United States Patent

[11] **3,571,480**

[72] Inventors **Clyde L. Tichenor**
Sepulveda, Calif.;
Jody C. Hall, Elkhart, Ind.

[21] Appl. No. **651,178**
[22] Filed **July 5, 1967**
[45] Patented **Mar. 16, 1971**
[73] Assignee **Warwick Electronics Inc.**
Chicago, Ill.

[54] **FEEDBACK LOOP FOR MUSICAL INSTRUMENTS**
1 Claim, 2 Drawing Figs.

[52] **U.S. Cl.** **84/1.05,** 84/470, 84/383, 179/1
[51] **Int. Cl.** **G10m 3/00,** G10d 9/02
[50] **Field of Search** ..... 84/1.04, 1.065—8, 1.05, 1.07—1.10, (FB) (feedback), (MR)(Mechanical Ronsator), 93, 470; 179/M (Musical)

[56] **References Cited**

UNITED STATES PATENTS

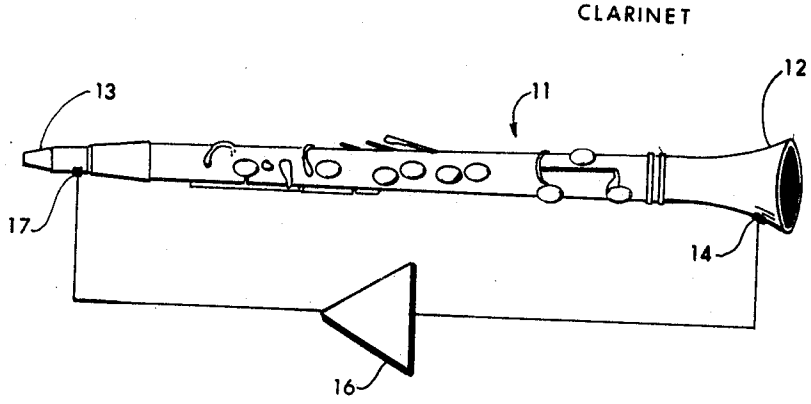
1,688,450	10/1928	Corbett	84/93X
1,893,940	1/1933	Hammond, Jr.	84/1.05
2,001,723	5/1935	Hammond, Jr.	84/1.05
2,138,500	11/1938	Miessner	84/382X
2,494,394	1/1950	Johnson	84/1.04
2,574,591	11/1951	Rudd	84/1.04X
2,762,781	3/1954	Miessner	84/1.05
2,948,178	8/1960	Jacobson	84/1.04X
2,984,140	5/1961	Barron	84/1.04
3,144,801	8/1964	Abreo	84/1.04X
3,377,716	4/1968	Schmoyer	84/470X

OTHER REFERENCES

Douglas, et al., " The electronic Musical Instrument Manual" , Chapter IV, " The Production & Mixing of Electrical Oscillations" , pp.97— 100, Pitman Pub. Corp. 1957, ML 1092 D6

Primary Examiner—Herman Karl Saalbach
Assistant Examiner—Wm. N. Punter
Attorney—Warren T. Jessup

ABSTRACT: An electrical pickup is secured to the output of a musical instrument, such as the bell end of a horn. The signal is amplified. The output of the amplifier is applied through a feedback loop to the input of the musical instrument, such as the mouthpiece of the horn. The feedback loop includes a small speaker. In one form of the invention, the speaker is mounted at the mouthpiece of the horn so that its output fortifies the input acoustic energy developed at the mouthpiece by the instrument player. In another form of the invention, the speaker consists of an earphone worn by or held against the ear of the instrument player. In this case the instrument player himself modifies his playing mode in accordance with what he hears in the earphone. Thus the player himself is involved in the feedback loop.



