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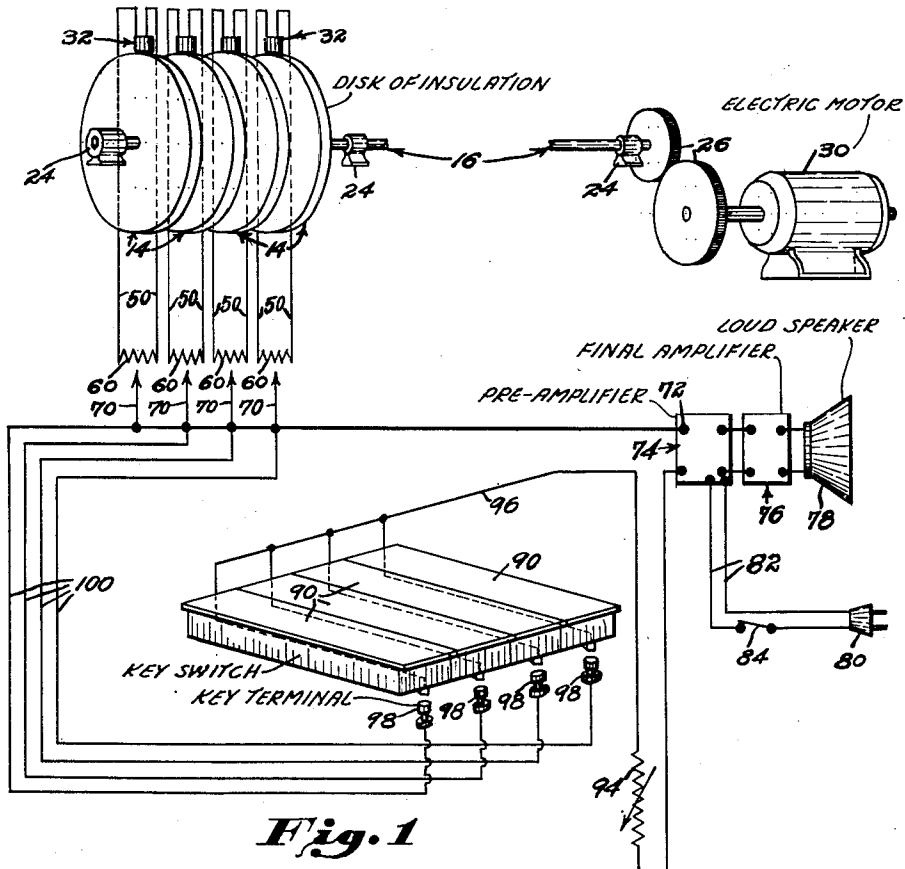
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2,533,461

