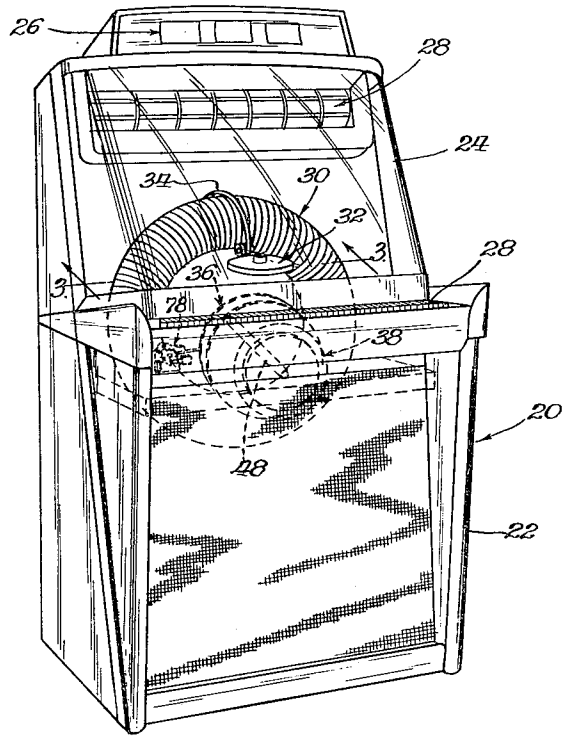
Aug. 22, 1961 J. J. TOOLAN 2,997,304

AUTOMATIC PHONOGRAPH

Filed Oct. 27, 1959 6 Sheets-Sheet 1

Fig. 1.



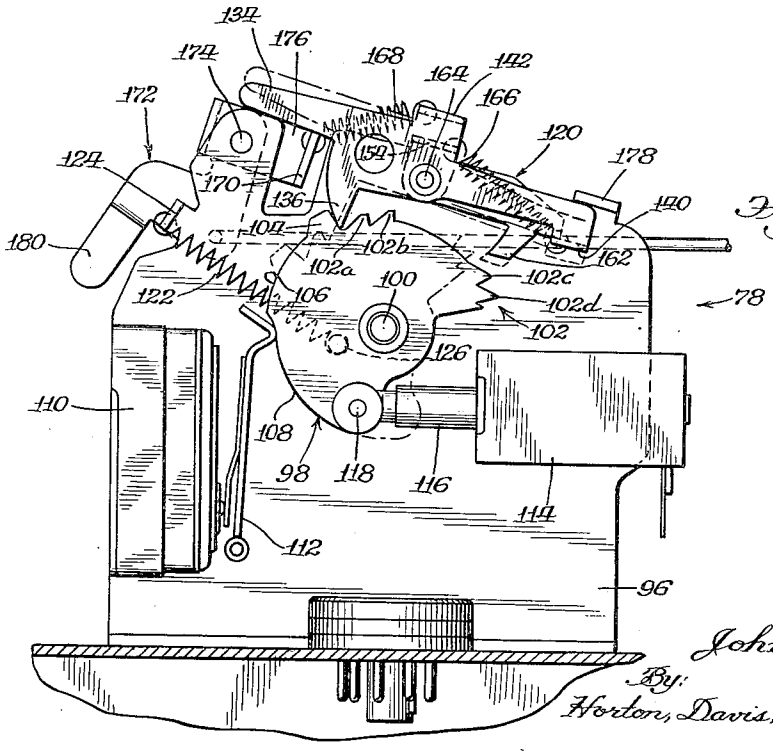


Fig. 2.

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Aug. 22, 1961 J. J. TOOLAN 2,997,304

AUTOMATIC PHONOGRAPH

Filed Oct. 27, 1959 6 Sheets-Sheet 2

Fig. 3.

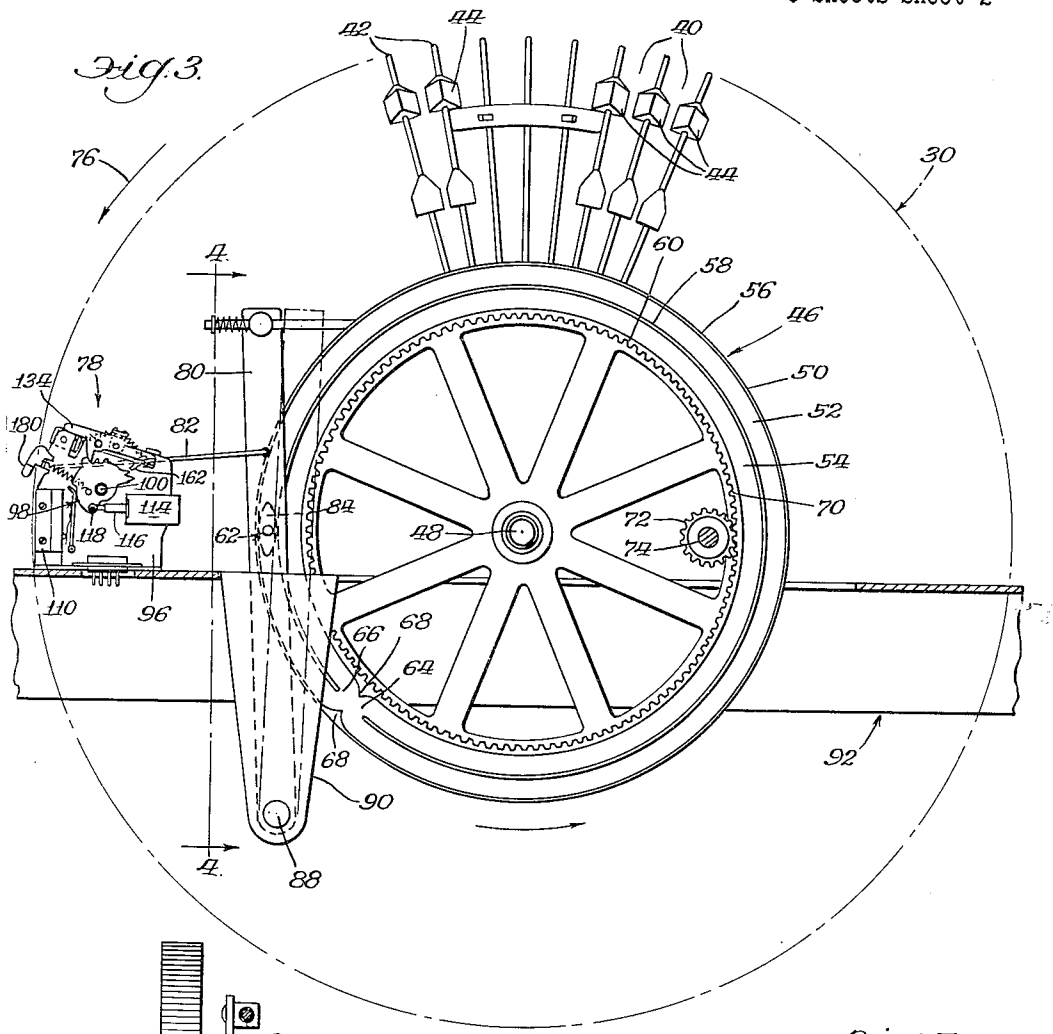


Fig. 4.

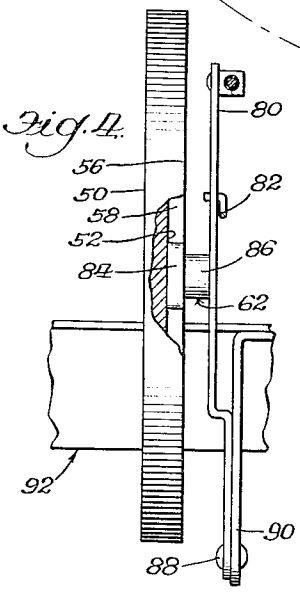
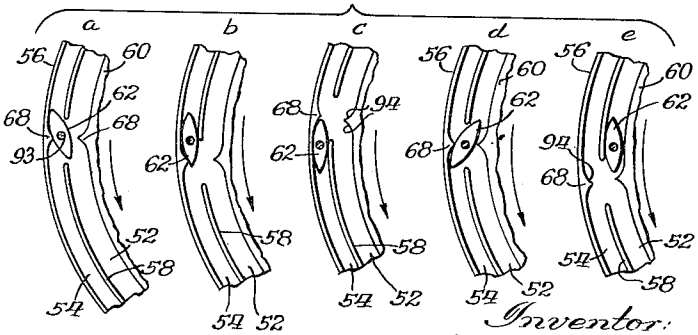


Fig. 5.



