United States Patent

[11] 3,553,339

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[21] Appl. No. **689,495**
[22] Filed **Dec. 11, 1967**
[45] Patented **Jan. 5, 1971**

[54] **DRUM-LIKE MUSICAL INSTRUMENTS WITH ELECTRICAL PICKUPS AND CIRCUITRY**
5 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **84/1.15**
[51] **Int. Cl.** **G10d 13/02**
[50] **Field of Search** ..... 84/1, 2, 3, 104, 411, 412, 415, 462, 1.15, 1.24, 1.27, G, K, MR; 84/1.01, 1.03, 1.04, 1.14, 1.16

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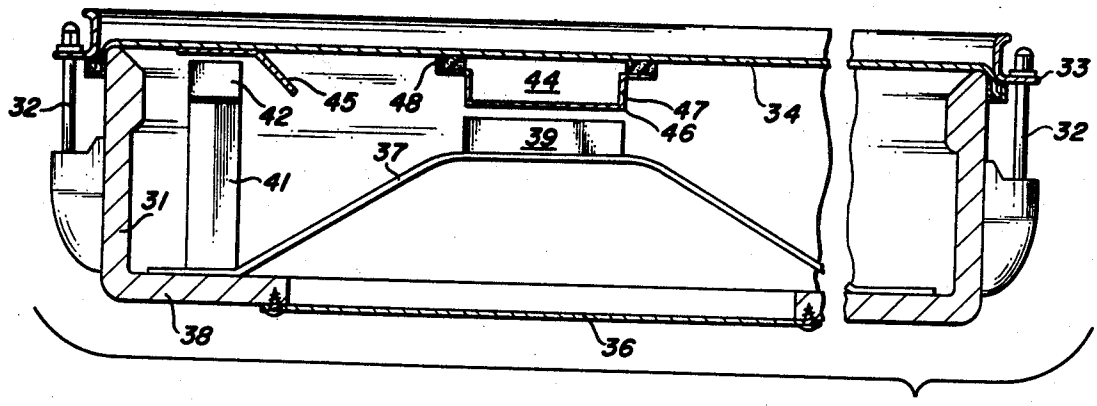
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ABSTRACT: Musical instruments for electrically producing diverse drumlike sounds which include a rigid frame, a vibratable diaphragm carried by the frame, one or more metal foils on the diaphragm, and one or more variable reluctance pickup cartridges on the frame. A tom-tom is provided with a bridge and reverberation strings, and a snare is provided with a damping arm. A transportable cabinet with amplifiers, tone controls, and a speaker is provided for the tom-toms, snare, and other drumlike instruments.



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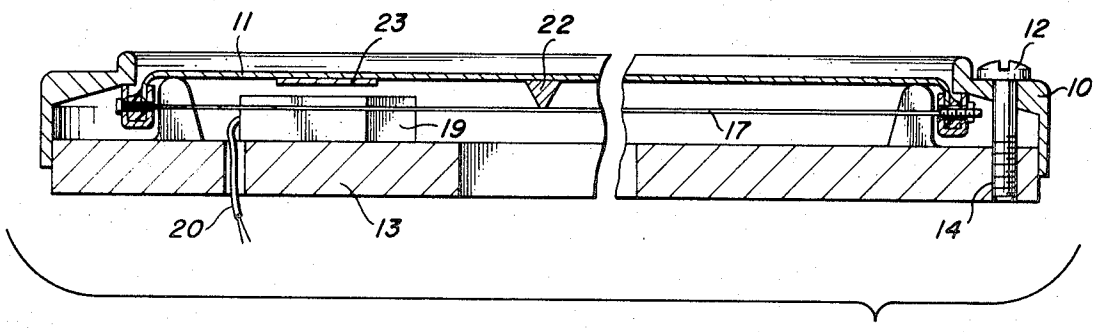