ELECTRONIC MUSICAL INSTRUMENT

Filed Aug. 28, 1948

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

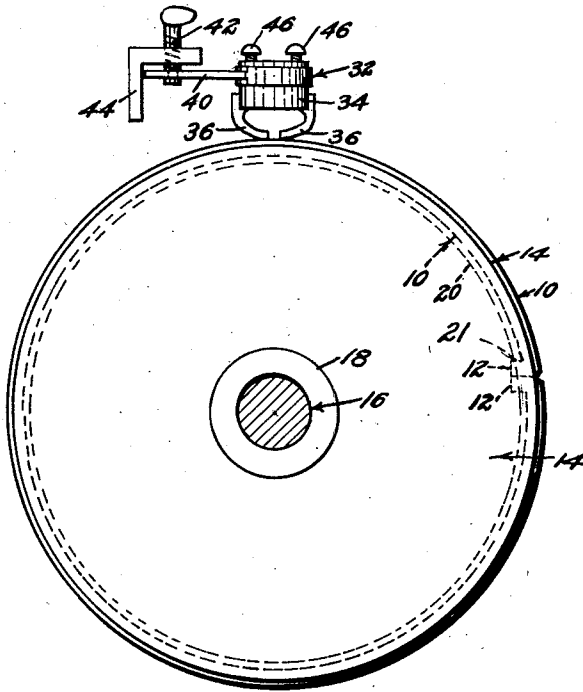


**Fig. 2**

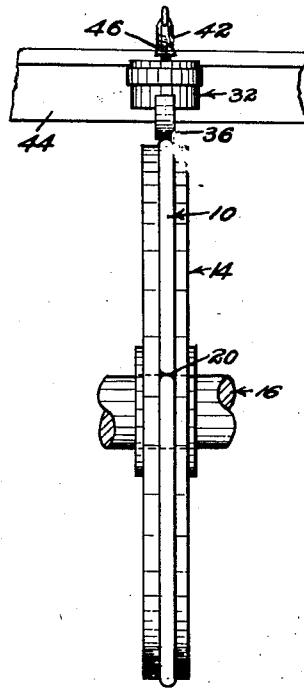


**Fig. 3**

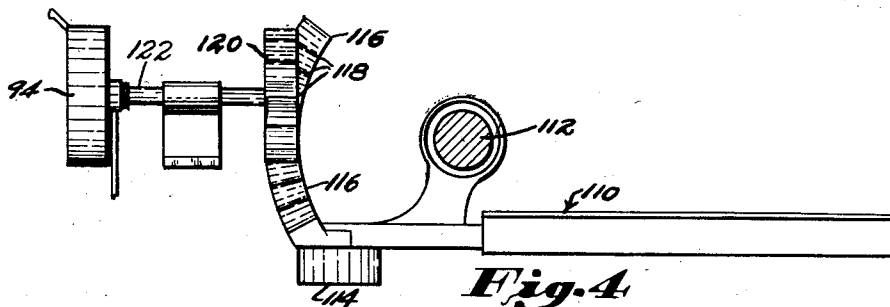


**Fig. 4**

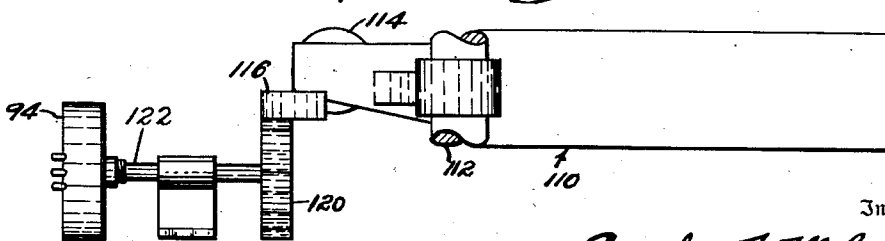


**Fig. 5**

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## UNITED STATES PATENT OFFICE

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## ELECTRONIC MUSICAL INSTRUMENT

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6 Claims. (Cl. 84—1.28)

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This invention relates to musical instruments and more particularly it is an object of the invention to provide a musical instrument employing elements having notes recorded by magnetism thereon.

In the last few years and during the recent war, methods have been perfected whereby elongated wires and tapes can be treated in such a manner as to induce different magnetic characteristics in different portions thereof. Pick up means have also been devised for causing the different magnetic characteristics of different sections of such wires to induce electrical currents of proportional characteristics in said pick ups for amplification to audible sound.

Devices of this type are now on the market and they are popularly called "wire recorders." It is also known that similarly magnetized tape will perform largely the same function as wire.

It is therefore an object of this invention to provide a musical instrument employing these newly discovered principles in a unique manner.

Another object of the invention is to provide a musical instrument which may be provided with controls similar to the controls of a piano.

A further object of the invention is to provide a musical instrument as described, having a plurality of magnetized elements, each having a different note recorded by magnetism thereon, whereby the several elements may be placed in operation by convenient control and in a manner for playing music.

Yet another object of the invention is to provide a device as described which can function in much the same manner as an expensive piano but which will be less costly to manufacture, and in which the notes will not tend to gradually die or diminish in volume unless desired.

Yet a further object of the invention is to provide a musical instrument as described which can reproduce the sounds generated by other musical instruments.

Another object of the invention is to provide a device for the purpose described which is sturdy and durable in construction, reliable and efficient in operation, and relatively simple and inexpensive to manufacture, assemble and utilize.

Other and still further objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment thereof:

In the drawings:

Figure 1 is a diagrammatic view of the musical instrument of the invention, a frame or casing not being shown, a portion of the tone ele-

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ment supporting disc shaft together with certain of the supporting discs and their related electrical circuits not being shown; the tone elements themselves not being shown in this view because of its small scale;

Figure 2 is a detailed end elevation of one of the magnetized tone elements of the invention, its supporting disc, its driving shaft and a magnetic pickup head and head attaching bracket;

Figure 3 is a side elevation of the parts shown in Figure 2, parts of the bracket being broken away;

Figure 4 is an end elevation of a foot pedal and rheostat mechanism for controlling the volume of the instrument; and

Figure 5 is a top plan view of the mechanism of Figure 4.

The musical instrument of this invention includes a frame, not shown, on which following mechanism is mounted:

The mechanism includes a plurality of magnetized elements 10. The elements 10 are elongated, circular and approximately continuous as is best shown in Figure 2. The elements 10 may each be an endless continuous circle, if desired. It is preferable, however, that the elements be approximately circular, but have ends as indicated in dotted lines at 12 in Figure 2 which are turned toward the center of the circle formed by the elements.

