July 29, 1941. R. M. SOMERS 2,251,173

PHONOGRAPH

Filed Jan. 5, 1940 5 Sheets-Sheet 1

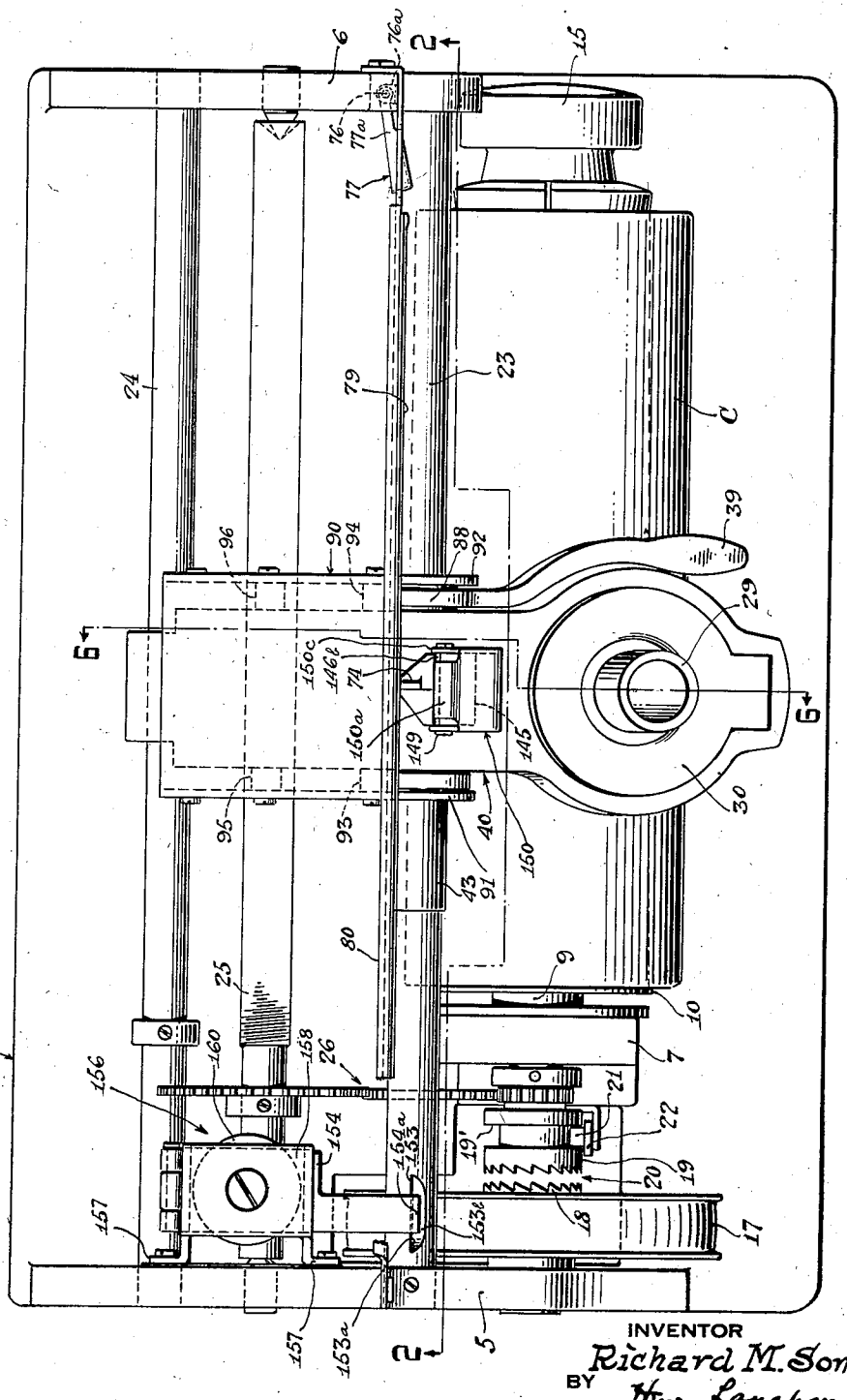


Fig. 1

INVENTOR
Richard M. Somers
BY Henry Lanahan
ATTORNEY

July 29, 1941. R. M. SOMERS 2,251,173

PHONOGRAPH

Filed Jan. 5, 1940 5 Sheets-Sheet 2

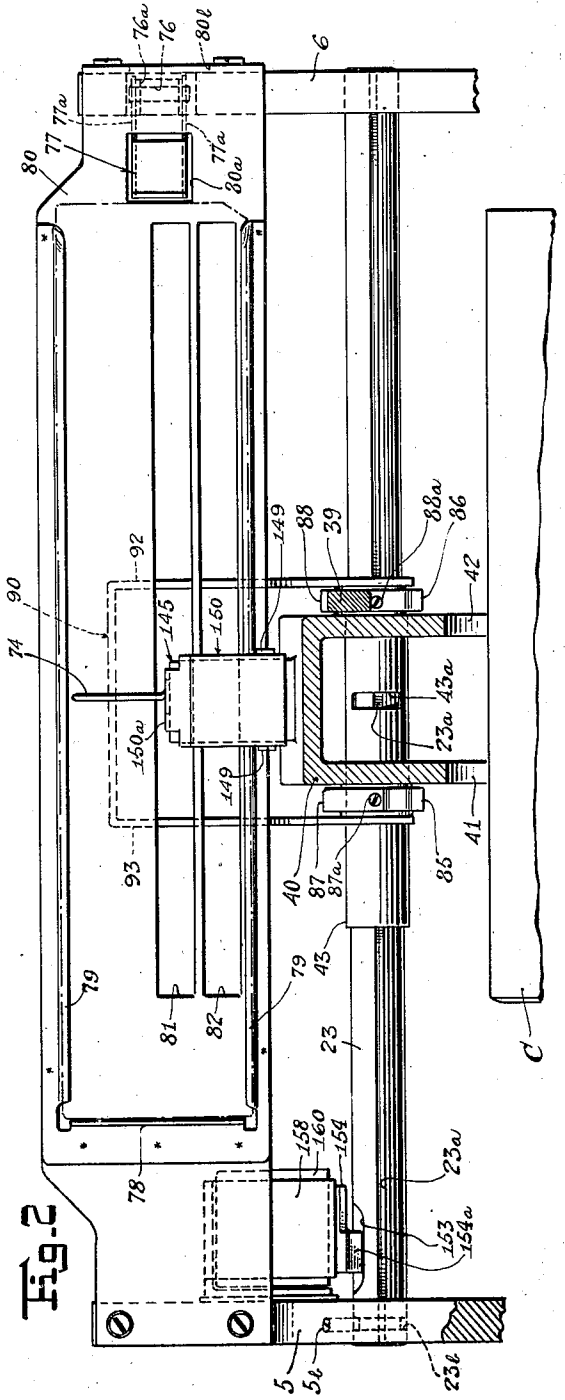


Fig. 2

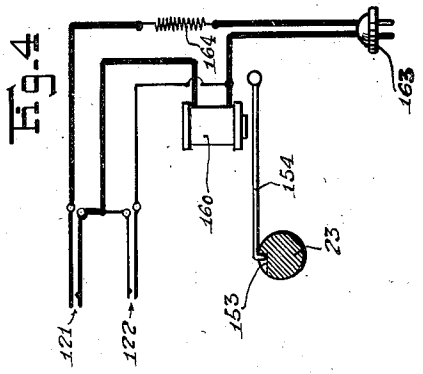


Fig. 4

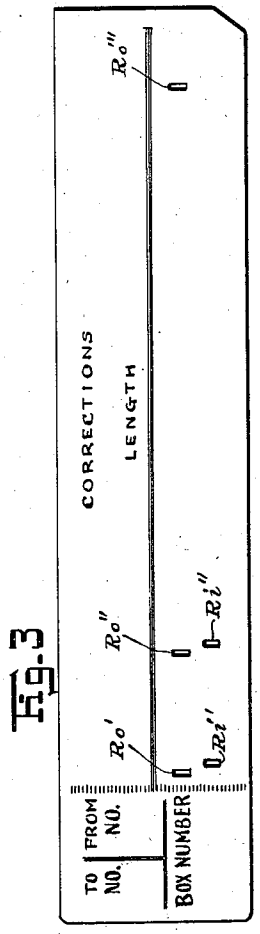


Fig. 3

INVENTOR
Richard M. Somers
BY Henry Lanahan
ATTORNEY

July 29, 1941. R. M. SOMERS 2,251,173

PHONOGRAPH

Filed Jan. 5, 1940 5 Sheets-Sheet 3

Fig. 5

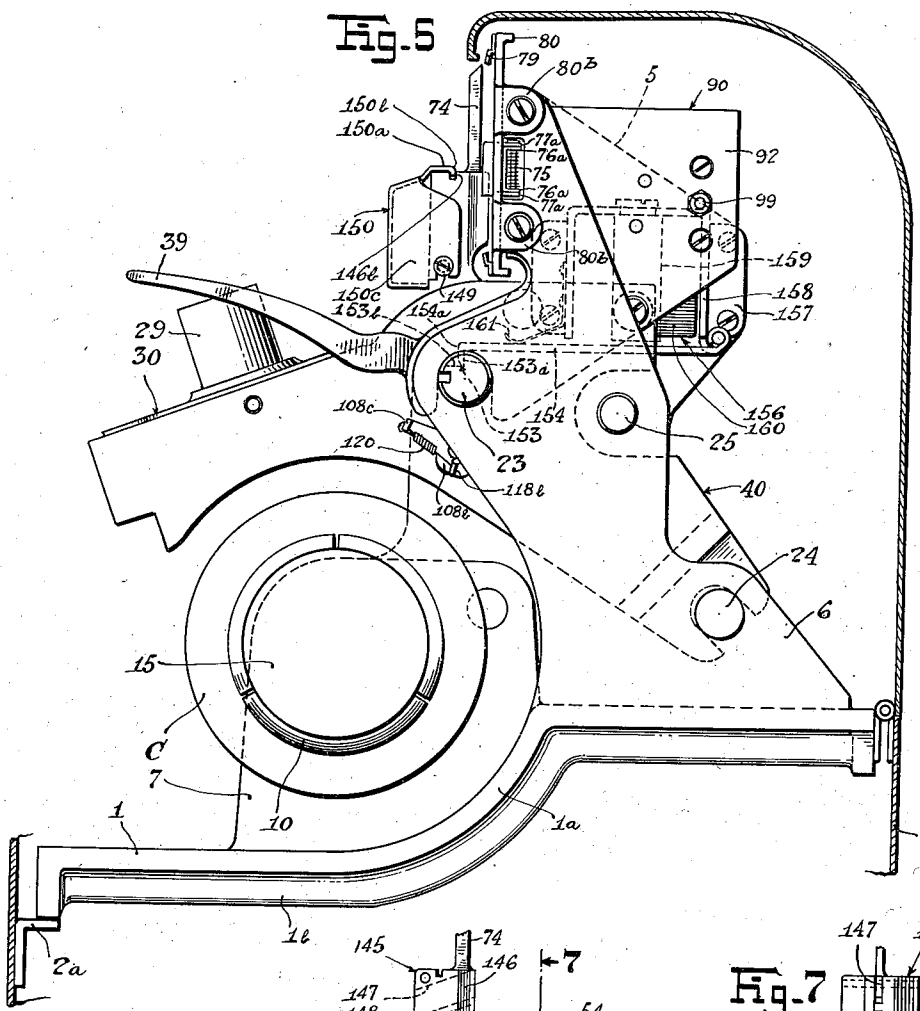


Fig. 6

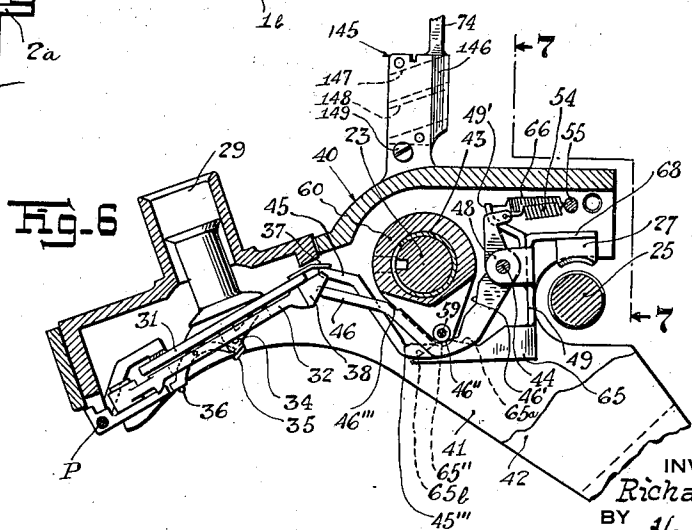
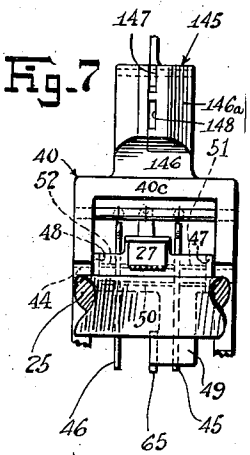


Fig. 7

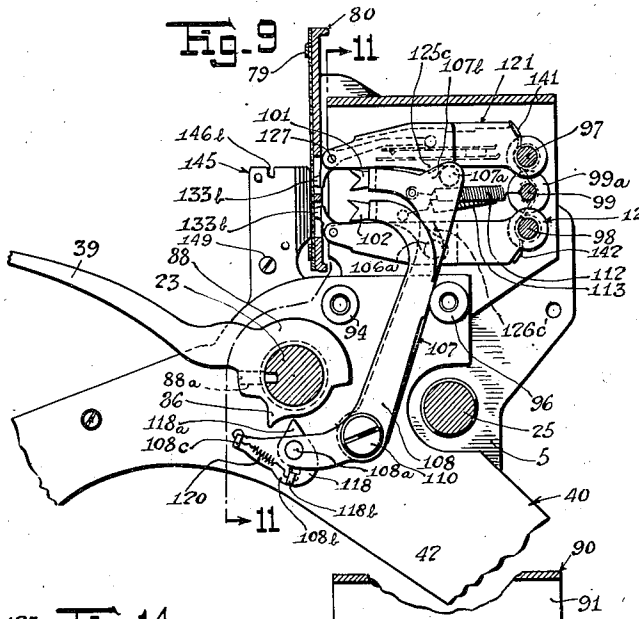


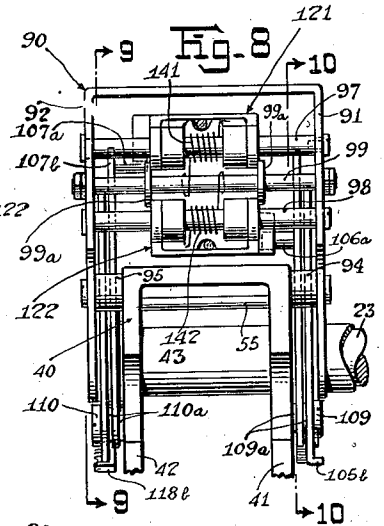
INVENTOR
Richard M. Somers
BY
Henry Lanahan
ATTORNEY

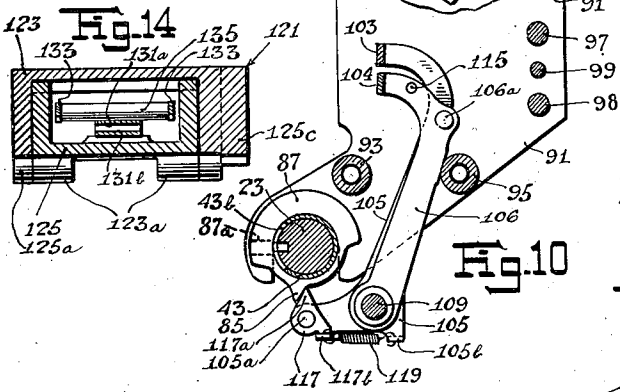
July 29, 1941. R. M. SOMERS 2,251,173

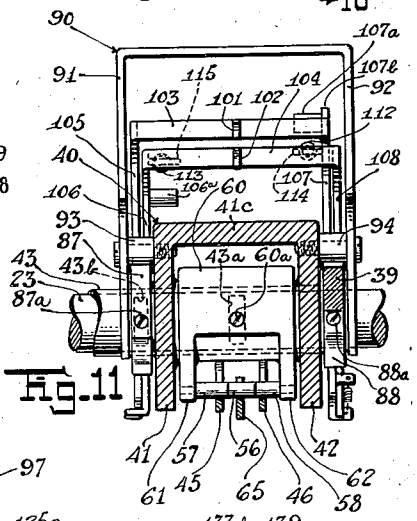
PHONOGRAPH

