

# United States Patent

May

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## [54] PERCUSSION INSTRUMENT

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[21] Appl. No.: 156,994

### Related U.S. Application Data

[63] Continuation of Ser. No. 782,196, Dec. 9, 1968, abandoned.

[52] U.S. Cl. 84/1.04, 84/1.13, 84/DIG. 12

[51] Int. Cl. G10h 3/00

[58] Field of Search 84/1.01, 1.04, 1.13, 1.16, 84/1.17, 1.26, DIG. 12, DIG. 30

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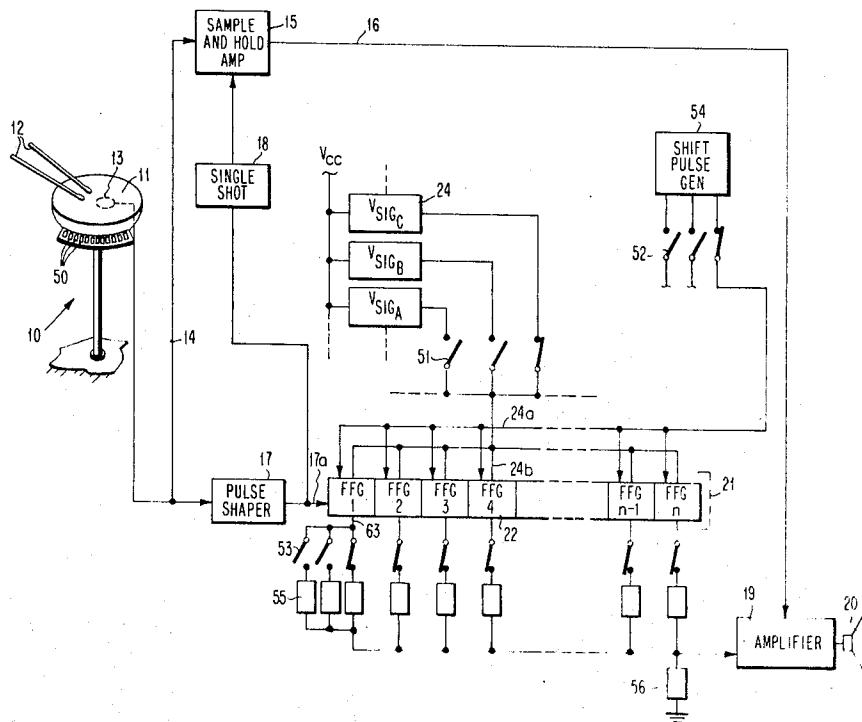
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### [57] ABSTRACT

A musical perussion instrument having components which are removably mounted on a base providing space for storage and transportation, and including a drum head transducer with electronic circuit components including a signal amplifier and sound simulators for simulating the sound of percussion instruments and other sounds in response to striking the head.

