

Nov. 30, 1937.

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2,100,434

SOUND CONTROLLED ACTUATING MECHANISM

Filed Nov. 14, 1933

3 Sheets-Sheet 1

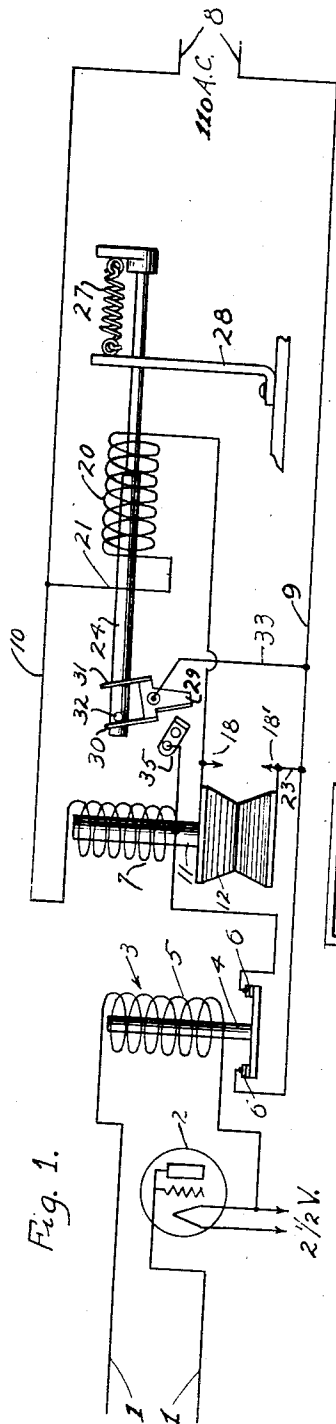


Fig. 1.

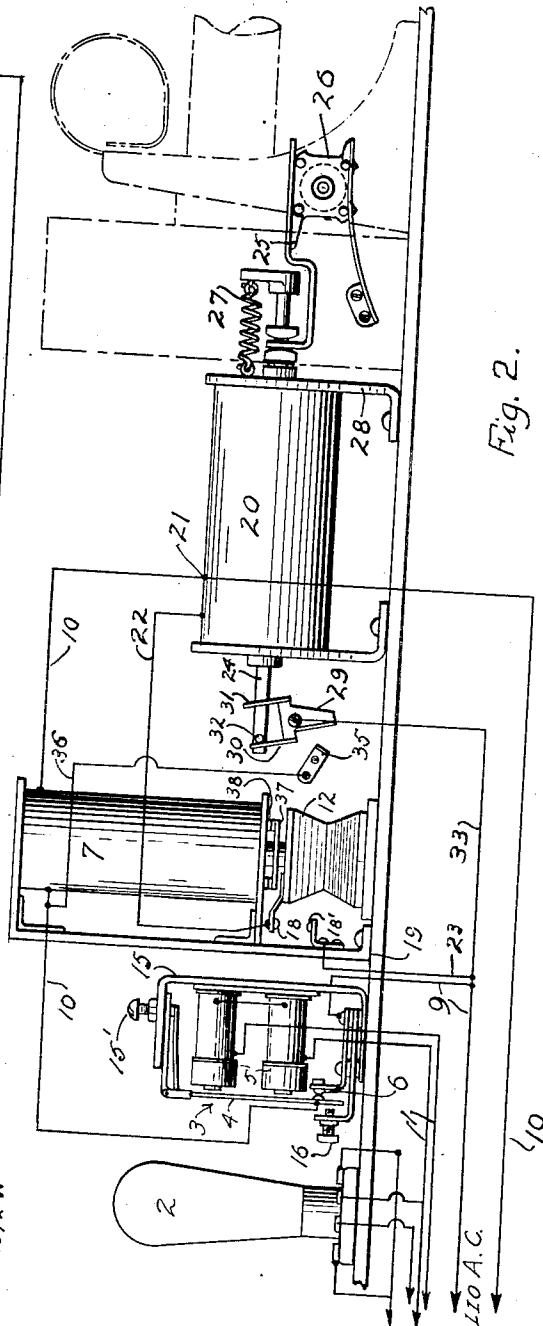


Fig. 2.