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Aug. 22, 1961 J. J. TOOLAN 2,997,304

AUTOMATIC PHONOGRAPH

Filed Oct. 27, 1959 6 Sheets-Sheet 3

Fig. 6.

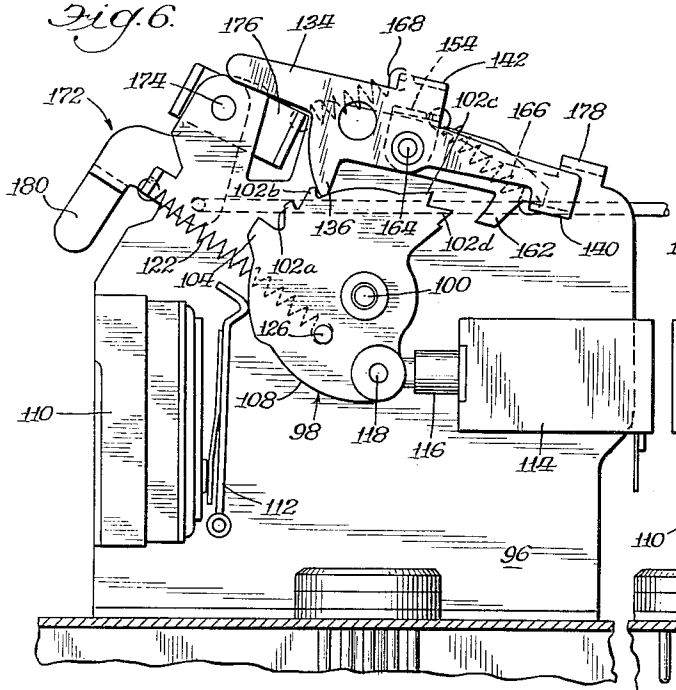
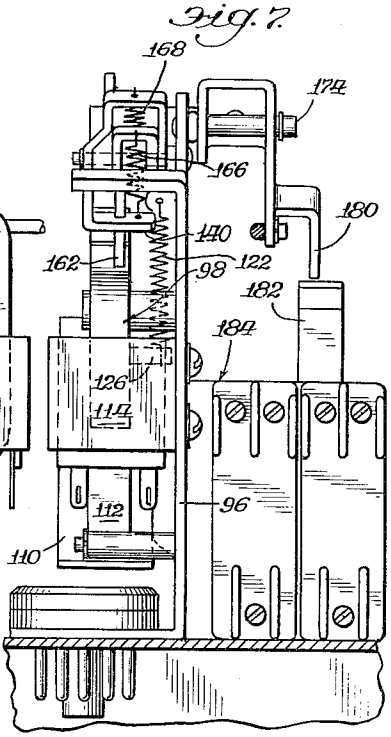


Fig. 7.



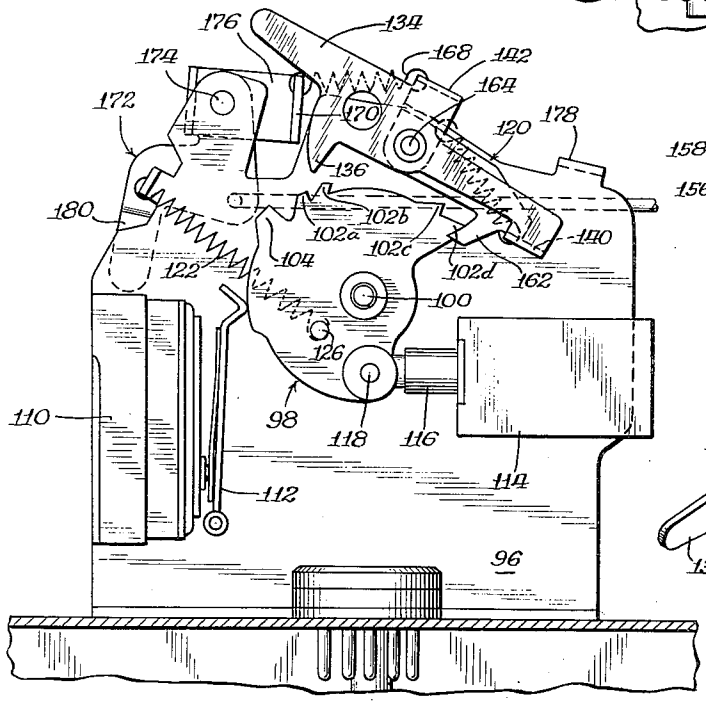


Fig. 8.

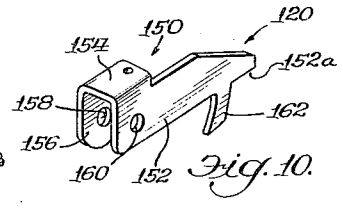


Fig. 10.

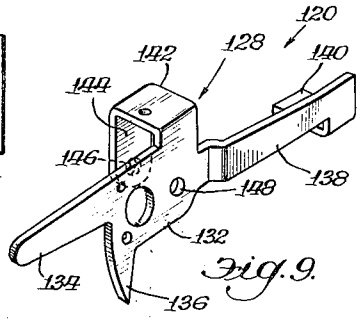


Fig. 9.

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Aug. 22, 1961 J. J. TOOLAN 2,997,304

AUTOMATIC PHONOGRAPH

Filed Oct. 27, 1959 6 Sheets-Sheet 4

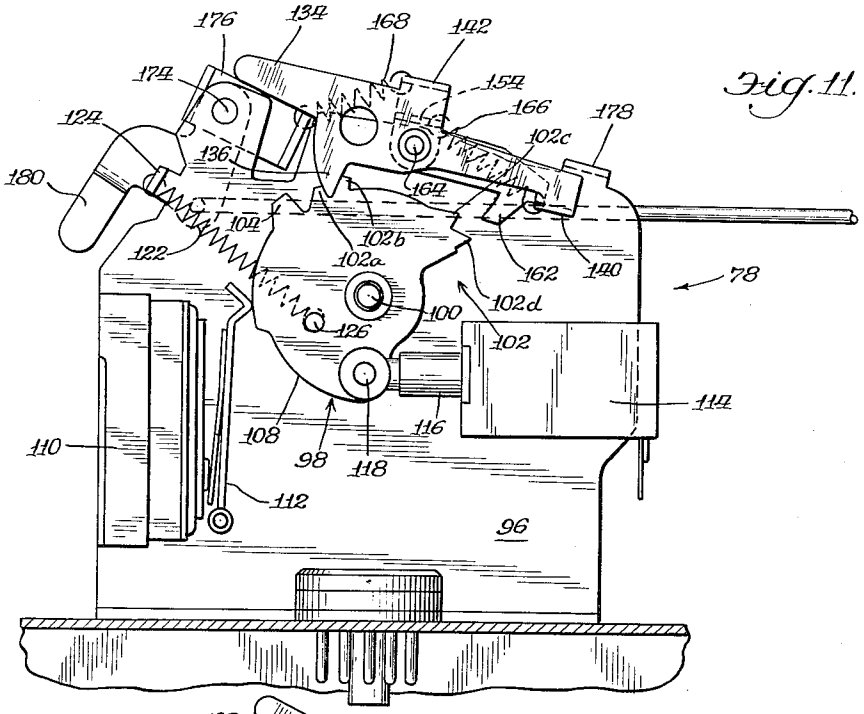


Fig. 11.