fig. 4

fig. 3

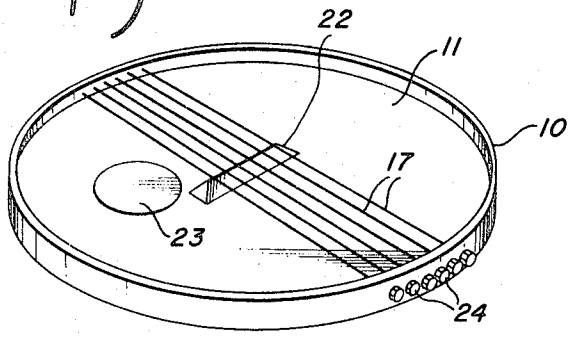


fig. 2

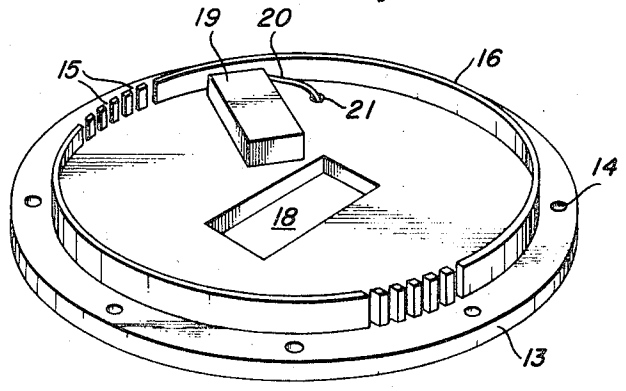
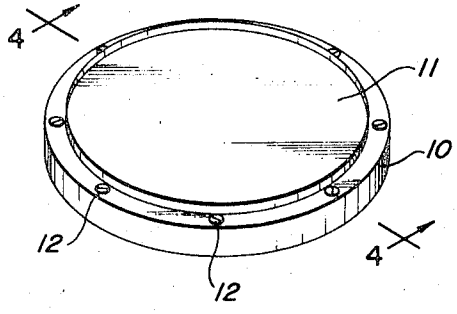


fig. 1



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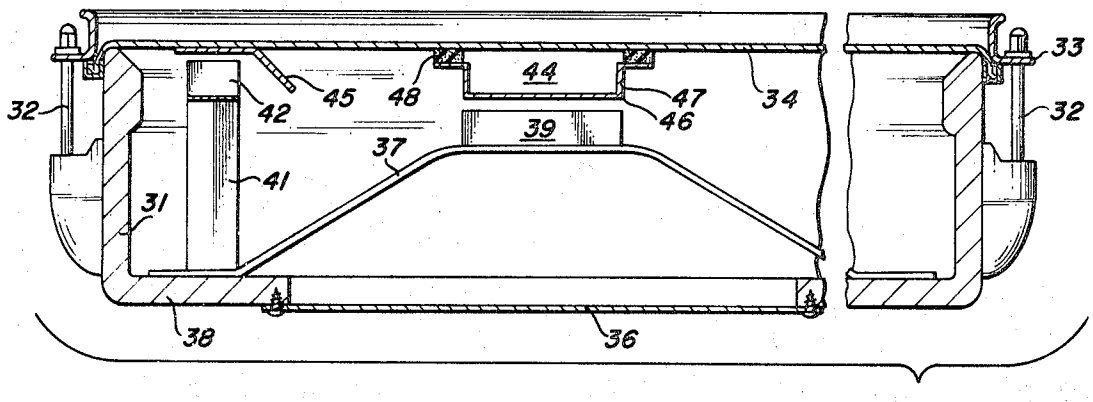