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3 Sheets-Sheet 2

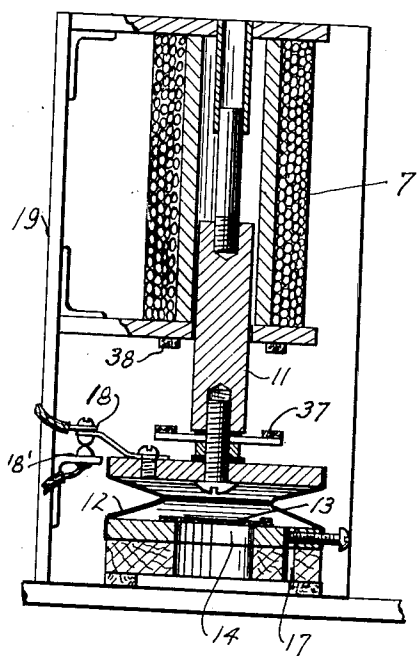


Fig. 3.

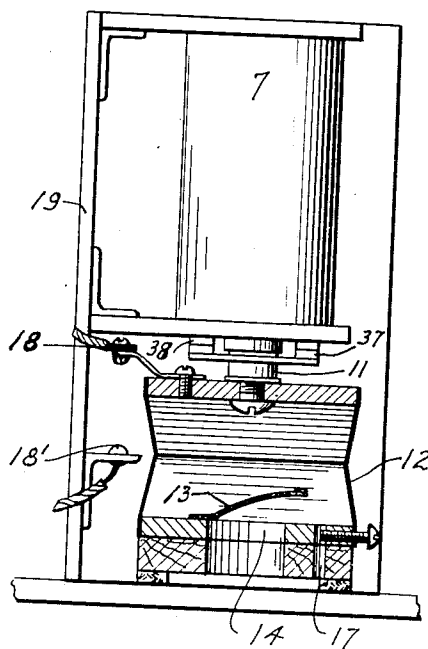


Fig. 4.

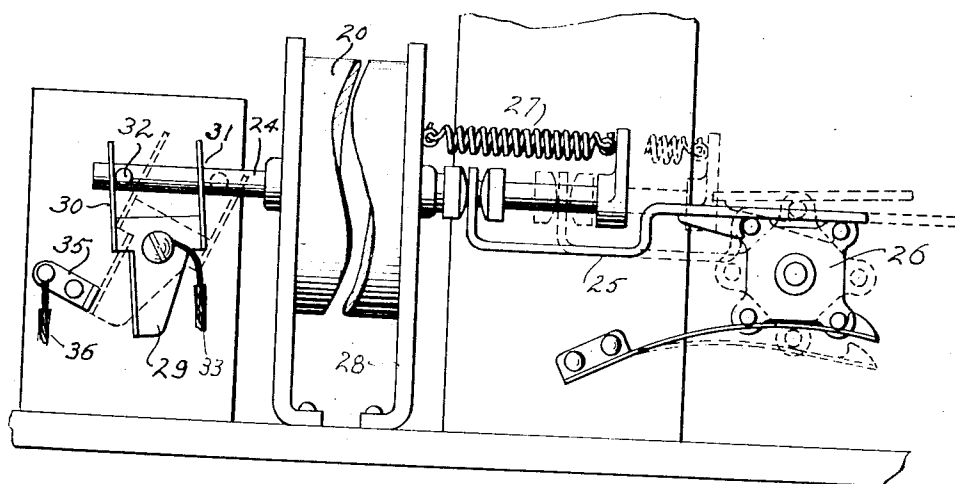


Fig. 5.

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Fig. 6.

