

Dec. 3, 1940.

A. A. KUCHER

2,223,489

MUSICAL SYSTEM

Original Filed July 21, 1936

2 Sheets-Sheet 1

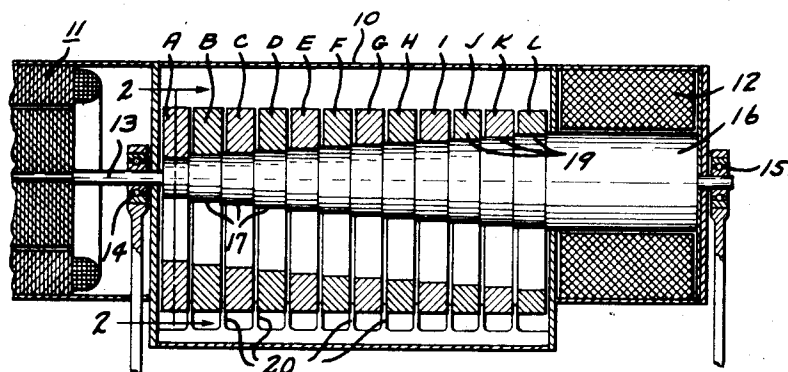


Fig. 1

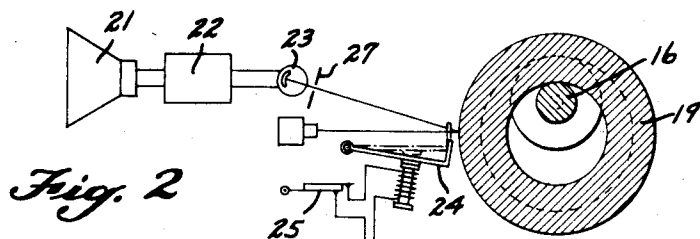


Fig. 2

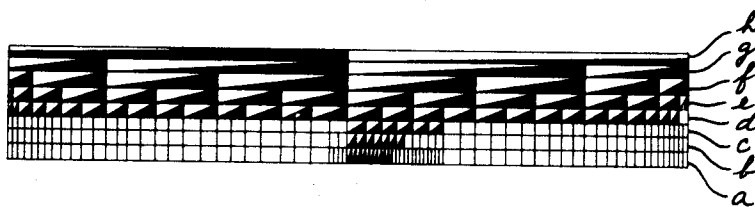


Fig. 3

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2 Sheets-Sheet 2

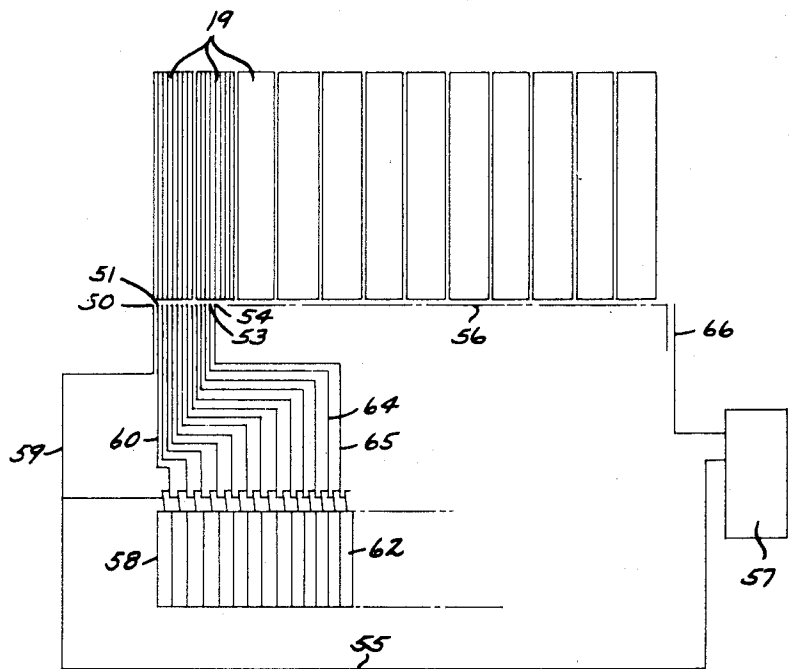


Fig. 4

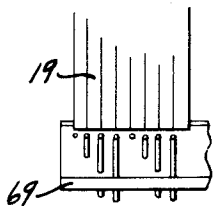


Fig. 5

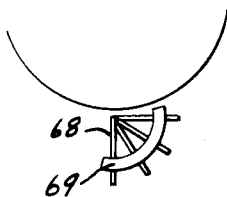


Fig. 6

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2,223,489

MUSICAL SYSTEM

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Original application July 21, 1936, Serial No. 91,726. Divided and this application May 22, 1939, Serial No. 275,094

6 Claims. (Cl. 84—1.28)

The present application is a division of my earlier filed application, Serial No. 91,726, filed July 21, 1936.

