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MULTIPLE ZONE STEREOPHONIC EFFECT FOR ELECTRIC ORGANS

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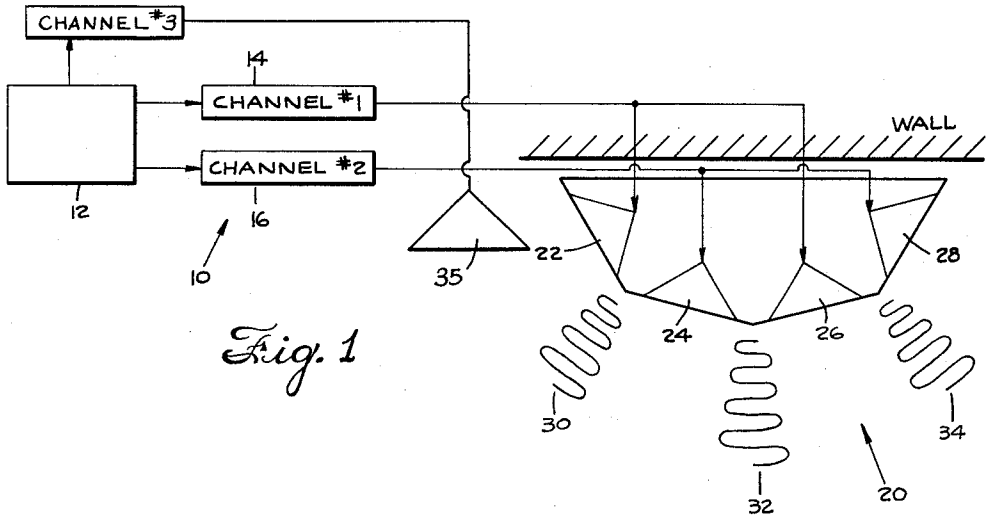


Fig. 1

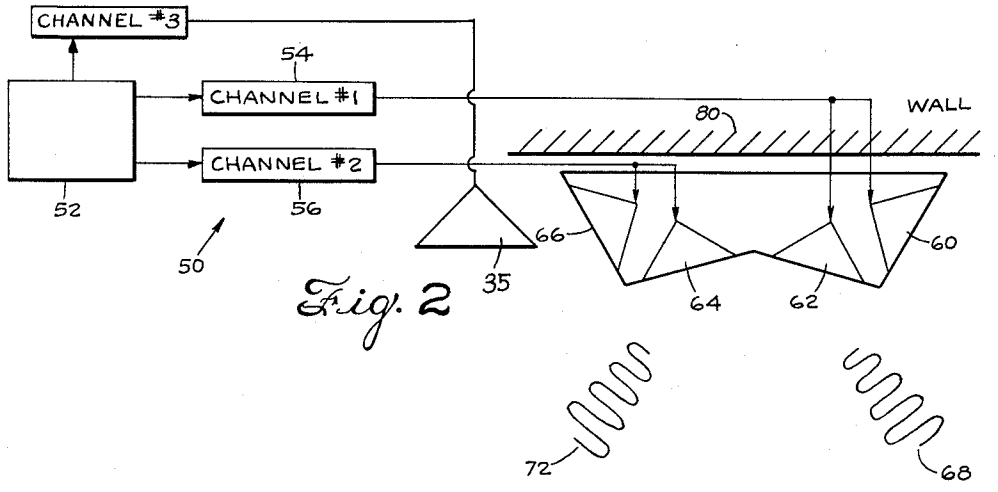
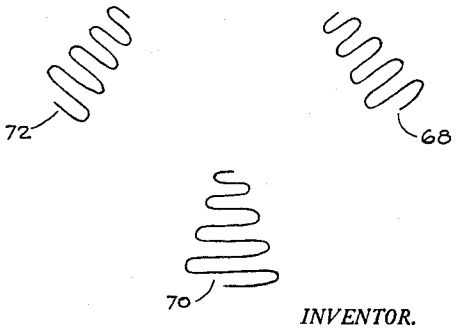


Fig. 2



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MULTIPLE ZONE STEREOPHONIC EFFECT FOR ELECTRIC ORGANS

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1 Claim. (Cl. 84—1.24)

This invention relates to apparatus for producing a multiple zone pattern for stereophonic presentation of music.

In electric organs, it is frequently desirable to produce a stereophonic effect whereby a more desirable presentation of music may be had. It is to this particular problem which the present invention is directed; however, it will be appreciated that the invention is to be limited only by the scope of the appended claims.

Another desirable feature of the electric organ is the provision of means for obtaining better room distribution of the musical tones especially in the middle and upper frequencies. Many attempts have been made to provide more adequate distribution, for example, by way of improved cabinets with diffusers. The problem is more serious as the number of listeners increases and as the size of the enclosure within which the music is being played increases.

In the prior art organs in which means have been provided for obtaining a stereophonic effect, the zone within which the effect is suitable for perception by the listener is severely limited primarily because it lies only within the overlapping pattern area of two adjacent speakers and is satisfactory only in that portion of the overlapping pattern within which the signals from the two speakers are substantially at the same level of intensity. No known satisfactory means has been provided in the organ art whereby the zone within which the stereophonic effect is satisfactorily achieved has been extended.

Accordingly, it is an object of the present invention to provide an improved means for extending the area within which satisfactory stereophonic effect is achieved.

It is another object of the present invention to utilize the means for extending the area of stereophonic effect for also providing better distribution of the musical tones produced by the organ especially the middle and upper frequencies.