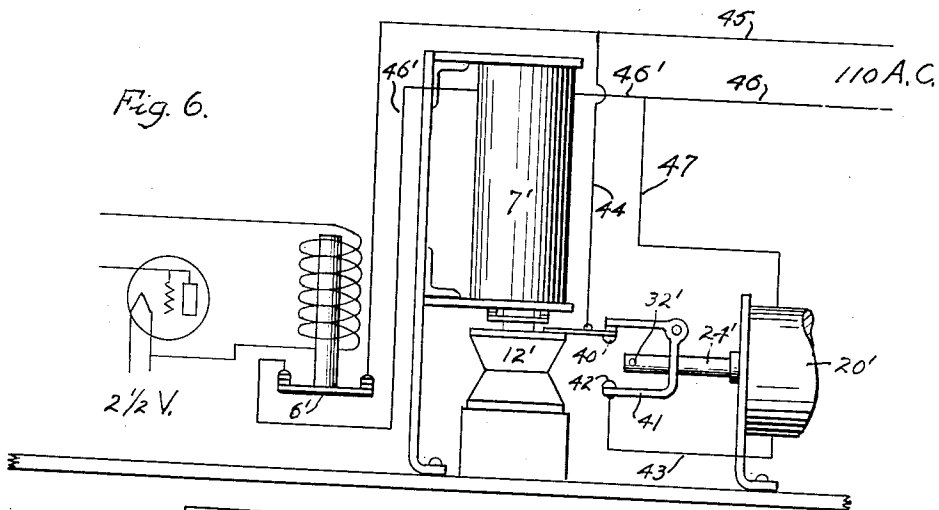


Fig. 8.

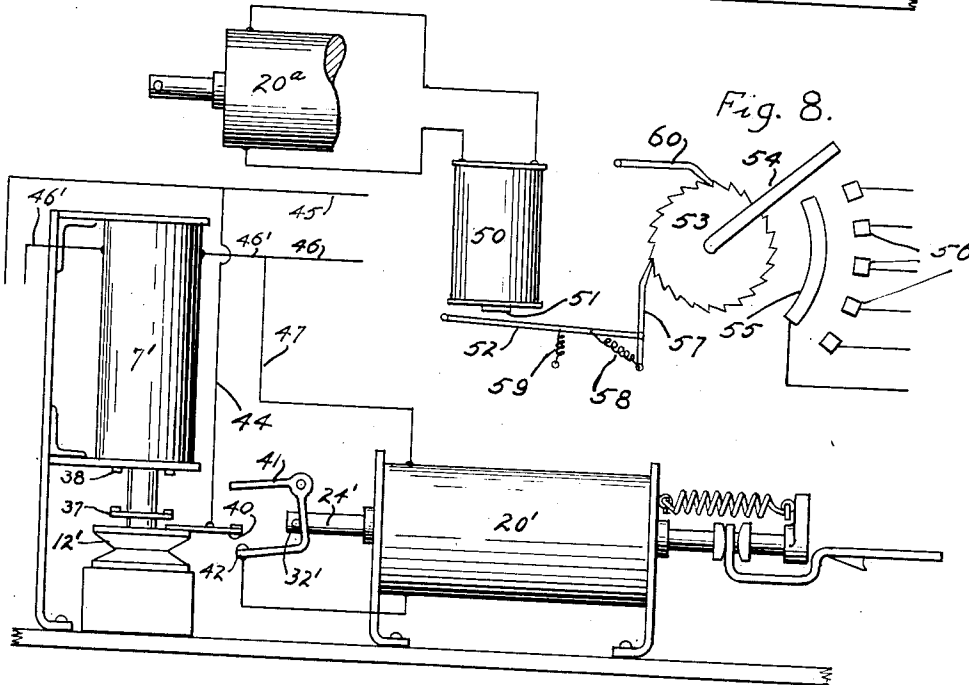


Fig. 7.

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SOUND-CONTROLLED ACTUATING MECHANISM

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13 Claims. (Cl. 179-100.4)

The present invention pertains to a novel mechanism for operating apparatus at predetermined, although not necessarily regular, intervals. The operation of the mechanism is controlled in the present instance by silent grooves of given minimum length in a phonograph record, and the apparatus controlled by the mechanism may be any device related in its operation to the sound produced by the record. A good example of such a device is a slide film projector or a motion picture projector, and in another embodiment herein described, it is a multiple switch for operating various electrical devices in relation to the sound produced by the record.

