May 23, 1950 E. O. THOMPSON 2,508,845

PHONOGRAPH APPARATUS

Filed April 18, 1945 6 Sheets-Sheet 1

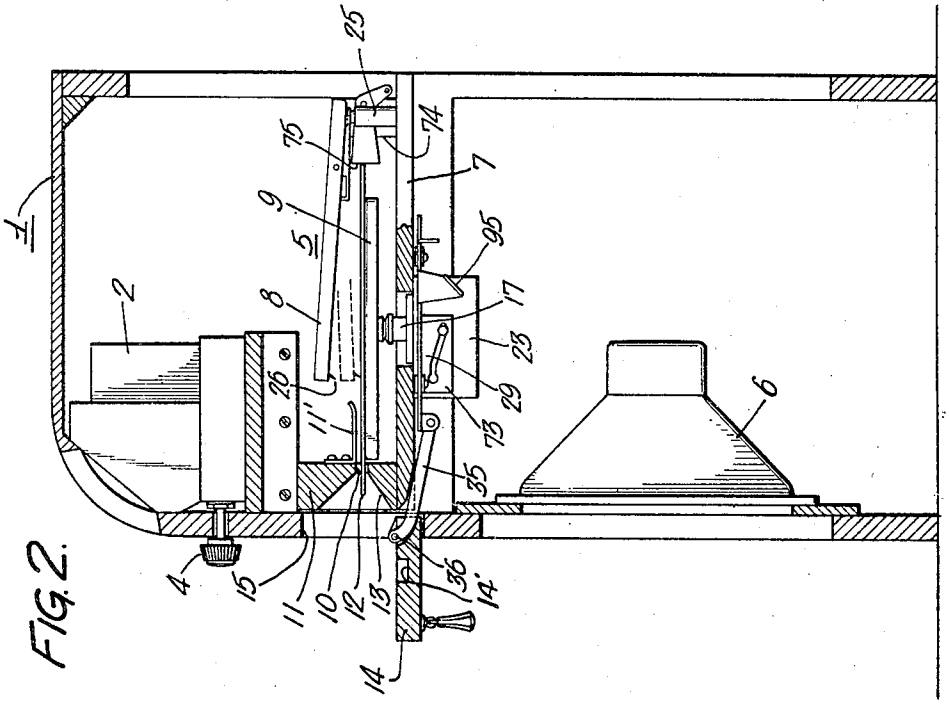


FIG. 2.

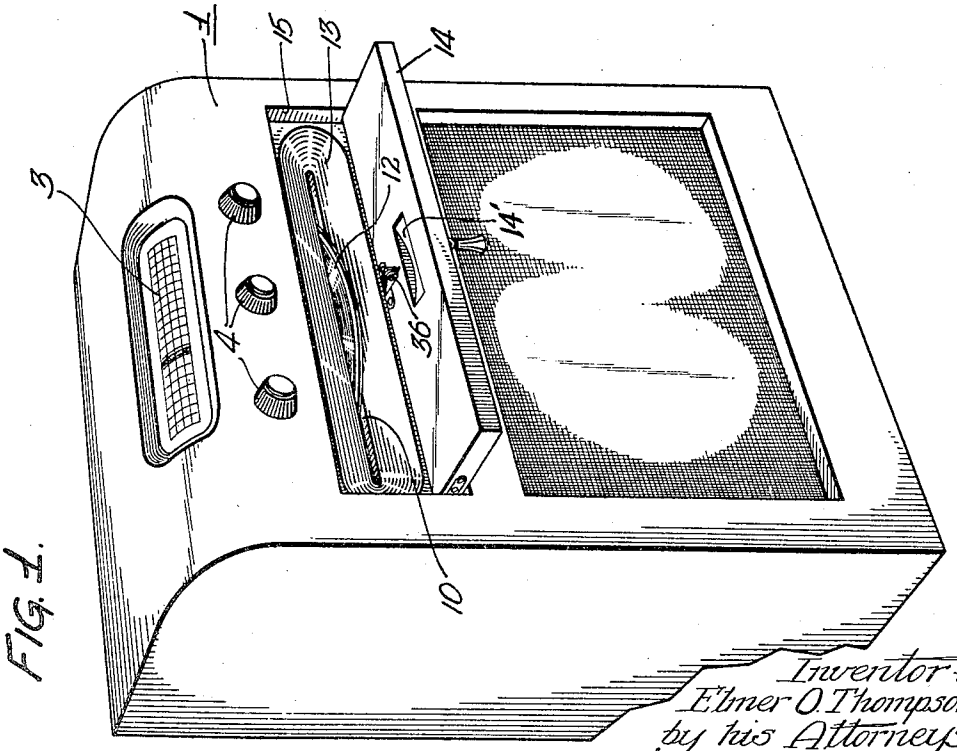


FIG. 1.

Inventor:
Elmer O Thompson
by his Attorneys
Howson & Howson

May 23, 1950 E. O. THOMPSON 2,508,845

PHONOGRAPH APPARATUS

Filed April 18, 1945 6 Sheets-Sheet 2

FIG. 3.

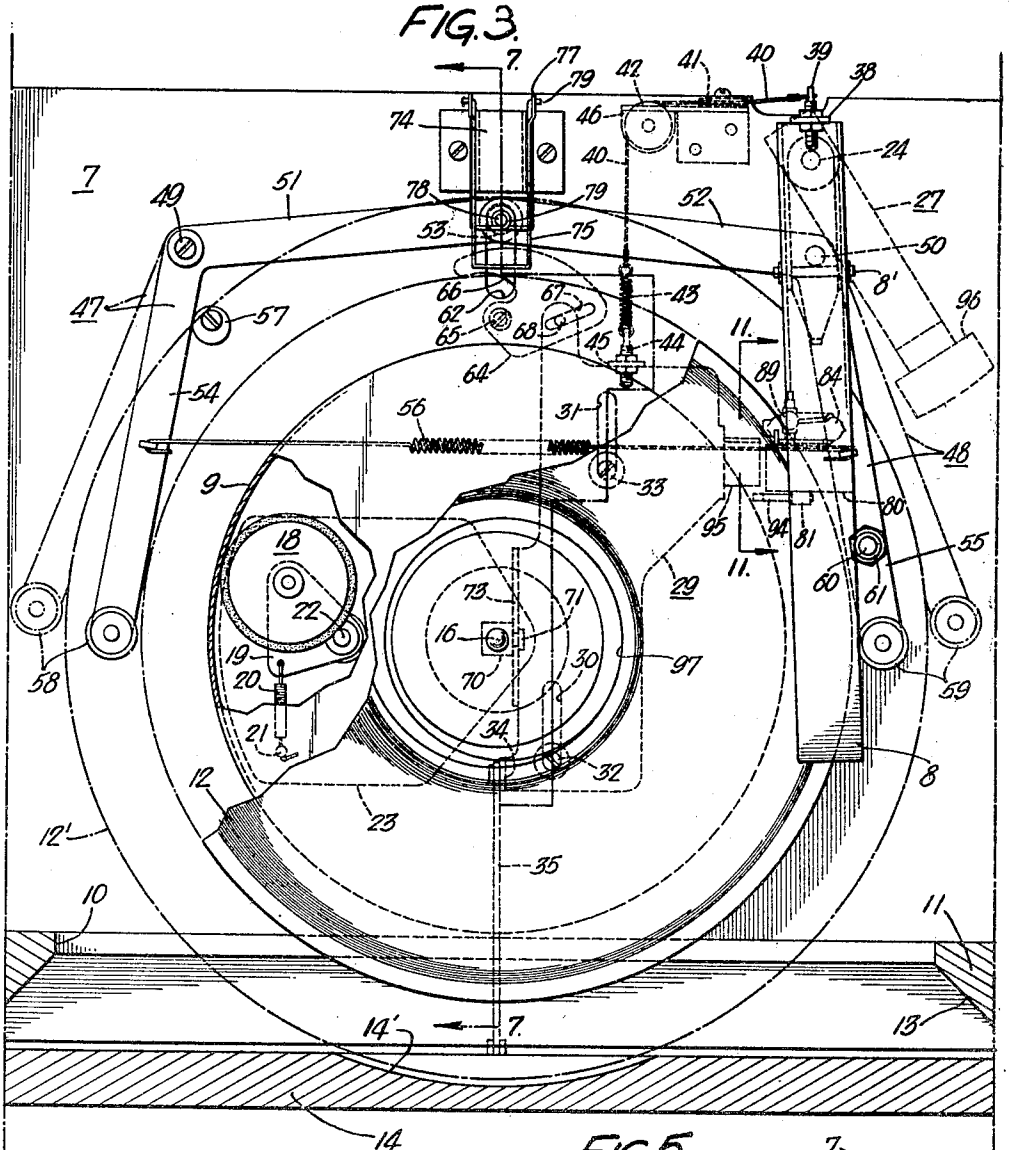


FIG. 4.

