Jan. 16, 1951 W. S. FARRELL 2,538,358

COIN OPERATED TIME CONTROL MECHANISM

Original Filed March 6, 1943 3 Sheets-Sheet 1

Fig. 1.

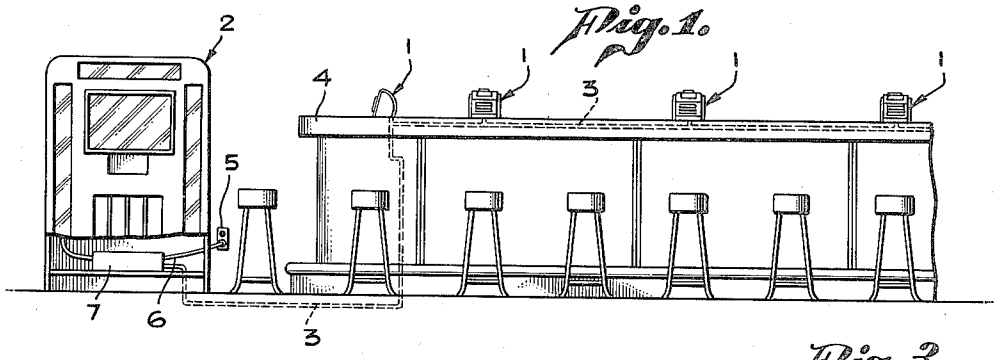


Fig. 2.

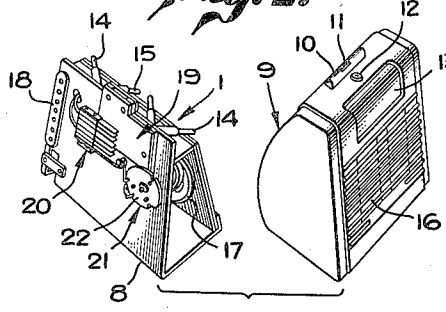


Fig. 3.

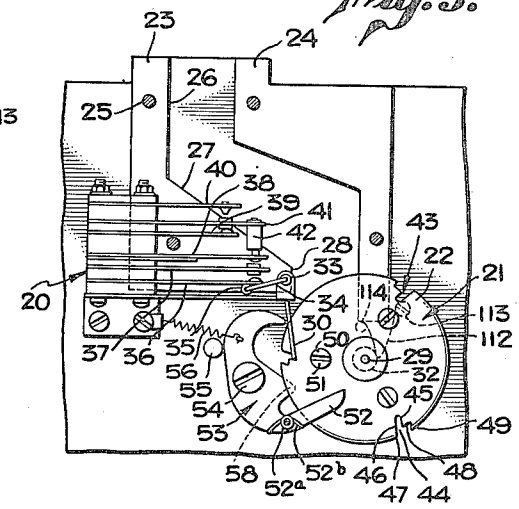


Fig. 4.

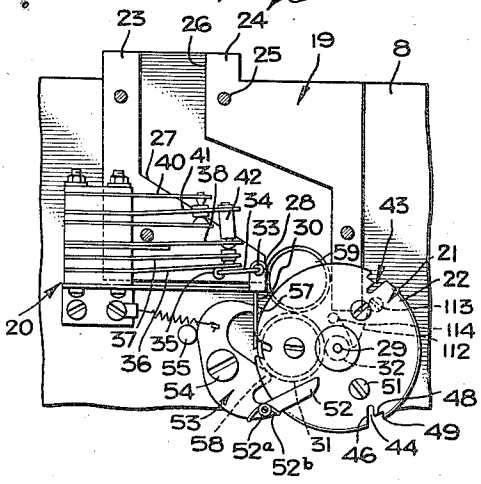


Fig. 5.

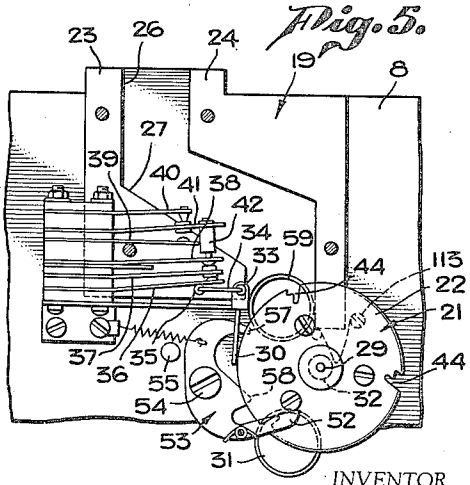
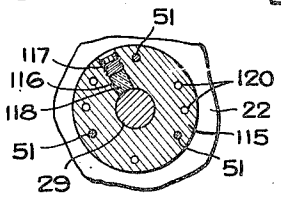


Fig. 8.



INVENTOR
William S. Farrell
BY
ATTORNEY

Jan. 16, 1951 W. S. FARRELL 2,538,358

COIN OPERATED TIME CONTROL MECHANISM

Original Filed March 6, 1943 3 Sheets-Sheet 2

Fig. 6.

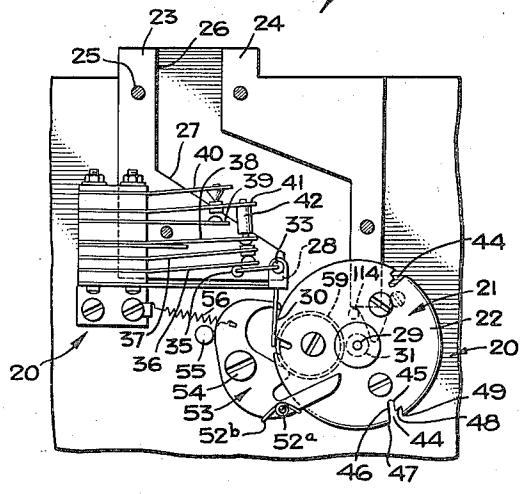


Fig. 7.