15 The control of the mechanism from the record depends on the formation of the silent grooves of given length in the record. These grooves are continuous with the usual sound grooves but are plain and soundless so that they produce no sound when traversed by the reproducer needle. The mechanism has a normal tendency to operate through the action of a weighted member, a spring, a magnet or any other such device; but this tendency is opposed and overcome by an electro-magnet which is energized when current is flowing in the output transformer of the amplifier associated with the record. Obviously, this current flows when the needle traverses sound-producing grooves in the record; but when the needle is in a silent groove, the electro-magnet is not energized, and there is no opposition to the normal tendency of the mechanism to function.

25 The electro-magnet must, however, remain de-energized for a given period of time before the mechanism actually operates. This time interval is introduced to prevent actuation on short pauses or between sentences, with the result that actuation occurs only when the silent groove is of a given minimum length as above stated. The delay in operation is brought about by any suitable retarding means. For example, in the present instance, the specific member which is under a normal tendency to operate is a bellows adapted to contract under its own weight when unopposed by the electro-magnet but having a small exhaust port, the actual functioning of the mechanism depending on a pair of contacts which engage each other only when the bellows is fully contracted. On the other hand, the bellows has a large air inlet port so that it rises rapidly and separates the contacts when the electro-magnet is again energized by the entrance of the needle into a sound groove.

55 The invention is fully disclosed by way of

example in the following description and in the accompanying drawings, in which:—

Figure 1 is a diagrammatic view of the apparatus;

Figure 2 is an elevation of the apparatus, showing the wiring diagrammatically;

Figure 3 is a vertical section of the time relay device in contacting position;

Figure 4 is a similar section, partly in elevation, showing the time delay device in the opposite position;

Figure 5 is a detail elevation of the actuator and associated parts;

Figure 6 is an elevation of a modified construction, showing certain conventional electrical apparatus diagrammatically;

Figure 7 is a similar elevation showing the parts in a different position, and

Figure 8 is a diagrammatic view of the multiple switch which may be actuated by the mechanism.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

A phonograph record with a series of silent grooves in combination with recorded sound grooves is reproduced on an electric phonograph of usual and well known design. My device is connected by its connecting wires 1 to the output transformer of this electric phonograph on either the primary or secondary side. The loud speaker of the electric phonograph is left connected in its usual position and reproduces sounds from the record as usual.

When sounds are being reproduced from a phonograph record, current is generated in the output transformer of the electric phonograph, both in the primary and secondary side, by the usual and well known system. When no sounds are being reproduced from a record, no current is generated in the output transformer.

The alternating pulsating current generated in the transformer passes through connecting wires 1 to a vacuum tube 2 and is rectified by this tube into direct pulsating current by the well known vacuum tube rectifying system. This direct pulsating current passes from tube 2 to sensitive relay 3 whose armature 4 is attracted to its energized solenoid 5. The armature closes a pair of contacts 6 which supply the solenoid 7 of a time delay relay with an energizing current from a suitable external source 8. From this source a conductor 9 extends to one of the contacts 6 and another conductor 10 extends from the source to the solenoid 7 and from the solenoid to the other contact 6.

When the solenoid of the time delay relay is thus energized it draws its armature 11 and attached bellows 12 up to the top of its stroke. The armature and bellows are drawn rapidly by the solenoid to the top of its stroke because an inlet valve 13 opens a large intake port 14 by the vacuum thus created in the bellows, as shown in Figure 4.

When no sounds are being reproduced from the record and no current is generated in the output transformer, it follows that no current passes through connecting wires to tube 2 and thence to sensitive relay 3.

The contacts of relay 3 are normally open by virtue of the construction shown in Figure 2. The frame 15 which carries the coils of solenoid 5 has the armature 4 attached thereto in the form of an angular strip member. One of the contacts 6 is carried by one leg of the armature, and the other leg is engaged by an adjustable stud 15' in the top of the frame, thus placing the armature under a spring tension which tends to draw it from the other contact 6 fixed on the frame. Another adjustable stud 16 in the lower part of the frame limits the retraction of the armature.