fig. 8

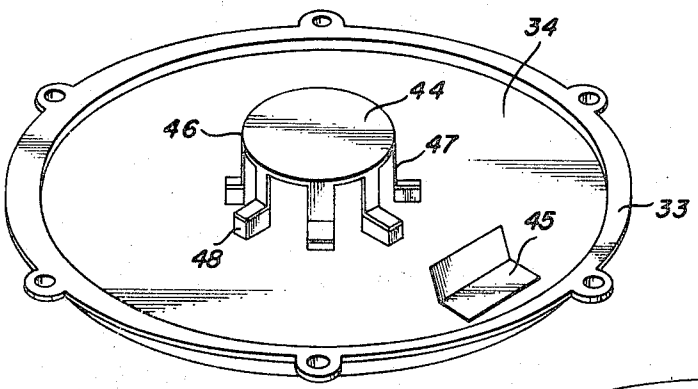


fig. 7

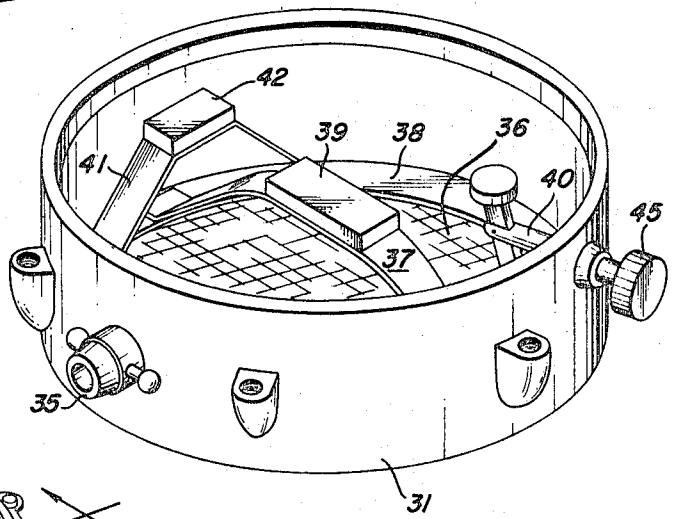


fig. 6

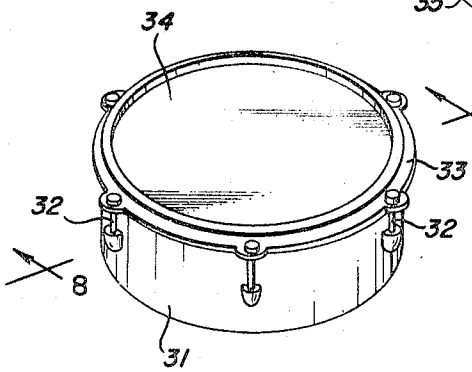


fig. 5

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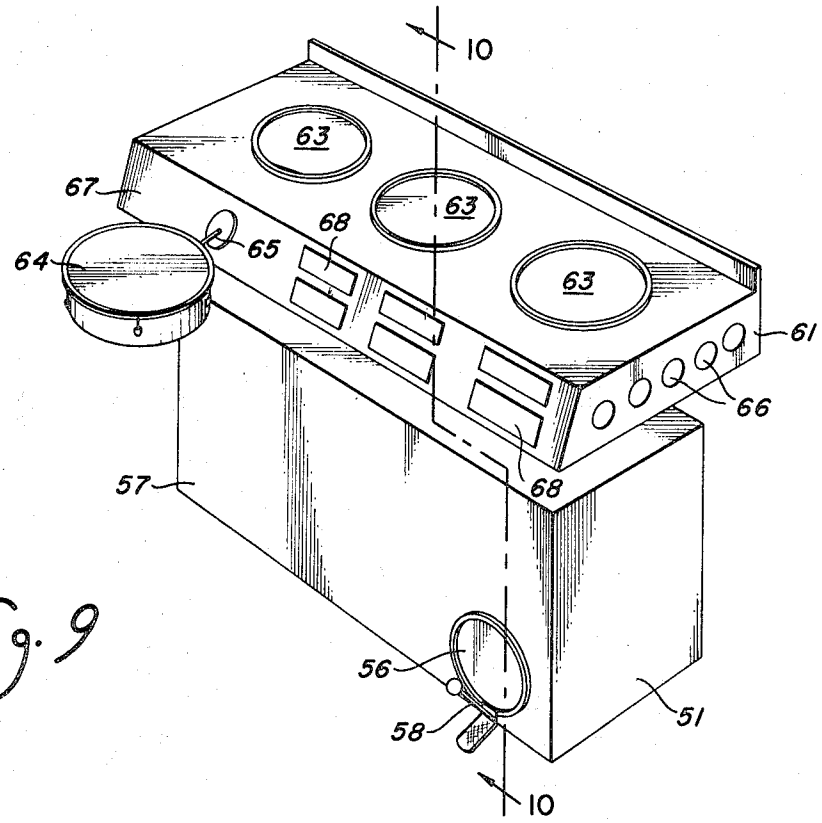