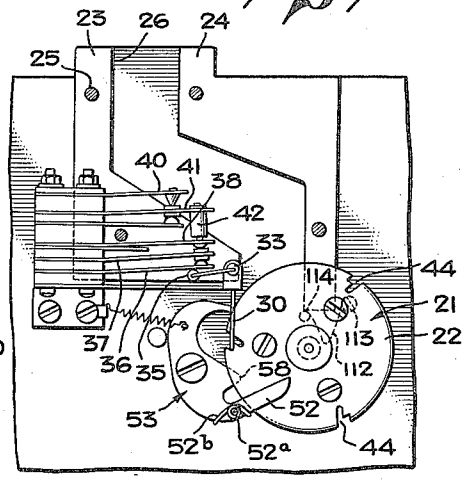
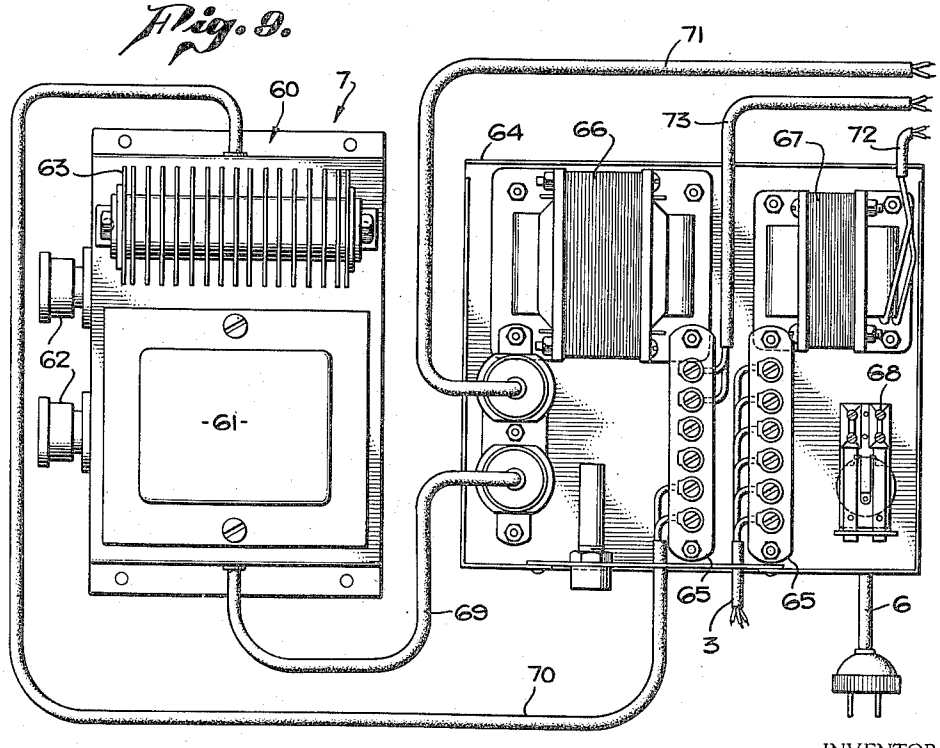


Fig. 9.



INVENTOR
William S. Farrell
BY
Harold B. Ingraham
ATTORNEY

Jan. 16, 1951 W. S. FARRELL 2,538,358

COIN OPERATED TIME CONTROL MECHANISM

Original Filed March 6, 1943 3 Sheets-Sheet 3

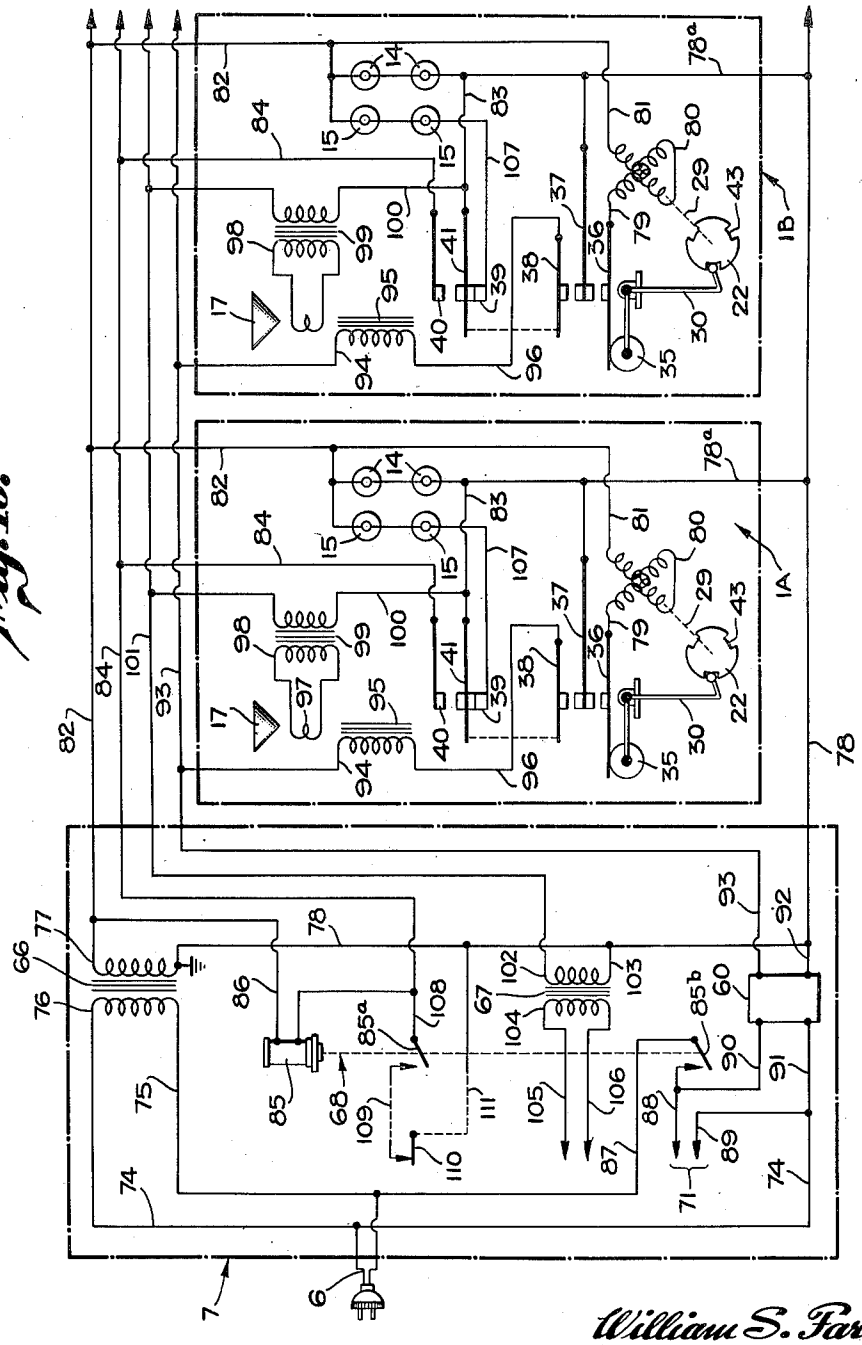


Fig. 10.

William S. Farrell
INVENTOR

BY Harold R. Martin
ATTORNEY

Patented Jan. 16, 1951 2,538,358

UNITED STATES PATENT OFFICE

2,538,358

COIN-OPERATED TIME CONTROL MECHANISM

William S. Farrell, Los Angeles, Calif.

Original application March 6, 1943, Serial No. 478,183, now Patent No. 2,413,700, dated January 7, 1947. Divided and this application October 21, 1946, Serial No. 704,737

5 Claims. (Cl. 194—9)

1

My invention relates to entertainment reproducing systems and has particular reference to a system for reproducing at a plurality of remotely situated control stations entertainment material produced or reproduced at a central source of such entertainment material, such as an automatic phonograph, radio receiver, television or other visual or audible entertainment source which produces such material, capable of being transmitted over telephone wires and the like, in which the amount of the entertainment material to be reproduced at each of the control stations is controlled by the number or denomination of coins deposited in that particular control station.

This application is a division of my copending application, Serial No. 478,183, filed March 6, 1943 which has matured into Patent No. 2,413,700, issued January 7, 1947.

For ready understanding of my invention, the following description pertains to the embodiment of my invention in a sound reproducing system such as that which may be employed with an automatic phonograph as the central source of the material and the type of reproducer of the entertainment material is shown and described as a loud speaker for reproducing at the control station the entertainment in the form of sound. However, it is to be understood that visual types of entertainment may be employed equally well with my system by substituting a central source of visual entertainment and substituting at the control stations a visual reproducer for such material, and hence wherever the expressions "sound reproducing" or "sound reproduction" are used herein, it is so used merely for purposes of convenience and is not intended to exclude such substituted visual reproduction.