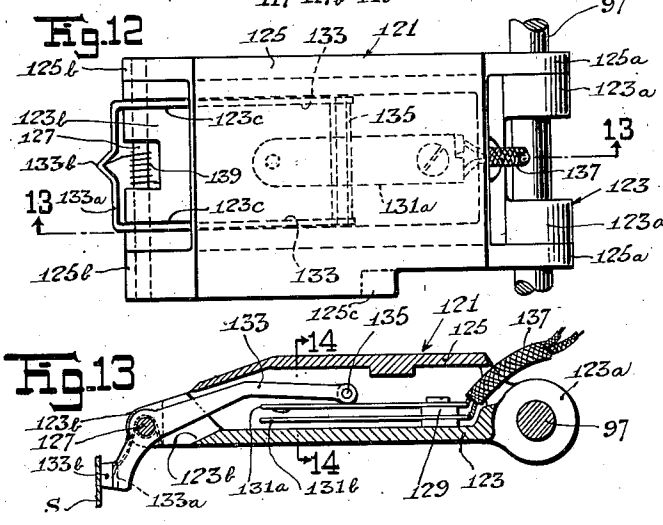
Filed Jan. 5, 1940 5 Sheets-Sheet 4

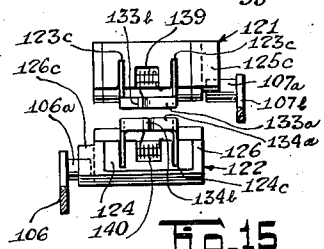












INVENTOR
Richard M. Somers
BY Henry Lanahan
ATTORNEY

July 29, 1941. R. M. SOMERS 2,251,173

PHONOGRAPH

Filed Jan. 5, 1940 5 Sheets-Sheet 5

Fig. 17

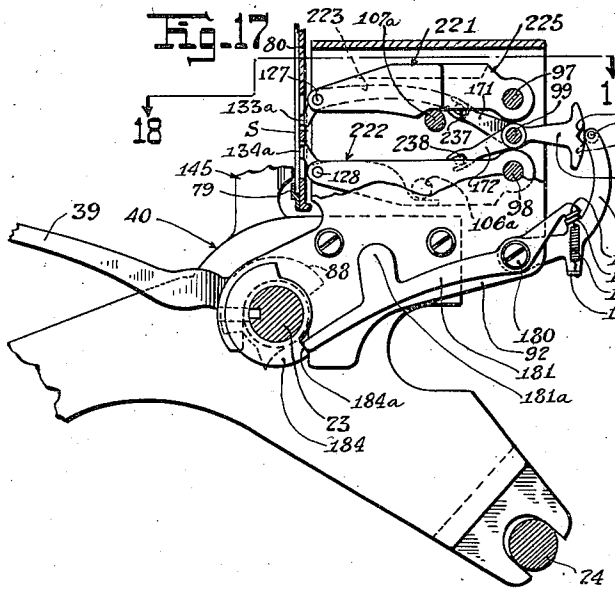


Fig. 16

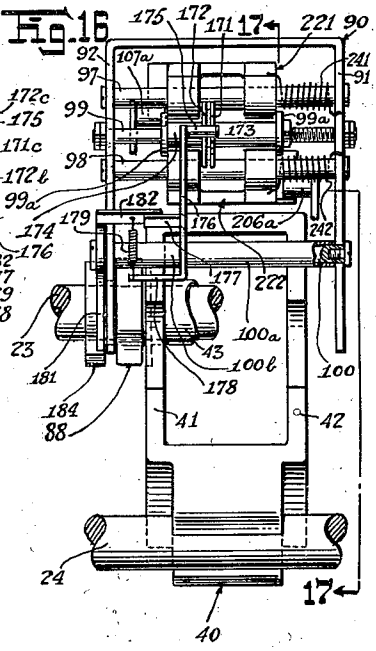
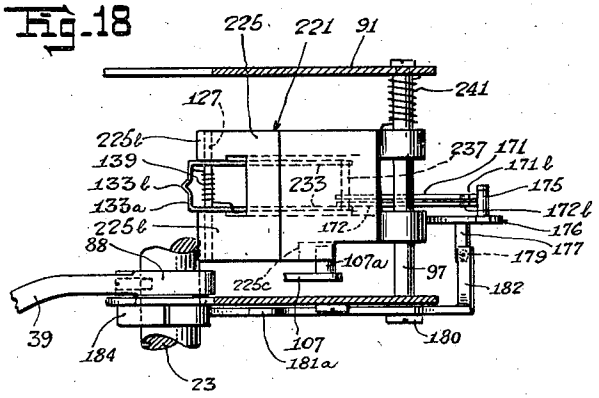


Fig. 18



INVENTOR
Richard M. Somers
BY Henry Lanahan
ATTORNEY

Patented July 29, 1941

2,251,173

UNITED STATES PATENT OFFICE

2,251,173

PHONOGRAPH

Richard M. Somers, West Orange, N. J., assignor to Thomas A. Edison, Incorporated, West Orange, N. J., a corporation of New Jersey

Application January 5, 1940, Serial No. 312,455

17 Claims. (Cl. 274—17)

This invention relates to phonographs, and has especial utility in connection with phonographs of the type by which there may be recorded, or selectively recorded and reproduced, sounds such as dictation and the like.