In my aforesaid application, I have disclosed an invention relating to the art of reproducing sound, and particularly musical notes and tones. The apparatus disclosed includes a plurality of wheels or bands, each carrying on its peripheral surface the wave form patterns of eight fundamental notes of the musical scale arranged in octave relation. These wheels or bands, and consequently, the wave form patterns, are rotated at a speed calculated to produce perfect pitch of the notes patterned thereon, and the impulses or frequencies produced thereby may be transmitted to a sound reproducing device either by means of a light sensitive circuit or by a magnetic pick-up circuit.

My present invention relates to such a system, and particularly to a novel arrangement of parts providing a plurality of sources of light for the wave form patterns. In its broader aspect, my invention has for its object the provision of a system including a source of power having two parallel circuits connected thereto, one circuit including a plurality of series arranged power consuming devices, each controlled by its individual switch arranged in shunt relation thereto, and in the second circuit.

More specifically, my invention has for its object the provision of a system including a plurality of sources of light, one for each wave form pattern, arranged in series and means in the form of a plurality of switches arranged in series in a second circuit, for shunting one or more of the sources of light, as the case may be.

Many more specific objects will become apparent from the following specification and claims, taken with the drawings wherein:

Fig. 1 is a cross section of a portion of my improved system showing twelve units mounted on steps constituting shafts of varying diameters;

Fig. 2 is a section taken on the line 2—2 of Fig. 1 with certain other elements of my improved system shown diagrammatically;

Fig. 3 is a plan view of the periphery of one of the wheels used in the embodiments of my invention;

Fig. 4 is a diagrammatic view of twelve units as in Fig. 1, in combination with an improved source of light;

Fig. 5 is an elevation of the arrangement shown in Fig. 4; and

Fig. 6 is an end elevation of the arrangement shown in Fig. 5.

I have illustrated in Figs. 1 and 2 a system employing twelve similar wheels or bands, each wheel carrying the wave form patterns of eight fundamental notes of the scale in octave relation. The peripheral surface of one of such wheels is shown in Fig. 3, and carried thereon are eight wave form patterns arranged in the form of tracks extending circumferentially of the wheel. These tracks are designated by the reference characters *a, b, c, d, e, f, g, and h* and have frequencies in octave relation. All of the wheels are similarly constructed and carry the same patterns.

The wave form patterns may be formed on the peripheral surface of the wheel in different ways. For example, they may be etched or embossed on the peripheral surface, and, if a magnetic pick-up means is to be used, the peripheral surface may be made of magnetic material such as iron. Or such wave forms, when etched or embossed, may be polished to reflect light upon a photo-electric cell or cells. Or the wave form patterns may be formed in photographic film shaped into the form of a wheel or mounted on the peripheral surface of the wheel. Or, if desired, the wave form patterns may be formed in opaque material by perforations; all, of course, depending upon the type of apparatus used in transmitting the impulses from the wave form patterns to the reproducing device.

The wave form patterns are in octave relation and consequently the speed of the unit or units may be calculated to produce perfect pitch of all of the notes patterned thereon.

With reference to Figs. 1 and 2, I have shown therein an embodiment of apparatus wherein wave form patterns similar to those of Fig. 3 may be used to produce all of the frequencies of the musical scale. Such apparatus is shown as including a frame 10 carrying a motor 11 provided with a shaft 13. The shaft 13 is mounted in the bearings 14 and 15 and, intermediate the enlargement 16 formed on its right hand end, and the motor 11, the shaft is provided with a plurality of steps 17 forming in effect shafts of different diameters. In the particular embodiment shown, a means 12 is provided for magnetizing the steps 17. This means is shown in the form of an electromagnet and the enlargement 16 constitutes the core thereof. However, it should be understood that the steps 17 may be in the form of permanent magnets themselves and in such case, the electromagnet may be dispensed with.

On each of the steps 17 is suspended a wheel or band 19 held in position by the magnetic pull

exerted on the wheels by reason of the magnetic field created in the shaft 13 by the electromagnet 12. To prevent displacement of the wheels while the shaft is rotating, the frame 10 carries guides 20 in the form of a comb extending between the wheels 19.

In the particular embodiment now being considered, the wheels 19 are made of magnetic material such as iron and the wave form patterns 10 may be formed therein in any of the ways described in connection with Fig. 3.

The apparatus so far described operates as follows. The electromagnet 12 sets up a magnetic field in the shaft 13, thereby causing the wheels 19 to be held securely against the steps 17 of the shaft 13. The operation of the motor 12 will cause rotation of the shaft 13 and its steps 17 and consequently the wheels 19 will roll about the steps 17 without slippage. Due to the fact that the steps are of different diameters, the wheels 19 will roll at different speeds. Since all of the wave form patterns are in octave relation on any one wheel, the speed thereof can be calculated to produce perfect pitch of all of the notes patterned thereon.

With respect to the apparatus shown in Fig. 1, the specific dimensions of the various parts are given in detail in my prior application Serial No. 91,726, and attention is directed thereto for a more complete description.

