

Nov. 20, 1923.

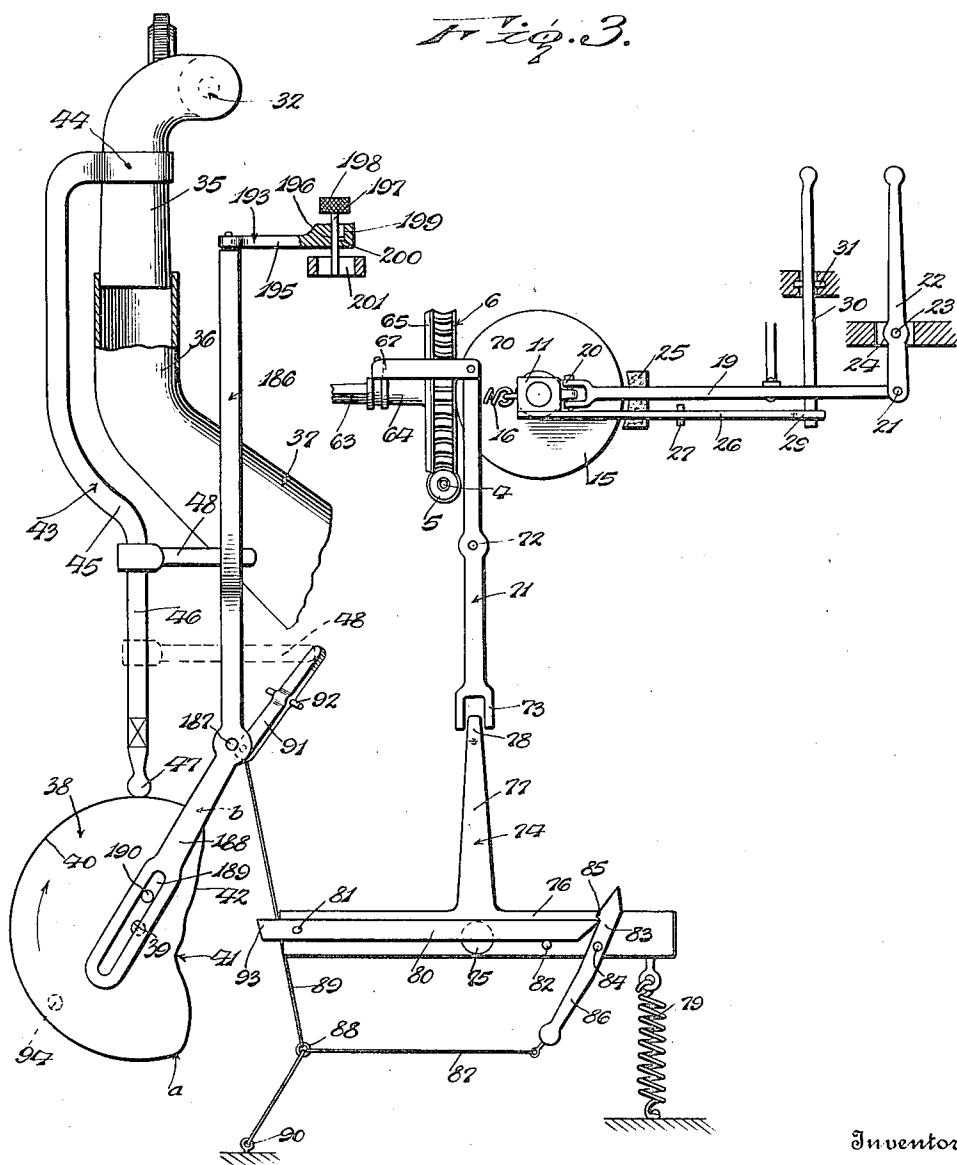
1,474,776

F. D. HUNT

SOUND REPRODUCTION APPARATUS

Filed Oct. 15, 1921

7 Sheets-Sheet 3



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Nov. 20, 1923.

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SOUND REPRODUCTION APPARATUS