For well understood reasons such phonographs are usually arranged so that the translating device which cooperates with the record may be selectively placed in and taken out of condition for recordation on the record; a typical purpose of its removal from recordation condition may be its re-conditioning for reproduction of previously recorded matter. When it is desired to restore the translating device to recordation condition it is important that this be done at the proper position relative to the record, so that there may be avoided on the one hand an unnecessary wastage of record space, and on the other hand a re-recordation on parts of the record already recorded upon.

It is an object of my invention to provide novel and improved means for insuring the placement of the translating device into recordation condition at proper position relative to the record.

It is an object to provide improved means for controlling the return of the translating device to recordation condition with respect to any record in accordance with its prior conditionings relative to that record.

It is an object to provide improved means for insuring the initial placement of the translating device into recordation condition at the intended initial extremity of recording space on the record.

It is an object to provide automatic means for making permanent registrations of the positions occupied by the translating device when it is reconditioned.

It is an object to provide a combination of registration-making and registration-scanning means for fulfilling broader objects of my invention.

It is an object to provide a control system wherein distinct registrations are made of positions at which the translating device is respectively placed in and taken out of recordation condition, and wherein those two types of registrations are jointly utilized in advantageous functional relationship to each other.

It is a general object to provide an improved phonograph of the type described.

Other and allied objects will more fully appear from the following description and the appended claims.

In the description reference is had to the accompanying drawings, of which:

Figure 1 is a plan view of the principal portion of a phonograph in which my invention has been embodied;

Figure 2 is a vertical cross-sectional view taken substantially along the line 2—2 of Figure 1, certain components (including elements carried in the carriage) being omitted;

Figure 3 is a view of an index slip such as may be employed in carrying out my invention in its particularly described forms;

Figure 4 is principally a schematic diagram of the electric circuit in which certain of the components are connected;

Figure 5 is a righthand elevational view of the phonograph of Figure 1;

Figure 6 is a vertical cross-sectional view of the carriage proper, taken principally along the line 6—6 of Figure 1;

Figure 7 is a rear elevational view of the carriage proper, taken substantially along the line 7—7 of Figure 6;

Figure 8 is a rear elevational view of the carriage (with certain internal elements omitted), showing especially components carried on top of and at the sides of the carriage proper;

Figure 9 is a vertical cross-sectional view taken substantially along the line 9—9 of Figure 8;

Figure 10 is a vertical cross-sectional view taken substantially along the line 10—10 of Figure 8;

Figure 11 is a vertical cross-sectional view taken substantially along the line 11—11 of Figure 9, the switch devices 121 and 122 seen in Figures 8 and 9 being omitted;

Figure 12 is an enlarged top plan view of the switch device 121;

Figure 13 is a vertical cross-sectional view taken substantially along the line 13—13 of Figure 12;

Figure 14 is a vertical cross-sectional view taken substantially along the line 14—14 of Figure 13;

Figure 15 is a front elevational view of the switch devices 121 and 122 as they would appear if shown in Figure 11;

Figure 16 is a rear elevational view generally analagous to Figure 8, but illustrating the embodiment of my invention in a modified form, certain elements common to both forms being omitted from this figure;

Figure 17 is a vertical cross-sectional view

taken substantially along the line 17—17 of Figure 16, similar elements being omitted; and

Figure 18 is a horizontal cross-sectional view taken substantially along the line 18—18 of Figure 17, the mentioned elements being again omitted.

The phonograph in which my invention has been embodied may be generally described with reference first to Figures 1, 2 and 5. It includes a cast base plate 1 which is generally horizontal, but which may be provided with a curved step 1a to bring its rear portion to a higher level than its forward portion, as may be seen in Figure 5. The base plate may be provided with a downward flange 1b along at least its front and rear edges, and along its rear edge may be hinged to a lower enclosure 2, the front of the base plate normally resting on a bracket 2a extending inwardly from the front of that enclosure. Extending upwardly from the base plate are the lefthand and righthand standards 5 and 6, respectively, and the intermediate standard 7, these standards serving to support various elements of the phonograph as hereinafter appears.

Journalled in the standard 7 is a mandrel shaft 9 on which, to the right of that standard, is carried a record support in the form of a generally cylindrical mandrel 10. This may for example be of the form disclosed in U. S. Patent No. 2,010,717, issued August 6, 1935, on application of H. F. M. Gramann, and its detailed description herein is unnecessary. It may be noted, however, that it includes a righthand end knob 15 over which a record may be slid leftwardly in mounting of the record on the mandrel, and which when pressed leftwardly when a record is on the mandrel will cause the rightward ejection of the record. Figures 1 and 5 illustrate a cylindrical record C, purely typically of a wax composition, mounted on the mandrel.

The mandrel shaft 9 extends to the left of standard 7 toward a driving pulley 17 rotatably mounted at the right of standard 5, the pulley 17 being rotated as by a belt and motor not herein necessary to show. Secured to the pulley 17, and splined on the end portion of the shaft 9, are the respective elements 18 and 19 of a clutch 20. The element 19 is provided with an annular groove 19', in which there is positioned a pin 21 secured in the upper extremity of a clutch-operating arm 22. The arm position is controlled by a start-and-stop device, not herein necessary to show, to shift the element 19 selectively into and out of engagement with the element 18, and so to engage and disengage the clutch to cause and stop rotation of the mandrel by the pulley 17.

Above and behind the mandrel there extend, between the standards 5 and 6, the respective carriage rods 23 and 24, along which there is slidable a carriage 40. The carriage extends forwardly over the mandrel, and carries in its forward portion a translating device 30 arranged, in manner hereinafter more detailedly apparent, for cooperation with the record C on the mandrel. The carriage may be driven rightwardly along the rods 23 and 24 by a feed screw 25, journalled between standards 5 and 6 behind the rod 23, and engageable by a feed nut 27 carried in the carriage. The feed screw 25 may be rotated, by a train of gears 26 coupling it rotationally with the mandrel shaft 9, coincidentally with mandrel rotation.

It will be understood that the mandrel 10 and the carriage 40 form a system for producing translation-effecting relative movement between the record C and the translating device 30—e. g., a movement which causes either of the translating device styli (hereinafter mentioned) to traverse a spiral path on the record, for the translation of oscillatory energy into a recording on the record or vice versa. And while the described translation-effecting movement is the movement appropriate to the type of record and type of phonograph which I have chosen for illustrative purposes, I intend no unnecessary limitation of the broader aspects of the invention to those types or to the particular nature of that movement.

While the translating device 30 may in recordation be actuated by, and may in reproduction produce, oscillatory energy of any of a wide variety of natures, I have shown it as provided with an upwardly extending neck 29, to which a sound-conveying tube (not shown) may be attached for the conveyance of sound to and from the translating device. The translating device which has been chosen for illustrative purposes is a sound box, which in its most essential elements may for example be similar to that disclosed in U. S. Patent No. 1,989,198, issued January 29, 1935, on application of Charles Heunlich. While reference may be had to that patent for a more detailed disclosure of such a sound box, a general showing is present in Figure 6 of the accompanying drawings, to which the following sound box description is pertinent.

The illustrated sound box includes two generally circular members pivoted (as at point P) at the front of the device and extending generally rearwardly, the upper of these members being designated as 31 and the lower as 32. When both members are free of upward restraint, a smooth ball 34 attached to member 32 contacts the record surface, without effect on the latter, and a recording stylus 35 carried by the upper member 31 also contacts the record surface; the translating device is then conditioned for recordation on the record—e. g., for the engraving in the record surface of a groove of depth undulating in accordance with sound energy supplied to the device through the neck 29. When the upper member 31 only is held upwardly (as by means hereinafter described) both the ball 34 and the recording stylus 35 are held away from the record, and a reproducing stylus 36, suitably carried by the member 32, is brought into contact with the record surface; the translating device is then conditioned for reproduction from the record—e. g., for the emission through the neck 29 of sound energy translated by the device from an undulating record groove being traversed by the reproducing stylus 36. When both members 31 and 32 are held upwardly (as by means hereinafter described) the ball 34 and both the styli 35 and 36 are held away from the record; the translating device is then in neutral condition (which is that illustrated in Figure 6).

The carriage 40 is provided with a horizontal sleeve 43 secured between the lefthand and righthand side members of the carriage (41 and 42 respectively) and extending for a distance leftwardly from 41, this sleeve slidably surrounding the rod 23 and forming a long bearing for the carriage on that rod. The means for variously positioning the circular members 31 and 32, and thus for selectively conditioning the translating device, comprises a member 60 rotatably surrounding this sleeve 43 within the carriage; two arms 45 and 46 carried in the carriage and extending forwardly to underneath respective lugs

37 and 38 which respectively extend rearwardly from the circular members 31 and 32; and a mechanism for moving the arms 45 and 46, and therethrough the circular members 31 and 32, in accordance with angular movements of the member 60 about the sleeve 43, this mechanism being seen principally in Figure 6.

Between the carriage side members 41 and 42, behind the sleeve 43, is secured a cross rod 44. On this rod, just inside 41 and 42, are pivotally secured two respective ears 47 and 48 which extend forwardly from and support a generally vertical plate 49 hereinafter mentioned. Rotatably surrounding the rod 44 between the ears 47 and 48 are a series of three collars 51, 50, 52 (seen in dotted illustration in the rear-view Figure 7); the arm 45 is secured to the righthand side of the lefthand collar 51, while the arm 46 is secured to the lefthand side of the righthand collar 52, so that the arms are supported by and may be rocked about the rod 44. The principal portion of each of the arms 45 and 46 extends downwardly and forwardly from rod 44; but each arm also extends a short distance upwardly from rod 44, to have its top extremity engaged by the forward extremity of a respective tension spring, shown as 54 for the arm 46. The rear extremities of these springs are secured to a stationary cross rod 55 (at the rear of the carriage) to bias upwardly the forward extremities of the arms 45 and 46; this arm bias of course tends to cause the raising of both the circular members 31 and 32, and hence tends to establish a neutral condition of the translating device 30.