In my Patent No. 2,352,188, issued June 27, 1944, and entitled "Sound Reproducing System and Coin Collecting Actuator Therefor," I have disclosed and claimed a novel sound reproducing system of the general type referred to in the preceding paragraph wherein the mechanism is so arranged as to guarantee the reproduction at the coin collecting station in which the coin was deposited one full musical selection or phonograph recording irrespective of the operation of the phonograph or entertainment source as a result of coins deposited in other coin collecting mechanisms.

While this system has proved to be eminently satisfactory in practice, it does nevertheless embody certain disadvantages, among which may be enumerated the relative complexity of the

2

mechanism and control circuits required to provide for the guarantee of a full musical selection at each coin collecting station and the difficulty of adapting the system to certain particular types of automatic phonographs or sound producing systems.

It has been found that the customer reaction to a definite time of reproduction as compared with the full selection type of reproduction is entirely satisfactory and that a considerable proportion of the complexity of the device disclosed in my above mentioned patent can be avoided by operating the system on a definite time basis.

It has also been found disadvantageous to effect the starting and stopping of the reproduction abruptly as results from the closing and opening of an ordinary control switch. Many times customers fail to realize that they have received the full amount of entertainment for which they have paid by the deposit of the coin in the coin collecting device and are led, by the abruptness with which the entertainment is discontinued, to believe that the mechanism has failed in some respect to perform as it should.

I have also discovered that the desire in a customer to deposit a coin and have musical selections and other entertainment reproduced for his benefit can be heightened if the mechanism is so arranged as to more or less continuously reproduce such entertainment within the hearing of the customer but at such a low level as to be unsatisfactory for entertainment purposes. It often occurs that a prospective customer under these circumstances will be so intrigued by hearing the faintly reproduced orchestral number or song that he is impelled to deposit a coin in the device in order that he may hear that same selection with sufficient loudness and clarity as to provide a pleasing result.

It is therefore an object of my invention to provide a sound reproducing system which overcomes certain of the above noted disadvantages by operating on a definite time principle wherein the deposit of a coin in the coin collecting mechanism results in the entertainment, music or other material emanating from a central source being reproduced for a definite period of time and solely at the location of the coin collecting mechanism in which the coin was deposited.

It is also an object of my invention to provide a sound reproducing system of the character set forth in the preceding paragraph which includes a coin receiving mechanism including means for placing into operation a timing mechanism and wherein the timing mechanism in turn places

the reproducing system in operation so as to effect the reproduction of previously recorded material at that location and for a predetermined length of time.

It is a still further object of my invention to provide a sound reproducing system of the character set forth in the preceding paragraph in which two or more coins may be received in the coin collecting mechanism at one time and in which a means is provided for maintaining the system operative for unbroken successive periods of time equal in number to the number of coins deposited in the coin collecting mechanism.

It is additionally an object of my invention to provide in a system of the character set forth in the preceding paragraphs a means which functions to apprise a customer who has previously deposited coins in the coin collecting mechanism that the period of entertainment paid for by the deposited coins is about to expire.

It is also an object of my invention to provide a sound reproducing system of the character set forth in the preceding paragraphs which includes a means for starting and stopping the reproduction of entertainment material at the beginning and end, respectively, of a predetermined time period and in which the starting and stopping is so arranged as to smoothly and gradually build up the volume of the reproduced entertainment from a substantially inaudible level to a satisfactory audible level and at the conclusion of the predetermined time period gradually and uniformly reduce the level of the reproduced entertainment to a substantially inaudible value.

It is a still further object of my invention to provide a sound reproducing system of the character set forth in the preceding paragraphs which includes an electromagnetic dynamic loud speaker having its voice coil or signal receiving element permanently connected to the source of reproduced entertainment and in which the placing of the loud speaker into and out of operation is accomplished by completing and interrupting the field supply circuit for the loud speaker.

Other objects and advantages of my invention will be apparent from a study of the following specifications, read in connection with the accompanying drawings, wherein:

Fig. 1 is an elevational view illustrating diagrammatically the manner of installation of the component parts of my sound reproducing system and the manner in which these parts are interconnected with each other;

Fig. 2 is a perspective view of one of the control units illustrated in Fig. 1, Fig. 2 illustrating the appearance of the control unit when the cover portion thereof is removed;

Fig. 3 is a fragmentary elevational view of the coin collecting and controlling mechanism comprising a part of the control unit illustrated in Fig. 2, Fig. 3 illustrating the relative positions of the various parts when the system is idle and before coins are deposited in the coin mechanism;

Fig. 4 is a view similar to Fig. 3 but illustrating the relative positions of the parts immediately subsequent to deposit of one or more coins in the coin collecting mechanism;

Fig. 5 is a view similar to Fig. 4 but illustrating the relative positions of the parts at a time subsequent to the deposit of the coins in the coin collecting mechanism and illustrating the manner in which a deposited coin is conveyed to a coin receiver;

Fig. 6 is also a view similar to Fig. 3 but illustrating the relative positions of the parts at the conclusion of the next to the last period of entertainment reproduction paid for by the deposit of coins in the coin collecting mechanism;

Fig. 7 is likewise a view similar to Fig. 3 but illustrating the relative positions of the parts a few seconds prior to the expiration of the final time period paid for by the deposit of coins in the coin collecting mechanism;

Fig. 8 is a cross sectional view taken through the timer shaft and control cam hub illustrated in Figs. 3 through 7 and illustrating a novel form of friction clutch which is employed in the timing mechanism;

Fig. 9 is a plan view illustrating the component parts and the manner of interconnection of certain auxiliary equipment associated with the system of my invention; and

Fig. 10 is a schematic wiring diagram illustrating the electrical connections employed in the preferred embodiment of my invention.

Referring to the drawing, I have illustrated in Fig. 1 a plurality of control units 1 as being interconnected with each other and with a suitable central source of entertainment which for purposes of illustration herein is shown as an automatic phonograph 2 as by means of a multiple conductor electric cable 3. The units 1 are each illustrated as being mounted at convenient intervals along a counter or bar 4 and it will be appreciated that this is but one of the many modes of installation to which my invention is susceptible, it being feasible to mount such control units at strategic locations in dining rooms, cafe booths or at the seats or berths of railroad trains.

Power for operating the system is indicated as being derived from a conventional wall outlet 5 to which the phonograph 2 is illustrated as being connected as by means of an attachment cord 6. The system also includes an adaptor unit 7 which is connected between the phonograph 2 and the control units 1 and which serves the purpose of controlling the operation of the phonograph 2 in accordance with the operation of the various control units 1.

Each of the control units 1 is preferably constructed along the lines illustrated in Fig. 2, and includes a base structure 8, upon which the various control instrumentalities are mounted, which base structure is adapted to be enclosed by a suitable cover 9. The cover 9 preferably includes a means 10 which defines a coin slot 11 into which coins may be inserted by a customer. The cover 9 may be secured to the base structure 8 in any suitable manner and the attaching means is preferably provided with a lock 12 to prevent unauthorized entry into the mechanism.