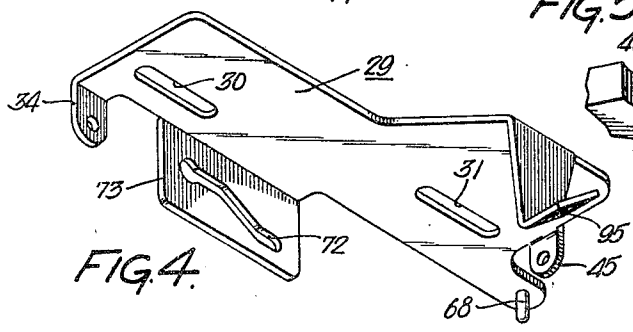
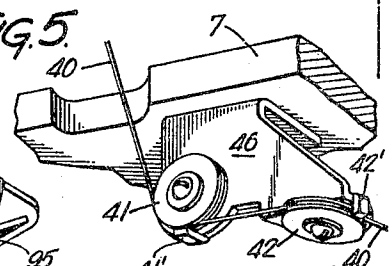


FIG. 5.



Inventor:
Elmer O. Thompson
by his Attorneys
Howson & Howson

May 23, 1950 E. O. THOMPSON 2,508,845

PHONOGRAPH APPARATUS

Filed April 18, 1945 6 Sheets-Sheet 3

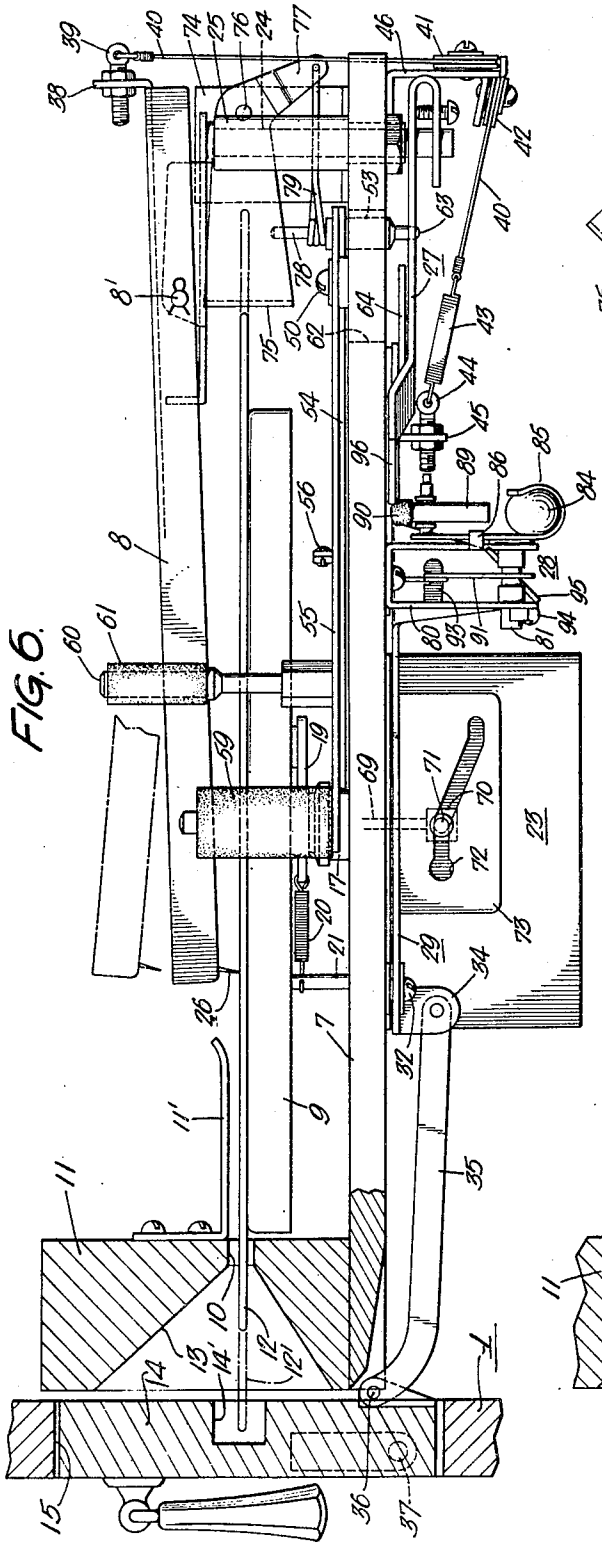


FIG. 6.

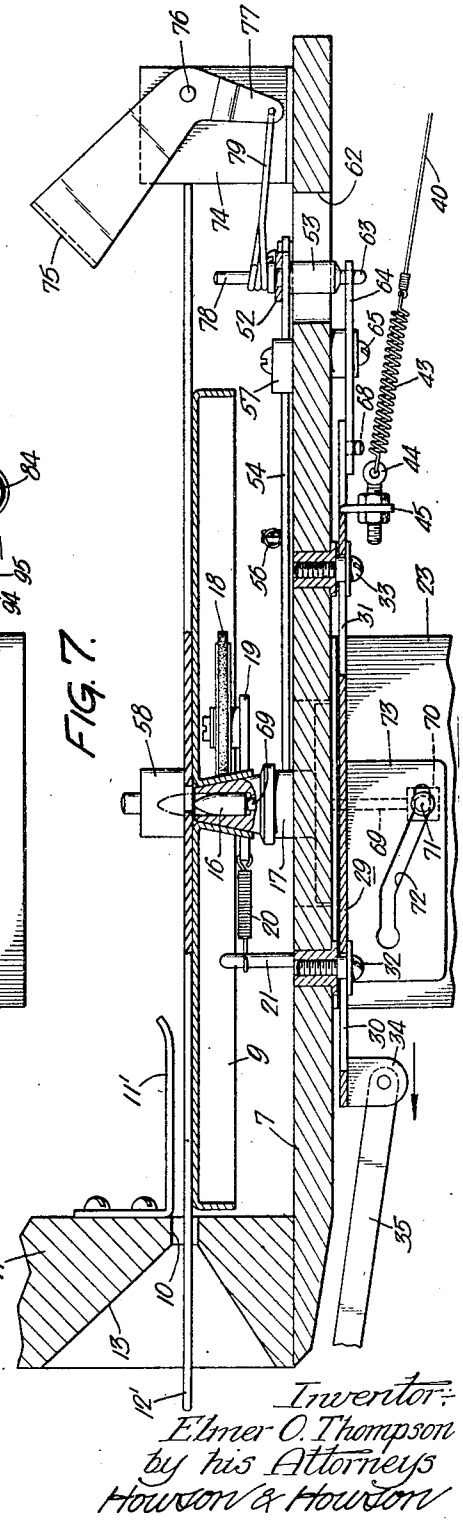


FIG. 7.

Inventor:
Elmer O. Thompson
by his Attorneys
Howson & Howson

May 23, 1950 E. O. THOMPSON 2,508,845

PHONOGRAPH APPARATUS

Filed April 18, 1945 6 Sheets-Sheet 4

FIG. 8.

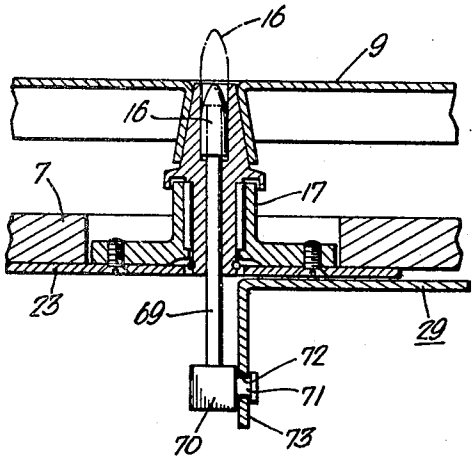


FIG. 10.