The member 60, surrounding the sleeve 43 within the carriage, is generally cylindrically shaped; but some material is removed from its bottom, and two ears 61 and 62 extend generally downwardly from its respective extremities (as seen in Figure 11). Between these ears there extends a thin cross pin 59, on which three rollers (57, 56, 58) are carried (also as seen in Figure 11). When the member 60 occupies the angular position about sleeve 43 in which it has been illustrated in Figure 6, the horizontally aligned rollers 57 and 58 will respectively be in contact with top surface portions of the two arms 45 and 46, that portion for the arm 46 having been designated as 46''. The configurations of the top surfaces of the two arms are such that the forward arm extremities are then in raised position, and the translating device 30 is therefore in neutral condition.

From the portions typified by 46'', toward the pivoting rod 44, the top surfaces of the arms 45 and 46 extend (similarly to each other, and as indicated by the arm 46 in Figure 6) more nearly vertically than the rearward arcuate path traversed by the rollers upon rocking counterclockwise (when viewed as in Figure 6) of the member 60. Accordingly upon such rocking (for example to bring the rollers into slight indentations indicated as 46' for arm 46) the arms will be rocked about rod 44 to bring their forward extremities downwardly; this results in a lowering of both the circular members 31 and 32 and therefore conditions the translating device 30 for recordation.

From the portions typified by 46'' the top arm surfaces extend forwardly with different elevational configurations. That of arm 45 extends a distance forwardly (for example to the slight indentation 45''') approximately along the forward arcuate path traversed by the rollers 57 and 58 upon the rocking clockwise (when viewed as in Figure 6) of the member 60. On the other hand, that of arm 46 extends (for example to the slight indentation 46''') materially more upwardly than that forward arcuate path. Accordingly upon such rocking (for example to bring the rollers into the indentations 45''' and 46''' the arm 45 will be left approximately in its Figure 6 position, while the arm 46 will be rocked to move its forward extremity downwardly; this results in a lowering of the circular member 32 but not of 31, and therefore conditions the translating device 30 for reproduction.

The member 60 may be rocked about the sleeve 43, to control the condition of the translating device, by a corresponding rocking of the rod 23 within the sleeve. To render this rod rockable, it may be freely fitted into the end standards 5 and 6 which support it, and its longitudinal retention therein may be by a substantially vertical screw 5b in the lefthand standard 5 extending into an annular groove 23b provided in rod 23 close to its lefthand extremity, as best seen in Figure 2. To couple the rod 23 to the member 60 for joint rocking, the rod may be provided with a longitudinal groove or keyway 23a, and a screw or key 60a may extend from approximately the front of member 60 inwardly into the groove 23a, splining that member to that rod. There must of course be a passage of the screw 60a through the sleeve 43; the latter is therefore provided with a fractional-annular slot 43a through which this passage may occur. This slot is of length appropriate to the range of rocking of member 60 required for the several conditions of the translating device, and its extremities may form stops for preventing excess rocking of that member.

A manual control of the condition of the translating device may be provided by a lever 39 extending generally forwardly from a collar 88 which surrounds the rod 23 just to the right of the righthand carriage side member 42, and which is splined to the rod 23 by a screw or key 88a extending inwardly into the groove 23a. When the lever 39 is in the position illustrated in Figure 5 the translating device may be in neutral condition; and it will be understood that downward and upward rockings of the lever from this position will serve, by correspondingly rocking the rod 23 and therethrough the member 60, to place the translating device in recordation and reproduction conditions, respectively.

It is desirable that the feed nut 27 be disengaged from the feed screw 25 throughout a neutral condition, but engaged therewith during either translational condition (i. e., for recordation or for reproduction), of the translating device. Accordingly the feed nut may be mounted, above the feed screw, on the bottom of a horizontal rearward extension 68 formed from the top of the plate 49 abovementioned; and the plate 49 in its lefthand portion may be extended downwardly, to have an arm 65 folded forwardly therefrom and passing underneath the central roller 56. The arm 65 is biased upwardly, to force its top surface against that roller, by a suitable bias of the plate 49 about the rod 44; this bias may be provided by a spring 66 tensioned between cross rod 55 and a bracket 49' extending upwardly from the plate 49. The portion of the top surface of the arm 65 which bears on the roller 56 when the translating device is in neutral condition is illustrated as 65'', and when this bears against the roller the feed nut 27 is held raised from the feed screw 25.

From this portion there slope downwardly the rearward and forward top surface portions 65*a* and 65*b*; and as the member 60 is rocked to move the rollers either rearwardly or forwardly (for adjustment of the translating device into either recordation or reproduction condition) the roller 56 travels over the surface portion 65*a* or 65*b*, the arm 65 moves upwardly in response to its bias, and the fed nut 27 is rocked downwardly into contact with the feed screw 25.

From the foregoing it will be understood that the carriage and translating device are freely movable manually relative to the record when the translating device is adjusted to neutral condition, but are movable only by the rotation of the feed screw when the translating device is adjusted for either recordation or reproduction.

In the use of such a phonograph as has now been generally described, a conditioning of the translating device for reproduction will ordinarily be resorted to for the purpose of listening back by the dictator or operator to matter previously recorded on the record. At some point in the recordation process the control lever 39 will be thrown from its recordation into its neutral position, and the carriage and translating device will be "backspaced" or returned some distance leftwardly, over the portion of the record already recorded on. Then the control lever 39 will be thrown into its reproduction position and the carriage will again be driven slowly rightwardly, with the reproducing stylus in contact with the record, to cause the reproduction of the recorded matter. There may or may not be desired a continuance of this reproduction to the end of that recorded matter before the reconditioning of the translating device for further recordation. When that continuance is desired, the point at which the audible reproduction stops furnishes an indication of where the translating device may properly be restored to recordation condition; this indication is not a positive one, however, and may result in some wastage of record space. And even this impositive indication is entirely lost when the above-mentioned continuance of reproduction is not desired; at the end of the desired reproduction the control lever 39 must be thrown into neutral position and the carriage and translating device advanced by a distance which can only be estimated, before throwing the control lever into recordation position. If the carriage is advanced too far before the reconditioning for recordation, wastage of record space results. If it is advanced too little, the recording stylus will be brought down on and will obliterate previously recorded matter. Danger of bringing the recording stylus down on and obliterating previously recorded matter also lurks in the possibility of accidental throwing of the control lever into recordation position, instead of reproduction position, after returning the carriage leftwardly in preparation for the intended reproduction of recorded matter.

There are broadly known arrangements for preventing misoperations of this character. These arrangements involve so-called "farthest-advance" devices, moved by or in accordance with the advancing movement of the carriage, and a typical one of them has been disclosed in my co-pending application Serial No. 239,055, filed November 5, 1938 (on which Patent No. 2,212,672 has since been issued). Such devices operate by making a temporary registration of the position of farthest advance attained by the translating device or carriage prior to a backspacing thereof; this registration is embodied in the position or condition of the farthest-advance device, and is maintained only until the translating device is brought into a new position of farthest advance. The instant invention, however, is designed to prevent these and other misoperations without employing such movable farthest-advance devices. In a broad aspect the instant invention operates by making permanent registrations of the positions at which the translating device is taken out of recordation condition, and by blocking any restoration of the translating device into recordation condition excepting at a position predeterminedly related to the last-made such permanent registration. In another aspect, it operates by making registrations of the positions at which the translating device is put into and taken out of recordation condition, and by controlling subsequent placements of the translating device into recordation condition in accordance with both such registrations. In still another aspect, it operates by making a registration of any postion at which the translating device is taken out of recordation condition, by blocking the restoration of the translating device into recordation condition excepting at a position predeterminedly related to such a registration, and by annulling the effect of each such registration (although that registration may be retained) as an incident of the next subsequent placement of the translating device into recordation condition. Such annulment may for example be effected in a manner which includes the making of another type of registration of each position at which the translating device is put into recordation condition. As will be apparent from the detailed description of an embodiment of the invention, its new mode of operation has various advantages, among which are of course the elimination of the many problems occasioned by the use of any form of movable farthest-advance device.

The broader aspects of my invention are not limited as to the precise place in which the registrations are made, but rather contemplate simply that the registrations for any record be peculiar, or individual, to that record. In the preferred embodiment of the invention, however, I have chosen to make the registrations on the individual index blank which it is common, in phonographs of the general type described, to employ with each individual record. This blank typically is in the form of a paper or other slip, may be inserted in an appropriate holder in the phonograph when a record is mounted on the mandrel, and may be removed from the holder when that record is removed from the mandrel. An indicating means is commonly associated with the holder, to move longitudinally of the index blank in accordance with the movement of the translating device relative to the record. The broad function of the indicating means in cooperation with the blank may of course include the furnishing not only of a moment-to-moment indication of the translating device position relative to the record, but also of a guide or means for marking or annotating of the index blank to indicate points of error and/or correction in the recordation, lengths of dictation sequences, and the like.

In the illustrated phonograph a holder for an index slip has been shown as 80, disposed above the path of the carriage, for example in a vertical plane passing slightly behind the mandrel 10.

The holder may consist of a flat plate, terminally secured to the standard 5 and (through folded-back lugs 80b) to the standard 6, and having retaining flange members 79 welded to its front surface near the top and bottom edges. These retaining flange members may if desired be integral with a vertical lefthand stop member 78, it being understood that an index slip S will be inserted leftwardly into the holder between the retaining flange members 79 until its lefthand extremity impinges against the stop member 78. To positively hold the slip S in this position until its removal is deliberately desired, there may be employed a catch member 77 biased to extend diagonally forwardly and leftwardly through an aperture 80a provided in the holder 80 just to the right of the righthand extremity of a fully inserted slip. This catch member will be automatically cammed rearwardly by the slip during the slip insertion; will fly forwardly, upon the completion of that insertion, to the illustrated position wherein it blocks rightward movement of the slip; and may be pressed rearwardly, to permit deliberate rightward slip removal, by the finger of the operator in the act of grasping the slip for removal. The catch member may have rearwardly extending top and bottom flanges 77a, these being extended rightwardly behind the holder 80 to be pivoted on a vertical pin 76 held between lugs 76a extending rearwardly from the holder; and a torsion spring 75 encircling the pin 76 may be arranged to provide the bias for the catch member.

Figure 3 illustrates a typical index slip S, removed from the phonograph, while Figure 2 illustrates in dash-dot lines the periphery of the slip when fully inserted in the holder. By way of illustration, the upper portion of the slip has been shown as adapted to receive such marks or annotations as were mentioned above; and as a guide or means for making the latter, a pointer 74 will be seen extending upwardly from the carriage in front of the upper portion of the inserted slip.