The front portion of the cover 9 is provided with a translucent or transparent window 13 adapted to be suitably illuminated as by means of lamps 14 and 15 mounted on the supporting structure 8. The front portion of the cover 9 is similarly provided with a grill 16 or other suitably decorated opening adapted to register with an electrodynamic loud speaker 17 mounted on the base unit 8.

The base member 8 may also carry a suitable terminal board 18 to facilitate the electrical connections to the device and preferably also mounts a suitable structure 19 for defining a coin receiving channel, a switch mechanism 20 and a

timing mechanism 21 which may include a timing motor 80 and a time controlled cam dish 22.

The coin chute, switch and timing control mechanism above referred to are illustrated in more detail in Figs. 3 through 7, each of which comprises an elevational view of that portion of the base structure 8 upon which these mechanisms are mounted, the coin chute defining structure 19 being illustrated with the cover portion thereof removed to show the configuration of the coin chute.

As is clearly shown in Figs. 2 and 3, the coin chute is preferably defined by a pair of thin members 23 and 24 which are spaced from each other and secured to the base member 8 as by means of screws or other attaching means 25. The configuration of the members 23 and 24 is such as to define a coin chute 26 which is so positioned as to register with the coin slot 11 when the cover 9 is placed over the base member 8 and which extends downwardly through the first part of its length and then turns to the right along an angular surface 27.

The angular portion 27 of the chute communicates with a vertically disposed portion 28 situated between a shaft 29 of the timing mechanism 21 and a switch arm 30 of the multi-pole switch structure 20 so that a coin, such as the coin 31, illustrated by dotted lines in Fig. 4 passing downwardly through the straight portion of the chute 28 will wedge between the switch arm 30 and a suitable spacer 32 which surrounds the shaft 29.

The normal distance between the switch arm 30 and the spacer 32 is made somewhat less than the diameter of the coin with which the device is to be used so that as the coin moves downwardly to the position illustrated in Fig. 4, the switch arm 30 will be displaced to the left as illustrated by the change in its position from Fig. 3 to Fig. 4. The switch arm 30 may be pivotally supported as at 33 and include a bell crank portion 34 which carries an insulating roller 35 bearing against a lower spring member 36 of the switch 20.

The switch 20 includes a three contact switch structure including the member 36 and a pair of adjacently disposed members 37 and 38 so arranged that as the member 36 is moved upwardly, an electrical circuit is established between the member 36 and the members 37 and 38. The switch structure 20 also includes a double-throw switch structure comprising a normally closed stationary contact 39 and a normally open stationary contact 40 between which is positioned a movable contact member 41. The member 41 is connected to the upper spring contact member 38 as by means of an insulating connecting member 42 so that upward movement of the member 38 will result in the opening of the normally closed contacts 39 and the closing of the normally open contact 40.

The shaft 29 of the timing mechanism is arranged to be driven at a constant speed by a suitable timing mechanism and preference is expressed for a synchronous electric motor. The shaft is preferably connected to the motor in such manner that the time required for one complete revolution of the shaft 29 is equal to one or more whole predetermined time periods, each comprising the duration of the reproduction of the entertainment period paid for by the deposit of a single coin in the coin slot 11. In the form of the invention illustrated herein the time period of reproduction paid for by one coin has been arbitrarily chosen as four minutes and the shaft 29 is arranged to make one revolution in twelve minutes so that one revolution of the shaft 29 corresponds to three predetermined periods of entertainment reproduction.

The time controlled cam 22 which is secured to the shaft 29 is accordingly provided with three switch controlling notches 43 spaced equally about the periphery of the cam member 22, which cam member preferably comprises a flat circular disk so disposed as to lie closely adjacent the outer surface of the members 23 and 24 and under the switch arm 30. The lower end of the switch arm 30 is turned inwardly to extend across the path of a coin travelling along the straight portion 28 of the coin chute.

Each of the notches 43 comprise cam control surfaces adapted to control the movement of the switch arm 30 by the rotary movement of the cam member 22. Each of the notches 43 include a relatively deep portion 44 defined by a substantially radial surface 45 and a sloping surface 46 which is preferably rounded as at 47 at the junction of the surface 46 with the outer periphery of the member 22. The notches 43 each include a shallower notch portion contiguous to the deep portion 44 and including a circumferential surface 48 and a substantially radial surface 49 extended between the surface 48 and the outer circumference of the member 22.

Since in the form of the invention illustrated the cam member 22 embraces three time periods, it also carries three actuating pins 50 illustrated as axially extending sleeves secured to the member 22 as by means of screws 51. The members 50 are likewise spaced equidistant about the center of rotation of the cam member 22 and are arranged to successively engage an overlying trigger portion 52 of a coin arresting control member 53 which is pivotally secured to the base member 8 as by means of a pivot screw 54.

The coin control member 53 is normally urged in a counter-clockwise direction to a non-operated position bearing against a stop 55 as by means of a tension spring 56. The coin control member 53 includes an upper coin engaging portion 57 and a lower coin engaging portion 58, these portions being so disposed as to extend beneath the cam member 22 and into the straight portion 28 of the coin chute. The portions 57 and 58 are made of such length that one or the other but not both of these portions may extend into the coin chute a distance sufficient to engage a coin and arrest its passage through the coin chute, the one which so engages the coin depending upon the position then occupied by the coin control member 53.

As is illustrated in Figs. 4 and 5, the coin engaging portions 57 and 58 are spaced from each other a distance such that when the member 53 is moved from its non-operated position which is illustrated in Fig. 4 to its operated position which is illustrated in Fig. 5, the lower coin engaging portion 58 will be withdrawn a distance sufficient to allow the coin 31 to proceed downwardly past the portion 58 while at the same time the portion 57 will be projected into the chute in a position to pass beneath a subsequently deposited coin 59 resting upon the previous coin 31 so that the coin 59 will be held against further downward movement as is illustrated in Fig. 5 until the coin control member 53 is returned to its non-operated position.

Reference has been had hereinbefore to the adaptor unit 7. This unit is illustrated in more detail in Fig. 9 as including a field supply unit

60 which may include a suitable transformer 61 protected by fuses 62 and connected to a rectifier 63 illustrated in Fig. 9 as comprising a copper oxide type of rectifier. The adaptor unit 7 may also include a suitable supporting structure 64 upon which is mounted terminal boards 65 by means of which connections to the cable 3 and other electrical connections may be readily established.

Mounted on the support 64 I provide a control transformer 66 adapted to supply low voltage alternating current for control purposes, an audio-matching transformer 67 employed for the purpose of matching the transmission line impedance to the output impedance of the automatic phonograph 2 or other central source of entertainment and a control relay indicated generally at 68. Power for operating the system is conveyed over the attachment cord 6 which is preferably connected to the adaptor unit 7 and a cable 69 may supply such power to the field supply unit 60, the rectified direct current output of which is conveyed to the terminal boards 65 as by means of a cable 70.

When the system is used to reproduce entertainment from an automatic phonograph, the adaptor unit may be so arranged as to furnish power for operating the phonograph as by supplying the power from the adaptor unit 7 by means of a cable 71, and a pair of conductors comprising a cable 73 may be employed to establish a control connection between the adaptor and a "bump-switch" incorporated in the phonograph 2 and employed in a manner to be described hereinafter. The music or reproduced entertainment is conveyed from the automatic phonograph 2 or other entertainment source to the transformer 67 by means of a cable 72.