CLARINET

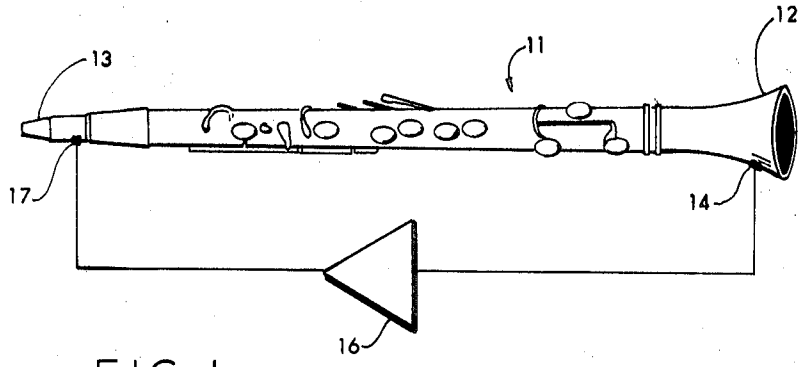


FIG. 1.

TROMBONE

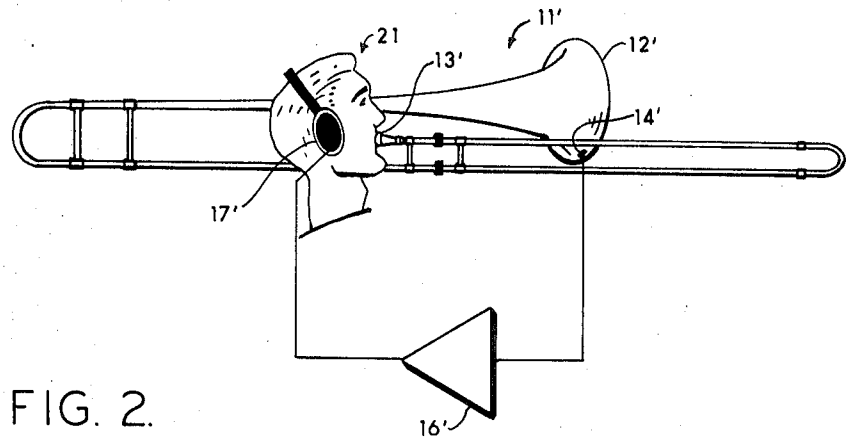


FIG. 2.

INVENTOR.
CLYDE L. TICHENOR
JODY C. HALL
BY Warren T. Jessup
ATTORNEY

FEEDBACK LOOP FOR MUSICAL INSTRUMENTS

BACKGROUND OF THE INVENTION

The playing of certain musical instruments, for example, horns, often requires the instrument player to develop a rather high level of acoustic musical energy at the mouthpiece of the horn. This takes a great deal of skill and is quite tiring. In fact, in the case of high frequencies, it is virtually unattainable by any but the most proficient performers. The first disclosed form of the present invention remedies this problem by allowing the performer to play such an instrument with much greater ease, particularly in the development of high frequencies.

Another problem encountered by musical instrument performers, particularly horn players, is the inability of the player to discern exactly what his instrument is sounding, when located in an environment of high background acoustic energy, as, for example, when playing in an orchestra or band. This is particularly acute in the case of a horn player, because the sounds which he is making are directed away from his own ears, whereas those being made by his fellow performers are often directed right into his ears. Not hearing exactly what he is playing, it is extremely difficult for the player to perform with precision, because he cannot correct for slight errors which he might make. This is particularly true for instruments such as the slide trombone, where the only guide which the player has for manipulating his hands is the sounds which reach him through his own ears. The second disclosed form of the invention aims at alleviating this problem.

Both disclosed forms of the present invention are characterized by a feedback loop from the output or bell end of the horn, back to the input or mouthpiece end.

SUMMARY OF THE INVENTION

A positive feedback loop, involving an amplifier, is applied between the output of a musical instrument, such as the bell end of a horn, back to the input of the instrument, such as the mouthpiece of the horn.

In one form of the invention the feedback loop has a small speaker which is mounted at the mouthpiece of the horn and receives the output of the amplifier. In this location its output serves to fortify the acoustic energy developed in the mouthpiece by the instrument player. It thus makes the playing much easier, since the performer need not develop so much acoustic energy himself. In the case of high frequencies, the invention often makes possible the playing of notes which would otherwise be unattainable by many players.