fig. 9

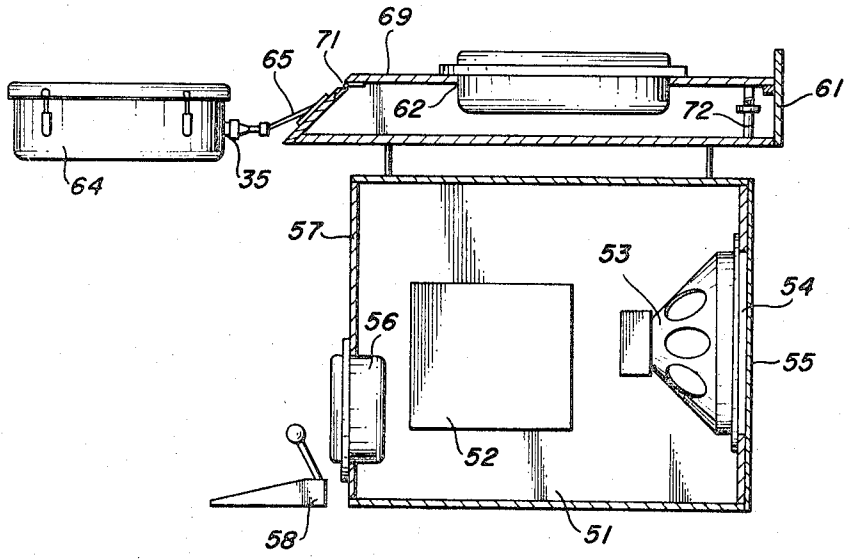


fig. 10

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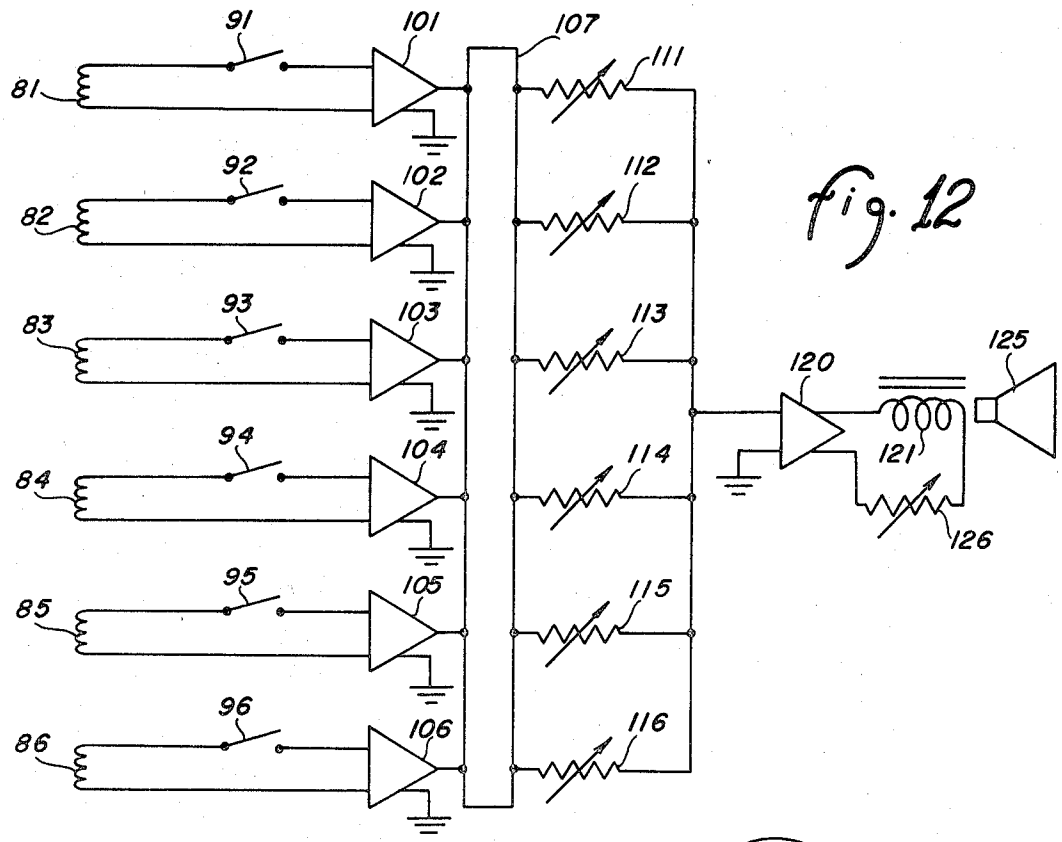
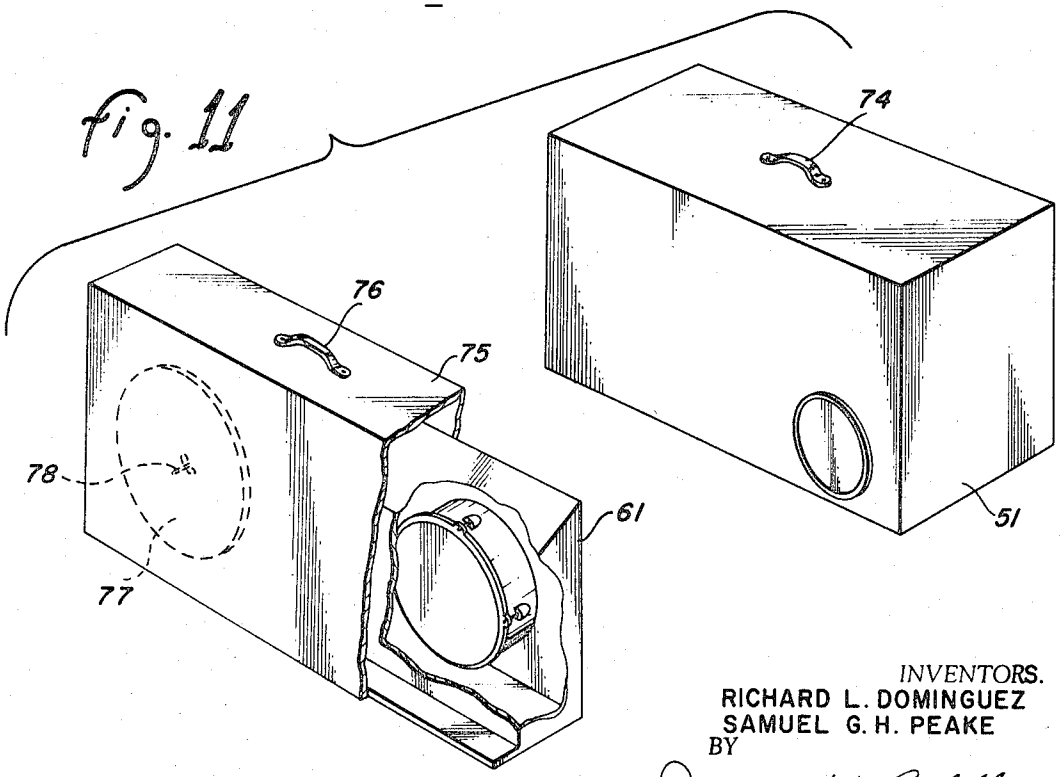


