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BRASS VOICE FORMANT SYSTEM FOR ELECTRONIC ORGAN

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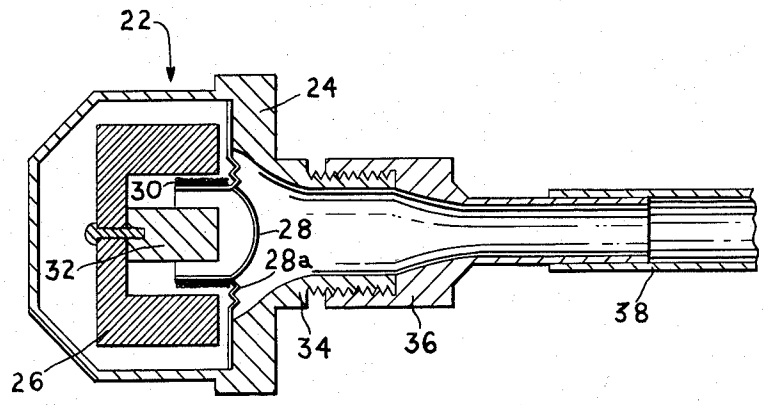

Fig. 2

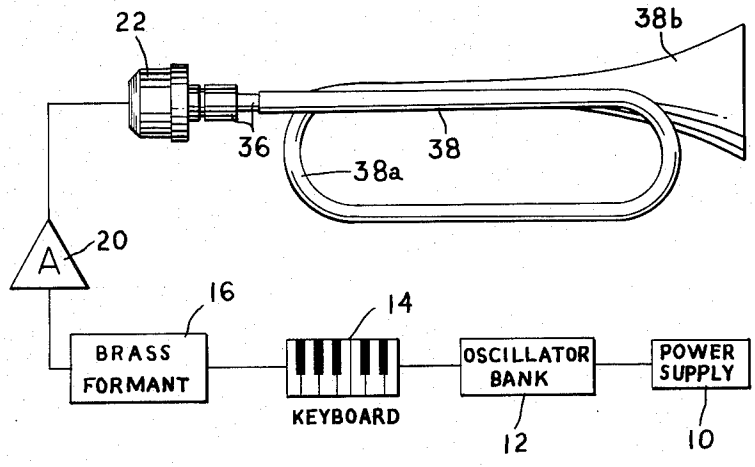

Fig. 1

INVENTOR.
IRWIN F. HYDEN

BY

Dunlap, Laney & Hubbard
ATTORNEYS

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BRASS VOICE FORMANT SYSTEM FOR ELECTRONIC ORGAN

Irwin F. Hyden, 408 Trenton Road, Norman, Okla.

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This invention relates to electronic musical instruments and more particularly, but not necessarily by way of limitation, relates to "voicing" or tone formant means for producing realistic "brass" musical effects for an electronic organ.

As is well known in the art, organ music has experienced a very rapid rise in popularity during the last few decades. This greatly increased popularity of organ music is primarily attributable to the so-called orchestral type electronic organ which is capable of producing a multitude of "voices" or tones simulating the various instruments of an orchestra. These "voices" add color and versatility to the more conventional types of organs and permits the artist to play almost all types of musical compositions, including the more contemporary "popular" melodies. As is known, the orchestral type organ is capable of producing with considerable aesthetic quality the sounds or "voices" of the flutes, reeds, chimes, and stringed instruments entirely by electronic wave shaping means. This production of various sound simulations is in general referred to in the art as "voicing" and is accomplished by so-called "formant" circuits or systems. However, within my knowledge, the production of a "brass voice" having outstanding aesthetic quality has not heretofore been accomplished in the electronic organ art. Although the wave shapes of the brass instrument audio signals can be fairly closely approximated by electronic wave shaping or formant circuits, the resulting audio sound generated by a conventional loudspeaker, which is used for all other voices of the organ, is not sufficiently authentic to be acceptable from an aesthetic standpoint.

Therefore, it is an important object of the present invention to provide a voice formant system in an electronic organ for producing a "brass voice" effect which simulates a brass musical instrument and which is of sufficient quality to be aesthetically acceptable to the performing artist and to those appreciating high quality organ music.

The present invention accomplishes this high objective by providing an audio driver which is driven by an electrical signal which has been shaped by any suitable organ electronic formant circuit to simulate the frequency and tone content of a brass horn audio signal. The audio driver is coupled to a suitable brass musical instrument, such as the conventional bugle, to introduce the audio signal to the instrument in the same manner that an audio signal is introduced by the lips and wind of a person playing the instrument. The resulting "brass voice" is aesthetically acceptable as a simulation of a brass instrument and has a particularly striking effect when played as a solo or single note type melody with accompaniment from the other voices of an orchestral organ. The strikingly authentic effect is believed to be the result of mating the electronic formant circuit within the organ which produces through the audio driver a mechanical effect corresponding to the lips and wind of an artist playing the brass instrument and the ability of the brass type musical instrument to mechanically form or shape the sound produced therethrough and produce the final brass simulation.

Additional objects and advantages will be evident from the following detailed description and drawings wherein:

FIGURE 1 is a diagram of a combination electronic and mechanical voice formant system in accordance with the present invention.

FIGURE 2 is a cross-sectional view of a part of the device of FIG. 1.