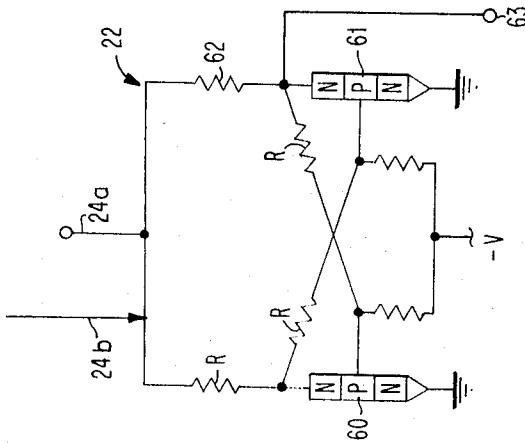
12 Claims, 4 Drawing Figures



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**FIG. 2**

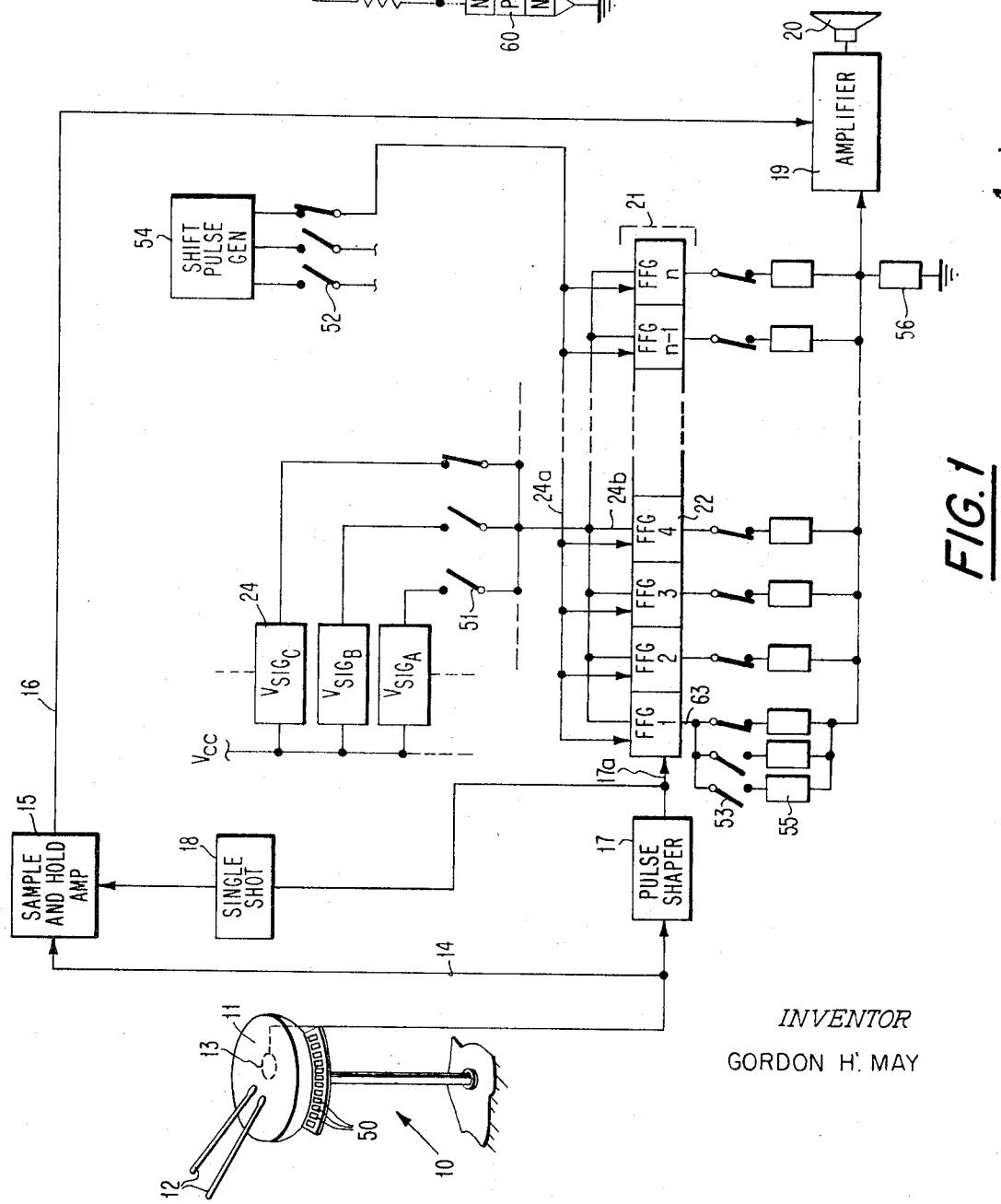


FIG. 1

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