When sensitive relay 3 ceases to supply energizing current to the solenoid of the time delay relay, the armature 7 and attached bellows 12 descend by gravity to close the large air intake valve 13 by the pressure thus produced in the bellows. The descent is retarded by a small adjustable air vent 17 which allows the bellows to descend in a predetermined period of time. Thus, when sound is being reproduced on a record, the armature and attached bellows rise rapidly with each impulse and descend slowly when the sound ceases. Short pauses between words and sentences on a record do not cause or allow the bellows and attached armature 11 to descend to the bottom of their stroke, because the time necessary for the bellows to descend is set to be longer than such pauses between words and sentences. Thus, on pauses between words or sentences, the bellows and armature begin to descend, but do not reach the bottom of their stroke because the following sound raises the bellows and armature rapidly. When a pause of greater time length than that required for the bellows and armature to descend to the bottom of their stroke is recorded on the record for the purpose of operating a machine or apparatus connected to my device, the armature and bellows descend and close a pair of contacts 18 and 18' carried respectively by the movable part of the bellows and a fixed member such as the frame 19 of solenoid 7.

Another solenoid 20 has one end connected at 21 into the line 10 while its other end is joined by a conductor 22 to contact 18. The complementary contact 18' is joined by a conductor 23 to line 9. Thus, engagement of contacts 18, 18' is necessary in delivering current from the source 8 to solenoid 20.

Energization of solenoid 20 advances an armature 24 which is adapted to actuate some other device or apparatus. For example, the armature 24 may push a slide 25 which turns the feed wheel 26 of a slide film feed. One end of the armature is connected by a retractile spring 27 to the armature frame 28, so that when the solenoid 20 is de-energized, the spring returns the armature to its former position.

Because alternating current produces an objectionable hum or vibration in some apparatus, I provide means for shutting the current off the

solenoid 20 immediately after the latter has performed its function. Some apparatus, such as the solenoid 20 operating the slide film projector shown in Figure 2, perform their functions in a small part of a second. I will briefly describe a device for shutting the current off the solenoid 20 after it has performed its function.

Another switch is mounted adjacent to the armature 24 and includes a pivoted contact 29 having fingers 30 and 31 at opposite sides of a pin 32 carried by the armature. This contact is connected by a conductor 33 to conductor 9, and the co-operating fixed contact 35 of the switch is joined by a conductor 36 to conductor 10 at a point between the solenoid 7 and the contacts 6, 15.

When solenoid 20 receives its energizing current it draws its armature 24 forward, drawing pin 32 between the fingers 30 and 31. At the end of its stroke the pin 32 strikes finger 31 to close the contacts 29 and 35. These contacts close a circuit which supplies current from source 8 to solenoid 7 of the time delay relay, which draws its armature 11 and bellows 12 up, breaking contacts 18, 18' and thereby shutting the current off the driving solenoid 20. When solenoid 20 is thus de-energized, its armature 24 is returned by retractile spring 27 and strikes arm 33 of switch contact 29 to separate the latter from contact 35, thus de-energizing solenoid 7 of the time delay relay and placing the contacts 29, 35 in position for another operation such as that just described. When solenoid 7 is thus de-energized the bellows 12 begins to descend by gravity, unless the solenoid 7 is being energized by the following sound on the phonograph record through tube 2 and sensitive relay 3, as previously set forth.

In both embodiments of the invention, the armature of the solenoid 7 or 7' carries a stop 37 co-operating with stops 38 mounted beneath the solenoid in order to limit the upward stroke of the armature.

If the reproducer needle is still in a silent groove having sufficient remaining length, the bellows 12 descends and initiates another cycle such as that already described, which in this case would be useless. In order to avoid this repeated operation from a silent groove having at least twice the length necessary to permit descent of the bellows 12, I provide the modified construction shown in Figures 6 and 7.