In the illustrated structure the registrations which have been generally discussed above are made in the lower portion of the index slip. While it will be obvious that registrations of any of a variety of natures may be employed in carrying out my invention, and while I intend no unnecessary limitation in this respect, the preferred and illustrated embodiment of the invention employs registrations in the form of holes punched in the slip. These may for example be punched from the rear by a mechanism carried by the carriage and hereinafter detailedly described. To permit the operation of such punching mechanism on the slip, the holder 80 may be provided with a continuous longitudinal slot or aperture 81, for example just below the horizontal center line of the holder, as best seen in Figure 2. As will hereinafter be apparent, the registrations made by punching through the slot 81 are registrations of the positions at which the translating device is taken out of recordation condition. Other registrations are made of the positions at which the translating device is placed into recordation condition; these may be made by punching through a slot or aperture 82 in the holder 80, below and parallel with the slot 81. The two types of registrations, which respectively may be termed "out" and "in" registrations, are thus made in respective upper and lower paths on the index slip. Registrations of the two types appear as the holes R_o and R_i, respectively, in the typical index slip illustrated in Figure 3.

The punching mechanism may best be seen in Figures 8 through 11. This mechanism, and a mechanism responsive to or actuated by the registrations and hereinafter detailedly described, are assembled to the carriage, being located to the right and left of the righthand and lefthand carriage side members 42 and 41 and above the carriage top member 40c. They are disposed within an inverted U-shaped housing 90 whose righthand and lefthand side members are designated as 92 and 91, respectively. Side member 92 is held in spaced relation to carriage side member 42 through front and rear spacing posts 94 and 96, respectively, while side member 91 is held in spaced relation to carriage side member 41 through front and rear spacing posts 93 and 95, respectively. The lower portions of the housing side members 92 and 91 extend forwardly and are terminally bifurcated, the extremity of 92 slidably fitting about rod 23, and the extremity of 91 fitting about the leftwardly extending portion of sleeve 43. The collar 88, from which the control lever 39 extends as above described, is retained about the rod 23 between the carriage and housing side members 42 and 92. And it is convenient to note at this point that between the carriage and housing side members 41 and 91 there is retained, in rotatably surrounding relation to sleeve 43, a generally similar collar 87. Like collar 88, it is splined to rod 23; this splining may be by screw or key 87a extending inwardly to engage the groove 23a in the rod, through an elongated arcuate slot 43b in sleeve 43.

The punches for the "out" and "in" registrations appear as 101 and 102, respectively; each may for example be formed of flat material, may be disposed in a front-and-back extending vertical plane, and may have a bifurcated front extremity to provide a double (top and bottom) cutting edge. In respect of side-to-side location, the punches may be disposed at approximately the center of the carriage, for example in alignment with each other. In respect of elevation, the punches are respectively disposed opposite the slots 81 and 82, the punch 101 therefore being above 102. The punches extend forwardly from and are carried by two respective bails 103 and 104, which extend from side to side within the housing 90. The lefthand end members 105 and 106 of the two respective bails are curved rearwardly and then downwardly; and they extend, in closely spaced relation to each other, between the housing and carriage side members 91 and 41 down to a horizontal stud 109 secured in 41, on which stud they are terminally pivoted (slightly spaced from each other and from 41 by washers such as 109a). The righthand end members 107 and 108 of the two respective bails are similarly curved rearwardly and downwardly; and they extend, in closely spaced relation to each other, between the carriage and housing side members 42 and 92 down to a horizontal stud 110 secured in 42, on which stud they are terminally pivoted (slightly spaced from each other and from 42 by washers such as 110a). Normally the bail end members will extend upwardly from the studs 109 and 110 with a slight rearward inclination, resting against rearward stops which are conveniently provided by the spacing posts 95 and 96 abovementioned. They may be biased to this position not merely by gravity, but also by respective springs 112 and

113 tensioned from a cross rod 99 (extending between the housing side members) to respective pins 114 and 115 extending inwardly from 106 and 107, respectively. When the bail end members are in this normal position, the forward punch extremities are spaced rearwardly away from the holder slots 81 and 82.

Each of the bails 103 and 104 is moved forwardly, to operate its respective punch through the respective slot 81 or 82, in response to a respective movement of the control lever 39, and thus in response to a particular re-conditioning of the translating device. More specifically, the bail 103 may be so moved, to operate the punch 101 for making of an "out" registration, by the movement of the control lever from its recordation to its neutral position; and the bail 104 may be so moved, to operate the punch 102 for making of an "in" registration, by the movement of the control lever from its neutral to its recordation position. Conveniently, the mechanism for moving the bail 103 may be associated with the collar 87 (from which the lever 39 extends), and that for moving the bail 104 with the collar 88 (which, by virtue of the splinings abovementioned, moves co-ordinately with the collar 87).

Referring first to the mechanism (illustrated principally in Figure 9) for moving bail 104, it will be seen that approximately the lower half of the periphery of collar 88 is of reduced radius, excepting for a triangular cam 86 extending outwardly to the full collar radius in position to be directed downwardly slightly before the control lever 39 completes a movement from its neutral to its recordation position. The lower extremity of the bail end member 108 is extended forwardly from the stud 110; and at 108*a*, underneath the rod 23, there is pivotally secured against the lefthand face of 108 a pawl 118 having a pointed extremity 118*a* normally extending upwardly almost into contact with the reduced-radius periphery of collar 88. A lug 118*b* folded rightwardly from the lower portion of the pawl normally abuts against a shoulder 108*b* formed by downwardly widening the member 108 forward of the point 108*a*; this abutment is normally maintained by a spring 120 tensioned between lug 118*b* and a lug 108*c* folded rightwardly from the front extremity of 108.

As the control lever 39 is rocked downwardly from its neutral (Figure 9) position into its recordation position, the cam 86 will presently engage the pointed extremity 118*a* of pawl 118. The abovementioned abutment of lug against shoulder prevents that pawl rotation which would move its extremity 118*a* rearwardly, so that the pawl remains stationary relative to member 108; consequently as the lever rocking is continued the pawl will be forced downwardly by the cam, moving the bail end member 108 counterclockwise (as seen in Figure 9) about stud 110, and thus rocking the bail 104 forwardly to project the punch 102 through the slot 82 for punching of an "in" registration in the slip S in the holder 80. As the lever rocking is completed the pawl extremity 118*a* will be just fully disengaged by the cam 86, so that the bail and punch will have returned to their normal positions under the influence of their bias. It will of course be understood that upon the reverse movement of the control lever 39—i. e., from recordation into neutral position—the engagement of the pawl extremity 118*a* by the cam 86 will be ineffective on the bail 104 and punch 102; the pawl will simply yield with counterclockwise rotation (as seen in Figure 9) about the pivot point 108*a*, to pass the cam without movement of 108.

Referring now to the mechanism (illustrated principally in Figure 10) for moving bail 103, it will be seen that approximately the lower half of the periphery of the collar 87 is of reduced radius, excepting for a triangular cam 85 extending outwardly to the full collar radius in position to be directed downwardly slightly before the control lever 39 (which influences this collar through the splinings abovementioned) completes a movement from its recordation to its neutral position. The lower extremity of the bail end member 105 is extended forwardly from the stud 109; and at 105*a*, underneath rod 23, there is pivotally secured against the righthand face of 105 a pawl 117 having a pointed extremity 117*a* normally extending upwardly almost into contact with the reduced-radius periphery of collar 87. A lug 117*b* folded leftwardly from the bottom rear portion of the pawl normally abuts against the bottom of the member 105; this abutment is normally maintained by a spring 119 tensioned between lug 117*b* and a lug 105*b* folded leftwardly from a more rearward portion of 105.

As the control lever 39 is rocked upwardly into its neutral (Figure 9) position from its more downward recordation position (rocking collar 87 into its Figure 10 position from a more counterclockwise one), the cam 85 will presently engage the pointed extremity 117*a* of pawl 117. The abovementioned abutment of the lub 117*b* prevents that pawl rotation which would move its extremity 117*a* forwardly, so that the pawl remains stationary relative to member 105; consequently as the lever rocking is continued the pawl will be forced downwardly by the cam, moving the bail end member 105 counterclockwise (as seen in Figure 10) about the stud 109, and thus rocking the bail 103 forwardly to project the punch 101 through the slot 81 for punching of an "out" registration in the slip S held in the holder 80. As the lever rocking is completed the pawl extremity 117*a* will be just fully disengaged by the cam 85, so that the bail and punch will have returned to their normal positions under the influence of their bias. It will of course be understood that upon the reverse movement of the control lever 39—i. e., from neutral into recordation position—the engagement of the pawl extremity 117*a* by the cam 85 will be ineffective on the bail 103 and punch 101; the pawl will simply yield with clockwise rotation (as seen in Figure 10) about the pivot point 105*a*, to pass the cam without movement of 105.

From the foregoing there will be understood one exemplary and preferred manner in which I may make registrations of the positions at which the translating device is placed into and taken out of recordation condition. In accordance with my invention, I control the subsequent conditioning of the translating device—or, more specifically, the subsequent manipulation of the control lever 39—in accordance with the precedingly made registrations. More specific aspects of this control are hereinafter developed. At this point, however, I may note that in effecting this control I make use of a mechanism responsive to the precedingly made registrations, and such mechanism may now conveniently be described. It may comprise a pair of scanning devices, respectively actuated by the "in" and "out" registrations.

Each scanning device may be actuated by a registration of its respective type when the translating device occupies a position predeterminedly related to the position occupied by the translating device when that registration was made. By way of preferred example, the scanning device responsive to each "in" registration may be actuated when the translating device occupies a position of substantial identity with the position it occupied when that registration was made, while the scanning device responsive to each "out" registration may be actuated when the translating device occupies a position slightly advanced from the position it occupied when that registration was made. In the embodiment of the invention illustrated in the figures through Figure 15 the scanning devices comprise two electric switches, respectively associated with the slots 81 and 82, the actuations of the devices comprising closures of the switches.

The switch actuated by the "out" registrations is designated in its entirety as 121. As seen in Figures 8 and 9, it is positioned within and near the top of the housing 90, its rear extremity being pivotally assembled onto a cross rod 97 extending between the sides of the housing above the cross rod 99 abovementioned. While some of the details of the switch 121 appear in Figures 8 and 9, they are better illustrated in the enlarged Figures 12 through 15. The switch may comprise an inner, generally channel-shaped casing 123, and an outer, inverted channel-shaped casing 125; these casings are preferably of insulating material. The sides of the outer casing 125 are extended rearwardly to form lugs 125*a* through which the cross rod 97 pivotally passes, and are extended forwardly to form lugs 125*b* between which is supported a cross pin 127. The base of the inner casing 123 is extended rearwardly to form the bifurcated hub 123*a* pivotally surrounding the cross rod 97 between the lugs 125*a*, and is upwardly thickened in its bifurcated forward portion 123*b*. The cross pin 127 passes through this portion 123*b*, rendering the inner and outer casings secure with respect to each other—their separability being simply for purposes of assembly. To the base of the inner casing, near its rear, there is secured an insulating stack 129; and normally open contact springs 131*a* and 131*b* are held in and extend forwardly from this stack. Each side of the forward portion 123*b* of the inner casing is provided with a respective narrow vertical slot 123*c*. Through these slots, and pivoted on the cross pin 127 where it passes transversely through the slots, there extend into the interior space between the casings two respective levers 133. At the rear extremities of these levers there is secured between them a horizontal cross pin 135, up against which the top contact spring 131*a* may be lightly biased. It will be understood that the function of the pair of levers 133 is at appropriate times to press the cross pin 135 downwardly against the spring 131*a*, thereby moving the latter into contact with the contact spring 131*b* and so closing the switch 121—connections to the switch being made by conductors 137 passing inwardly of the casings at the rear of 123 and respectively connected to the contact springs 131*a* and 131*b*.