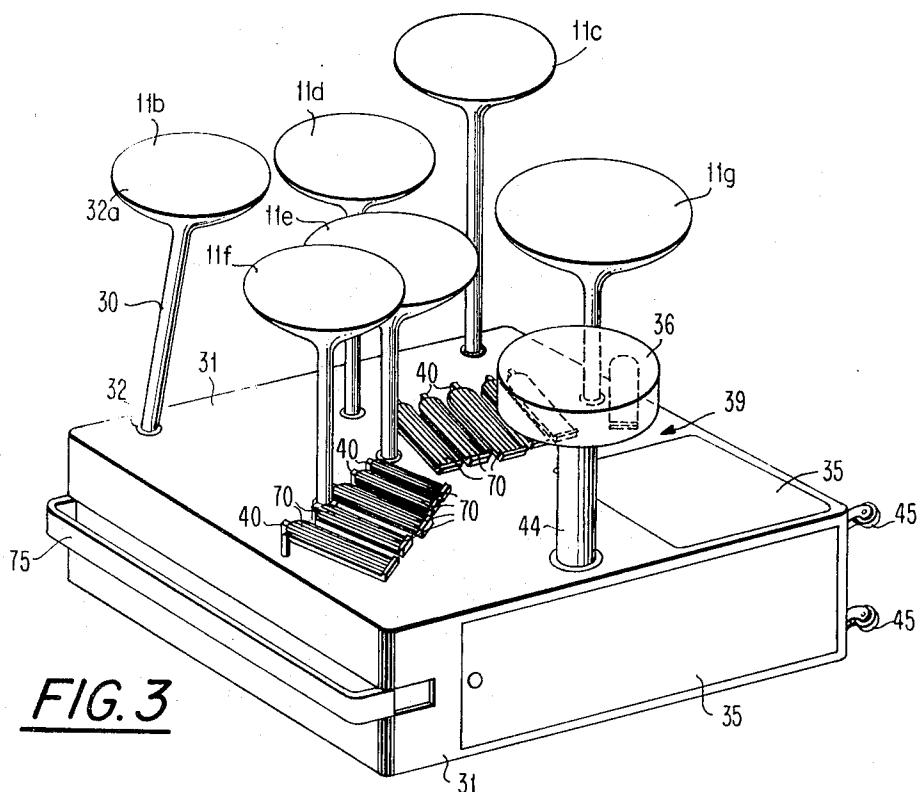


FIG. 3

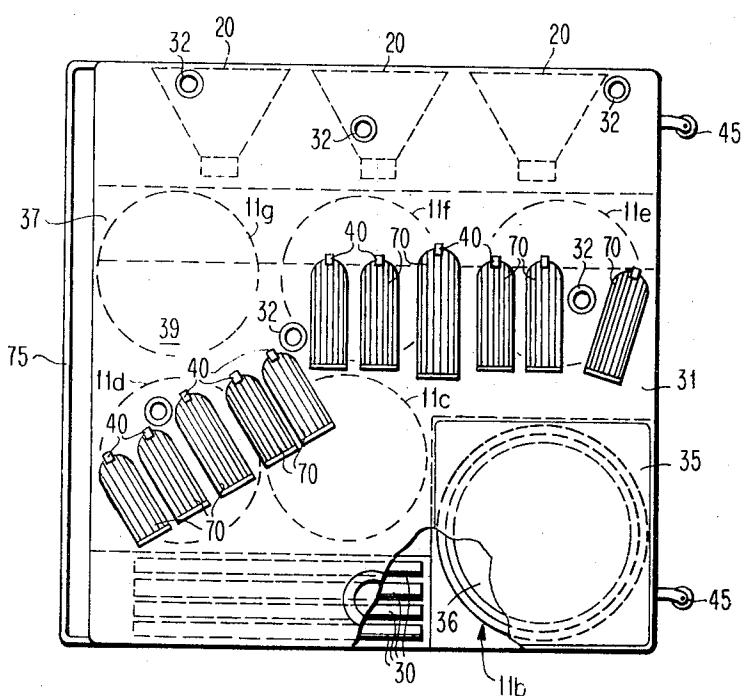


FIG. 4

## PERCUSSION INSTRUMENT

This application is a continuation of application Ser. No. 782,196 filed Dec. 9, 1968, and now abandoned.

