Dec. 26, 1939. J. O. AALBERG 2,184,728

METRONOME

Filed May 21, 1937 2 Sheets-Sheet 1

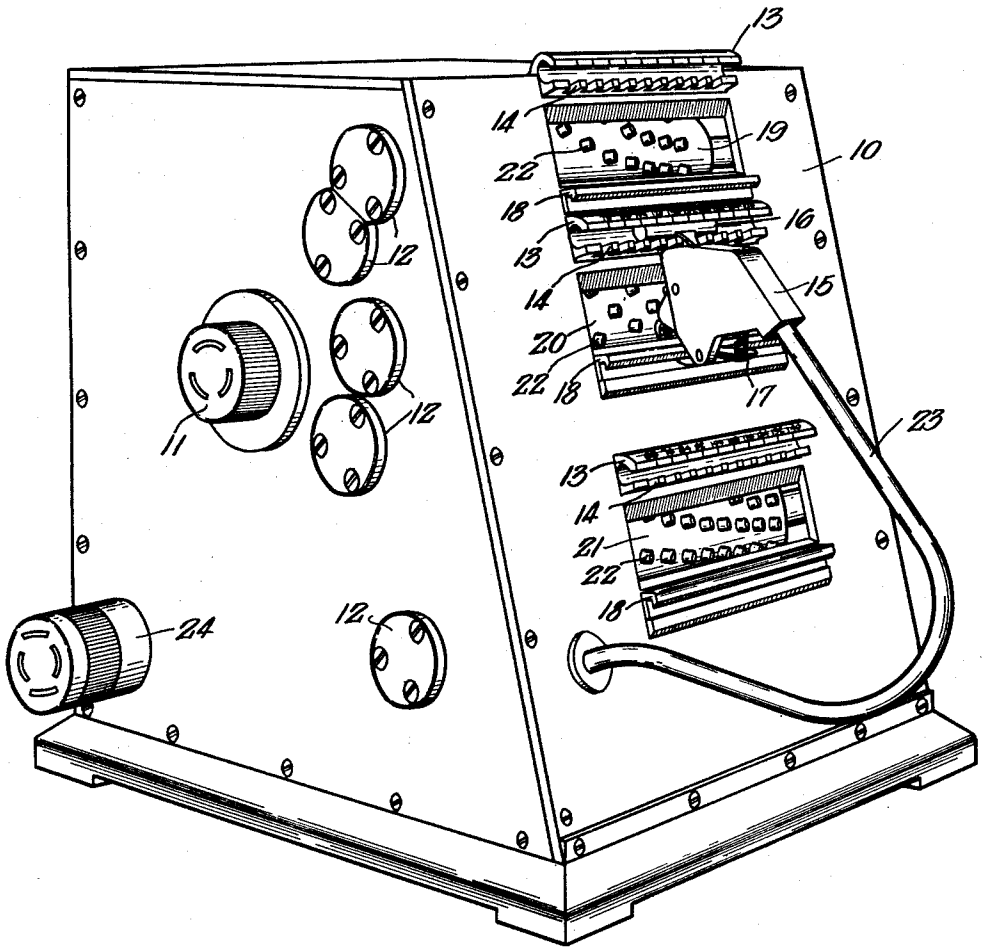


Fig. 1

INVENTOR
JOHN O. AALBERG
BY
ATTORNEY

Dec. 26, 1939. J. O. AALBERG 2,184,728

METRONOME

Filed May 21, 1937 2 Sheets-Sheet 2

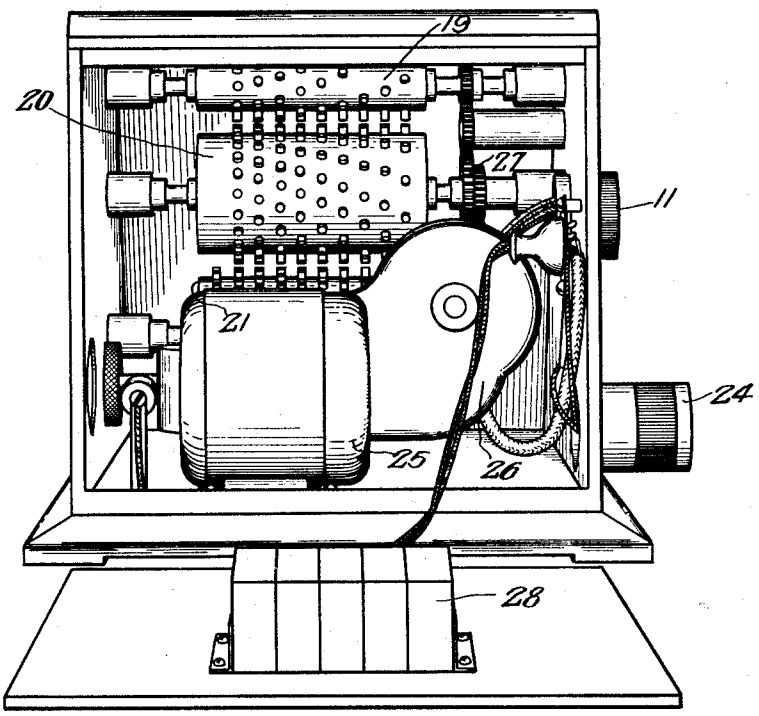


Fig. 2

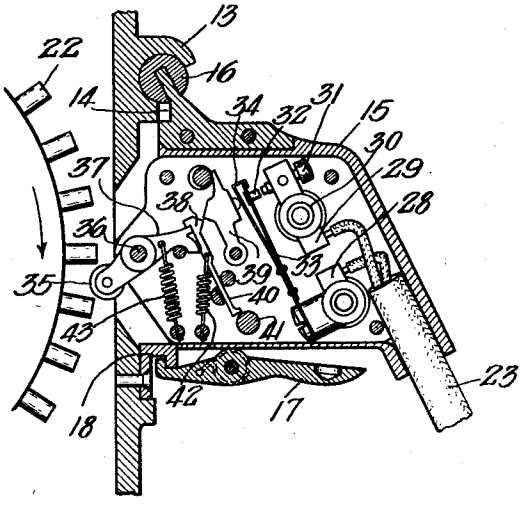
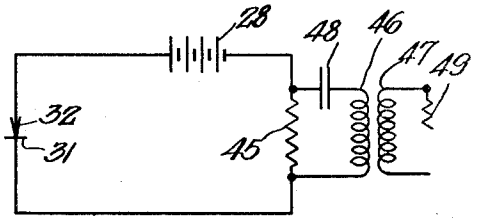


Fig. 4

Fig. 3



INVENTOR
JOHN O. AALBERG
BY
ATTORNEY

Patented Dec. 26, 1939 2,184,728

UNITED STATES PATENT OFFICE

2,184,728

METRONOME

John O. Aalberg, Los Angeles, Calif., assignor to RKO Studios, Inc., a corporation of Delaware

Application May 21, 1937, Serial No. 143,881

7 Claims. (Cl. 200—30)

This invention relates to an improved metronome, and more particularly to a metronome in which the speed can be adjusted to any predetermined exact value and to such a degree of exactness as to permit music performed in accordance therewith to be exactly synchronized with pictures taken at a correspondingly exactly predetermined speed.

It is customary to use a device called a metronome to determine the tempo of music to be performed by a band, orchestra, chorus or the like, and for the mere indication of the approximate tempo such a device as a pendulum of known length held in the hand has been sufficient. For more exact and continuous determination of tempo, as, for example, in practicing on musical instruments, it has been customary to use a type of metronome consisting of a partly counterbalanced pendulum with an appropriate spring motor which emitted a loud click for each beat, such, for example, as the conventional Maelzel metronome, and such instruments have also been fitted with bells to indicate the first beat of each measure.

All of such devices were sufficient for mere indications of tempo and some even were suitable for practice over long periods of time. They were unsatisfactory for either replacing or advising an orchestra conductor. This was in part due to the fact that their use was unnecessary as the conductor could and, in the course of an ordinary performance of a musical composition, should indicate the tempo as well as other characteristics of the manner in which the music was to be played. However, the introduction of sound pictures, wherein the picture was run at a predetermined rate and a sound record was made to exactly accompany the picture, raised a question of synchronization which it was impossible for an orchestra conductor to take care of. This difficulty was further aggravated by the direct recording of sound on the picture film and the establishment of a standard rate of ninety feet per minute for running the film. In the production of such film, it from time to time became necessary for the performance of the orchestra or other music to be accomplished entirely independently of the taking of the pictures and the proper synchronization of sound and picture became difficult if not impossible.