The contacts 18 and 18' of Figures 1 and 2 for completing the circuit to the driving solenoid are here replaced respectively by a contact 40 carried by the bellows 12' and a U-shaped member 41 pivoted adjacent to the armature 24' of the driving solenoid 20'. The member 41 is non-conducting except at its contact point 42 adapted for engagement by contact 40 and wired at 43 to one end of the driving solenoid 20'. The contact 40 is joined by a conductor 44 to one of the mains 45 of the power source. The other main 46 is connected by conductor 47 to the other end of solenoid 20' and is extended through the time delay solenoid 7' to the relay 6', as indicated by the numeral 46' so that the relay governs the circuit through the time delay solenoid as in Figures 1 and 2.

When the bellows 12' descends, the circuit from the source to solenoid 20' is completed at contacts 40, 42. As the armature 24' is advanced, the pin 32' on the rear end thereof engages and turns the member 41 to the position shown in Figure 7, thereby breaking the circuit to the driving solenoid. However, as distinguished from the first described construction, the time delay

solenoid 7' is not again energized until the reproducer needle is out of the silent groove, because the U-shaped member 41 remains in its tilted position and is not returned by the mere retraction of the armature 24'. The member 41 is returned to its normal position only when the solenoid 7' is again energized from a sound groove in the record in the regular manner, whereupon the bellows 12' and contact 40 are lifted and the latter engages the non-conducting upper arm of the member 41 as shown in Figure 6. Therefore, repeated energizing of the solenoids 7' and 20' during a single silent groove is impossible.

Figure 8 shows a multiple switch for operating a series of devices in succession on the occurrence of successive silent grooves in the record. The driving solenoid 50 is wired to receive current simultaneously with a solenoid 20a similar to solenoid 20' which is provided because of the anti-repeating mechanism associated with its armature. The solenoid 50 has a fixed core 51 adapted to attract an external pivoted armature 52. The switch comprises a ratchet wheel 53 carrying an arm 54 adapted to connect a common contact 55 successively to a series of separate contacts 56. As usual in multiple switches, the common contact is connected to one side of the line, and the separate contacts are connected respectively to the several devices which in turn are connected to the other side of the line.

The armature 52 carries a driving pawl 57 held against the ratchet wheel by a spring 58, the armature being normally withdrawn from the core 51 by a spring 59. A detent 60 holds the ratchet wheel from turning backward.

It will be evident that successive movements of the armature 52 caused by successive silent grooves of sufficient length, turn the ratchet wheel so that the switch arm 54 engages the contacts 56 in succession. The electrical devices connected with the contacts 56 may be of any suitable nature such as lamps to be lighted or electrical machines to be operated at given points in the recording.

Although specific embodiments of the invention have been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention, as indicated by the appended claims. It is also contemplated that the invention be used with other sounding instruments than a phonograph record inasmuch as its operation depends on the absence, rather than the presence of sound.

What I claim is:

1. In combination, an actuating mechanism adapted to operate another apparatus, means for setting said mechanism in motion, said means being operable by the effect produced by the traveling of a reproducer needle in a blank groove, with no recorded frequency, formed in a sound record, said apparatus being inoperative on the relative movement between said needle and recordings on said record.

2. In combination, an actuating mechanism adapted to operate another apparatus, means tending normally to set said mechanism in motion, means for opposing the first named means, the opposing means being adapted to be rendered inoperative by the traveling of a reproducer needle in a blank groove, with no recorded frequency, formed in a sound record, whereby the first means is operable when the needle travels in such blank groove, said apparatus being in-

operative on the relative movement between said needle and recordings on said record.

3. In combination, an actuating mechanism adapted to operate another apparatus, an electrical control device for starting and stopping the operation of said mechanism, said device being adapted for connection to and operation by the variable current in a sound amplifying system and sensitive to the effect produced by the traveling of a reproducer needle in a blank groove with no recorded frequency, formed in a sound record, said apparatus being inoperative on the relative movement between said needle and recordings on said record.

4. In combination, an actuating mechanism adapted to operate another apparatus, means for setting said mechanism in motion, said means being sensitive to the effects produced by the traveling of a reproducer needle in a silent groove of a sound record, said apparatus being inoperative on the relative movement between said needle and record, a time relay device operative on said means and adapted to prevent functioning thereof until the needle has traveled in the sound groove a given period of time.