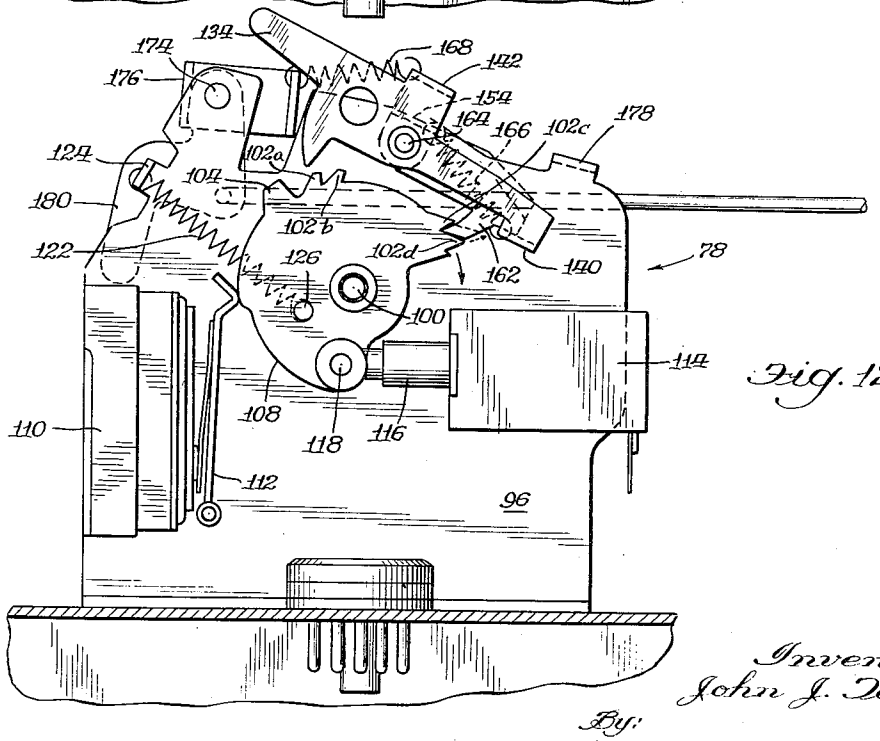


Fig. 12.

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Aug. 22, 1961 J. J. TOOLAN 2,997,304

AUTOMATIC PHONOGRAPH

Filed Oct. 27, 1959 6 Sheets-Sheet 5

Fig. 13.

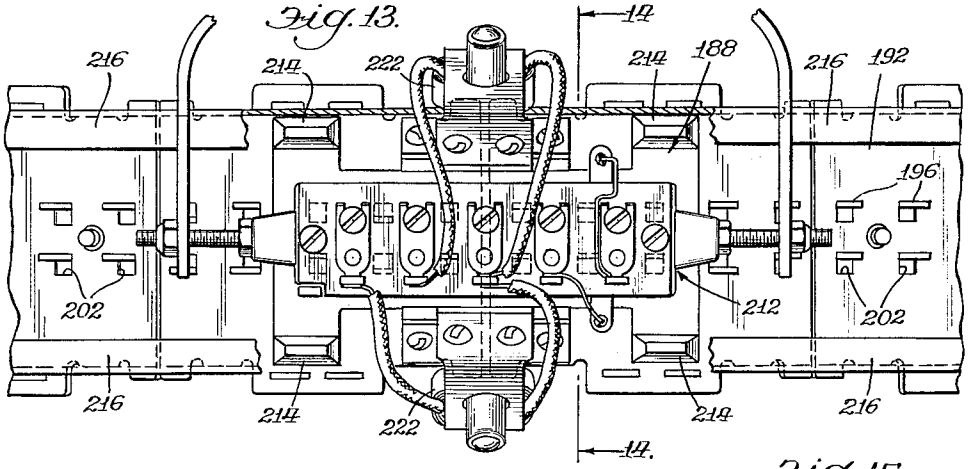


Fig. 14.

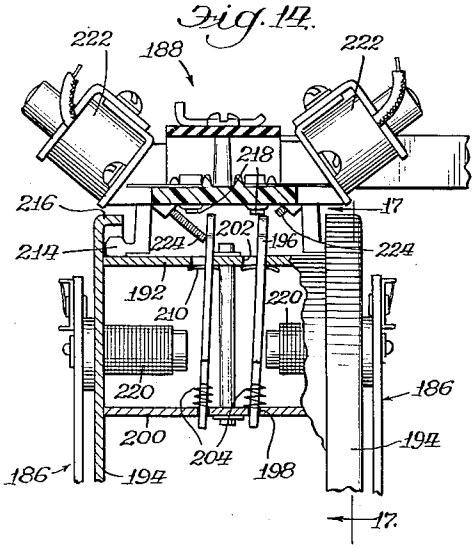


Fig. 15.

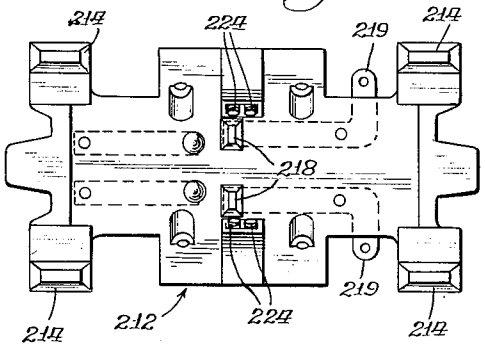


Fig. 16.

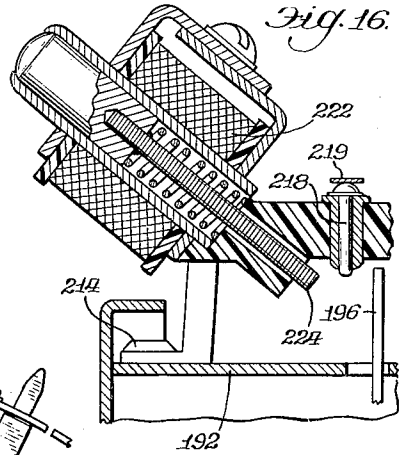
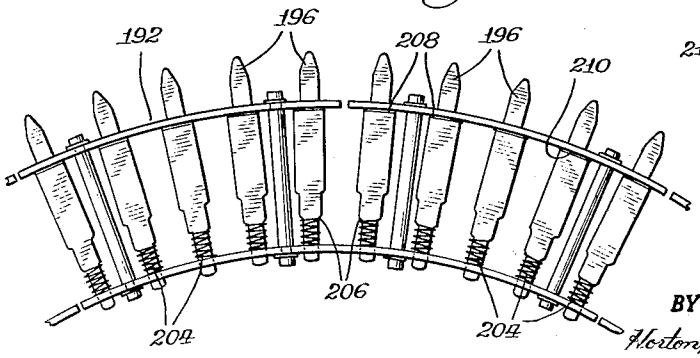


Fig. 17.