Filed Oct. 15, 1921

7 Sheets-Sheet 4

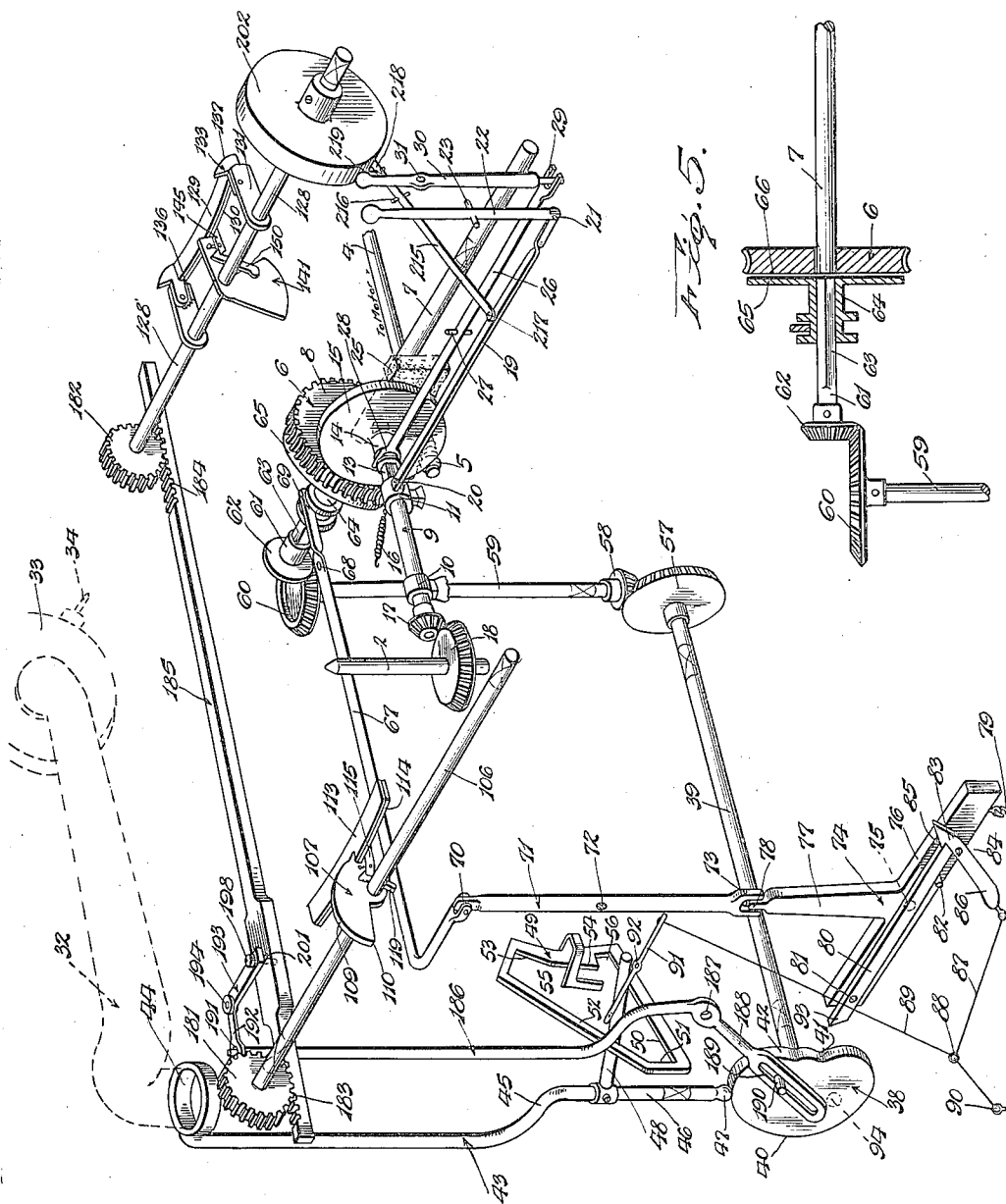


Fig. 1.

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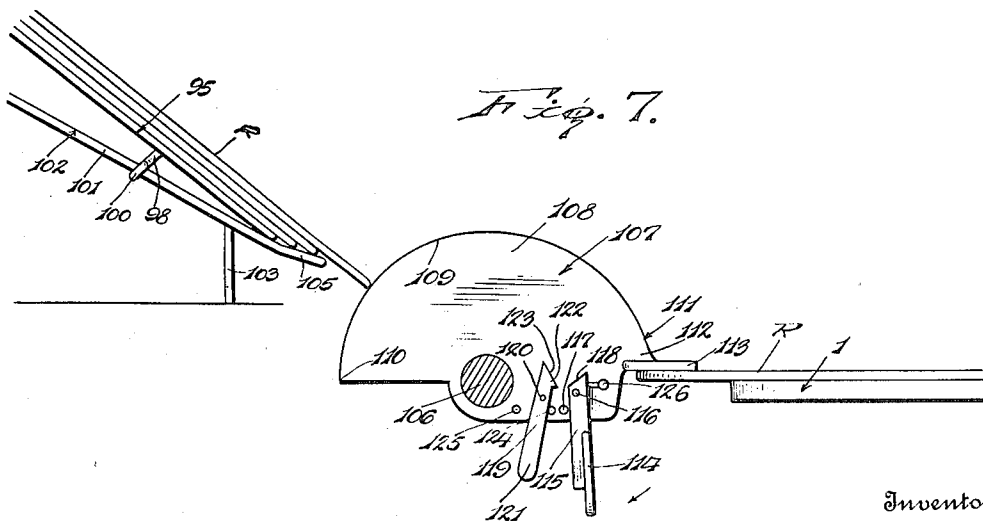
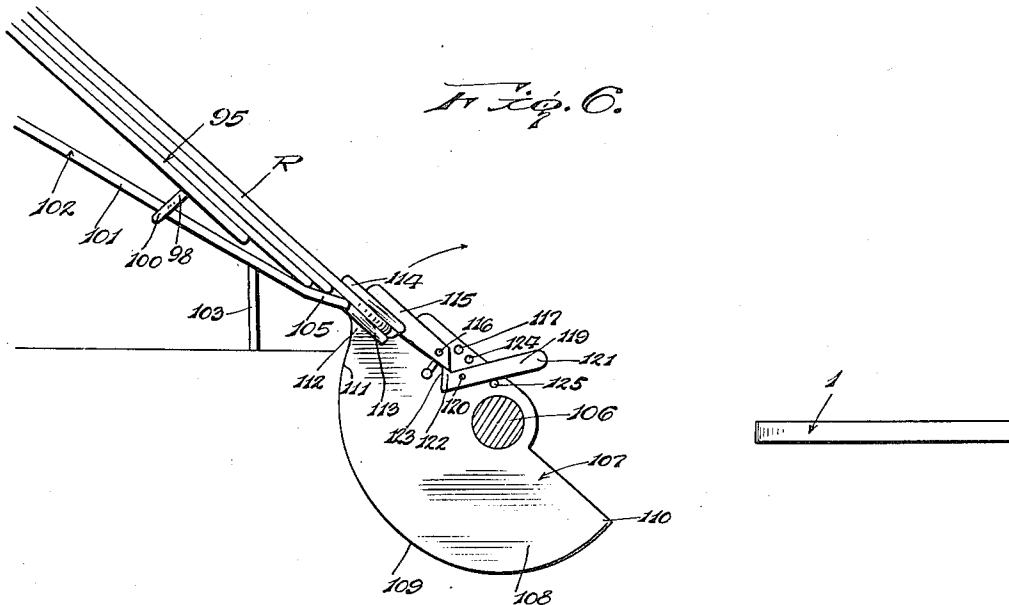
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Filed Oct. 15, 1921

7 Sheets-Sheet 5



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SOUND REPRODUCTION APPARATUS

Filed Oct. 15, 1921

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Fig. 8.