Referring now to FIG. 1, a power supply **10** is connected to drive a bank of tone generators consisting of oscillators, dividers or the equivalent represented by the block **12**. The bank of oscillators **12** may be of any suitable conventional design as presently used in electronic organs which usually comprises a separate oscillator device for each note of the musical scale to be produced. The outputs from the oscillators are usually pure sine waves and are selectively controlled by a conventional organ keyboard **14** in a conventional manner. When pressed, each key of the keyboard **14** selectively connects the output signal from the corresponding note oscillator to a desired formant circuit, which in the present case is the brass formant circuit **16**. Although the diagram illustrates the type of organ which is operated by keying the output from the oscillators, it is to be understood that other conventional types of organs, such as those which utilize a key system between the power supply and the oscillators, may also be employed. It is also to be understood that the oscillators **12** are connected to the brass formant circuit **16** by the appropriate stop tab switch in the conventional manner known in the organ art. The generated wave signal is shaped by the formant circuit **16** to produce a signal corresponding in frequency content or shape (resulting from the necessary harmonics) to that of an audio sound produced by a brass instrument. In other words, the signal from the brass formant circuit **16** has a primary frequency and harmonic content corresponding as closely as is electronically possible to duplicate that of an audio signal from a brass instrument. The output from the brass formant circuit **16** is fed to an amplifier **20** where the signal is amplified and fed to a small diaphragm audio driver **22**.

The audio driver **22** is shown in detail in the cross-sectional view of FIG. 2 and comprises a case **24** which houses a magnet **26**. The magnet **26** is supported in fixed position within the housing **24** by any suitable means (not shown). A diaphragm **28** is supported within the case **24** in a conventional manner by an annular flexible portion **28***a* which permits the diaphragm **28** to oscillate. A coil **30** is connected to the diaphragm **28** and is disposed within the magnet **26** and surrounds the core **32**. The coil **30** is connected to receive the electrical signal from the amplifier **20**, and when the signal is passed through the coil, the diaphragm is oscillated in the conventional manner to produce an audio signal. The face of the diaphragm **28** is directed towards an audio output sleeve **34** which is threaded into an adaptor sleeve coupling **36**. The adaptor sleeve coupling **36** corresponds very closely to the mouthpiece of a conventional brass instrument except that it is threaded internally for receiving the threaded portion of the audio output sleeve **34**. The adaptor **36** is then received in the first end **38** of a conventional brass musical instrument of a type which it is desired to most closely simulate. The brass musical instrument which has been found to produce a very satisfactory result is the conventional bugle (FIG. 1), which has a proportionately long first portion of substantially constant diameter, which is represented by the coiled portion **38***a*, and a short bell flare **38***b* at the second end thereof.

In operation, the electronic organ functions in the conventional manner when played by an artist. When the "brass" stop is pressed, the generated wave signals from the oscillator bank **12** are fed, when the corresponding key on keyboard **14** is pressed, to the brass formant circuit **16**. The waves are shaped or "formed" by the

formant circuit **16** to contain the various harmonics of the sounds of brass musical instruments. The shaped brass signals are then amplified by amplifier **20** and applied to the audio driver **22** which produces an audio signal having a harmonic content substantially like that of the shaped electrical signal from the formant circuit. The audio signal produced by the audio driver is then mechanically modified by the brass instrument to produce the final "brass voice."

From the above detailed description, it will be evident that a novel voice formant system has been described for producing an acceptable "brass voice" by the combination of electronic and mechanical formant components. Experimentation has revealed that the combination of mechanical parts comprising the diaphragm audio driver and the brass horn is useful in providing unique and aesthetic "voices" when used in combination with electronic formant circuits which normally produce reed and string voice simulations, although its principal and most authentic use is in combination with the brass formant circuitry. Therefore, it is to be understood that various changes can be made in the components of the combination without departing from the spirit and scope of my invention as defined by the appended claims.

I claim:

1. An electronic organ formant system for producing a simulated brass sound comprising in combination:

a plurality of oscillator means for producing a plurality of electrical signals of frequency corresponding to that of various musical notes;

a power source for driving the oscillator means;

keying means for selectively producing the various electrical signals;

electronic circuit formant means receiving the various electrical signals for shaping the signals to form voicing signals having frequency content simulating that of sound waves produced by a brass instrument;

a diaphragm audio driver means connected to receive the voicing signal from the formant means for producing an audio signal; and

a horn having a long tubular portion of substantially constant diameter at the first end thereof and a short bell flare at the other end thereof, the horn being coupled at the first end thereof to the audio driver means for receiving the audio signal therefrom whereby a simulated brass sound will be produced as a result of the combination of the electrical voicing signal producing a corresponding audio signal and the mechanical forming of the audio signal by the horn.

2. In combination with an electronic organ having electronic voice formant means for selectively producing electrical signals of frequency content and shape approximating the frequency content and shape of audio signals produced by a brass musical instrument, an audio driver connected to receive the electrical signals and produce an audio signal, and a bugle having a proportionately long portion of generally constant, proportionately small diameter extending from the first and to a short bell flare at the second end, the first end of the bugle being coupled to the audio driver for receiving the audio signal therefrom and producing an audible sound simulating the sound of a brass instrument.

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