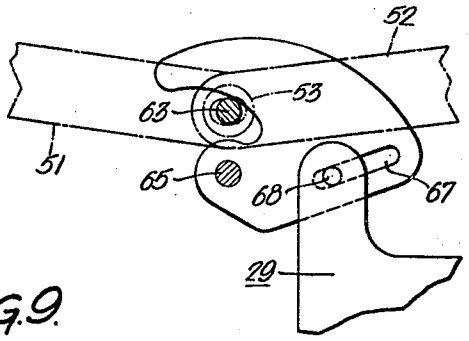
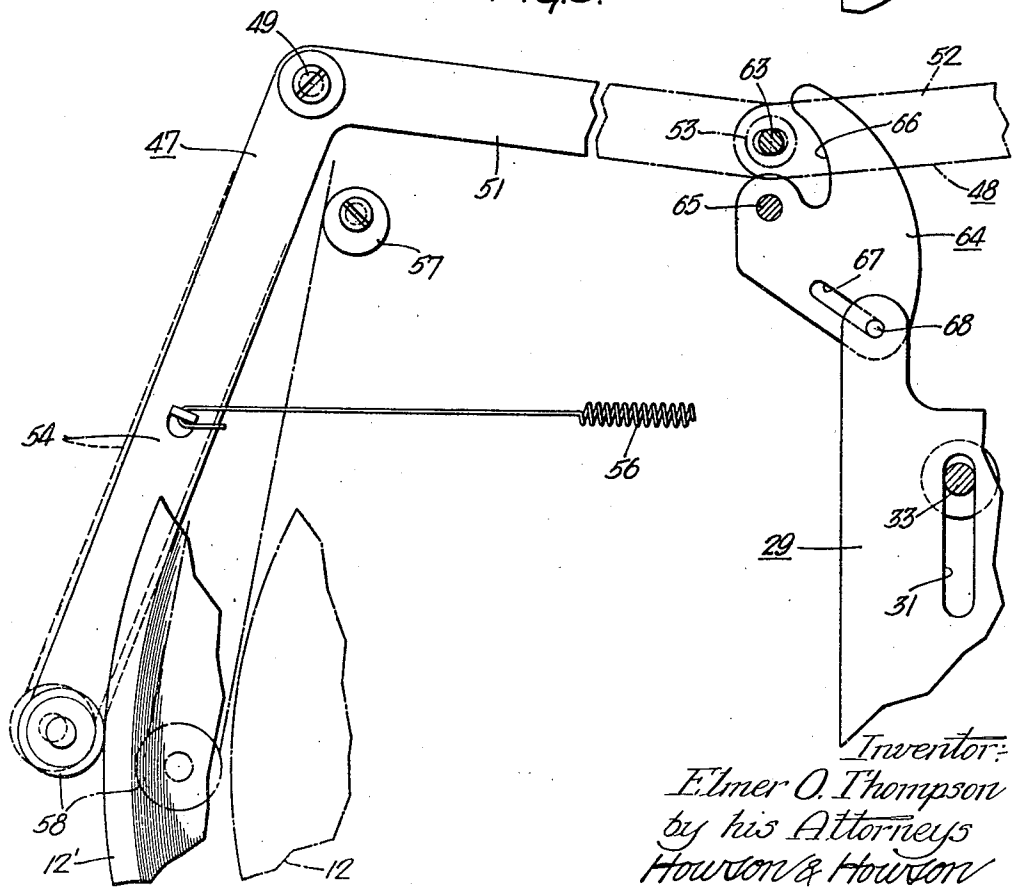


FIG. 9.



Inventor:
Elmer O. Thompson
by his Attorneys
Howson & Howson

May 23, 1950 E. O. THOMPSON 2,508,845

PHONOGRAPH APPARATUS

Filed April 18, 1945 6 Sheets-Sheet 5

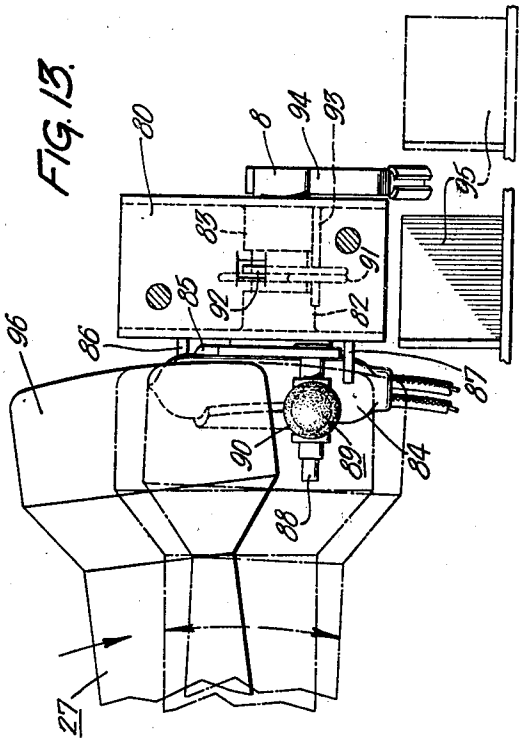


FIG. 13.

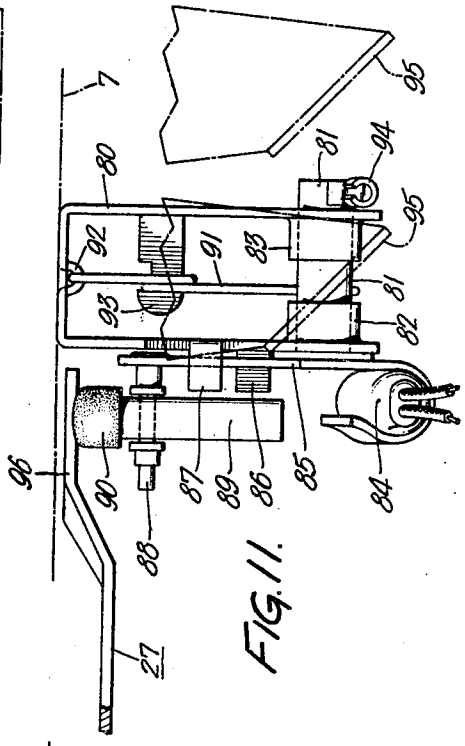


FIG. 11.

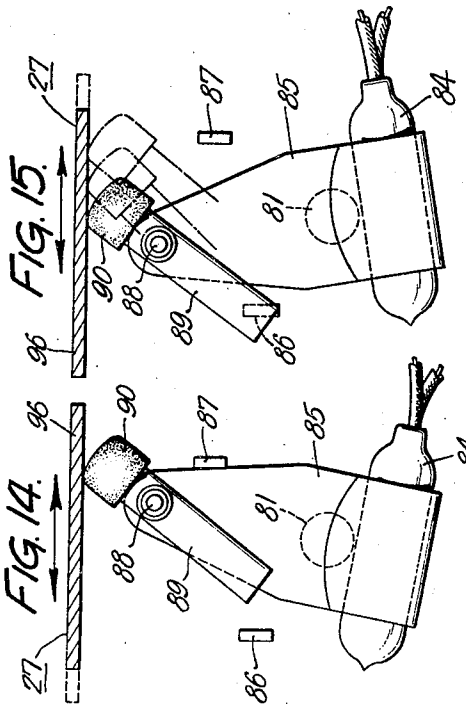


FIG. 15.

FIG. 14.

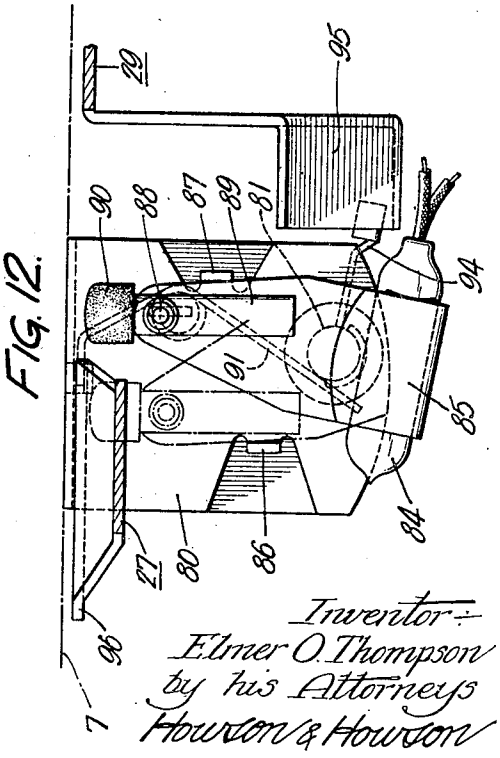


FIG. 12.

Inventor:
Elmer O. Thompson
by his Attorneys
Howson & Howson

May 23, 1950 E. O. THOMPSON 2,508,845

PHONOGRAPH APPARATUS

Filed April 18, 1945 6 Sheets-Sheet 6

FIG. 16.