Outside and at the front of the casings the levers 133 extend a short distance downwardly and slightly forwardly, and are then joined together by a bridging member 133*a* disposed in a vertical plane; in the intermediate portion of the bridging member 133*a* it is formed into a V-shaped nose 133*b* having a forwardly directed apex. A torsion spring 139 is wound about the cross pin 127 between the sides of the casing portion 123*b*, and is terminally secured to that casing portion and to the nose 133*b*; it serves to bias the nose 133*b* forwardly and the levers thus into switch-closing position. The entire switch 121, its rear pivoted on cross rod 97 as abovementioned, is held in a normal substantially horizontal position by a large pin 107*a* extending leftwardly, from an upward projection 107*b* on the bail end member 107, some distance forwardly of the cross rod 97—this pin 107*a* extending to underneath a rightward extension 125*c* of the outer casing 125. In this way the switch is supported so that the nose 133*b* is normally at the mean level of the punch 101 (and thus of the registrations R_o made by that punch in the slip S). And, as further illustrated in Figure 9, the front-and-back disposition of the switch is such that the nose 133*b* will extend into the slot 81—and such that the nose will normally be held, by the rear surface of the slip S in the holder 80, sufficiently rearwardly against its bias to maintain the switch 121 open. (The nose will of course be displaced forwardly by its bias and the switch thus closed when no slip is in the holder, but the slip during its insertion will cam the nose rearwardly into the illustrated and described position.)

It may here be noted that the entire switch 121 (as well as the entire switch 122, below described) is held in a fixed, substantially central side-to-side position within the housing 90 by washers 99*a* secured on the cross rod 99 and extending therefrom sufficiently to be abutted against by the rearwardly extending lugs 125*a* (and by the analogous elements in the switch 122).

From the above description it will be obvious that the bridging member 133*a* from which the nose 133*b* is formed lies in the path which the punch 101 must traverse when it is projected forwardly through the slot 81 to make a registration in the slip S. To remove the bridging member from that path when the punch 101 is operated, the entire switch 121 may be automatically rocked upwardly about cross rod 97; this is arranged for by bevelling the bottom of the casing extension 125*c* diagonally downwardly for a distance forwardly from the normal position of contact with the pin 107*a*, so that when the bail 103 is rocked forwardly to project the punch 101 through slot 81, the entire switch 121 is cammed upwardly. In turn, the slot 81 is made with a sufficient dimension above the normal level of the punch 101 and nose 133*b* to permit the temporary raising movement of the latter within the slot. To insure the prompt return of the switch 121 to its normal position upon the return of the bail 103 to its normal position after a punching operation, a torsion biasing spring 141 may be wound about the cross rod 97 and its terminals respectively engaged with the switch 121 and with a stationary member such as cross rod 99.

The switch actuated by the "in" registrations is designated in its entirety as 122. As seen in Figures 8 and 9, it is positioned within the housing 90, below the switch 121, its rear extremity being pivotally assembled onto a cross rod 98 extending between the sides of the housing below the cross rod 99 abovementioned. Subject to such few exceptions as may hereinafter appear, the switch 122 may be an inverted duplicate of the switch 121; detailed description will therefore not be repeated, but it will simply be noted that parts of and immediately associated with the switch 122 have been assigned reference numerals each

higher by 1 than those assigned above and in the drawings to the corresponding parts of and associated with the switch 121. It will of course be understood that up-and-down and right-and-left (but not the front-and-back) relationships of parts will be reversed in the switch 122, in view of its inversion; thus for example the external portions of its levers 134 will extend, from the front of the casings, generally upwardly rather than downwardly, but the biasing of the nose 134b (by spring 140) will, like that of the nose 133b, be a forward, switch-closing bias.

The entire switch 122 is held in a normal substantially horizontal position by a large pin 106a extending rightwardly from the bail end member 106 some distance forwardly of the cross rod 98. This pin extends into association with a leftward extension 126c of the outer casing 126 of the switch; but instead of extending underneath that extension, the pin 106a extends into a slot 126c' cut into the lefthand face of the extension 126c, and passing from the top surface of that extension diagonally rearwardly and downwardly to near its bottom surface. The entire switch 122 is strongly biased upwardly about the cross rod 98 by a torsion spring 142 wound about that cross rod and having its terminals respectively engaged with the switch and with the cross rod 99; this causes the bottom-rear extremity of the slot 126c' to bear upwardly against the pin 106a therein, establishing the normal position of the switch. This position is such that the nose 134b is normally at the mean level of the punch 102 (and thus of the registrations R_i made by that punch in the slip S); the nose will extend into the slot 82 and will normally be held, by the rear surface of the slip S, sufficiently rearwardly against its bias to maintain the switch 122 open.

The bridging member 134a from which the nose 134b is formed of course lies in the path which the punch 102 must traverse when it is projected forwardly through the slot 82 to make a registration in the slip S. To remove the bridging member from that path when the punch 102 is operated, the entire switch 122 is automatically rocked downwardly about the cross rod 98; this is accomplished by the diagonal arrangement of the slot 126c' already described, which causes the pin 106a to cam the entire switch downwardly, against its bias, when the bail 104 is rocked forwardly to operate the punch 102. In turn, the slot 82 is made with a sufficient dimension below the normal level of the punch 102 and nose 134b to permit the temporary lowering movement of the latter within the slot.

It may be noted that, for reasons hereinafter apparent, the side-to-side position of the nose 133b is preferably displaced very slightly leftwardly (i. e., in a direction opposite to that of carriage driving) from the associated punch 101, while the nose 134b is preferably in side-to-side alignment with its associated punch 102. This is illustrated in Figure 15, showing the two noses, when considered in connection with Figure 11, showing the two punches.

From the construction as above described it will be understood that during the rightward travel of the carriage the noses 133b and 134b constantly press against the rear of the index slip S. When the nose 133b reaches a registration R_o already made in the slip—which it will preferably do when the translating device is very lightly advanced beyond the position it occupied when that registration was made—that nose moves forwardly into that registration, the distance of this movement being sufficient to actuate, or cause the closing of, the switch 121. And when the nose 134b reaches a registration R_i already made in the slip—which it will preferably do when the translating device occupies the same position as when that registration was made—that nose moves forwardly into that registration, actuating or closing the switch 122.

The description of the illustrated mechanisms for making and for responding to the registrations may be completed by noting the preferable use of an anvil member 145 immediately in front of the index slip—this member moving with the carriage, and acting as a die for each of the punches 101—102 and as a reinforcement for the slip against the constant forward pressure of the noses 133b—134b. The anvil member proper is best seen in Figures 6 and 7. It may comprise a block 146 extending upwardly from the carriage top member 40c, its rear vertical edges being bevelled to present a relatively narrow vertical surface to the front of the slip S in the holder 80 (as may also be seen in Figure 1). The upper lefthand half 146a of the block 146 is made removable; and in it from front to back, before its assembly to the rest of the block, are cut two slots 147 and 148, each of cross-sectional dimensions corresponding to those of the ends of the punches, and having their rear extremities aligned so as to be entered by the respective punches upon operation of the latter. The slots may lead diagonally downwardly and forwardly, to facilitate the forward expulsion therefrom of punchings from the index slip. To trap and accumulate these punchings there may be removably attached to the front of the block 146 a cover member 150. This may have a top portion 150a, extending rearwardly over the front portion of the top of the block 146, and having a narrow edge 150b folded downwardly along its rear extremity to fit removably in a side-to-side slot 146b cut in the top of the block 146; and it may have side portions 150c, extending rearwardly over the front portions of the sides of the block 146, and slotted in their bottom edges to be removably engaged by screws 149 respectively extending into the bottom portions of the block sides.

The pointer 74, above referred to, may be secured to and extend upwardly from the top of the block 146, to move in front of the upper portion of the slip S held in the holder 80.

One non-limitative way in which I have contemplated employing previously made registrations to control the subsequent conditioning of the translating device is the blocking of the placement of the translating device into recordation condition excepting at a position predetermined by those registrations. In doing this I may employ a means which normally blocks that conditioning of the translating device, but which is rendered ineffective by the means responsive to or actuated by the registrations—e. g., by the switches 101—102—under certain conditions. Such a blocking means has been illustrated in Figures 1, 2 and 5, and may now be described.

The front carriage rod, just to the right of the lefthand standard 5, is provided with a recess 153. The rod being taken as in the position it assumes when the translating device is in neutral condition, (as illustrated), this recess may be described as formed by a vertical radial cut extending from the top of the rod downwardly for about a quarter of the rod diameter, and by a horizontal cut extending forwardly from the

bottom of the vertical cut to the rod periphery. In the drawings the vertical surface of the recess is indicated as **153***a*, and the horizontal surface as **153***b*. A latch member **154** is pivoted to a stationary member disposed to the rear of the rod **23** (as hereinafter more specifically noted), and extends forwardly to have the latch **154***a* folded downwardly at its front extremity; when the translating device is in neutral condition, the latch **154***a* will normally rest in the recess **153**, closely adjacent the vertical surface **153***a*. It will be understood that this latch, so long as it occupies the stated position, will by engaging the surface **153***a* prevent that rotation of the rod **23** which accompanies a placement of the translating device into recordation condition, and hence will prevent such a conditioning of the translating device. It does not, however, prevent the free re-conditioning of the device between neutral and reproducing conditions, since the generally horizontal surface **153***b* will then act effectively as a cam for the latch.

For removing the latch from the stated position under certain circumstances there may be employed an electromagnet **156**. This has been illustrated as comprising an inverted U-shaped frame **158** held as by brackets **157** against the righthand surface of the standard **5**; a vertical core **159** extending centrally within the frame; and a coil **160** surrounding the core within the frame. The latch member **154** may be pivoted to the lower rear extremity of the frame **158**; and when in its above-stated position it may be slightly spaced below the bottom end of the core **159**—being biased downwardly, if desired, not only by gravity but also by a light leaf spring **161** secured to the front of the frame **158**. It will be understood that upon energization of the electromagnet the latch member **153** will be attracted upwardly into contact with the end of the core **159**, raising the latch **153***a* above the top of the rod **23**—and so rendering ineffective, or releasing, the blocking means above described.