Various schemes have been proposed for accomplishing synchronization, practically all of which have been dependent on a physical interrelation of the picture film and the musical performance. Such an arrangement, however, makes the production of the picture film a prerequisite to the performance of a musical composition and thus not only delays time of production but renders an exact predetermination of the time of the musical performance impossible.

My invention provides a means for predetermining the exact time of performance of the musical composition and correspondingly for determining the exact synchronization of a record thereof with a motion picture with which it may be desired to be synchronized. Further, the apparatus permits an exact calculation of the time involved so that music may be performed in exact synchronization with the picture, entirely independent thereof, or the picture and musical record may be produced entirely independently of each other, as, for example, in the production of musical accompaniment to a cartoon, consisting of a series of drawings, and both may be produced simultaneously and independently of each other.

I accomplish these novel results by providing a mechanical device driven by a synchronous motor which serves to make and break an electrical circuit causing an appropriate indication at any desired and exactly predeterminable speed.

It has heretofore been proposed to use not only mechanical but even electrical oscillators for such purpose, but such devices have been unsatisfactory due to the fact that their speed was variable and their results were not exactly reproduceable from time to time, while an ordinary oscillator circuit of the proper frequency or an electrical contacting device usually produced a double click which was extremely confusing to the musicians.

One object of my invention is to provide a novel construction of metronome.

Another object of my invention is to provide a metronome which gives exact time intervals.

Another object of my invention is to provide a metronome which gives exactly predeterminable time intervals.

Another object of my invention is to provide a metronome which gives only a single audible sound for each beat indicated.

Another object of my invention is to provide such a device which is capable of continuous use over long periods of time without any material variation in the performance thereof.

Other and incidental objects of my invention will be apparent to those skilled in the art from a reading of the following specification and an inspection of the accompanying drawings, in which

Figure 1 is a perspective view partly from the front of my improved metronome;

Figure 2 is a rear view of the device showing the cover removed;

Figure 3 is a schematic diagram of the manner in which the contacts of the device are connected to an appropriate audio frequency amplifier; and

Figure 4 is a sectional view of the movable contact member.

Referring first to Fig. 1;

An appropriate casing 10 is provided for housing the mechanism. Current is supplied to the device through the receptacle 11 from an appropriate alternating current source, preferably the three-phase, 220-volt, 60-cycle current which is usually available around motion picture studios for driving the device at a constant speed. The walls of the casing may be provided with appropriate member 12 for securing interiorly thereof appropriate shaft bearings. The sloping front of the casing is provided with scales 13 on which are marked, above the corresponding notches 14, the tempo which will be indicated when the contactor 15 is located in the notch beneath the scale marking.

It will be apparent that each of the scales 13 has the corresponding notched bar made integral therewith, and between the notches and the scale there is provided a groove substantially circular in cross section in which the member 16 slides. The contactor 15 is secured to the member 16 by an appropriate strip of metal adapted to fit snugly in the notches 14 in order to retain the contactor in adjusted position and the contactor is also provided with a spring pressed clamp 17 which is adapted to engage the channel rails 18 to prevent outward movement of the contactor. Within the casing the drums 19, 20 and 21 are arranged in proper relation to the corresponding apertures in the front of the casing so that the projecting pins 22 on these drums can engage the contactor. It will be apparent that to move contactor from one drum to another it is only necessary to raise the spring clamp 17 to disengage it from the corresponding channel 18, when the contactor may be lifted until the member 16 may be slid out from between the scale and the notched member, whereupon it may be inserted longitudinally into the corresponding space at either of the other drums.

An appropriate electrical conductor 23 is provided connecting the contactor 15 to the interior mechanism and impulses produced by the device are fed out through an appropriate receptacle 24.

As shown in Fig. 2, the device is provided on its interior with a synchronous motor 25 and a reducing gear 26. This reducing gear may be of any conventional worm type and serves to give a predetermined speed to the drums. As will be apparent from Fig. 2, these drums are connected together and to the reducing gear 26 by an appropriate gear train 27, the speeds of the respective drums being determined in accordance with the numbers of pins 22 thereon and the tempos desired.

An appropriate battery 28 is provided within the casing as a source of direct current which is transmitted through the contactor to the output connection 24.