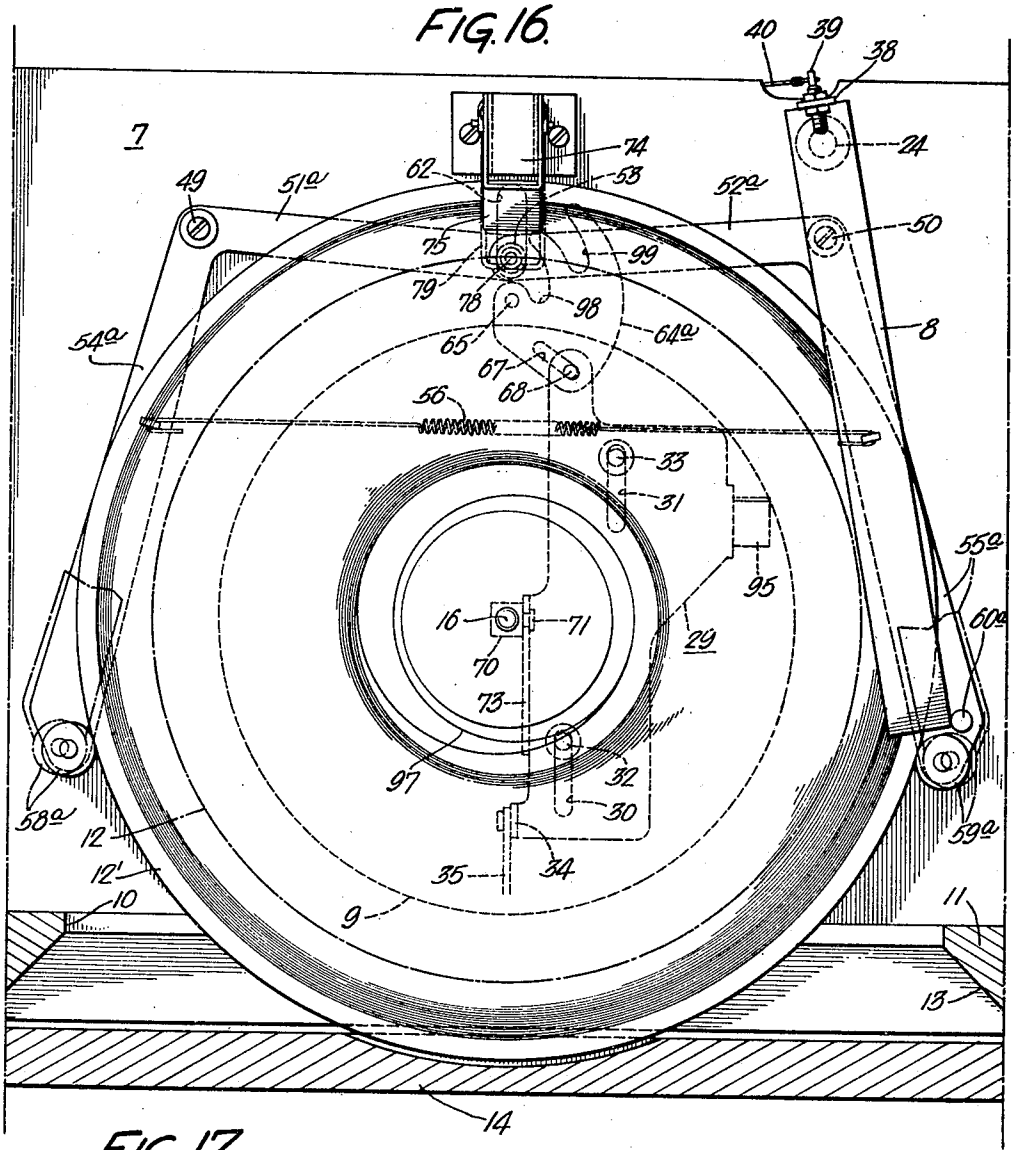
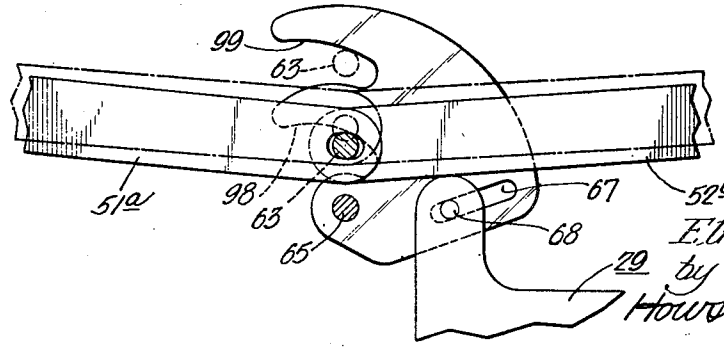


FIG. 17.



Inventor:
Elmer O. Thompson
by his Attorneys
Howson & Howson

Patented May 23, 1950

2,508,845

UNITED STATES PATENT OFFICE

2,508,845

PHONOGRAPH APPARATUS

Elmer Oluf Thompson, Grasmere, N. Y., assignor, by mesne assignments, to Philco Corporation, Philadelphia, Pa., a corporation of Pennsylvania

Application April 18, 1945, Serial No. 589,019

16 Claims. (Cl. 274—9)

1

This invention relates to certain improvements in a phonograph apparatus which is adapted to play records successively supplied thereto, without any effort on the part of the user other than the insertion and removal of the records and the operation of a door or like member.

More particularly, the invention relates to certain improvements in a phonograph apparatus of the character disclosed and claimed in a copending application of E. Harman, Serial No. 588,924, filed April 18, 1945. In such apparatus, there is provided a restricted slot-like opening through which records are inserted and removed, and there is also provided a door or lid which conceals the said opening when in closed position. The user has only to open and close the door, and to insert and remove records, and the operating parts are automatically actuated and controlled in response to these acts on the part of the user. Provision is made for the playing of different sized records without any further effort on the part of the user. This is accomplished by means of a "feeler" mechanism which conditions the apparatus according to the size of an inserted record.

The object of the present invention is to provide certain improvements in a photograph apparatus of this character.

One feature of the present invention is the provision of a retractable record-centering pin or spindle which is actuated by the door so as to be in retracted position when the door is open. This feature facilitates the insertion and removal of records and it also permits the use of a very narrow record-insertion opening.

Another feature of the present invention is the provision of an improved mechanism for positioning an inserted record, and for positioning or indexing the tone arm according to the size of the inserted record. Such mechanism is novelly characterized by the provision of a pair of interconnected pivoted feeler members one of which carries a tone arm-indexing member, and a two-part stop structure which is controlled by said feeler members and cooperates therewith to position an inserted record.

Another feature of the invention is the provision of novel latch and cam means in association with the feeler members for disengaging them from the record in response to closing movement of the door.

These and other features of the invention will be apparent from the following detailed description in conjunction with the accompanying drawings, in which:

2

Fig. 1 is a perspective view of a radio-phonograph combination embodying the improvements of the present invention;

Fig. 2 is a sectional view taken vertically through the same;

Fig. 3 is a horizontal sectional view showing the phonograph apparatus in plan;

Fig. 4 is a perspective view of a slide member which serves to actuate certain parts;

Fig. 5 is a fragmentary perspective view showing the cord and pulley arrangement employed;

Fig. 6 shows the phonograph apparatus in side elevation with the door in closed position and with a small sized record on the turntable;

Fig. 7 is a sectional view taken along lines 7—7 of Fig. 3 showing the parts in the positions which they assume when the door is opened and a large sized record is inserted;

Fig. 8 is a detailed sectional view showing more clearly the receding spindle arrangement which is employed;

Fig. 9 is a fragmentary plan view of the "feeler" mechanism;

Fig. 10 is a fragmentary plan view showing the latch member of the same mechanism in a different position than that of Fig. 9;

Fig. 11 is a detail view of the switch mechanism which controls the turntable operation, said view being taken along line 11—11 of Fig. 3;

Fig. 12 is a view of the same mechanism taken from the left side of Fig. 11.

Fig. 13 is a plan view of the same mechanism;

Figs. 14 and 15 are explanatory views showing how the switch is operated;

Fig. 16 is a plan view of a modified form of the "feeler" mechanism; and

Fig. 17 is a fragmentary view of the latch member in a different position than that of Fig. 16.

The phonograph apparatus illustrated in the drawings is similar to one of the embodiments shown in the above-mentioned Harman application. It embodies subject matter claimed in the Harman application and also subject matter claimed in a copending application of E. O. Deaver, Serial No. 589,017, filed April 18, 1945, now U. S. Patent No. 2,485,575, as will be pointed out particularly hereinafter.