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AUTOMATIC PHONOGRAPH

Filed Oct. 27, 1959 6 Sheets-Sheet 6

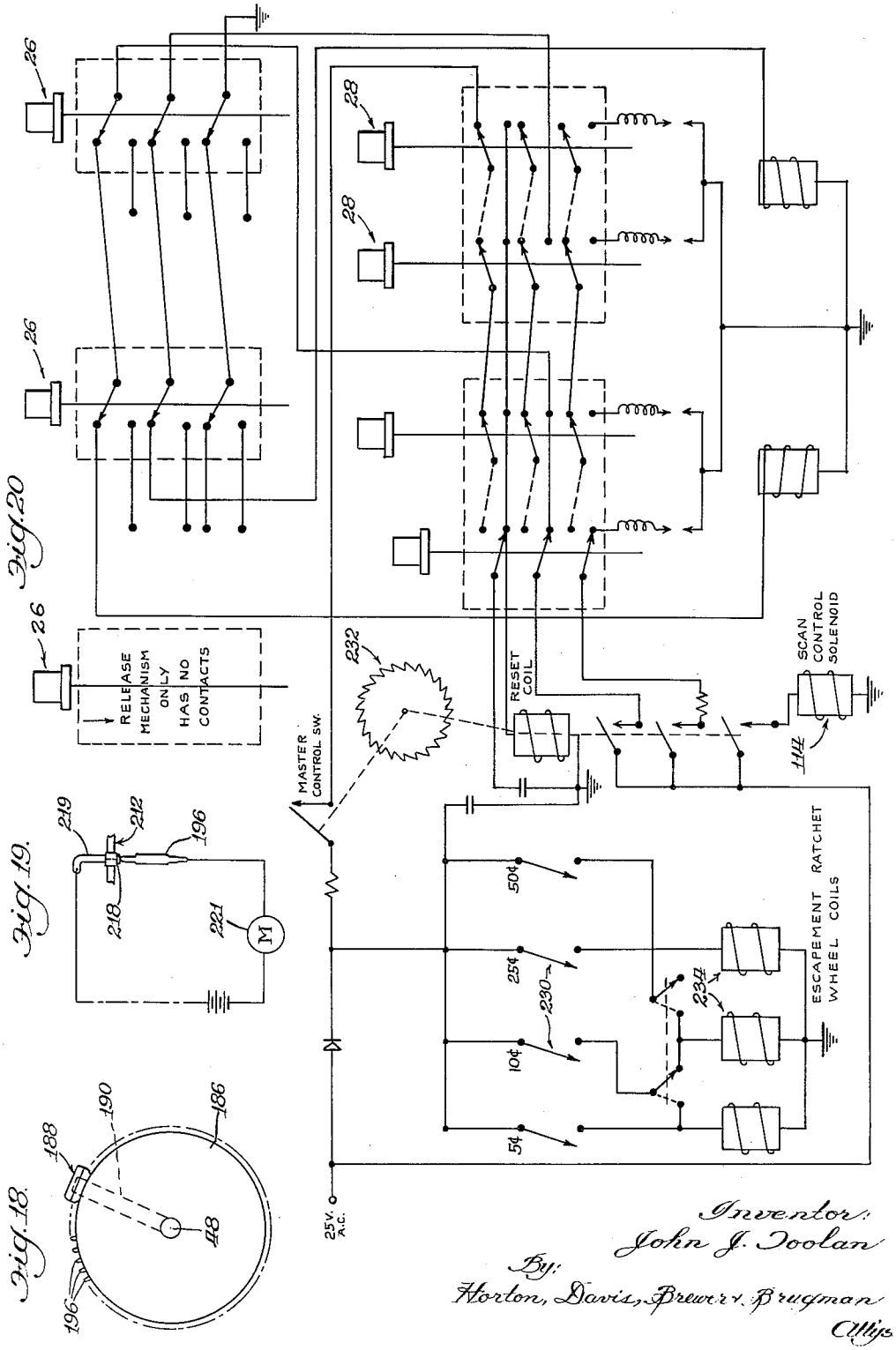


Fig. 20

Fig. 19.

Fig. 18.

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United States Patent Office

2,997,304

Patented Aug. 22, 1961

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AUTOMATIC PHONOGRAPH

John J. Toolan, River Forest, Ill., assignor to Rock-Ola Manufacturing Corporation, Chicago, Ill., a corporation of Delaware

Filed Oct. 27, 1959, Ser. No. 849,113
13 Claims. (Cl. 274—10)

The present invention relates to coin controlled automatic phonographs.

The invention relates more particularly to scan control means for controlling the operating mechanism of the phonograph for effecting operation of it through a certain predetermined minimum cycle and playing of all records selected to the extent of the value of the coin or coins deposited and the selector keys actuated.

The invention is especially adaptable to incorporation in a phonograph which operates to place the selected record in playing position with either the obverse side or reverse side facing upward, selectively, and playing that side, the sequence usually being, in such kind of phonograph, to scan the obverse sides of all the records in the magazine of the phonograph, in one portion of the cycle, and the reverse sides in another portion.

In the course of playing an automatic phonograph, in the usual manner, by a patron, a cycle of operation is many times, if not most times, more complex than as indicated above, in that a plurality of selections are made at one time for playing in the next ensuing period, with an appropriate insertion of one or more coins and actuation of selector keys. The mechanism operates through its minimum cycle so as to pick up all selections made before the beginning of the cycle.

However, quite often additional selections are made later and after the cycle of operation has begun. These additional selections are sometimes made at positions posterior to the position of the scanning means in its minimum cycle, and in order for it to be able to pick up the latter selections, it must continue its cycling movements beyond its original minimum cycle.

In the operation of the operating mechanism, a record magazine moves through a range of movement, in a rotary direction in the form of invention illustrated herein, and a record transfer means and player mechanism remaining bodily in a fixed location, remove the selected records from the magazine and play them, and replace them in the magazine. The records are selected first as to the recordings on a first side, such as the obverse side, in one revolution, and then on the second side, or reverse side, in the next revolution, and therefore the magazine must make a plurality of revolutions in a minimum cycle of operation.

A principal feature of the invention resides in an arrangement whereby a cycle of operation is "extended" in response to a selection made posterior to the position of the scanning means in its normal minimum cycle, accompanied by deposit of sufficient coins.

Another important feature, and corresponding object of the invention, is to determine a cycle of operation according to the number of selections made, and coins inserted, so that the operating and scanning means will continue cycling so long as selections have been made and proper coins having been inserted.

Another object is to provide in an automatic phonograph, selection mechanism for manually effecting selection of the records in the phonograph, which includes an element for each side of each of the records in the phonograph, and a novel arrangement of switch means common to all of said selection elements for effecting energization of the cycling means in response to selection of any of the record sides.

A further object is to provide an automatic phonograph having a relatively movable record magazine and selector

means for effecting playing of records supported in the magazine, manually actuated selector keys for effecting selection of the records in the magazine for playing, and coin controlled switch means which together with the manually actuated selector keys control the cycling of the operating means, in which each selector key upon actuation thereof is operative for establishing circuit means for controlling the cycling and playing means, wherein novel scan control means is provided including common switch means controlled by the coin control means and selector keys for establishing circuit means for controlling the cycling means.

A still further object is to provide in an automatic phonograph, a novel scan control unit including a ratchet moved to an advanced position by electric means controlled by coin insert means and manually actuated selector keys, and pawl means controlling the release of the ratchet means to retracted position for establishing a predetermined cycle of operation of the phonograph.

Other objects and advantages of the invention will appear from the following detailed description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view of an automatic phonograph of a kind to which the present invention is adapted, showing certain main parts of the phonograph;

FIG. 2 is a front view of the scan control unit in retracted position;

FIG. 3 is a view of the record magazine and scan control unit, oriented as if taken on the vertical plane of line 3—3 of FIG. 1;

FIG. 4 is a view taken on line 4—4 of FIG. 3;

FIG. 5 is a view of a series of different positions of certain control elements included in FIGS. 3 and 4;

FIG. 6 is a view of the scan control unit of FIG. 2, showing it with certain parts in fully advanced position;

FIG. 7 is an end view taken from the right of FIG. 6;

FIG. 8 is another view of the control unit shown in FIGS. 2 and 6, but with the parts in different positions;

FIG. 9 is a detailed perspective view of one member of a pawl used in the control unit of FIGS. 2, 6 and 8;

FIG. 10 is a detailed perspective view of another member of the pawl;

FIG. 11 is another view of the control unit shown in FIGS. 2, 6 and 8 with the various parts in still different positions;

FIG. 12 is still another view of the control unit shown in FIGS. 2, 6, 8 and 11 and with the different parts in different positions;

FIG. 13 is a detailed view of a portion of selector drum included in FIG. 1;

FIG. 14 is a view taken on line 14—14 of FIG. 13;

FIG. 15 is a bottom view of the selector carriage included in FIGS. 13 and 14;

FIG. 16 is a large scale sectional view of one of the cancel solenoids of FIGS. 13 and 14;

FIG. 17 is a detailed view of a portion of the selector drum of FIGS. 13 and 14 oriented approximately according to line 17—17 of FIG. 14;

FIG. 18 is a diagrammatic view of the selector drum and selector carriage;

FIG. 19 is a circuit portion showing one of the selector levers in the selector drum and the manner of its inclusion in the circuit of the phonograph; and

FIG. 20 is a diagram of a portion of the electric circuit used in the phonograph.

Reference may now be had to FIG. 1 showing the general view, an automatic phonograph of a kind particularly adapted to incorporation of the present invention therein. It will be understood that the invention may be incorporated in phonographs of different kinds, the present one illustrated and described herein, being merely an example of such phonograph.

The automatic phonograph illustrated in FIG. 1 includes a main cabinet 20 enclosing the various operating parts of the phonograph which may be made accessible to a service man by opening certain sections of the cabinet, such as a lower front section 22 and an upper front section 24 which are provided with hinges for that purpose and are normally in closed position so as to prevent unauthorized accessibility to the interior. Exposed to the exterior for actuation by a patron, are group control buttons 26 and individual control keys 28, the buttons and keys being actuated by the patron in the selecting operations to be described more fully hereinbelow. Also viewable from the exterior, but preferably enclosed within a transparent portion of the cover section 24 is a program holder 28 which is positionable to selected ones of a plurality of positions under the control of the group control buttons 26 as described more fully hereinbelow. These control buttons 26 and control keys 28 also appear in the circuit diagram of FIG. 20.

Other operating parts of the automatic phonograph shown or indicated in FIG. 1 include a record magazine 30, a turntable 32, record transfer means 34, a selector drum 36 and a popularity meter 38.

The record magazine 30, turntable 32, record transfer means 34 and selector drum 36 may be generally of the kind shown and described in United States Letters Patent No. 2,804,307 issued August 7, 1957, to Rock-Ola Manufacturing Corporation as assignee of David C. Rockola, while the popularity meter 38 of the form preferred is shown and described in the co-pending application of said David C. Rockola, Serial No. 826,669, filed July 13, 1959. However, the selector drum 36 herein includes refinements made possible by the present invention and is described in some detail hereinbelow. The popularity meter 38 does not enter into the present invention as such.