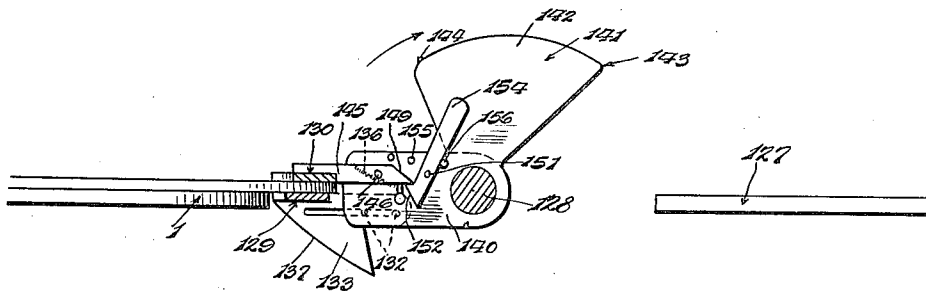


Fig. 9.

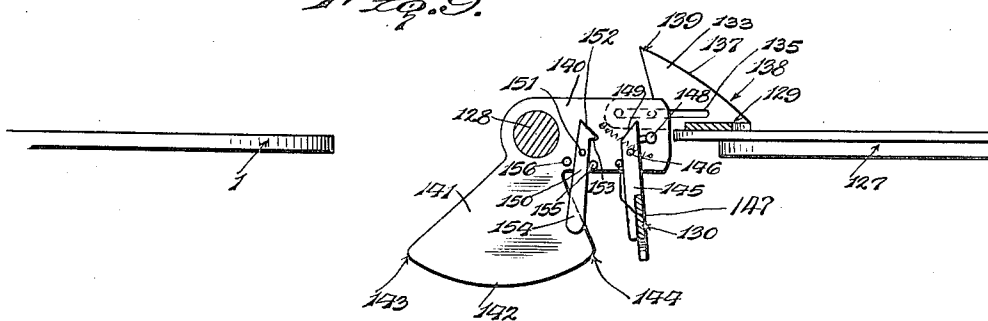


Fig. 10.

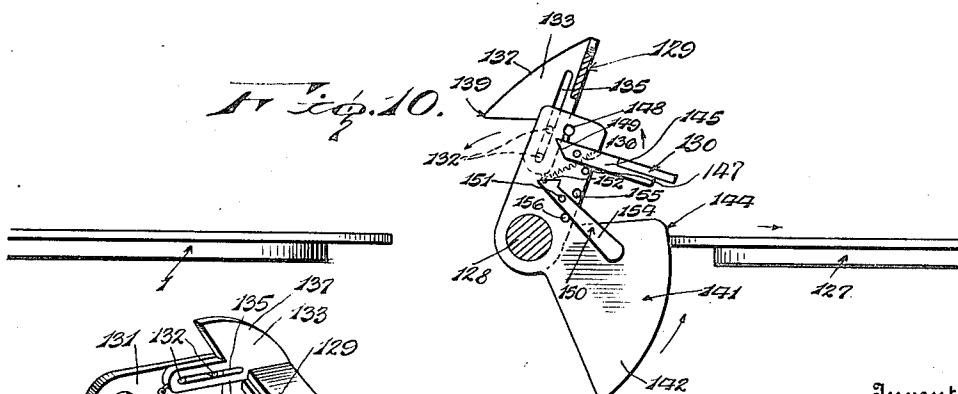
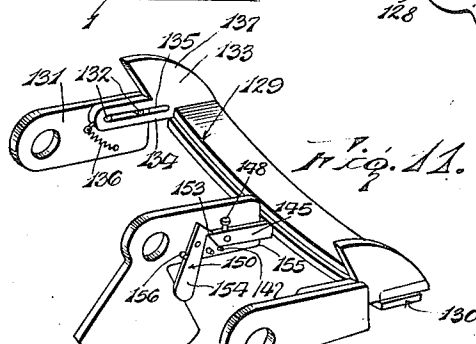


Fig. 11.



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Fig. 12.

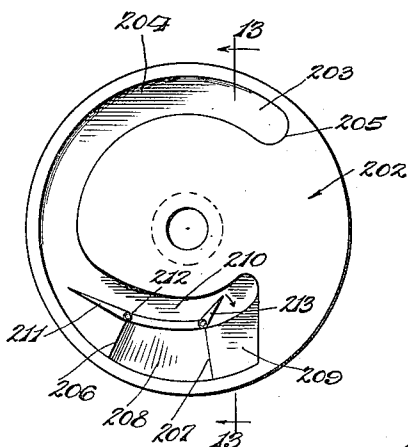


Fig. 13.

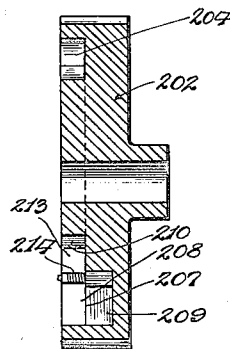


Fig. 14.