Referring first to Figs. 1 and 2, the phonograph apparatus is shown embodied in a radio-phonograph combination comprising a cabinet 1, radio receiver 2 and its associated dial 3 and control knobs 4, phonograph apparatus 5, and loudspeaker 6. The phonograph mechanism is supported by a horizontal shelf or panel 7 within the cabinet.

The phonograph tone arm and turntable are shown at 8 and 9, respectively. The phonograph apparatus is inaccessible to the use during operation, and provision is made for the playing of successive records simply by inserting them into a restricted slot-like opening 10 adjacent the turntable 9, and by operating a door associated with said opening. To this end, there is provided a front wall member 11 which forms a part of the cabinet structure and which has the record-insertion opening 10 therein. A record 12 is shown on the turntable, and it will be noted that the record protrudes from the opening 10 into a recess 13 provided in member 11. The purpose of this arrangement is to enable insertion and removal of the record, as will be obvious. Adjacent the recess 13, and hingedly mounted on the outer part of the cabinet, is a manually operable door 14 which occupies the door opening 15 when in closed position. When closed, the door conceals the record insertion opening 10, and when opened it affords access to the said opening. As previously mentioned, the movement of the door serves to control the tone arm and the turntable.

It will be apparent from Figs. 1 and 2, and from the description thus far, that the phonograph apparatus is fully protected against accidental misuse or abuse, there being no reason for access to the parts since the user is required only to operate the door 14 and to insert and remove records.

While the phonograph apparatus is shown in Figs. 1 and 2 as a part of a radio-phonograph combination, it need not be associated with a radio receiver, as will be well understood.

Referring now to Figs. 3 to 10, these figures illustrate the mechanism by which the tone arm and turntable are controlled by the door 14, and they also illustrate the mechanism by which the apparatus is adapted to play different sized records without any further effort on the part of the user. As shown most clearly in Fig. 6, the turntable 9 is arranged in relation to the restricted opening 10 so that the upper surface of the turntable is slightly above the bottom surface of the opening. This permits the record 12 to rotate freely with the turntable. It will be noted also that the door 14 has a recess 14' to accommodate a larger sized record represented in dot and dash outline at 12'. A guide member 11' is secured to the wall 11 and extends therefrom above the turntable as shown. This member may take the form of a strip or plate of metal or other material, and its purpose is to insure proper insertion of the record, as will be seen later. The record is centered on the turntable by means of a central pin or spindle 16 (Fig. 7) which is automatically retracted in response to opening movement of the door 14, as will be described further hereinafter. As shown in Fig. 8 the turntable is supported by means of a bearing structure 17 carried by the supporting shelf or panel 7. The details of the bearing structure are unimportant except that it may be noted that the record-centering spindle 16 is slidably mounted within the same structure. The turntable is driven in conventional manner (see Fig. 3) by means of a driving friction wheel 18 which is mounted on a pivoted bracket 19 and is maintained in engagement with the turntable flange by a spring 20, one end of which is attached to the bracket 19 while the other end is secured to a stationary pin 21 on the supporting panel 7. The wheel 18 is driven by a smaller wheel or roller 22 which in turn is suitably driven by the driving motor unit 23.

The tone arm 8 is mounted at the upper end of a spindle 24 (see Fig. 6) which is rotatably supported by a hollow post 25 mounted on the supporting panel 7, so that the tone arm is adapted to move laterally or horizontally with respect to a record on the turntable. The tone arm is pivotally mounted on a horizontal pivot 8' so as to be vertically movable with respect to the record. At its free end the tone arm carries a suitable pick-up which may be of conventional form and which includes the usual needle or stylus 26. At the lower end of the tone-arm-carrying spindle 24, there is provided an extending arm 27, the purpose of which is to actuate a switch mechanism 28 at the end of the playing of a record so as to automatically stop the rotation of the turntable, as will be further described hereinafter.

As previously mentioned the operating parts are controlled by the movements of the door 14. To this end, there is provided at the under side of the supporting panel 7 a slide member 29 (see Fig. 4), which is slidably supported by the supporting panel. Member 29 has slots 30 and 31 therein, by means of which it is slidably supported for rectilinear movement forwardly and rearwardly. As shown in Fig. 7, the supporting arrangement for the slide member 29 may include a pair of suitable fastening elements, such as screws 32 and 33, which are carried by the supporting panel 7 and which extend through the slots 30 and 31 respectively. Thus it will be seen that the slide member 29 is supported for guided movement in the manner stated. At its forward end, the slide member 29 has a depending lug 34 to which one end of a connecting link 35 is pivotally connected. The other end of link 35 is pivotally connected to the door 14 at a point 36 (see Fig. 6) offset from the hinge or pivot 37 of the door. When the door is opened, the link 35 is pulled forwardly so as to move the slide member 29 from the position of Fig. 6 to that of Fig. 7, and when the door is closed, the said parts are moved in the reverse direction so that the slide member 29 moves to the position of Fig. 6.

The tone arm 8 is actuated in response to movement of door 14 and slide member 29 by means of the mechanism now to be described which is claimed in the above-mentioned Deaver patent. As clearly shown in Fig. 6 there is provided at the rear of the tone arm 8 an extending lug 38 carrying a screw 39 to which one end of a flexible cord 40 is attached. The cord passes around a pair of pulleys 41 and 42, and its other end is attached to one end of a helical spring 43 whose other end is secured to a screw 44 carried by a depending lug 45 on the slide member 29. The pulleys 41 and 42 (see Fig. 5) are rotatably mounted on a bracket 46 secured to the under side of the supporting panel 7. The bracket 46 has cord guiding and retaining portions 41' and 42' as clearly shown in Fig. 5. The pulleys are so arranged that when a pull is exerted on the cord 40 by the forward movement of the slide member 29, the tone arm is subject to both vertical and horizontal force components which lift the tone arm off of the record and swing it laterally to a position in which it may be lowered onto the next record. Furthermore, the horizontal pivot 8' of the tone arm is so arranged in relation to the vertical pivotal support that the vertical force component is effective to lift the needle or stylus off the record before the tone arm is moved laterally, thus preventing scratching of the record. When the slide member 29 is in its rearward position, i. e. when the door 14 is closed, there is no

tension on the spring 43 and the tone arm is in its operative position. When the slide member is in its forward position, i. e. when the door 14 is open, the spring 43 is placed under tension and the tone arm is raised. The tension of the spring urges the tone arm laterally against a stop, as will be described further hereinafter.

The phonograph apparatus is adapted to condition itself automatically for the playing of different sized records. Since records are commonly made in two sizes, 10 inch and 12 inch respectively, the apparatus is preferably designed to play such records. The automatic conditioning is accomplished by the provision of a "feeler" mechanism, the specific form of which is a feature of the present invention. Such mechanism is claimed more broadly in the above-mentioned Harman application. As shown in Fig. 3, this mechanism comprises a pair of L-shaped members 47 and 48 pivotally supported at the upper side of supporting panel 7 at points 49 and 50 respectively. These feeler members are arranged as shown and their inwardly extending arms 51 and 52 (Fig. 3) are pivotally connected together by a pin 53, as shown most clearly in Figs. 6 and 7. To permit free movement of the feeler members about their pivots 49 and 50, the arms 51 and 52 may have slightly elongated openings for the pin 53, as shown in Fig. 9. The forwardly extending arms 54 and 55 of the said feeler members are interconnected by means of a spring 56 which urges the said arms toward one another. A stop 57 is arranged so as to be engageable by arm 54 and serves to limit the inward movement of the two arms. At their outer ends, each of the forwardly extending arms 54 and 55 carries a roller 58 and 59 for engagement with an inserted record as hereinafter described.

The arm 55 also carries a post 60 which serves as a positioning or indexing means for the tone arm, so as to govern the record-commencing position of the tone arm according to the size of the record which it is desired to play in any instance. A covering 61 on the upper part of post 60 serves to cushion the tone arm when coming in contact with the post. The post 60 functions cooperatively with the cord and pulley arrangement hereinbefore described to position the tone arm for the playing of an inserted record. When the door 14 is opened and the tone arm is raised, the tension of spring 43 urges the tone arm against the post 60.

As shown in Figs. 3 and 7 the connecting pin 53 for the feeler members 47 and 48 is movably mounted in a slot 62 provided in the supporting panel 7. At its lower end the pivot pin has a projection 63 which is engageable by a latch member 64 (see Figs. 9 and 10) which is pivotally carried at the underside of the supporting panel at 65. This latch member is shaped as illustrated and has a recess 66 into which the projection 63 may enter, as shown in Fig. 10. The latch member 64 also has a slot 67 through which a pin 68 on the slide member 29 extends. By means of this interconnection between the latch member 64 and the slide member 29, the former is rotated about the pivot 65 during movement of the slide member. The purpose of the structure just described will be apparent presently.