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

This invention relates to percussion instruments, and is particularly suited for adaption to those percussion instruments employing sound synthesizing components.

## 2. Description of the Prior Art

Percussion instruments played with orchestras or other such stationarily positioned groups are usually played by one individual positioned near the middle of a plurality of different sound heads. The heads usually are struck by a stick or other suitable means to generate various percussion sounds ranging, for example, from those of bells or cymbals to those of a bass drum. The number of instruments which one player needs is governed by the demands of the music played and the physical space in which the components can be placed and easily be reached by the player. Usually for any one player the number is maintained constant since he becomes adjusted to the precise positioning of each component such that the playing, even though fast with much intermingling of the percussion sounds, is automatic in that he need not look precisely at the instruments.

Modern day music has put greater demands on the percussion player since many more sounds are being incorporated in the music. Much of this demand has been brought about with the wide ownership of high fidelity sound transcription equipment making it possible for the average listener to distinguish more expertly between the various instruments as well as to appreciate the wide frequency range of his sound equipment. Thus, the trend has been for the percussion section to include many more components which must be positioned precisely about the player for easy playing. This also has multiplied the problems of transporting and setting up the equipment for play at different locations.

The primary object of this invention is to provide a percussion instrument which will generate a wide range of sounds yet which can be easily played and efficiently and safely transported from place to place.

## SUMMARY OF THE INVENTION

A percussion instrument wherein the various heads, pedals, and seat components are removably attached to a base providing internal compartments for transportation and storage, and including electronic transducer means and control switches easily reached by the player to energize sound generating electronic equipment for producing a wide range of simulated percussion and other sounds.

The foregoing and other objects, features, and advantages of the invention will be apparent from the following description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic and circuit diagram of one embodiment of the invention,

FIG. 2 is a circuit diagram of a preferred gating circuit for the circuit of FIG. 1,

FIG. 3 is a perspective view of a second embodiment of the invention, and

FIG. 4 is a top plan view of the embodiment of FIG. 3 with the instruments shown in dotted outline stored in the base.

## DESCRIPTION OF THE INVENTION

FIG. 1 shows a percussion instrument 10 in which the subject invention can be applied. In the normal manner a head 11 is struck by a stick 12 to generate a percussion sound. Normally the sound of such an instrument occurs from the vibration of the head and results in a single sound varying in amplitude with the force with which the head is struck.

In accordance with the present invention, several sounds can be selectively generated by the striking of the single head 11. As shown in FIG. 1, the sound desired is selected by actuation of one or more of a series of switches 50. Although said switches 50 are shown to be stick or finger operated, it should be understood that positioning on the floor for foot operation may also be desirable as in the second embodiment of this invention. Means are provided responsive to the actuation of each switch for generating a sound responsive in volume to the force with which the head is struck and responsive in tone to the switch which is actuated.

When the head 11, shown in FIG. 1, is struck, the impact is detected by a transducer 13 positioned within the instrument 10. An electric signal responsive to the impact is passed through a conductor 14, the signal amplitude being a function of the force with which the head 11 is struck. This signal is conducted to a standard sample and hold circuit 15 which produces a direct output through the conductor 16 having a voltage V responsive to the amplitude of the signal in conductor 14. The transducer can be any type capable of picking up the sound vibrations generated by movement of the head 11 (as a result of being struck) and capable of transforming these sounds into an electrified signal. For instance a transducer similar to those used in electric guitars can be used. Said transducer is capable of sensing amplitude and frequency of vibrations emitting from a given stimulus.