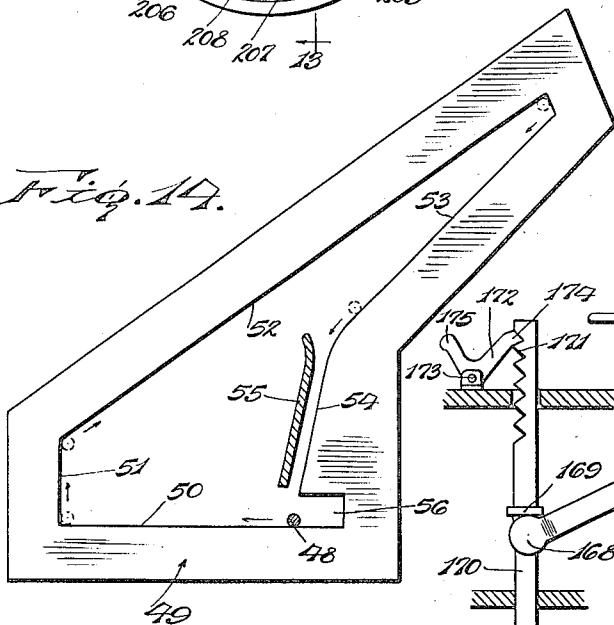
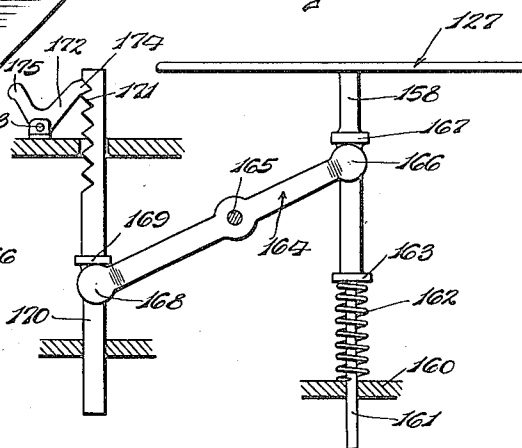


Fig. 15.



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UNITED STATES PATENT OFFICE.

FLOYD D. HUNT, OF BURLINGTON, VERMONT.

SOUND-REPRODUCTION APPARATUS.

Application filed October 15, 1921. Serial No. 507,932.

To all whom it may concern:

Be it known that I, FLOYD D. HUNT, a citizen of the United States, residing at Burlington, in the county of Chittenden and State of Vermont, have invented certain new and useful Improvements in Sound-Reproduction Apparatus, of which the following is a specification.

This invention relates to improvements in sound reproduction apparatus and has as its general object to provide an apparatus of this class adapted to automatically reproduce or play, in succession, practically any desired number of records without requiring any attention whatsoever except at the time of arrangement of the records at the beginning of the operation.

One of the more specific objects of the invention is to provide in an apparatus of this class embodying a record supporting turn table, means for automatically delivering records successively to said table and for automatically removing each record after it has been reproduced.

Another object of the invention is to provide means for automatically delivering a record to the turn table of the apparatus, means for swinging the tone arm automatically to position such that the stylus of the reproducer will engage in the outer end of the record groove, means for automatically arresting the motion of the turn table when the reproduction of the record has been completed, means for automatically swinging the tone arm, at such time, to inactive position with the reproducer clear of the turn table and the record supported thereon, and means for automatically removing the record from the turn table. In this connection the invention further has as its object to provide means for effecting the automatic repetition of the operation outlined so that practically any number of records within reason may be successfully reproduced.

Another object of the invention is to so construct the apparatus that it will perform its functions automatically, completely reproducing each and every record acted upon by it, regardless of the usual variations in the lengths of the record grooves or in other words the variation in distance between the inner ends of the grooves and the peripheries of the records.

The invention also has as one of its objects to provide a novel and highly efficient means

for effecting the transfer of the records from the storage means to the record supporting turn table and from the record supporting turn table to the receiving means, the transfer means being so constructed and operating automatically in such manner as to positively grip the record to be transferred, transfer the same, and automatically disengage from the record for subsequent repetition of its operation.

Another important object of the invention is to provide novel means for supporting the records which are to be reproduced, this means and the means which is operable to transfer the records therefrom to the record supporting turn table, being of such construction and operating in such a manner that a relatively great number of records may be disposed for reproduction prior to setting the apparatus in operation, and their successive individual separation from the pile or stack effected with certainty and in an entirely automatic manner.

Another important object of the invention is to provide a novel means for receiving and storing the records after they have been reproduced, this means being so constructed and being adapted to function automatically in such manner as to accommodate any number of records within reason and support and maintain the same in stacked relation.

The invention further has as its object to provide means whereby, if desired, any desired number of the stacked records which have been previously reproduced, may be removed from the stack without interfering with the subsequent automatic functioning of the receiving mechanism.

The invention further has as one of its objects to provide means whereby the automatic operation of the apparatus may be discontinued at the will of an attendant to the extent that any record may be reproduced repeatedly any desired number of times.

The invention has as a further object to provide means whereby the speed of rotation of the record supporting turn table may be varied as desired without in any way interfering with the automatic operation of the apparatus.