In Figs. 3 and 6 the record 12, shown in solid lines, is a small sized record, e. g. a 10 inch record. Normally the feeler arms 54 and 55 are positioned in their innermost positions, as shown in Fig. 3, and the pin 63 is removed from the latch member 64. In this condition of the apparatus, the

rollers 58 and 59 are spaced apart sufficiently so that a 10 inch record may be inserted between them without actuating the feeler mechanism, as may be seen in Fig. 3. When the record is in place on the turntable, the rollers are free of the edge of the record. The stop 57, which establishes the innermost position of the rollers, is eccentric in form and may be adjusted to provide the desired clearance between the rollers and the record.

When a larger sized record, e. g. a 12 inch record, is inserted, it engages the rollers 58 and 59 and moves the feeler arms outwardly as shown in dot and dash outline in Fig. 3, wherein the larger sized record is shown in dot and dash outline at 12'. At this time, the door 14 is necessarily open and the slide member 29 has moved forwardly so that the latch member 64 is in the position of Fig. 9. As the feeler arms move outwardly, the pin 53 moves forwardly into the position shown in Fig. 9. At this time the feeler arms are being held in their outer position by the larger record 12', as shown by the solid line illustration in Fig. 9. When the door is closed, the slide member 29 moves the latch member 64 to the position of Fig. 10. The latch member thus latches the feeler arms in their outer position and it is also shaped so as to cam the pin projection 63 slightly forward and thereby move the feeler arms a little further outwardly so that the rollers 58 and 59 are free of the record 12', as shown by the broken line representation of the arm 54, in Fig. 9. When the door is opened, following the playing of the record, the latch member 64 is returned to the position of Fig. 9, and when the record 12' is removed, the feeler arms return to their inner positions. Thus, each time a larger sized record is inserted, the feeler arms are moved outwardly sufficiently to clear the record, as soon as the door is closed, and when the door is opened and the record is removed, the feeler arms return to their normal inner position.

One purpose of the feeler arm movement is to position the tone arm indexing post 60 so that the tone arm will be properly indexed for the different sized records. Normally the post 60 is positioned as shown in Fig. 3 so as to index the tone arm for the smaller sized records, but when a larger sized record is inserted, the indexing post is moved outwardly to a position in which it indexes the tone arm for the larger sized record. In either position of the post 60, the spring 43 urges the tone arm against the post. When a larger sized record is inserted and the post moves outwardly, the tone arm follows the post to the new position under the impetus of spring 43.

As previously mentioned, a further feature of the present invention is the provision of means for causing the record-centering spindle 16 to recede in response to opening movement of the door 14. As shown in Figs. 7 and 8, the centering spindle is lowered from its operative position to an inoperative position, in which its upper end is flush with or slightly below the surface of the turntable 9. This withdrawal of the centering spindle facilitates insertion and removal of the records, and it permits the employment of a narrower record-insertion slot than would otherwise be permissible, since it permits the insertion and removal of records in a horizontal plane immediately above the turntable and does not require any tilting or inclination of the record.

Referring to Figs. 7 and 8, the centering spindle 16 has its upper end tapered and it is carried by a rod 69 which is slidably mounted within the turntable bearing structure 17. At its lower end, the

rod 69 carries a block 70 from one side of which projects a pin 71. The latter is disposed in a cam slot 72 (see Fig. 4) of a depending plate 73 formed integrally with the slide member 29. The cam slot 72 is so shaped that it lowers and raises the centering spindle 16 in response to opening and closing movements of the door 14. When the door is closed, the pin 71 is in the higher portion of the cam slot 72, as shown in Fig. 6, and the centering pin is in its operative position. When the door is opened, the forward movement of the cam slot 72 lowers the spindle 16 to its inoperative position, as shown in Fig. 7, at which time the pin 71 is in the lower part of the cam slot 72. When the door is again closed, the inclined portion of the cam slot 72 moves the spindle-carrying rod 69 upwardly to return the spindle 16 to its operative position.

When a record is inserted, at which time the door 14 is open and the centering spindle 16 is in inoperative position, the record is approximately centered on the turntable by the feeler arms 54 and 55 and also by a rear stop structure now to be described, which also constitutes a feature of the present invention. Referring to Figs. 3, 6 and 7, this rear stop structure comprises a stationary stop 74 mounted on the supporting panel 7 and a movable stop 75 pivotally mounted on the stationary stop at 76. Movable stop 75 is generally of U shape and has downwardly extending arms 77. The ends of these arms are interconnected with the pin 53 which interconnects the arms 51 and 52 of the feeler mechanism, as previously described. To this end, the pin 53 has an upper projection 78, and a connecting element 79 serves to interconnect the arms 77 with the said upper projection of the pin 53. As illustrated, the element 79 may take the form of a piece of stiff wire or a bendable rod whose intermediate portion encircles the projection 78 and whose ends are secured to the arms 77. By means of this structure, the movable stop 75 is actuated in response to movement of the pin 53.

When the feeler mechanism is in the normal position for the playing of smaller sized records, as previously described, the pin 53 is at the rear of slot 62, as shown in Fig. 6, and the movable stop 75 is in operative position and serves to limit the movement of a record during insertion thereof. However, when the feeler mechanism is actuated by the insertion of a larger sized record, as previously described, the pin 53 moves forwardly in slot 62 and raises the stop 75 to an inoperative position, as shown in Fig. 7. The stationary stop 74 is then effective to limit the movement of the larger sized record as the latter is inserted. It should be noted that the movable stop 75 is raised before the edge of the record reaches the location of the stop structure.

By means of this arrangement, either sized record is approximately centered on the turntable, and when the center spindle 16 moves upward to its operative position, its tapered end enters the center hole of the record and the spindle centers the record exactly on the turntable.

The phonograph apparatus illustrated further embodies provision for automatically stopping the turntable after the playing of a record and for automatically starting the turntable in response to closing movement of the door 14. The switch mechanism 28 hereinbefore mentioned is employed for this purpose. The switch mechanism, which is the subject of a divisional application, is shown in detail in Figs. 11 to 15 to which reference may now be had. This mechanism comprises an inverted U-shaped supporting bracket 80 secured to the underside of the supporting panel 7, the under surface of which is represented by the dot-and-dash horizontal line in Figs. 11 and 12. The bracket 80 carries a rotatable shaft 81 which is suitably journaled for instance in bearings 82 and 83 which may form integral parts of the supporting bracket. A mercury switch 84 is carried by a supporting member 85 which is mounted on one end of the shaft 81 so as to be rotatable therewith. A pair of stops 86 and 87, formed integrally with the supporting bracket 80, serve to limit the movement of the switch-supporting member 85 as shown in Fig. 12. Member 85 extends upwardly from the axis of rotation and carries a pin 88 at its upper end, upon which an actuating element 89 is pivotally mounted. The upper end of element 89 is provided with a friction hood 90 preferably formed of rubber or like material. The element 89 functions cooperatively with the previously mentioned arm 27 to actuate the switch mechanism at the end of the playing of a record, as will be described presently.

A resilient member 91, which may take the form of a piece of spring wire or the like, is secured to the bracket 80 at 92 and is wound about a supporting projection or finger 93 on the bracket 80, and has its lower end portion in frictional engagement with the shaft 81 so as to impose a frictional drag on the shaft and thus tends to oppose rotation of the shaft. The purpose of this will appear presently. At the end of shaft 81 opposite the switch 84, there is provided a resilient finger 94 which is engageable by a cam member 95 (see Fig. 4) formed integrally with the slide member 29, the purpose of which will also appear presently.

Referring again to Fig. 3, the arm 27, which extends from the lower end of the tone arm-supporting spindle 24, has an enlarged end forming a plate 96 which is adapted to engage the friction hood 90, as shown in Figs. 14 and 15. The arm 27 is so positioned in relation to the tone arm 8 that the plate 96 engages the friction hood 90 when the needle or stylus engages the eccentric groove at the end of a record, the said groove being shown in Fig. 3 at 97. The eccentricity of the groove 97 may vary from one record to another, and the switch mechanism is designed to insure operation of the switch regardless of such variation.