The elements 10 may be either circular in cross-section, or rectangular in the form of a tape having a flat outer surface. Other cross-sectional shapes may also be employed. In the following description, wires of circular cross-section will be employed for purposes of illustration.

The elements 10 are each mounted on one of a plurality of discs 14 of electrically insulating non-magnetizable material which latter are disposed in spaced apart parallelism along the shaft 16.

Adjacent the center of each disc 14, the latter may be provided with a hub 18 having an opening therethrough for receiving the shaft 16, the shaft being rigidly secured to each disc 14.

The outer circumference of each disc 14 is preferably provided with an elongated, circular groove 20, best shown in Figure 3 for the purpose of receiving the wire 10. A recess 21 is also provided, extending inwardly of the circumference of each disc 14 for receiving the ends 12 of the element 10.

The shaft 16 is preferably mounted in suitable bearings 24 and is rotated by means of two or more gears 26 and a driving motor 30.

It is desirable that in place of the shaft 16 a plurality of separate shaft segments be employed, each segment being interconnected with the next segment by a flexible fitting to couple the shafts for simultaneous rotation.

As many discs 14 as desired may be placed on the same shaft 16 or upon the same section of the shaft. The total number of discs employed can be varied although a preferred number is 88, the total number of keys on a piano.

The elements 10 are previously magnetized in a well-known manner, preferably so that each element contains a different note. The total length of each element 10 must be such as to accommodate the tone of its note.

For each element 10 a magnetic pickup head, generally indicated at 32 is provided. The pickup heads 32 are of any suitable type and have a coil in a casing 34 and two magnetic arms 36. Each head 32 is mounted sufficiently close to its element 10 as to have an electrical current induced thereinto by the magnetized portions of the element as the latter rotates past the head 32. If desired, the arms 38 may touch the element 10.

The heads 32 are each secured by means of a bar 40 and an adjusting thumb-screw 42 to a bracket 44. The bracket 44 may be of any suitable shape and is rigidly secured to the frame of the instrument. Each head 32 is provided with two terminals 46 to which electrical wires 50 are secured.

The wires 50 are two in number for each head 32 and each wire 50 interconnects one terminal of the resistance element of a rheostat 60 with one terminal of a head 32.

In this manner a separate rheostat 60 is provided for each head 32. The resistance elements of the rheostats 60 are each electrically connected by the wires 50 between the terminals 46 of different ones of the heads 32.

The taps or sliding contact members of the rheostats 60 are diagrammatically shown at 70 and are electrically connected with an ingoing terminal 72 of a pre-amplifier 74. The pre-amplifier 74 is itself in electrical communication with the final amplifier 76, which latter is connected to a loud speaker 78.

A single amplifier of suitable type may be used in place of the pre-amplifier 74 and final amplifier 76, if desired.

The pre-amplifier 74 is provided with a power plug 80 and two power intake wires 82 in one of which latter a cut-off switch 84 is provided.

A plurality of key switches 90 are employed each having a terminal disposed in electrical communication with the resistance element of another rheostat 94 through a suitable wire 96.

The said key terminals are adapted to be placed in communication with other key terminals 98 at desired times and when the keys 90 are depressed.

Each of the key switch terminals 98 are themselves disposed in electrical communication, by means of one of a plurality of wires 100, with a different one of the sliding contact members or sliding taps 70.

Springs or their equivalent, not shown, are provided for maintaining the keys 90 out of contact with the terminals 98, except at times when the keys are depressed.

The total number of keys 90 is the same as the number of elements 10 employed, the total number of each being 88 as in a piano keyboard.

The device further includes a foot pedal 110 as shown in Figures 4 and 5, the latter being piv-

otally secured to a suitable mounting shaft 112 and is provided with a weight 114 disposed for counterbalancing the weight of the pedal 110 in order to cause the pedal 110 to revert to an "up" position at times when the pedal is not depressed by the foot of the operator.

A preferably arcuate member 116 is secured to the pedal 110 and projects upwardly therefrom. The member 116 is provided with a plurality of teeth 118 on one side thereof for the purpose of engaging the teeth of a gear 120.

The gear 120 is rigidly secured to the rotatable shaft 122 which controls the movements of the sliding contact member or taps of the rheostat 94.

The shaft 16 is caused to rotate at a constant speed, such speed being sufficient for the largest cycle note element 10.

The operator, by pushing downwardly upon a desired one of the keys 90 may cause the tones of the notes of the corresponding elements 10 to be sounded through the loud speaker 78. In this manner, the instrument may be played much the same as the conventional piano.