Fig. 12

Fig. 11



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DRUM-LIKE MUSICAL INSTRUMENTS WITH ELECTRICAL PICKUPS AND CIRCUITRY

This invention relates to a novel musical instrument.

More specifically, the invention concerns a novel percussion musical instrument which produces a drumlike sound which is electrically amplified and transmitted to the listener.

In still another respect, the invention relates to a novel combination of devices which perform the function of a set of so-called "traps," but which is much more compact and more easily stored and transported than conventional traps.

In yet another aspect, the invention concerns means for duplicating the sound of snare drums, tom-toms and bass drums normally employed in trap sets.

In still another aspect, the invention concerns apparatus which can be adjustably controlled by the player to mix and balance the sounds produced to achieve a wider and more varied range of sounds than is practically possible with the prior art traps.

In yet another respect, the invention relates to an integrated apparatus for storing, transporting and using novel percussion musical instruments which, in combination, perform all of the functions of a set of traps.

In musical organizations such as dance bands, it is common for a single performer to play all of the percussion instruments. These instruments are easily arranged in an array of snare drums, tom-toms, bass drum, cymbals, etc, collectively known as a set of "traps." The traps are ordinarily quite cumbersome, difficult to store and transport, require a substantial amount of time to assemble in proper operative relationship prior to performance, and require additional time and effort to disassemble after each performance for further transportation and storage.

Commonly and typically a trap set will include at least one snare drum, one or more toms, at least one base drum and a cymbal. The base drum may be several feet in diameter and the toms and snares, while being smaller in diameter, are nevertheless of sufficient thickness to require substantial space. The cymbal is usually disposed on a vertical stand which must be collapsed for storage and transportation. All of the elements of the common prior art trap set are arranged and usually interconnected by means of brackets and stands to form a rather complicated assembly which usually requires a considerable amount of time prior to and after a performance to assemble and disassemble.

It would be highly advantageous to provide apparatus of smaller physical dimensions for duplicating the drum and percussion sounds of a common trap set and which would be more easily stored, transported, assembled and disassembled.

It is therefore a principal object of this invention to provide simplified apparatus for duplicating the drum and percussion sounds of a common trap set.

Another object of the invention is to provide individual assemblies for reproducing snare, tom and bass drum sounds but which are of reduced physical dimensions.

Still another object of the invention is to provide means for producing and electrically amplifying and transmitting drumlike sounds.

Yet another object of the invention is to provide novel electrical drums which can be adjustably controlled to provide a wider range of effects than is practically possible from conventional drums.

Still another object of the invention is to provide a more convenient and less time-consuming method of storing, transporting, assembling and disassembling the prior art traps.

These and other, further and more specific objects. and advantages of the invention will become apparent from the following detailed description of the invention taken in conjunction with the drawings, in which:

FIG. 1 is a perspective view of a tom drum embodying the present invention;

FIG. 2 is a perspective view of the lower portion of the tom drum of FIG. 1 with the cover removed for purposes of illustration;

FIG. 3 is a perspective view of the lower side of the cover portion of the tom drum of FIG. 1;

FIG. 4 is a sectional view of the tom drum of FIGS. 1—3 taken along section line 4–4 of FIG. 1;

FIG. 5 is a perspective view of a snare drum embodying the present invention;

FIG. 6 is a perspective view of the lower portion of the snare drum of FIG. 5 with the cover removed for purposes of illustration.