In the accompanying drawings:

Figure 1 is a top plan view of the apparatus embodying the invention;

Figure 2 is a front elevation of the apparatus, parts being shown in section;

Figure 3 is a vertical front to rear sectional view taken substantially on the line 3-3 of Figure 2;

Figure 4 is a perspective view illustrating a considerable portion of the apparatus separated from the supporting structure so as to better illustrate the construction and the arrangement of the various component parts thereof;

Figure 5 is a vertical front to rear sectional view taken substantially on the line 5-5 of Figure 1;

Figure 6 is a view in elevation illustrating the means for effecting the transfer of the records from the record storage means to the record supporting turn table, the parts being illustrated in the positions which they will assume at the time the record is gripped;

Figure 7 is a similar view illustrating the positions assumed by the parts immediately after the delivery of the record to the record supporting turn table;

Figure 8 is a sectional view illustrating the means provided for transferring a record from the record supporting turn table to the record receiving table, the parts being in the positions which they will assume after the record has been gripped and prior to its removal from the turn table;

Figure 9 is a view similar to Figure 8 illustrating the positions assumed by the parts at the moment the record is disposed upon the receiving table;

Figure 10 is a similar view illustrating the positions assumed by the parts as the record gripping and transferring means is returning from the position shown in Figure 9 to the position shown in Figure 8;

Figure 11 is a perspective view of the mechanism shown in Figures 8, 9 and 10;

Figure 12 is a view in side elevation of the control cam of the mechanism;

Figure 13 is a vertical sectional view on the line 13-13 of Figure 12;

Figure 14 is a side elevation of the means for effecting automatic swinging of the tone arm;

Figure 15 is a detail view partly in elevation and partly in section illustrating the record receiving table and the parts associated therewith.

In the drawings, for the sake of clearness, the casing for the apparatus has been omitted and the supporting structure for the various parts is illustrated only in a general and fragmentary manner but it will be understood that such details may be attended to in suitable ways in the actual manufacture of the apparatus.

The record supporting turn table is indicated by the numeral 1 and its supporting and operating shaft by the numeral 2. The numeral 3 indicates in general an electric or other suitable type of motor and the

numeral 4 indicates the shaft of this motor which is provided with a worm 5. The worm 5 meshes with a worm gear 6 fixed upon a shaft 7 supported for rotation in any suitable manner, and the said worm gear 6 has a plane friction face 8. A shaft 9 is journaled at one end in a bearing 10 capable of slight swiveling movement and also in a bearing 11 slidably mounted as at 12 upon any suitable fixed support. Beyond the bearing 11 the shaft 9 is squared as indicated by the numeral 13, and slidably fitted upon this portion of the shaft is the interiorly squared hub 14 of a friction wheel 15 the periphery of which wheel is designed to coact with the friction face 8 of the gear 6. A tension spring 16 is connected at one end to the bearing 11 and at its other end to a suitably located fixed part and holds the bearing 11 yieldably at the limit of its sliding movement in the direction of the gear 6. This spring 16 therefore serves to normally hold the periphery of the friction wheel 15 in contact with the friction face 8 of the gear 6 so that when the motor 3 is running, the shaft 7 will be rotated and rotary motion will be transmitted through the gear 6 and friction wheel 15 to the shaft 9. A bevel pinion 17 is fixed upon the end of the shaft 9 which is mounted in the bearing 10 and meshes with a bevel gear 18 fixed upon the shaft 2, rotary motion being in this manner transmitted from the shaft 9 to the said shaft 2 and finally to the record supporting turn table. Inasmuch as the bearing 11 is slidably mounted, and the bearing 10 is swiveled, the first mentioned bearing may be shifted, against the tension of the spring 16, so as to move the friction wheel 15 out of peripheral contact with the friction face of the gear 6, and when this is done power will cease to be transmitted to the shaft 9 and the record supporting turn table will be no longer rotated. For the purpose of shifting the bearing 11 so as to disengage the friction wheel 15 from the gear 6, an automatic means is provided which will presently be described, and associated therewith is a manually operable means comprising a rod 19 illustrated in Figure 3 as pivotally connected at one end as at 20 to the said bearing 11 and at its other end as at 21 to the lower end of a manually operable finger lever 22 pivotally supported as at 23 preferably within a slot 24 in the top board of the cabinet or casing within which the apparatus is arranged, the upper end of the lever 22 extending above the top board as shown in the said figure and being thus positioned for convenient manipulation. In order that, when the bearing 11 is shifted against the tension of the spring 16 to discontinue the transmission of power from the motor 3 to the turn table shaft 2, the rotation of the record supporting turn table may

be positively arrested, a brake shoe 25 is arranged opposite the periphery of the friction wheel 15 and in such position that when the wheel is moved out of engagement with the gear 6, its periphery will contact the said brake shoe 25 for the purpose stated.

As explained above, the hub of the friction wheel 15 is interiorly squared and slidably disposed upon the squared portion 13 of the shaft 9, and the said wheel is thus mounted in order that it may be adjusted across the face of the gear 6 so as to vary the speed of rotation of the shaft 9 and consequently the record supporting turn table. In order that the friction wheel may be so shifted, a rock arm 26 is pivotally mounted as at 27 and is provided at one end with a yoke 28 engaging the hub 14 of the friction wheel in the usual manner. The opposite end of the arm 26 is provided with a fork 29 in which is engaged the lower end of a manually operable finger lever 30 pivotally supported as at 31 and capable of manipulation so as to rock the arm 26 and shift the friction wheel 15 for the purpose stated.