The manner in which the above described instrumentalities are interconnected and the manner in which they cooperate to achieve the stated objects of the invention can perhaps best be had by having reference to the wiring diagram Fig. 10 and describing the operation of the device with reference to that diagram while carrying the description of the electrical connections along concurrently therewith.

As is shown in Fig. 10, power for operating the system is conveyed to the auxiliary unit 7 through the attachment cord 6, conductors 74 and 75 of which are connected to a primary winding 76 of the control power transformer 66. One terminal of a secondary winding 77 of this transformer is preferably grounded and is extended by means of a grounded conductor 78 included in the interconnecting cable 3 to each of the control units 1. Two of such control units are illustrated in Fig. 10 and the mechanism associated therewith is illustrated as being enclosed in the dot-dash rectangles 1A and 1B.

Prior to the deposit of a coin in the coin slot 11 the parts of each of the control units 1 will occupy the position shown in Fig. 3. When a coin is deposited it will pass down through the vertical portion 26 of the coin chute and then along the angled portion thereof until it arrives at a position at which it becomes wedged between the spacer 32 on the timer shaft 29 and the inturned end of the switch arm 30. This wedging action will cause the switch arm 30 to be moved to the position shown in Fig. 4, which movement will move the contact spring 36 a distance sufficient to electrically interconnect the springs 36, 37 and 38. This movement will also move the spring 41 a sufficient distance upwardly to contact the spring 40, the resilience of the spring 39 being sufficient to follow the movement of the spring 41 to maintain contact between the springs 39 and 41 even after the initial contact between the springs 41 and 40.

The connections established by the interconnection of the springs 36 and 37 will close the circuit to a synchronous electric motor 80 comprising the timing element connected to the timing shaft 29. The connections established by the interconnection of the springs 37 and 38 will supply current through the field winding of the speaker in the control unit 1 in which the coin has been deposited while the interconnection of springs 41 and 40 will complete a circuit through the voice coil of the speaker. Thus upon the initial deposit of the coin the speaker of the control system will be instantly connected for active reproduction of the entertainment emanating from the automatic phonograph or other central source of entertainment with which the control units may be associated.

The circuit thus established for the synchronous motor 80 extends from one terminal of the transformer 77 by way of a conductor 78 which extends as a line conductor to each of the control units 1, at each of which units a branch 78a extends to the contact spring 37. Thence the circuit extends through the contact spring 36 and conductor 79, through the windings 80 of the synchronous motor 80 and thence by way of conductor 81 to a line conductor 82, which line conductor 82 extends from the opposite terminal of the transformer 77 to connection with each of the control units 1 employed in the system.

Thus the initial deposit of the coin causes the timing motor 80 to slowly rotate the timing cam 22 in a counter-clockwise direction. Where the control units are associated with an automatic phonograph such as that shown in Fig. 2, the initial closing of the contact springs 40 and 41 to establish connection therebetween may be utilized to complete a circuit starting the automatic phonograph into operation, this circuit extending from the line conductor 78 through conductor 78a and a branch conductor 83 to the contact spring 41, thence to the contact spring 40 and through conductor 84 which extends to a relay coil 85 in the adaptor unit, and thence through conductor 86 to the ungrounded terminal of the control power secondary winding 77. The closing of the normally open contacts 40 thus serves to energize the control relay coil 85 to close each of its normally open contacts 85a and 85b.

The normally open contact 85b is included in a circuit comprising a conductor 87 (connected to the conductor 75) and a conductor 88. The conductor 88 is one of the two conductors comprising the cable 71 previously referred to as supplying power to the mechanism of the automatic phonograph 2, the other conductor of the cable 71 comprising a conductor 89 which is connected to the conductor 74 of the power supply circuit 6. Conductors 88 and 89 are shown as cable 71 in Fig. 9. The energization of the relay 85 resulting in the closing of the contacts 85b thus serves to energize the electrical mechanism included in the automatic phonograph 2 and so places the phonograph in operation. At the same time the closing of the contacts 85b completes a circuit extending between the conductor 87 and a conductor 90 which is connected to the input side of the field supply unit 60, the other input

terminal of the unit 60 being connected as by means of a conductor 91 to the conductor 74.

The output of the field supply unit is conveyed to the balance of the system through the cable 70, one conductor 92 of which is connected to the grounded line conductor 78 and the other conductor of which is connected to a line conductor 93 included in the interconnecting cable 3 and extended into connection with all of the control units 1 as indicated in Fig. 10. Conductors 92 and 93 are indicated as cable 70 in Fig. 9.

In each of the control units 1 the conductor 93 is connected as by means of a conductor 94 to one terminal of a field winding 95 comprising the magnet portion of the electrodynamic loud speaker 17 previously referred to. The other terminal of the field winding 95 is connected as by means of a conductor 96 to the aforementioned contact spring 38 which, it will be recalled, is upon the initial deposit of a coin moved into engagement with the contact spring 37 to which is connected the grounded conductor 78. The closing of the circuit between the switch contact springs 37 and 38 thus serves to connect the field winding 95 across the output of the field supply unit 60 so as to place the loud speaker 17 in an operative condition.

The voice coil or signal receiving element of the loud speaker 17 is illustrated in Fig. 10 as comprising a coil 97. This coil is connected to a secondary winding 98 of an impedance matching transformer 99. The primary winding of the transformer 99 has one terminal connected as by means of a conductor 100 to the aforementioned grounded line conductor 78 and the other terminal is connected to a fifth line conductor 101 included in the interconnecting cable 3.

Within the adaptor unit 7 the conductor 101 is connected to a secondary winding 102 of the impedance matching transformer 67 previously referred to, the other terminal of the secondary 102 being connected as by means of a conductor 103 to the grounded line conductor 78. Conductors 101 and 103 are shown as cable 3 in Fig. 9. It is thus apparent that any signal voltages generated in the secondary 102 are impressed across conductors 101 and 78 and are thus applied to the primary winding of the matching transformer 99 and from there to the voice coil 97 of the speaker 17 so that these signal currents are reproduced as corresponding sounds at the location of the control unit.

The impedance matching transformer 67 is provided with a primary winding 104 which is connected by means of conductors 105 and 106 to the signal output terminals of the reproducing apparatus comprising the automatic phonograph 2. Thus any music or other entertainment which is reproduced by the placing of the automatic phonograph 2 in operation is reproduced as sound at the location of the control unit in which the coin was deposited. Conductors 105 and 106 are shown as cable 72 in Fig. 9.

Reference has been had heretofore to the electric lights 14 and 15 which are positioned behind the transparent or translucent section 13 and behind the grill 16. The lights 14 are preferably connected either in parallel or in series as indicated in Fig. 10 between conductors 82 and 78 so as to be continuously illuminated whenever the mechanism is placed in an operative condition by plugging the cord 6 into the wall socket 5. The lights 15 are preferably included in a similar circuit which is extended from the conductor 82 by means of a conductor 107 to the normally closed contacts 39 of the switch structure 20, so that upon the initial insertion of the coin and the movement of the switch structure 20 to the position shown in Fig. 4, the lights 15 will remain illuminated.