The record magazine 30 is indicated partially and diagrammatically in FIG. 3 and includes a plurality of record receiving pockets 40 formed by a plurality of spacer wires or bails 42 arranged radially and provided with spacer elements 44 of suitable material such as a plastic material providing a certain degree of resilience for preventing marring the records. These spacers or bails are secured to a hub member indicated in its entirety at 46 but which may be of any desired construction from the standpoint of mounting the spacers 42. This hub member is rotatably mounted on a shaft 48 for selectively presenting the various pockets 40 with the records therein at an indexing position which in the present instance may be at the top of the magazine, in register with the record transfer means 34 shown in FIG. 1 poised for removing a record from the pocket that is then at such indexing position.

The hub member 46 includes an outer ring portion 50 which is provided with a pair of cam tracks or "canals" 52 and 54, concentric about the axes of rotation defined by the shaft 48. The cam tracks open laterally and are defined by a radially outer wall element 56, a central wall element 58 and an inner wall element 60. These cam tracks are adapted for receiving a cam track follower or "canal boat" 62 shown in FIGS. 3, 4 and 5 and referred to again in detail herein-below. The cam tracks 52 and 54 are provided with a transfer or cross-over passage indicated in its entirety at 64 for controllably moving the cam track follower from one cam track to the other in response to rotation of the ring 46 which rotates with the magazine. This transfer passage is provided by an interruption or gap 66 in the central wall element 58 and projections 68 formed in the outer and inner wall elements 56 and 60 in register with this gap and directed toward each other. The precise function of this transfer passage will be described hereinbelow. This cam track and follower arrangement are disclosed and claimed in the co-pending application of said David C. Rockola, Serial No. 848,373, filed October 23, 1959.

The ring 50 is provided with an internal ring gear 70 with which a pinion 72 meshes, this pinion being mounted on a shaft 74 driven by a suitable drive motor. Upon operation of the drive motor the magazine 30 is rotated for positioning the selected record receiving pocket in the indexing position at the top of the magazine.

In the illustrated form of phonograph, the record magazine rotates in a single direction, namely, counterclockwise as viewed in FIGS. 1 and 3 and indicated by the arrow 76 in FIG. 3. The invention associated with this single direction of rotation of the magazine is disclosed and claimed in the above mentioned application, Serial No. 848,373. The control means of the present invention is adapted to the uni-directional rotation of the magazine and in this operation the cam track follower 62 is alternately moved from each cam track to the other pursuant to successive complete rotations of the magazine.

Associated with the cam track construction and the follower 62 is the scan control unit indicated in its entirety at 78, shown generally in FIG. 3 and shown in greater detail in FIGS. 2, 6, 8, 11 and 12. The control unit 78 is controlled by the movement of the magazine as well as other instrumentalities, that phase of the control exerted by the magazine being through the cam tracks 52 and 54 and the follower 62, through the medium of a reciprocating lever 80 on which the follower is mounted, and a link 82 connected between that lever and the control unit 78. The cam track follower includes a main or cam portion 84 (FIG. 4) and a hub or mounting portion 86 which may be integral with the portion 84. The cam portion 84 is double convex in axial view, i.e., as viewed in FIGS. 3 and 5 having pointed ends through which the follower is controllably moved from one cam track to the other. The hub portion 86 is utilized for mounting the follower on the lever 80, this lever being pivoted at its lower end by suitable means such as a rivet 88 mounting the lever on a fixed element of the machine such as the bracket 90 which is mounted on a frame portion 92 of the machine. The cam track follower 62 is pivotally mounted on the arm 80 as indicated at 93 for enabling pivoting movement thereof as indicated in FIG. 5 and referred to hereinbelow.

Each projection 68 of the cam tracks is defined by opposed concave surfaces 94, these surfaces being curved about axes located generally in the region of the ends of the central wall element 58 on opposite ends of the gap, and the surfaces of the ends of the element 58 are curved generally complementally to the surfaces 94. As the cam track follower 62 moves in the cam tracks, i.e., relatively speaking, since the follower remains stationary linearly of the cam tracks while the cam track ring rotates, the leading pointed end of the follower engages one of the surfaces 94 and is deflected diagonally through the transfer passage 64. For a more specific example of this action, attention is directed to FIG. 5 which includes the positions *a*, *b*, *c*, *d* and *e*. Position *a* is approximately the home position or that in which the parts rest after a cycle is completed and the mechanism is at rest, in which the cam track follower is disposed at a small angle in the transfer passage 64. The relative positions of the elements indicates that the follower is leaving the inner track 52 and moving into the outer track 54. Upon movement of the cam track ring (counterclockwise, FIG. 5) the follower continues into the outer track, as shown in position *b*, the righthand projection 68 following the trailing end of the follower and moves it in clockwise direction, whereby the follower is aligned longitudinally with the linear direction of the cam track. Thereafter the follower is confined to that cam track through the ensuing rotation until it reaches the position *c*, which is at the end of that rotation. In position *c* the action just described is reversed as indicated by the relation between positions *c*, *d* and *e*, representing successive rotations of the magazines. Two complete rotations have thus been completed. In consequence, the cam track follower 68 moves from each cam track into the other at the end of the respec-

tive rotation of the record magazine, which results in reciprocating movements of the pivoted arm 80 between the full and the dot-dash line positions of FIG. 3. These reciprocating movements transmitted through the link 82 exert certain control on the control unit 78 in conjunction with other operating steps described hereinbelow.

Reference may be directed next to the scan control unit 78 shown in its environment with the magazine in FIG. 3, and shown in greater detail in FIGS. 2, 6, 8, 11 and 12. This control unit is mounted on a convenient fixed portion of the phonograph such as the frame portion 92 (FIG. 3) and includes a frame member 96 upon which the other portions of the unit are mounted. The unit includes a ratchet-cam member 98 pivotally mounted on a stud 100 supported in the frame member 96. This member 98 includes a plurality of teeth 102 individually identified as 102*a*, 102*b*, 102*c* and 102*d*, as well as another projection or stop element 104 closely adjacent to the first tooth 102*a*. Another portion of this member 98 includes a high cam point 106 of substantial arcuate dimension and a low cam point 108, utilized for controlling a switch 110 having a control lever 112.

The ratchet-cam member 98 is moved to advanced position, in counterclockwise direction, by a solenoid 114 having an armature 116 pivotally secured to the member 98 as by a pin 118. Upon energization of the solenoid, its armature is retracted and it rotates the member 98 to its dotted line position (FIG. 2) in which it is releasably retained by a pawl indicated generally at 120 and described in detail hereinbelow.

The ratchet-cam member 98 is biased in clockwise direction to its retracted position shown in full lines in FIG. 2 by a tension spring 122 anchored between a fixed element on the unit such as a lug 124 formed on the frame member 96, and an eccentrically located pin 126 on the member 98. When the member 98 is in retracted or home position shown in full lines in FIG. 2, and only in this position, the actuating lever 112 of the switch 110 engages the low point 108 and the switch 110 is open; in all other positions of the member 98, of which there are a plurality, beyond the retracted position in advanced direction, the actuating lever 112 rides onto the high point 106 and closes the switch 110. The switch 110 is a main control switch for the operating mechanism for the phonograph and in all positions of the member 98, except full retracted position, the circuit portion controlled by the switch 110 is energized and is in condition for operating the phonograph upon certain other operational steps being performed.

The pawl 120 cooperates with the teeth 102 for producing an escapement operation for controllably releasing the ratchet-cam member 98 from advanced position to retracted or home position in steps corresponding to successive rotations of the magazine 30 in a predetermined cycle of operation as described more fully hereinbelow. The pawl 120 is a compound arm made up of two parts individually illustrated in perspective in FIGS. 9 and 10 respectively. In FIG. 9 is shown a larger or main member 128 which includes an arm element 130 made up of a mounting portion 132, an end trip finger 134, an escapement pallet 136, and a rear extension 138. This extension 138 has a laterally extending lug 140. The member 128 also has a U-shaped extension 142 including a downwardly extending lug 144 having an aperture 146 aligned with an aperture 148 in the portion 132 for pivotal mounting of the member on the control unit frame 96.