The tone arm is indicated in general by the numeral 32 and supports the usual reproducer or sound box 33 having means for the support of the usual stylus 34, the tone arm 32 and the reproducer 33 being of that type in which the reproducer is supported in such a manner that it may have vertical swinging movement and is adapted to assume by gravity a position with its stylus 34 resting in engagement with the record surface. The tone arm 32 is provided with the usual downwardly extending neck 35 which is rotatably and vertically slidably fitted into the neck 36 of an amplifier 37, the connection between the parts 35 and 36 permitting of vertical displacement of the tone arm independent of its swinging movement, and the said tone arm being capable of being swung to substantially the position shown in Figure 1 in which position the reproducer and the stylus will be entirely clear of and laterally displaced with relation to the record supporting turn table and the record thereon, the arm being further adapted of course to have free inward swinging movement as the stylus is moved inwardly by the record groove. The travel of the record groove past the stylus of the reproducer effects gradual inward travel or swing of the tone arm toward the center of the record in the usual manner, and means is provided, which will now be described, for bodily elevating the tone arm after the stylus of the reproducer has reached the inner end of the record groove, for swinging the said arm outwardly to position clear of the record, for subsequently swinging the arm inwardly and at the same time lowering the same until the stylus has been brought to position resting upon the smooth surface portion of the

record between the record groove and the periphery of the record, and for finally moving the tone arm inwardly toward the center of the record until the stylus has been brought to position engaging in the outer portion of the record groove.

The means referred to above includes a cam 38 which is fixed for rotation upon a shaft 39 and the rotation of which is automatically controlled by a mechanism to be presently described. The high part of the periphery of the cam is indicated by the numeral 40 and is concentric to the shaft 39 upon which the cam is mounted and extends throughout slightly more than one-half the circumference of the cam and, as illustrated in Figure 3 of the drawings, from the point *a* to the point *b*. The low point of the cam is indicated by the numeral 41 and from this point the cam surface is comparatively abruptly elevated as at 42 to the point *b*. The cam is rotated in the direction indicated by the arrow in Figure 3. The numeral 43 indicates in general a supporting standard for the tone arm 32 and this standard is provided at its upper end with a collar 44 which is clamped about or otherwise secured to the neck 35 of the tone arm so as to rigidly connect the supporting standard with the arm. From its collar 44, the standard extends downwardly and, at a point adjacent the neck 36 of the amplifier 37 is provided with a lateral bend 45 which brings its lower portion 46 into vertical alignment with the axis of the neck 35 of the tone arm. The extremity of the portion 46 is provided with a preferably spherical bearing head 47 which rests in engagement with the periphery of the cam 38. It will now be evident that when the cam 38 has been rotated to such position that the bearing head 47 will rest at the low point 41 of the cam periphery, which is the rest position of the parts, the tone arm 32 and its supporting standard 43 will be in lowered position, and it is while the tone arm is in this position that the record is being reproduced. On the other hand it will be evident that when the cam 38 is rotated in the direction indicated by the arrow in Figure 3, the supporting standard 43 will be elevated thus effecting bodily displacement of the tone arm 32 in an upward direction, this movement of the tone arm taking place after the cam surface 42 rides beneath the bearing head 47. Of course in the continued rotation of the cam 38 and while the high part 40 of the cam is passing beneath the said bearing head 47, the tone arm 32 will be maintained in its bodily elevated position, and it is during this period that means provided for the purpose acts automatically to effect outward swinging movement of the tone arm to position where it will be entirely clear of the record support-

ing turn table and the record thereon and consequently so disposed that it will not in any way interfere with the removal of the record from the turn table and the disposal upon said table of another record.

In order to effect the outward swinging movement of the tone arm referred to above, an arm 48 is fixed upon the lower portion 46 of the tone arm supporting standard 43 and extends radially therefrom and works in a guiding member indicated in general by the numeral 49 and illustrated most clearly in Figure 14 of the drawings. The guiding member 49 is in the nature of a plate which may have the irregular contour illustrated in the said figure or may be of some other marginal contour as found expedient, but in any event the plate will be cut out within the bounds of its margin to provide guiding edge portions indicated by the numerals 50, 51, 52, 53 and 54. The arm 48 is illustrated in Figure 14 in one position in full lines and in various other positions in dotted lines and in its travel it takes the course indicated by the several arrows in the said figure. When the tone arm is lowered to reproducing position, which may be considered as the beginning of a cycle of operation of the apparatus as a whole, the arm 48 will assume the full line position shown in Figure 14, the guiding member 49 being of course disposed and rigidly supported in proper operative relation to the standard 43 and arm 48 as illustrated in Figure 1 of the drawings. As the tone arm moves inwardly toward the center of the record, the arm 48 will ride above the guiding edge portion 50, from the full line position shown in Figure 14, until the tone arm reaches the limit of its inward movement whereupon the arm 48 will assume a position in contact or nearly in contact with the guiding edge portion 51. At this time, in a manner which will presently be more fully explained, the cam 38 will begin to elevate the tone arm supporting standard 43 to bodily elevate the tone arm. As previously stated the reproducer is so connected with the tone arm that it may have vertical swinging movement and consequently the tone arm may be bodily elevated a predetermined distance without effecting disengagement of the stylus of the reproducer from the record surface. After this time however the continued upward displacement of the tone arm will result in the stylus being lifted clear of the record. As the standard 43 is bodily elevated, the arm 48 will of course be carried with it and will move along or in proximity to the guiding edge 51 until it comes into engagement with the guiding edge 52. The edge 51 is perpendicular to edge 50 but edge 52 is obliquely disposed and inclined upwardly from edge 51. Now as the high point of the cam 38 approaches the