The electromagnet **156** is energized, and the blocking means thus rendered ineffective, under the control of the switches **121** and **122**; an electrical circuit suitable for effecting this control is shown in Figure 4. The basic circuit, shown in heavy lines, may comprise simply a series connection, across the current source as typified by the plug **163**, of the electromagnet coil **160** and the switch **121** and a current-limiting resistance **164**. The circuit as thus described is arranged to energize the electromagnet whenever the switch **121** is closed—i. e., to release or render ineffective the blocking means whenever the nose **133***b* reaches a previously made "out" registration R_0, or, in still other words, to permit the placement of the translating device into recordation condition when it occupies a position very slightly advanced from a position at which it was previously taken out of that condition. (It will of course be understood that the reason for the slight side-to-side displacement of the nose **133***b* and punch **101** relative to each other, as above described, is to enforce the slight advance just mentioned—the latter being desirable for well understood reasons, including the provision of a positive assurance that the recording stylus will not be brought down on the terminal portion of a recording already made on the record.)

Of course if it were possible to assume that with any given record the translating device would be taken out of and returned to recordation condition no more than once, the arrangements and their functions as so far described would be sufficient to insure that its return would be effected at the proper position. Such an assumption obviously cannot be made, however, since there is no limitation on the number of times that the translating device may be so manipulated, for listening-back or other purposes. I therefore keep the blocking means effective not only when switch **121** is open, but also whenever it is closed by the nose **133***b* encountering any one of the "out" registrations R_0 excepting the last-made one of those registrations. To do this is a principal function of the "in" registrations R_i and the switch **122** responsive thereto. Structurally these have already been described—and it is here recalled that a respective registration R_i is made for any position where the translating device is placed into recordation condition, and that the switch **122** is closed so long as the translating device remains in, and whenever it is returned to, that position.

In considering the action of the registrations R_i and the switch **122**, let it first be assumed that the translating device is traversing a given record without yet having been taken out of recordation condition. When it is taken out for the first time, a registration R_0 is made, such as that specially designated as R_0'' in Figure 3. The translating device may be backspaced and placed in reproduction condition (for listening-back purposes), or otherwise manipulated, but it can be restored to recordation condition only at the one position which causes the nose **133***b* to come into the registration R_0''. When it is so restored at this one position, the adjacent registration R_i'' is made; and not only so long as the translating device may remain in this one position, but also whenever it is returned thereto, both switches **121** and **122** will be closed. As indicated in Figure 4, switch **122** may be connected across the electromagnet coil **160**; therefore its closure, by short-circuiting the electromagnet, annuls the electromagnet-energizing effect of the closure of switch **121** (it being noted that the resistance **164** prevents a short-circuiting of the current supply). Thus the effect of the registration R_0'', to permit the restoration of the translating device into recordation condition at a position slightly advanced from that which it occupied when that registration was made, is annulled by the registration R_i'' automatically made upon that restoration. If, either before or after further record traversal in recordation condition, the translating device be again taken out of that condition, another "out" registration such as R_0''' will be made. Although the previous registration R_0'' physically remains besides the new registration, its effect has just been seen to have been anulled by R_i'', and thus the last-made "out" registration R_0''' is the only one now effective to establish a position at which the translating device may be restored to recordation condition. The registration R_0''', too, would be anulled effectively when the translating device was again placed into recordation condition, so that a still subsequently made "out" registration would become the only effective one—and so on, so that only the last-made "out" registration is effective in establishing that single position at which the translating device may be restored to recordation condition.

In the preceding paragraph it was initially assumed that the translating device was traversing a record in recordation condition. With the system as above described, however, some provision

must be made to permit the placement of the translating device into recordation condition in the first instance—i. e., for the beginning of the traversal of the record. This may be accomplished by providing for all records uniform initial registrations, each simulating an "out" registration actually made in the phonograph but positioned to actuate the device responsive to "out" registrations (e. g., the switch **121**) when the translating device is at the very initial position in its range of traversal of the record. When the registrations are made in the index slips S, such initial registrations may be incorporated in the slips when manufactured; and when the registrations are in the described and illustrated form of holes punched in the slip, the initial registration may be a like hole such as R_0' in Figure 3. Upon the initial placement of the translating device into recordation condition (now effectable only at its proper initial position) there will of course be made a registration R_1' adjacent to, and of annulling effect upon, the initial registration R_0'.

It may be noted that if those who prepare the records for use wish for any reason (such as a defective condition of the initial end portion of a particular record) to restrict the area of a record to be recorded on, they may supply that record with a special initial registration—e. g., a specially placed initial R_0 registration in the accompanying slip—either without the usually placed initial R_0 registration, or with the latter annulled by an appropriately placed R_1 registration. Thus my invention provides a way of establishing a definite position, which may be peculiar to any individual record, at which recordation on that record may be initially begun.

It may also be noted that the operator of the machine, when desiring to place the translating device from neutral into recordation condition (whether or not the record has been partially recorded on already) will slide the carriage along its rods, either with a continued downward pressure on the lever **39**, or without such pressure—in the latter case until he hears the signal inherently provided by the operation of the electromagnet **156**, apprizing him that he has reached the one position at which he may effectively exert downward pressure on the lever.

It will be understood that while I have so described in detail a particular and preferred embodiment of my invention, many of its individual features are subject to wide modifications without departure from the spirit or true scope of the invention. By way of example, the non-limitation to the index blank as a necessary member for receiving the registrations, the non-necessity for punching as a particular means of effecting the registrations, and the like, have already been mentioned. By way of further example, the invention is not limited to the use of electrical scanning devices responsive to or actuated by the registrations. Thus in Figures 16, 17 and 18 I show modifications of a portion of the phonograph of earlier figures, which modifications involve the substitution of mechanical scanning devices responsive to the registrations. It will be understood that in these figures only so much of the phonograph and its parts has been illustrated as is necessary to show the alterations; and to simplify the showings of the portions actually illustrated, there have been omitted therefrom the punching means and the like, the use of which as a typical registration-making means is contemplated as before.

In Figures 16 through 18 the scanning devices actuated by "out" and "in" registrations are generally designated as **221** and **222**, respectively. The principal portions of these devices, like **121** and **122** above described, may be respectively pivoted on the cross rods **97** and **98**. The device **221** may comprise a casing **225** generally similar to the outer casing **125** of earlier figures, though preferably having thicker sides and front lugs **225***b*, against which latter fit the levers **233**. These are generally similar to the levers **133** of earlier figures, again being supported on cross pin **127** and having bridging member **133***a* with nose **133***b* and being biased by spring **139**; but rearwardly the levers **233** may extend a little further, with a slight downward curve, to support the cross pin **237** between their rear extremities. The casing **225** may be biased downwardly by torsion spring **24** (analagous to **141** of earlier figures), and may be supported—and cammed upwardly when the punch **101** is operated—by pin **107***a* as was the casing **125** of earlier figures.

The principal portion of the device **222** may be essentially an inverted duplicate of that just described, in the same way as **122** was an inverted duplicate of **121**, and the description immediately above may be applied thereto with the designating numerals each increased by 1. It will of course be understood that the casing **226** may be biased upwardly by torsion spring **242** (analagous to **142** of earlier figures), and may be positioned normally—and cammed downwardly when the punch **102** is operated—by pin **106***a* as was the casing **126** of earlier figures.

The scanning device **221** may be considered as further comprising an arm **171** which has a bifurcated forward extremity engaging the cross pin **237**, and which has a central portion pivoted on the cross rod **99**—the central arm portion preferably being secured to the righthand face of a sleeve **173** extending rightwardly from the lefthand washer **99***a* about cross rod **99**. From the cross rod **99** the arm **171** extends rearwardly, and is terminally widened in an up-and-down direction; its rear edge **171***b* is shaped as an arc about the cross rod **99**, and in the lower portion of that edge there is cut inwardly a V-shaped notch **171***c*. When the nose **133***b* encounters a registration and moves forwardly in response to spring **139**—i. e., when the scanning device **221** is actuated—the cross pin **237** is rocked a little ways downwardly, and thereby the rear edge **171***b* of arm **171** is rocked upwardly to bring the notch **171***c* up to the level of the cross rod **99**.

The scanning device **222** may correspondingly be considered as further comprising an arm **172** which has a bifurcated forward extremity engaging the cross pin **238**, and which has a central portion pivoted on the cross rod **99**—the central arm portion preferably being secured to the lefthand face of a sleeve **174** extending leftwardly from the righthand washer **99***a* about cross rod **99**. From the cross rod **99** the arm **172** extends rearwardly, and like arm **171** is terminally widened in an up-and-down direction; also like the rear edge of arm **171**, its rear edge **172***b* is shaped as a similar-radius arc about the cross rod **99**, but in this edge a V-shaped notch **172***c* is centrally cut, to be at the level of the cross rod **99** when the device **222** is unactuated. When the nose **134***b* encounters a registration and moves forwardly in response to spring **140**—i. e., when the scanning device **222** is actuated—the cross pin **238** is rocked a little ways upwardly, and

thereby the rear edge 172b of arm 172 is rocked downwardly to carry the notch 172c below the level of cross rod 99 abovementioned.

A pin 175 is supported and forwardly biased, in manner hereinafter described, behind the edges 171b and 172b at approximately the level of the cross rod 99. At all times when either the scanning device 221 is unactuated, or the scanning device 222 is actuated, or both these conditions obtain, the pin 175 is held in a normal position as illustrated in Figure 17, wholly behind the arcuate contour of the edges 171b and 172b (analogously to the electromagnet 156 remaining unenergized when either the scanning device 121 was unactuated, or the scanning device 122 was actuated, or both those conditions obtained). But when, and only when, the scanning device 221 is actuated and the scanning device 222 is unactuated, both the notches 171c and 172c are in alignment with each other at the level of pin 175, and that pin moves forwardly thereinto (analogously to the electromagnet 156 being energized when the scanning device 121 was actuated and the scanning 122 was unactuated).

There may now be described the manner in which the position of the pin 175 enforces and releases a blocking of the placement of the translating device into recordation condition. The pin 175 extends leftwardly, to behind the edges 171b and 172b, from the free extremity of a lever 176. This lever leads from the pin downwardly and then forwardly to be pivoted on a cross rod 100 extending between the housing side members 91 and 92 below the cross rod 93; the cross rod 100 may be surrounded on the respective sides of the lever 176 by the sleeves 100a and 100b, to one of which the lever may be secured. From the upper edge of an intermediate portion of the lever 176 there is folded rightwardly a lug 177; and from the lower edge of that lever portion, below lug 177, there is folded rightwardly another lug 178. Against the righthand side of the righthand housing side member 92 there is pivotally held, on a stud 180 axially aligned with the cross rod 100, a lever 181. This lever 181 extends from stud 180 rearwardly to behind the housing side member 92, and from its rear extremity there is folded rightwardly a lug 182. This lug 182 overhangs the lug 177, and these two lugs are biased into contact with each other by a spring 179 tensioned from lug 182 to lug 178.