At the same time, the transducer signal is fed to a pulse shaper 17 comprising a series of filter networks for deleting extraneous noise in the signal. Thereafter the clear signal is fed to a single shot multivibrator 18 which fires. The single shot generates (upon firing) a pulse of sufficient duration to reset the sample and hold circuit 15 after it has sampled the peak output of the signal from the conductor 14. The signal thus passed through conductor 16 controls the gain of a standard amplifier 19 driving a loudspeaker 20, thereby determining the output volume of the sound generated.

The output signal from the pulse shaper 17 also is fed through conductor 17a to a register 21 made up of a series of flip flop gate circuits 22. The purpose of the series of gates 22 is to vary with time the tone generated responsive to the head being struck. When a switch 50 is actuated, it causes a predetermined combination of switches 51, 52, and 53 to close, thereby selecting a signal source, a timing rate, and an amplitude or frequency envelope respectively. This combination is chosen to be characteristic of the instrument desired by the selection of one of the switches 50. The closing of one or more of the switches 51, 52, 53 allows a preset signal from one of the signal generators 24 to be transmitted to the loudspeaker 20 in a predetermined sequence to be explained hereinafter. By using one or more of these preset signals in a sequence, various simulated, percussion sounds are generated as a result of the striking of the head 11.

In the FIG. 1 embodiment, register 21 is a digital shift register. When the pulse shaper 17 delivers a signal through the conductor 17a to the register 21 as shown, a logical "one" is set into the leftmost flip flop gate 22 with all other such elements being understood to contain logical "zeroes." The shift pulse generator 54 delivers pulses at a rate determined by the actuation of the switches 52 to all flip flop gates causing them to shift the logical "one" from left to right and finally out the end of the register, leaving the register containing all logical "zeroes" again. As each flip flop gate 22 assumes the "one" state, it acts as a gate to pass the audio signal from the source 24 selected by switch 51 to the summing impedance 55 selected by switches 53. This impedance acts in conjunction with the reference impedance 56 to pass some portion of the audio signal to the amplifier 19 with the timing and duration of the signal portion being determined by the sound to be simulated. The pulse generator 54 is capable of generating pulse signals at different frequencies. By selecting a proper switch 52, different frequency signals are transmitted to the conductor 24a to change the rate of actuation of the gates 22. In this manner double or triple beat sounds can be generated by a single striking of the percussion head 11.

FIG. 2 shows an example of the standard flip flop gate 22 in detail. The audio gating action takes place as follows: When the circuit is in the logical "zero" state, transistor 60 is cut off, transistor 61 is saturated. The resistors R correspond to those normally used in a flip flop gate. The collector supply voltage is applied through conductor 24a with the audio signal from the selected signal source 24 superimposed. The signal is divided down by the ratio of the saturation impedance of transistor 61 to the collector load impedance 62, therefore very little signal reaches the output conductor 63. When the circuit is switched to the logical "one" state, transistor 61 becomes cut off and so looks like a high impedance. At this instant the signal applied through conductor 24a is passed directly through resistor 62 to the output terminal 63 undiminished.

FIG. 3 shows a second embodiment of the invention. Herein a plurality of contact heads 11b, 11c, 11d, 11e, 11f, and 11g are mounted on individual upright supports 30 attached to a base 31. These contact heads preferably are similar to those shown in FIG. 1 in that a percussion vibration is generated when a top-mounted membrane similar to the head 11 is struck by a stick or other suitable means. Also, foot pedals 70 are mounted on the top surface 39 of the base which functions in the same manner as the switches 50 did in the first embodiment of the invention.