When the timing motor is started and the cam 22 begins to rotate, the curved portion 47 of the notch 43 will press against the inturned end of the switch arm or lever 30 and cause the lever to be moved slightly further to the left, which in turn moves the several contact springs to the position shown in Fig. 5, obtaining contact between the switch springs 40 and 41 but separating the contact springs 41 and 39. This additional flexing of the contact springs performs two functions; first, the opening of the circuit to the lights 15 and, second, causing the contact points on the springs to slide somewhat relative to each other to provide a wiping action between them. The purpose of extinguishing the lights 15 will be made more apparent hereinafter.

Assuming now that two or more coins such as the coins 31 and 59 have been deposited in the coin chute 11, I have shown how the mechanism is placed in operation by the engagement of the first coin with the switch arm 30 so as to effect the reproduction of the recorded material at the location of that one of the control units in which the coin was inserted. As the cam member 22 continues to rotate as a result of the energization of the motor 80, one of the actuating members 50 is brought into engagement with the trigger arm 52 of the coin control member 53 so as to move that member from its normal position illustrated in Figs. 3 and 4 to a coin releasing position such as that illustrated in Fig. 5.

It will be noted that the coin 31 is held in the position illustrated in Fig. 4 by the lower coin engaging portion 58 of the member 53 when that member is in its normal position. Upon movement of the member to a coin releasing position such as is illustrated in Fig. 5, the portion 58 is retracted a distance sufficient to allow the coin 31 to fall into the coin receiver comprising the unoccupied space defined within the base member 8. The retracting movement of the portion 58 is accompanied by an inward movement of the portion 57 which extends into the coin chute at a point disposed between the coins 31 and 59 so as to pass beneath the coin 59 and hold the same within the chute until the member 53 is restored to its initial position.

It will be noted that during this movement of the coin control member 53, the switch arm 30 is held in its fully operated position by engagement of the inturned end portion thereof with the outer periphery of the cam 22. As soon as the actuating member 50 is moved a distance sufficient to clear the end of the trigger 52, the spring 56 will restore the member 53 to its normal position as is illustrated in Figs. 4 and 6. This serves to withdraw the coin engaging portion 57 and re-insert the coin engaging portion 58, allowing the coin 59 to drop to the position initially occupied by the coin 31, all as indicated in Figs. 5 and 6.

In order to prevent possible jamming of the mechanism by the insertion of an under-sized coin, which might make the next following coin to be disposed too far down relative to the coin engaging portion 57, the trigger 52 may be formed as a piece separate from the member 53 and may be pivoted thereto by means of a screw

as indicated at 52a, the trigger 52 being held against movement relative to the member 53 as by means of a spring 52b which is wound about the screw 52a and has its opposite ends engaged, respectively, below the actuating member 53 and the trigger 52. The strength of the spring 52a should be such that it will not yield except upon the exertion of abnormal force on the spring 52 which would be occasioned by the jamming of the finger 57 against the side of the next uppermost coin.

Upon the completion of the first period of entertainment reproduction period paid for by the deposit of the coin 31, the cam member 22 will have moved to a position bringing the next notch therein adjacent the inturned end portion of the arm 30. It will be noted by having reference to Fig. 6 that movement of the switch structure 20 to a normal position is, however, prevented by the presence of the coin 59, the switch arm 30 being permitted only a slight amount of inward movement sufficient to bring it into engagement with the periphery of the coin 59.

The circuits established by the switch structure 20 upon the deposit of the coin 31 are thus maintained by the coin 59 so that the cam member 22 continues to rotate as before described. Thereafter the next actuating member 50 is brought into engagement with the trigger 52 and the above described operation of the coin control member 53 is repeated so as to drop the coin 59 into the coin receiver in the same manner as previously described in connection with the coin 31. Here again the switch arm 30 is maintained in its fully operated position by its engagement with the outer periphery of the cam member 22. A few seconds before reaching the end of the second period of reproduction; namely, the period which has been paid for by the deposit of the second coin 59, the cam member 22 will have been moved to a position such as that illustrated in Fig. 7, bringing the shallow notch portion 48 adjacent the switch arm 30 so as to allow the arm 30 to move inwardly to an intermediate position such as that illustrated in Fig. 7.

This movement of the switch arm serves to move the various contact elements of the switch structure 20 a distance sufficient to close the normally closed contact 39 but not sufficient to open the contact between contacts 40 and 41, without, however, interrupting the circuits established through the switch fingers 36, 37 and 38.

This movement of the switch will cause reestablishment of the circuit through the lights 15 constituting a warning that the time period of entertainment purchased by the last deposited coin is about to end so that the customer may, if he desires, deposit a new coin or coins without interrupting his listening to the entertainment.

It is intended that the translucent or transparent window 13 be provided with suitable baffles or barriers within the interior of the housing 9 so as to limit the illumination afforded by the lamps 15 to a relatively small area of the window 13. For example, in a commercial model of my invention, I have so arranged the window 13 that the portion which is continuously illuminated by the lamps 14 glows with a pleasing color such as blue and is inscribed with the legend "Deposit one to five pennies." The limited area which is illuminated by the lamps 15 is colored a contrasting color such as a bright red and bears the large inscription "Now." Thus during the normal operation of the device the lighted window 13 merely urges a customer to deposit one to five pennies. Upon arrival at the point where the switch arm 30 moves into the shallow notch 44, the remainder of the legend is illuminated and the customer is urged to deposit his money "Now."

If the additional coins are deposited as requested, the first of such additional coins will fall to the position occupied by coin 31 in Fig. 4 and so hold the switch arm 30 in its operative position and maintain the circuit completed through the timing motor 80. This will serve to bring the curved nose portion 47 of the cam notch 46 into engagement with the switch arm 30 and move the switch sufficiently to reopen the normally closed contacts 39 and the word "Now" again becomes obscured.

If, on the other hand, the additional coins are not deposited, the movement of the switch arm 30 into the deep notch 46 will restore the switch structure to its non-operative position such as is illustrated in Fig. 3, thus deenergizing the timing motor 80, opening contacts 37 and 38 to disconnect the field of the speaker in that control unit and opening contacts 40 and 41 to deenergize the circuit between the control unit and the relay 85.

Deenergizing the circuit for the relay 85 would stop the phonograph 2 but in view of the fact that the end of the time period for which the last penny paid for may not coincide with the end of the record which had been playing on the phonograph 2, the immediate stopping of the phonograph with the reproducer needle resting on the record might result in perforation or injury to the phonograph record disk. It is therefore desirable that irrespective of the operation of the switch structure 20 to its non-operative position, the phonograph mechanism should be continued in operation until the end of the record is reached and the reproducer is separated from the record before the phonograph is actually stopped.

To insure this continued operation of the phonograph until the end of the record is reached, I connect the normally open contacts 85a of the relay 85 in a self-holding circuit extended by means of a conductor 108 from conductor 84 through the normally open contact 85a and by means of a conductor 109 embodied in the aforementioned cable 73 to a "bump-switch" 110 provided on the automatic phonograph 2. From the bump-switch 110 the circuit returns via conductor 111 also embraced within the cable 73 and into connection with the grounded line conductor 78.

The bump-switch 110 is a normally closed switch so positioned as to be momentarily opened upon arrival of the reproducing head at the end of each recording. It will thus be seen that when the relay 85 is initially energized, a self-holding circuit is established through the contacts 85a.