The operation of the switch mechanism may best be explained with specific reference to Figs. 12 to 15. The mercury switch 84 is connected in circuit with the turntable driving motor so as to control the operation thereof, and during playing of a record, the switch is in the position of Figs. 12 and 14 in which it is closed, so that the turntable driving motor is energized.

Prior to the engagement of plate 96 with the friction hood 90, the element 89 is vertically positioned, as shown in Fig. 12, due to the fact that its supporting pin 88 is above its center of mass. As the needle or stylus approaches the eccentric groove at the end of the record, the plate 96, moving from left to right, as viewed in Figs. 12, 14 and 15, engages the friction hood 90 and deflects the element 89 to a position such as shown in Fig. 14. When the stylus enters the eccentric groove at the end of the record, the plate 96 moves back and forth, as indicated by the double head arrow in Figs. 14 and 15. The range of this oscillatory motion of the plate 96 is indicated by the dotted line representation in Fig.

13 and the associated double head arrow. Movement of the plate 96 toward the left in Figs. 14 and 15 causes application of a force to the pin 88 through the upper portion of element 89, which force moves the switch support 85 counter-clockwise from the position of Fig. 14, as shown in Fig. 15. If the eccentricity of the record groove is relatively great, the first left-hand movement of plate 96 may move switch 84 sufficiently to open it. If the groove eccentricity is not so great, the element 89 is stepped progressively toward the left as shown in Fig. 15, thereby moving the switch progressively until it opens. Thus the switch is opened even though the eccentricity of the record groove may vary from one record to the next. The friction drag element 91 serves to maintain the switch in any position to which it is moved.

During the playing of a record, the cam member 95 is in the left hand position shown in Figs. 11 and 13. When the door 14 is opened, after the playing of a record, the cam member 95 moves to the right hand position shown in dotted outline in Figs. 11 and 13, and during such movement the upper surface of the inclined cam member engages the end portion of resilient finger 94. This would effect actuation of the switch mechanism to open the switch 84 if the switch had not already been opened by the action of the plate 96, as above described. Consequently, resilient finger 94, being in a raised position, is engaged by the upper part of the cam member 95 and is deflected sufficiently to enable its end portion to ride over the upper part of the cam member as the latter moves to the right hand position shown.

When the door 14 is closed to initiate the playing of another record, the cam member 95 moves to the left hand position shown in Figs. 11 and 13. During this movement, the lower face of the inclined cam member engages the finger 94 and moves it downwardly, thus causing rotation of shaft 81 in a direction to close the switch 84 and thus energize the turntable driving motor. During this operation, the resilient finger 94 rides over the lower portion of the inclined cam member 95 to the position shown in Fig. 11.

Thus the cam member 95 functions, in response to movement of the door 14, to insure that the switch 84 is opened and to close the switch so as to start rotation of the turntable when the door is closed.

Considering the operation of the phonograph apparatus as a whole, let us assume that a record is being played, the door 14 being closed. At the end of the playing of the record, the switch mechanism 28 opens the switch 84 to stop the turntable in the manner just described. When the door 14 is opened to remove the record which has just been played and to insert a new record, the slide member 29 moves forwardly, and in doing so it performs several functions. It lifts the tone arm 8 off of the record and moves it to a starting position above the marginal portion of the record through the action of the cord and pulley arrangement, as hereinbefore described. It also moves the latch member 64 (Figs. 9 and 10) to an ineffective position. It also lowers the record centering spindle 16 to its inoperative position. It also insures that the motor switch 84 is opened.

The user may now remove the record which has just been played and insert a new record. Assuming that a smaller sized record is inserted, the feeler mechanism is not actuated but the other parts are actuated in response to closing movement of the door 14. During the insertion of the smaller sized record, the rollers 58 and 59 and the stop 75 serve to center the record approximately, as previously described. When the door 14 is closed, the rearward movement of slide member 29 raises the centering spindle 16, closes switch 84 to start rotation of the turntable, and lowers the tone arm to bring the stylus into engagement with the marginal portion of the record. The parts are so designed that these functions are performed in the order named. The spindle 16 exactly centers the record so that it is free of contact with the feeler rollers and the rear stop. The operating cycle is now repeated.

Suppose however, that a larger sized record is inserted. In such case the feeler mechanism is actuated, causing pin 53 to move forwardly in its slot 62 and thus moving the stop 75 to an inoperative position, as shown in Fig. 7. The approximate centering of the record is then effected by the stationary stop 74 in cooperation with the rollers 58 and 59. When the door 14 is closed, the pin 53 is latched in its forward position by the latch member 64 and is also cammed by the latch member sufficiently to disengage the rollers 58 and 59 from the edge of the record, as previously described with reference to Figs. 9 and 10. Aside from the operation of the feeler mechanism, the parts are actuated in the same manner regardless of the size of the inserted record.

While it has been assumed that the user desires to change records, as will usually be the case, in some instances the user may desire to repeat the playing of a record. In such case he simply opens the door 14 and then closes it without changing records. The opening and closing movements of the door effect automatic operation of the parts to repeat the playing of the record, as will be obvious from the foregoing description.

It should be noted also that the playing of a record may be interrupted at any time merely by opening the door 14, in which case the cam member 95 will open switch 84, as hereinbefore described.

In Figs. 16 and 17 there is shown a modification of the feeler mechanism, by means of which a possible objection of the previously-described mechanism is eliminated. In the apparatus hereinbefore described, the feeler arm rollers 58 and 59 (see Fig. 3) are disposed at the widest part of the record, and if the record should strike the rear stop with considerable force, the record might rebound outwardly and the center hole thereof might not be substantially aligned with the centering spindle. The modification of Figs. 16 and 17 prevents this from happening. As may be seen in Fig. 16 the feeler arms 54*a* and 55*a* (the latter carrying the tone arm positioning post 60*a*) are extended forwardly so that the rollers 58*a* and 59*a* are disposed forwardly beyond the wide portion of an inserted record. This arrangement prevents the record from rebounding as above-mentioned. In this instance, the feeler mechanism is actuated by both the smaller and larger sized records, and the latch member 64*a* is provided with two recesses 98 and 99 so as to latch the feeler arms in different positions for the different sized records. The different sized records are shown for comparison at 12 and 12'. If a smaller sized record is inserted, the feeler arms are inwardly disposed and the pin 53 is in the rearward end of its slot 62. Accordingly, the pin projection 63 enters recess 99 when the latch member 64*a* is moved to its operative position, and the feeler arms are latched and are also

moved outwardly a slight amount to disengage the rollers from the record, by virtue of slight camming of the pin projection 63 as it moves into recess 99.

When a larger sized record is inserted, the feeler arms 54a and 55a are moved outwardly, causing the pin 53 to move to the forward end of its slot 62 in which it is positioned to enter the recess 98. When the latch member 64a is moved to its operative position, the feeler arms are latched and are moved outwardly a slight amount to disengage the rollers 58a and 59a from the record, by reason of the camming of the pin projection 63 as it moves in recess 98.

The modified feeler mechanism of Figs. 16 and 17 may be employed in the apparatus of the previous figures without changing the other parts, since such modification merely involves extension of the feeler arms and a different design of the latch member.

The novel features of the present invention have now been fully described with reference to the phonograph apparatus illustrated. It will be understood, of course, that the specific disclosure is not intended to limit the invention, the scope of which is defined by the appended claims.

I claim:

1. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, and means operable by said door to move said pin to its inoperative position when said door is opened and to move the pin to its operative position when the door is closed.

2. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door to move said pin to its inoperative position when said door is opened and to move the pin to its operative position when the door is closed, means engageable by an inserted record to center the record on the turntable while said pin is in its inoperative position, and means operable by said door to disengage said last-named means from the record when the door is closed.

3. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of said turntable for the insertion and removal of different sized records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door to move said pin to its inoperative position when said door is opened and to move the pin to its operative position when the door is closed, self-adjustable means engageable by different sized records to center an inserted record on the turntable while said pin is in its inoperative position, and means operable by said door to disengage said last-named means from the record when the door is closed.

4. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a pick-up device arranged for movement relative to a record on the turntable, a record-centering pin supported in the central aperture of said turntable for movemennt between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door for moving said pick-up device into and out of engagement with a record on the turntable, and means operable by said door for moving said pin so as to permit the changing of records.

5. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclousre adapted to conceal said opening when in closed position, a pick-up device arranged for movement relative to a record on the turntable, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door for moving said pick-up device into and out of engagement with a record on the turntable, means operable by said door for moving said pin so as to permit the changing of records, means engageable by an inserted record to center the record on the turntable while said pin is in its inoperative position, and means operable by said door to disengage said last-named means from the record when the door is closed.

6. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable and driving means therefor within said enclosure, said enclosure having a narrow slit opening adjacent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a pick-up device arranged for movement relative to a record on the turntable, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door for moving said pick-up device into and out of engagement with a record on the turntable, means operable by said door for controlling the operation of said driving means, and means operable by said door for moving said pin so as to permit the changing of records.

7. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable and driving means therefor within said enclosure, said enclosure having a narrow slit opening adja-

cent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a pick-up device arranged for movement relative to a record on the turntable, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door for moving said pick-up device into and out of engagement with a record on the turntable, means operable by said door for controlling the operation of said driving means, means operable by said door for moving said pin so as to permit the changing of records, means engageable by an inserted record to center the record on the turntable while said pin is in its inoperative position, and means operable by said door to disengage said last-named means from the record when the door is closed.

8. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of the turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a pick-up device arranged for movement relative to a record on the turntable, a record-centering pin supported in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door for moving said pick-up device into and out of engagement with the record, means operable by said door for moving said pin so as to permit changing of records, means including a pair of arms engageable by an inserted record to center the record on the turntable while said pin is in its inoperative position, and means on one of said arms for positioning the pick-up device according to the size of the inserted record.

9. In a phonograph apparatus, an enclosure, a centrally-apertured record-supporting turntable therein, said enclosure having a narrow slit opening adjacent the supporting surface of the turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a pick-up device arranged for movement relative to a record on the turntable, a record-centering pin support in the central aperture of said turntable for movement between an operative position in which it projects above said turntable surface and an inoperative position below said surface, means operable by said door for moving said pick-up device into and out of engagement with the record, means operable by said door for moving said pin so as to permit changing of records, means including a pair of arms engageable by an inserted record to center the record on the turntable while said pin is in its inoperative position, means on one of said arms for positioning the pick-up device according to the size of the inserted record, and means operable by said door to disengage said arms from the record when the door is closed.

10. In a phonograph apparatus, an enclosure having a restricted opening through which records may be inserted or removed, a record-supporting turntable arranged within said enclosure to receive an inserted record, a pair of L-shaped feeler members pivoted at their elbows and having record-engageable arms and inwardly extending arms interconnected by a connecting pin, stop means engageable by an inserted record and cooperative with said record-engageable arms to position an inserted record on the turntable, said stop means comprising a pair of stop members, one of which is movable between operative and inoperative positions and serves to position records of one size, and the other of which is fixed and is operative to position larger sized records when the movable stop member is in its inoperative position, and means connecting said pin and said movable stop member to control the latter according to the size of the inserted record.

11. In a phonograph apparatus, an enclosure, a horizontal centrally-apertured record-supporting turntable therein, said enclosure having a narrow horizontal slit opening adjacent the supporting surface of said turntable for the insertion and removal of records, a hinged door on said enclosure adapted to conceal said opening when in closed position, a record-centering pin mounted for vertical movement between an operative position in which it projects upward from the central aperture of the turntable above said turntable surface and an inoperative position in which said pin is below said surface, a horizontally movable member operable by said door and having a cam slot therein, and a cam follower element disposed in said cam slot and connected to said pin, said cam slot being shaped to move said pin to its inoperative position when said door is opened to move the pin to its operative position when the door is closed.

12. In a phonograph apparatus, an enclosure having a restricted opening through which records may be inserted or removed, a record-supporting turntable arranged within said enclosure to receive an inserted record, a pair of L-shaped feeler members pivoted at their elbows and having record-engageable arms and inwardly extending arms interconnected by a connecting pin, stop means engageable by a inserted record and cooperative with said record-engageable arms to position an inserted record on the turntable, said stop means comprising a pair of stop members, one of which is movable between operative and inoperative positions and serves to position records of one size, and the other of which is fixed and is operative to position larger sized records when the movable stop member is in its inoperative position, means connecting said pin and said movable stop member to control the latter according to the size of the inserted record, and latch means operatively associated with said pin to latch said feeler members in a position free of a larger sized record to permit free rotation of the record during the playing thereof.

13. In a phonograph apparatus, an enclosure having a restricted opening through which records may be inserted or removed, a record-supporting turntable arranged within said enclosure to receive an inserted record, a pair of L-shaped feeler members pivoted at their elbows and having record-engageable arms and inwardly extending arms interconnected by a connecting pin, stop means engageable by an inserted record and cooperative with said record-engageable arms to position an inserted record on the turntable, said stop means comprising a pair of stop members, one of which is movable between operative and inoperative positions and serves to position records of one size, and the other of which is fixed and is operative to position larger sized records when the movable stop member is in its inopera-

tive position, means connecting said pin and said movable stop member to control the latter according to the size of the inserted record, and latch means operatively associated with said pin to latch said feeler members in different positions for the playing of the different sized records, in each of which positions the feeler members are free of the record being played so as to permit free rotation of the record.

14. In a phonograph apparatus, an enclosure having a restricted opening through which records may be inserted or removed, a record-supporting turntable arranged within said enclosure to receive an inserted record, a pick-up device arranged within said enclosure for movement into and out of engagement with a record on the turntable, a hinged door on said enclosure adapted to conceal said opening when in closed position, means responsive to closing and opening movements of said door for moving said pick-up device into and out of engagement with the record, a pair of angle members pivoted at their apices and having record-engageable arms and inwardly extending arms interconnected by a connecting pin, spring means urging said record-engageable arms inwardly, stop means engageable by an inserted record and cooperative with said record-engageable arms to position an inserted record on the turntable, said stop means comprising a pair of stop members, one of which is movable between operative and inoperative positions and serves to position records of one size, and the other of which is fixed and is operative to position larger sized records when the movable stop member is in its inoperative position, means connecting said pin and said movable stop member to control the latter according to the size of the inserted record, and an indexing member on one of said record-engageable arms for positioning said pick-up device according to the size of an inserted record.

15. In a phonograph apparatus, an enclosure having a restricted opening through which records may be inserted or removed, a record-supporting turntable arranged within said enclosure to receive an inserted record, a pick-up device arranged within said enclosure for movement into and out of engagement with a record on the turntable, a hinged door on said enclosure adapted to conceal said opening when in closed position, means responsive to closing and opening movements of said door for moving said pick-up device into and out of engagement with the record, a pair of angle members pivoted at their apices and having record-engageable arms and inwardly extending arms interconnected by a connecting pin, spring means urging said record-engageable arms inwardly, stop means engageable by an inserted record and cooperative with said record-engageable arms to position an inserted record on the turntable, said stop means comprising a pair of stop members, one of which is movable between operative and inoperative positions and serves to position records of one size, and the other of which is fixed and is operative to position larger sized records when the movable stop member is in its inoperative position, means connecting said pin and said movable stop member to control the latter according to the size of the inserted record, a movable latch member operatively associated with said pin and adapted to latch said angle members in a position free of a larger sized record to permit free rotation of the record during the playing thereof, and means responsive to the movement of said door for actuating said latch member.

16. In a phonograph apparatus, an enclosure having a restricted opening through which records may be inserted or removed, a record-supporting turntable arranged within said enclosure to receive an inserted record, a pick-up device arranged within said enclosure for movement into and out of engagement with a record on the turntable, a hinged door on said enclosure adapted to conceal said opening when in closed position, means responsive to closing and opening movements of said door for moving said pick-up device into and out of engagement with the record, a pair of angle members pivoted at their apices and having record-engageable arms and inwardly extending arms interconnected by a connecting pin, spring means urging said record-engageable arms inwardly, stop means engageable by an inserted record and cooperative with said record-engageable arms to position an inserted record on the turntable, said stop means comprising a pair of stop members, one of which is movable between operative and inoperative positions and serves to position records of one size, and the other of which is fixed and is operative to position larger sized records when the movable stop member is in its inoperative position, means connecting said pin and said movable stop member to control the latter according to the size of the inserted record, a movable latch member operatively associated with said pin and adapted to latch said angle members in different positions for the playing of the different sized records, in each of which positions the angle members are free of the record being played so as to permit free rotation of the record, and means responsive to the movement of said door for actuating said latch member.

ELMER OLUF THOMPSON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,358,709	Dalrymple	Nov. 16, 1920
1,429,839	Boswell	Sept. 19, 1922
2,083,314	Carson	June 8, 1937
2,100,686	Collaro et al.	Nov. 30, 1937
2,219,230	Krause	Oct. 22, 1940
2,337,815	Hartman et al.	Dec. 28, 1943

FOREIGN PATENTS

Number	Country	Date
539,492	Great Britain	Sept. 12, 1941