In accordance with another feature of the present invention, FIGS. 3 and 4 show storage means provided in the base for the instrument. For instance, all the contact heads are removably fixed to the supports 30 which are also removably fixed to the base 31 by suitable clamps 32 and 32a. Said clamps allow for horizontal and vertical adjustment of each contact head to suit the desire of the musician. Additionally, the base provides internal compartments shown in dotted outline (FIG. 4). FIG. 3 shows access doors 35 suitable for the storage of these removable members for safe and easy transportation thereof. A removable seat 36 also is provided for the player which is storable within the base. The specific arrangement in the base is optional. Additionally the electronic equipment shown diagrammatically in FIG. 1 and represented by the dotted outline 37 in FIG. 4 is mounted within the base 31 with the speakers 20 facing the front thereof. Suitable latch means 40 are also provided to lock foot pedals 70 flush with the top surface 39 of the base 31 for storage and transportation. Retractable casters 45 and carrying handle 75 are provided for ease of moving the instrument from place to place.

It is understood that the musical instrument is not limited to the specific musical instruments described but will be understood by those skilled in the art that other changes in the form and details may be made without departing from the invention. The use of this device will enable the playing of a single contact head to generate the various percussion sounds, such as a bell, blocks, castanets, maracas, tambourines, a hi-hat, a bass drum, cymbals, tympani, and a bongo drum. The number of different instrument sounds is limited only by the capabilities built into the basic signal generators.

I claim as my invention:

1. An electronic musical instrument comprising the combination of:
  - a. a contact head suitable for being struck with a stick or other suitable instrument for mechanically activating said head;
  - b. electrical transducing means for generating a signal responsive to the activation of the head being struck;
  - c. electronic means for receiving said signal and operable to a plurality of states to generate in each state a separate sound responsive to the striking force and beat of said head being contacted but representative of various in-

dividual instruments, said electronic means comprising a plurality of tone generators and a gating means operable responsive to said signal for creating different sounds in each state; and

- d. switching means operable for switching said electronic means to selected ones of said states to enable the selection of the various sounds by one beating said head
- e. said tone generators being coupled to said gating means through said switching means.

10. An electronic musical instrument as described in claim 1 wherein said switching means is positioned next to the contact head and operable by being struck by said stick.

11. An electronic musical instrument as described in claim 1 wherein said switching means is positioned below said contact head for operation by the foot of the player.

12. An electronic musical instrument as described in claim 1 wherein said electronic means include a volume control positioned for constant operation by the player for adjusting the sound level of the instrument.

13. An electronic musical instrument as defined in claim 1 wherein said electronic means include sound amplifying acting responsive to the amplitude of said signal for controlling the volume of the separate percussion sounds.

14. An electronic musical instrument as defined in claim 1 wherein said electronic means includes a shift pulse generator operable to change the register to a reverberating state to generate a beat which is a multiple of the beat created by the contact head being struck by a stick.

15. In an electronic musical instrument as defined in claim 1 further including
 

- f. a support for mounting each said head at a suitable level for the user to strike;
- g. a seat on which the user can sit;
- h. electronic amplifying means including an amplifier and speaker combination for receiving the sound signal and radiating it in an amplified state; and
- i. a hollow base having mounting means for supporting said head supports and said seat, said base including internal compartments for storing contact heads, seat and supports therefor for transporting said combination and having compartments for mounting and amplifying means during both the transportation and playing of the instrument.

16. An electronic musical instrument as defined in claim 7 in combination with at least one base mounted foot pedal and connected electronic control operable to adjust the sound generated by the amplifying means responsive to the striking of one of said contact heads.

17. An electronic musical instrument as defined in claim 8 wherein said electronic means includes tone generating means operable to a plurality of states for generating and radiating in each state a separate sound responsive to the signal resulting from the striking force and the beat of said contact head but representative in tone of individual musical instruments different from said contact head being struck.

18. An electronic musical instrument as defined in claim 9 including at least one base mounted foot pedal operable for switching said tone generating means to various selected states.

19. An electronic musical instrument as defined in claim 10 wherein said electronic means is operable to a state wherein it generates a sound which is a multiple beat with respect to the original beat created by the activation of the contact head.

20. An electronic musical instrument as defined in claim 1 wherein said contact head comprises a plurality of contact heads.

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