The other member of the compound pawl 120 is shown in FIG. 10 and is designated generally 150. This member includes a main portion in the form of an arm 152 having a lateral U-shaped extension 154 which includes a downwardly extending lug 156 provided with an aperture 158 aligned with another aperture 160 in the main portion 152. At the end of the arm element 152 is an escapement pallet 162. These two members 128 and 150 are assembled to form the pawl 120 for both compound and individual pivotal movement on a pin or stud 164 secured to the frame member 96. In the assembly of the members, the extension 154 on the member 150 is inserted within the similar extension 142 on the member 128 and the pin 164 is received in the four aligned apertures 146, 158, 160 and 148.

A tension spring 166 is connected between the lateral extension 154 on the member 150, and the lateral lug 140 on the member 128. This spring biases the member 150 in clockwise direction about the pivot pin 164 and relative to the member 128 to a position in which the extended end 152*a* of the member 150 engages the lug 140. In the absence of any extraneous forces of the kind referred to hereinbelow, the members 150 and 128 assume a fixed position relative to each other and move bodily together. However, the member 150 is enabled to swing upwardly in counterclockwise direction relative to the member 128 in response to the ratchet teeth 102*c* and 102*d* riding past the escapement pallet 162. The pawl 120 thus constituted by the assembly of the members 150 and 128 is biased in counterclockwise direction by means of a tension spring 168 connected between the lug 142 on the member 128 and a lug 170 on member 172 pivoted on the frame element 96 as by a pin 174. This member 172 includes an arm portion 176 which bears the lug 170. This member 172 also constitutes the specific member by which the link 82 (FIG. 3) is connected to the scan control unit 78. In response to reciprocating movements of the link 82 pursuant to rotations of the magazine as described above, the member 172 is rocked about the pivot pin 174, to opposite positions shown in contrast in FIGS. 6 and 8, being in retracted position in FIG. 6 and in advanced position in FIG. 8. The lug 170 is positioned for engaging the trip finger 134 and controls the movement of the compound pawl 120 both by direct engagement and positive movement thereof, and by biasing force exerted through the tension spring 168. When the member 172 is in its retracted position of FIG. 6, the lug 170 is in a lowered position which enables the pawl 120 to swing bodily in counterclockwise direction and in this position also the tension on the spring 168 is increased and its tension on the pawl is increased. When the member 172 moves in counterclockwise direction to raised position shown in FIG. 8, the lug 170 engages the trip finger 134 and moves the pawl positively in clockwise direction to its alternate position and through this movement of the lug 170, the tension on the spring 168 is somewhat relieved. A lug 178 may be provided on the frame element 96 for engagement by the corresponding end of the extension 138 of the member 128 for limiting movement of the pawl in corresponding direction or in counterclockwise direction. The member 172 may be provided with a finger or extension 180 for actuating an arm 182 (FIG. 7) of a switch 184 mounted on the rear side of the frame member 96.

In the operation of the scan control unit 78 the first controlling operation is energization of the solenoid 114 which in turn is controlled by other steps referred to hereinbelow. When the phonograph is at rest and all previous playing cycles have been completed, the scan control unit reposes in the state shown in FIG. 3 in which the ratchet-cam member 98 is in its home or full retracted position. In such condition the pawl 120 is also in its retracted position. In this condition the escapement pallet 136 of the pawl is engaged by the stop element 104. Upon energization of the solenoid 114 the member 98 is moved in counterclockwise direction from its position of FIG. 3 to its fully advanced position of FIG. 6 in which the pallet 136 is engaged by the tooth 102*b* on the member 98. In this advancing movement of the member 98 the teeth 102*a* and 102*b* ride past the pallet 136, the pawl 120 yielding to enable this action.

The member 172 assumes its position of FIGS. 3 and 6, at the beginning of a cycle of operation since the cam track follower 62 (FIG. 3) is in the outer cam track 52 whereby the arm 80 reposes in its leftmost position and the member 172 assumes its position shown since the link 82 is connected with the member 172 at a point below the pin 174, as will be seen in FIGS. 3, 6 and 7. When the magazine has completed its first rotation, the cam track follower 62 moves into the inner cam track 54 as described above and swings the arm 80 (FIG. 3) to its alternate or dot-dash line position. This movement swings the member 172 in counterclockwise direction from its position of FIG. 6 to its position of FIG. 8, and the member 172 in turn swings the pawl 120 in clockwise direction from the position of FIG. 6 to the position of FIG. 8. In this movement of the pawl 120, the escapement pallet 136 is released from the tooth 102*b*, and the opposite escapement pallet 162 engages in front of the tooth 102*d*. This condition remains throughout the second rotation of the magazine.

Upon completion of the second rotation of the magazine, the cam track follower 62 is again moved into the outer cam track 52 and the member 172 is again moved to its opposite position, moving the various elements to the positions illustrated in FIG. 11. In this condition the escapement pallet 136 engages in front of the tooth 102*a*. Still further, upon completion of the third rotation of the magazine, the various parts are moved from the position of FIG. 11 to the position of FIG. 12 in which the pallet 162 engages in front of the tooth 102*c*. The present condition illustrated in FIG. 12 is that corresponding to the fourth rotation of the magazine. Finally, at the completion of the fourth rotation, the cam track follower 62 is again moved into, or nearly into, the outer cam track 52 to the starting position, and the parts of the control unit move from their positions of FIG. 12 to their positions of FIG. 3 and a single minimum cycle of operation is completed. In this condition the escapement pallet 136 again engages the stop member 104 and the ratchet-cam member 98 is in retracted or home position.

This escapement means 120—98 controllably releases the member 98 from its full advanced position to its retracted position in four steps, corresponding to four successive rotations of the record magazine.

In all of the advanced positions of the member 98, including full advanced position and the other three steps of retracting, the actuating lever 112 of the switch 110 is engaged by the high point 106 of the member 98 and all through these steps the switch 110 is retained in closed position, but in the home position, as mentioned above, the lever 112 rides down into the low point 108 and the switch opens.

The selector drum 30 (FIG. 1) is utilized in making selections of the records in the record magazine 30. This selector drum is indicated diagrammatically in FIG. 18 and shown in some detail in FIGS. 13–17. It includes a drum proper, 186, mounted coaxial with the magazine but stationary, and also includes a selector carriage 188 mounted on an arm 190 secured to the shaft 48, and in response to rotation of the shaft, sweeps around the drum 186. The general construction of the selector drum and its overall operation is of the type shown in United States Letters Patent No. 2,804,307 referred to above. However, certain details of construction and operation of the selector drum are characteristic of the features of the present invention.

The drum proper 186 includes a peripheral cylindrical outer element 192 (FIGS. 13, 14, 17) and side plates 194. The drum includes a plurality of selector levers 196 equal in number to the sides of the records of the capacity of the machine. For example, the magazine 30 has sixty record receiving pockets 40, and when filled to capacity the sixty records thus in the magazine have one hundred-twenty sides. The selector levers 196 in the present instance therefore number one hundred-twenty, and are arranged circumferentially in two series of sixty each, and arranged in pairs with those of a pair aligned in axial direction. Each of the pairs corresponds to a respective record receiving pocket 40, and each of the levers of the pair corresponds to a respective side of a record in that pocket.

Considered structurally, the selector levers 196 may best be seen in FIGS. 14 and 17, and since all are alike in construction, a description of one will suffice for all. Each lever 196 has an inner end fitted in an aperture 198 in a circular plate 200 in the drum. Its outer end projects through an aperture 202, which is of considerable dimension, axially of the drum, to permit the outer end of the lever to be moved in corresponding directions. A compression spring 204 surrounds the inner end portion of the lever and is compressed between the plate 200 and shoulders 206 of the lever (FIG. 17), biasing the lever radially outwardly to a position in which outwardly facing shoulders 208 are limited by the outer circular plate 192. Clips 210 preferably are interposed between the shoulders 208 and the plate to provide a frictional or dragging effect to normally retain the lever in the position to which it is moved.

The selector carriage 188, as indicated above, sweeps around the drum, and in so doing makes contact with the outer ends of the selector levers 196 when the levers are in active positions as described below. The selector carriage may include a body member 212 of suitable material such as a plastic having electrical insulating properties. This body portion has foot elements 214 riding on the plate 192 and confined under flanges 216 on the side plates 194. Mounted in the body member 212 is a pair of contact elements 218 each in position to engage the selector levers 196 in the corresponding circumferential series thereof when the levers are in active positions. Such active positions of the levers are represented by the righthand lever of FIG. 14. The selector levers are arranged for outward swinging movement of their radially outer ends by means of solenoids 220 of which there is one for each lever. These solenoids are arranged so that upon energization thereof the outer end of the corresponding lever is attracted to it while the inner end is confined in the aperture 198, to produce a pivoting motion. The outer end is then in the path of the contact element 218 on that side of the carriage. A circuit portion (shown in FIG. 19) is thereby set up which is one component of circuit means for controlling the operation of the phonograph. When this circuitry is thus set up, the motor 74 (FIG. 3) for driving the magazine is immediately dynamically braked and a motor 221 (FIG. 19) is placed in circuit for operating the record transfer means 34 (FIG. 1) and other playing mechanism, all as described fully in United States Letters Patent No. 2,804,307 referred to above.

