a relatively long horn extending upward in the reverberating chamber and to a point near the top thereof, a rotary sound deflector operably mounted over the upper end of the reverberating chamber, a baffle board beneath the two dynamic cone speakers, a second rotary sound deflector mounted on said baffle board and operably connected with the first mentioned sound deflector, and an electric amplifying circuit for operating the speakers.

6. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal

housing within the cabinet forming a reverberating chamber, speakers directing the sounds issuing therefrom into the reverberating chamber, a metal shaft extending through the reverberating chamber, sound deflectors connected to said shaft, means for rotating said shaft and said sound deflectors, and an electric amplifying circuit for operating said speakers.

7. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal housing within the cabinet being larger at the base than at its apex to form a reverberating chamber, dynamic cone speakers mounted in the lower end of the chamber, a dynamic driver type speaker having a relatively long horn extending upward within the reverberating chamber and to a point near the top thereof, a baffle board mounted directly beneath the dynamic cone speakers, a rotary sound deflector mounted at the top of the housing and a similar sound deflector mounted on the under-surface of the baffle board, interconnecting means between the said sound deflectors, means for rotating the sound deflectors in unison and an electric amplifying circuit for operating the said speakers.

8. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal open-ended housing within the cabinet forming a reverberating chamber, dynamic cone speakers mounted in the lower end of the chamber, a dynamic driver type speaker also leading into the reverberating chamber, a baffle board mounted directly beneath the dynamic cone speakers, said baffle board having a central opening, a rotary sound deflector mounted at the top of the housing and a similar sound deflector mounted over the opening in the baffle board, each of said sound deflectors having a metal angular-shaped hood with a relatively large mouth, means for operating the rotary sound deflectors in unison, and an electric amplifying circuit for operating the speakers.

9. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal open-ended housing within the cabinet forming a reverberating chamber, speakers of different types for directing sounds into the reverberating chamber, a baffle board beneath the said speakers having a central opening therein, a sound deflector mounted at the upper end of the housing and a second sound deflector mounted across the opening in said baffle board, each of said sound deflectors including a spoked circular base and a metal hood extending at an angle to the horizontal, the mouth of the hood being only slightly less than the diameter of the circular base, electric means for operating the speakers, and electric means for rotating the sound deflectors.

10. In a sound reproducing system for electric organs and the like, a tonal cabinet, a metal open-ended housing within the cabinet forming a reverberating chamber, speakers of different types for directing sounds into the reverberating chamber, a baffle board beneath the said speakers having a central opening therein, a sound deflector mounted at the upper end of the housing and a second sound deflector mounted across the opening in said baffle board, inter-connecting means between the two said sound deflectors, each of said sound deflectors including a spoked circular base and a metal hood extending at an angle to the horizontal, the mouth of the hood being only slightly less than the diameter of the circular base, electric means for operating the speakers and electric means for rotating the sound deflectors.

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