FIG. 7 is a perspective view of the lower side of the cover portion of the snare drum of FIG. 5;

FIG. 8 is a sectional view of the snare drum of FIGS. 5—7 taken along section line 8–8 of FIG. 5;

FIG. 9 is a perspective view of the assembly of components illustrated in FIGS. 1—8 to form an easily portable and readily assemblable set of traps;

FIG. 11 is a cross section of the trap set assembly of FIG. 9 taken along section line 10–10 thereof;

FIG. 11 is a perspective view of the trap set of FIGS. 9 and 10 in disassembled condition ready for transportation and storage with portions of the containers broken away for clarity of illustration; and

FIG. 12 is a schematic electrical circuit illustrating the apparatus and method of introducing, amplifying and transmitting the sound produced by my novel instrument.

Briefly, in accordance with one embodiment of my invention, we provide a novel drumlike musical instrument comprising a substantially rigid frame, vibratable diaphragm means forming a drum head carried by the frame, and signal generating means integral with the instrument for generating an electrical signal in response to vibration of the diaphragm means.

In a preferred embodiment, the signal generating means comprise a ferromagnetic member and a variable reluctance pickup member for generating an electrical signal in response to the time rate of change of the distance between the ferromagnetic member and the pickup member. One of the members is carried by the diaphragm means and is vibratable therewith while the other of the members is carried by the frame. In general, we prefer to affix the ferromagnetic member to the diaphragm means and the variable reluctance pickup member is carried by the frame, vibrations of the diaphragm means causing differences in the time rate of change of the distance between the members, thereby generating an electrical signal.

To produce the "tom-tom" sound, we provide tension strings stretched across and carried by the rigid frame beneath the diaphragm and bridge means which mechanically intercouple the tension strings and the diaphragm, thereby to induce sympathetic vibrations in the tension string in response to vibration of the diaphragm. These sympathetic vibrations enhance the reverberation effect, providing harmonics of the basic frequency of vibration of the diaphragm to produce the desired tone sound.

The drums embodying the principles of my invention are desirably provided with means for adjustably damping the vibration of the diaphragm to provide varied tonal qualities. In this way, the performer can achieve different tonal qualities for each of the several drums comprising the trap set to provide the desired overall balance of drum and percussion sounds.

The signal generating means are preferably provided with means for adjustably controlling the amplitude of the electrical signal, thereby enabling the performer to adjust the volume of each of the drums to achieve the desired overall aural effect and providing for variations in the overall aural effect which are not practically obtainable from common prior art trap sets.

Turning now to the drawings, which in conjunction with the following description will enable those skilled in the art to understand and practice the invention and the preferred embodiments thereof, each of the reference characters denotes similar parts in the respective views.

FIG. 1 is a perspective view of a tom-tom drum embodying the present invention and depicts a circularly shaped rigid frame 10 and a vibratable diaphragm member 11 carried by

the frame 10. The diaphragm member 11 can be fabricated of any suitable material; for example, various plastics and treated papers may be employed in accordance with art-recognized techniques for manufacturing normal drum heads. In a preferred embodiment of my invention, we employ the diaphragm head heads normally used in practice drum pads, for example, those commercially available under the trade name "Weather King" manufactured by Remo, Inc. The diaphragm 11 is affixed to the frame and stretched to produce the required tension by means of threaded adjusting screws 12.

FIG. 2 illustrates the drum apparatus of FIG. 1 with the diaphragm member 11 and the tensioning frame 10 removed to expose the base frame member 13 provided with threaded holes 14 which receive the adjusting and tensioning screws 12. A series of slots 15 are provided in the rim 16 of the base frame 13. These slots register with reverberation tension strings 17 carried in the tensioning frame 10 of the head portion. The base member 13 is provided with an aperture 18 which prevents the assembly from being airtight which would interfere with the operation of the drum due to air pressure variations when the drum head is vibrated. The variable reluctance pickup cartridge 19 is mounted within and affixed to the base member 13, and the electrical leads 20 pass from the cartridge 19 through an aperture 21 in the base member 13.