After the playing operation corresponding to the active lever 196 is completed, that active lever is to be moved to an inactive position. This is accomplished by cancel solenoids 222 of which there is one for each lever. These solenoids 222, as shown particularly in FIGS. 14 and 16, each include an armature having a plunger 224 which, upon energization of the corresponding solenoid, is projected downwardly and it engages the corresponding selector lever 196, moving it inwardly to its inactive position. As viewed in FIG. 14, the selector levers 196 are in inactive position in their inner positions, i.e., when moved toward each other to limit positions in those directions. The lefthand one of these levers is shown in its inactive position with the plunger 224 of the corresponding solenoid in position corresponding to energization of that solenoid and resulting movement of the selector lever, while the righthand selector lever is in active position, i.e., the position to which it is moved by the corresponding solenoid 220. The solenoid 220 is energized in response to actuation of the control buttons and keys 26

and 28 and deposit of an appropriate coin into the machine while the cancel solenoids 222 are energized and actuated automatically in the operating cycle of playing the side of the record corresponding to that selector lever.

The selector lever 196 corresponding to the record side desired to be played becomes a component in the circuit portion represented in FIG. 19. Whether a single selection is made or whether a plurality of selections are made, the switch means or circuit portions involving the active selector levers must remain as an energized circuit so that the various operating parts will function as intended throughout a minimum cycle of operation of the phonograph, which includes four rotations of the magazine. So long as this condition exists, and the switch controlled by the coin deposited in the phonograph is closed, the ratchet-cam member 98 remains in advanced position which retains the switch 110 in closed position. It becomes unnecessary to set up a separate switch for each of the selector levers 196, because of the switch 110. This switch is common to all of the selector levers, enabling the selector drum to be made more economically, since the selector levers 196 do not operate isolated switches, and the outer plate 192 may be made of metal instead of insulation material, and thus fabricated less expensively.

The general operation of the phonograph as described in United States Letters Patent No. 2,804,307 referred to above, is that in the scanning cycle when the selector carriage 188 moves to the position of an active selector lever 196, circuit is made through that particular selector lever for effecting operation of the mechanism of the phonograph, i.e., the record transfer means, rotation of the turntable operation, of the tone arm, and reproduction of the record, and finally the return of the record from the turntable to the magazine by the record transfer means.

The selector levers 196 in one circular series represents all of the odd or obverse sides of the records, while the other circular series represents the even of reverse sides of the records. The cam track means 50 and cam track follower 62 together with the reciprocating arm 80 through the instrumentality of the switch 110, referred to above, control the record transfer means for playing the records on the turntable with the obverse or reverse side facing upwardly according to which position the switch is in which, in turn, is determined by the particular rotation of the magazine in its cycle. Accordingly it is necessary for the record magazine and the selector carriage 188 to make two complete revolutions to scan all of the records at one time, the first rotation being for the odd sides and the second rotation for the even sides.

The record magazine and scanning means return to the same home position after each cycle, whether a simple cycle of four rotations is made, or a longer cycle of six or more rotations. Regardless of the magnitude of the cycle, it always consists of an even number of rotations, so that in beginning a new cycle, the first rotation is that in which the odd or obverse sides of the records are scanned, while the even or reverse sides are scanned in the second rotation. This order is always maintained so that the obverse sides are scanned in the odd-numbered rotations of all cycles and the reverse sides are scanned in even-numbered rotations of all cycles.

The circuit of FIG. 20 includes representative control members of the electrical circuit of the phonograph. The group selector buttons 26 control which group of records are to be played in a particular operation. As brought out in detail in the co-pending application of said David C. Rockola, Serial No. 839,725, filed Sept. 14, 1959, the records are arranged in groups which are designated by the program holder here indicated at 28. The program holder is movable to selected ones of several positions, e.g., three or five positions, according to the capacity of the phonograph. Upon actuation of one of the group control buttons 26 the program holder 28 is moved to a position corresponding to that particular button, i.e., a position in which the selected group is presented to the patron, and in this same operation a particular circuit portion is controlled and energized for playing the records contained in that group.

The individual control keys 28 are equal in number to the number of record sides in any one group, and after actuation of the desired group control button 26 the patron then depresses that one of the individual selection keys 28 corresponding to the desired recording. The function of the portions of the circuit of FIG. 20 relating to these steps in the operation will appear from a study of this circuit and from reference to the co-pending application, Serial No. 839,725 referred to. As indicated above, operation of the phonograph normally begins upon depression of one of the individual record control keys 28, and deposit of a coin in the coin chute. Such coin chute is indicated diagrammatically by the series of switches 230, particular ones of which are actuated by deposit of coins of the values indicated at the respective switches. Upon one of these switches being closed in response to deposit of the coin and one of the individual control keys 28 being actuated, the scan control solenoid 114 (FIG. 20) is actuated. Energization of this solenoid sets up or advances the ratchet-cam member 98, as described above, the member 98 being held in advanced position by the pawl 120, and being released in steps during the course of the scanning cycle as referred to above.

The circuit of FIG. 20 includes a master accumulator ratchet 232 which is advanced various amounts by respective ones of the escapement ratchet wheel coils 234 and moved to retracted position in accordance with the value of the respective records played in the phonograph, as more fully disclosed in the co-pending application of said David C. Rockola, Serial No. 849,456 filed Oct. 29, 1959.

As previously noted, an important advantage is the provision for picking up all selections made in any given cycle of operation so long as sufficient credit of deposited coins remains in the machine. The scanning cycle includes a minimum of four rotations of the record magazine and the selector carriage 188. The selector levers 196 corresponding to the records selected are moved to active position and are picked up by the selector carriage in sweeping the selector drum. If all selections were made at one time, or before the beginning of a scanning cycle, a simple minimum cycle would be sufficient for picking up all of these selections, but it quite often occurs that additional selections are made after the operating mechanism has begun its scanning cycle, and in at least certain portions of this scanning cycle these additional selections would not be picked up if they are made posterior to the position of the selector carriage 188 in its scanning cycle. For example, in the first two rotations of the operating mechanism and scanning means, all selections made before the beginning of the scanning cycle will be picked up in the first two rotations of the magazine and scanning means. If additional selections are made posterior to the position of the scanning means, but while the scanning means is still making the first two rotations, these additional selections will be picked up in the third or fourth rotations of the magazine and scanning means, depending on whether they are odd or even selections, these third and fourth rotations being within the original minimum cycle of operation of the operating mechanism and scanning means.

The ratchet-cam member 98 and the pawl 120 are arranged so that the ratchet means is not advanced by any additional selections made within the first two rotations of the magazine and scanning means. This condition is represented in FIGS. 6 and 8 where it will be noted that in the position of the parts shown in FIG. 6, which is the position in the first rotation of the cycle, any addi-

tional energization of the solenoid **114** does not further advance the position of the member **98**. A similar condition exists in the second rotation in which the parts are disposed as illustrated in FIG. 8, where it will be seen that any additional energization of the solenoid **114** does not further advance the member **98**.

Should an additional selection be made during the third or fourth rotation of the magazine and scanning means, the scan control unit **78** is set up to a further advanced position so as to assure that the scanning means will pick up those selections made posterior to the scanning means. These two rotations are represented by the positions of the parts in FIGS. 11 and 12, FIG. 11 being that of the third rotation while FIG. 12 is that of the fourth rotation.

Referring to the position of the parts in FIG. 11, or that of the third rotation, if an additional selection is made in this rotation of the scanning cycle and sufficient credit remains in the coin deposit means, the solenoid **114** is energized which sets up the ratchet-cam member **98** from the position of FIG. 11 to the full advanced position of FIG. 6. The pawl **120** yields under this action against the biasing effect of the tension spring **168**. This action is represented in FIG. 2 where the pawl **120** is shown in dotted lines with the pallet **136** riding over the tooth **102***b*.