In a second form of the invention the feedback loop includes the performer himself. In this case the speaker consists of an earphone worn by the player. The player is thus able to accurately hear and appraise his own performance, and make appropriate corrections so as to produce exactly the sound which he wishes. This is particularly valuable when playing in a high-level acoustic background, as in an orchestra or band, where the sound of other instruments is constantly beating on the ears of the horn player.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates schematically the first form of the present invention;

FIG. 2 illustrates the second form of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, 11 designates a musical instrument such as a clarinet, having an output in the form of an end bell 12 and an input in the form of a mouthpiece 13. The clarinet player, by vibrating the reed in the mouthpiece, creates at that point acoustic energy in the range of musical frequencies. This energy is in effect tuned or filtered in the body of the clarinet and emerges from the bell 12 as a musical tone having a timbre which is unique to the instrument.

In accordance with the present invention, a small acoustic electric pickup 14, preferably a dynamic pickup, is mounted at the bell 12 of the horn 11. The musical tone signals from the pickup 14 are applied to the input of an audio amplifier 16. The output from the amplifier 16 is applied to a small electroacoustic transducer or speaker 17, which is mounted at the mouthpiece 13. The speaker 17 is preferably a dynamic speaker and may, in fact, be structurally exactly the same as the pickup 14.

The speaker 17 transduces the musical tone signals applied to it into acoustic energy of corresponding frequencies, which, appearing at the mouthpiece 13, serves to fortify the acoustic energy developed or generated by the instrument player. The loop thus formed by the pickup 14, amplifier 16, and speaker 17, thus constitutes a positive feedback loop.

The gain of the amplifier may be adjusted either above or below the regenerative level.

When the amplification gain falls short of the oscillation point, the instrument player retains full control over the tone sounded by the instrument. The effort required to sound the instrument is, as noted hereinbefore, measurably decreased. This type of operation is uniquely suited for lip-reed horns, where the tone sounded by the instrument is a function of lip manipulation, as well as the manual action of the player in playing the stops, slides, or other manually operable members.

In the second form of the invention, shown in FIG. 2, the amplifier 16′ output is also applied to a small speaker, but in this case the speaker is mounted in an earphone 17′ worn by the instrument player 21. As in the previous embodiment, the trombone shown in FIG. 2 includes a bell 12′ of the horn 11′ having a pickup 14′ mounted on the bell and connected to the amplifier 16′. Hearing accurately what he is playing, the performer 21 intuitively adjusts his mode of playing, both orally and manually, to create the desired results. He thus continually serves as a link in the feedback loop from the horn (trombone 11′), through the amplifier 16′, and back to the horn mouthpiece 13′.

The form of the invention shown in FIG. 2 is particularly useful when used in an area of high acoustic level background, as for example, when playing in a band or orchestra. Under these circumstances the player 21 usually hears the instruments of his fellow performers much more predominantly than he does his own. He is thus forced: to distinguish which of the sounds is his own instrument; to ignore the interfering sounds; and to compensate in accordance with what he alone is sounding. With the invention shown in FIG. 2, the surrounding sounds are, of course, still audible, but the earphone 17′ causes the player's own instrument to heavily predominate, so that he can easily and without strain adjust his playing in accordance with the output of his own instrument.

Even when playing alone, particularly indoors, the form of the invention shown in FIG. 2 is useful, because it gives the performer a more accurate acoustic or sonic picture of what his audience is hearing. That is, his listeners receive the sounds of the horn 11′ in a direct path, whereas the performer himself receives them primarily from echos off the walls, ceiling, and floor of the room. By use of the invention illustrated in FIG. 2, the performer receives the sound from his own instrument with more of the timbre heard by his listeners, and free from the modifying effects of the reflecting environment.

Whereas the present invention has been shown and described herein in what is conceived to be the best mode contemplated, it is recognized that departures may be made therefrom within the scope of the invention which is, therefore, not to be limited to the details disclosed herein, but is to be afforded the full scope of the invention as hereinafter claimed.

We claim:

1. Feedback loop for a musical instrument comprising:

a musical instrument having input means at which there is developed acoustic energy of musical frequencies, and output means from which acoustic energy is delivered;

pickup means located at said output means for transducing said acoustic energy into corresponding electric signals;

amplifier means for amplifying signals from said pickup means; and

feedback means including speaker means located at said input means and connected to said amplifier means for linking the output of said amplifier means to said input means.