In Fig. 2, I have shown diagrammatically a system containing a light sensitive cell or cells as the means for transmitting the impulses to the sound reproducing device. This circuit contains the loud speaker 21, the amplifier 22, light sensitive cell 23, a light slit 27, and a source of light 26 common to all of the wheels 19. An individual shutter 24, each with its individual key control 25, is provided for each wave form pattern so that by depressing one or more keys, light is admitted to and reflected by one or more wave form patterns as the case may be. The reflected light passes through the slit 27 to the cell or cells 23.

In place of the source of light 23 common to all of the patterns, I may use the arrangement shown in Figs. 6, 4 and 5. In Fig. 4, the wheels are shown diagrammatically at 19 and opposite each wave form pattern is located a spark gap. Several such gaps have been shown, but since each gap is similar to each other gap, all of them have not been shown. One such gap includes the points 50 and 51 and another the points 53 and 54. All of the gaps are connected in key shunt relation; that is to say, each gap is short circuited by its key except when the key is depressed. To use other words, depressing of a key causes the spark to jump the gap controlled by that key.

When key 58 is depressed, current flows from the source of high tension, high frequency alternating current 57 through the leads 55, 59 and 60 and back through the remaining keys and the lead 56 to the source 57. Thus, a spark jumps the gap 50—51 and this spark serves as the source of light for the wave form pattern located opposite the gap 50—51.

If both keys 58 and 62 are depressed at the same time, then current flows from the source 57 through leads 55, 59 and 60, thence through the keys to the line 64 and back to the source 57 through the lines 65 and 56. In this case, sparks jump both the gaps 50—51 and 53—54 and serve as the sources of light for the wave form patterns opposite the gaps 50—51 and 53—54.

The circuit is so arranged that sparks may jump from one to twenty gaps at the same time,

depending upon how many of the keys are depressed.

It should be understood that the spark gap system just described constitutes the source of light in a light sensitive circuit, as described in connection with Fig. 2, for transmitting impulses from the wave form patterns to a light sensitive cell or cells. Such a circuit would include the light sensitive cell or cells, the loud speaker, the amplifier, etc. No shutters would be required, however, since the light is present only when desired.

Since high tension, high frequency alternating current is continuously produced by device 57, a bleeder spark gap 66 is provided to prevent short circuiting of the spark gap system when none of the keys is depressed.

To prevent jumping of the spark at places other than at the gaps, the leads to the gaps may be arranged as shown in Figs. 5 and 6. A frame arranged in the form of an arc 69 extends the width of the wheels 19 and the leads 68 to the various gaps are supported therein in staggered relation so that they are spaced apart a greater distance throughout their length than at their terminals.

In Fig. 4, I have shown the individual sources of light as spark gaps. Obviously, other sources of light may be used in the same system, and each such source may be by-passed or shunted by the closing of its individual controlling switch. The same system may, likewise, be used for purposes other than the purpose described.

Likewise, other forms of my invention are possible, all within the scope of the appended claims.

I claim as my invention:

1. The combination comprising a plurality of wave form patterns, a sound reproducing device, means for creating and transmitting impulses from said wave form patterns to said sound reproducing device including a light sensitive cell and a source of light, said source of light including a separate spark gap for each wave form pattern.
2. The combination comprising a plurality of wave form patterns, a sound reproducing device, means for transmitting impulses from said wave form patterns to said sound reproducing device, said means including a light sensitive cell and a source of light, said source of light including a separate spark gap for each wave form pattern, and an individual control for each spark gap.
3. The combination comprising a plurality of wave form patterns, a sound reproducing device, means for transmitting impulses from said wave form patterns to said sound reproducing device, said means including a light sensitive cell and a source of light, said source of light including a separate spark gap for each wave form pattern, a separate control for each spark gap, and means for causing movement of said wave form patterns with respect to said spark gaps.
4. The combination comprising a plurality of wave form patterns, a sound reproducing device, means for transmitting impulses from said wave form patterns to said sound reproducing device, said means including a light sensitive cell and a source of light, said source of light including a separate spark gap for each of said wave form patterns, a separate control for each of said gaps, means for causing movement of said wave form patterns with respect to said gaps, and means for causing up to and including twenty gaps to operate concurrently.
5. The combination comprising a plurality of

wheels each carrying on its peripheral surface the wave form pattern of notes of the musical scale arranged in octave relation, a sound reproducing device, means for creating and transmitting impulses from said wave form patterns to said sound reproducing device, said means including a light sensitive cell and a source of light, said source of light including a separate spark gap for each wave form pattern, a separate control for each gap, and means for causing a plurality of gaps to operate concurrently upon the depression of a plurality of the separate controls, and magnetic means for causing movement of said wheels relative to said gaps

and for causing movement of each of said wheels relative to each other.

6. In a musical system employing a separate wave form pattern for each of the notes of the scale, a source of light comprising a system having a plurality of spark gaps, one for each wave form pattern, all of said gaps being connected in key shunt relation, a separate control for each of said gaps, a source of high tension high frequency alternating current for said spark gaps, and means for operating a plurality of said controls concurrently for causing sparks to jump a plurality of said gaps at the same time.

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