If a sufficient number of coins is deposited to maintain the phonograph 2 in operation for a period of time longer than that required to reproduce one full recording, the bump-switch 110 will be momentarily opened at the time the recordings are automatically changed by the phonograph mechanism. This will not, however, serve to deenergize the relay 85 because the initial energizing circuit thereto is completed by way of conductor 84 and the normally open contacts 40 included in the switch structure 20. However, upon the opening of the circuit 84 as at the end of the time period paid for by the deposit of coins in the control station 1, the relay

85 will be maintained energized through the self-holding circuit until the record then being reproduced is finally completed, at which time the momentary opening of the bump-switch 110 will deenergize the relay 85 and subsequently stop the operation of the automatic phonograph.

It will be noted, however, that even though the automatic phonograph is by this means maintained in operation, the reproduction of the recorded entertainment at the location of the control unit 1 is arrested at the time the switch structure 20 is moved to its non-operated position by the opening of the circuit between the switch fingers 37 and 38. The interruption of this circuit serves to deenergize the field structure 95, whereupon the loud speaker 17 is rendered substantially non-operating.

The connections above described with respect to the control unit 1a are duplicated in all of the control units 1 embraced within the system and it will be noted that since each of the instrumentalities are connected in parallel with each of the corresponding instrumentalities in the other control units, the automatic phonograph 2 will be placed in operation by the deposit of the first coin in any one of the control units 1 and will thereafter be maintained in operation a length of time sufficient to supply the reproduced entertainment which is paid for by the subsequent deposit of coins in any of the other control stations.

Attention is directed particularly to the manner in which the loud speakers 17 are each connected to the system and the manner in which these loud speakers are controlled. It will be noted first that the signal circuits for each of the loud speakers are connected in parallel across the signal supply lines and that the loud speakers are rendered operative or inoperative by the energization or de-energization of the field windings thereof. Thus the load impedance which is connected across the signal circuit remains substantially constant irrespective of the number of loud speakers 17 which are in operative condition so that it is possible to accurately match the various transmission impedances to insure high fidelity of the reproduction at each and every control station irrespective of the number of control stations at which the recorded entertainment is actually being reproduced.

A second very advantageous feature which results from this arrangement is the fact that those of the loud speakers 17 which are rendered inoperative by the de-energization of the field structure 95 are actually operative to a very slight extent because of the residual magnetism of their field structures. Thus when the reproducing system is placed in operation by the deposit of a coin in one of the control units 1, the reproduced entertainment will be reproduced as sound at the location of that control station, the intensity of such sound being preferably adjusted to provide an adequate volume for those persons situated immediately adjacent that control station but absolutely inadequate to provide satisfactory entertainment for those persons situated adjacent other control units.

At the same time the slightly operative condition of the loud speakers in the other control units causes that same recorded entertainment to be reproduced very, very softly in the immediate vicinity of the persons adjacent the control units in which no coin has been deposited. The effect is that such persons hear the reproduction of the entertainment at such a low volume as to be unsatisfactory for entertainment purposes but at a sufficient volume to make them conscious of the fact that there is a particular musical selection, song or other entertainment being reproduced, thereby inducing a desire in such persons to deposit coins in the control units so that the entertainment may be reproduced at a volume adequate for entertainment purposes.

Still a third advantage resides in the employment of the loud speaker arrangement being discussed. This advantage resides in the fact that the field flux which is generated by the field windings 95 builds up relatively slowly upon the completion of the field winding circuit and similarly collapses relatively slowly upon the interruption of this circuit due, of course, to the relatively high inductance of the field windings. This serves to bring the loud speakers smoothly into operation and to cause their operation to cease gradually upon the deenergization of the field windings in contra-distinction to the abrupt turning "off" and "on" of the device which results from the conventional circuit arrangements in which the signal circuit itself is closed and opened by an ordinary switch or relay structure.

I have found that this gradual building up of volume upon the deposit of a coin in the control units and the gradual fading out of the sound at the conclusion of the time period paid for by the deposit of such coin is of definite value in a definite time system such as is herein disclosed for the reason that almost invariably the starting and stopping of the actual reproduction occurs at some time other than the actual beginning or end of the musical selection or other entertainment which is reproduced during the period paid for. If the starting and terminating of the operation of the device at the beginning and end of the period paid for is abrupt as in the ordinary switching arrangements, the customer for some reason immediately draws the conclusion that the device has failed to operate as intended and similarly feels that this failure can be cured by hammering on the control unit with whatever instrument is at hand. The disastrous results of such conduct appear to be almost entirely avoided by causing the starting and terminating of the operation to be accomplished in a smooth and gradual manner as above described.

The coin slot 11 which is provided in the upper portion of the housing 9 is preferably sized to correspond rather closely to the size of the coin which it is intended to be deposited in the device so as to automatically prevent the deposit of larger coins than intended. It occasionally happens, however, that a customer will inadvertently deposit a smaller sized coin in the slot 11. For example, if the device is arranged to be operated by nickels, a customer will occasionally deposit a penny, and similarly if the device is arranged for operation by the deposit of pennies, a customer will occasionally deposit a dime. This tends to jam the coin control mechanism.

It will be noted by having reference to Fig. 4 that if the coin 31 and/or the coin 59 is of a lesser diameter than indicated in Fig. 4, the inward movement of the upper coin engaging portion 57 upon movement of the coin control member 53 will be very apt to bring the end of the projection 57 into engagement with the side of the uppermost coin rather than to cause the same to pass under the coin as is illustrated in Fig. 5. As this condition prevents further movement of the coin control member 53, the trigger 52 by its engagement with the actuating mem-

ber 50 will tend to stop the rotation of the cam member 22.

Because of the high gear ratio between the timing motor 30 and the shaft 29, it is found that such a jamming of the mechanism does not in fact stall the motor 30 but instead results in either the twisting off of the shaft 29 or the stripping of the gears in the gear reduction unit. I have provided against this disastrous consequence by employing at the lower end of the coin chute a spring member 112 which may be of hairpin form having one end secured to the base structure 8 as by means of a screw 113 and having the other end coiled as indicated at 114 and normally disposed in such position that the innermost edge of the coiled portion 114 defines a continuation of the lower portion of the chute 28.

This disposition of the spring 112 is clearly illustrated in Figs. 3 through 7. With this arrangement if for any reason the coin engaging projection 57 engages the side of the upper coin 59 rather than passing underneath such coin as intended, the coin is permitted to move laterally to flex the spring 112 and thereby permit sufficient movement of the coin control member 53 as to allow the actuating member 50 to pass beyond the end of and clear the trigger 52.

However, in addition to the above provision, I prefer to secure the cam member 22 to the shaft 29 through a friction drive or slip clutch arrangement so that in the extremely unlikely event that the mechanism will become jammed and further rotation of the cam member 22 will be prevented, the shaft 29 may continue in its rotation to thus prevent the twisting off of the shaft 29 or the stripping of the gears in the gear reduction unit.