bearing head 47, the standard 43 will be further elevated carrying with it the arm 48, and as this arm is now in engagement with the edge 52 and this edge is inclined in the manner stated, the arm will be caused to take the course of least resistance and will therefore be swung laterally at the same time it is being moved upwardly. The lateral swinging movement of this arm of course effects a rotation of the standard 43 about the axis of its lower portion 46, and in this manner corresponding swinging movement is imparted to the tone arm and the arm is moved to a position clear of the record supporting turn table and laterally displaced beyond the periphery thereon. As the arm 48 is moved in the direction stated it will of course ride upwardly along the edge 52 and will finally come to rest in the angle between this edge and the edge 53 and will maintain this position so long as the high part 40 of the cam is traveling beneath the head 47 of the standard 43. As the point *a* of the cam passes beneath the head 47, and the surface of the cam between this point and the low point 41 falls, the standard 43 will be permitted to lower carrying with it the arm 48 and the tone arm 32. The reproducer will of course be lowered bodily with the tone arm and in the direction of the plane of the new record which has been in the meantime automatically disposed upon the record supporting turn table, the record previously reproduced having been automatically removed from said table and transferred to the receiving table. Upon lowering movement of the arm 48, it will ride in contact with the guiding edge portion 53 and as this edge portion is inclined downwardly toward the edge portion 50, the arm 48 will take the path of least resistance and will be swung laterally in a direction the reverse of that effected by its riding in engagement with the edge 52. Therefore as the tone arm is bodily lowered, it is also swung inwardly toward the periphery of the record upon the turn table. As the lowering movement of the standard 43 is continued and the arm 48 rides from the edge 53 onto the edge 54, the stylus of the reproducer will be brought to position resting upon the smooth portion of the record surface between the record groove and the periphery of the record. The edge 54 is inclined downwardly at a slight angle to the perpendicular, the inclination being of such degree and this edge being of such length that the tone arm may move to and assume its full lowered position and the reproducer may have swinging movement to the required extent to adapt the reproducer to rest, as usual, by gravity with its stylus bearing upon the record surface, this change in position of the parts being accompanied by a further inward swinging

movement of the tone arm to such extent as is necessary to move the stylus across the said smooth peripheral portion of the record and into engagement in the outer portion of the record groove. By this time the low point 41 of said cam 38 has been brought to position beneath the head 47 and the arm 48 will then assume the full line position as shown in Figure 14, which completes the cycle of operation of this portion of the apparatus. At this point, by a means to be presently explained, the motion of the cam 38 will be arrested and the cam will remain stationary while the newly placed record is being reproduced. Inasmuch as when the arm 48 leaves the edge 53 and passes onto the edge 54 the change in direction of motion is abruptly in a downward direction, it will probably be found advisable to provide, opposite and in spaced relation to the said edge 54, a baffle 55 which may be supported in any suitable manner and which will, by offering an abutment for the arm 48, prevent any undue swinging movement of the said arm and the tone arm.

The mechanism embodied in the apparatus will be adapted for the reproduction of records of a predetermined size or diameter but it may at times become desirable to employ the apparatus, independent of its automatic functions, for the reproduction of a record of larger diameter and in order that this may be effected, the guiding member 49 has an offset recess 56 cut in its edge 54 at the lower end of said edge so that the arm 48 may enter this recess to permit of the tone arm being swung outwardly a greater distance than is required to engage its stylus in the outer end of the groove of a record of smaller size.

The necessity for the provision of means for automatically setting in motion the cam 38 and arresting its motion in consonance with the beginning and completion of the period of reproduction of the record, will be evident at this point, and there will now be described the means provided for performing this function. A bevel gear 57 is fixed upon the cam shaft 39, and a bevel pinion 58 meshes with this gear and is carried at the lower end of a shaft 59 which is vertically disposed and provided at its upper end with a bevel gear 60. A shaft 61 is mounted counter to the shaft 59 and has fixed upon it a bevel pinion 62 which meshes with the gear 60. The shaft 61 is in axial alignment with the shaft 7 and for a portion of its length is squared as indicated by the numeral 63. Slidably fitted upon this portion of the shaft 61 is the hub 64 of a friction wheel 65. This construction is clearly illustrated in Figure 5 of the drawings and it will be observed that the face of the friction wheel 65 directly opposes the face of the worm gear 6 which is opposite its

friction face 8 and is indicated by the numeral 66. It will now be apparent that when the friction wheel 65 is shifted upon the shaft 61 to bring its friction face into contact with the friction face 66 of the worm gear 6, the shaft 61 will be connected for rotation with the shaft 7 and consequently rotary motion will be imparted by way of the shaft 59 and the interposed gearing, to the cam shaft 39 and the cam 38 thereon. Automatic means is provided for shifting the friction wheel 65 and comprises a rock arm 67 pivotally mounted as at 68 and provided adjacent its pivot with a portion 69 having engagement with the hub 64 of the wheel 65 to provide for shifting of the hub upon the shaft 61 upon rocking of the arm 67. The other end of the arm is pivotally connected as at 70 to the upper end of a vertically disposed rock arm 71 pivotally supported for rocking movement as at 72 and provided at its lower end with a fork 73. The member 74 indicates in general a rocker which is pivotally mounted as at 75 and comprises a substantially horizontally disposed member 76 and an arm 77 which upstands from the member 76 above the pivot 75, this arm being formed at its upper end as at 78 for engagement in the fork 73 at the lower end of the arm 71. A spring 79 is connected at one end to one end of the member 76 of the rocker 74 and at its other end to a suitably located fixed part and exerts a downward pull upon this end of the said member of the rocker. The rocker is disposed in a plane parallel to the plane occupied by the cam 38 and with its end opposite the end to which the spring 79 is connected, located relatively close to the periphery of the said cam. A trip finger 80 is pivotally mounted near one end as at 81 upon the member 76 of the rocker 74, the pivot 81 being located near the last mentioned end of the said member, and this trip finger 80 extends beside the said member 76 and rests by gravity in engagement with a stop pin 82 which projects from the side of the said member 76. A detent 83 is pivotally mounted as at 84 upon the said side of the member 76 and is provided with a nose 85 for latching engagement with the free end of the trip finger 80. Below its pivot the detent 83 is extended downwardly as at 86 and has connected to it a wire or similar connecting element 87, this wire being likewise connected by a ring or other suitable means 88 to another wire 89 which is secured at its lower end as at 90 to any conveniently located fixed part. At its upper end the wire 89 is connected to one end of a trip arm 91 pivotally mounted between its ends as at 92 and having its other or free end located in the path of inward swinging movement of the arm 48. The shorter end of the trip finger 80 projects as at 93 be-

yond the adjacent end of the member 76 of the rocker 74 and in the path of movement of a pin 94 which is carried by the cam 38 and projects from one face thereof.