When it is desired to change the volume of the instrument this may be conveniently accomplished by pressing the foot pedal 110. It will be seen that when the rheostats 60 are properly adjusted that very satisfactory and superior musical tones can be played.

The tones of any musical instrument may be recorded upon the elements 10 so that the varieties of types of music which can be played upon an instrument of this type are almost unlimited.

This invention has provided an economical, practical musical instrument employing the newly discovered principles of "wire recorders" and which is adapted to reproduce sounds generated by musical instruments of almost all types.

From the foregoing description, it is thought to be obvious that an electronic musical instrument constructed in accordance with my invention is particularly adapted for use by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention is susceptible of some change and modification including variations in the shape and size of the parts without departing from the principles and spirit thereof, and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice, except as claimed.

I claim:

1. A musical instrument comprising: a plurality of elongated circular approximately continuous magnetizable elements, said elements each having a different note recorded by magnetism thereon, said elements each being long enough to accommodate the tone of one note; non-magnetizable supports for said elements; means for rotating said supports and elements; magnetic pick-up heads for each element, said heads being held sufficiently close to said elements to be energized thereby; a rheostat for each of said heads, said rheostats each having its resistance element electrically connected between the terminals of a different one of said heads; an amplifier, the sliding contact member of each rheostat being disposed in electrical communication with an ingoing terminal of said amplifier; a plurality of switch keys, each of said contact members also being connected with a

terminal of a different one of said switch keys; another rheostat, the other terminal of each switch key being connected to a terminal of the resistance element of said other rheostat, the sliding contact member terminal of said other rheostat being connected to the other intake terminal of said amplifier; and a movable foot pedal operably secured to the sliding contact member of said other rheostat for simultaneous movements therewith.

2. A musical instrument comprising: a plurality of elongated circular approximately continuous magnetizable elements, said elements each having a different note recorded by magnetism thereon, said elements each being long enough to accommodate the tone of one note; non-magnetizable supports for said elements; means for rotating said supports and elements; magnetic pick-up heads for each element, said heads being held sufficiently close to said elements to be energized thereby; a rheostat for each of said heads, said rheostats each having its resistance element electrically connected between the terminals of a different one of said heads; an amplifier, the sliding contact member of each rheostat being disposed in electrical communication with an ingoing terminal of said amplifier; and a plurality of switch keys, each of said contact members also being connected with a terminal of a different one of said switch keys, the other terminal of each of said switch keys being connected to the other intake terminal of said amplifier.

3. An instrument as described in claim 2 in which said rotating means rotates said supports and elements all at the same constant speed, said speed being sufficient for the largest cycle note element.

4. A musical instrument comprising: a plurality of elongated circular approximately continuous magnetizable elements, said elements each having a different note recorded by magnetism thereon, said elements each being long enough to accommodate the tone of one note; non-magnetic supports for said elements; means for rotating said supports and elements; magnetic pick-up heads for each element, said heads being held sufficiently close to said elements to be energized thereby; an amplifier; a plurality of separate members electrically interconnecting the terminals of each head together and independently of the other heads; means connecting the ingoing terminal of said amplifier with each of

said terminal interconnecting members; a plurality of switch keys, each of said interconnecting members also being connected to a terminal of a different one of said switch keys, the other terminals of said switch keys being each connected to the other terminal of said amplifier; another rheostat, the other terminal of each switch key being connected to a terminal of the resistance element of said other rheostat, the sliding contact member terminal of said other rheostat being connected to the other intake terminal of said amplifier; and a movable foot pedal, said foot pedal being operably connected to the sliding contact member of said other rheostat for correlated movements therewith.

5. A musical instrument comprising: a plurality of elongated circular approximately continuous magnetizable elements, said elements each having a different note recorded thereon, said elements each being long enough to accommodate the tone of one note; non-magnetic supports for said elements; means for rotating said supports and elements; magnetic pick-up heads for each element, said heads being held sufficiently close to said elements to be energized thereby; a plurality of separate members electrically interconnecting the terminals of each head together and independently of the other heads; an amplifier; means connecting the ingoing terminal of said amplifier with each of said terminal interconnecting members; and a plurality of switch keys, each of said interconnecting members also being connected to a terminal of a different one of said switch keys, the other terminals of said switch keys being each connected to the other terminal of said amplifier.

6. An instrument as described in claim 5 in which said rotating means rotates said supports and elements all at the same constant speed, said speed being sufficient for the largest cycle note element.

GRAYDON F. ILLSLEY.

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