To now describe the contact mechanism within the contactor 15: The leads from the cable 23 pass to an appropriate connection 28, which connects one side of a line to the casing of the device and to another connection 29 insulated from the casing by its supporting post 30 and which carries the current to the capstan headed contact member 31. The contact 31 is engaged by a contact 32 carried by the spring 33 at appropriate times to close the circuit. It will be apparent from Fig. 4 that the spring 33 is supported within a stirrup-shaped spring 34 and that the spring 34 can be moved toward the contact 31 after the contact 32 is in engagement therewith.

The drums rotate in such a direction that the teeth move downwardly at the point of contact with the roller 35 and as the roller 35 is moved downwardly about the pivot 36, the opposite end of the arm 37 moves upwardly carrying with it the member 38. This member 38, as shown, is provided with a sharp edge which engages a corresponding sharp edge on the lever 39. The member 38 has a flattened extension 40 which moves between the guide pins shown and which in its lower position rests against the stop 41. This member 38 is held downwardly by the spring 42, while the lever 37 is likewise held downwardly by the spring 43. Therefore, as the roller 35 moves downwardly the member 38 moves upwardly against the action of the spring 42 and as the sharpened edges of the members 38 and 39 pass each other the contacts 31 and 32 are brought together and instantly released, thereby producing a single pulse of current through the circuit which is shown in Fig. 3.

As shown in Fig. 3, the contacts 31 and 32 and the battery 28 are connected in series across a resistor 45. Shunted around this resistor is the primary 46 of a transformer having a secondary 47, and this primary 46 is connected with the circuit through the capacitor 48 preventing direct current from passing through the transformer.

The output from the transformer 46, 47 is preferably passed to the input circuit of an amplifier, as indicated at 49. The output of this amplifier may be fed to an appropriate earphone for the use of the orchestra conductor or may be used to actuate a glow lamp giving a visible indication to all the performers in accordance with each beat, or may be utilized in any other appropriate manner to secure its intended result.

Having now described my invention, I claim

1. A device for producing predetermined uniform electrical impulses comprising a cylinder, a plurality of pins projecting from said cylinder, said pins being arranged in parallel circular rows lying in planes perpendicular to the axes of said cylinder, means for rotating said cylinder at a predetermined speed, a device adapted to be positioned adjacent said cylinder having therein contacts adapted to be made when each of said pins passes said device, and means adjacent said cylinder for adjusting said contact element to any of said rows and locking said element in said adjustment.

2. A device for producing predetermined uniform electrical impulses comprising a plurality of cylinders arranged with their axes parallel to one another and in a substantially vertical plane, a plurality of pins on each of said cylinders, the pins on each cylinder being arranged in circular rows and in planes perpendicular to the axes of said cylinder, the number of pins in each circular row of each of said cylinders being different from the number of pins in the other rows of said cylinder, means interconnecting said cylinders and adapted to rotate each of said cylinders at a different speed, and a contact device having means for removing and locking said device adjacent each of said cylinders.

3. An electric metronome comprising a cabinet

having a front panel, a plurality of rotatable members arranged with parallel axes and in a substantially vertical plane adjacent said panel, said panel having respective openings therein to provide access to each of said members, a contact device, and means adjacent each of said openings for adjusting said contact device along each member and for locking said contact device in any adjusted position, said device being removable from one to another of said members.

4. An electric metronome comprising a cabinet having a front panel thereon, said panel having a plurality of openings, a plurality of rotatable members having projecting pins thereon serially accessible through respective openings in said panel, a substantially circular panel member along each opening, a U-shaped panel member along each opening, and a member adapted to make contact with the pins of said cylinders, said contact member having a substantially circular projection adapted to fit in said substantially circular panel and a locking element adapted to be accommodated in said U-shaped panel.

5. An electric metronome comprising a plurality of series of rotatable projections divided into groups, each group rotating at a different speed, means for mounting said projections for rotation, a panel having openings through which respective groups of projections are accessible, and a removable contact device with a flexible cable and adapted to be attached to said panel in operative relationship adjacent any series of projections in any group.

6. An electric metronome in accordance with claim 5 in which said projections are adapted to contact said device in a substantially common plane.

7. An electric metronome comprising a panel having a plurality of openings therein, groups of a series of pins, each group adapted to be moved past respective openings at different rates of speed, an electrical transmission circuit, and a contact device connected to said circuit and adapted to be operatively associated with any series of a particular group by an adjustable attachment to said panel.

JOHN O. AALBERG.