It is another object of the present invention to provide a very economical means for improving the area of stereophonic effect and for improving the distribution of the middle and upper frequencies of an electric organ by means which are readily adapted for use with prior art equipment.

Other objects and the various features of the invention will be evident upon a perusal of the following description in which:

FIGS. 1 and 2 are diagrammatic representations of two embodiments of an electric organ incorporating the teachings of the present invention.

The electric organ **10** shown diagrammatically in FIG. 1 comprises suitable means **12** for producing musical tone signals. In the preferred embodiments, the invention is not applied to the bass tone signals inasmuch as in the typical enclosure within which the organ is played the distribution of bass signals is usually satisfactory; but, in the event that it is desired to produce a stereophonic effect with the bass signals, the bass signals are applied in the usual manner to a single pair of speakers with the bass signals applied to each of the speakers being out of phase a desired amount.

The organ **10** includes first and second channels **14** and **16** each having the middle and upper frequency tone signals, the signals in each of the channels being suitably

out of phase with respect to each other. The organ **10** also includes a speaker assembly **20** including four speakers **22**, **24**, **26** and **28**. The speakers are arranged in a generally arcuate pattern with each of the adjacent speakers facing outwardly at a slightly different angle from its adjacent speakers. The tone outputs of the speakers **22** and **24** overlap to produce a zone **30**. Similarly, the tone patterns of speakers **24** and **26** overlap to form a zone **32** and the patterns of speakers **26** and **28** overlap to produce a zone **34**. The bass speaker **35** has general coverage and is separately energized through a bass channel indicated by the numeral **3**.

The output signals from channel **14** are applied to alternate speakers **22** and **26**, and the output of channel **16** is applied to alternate speakers **24** and **28**. Inasmuch as the patterns of adjacent speakers **22**, **24**, **26** and **28** overlap to form zones **30**, **32** and **34**, and inasmuch as the tone signals applied to succeeding speakers are out of phase with each adjacent speaker, the zones **30**, **32** and **34** each produce an acceptable stereophonic effect.

By bringing the speakers **24**—**28** closer together and by narrowing the angle between adjacent speakers, it is possible to increase the area of the overlapping stereophonic zones **30**, **32** and **34** and also to bring the zones closer together. Thus, where desirable, it is possible to produce an almost continuous stereophonic zone of substantial width. On the other hand, by increasing the angle between adjacent speakers, it is possible to more widely distribute the zones of stereophonic effect **30**, **32** and **34**, which feature may be desirable in some instances.

The embodiment of FIG. 2 discloses an organ **50** including a musical tone signal producing means **52** generally similar to means **12** and a pair of channels **54** and **56** which are similar to channels **14** and **16** and which carry in the preferred embodiment merely the middle and upper frequencies.

Again, as in the embodiment of FIG. 1, four speakers **60**, **62**, **64** and **66** are utilized to produce three zones **68**, **70** and **72** of stereophonic effect. In this instance, however, the output of the channel **54** is applied to adjacent speakers **60** and **62**, and the output of the channel **56** is applied to adjacent speakers **64** and **66**.

By proper selective positioning of the directions in which the speakers face, however, it is still possible to obtain an acceptable stereophonic effect in the three zones **68**, **70** and **72**. Thus the speakers **60** and **66** face away from the wall **80** at a sharp angle, for example, in the order of 30°. The speakers **62** and **64** face away from the wall **80** and slightly toward each other. The stereophonic effect is achieved between speakers **60** and **64** by reason of the wide angular patterns from each of the speakers which overlap at **68**. The patterns of the speakers **62** and **64** overlap to form the zone **70**, and the speakers **62** and **66** overlap to form the zone **72**. Because of the angles involved, it will be appreciated that the zone **70** will be substantially wider than those at **68** and **72**. This speaker assembly of FIG. 2 may be particularly advantageous in an enclosure within which the listening audience is primarily positioned in front of and between the speakers **62** and **64**, but within which there may be occasional members of the audience in zones **68** and **72**.

It will be appreciated that in each of the embodiments the use of the multiplicity of the speakers, for example 4, substantially improves the distribution of the middle and high frequencies and appears to be satisfactory in most typical enclosures which are encountered.

It is occasionally desirable in some unusually large enclosures such as a depot to provide the speakers in the center of the enclosure and to direct the sound outwardly in all directions therefrom. By positioning eight (not shown) equally spaced speakers about an axis in the

center of the enclosure and by energizing four alternate speakers with signals of one phase and the other four speakers with signals of a differing phase, it is possible to obtain highly satisfactory distribution and stereophonic effect through a substantial portion of the enclosure.

While I have shown and described the preferred embodiments of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claim to include within the scope of the invention, all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

In an electric organ system having means for providing a bass signal together with a pair of phase displaced related signals of a mutually substantially identical audio frequency range and of higher frequency range than said bass signal and characterized by having a high order of directionality as compared with said bass signal, said bass signal and said pair of higher frequency range signals together covering at least the major portion of audible frequency spectrum, the improvement comprising at least one speaker connected for reproducing said bass signal, four other mutually substantially identical speakers arranged in pairs with means connecting one of said pair of directional signals to both of the speakers of one of

the speaker pairs, and means connecting the other of said pair of directional signals to both speakers of the other speaker pair, whereby the signals fed to one speaker pair are out of phase with the signals fed to the other speaker pair, said four other speakers being arranged so that one speaker in each of said pairs is between the two speakers of the other of said pairs, and with all of said four speakers being arranged in a substantially horizontal plane with the axial line of each of said four speakers intersecting the axial line of each of the other three of said four speakers, said axis intersections occurring behind the speakers.

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