5. In combination, an actuating mechanism adapted to operate another apparatus, means tending normally to set said mechanism in motion, means for opposing the first named means, the second named means being sensitive to the effects produced by the traveling of a reproducer needle in a sound groove of a sound record, whereby the first means is operable when the needle travels in a silent groove, said apparatus being inoperative on the relative movement between said needle and record, a time delay device operative on the first named means and adapted to prevent functioning thereof until the needle has traveled in the sound groove a given period of time.

6. In combination, an actuating mechanism adapted to operate another apparatus, an electrical control device for starting and stopping the operation of said mechanism, said device being adapted for connection to and operation by the variable current in a sound amplifying system and sensitive to the minimum current value in said system, said apparatus being inoperative on the production of sound in said system, and a time delay device operative on the first named device and adapted to prevent functioning thereof until the minimum current value has persisted for a given period of time.

7. In combination, a driving solenoid having an armature adapted to operate another apparatus, a slow-closing and fast-opening switch in the circuit of said armature, a relay adapted to open said switch when energized, said relay being adapted for connection to and operation by the variable current in a sound amplifying system, and means tending normally to close said switch, whereby said armature is moved when said current is substantially zero, said apparatus being inoperative on the production of sound in said system.

8. In combination, a driving solenoid having an armature adapted to operate another apparatus, a slow-closing and fast-opening switch in the circuit of said solenoid, a relay adapted to open said switch when energized, said relay being adapted for connection to and operation by the variable current in a sound amplifying system, and means tending normally to close said switch, whereby said armature is moved when said current is substantially zero, and another switch movable by said armature and adapted to open

the first named switch and de-energize said solenoid.

9. In combination, a driving solenoid having an armature adapted to operate another apparatus, a slow-closing and fast-opening switch in the circuit of said solenoid, a relay adapted to open said switch when energized, said relay being adapted for connection to and operation by the variable current in a sound amplifying system, means tending normally to close said switch, whereby said armature is moved when said current is substantially zero, another switch movable by said armature and adapted to open the first named switch and de-energize said solenoid, and a retractile spring for returning said armature and opening the second named switch when said solenoid is de-energized.

10. In combination, a driving solenoid having an armature adapted to operate another apparatus, a bellows having a portion adapted to descend slowly by gravity, a contact carried by said portion, a fixed contact adapted for engagement by the first contact, said contacts constituting a switch in the circuit of said solenoid, a relay adapted to open said switch when energized, said relay being adapted for connection to and operation by the variable current in a sound amplifying system, whereby said armature is moved when said current is substantially zero.

11. In combination, a driving solenoid having an armature adapted to operate another apparatus, a bellows having a portion adapted to descend slowly by gravity, a contact carried by said portion, a fixed contact adapted for engagement by the first contact, said contacts constituting a switch in the circuit of said solenoid, a relay adapted to open said switch when energized, said relay being adapted for connection

to and operation by the variable current in a sound amplifying system, whereby said armature is moved when said current is substantially zero, and another switch movable by said armature and adapted to open the first-named switch and de-energize said solenoid.

12. In combination, a driving solenoid having an armature adapted to operate another apparatus, a bellows having a portion adapted to descend slowly by gravity, a contact carried by said portion, a fixed contact adapted for engagement by the first contact, said contacts constituting a switch in the circuit of said solenoid, a relay adapted to open said switch when energized, said relay being adapted for connection to and operation by the variable current in a sound amplifying system, whereby said armature is moved when said current is substantially zero, another switch movable by said armature and adapted to open the first named switch and de-energize said solenoid, and a retractile spring for returning said armature and opening the second named switch when said solenoid is de-energized.

13. In combination with a phonograph record having silent grooves of abnormal length between the beginning and the end of the recording thereon, a reproducer needle adapted to travel in said grooves, an actuating mechanism adapted to operate another apparatus, means for setting said mechanism in motion, said means being sensitive to the effects produced by the traveling of said needle in a silent groove, a time delay device operative on said means and adapted to defer the functioning of said means for a time interval no greater than that required for said needle to travel the length of one of said grooves.

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