I have illustrated in Fig. 8 a novel and simple form of construction for providing such a friction drive or slip clutch arrangement. As is illustrated in Fig. 8 the cam member 22 preferably comprises a flat disk to which is securely affixed by any suitable means a hub portion 115. The hub portion 115 is bored as indicated to receive the shaft 29 and is provided also with a laterally extending bore 116 suitably threaded to receive a set screw 117 by means of which the hub 115 may be secured to the shaft 29. In assembling the device the set screw 117 is removed and a pellet or small cylinder 118 of suitable friction material such as leather (preferably sole leather such as is used in the manufacture of shoes) is inserted into the bore 116 before the set screw 117 is screwed therein. The set screw 117 is then tightened very securely with the result that the leather 118 is compressed between the set screw 117 and the shaft 29.

I have found that this provides a sufficient frictional engagement between the cam member 22 and the shaft 29 to accomplish the normal intended operation of the device. In fact, the slip connection thus provided will not slip until a restraining torque is applied to the cam member 22 which is substantially three times the normal restraining torque effected by the switch arm 30 and the coin control member 53. It will thus be seen that irrespective of the size or type of coins or slugs which may be deposited in the device, the twisting off of the shaft 29, the stripping of the gears in the reduction gear unit, and the burning out of the motor 30 as a result of the stalling of that motor are avoided.

In the foregoing description the timing disk 22 and the location of the trigger engaging members 50 adapt the time period for each coin deposited for a 4-minute length of entertainment. The time period may be readily altered by substituting a different timing disk 22 having notches 43 spaced at different intervals about its periphery; for example, the disk 22 may be substituted for by a disk containing four equally spaced notches to divide the total time period of rotation of the shaft 29 (12 minutes) into four intervals of three minutes each, or a disk 22 having two notches might be substituted dividing the time interval of twelve minutes into two periods of six minutes each. The hub 115 may be initially bored with a plurality of extra threaded holes distributed as shown in Fig. 8 so that upon the substitution of a timing disk 22 with a different number of notches a number of trigger engaging members 50 may be used in place of the three members 50 employed with a 3-notch disk. By properly locating the threaded bores 120, the hub may be adapted for one, two, three or four equal divisions of the total time period of twelve minutes for each rotation of the shaft 29.

From the foregoing it will be observed that I have provided a sound reproducing system which is simple in construction and which may be readily and easily installed in substantially any desired location.

As has been pointed out hereinbefore, the device operates on a definite time principle whereby a customer is provided with continuous entertainment over a number of uninterrupted time periods corresponding to the number of coins which are deposited in the coin unit.

Each and every one of the various control stations operates independently of the other as regards the reproduction of entertainment at the location of such control units but operates in a dependent manner with respect to the control or operation of the automatic phonograph unit.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details of construction shown or described herein, except as defined in the appended claims.

I claim:

1. In a coin control unit for a sound reproducing system, the combination of: means defining a coin channel; control means including an operating member extending into said channel and engageable by a coin in said channel to move said control means to an operating position; a timing means including a member movable in response to movement of said control means to an operating position for defining a time period of predetermined duration; means mounting said movable member in a position to be moved into engagement with said operating member to thereby hold said control means in said operating position until the expiration of said time period; movable stop means in said channel normally disposed in a position to arrest said coin in a location engaging said operating member; and means on said stop means positioned to be engaged by said movable member before the expiration of said time period and move said stop means to a position permitting said coin to pass through said channel.

2. In a coin actuated time control mechanism, the combination of: a coin chute for receiving a coin and including a channel for guiding the coin along a path extending generally downward; a timing disk mounted for rotary movement and

disposed adjacent said channel; means for rotating said disk at a predetermined speed to define intervals of time; a multi-pole switch biased to assume a normal position; a switch operating lever for moving said switch from the normal position to an intermediate position and to an extreme position; means mounting said lever adjacent said coin channel to dispose said lever in the path of a coin passing through said channel whereby the switch is moved to its extreme position by the coin; means actuated by said switch when in either its intermediate position or extreme position for actuating said disk rotating means; and lever engaging means on said disk for holding said lever in the extreme switch operating position for a predetermined interval of time measured by the rotation of said disk and for holding said lever in said intermediate switch operating position for another predetermined interval of time measured by the rotation of said disk, said multiple switch including a plurality of circuit controlling contacts arranged to be actuated to one circuit controlling position when said switch is in said intermediate position and to be actuated to another circuit controlling position when said switch is in said extreme position.

3. In a coin actuated time control mechanism, the combination of: a coin chute for receiving a coin and including a channel for guiding the coin along a path extending generally downward; a timing disk mounted for rotary movement and disposed adjacent said channel; means for rotating said disk at a predetermined speed to define intervals of time; an electric switch biased to assume a normal position; a switch operating lever for moving said switch from the normal position to an operating position upon movement of said lever; means mounting said lever adjacent said coin channel to dispose said lever in the path of a coin passing through said channel whereby the switch is moved to its operating position by the coin; means actuated by the movement of said switch operating lever for starting said disk rotating means; means on said disk engageable with said switch operating lever for holding said switch in operating position through a predetermined interval of rotation of said disk independent of the position of the coin; coin arresting means disposed adjacent said channel and projecting therein to arrest a coin in switch operating position; and means on said disk for engaging said coin arresting means at some time within the interval of time measured by said disk for moving said arresting means out of the path of a coin prior to the expiration of said time interval.

4. In a coin actuated time control mechanism, the combination of: a coin chute for receiving a coin and including a channel for guiding the coin along a path extending generally downward; a timing disk mounted for rotary movement and disposed adjacent said channel; means for rotating said disk at a predetermined speed to define intervals of time; an electric switch biased

to assume a normal position; a switch operating lever for moving said switch from the normal position to an operating position upon movement of said lever; means mounting said lever adjacent said coin channel to dispose said lever in the path of a coin passing through said channel whereby the switch is moved to its operating position by the coin; means actuated by the movement of said switch operating lever for starting said disk rotating means; means on said disk engageable with said switch operating lever for holding said switch in operating position through a predetermined interval of rotation of said disk independent of the position of the coin; coin arresting means disposed adjacent said channel and projecting therein to arrest a coin in switch operating position; means on said disk for engaging said coin arresting means at some time within the interval of time measured by said disk for moving said arresting means out of the path of a coin prior to the expiration of said time interval; and means on said coin arresting means projectable into said channel above the position of a coin in switch operating position to engage and hold higher coins in said channel when the first coin is released by said arresting means.

5. In a coin actuated time control mechanism, the combination of: a coin chute for receiving a coin and including a channel for guiding the coin along a path extending generally downward; a timing disk mounted for rotary movement and disposed adjacent said channel; means for rotating said disk at a predetermined speed to define intervals of time; a multi-pole electric switch including a plurality of contact bearing springs biased to assume a normally open position for at least two sets of its contacts; a switch operating lever for moving said switch springs from the normal position to an intermediate position closing at least one pair of its contacts, and to an extreme position closing all of its contacts; means mounting said lever adjacent said coin channel to dispose said lever in the path of a coin passing through said channel whereby the switch is moved to at least its intermediate position by the coin; means actuated by the closing of the said one pair of switch contacts for actuating the disk rotating means; and lever engaging means on said disk for actuating said lever to extreme switch operating position, said last named means including a portion for forcing the lever toward said switch operating position and another portion for holding said lever in said position during an interval of time measured by the rotation of said disk.

WILLIAM S. FARRELL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,864,649	Hansen	June 28, 1932
2,097,456	Green	Nov. 2, 1937