A similar occurrence takes place in the fourth rotation of the scanning cycle which is represented by the position of the parts in FIG. 12. In this instance if the solenoid **114** is energized in the manner explained, the ratchet-cam member **98** is moved from the position of FIG. 12 to the advanced position of FIG. 8, whereby the pallet **162** rides over the tooth **102***d* and latches ahead of that tooth. In this step of the operation the member **128** of the pawl **120** remains in its illustrated position by the positive stop means **170**, but the member **150** is enabled to yield against the action of the tension spring **166**, notwithstanding the non-yielding restraint of the member **128**.

Thus, if any selections are made in the third or fourth rotation of the record magazine and scanning means, the scan control unit is set up a corresponding amount so that the cycle is extended an additional two rotations beyond the original minimum cycle. More specifically, if a selection is made in the third rotation, that rotation and three more rotations are completed in the cycle, while if a selection is made in the fourth rotation, that rotation is completed and two additional ones are made.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the forms hereinbefore described being merely preferred embodiments thereof.

I claim:

1. In an automatic phonograph having a coin-insert means and a plurality of manually actuated control keys, a magazine having a plurality of record-receiving pockets and rotatable for selectively positioning the pockets at an indexing position, means for rotating said magazine, the magazine having a predetermined cycle of rotation, first control means movable to advanced position in response to insertion of a coin in said coin-insert means and actuation of a control key and operative when in advanced position for conditioning said driving means for operation, means biasing said first control means to a retracted position, second control means controlled by rotation of said magazine for controlling said first control means and progressively releasing the first control means for movement to retracted position under the influence of said biasing means, and means operative in response to insertion of a coin in said coin-insert means and actuation of a control key during a said cycle of operation for again setting said first control means to advanced position.

2. In an automatic phonograph having coin-insert means including a circuit portion energized by the presence of a coin therein and having a plurality of control keys, a magazine having a plurality of record receiving pockets and rotatable for selectively placing said pockets at an indexing position, electrically controlled means for driving said magazine, a turntable, electrically controlled means for transferring a record between a pocket at said indexing position and said turntable, circuit means for controlling said driving means and record transferring means, and first control means for energizing said circuit means in response to the insertion of a coin in said coin-insert means and actuation of a control key, said first control means being movable between a retracted position at the beginning of a range of movement thereof and an advanced position through another portion of its range of movement, means biasing said first control means to retracted position, second control means operative in response to movement of said magazine through its cycle of operation for controlling the movement of the first control means from advanced position through said portion of its said range of movement to its retracted position, and the first control means being movable to its retracted position only at the end of movement of the magazine in its said cycle of operation, said first control means being movable to advanced position in response to the insertion of a coin in said coin-insert means and actuation of a control key during the movement of said magazine in its said cycle.

3. In an automatic phonograph having coin-insert means and a plurality of control keys, a magazine having a plurality of record receiving pockets and rotatable for selectively placing said pockets at an indexing position, a turntable, means for transferring records between a pocket at said indexing position and said turntable, said magazine having a cycle of rotation from a home position through at least two rotations, means responsive to rotation of said magazine for controlling said record transferring means for placing a record on the turntable with a first or second side selectively disposed upwardly, said last means effecting placement of each record with its first side facing upwardly in a first rotation of the magazine in its said cycle and the second side facing upwardly in the second rotation in its said cycle means for driving said magazine, first control means for energizing said driving means, said control means being moved to an advanced position in response to the insertion of a coin in said coin-insert means and actuation of a control key, and second control means actuated by rotation of said magazine and operative thereby for causing de-energization of said driving means at the end of said cycle of rotation of said magazine.

4. In an automatic phonograph, a magazine having a plurality of record-receiving pockets and rotatable for selectively placing the pockets at an indexing position, means for driving said magazine, means for energizing said driving means including coin-insert means and a plurality of control keys, said energizing means including a normally open switch, cam means for controlling said switch, means responsive to the insertion of a coin in said coin-insert means and actuation of a control key for advancing said cam means and thereby closing said switch, means biasing said cam means to a retracted position in which said switch is open, escapement means for controlling the movement of said cam means to retracted position, and means operated by said magazine for operating said escapement means in opposite directions in successive rotations of said magazine and thereby effecting release of said cam means through a plurality of steps in which said switch means remains closed to a final step in which the switch is permitted to open.

5. In an automatic phonograph, a magazine having

a plurality of record receiving pockets and rotatable for selectively placing the pockets at an indexing position, means for driving said magazine, a turntable, means for transferring a record between a pocket at said indexing position and said turntable, a selector element associated with each side of a record in each pocket, a control key associated with each said selector element and operable on actuation therof for controlling the associated selector element and effecting operation of said record transferring means for placing the corresponding record on said turntable with the associated side facing upwardly, coin-insert means, circuit means for controlling said driving means and record transferring means and including a normally open switch, a cam for closing said switch, means biasing said cam to an inactive position in which said switch is open, an electromagnet operative on energization thereof for moving said cam to active position and thereby moving said switch to closed position, said cam being in inactive position only at one end portion of a range of movement and in active position through a substantial portion of its range of movement, said electromagnet being energized in response to the insertion of a coin in said coin-insert means and actuation of a control key, escapement means for retaining said cam in active position including ratchet teeth on said cam and a pivoted pawl having elements engaging said ratchet teeth, and control means actuated by said magazine for rocking said pawl and releasing said cam for movement toward inactive position under the force of said biasing means progressively through its said active position corresponding to rotation of said magazine through a predetermined cycle, and movement into its inactive position adjacent the end of said cycle of said magazine.

6. A scan control unit of the character disclosed comprising, a normally open switch, a cam having a retracted position, means biasing the cam to retracted position, said cam being shaped for enabling said switch to assume its open position when the cam is in its retracted position and being operative for closing said switch when moved to an advanced position and having a substantial range of movement in advanced position in which said switch remains closed, an electromagnet for moving said cam in advancing direction and thereby closing said switch, said cam having ratchet teeth, an escapement pawl pivoted for alternately engaging said teeth for controlling the release of said cam from advanced position for movement to retracted position under the force of said biasing means.

7. The invention set out in claim 6 in which said pawl includes a pair of pawl members mounted on a common pivot means and pivotally movable relative to each other, and spring means interconnects the pawl members to normally but yieldingly retain them in fixed relation with respect to each other for conjoint movement.

8. In an automatic phonograph having coin-insert means, a magazine having a plurality of record receiving pockets and rotatable for selectively placing said pockets at an indexing position, a turntable, means for transferring a record between a pocket at said indexing position and said turntable, said record transferring means being operable for placing a record on the turntable with either side selectively disposed in upwardly facing position, means for playing a record on said turntable, selector means having a plurality of selector elements, one associated with each side of a record in each of the pockets, means rotatable with the magazine for scanning said selector elements, said selector elements each being movable between an active position and an inactive position and when in active position being cooperable with said scanning means for effecting placement of the record having the side corresponding to the respective selector element on the turntable with that side disposed upwardly, control key means for each of said selector elements, electric motor and circuit means for rotating said magazine and operating the record transferring and playing means, single switch means, means operable for actuating said switch means in response to the insertion of a coin in said coin-insert means and actuation of any of said control key means and thereby conditioning said circuit means for operating said magazine and transferring and playing means.

9. In an automatic phonograph, a magazine movable through a minimum scanning cycle including a plurality of repeated rotations, the magazine being thus movable for selectively placing the pockets therein in an indexing position, a turntable, means for transferring a record between a pocket at said indexing position and said turntable, means for playing a record on said turntable, coin-insert means, control elements one for each side of each record in said pockets, control means responsive to insertion of a coin in said coin-insert means and actuation of a control element for effecting driving said magazine through a said scanning cycle, and means responsive to additional actuation of said control elements for continuing driving said magazine beyond said minimum scanning cycle.

10. The invention set out in claim 9 in which said cycle includes at least one movement representing each of the first sides of all the records in the magazine, and the second sides thereof, respectively, and the continued movements beyond the minimum cycle include at least one movement representing each of the first sides of all the records in the magazine, and the second sides thereof, respectively.

11. The invention set out in claim 9 in which said cycle is constituted by an even number of rotations of the magazine and each continuing increment of the cycle is constituted by an even number of rotations.

12. The invention set out in claim 9 in which said minimum cycle is constituted by four rotations of the magazine, and the continuing increments of that cycle are produced in response to actuation of the control elements in the third and fourth rotations of the magazine.

13. The invention set out in claim 12 in which additional continuing increments of a cycle are produced in response to actuation of the control elements in any previous continuing increment.

No references cited.