The lever 181 extends forwardly from the stud 180 to terminate diagonally below and behind the rod 23. Its forward portion may be made sufficiently heavy, as by the local enlargement 181a, to somewhat more than counteract the rotating force of its rearward portion about stud 180 plus the rotating force of lever 176 about cross rod 100, thereby effecting the abovementioned forward bias of the pin 175—but not sufficiently heavy to cause the expansion of spring 179 with consequent separation of the lugs 182 and 177 from contact with each other.

About the rod 23 there is secured, in side-to-side alignment with the lever 181, a collar 184 having, generally at its rear, a reduced-radius portion separated near the bottom of the collar from the full-radius portion of the collar by the shoulder 184a. When the translating device is in neutral condition the forward extremity of the lever 181 extends into substantial abutment against this shoulder. The reduced-radius portion of the collar freely permits the shift of the translating device between neutral and reproduction conditions; but normally any placement of the translating device into recordation condition is blocked by the impingement of the shoulder against the lever extremity, which elements may thus be considered as the blocking means in this embodiment. But when the pin 175 is permitted to move forwardly into the notches 171c and 172c as above described, the lower extremity of lever 181 moves downwardly to clear the shoulder 184a, then and only then rendering the blocking means ineffective. The analogy of this action to that of the preceding embodiment will be apparent without further description.

It may be noted that the function of the yieldable contact between lugs 182 and 177 is to permit the forward lever extremity to be held downwardly displaced by the full-radius portion of the collar 184, after recordation condition of the translating device is once established, even when the pin 175 is thereafter forced rearwardly to the illustrated position.

It will be understood that with either embodiment of my invention it is impossible to place the translating device into recordation without a slip being inserted in the holder—since both the scanning devices will then be actuated and the blocking means therefore unreleased. As above noted, the slip in its insertion cams these noses rearwardly.

While I have described and illustrated my invention in terms of preferred embodiments thereof and for a preferred use, I intend thereby no unnecessary limitations. Obviously the translating device need not be one adapted for two alternate functions, but may simply be selectively conditionable in one predetermined translational condition and in one other condition (e. g. neutral) with respect to the record. And while the invention may have its greatest utility when that predetermined translational condition is recordation condition, no unexpressed limitation thereto is intended. Not only in these but also in many other respects it is obvious that the disclosed embodiments are capable of wide changes without departure from the spirit or scope of the invention.

I claim:

1. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and means for selectively conditioning said device in recordation and other conditions: the combination of means operated by said conditioning means, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making "in" registrations of the positions at which said device is placed into recordation condition and "out" registrations of the positions at which said device is taken out of that condition; and control means, including scanning means disposed in traversing relationship to said "in" and "out" registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said conditioning means to control the same in accordance with both said "in" and "out" registrations.

2. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said

record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record. said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making "in" registrations of the positions at which said device is placed into recordation condition and "out" registrations of the positions at which said device is taken out of that condition; and means, including scanning means disposed in traversing relationship to said "in" and "out" registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said device to control the conditionings thereof in accordance with both said "in" and "out" registrations.

3. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and means for selectively conditioning said device in recordation and other conditions: the combination of means operated by said conditioning means, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making permanent registrations of the positions at which said device is taken out of recordation condition; and control means, including scanning means disposed in traversing relationship to said registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said conditioning means to control the same in accordance with said registrations.

4. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and means for selectively conditioning said device in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making permanent registrations of the positions at which said device is taken out of recordation condition; and means, including scanning means disposed in traversing relationship to said registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said device to control the conditionings thereof in accordance with said registrations.

5. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making permanent registrations of the positions at which said device is taken out of recordation condition; and means, including scanning means disposed in traversing relationship to said registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said device to block the placement thereof into recordation condition excepting at a position predeterminedly related to a registered position.

6. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and means for selectively conditioning said device in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making registrations of the positions at which said device is taken out of recordation condition; means, including scanning means disposed in traversing relationship to said registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said device to block the placement thereof into recordation condition excepting at a position predeterminedly related to a registered position; and means, connected with said conditioning means and rendered effective upon operation thereof to place said device into recordation condition, for blocking a subsequent similar operation thereof at the same position.

7. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making registrations of the positions at which said device is placed into recordation condition; and means, including scanning means disposed in traversing relationship to said registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said device to block the placement thereof into recordation condition at a registered position.

8. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for

operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making "in" registrations of the positions at which said device is placed into recordation condition and "out" registrations of the positions at which said device is taken out of that condition; and means, including scanning means disposed in traversing relationship to both said "in" and "out" registrations and moved relative thereto by said moving means incidental to said first-mentioned movement, actuated by said registrations and operatively connected with said device to block the placement thereof into recordation condition at a position registered by an "in" registration and at any position not predeterminedly related to a position registered by an "out" registration.

9. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making permanent registrations of the positions at which said device is taken out of recordation condition; scanning means disposed in traversing relationship to said registrations and actuated thereby and moved relative thereto by said moving means incidental to said first-mentioned movement; means normally blocking the placement of said device into recordation condition; and releasing means controlled by said scanning means and connected with said blocking means to render the latter ineffective when said device occupies a position predeterminedly related to a registered position.

10. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making "in" registrations of the positions at which said device is placed into recordation condition and "out" registrations of the positions at which said device is taken out of that condition; scanning means disposed in traversing relationship to said "in" and "out" registrations and actuated thereby and moved relative thereto by said moving means incidental to said first-mentioned movement; means normally blocking the placement of said device into recordation condition; releasing means controlled by said scanning means and connected with said blocking means to render the same ineffective when said device occupies a position predeterminedly related to a position registered by an "out" registration; and means controlled by said scanning means and associated with said releasing means for opposing the effective action of the latter when said device occupies a position registered by an "in" registration.

11. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making "in" registrations of the positions at which said device is placed into recordation condition and "out" registrations of the positions at which said device is taken out of that condition; a pair of scanning devices respectively disposed in traversing relationships to said "in" and "out" registrations and actuated thereby and moved relative thereto by said moving means incidental to said first-mentioned movement; means normally blocking the placement of said device into recordation condition; and releasing means jointly controlled by said two scanning devices and connected with said blocking means to render the same ineffective when the translating device occupies a position predeterminedly related to the position registered by the last-made said "out" registration.

12. In a phonograph including record-supporting means and a translating device, and moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions: the combination of means operatively connected with said device for operation upon reconditionings thereof, and comprising mutually cooperative elements relatively moved by said moving means incidental to said first-mentioned movement, for making "in" registrations of the positions at which said device is placed into recordation condition and "out" registrations of the positions at which said device is taken out of that condition; scanning means disposed in traversing relationship to said "in" and "out" registrations and actuated thereby and moved relative thereto by said moving means incidental to said first-mentioned movement; mechanism controlling the conditioning of said device; means, connected with said scanning means and rendered effective upon the actuation thereof by an "out" registration, for operating said mechanism; and means, connected with said scanning means and rendered effective upon the actuation thereof by an "in" registration, for opposing the operation of said mechanism.

13. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and a support for registration-receiving means adapted to receive registrations of the position occupied at any time by said device: the combination of means operatively connected with said device for selectively conditioning the same in recordation and other conditions; registering means, arranged for operation upon the registration-receiving means and moved relative thereto by said moving means incidental to said first-mentioned

movement; and means, operatively interposed between said conditioning means and said registering means, for operating the latter upon operation of the conditioning means to effect a predetermined reconditioning of said device.

14. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and a support for registration-receiving means adapted to receive registrations of the position occupied at any time by said device: the combination of means operatively connected with said device for selectively conditioning the same in recordation and other conditions; registering means, arranged for operation upon the registration-receiving means and moved relative thereto by said moving means incidental to said first-mentioned movement, variously operable to make registrations of two respective types; and selective means, operatively interposed between said conditioning means and said registering means, for causing the latter to make registrations of the respective types upon operations of the conditioning means to effect two respective reconditionings of said device.

15. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and a support for registration-receiving means adapted to receive registrations of the position occupied at any time by said device: the combination of means for selectively conditioning said device in recordation and other conditions; registering means, arranged for operation upon the registration-receiving means and operatively connected with said device for operation incidental to a predetermined reconditioning of said device; scanning means disposed in traversing relationship to the registration-receiving means and actuated by registrations thereon, and operatively connected with said conditioning means to control the same; and means, operated by said moving means incidental to said first-mentioned movement, for effecting a joint movement of said registering and scanning means relative to the registration-receiving means, said scanning and registering means being disposed in predetermined relationship to each other along the direction of their joint movement.

16. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, and a support for registration-receiving means adapted to receive registrations of the position occupied at any time by said device: the combination of means for selectively conditioning said device in recordation and other conditions; "in" and "out" registering means, arranged for operation upon said registration-receiving means and operatively connected with said device for operations incidental respectively to the placement of said device into recordation position and to the taking of said device out of that condition; "in" and "out" scanning means disposed in traversing relationship to said registration-receiving means and actuated respectively by the registrations made by said two registering means, and operatively connected with said conditioning means to control the same; and means, operated by said moving means incidental to said first-mentioned movement, for effecting a joint movement of said "in" registering and scanning means relative to said registration-receiving means and for effecting a joint movement of said "out" registration and scanning means relative to said registration-receiving means, said "in" scanning means being in operative alignment with said "in" registering means along the direction of their joint movement, and said "out" scanning means being operatively slightly displaced from said "out" registering means oppositely to the direction of their joint movement.

17. In a phonograph including record-supporting means and a translating device, moving means for effecting relative movement of said record-supporting means and said device whereby said device passes through a continuous progression of positions relative to the record, said device being selectively conditionable in recordation and other conditions, and a support for registration-receiving means adapted to receive registrations of the position occupied at any time by said device: the combination of registering means, arranged for operation upon the registration-receiving means and moved relative thereto by said moving means incidental to said first-mentioned movement, operatively connected with said device to make registrations of the positions at which said device is taken out of recordation condition; and means, including scanning means disposed in traversing relationship to said registrations and actuated thereby and moved relative thereto by said moving means incidental to said first-mentioned movement, associated with and influencing said device to block the placement thereof into recordation position excepting at a position predeterminedly related to a position registered by a registration on the registration-receiving means, the registration-receiving means being provided with a registration corresponding with an initial position of said device in said progression of positions whereby to permit the initial placement of said device into recordation condition.

RICHARD M. SOMERS.