Turning to FIG. 3, the diaphragm 11 is stretched over a tensioning frame 10 which also carries reverberation tension strings 17 stretched across the frame 10 beneath the diaphragm 11. The tension strings are mechanically intercoupled with the diaphragm means of a suitable bridge member 22 which transmits vibrations from the diaphragm 11 to the strings 17, thereby improving the harmonic content of the sound produced when the diaphragm 11 is vibrated. A ferromagnetic member 23, in this case a thin piece of metal foil, is glued directly to the bottom side of the diaphragm 11 and is positioned upon the diaphragm proximate to the variable reluctance cartridge when the head and base members of FIGS. 2 and 3 are assembled. The tension of the strings is adjusted by means of knurled screws 24 carried by the tensioning frame 10.

FIG. 4 depicts the drum assembly of FIGS. 1—3 in cross section and shows the operative relationship of the various elements described above in connection with the description of FIGS. 1—3.

The drum assembly of FIGS. 1—4 is employed in the practice of my invention as a substitute for the tom-tom drums found in the typical traps of the prior art and as a substitute for the bass drum of the prior art trap set, as will appear more fully later.

The snare drum which we provide in the practice of our invention is depicted in FIGS. 5—8 and has the capability of providing both snare and tom sounds by appropriate adjustment of the controls.

FIG. 5 is a perspective view of the combination snare-tom drum and includes a rigid frame 31 provided with tensioning screws 32 which affix a tensioning frame 33 holding a vibratable diaphragm 34.

FIG. 6 illustrates the drum of FIG. 5 with the head assembly removed. The rigid frame 31 is provided with a positioning bracket 35. The bottom of the frame 31 is provided with a large screen-covered hole 36 to reduce air pressure fluctuations within the drum. A mounting bracket 37 affixed to the rim 38 of the hole 36 carries a first variable reluctance pickup cartridge 39. A second mounting bracket 41 carries a second variable reluctance pickup cartridge 42. A damping arm 40 controlled by an adjusting screw 45 is mounted inside the enclosure of the frame 31 and is adapted to damp the vibrations of the diaphragm 34 to adjust the tone of the drum.

FIG. 7 depicts the head of the drum assembly of FIG. 5 and shows the tensioning frame 33, the diaphragm 34 and two ferromagnetic members 44 and 45. The first ferromagnetic member 44 is in the form of an upstanding circular portion 46 spaced from the diaphragm 34 by support legs 47 which, in turn, are secured to the diaphragm 34 by felt pads 48 glued to the diaphragm 34. The second ferromagnetic member 45 is a piece of bent foil secured directly to the diaphragm 34 in the manner previously illustrated in connection with the drum of FIGS. 1—4. The first ferromagnetic member 44 registers with the first variable reluctance pickup cartridge 39, and the second ferromagnetic member 45 registers with the second variable reluctance pickup cartridge 42 when the head assembly of FIG. 7 is assembled with the base assembly of FIG. 6.

FIG. 8 is a cross-sectional view of the assembled components of FIGS. 5—7. The pickup 39 and ferromagnetic member 44 produce an electrical signal which duplicates the normal snare sound, and the pickup 42 and ferromagnetic member 45 produce an electrical signal which duplicates a tom sound. These sounds can be mixed or selected separately by means of electrical controls as will be described below.

FIGS. 9 and 10 illustrate the drums of FIGS. 1—8 mounted in playing position in a cabinet structure which serves the dual purpose of supporting the drums during playing and which also provides receptacles for providing transporting and storage of the drums when not in use. A base cabinet 51 encloses an electronic amplifier 52, a suitable speaker system 53 which plays through an opening 54 covered with speaker cloth 55. The bass drum unit 56 is mounted in the rear side 57 of the base cabinet 51 at a height above the floor level where it can be struck by the foot-pedal-operated mallet 58. The upper cabinet 61 is provided with openings 62 which receive and support a plurality of tom drums 63. The snare drum 64 is supported by means of a mounting bracket 65 attached to the drum bracket 35. The upper cabinet 61 is provided with vent holes 66 to equalize the air pressure on either side of the drum diaphragm. The rear edge 67 of the upper cabinet 61 is inclined and provides mounting panels 68 for the electrical switches and tone and volume controls for each of the drums and the amplifier. The top 69 of the upper cabinet 61 is hinged at its rear edge 71 and is provided with a height adjusting screw 72 such that the operator can vary the inclination of the top to obtain the desired angle of the drum playing surface according to his preference.

The assembly of FIGS. 9 and 10 can be disassembled and stored or transported in two suitcaselike enclosures as shown in FIG. 11. The base cabinet 51, which contains the bass drum, amplifier and speaker, is provided with a carrying strap or handle 74 and can be stored or transported as a single unit. The upper cabinet 61 slides inside a suitcaselike enclosure 75 provided with a carrying handle 76. The second suitcase may also contain provision for storage and transportation of other elements of trap sets such as cymbals, the bass drum foot pedal, etc. For example, cymbal 77 may be secured to the inside of the second suitcase 75 by means of a suitable wing nut 78 as indicated by the dashed lines.

FIG. 12 is a schematic circuit diagram in partial block form showing a representative circuit which may be employed in the system of the present invention. A plurality of pickup coils 81—86 are utilized to detect and translate the varying reluctance generated in the pickups to corresponding alternating electrical signals. Pickup coils 81, 82 and 83 are utilized to detect the vibrations of the toms while pickup 84 is used to detect the vibrations of the bass. Pickups 85 and 86 are similarly utilized to detect vibrations of the snare with pickup 85 provided for the of the snare sound while the pickup 86 is used for the detection of the tom sound. Each of the pickups is connected through series-connected switches 91—96 to preamplifiers 101—106. A tone control 107 is provided to receive the output of each of the preamplifiers to enable the tonal quality of the representing electrical signal to be altered to thereby permit the operator to select a tone for the connected instrument to suit his tastes. A control is provided for each of the input conductors such that each of the pickup devices, and therefore each of the drums, is provided with a tone control. The outputs of the tone control pass through a variable at-

tenuating resistor 111—116 and are ultimately connected to amplifier 120. The amplifier 120 is connected directly to the coil 121 of the speaker 125. It may be noted that the coil is connected in series with an attenuating resistor 126 (also variable) to provide volume control. The operation of the circuit of FIG. 12 is manifest and it may be seen that any one or combination of drums may be connected to the output amplifier 120 by closing the corresponding switch. Further, the snare drum may have either or both the snare sound and tom sound connected to the output amplifier 120. In those instances where more than one drum is connected through its preamplifier to the output amplifier 120, relative signal levels may be adjusted by adjusting the attenuating resistors 111—116 connected in series therewith. The overall loudness or volume is readily adjusted by the attenuating resistor 126. In this manner, any combination of drums and drum sounds may be achieved by simply selecting the appropriate switches and setting the corresponding attenuating resistors to the desired position.

Various changes and modifications of the invention can be made and, to the extent that such variations incorporate the spirit of this invention, they are intended to be included within the scope of the appended claims.

We claim:

1. A drumlike musical instrument comprising:
a. a substantially rigid frame;
b. vibratable diaphragm means forming a drum head carried by said frame; and
c. signal generating means spaced from said drum head integral with said instrument for generating an electrical signal in response to vibration of said diaphragm means, said generating means comprising a ferromagnetic member, a variable reluctance pickup member for generating an electrical signal in response to the time rate of change of distance between said ferromagnetic member and said pickup member, one of said members being carried by said diaphragm means and vibratable therewith, and the other of said members being carried by said frame.

2. Instrument of claim 1 which includes: a. tension strings stretched across and carried by said rigid frame beneath said diaphragm means; and b. bridge means mechanically intercoupling said snare strings and said diaphragm means.

3. Instrument of claim 1 which includes means for adjustably damping the vibration of said diaphragm means.

4. A drumlike musical instrument comprising:
a. a substantially rigid frame;
b. vibratable diaphragm means forming a drum head carried by said frame;
c. signal generating means integral with said instrument including; a ferromagnetic member carried by said diaphragm means and vibratable therewith, and a variable reluctance pickup member for generating an electrical signal in response to the time rate of change of distance between said ferromagnetic member and said pickup member when said ferromagnetic member vibrates with said diaphragm means;
d. means for adjustably damping the vibration of said diaphragm means;
e. means for adjustably controlling the amplitude of said electrical signal from said variable reluctance pickup member; and
f. amplifier-speaker means for amplifying said controlled signal and aurally transmitting said amplified signal to a listener.

5. A drumlike musical instrument comprising:
a. a substantially rigid frame;
b. vibratable diaphragm means forming a drum head carried by said frame;
c. signal generating means integral with said instrument including;
a ferromagnetic member carried by said diaphragm means and vibratable therewith; and
a variable reluctance pickup member for generating an electrical signal in response to the time rate of change of distance between said ferromagnetic member and said pickup member when said ferromagnetic member vibrates with said diaphragm means;
d. tension strings stretched across and carried by said rigid frame beneath said diaphragm means;
e. bridge means mechanically intercoupling said tension strings and said diaphragm means;
f. means for adjustably controlling the amplitude of said electrical signal from said variable reluctance pickup member; and
g. amplifier-speaker means for amplifying said controlled signal and aurally transmitting said amplified signal to a listener.