5 As heretofore stated, in the rest position of the cam 38, the bearing head 47 is in position bearing upon the periphery of the cam at the low point 41, this being the position of the parts during the period of reproduction. As the cam approaches and reaches this position in its previous cycle of movement, the pin 94 will be brought into engagement with the projecting end 93 of the trip finger 80, and as the opposite end 10 of the trip finger is engaged by the detent 83, the rocker 74 will be rocked against the tension of the spring 79 and this movement of the rocker will, through the intermediate connections 77, 71 and 67, effect shifting of the friction wheel 65 out of engagement 20 with the worm gear 6 so that transmission of motion to the cam 38 through the shaft 39 will be discontinued. Upon cessation of movement of the cam 38, the cam 25 will be in position with the bearing head 47 resting in engagement with the low point 41 of its periphery and the parts will maintain this relation during the period of reproduction. However, 30 as the tone arm approaches the limit of its inward swinging movement, the arm 48, which moves in consonance therewith, will ride upon the free end of the trip arm 91 thereby exerting a pull upon the wire 89 35 tending to straighten this wire (the pull upon the wire exerted by the wire 87 normally distorting it from a straight line as illustrated in Figures 3 and 4) and the pull will therefore be exerted by the wire 40 87 to disengage the detent 83 from the free end of the trip finger 80 thereby releasing the rocker 74 and permitting the said rocker to be returned to its normal position through the medium of the spring 79. As 45 the rocker moves to this position, its arm 77 will be swung in such manner as to rock the arm 71 and the arm 67 and shift the friction wheel 65 into clutch with the worm gear 6 thereby establishing drive connection between the shaft 7 and the cam shaft 39 and 50 setting in motion the cam 38. Release of the trip finger 80 of course permits the pin 94 upon the cam 38 to pass the end 93 of the said trip finger.

55 There will now be described the means provided for supporting the records to be reproduced, for transferring said records from the supporting means to the record supporting turn table, and for transferring 60 the records from the said turn table to the record receiving means. This portion of the apparatus, so far as it relates to the record storage means, comprises a record supporting table indicated in general by the 65 numeral 95. This table preferably com-

prises a plate 96 which may be of any desired marginal contour and of any desired dimensions, the plate however being of a width substantially equal to the diameter of the records which the apparatus is designed 70 to reproduce, and being provided at its lateral edges with upstanding guide flanges 97 between which the records, indicated by the reference letter R are confined when arranged upon the upper surface of the 75 plate 96 in the manner which will presently be explained. The plate 96 is provided upon its underside with supporting legs 98 and 99 having forks 100 at their lower ends. The legs 98 are shorter than the legs 99, 80 and the forks 100 of the two sets of legs rest slidably in engagement with the side rails 101 of a supporting frame structure indicated in general by the numeral 102, the said rails 101 being supported by standards 85 103 and 104. By reference to Figures 1 and 2 of the drawings it will be observed that the record storage table 95 and its supporting frame structure 102 are located at one side of the record supporting turn table 1. 90 It will also be observed, particularly by reference to Figure 2, that the supporting standards 103 of the frame structure 102 are shorter than the standards 104 so that the rails 101 are inclined downwardly in the 95 direction of the plane of the said turn table 1. Likewise the table 95 is so arranged upon the supporting frame structure that its shorter legs 98 will be located next adjacent the record supporting turn 100 table. The lower end portions of the rails 101 are deflected at an obtuse angle to their upper portions in an upward direction as indicated by the numeral 105 and these 105 deflected portions constitute retaining fingers for engagement by the peripheries of the records disposed upon the table 95.

The means provided for removing the records from the pile upon the table 95 and depositing them upon the record support- 110 ing turn table 1 includes a shaft 106 which, by means to be presently described, is to be rotated in consonance with the other mechanisms of the apparatus. This shaft supports and actuates a record gripping 115 means which functions between the record storage table 95 and the record supporting turn table 1. The record gripping means comprises a fixed gripping member indicated in general by the numeral 107 and 120 consisting of a disk 108 which is fixed in any suitable manner upon the shaft 106 and which is of approximately semi-circular form, the disk having an arcuate peripheral portion 109 which is eccentric to the shaft 125 106 and which has a gradually increasing radius from its low point, indicated by the numeral 110 to its high point indicated by the numeral 111 where it is curved out- 130 wardly along a reverse arc to form a nose

112. At this point the disk 108 is provided with a record gripping jaw 113 integrally connected at its intermediate portion with the disk and extending transversely of the plane thereof and of arcuate form and having a degree of curvature corresponding substantially to that of the periphery of the records to be handled. For coaction with the gripping jaw 113, there is provided a movable gripping jaw 114 likewise of arcuate form and corresponding in its general contour to that of the jaw 113. The jaw 114 is supported at the free end of an arm 115 which is pivoted at its other end as at 116 to one side of the disk 108 at such a point that the arm 115 may be swung upon the pivot to bring the jaw 114 into coactive relation to the jaw 113 as shown in Figure 6 or may be swung in the reverse direction to cause the jaw 114 to recede from or move out of active relation to the jaw 113. The swinging movement of the arm 115 in the latter direction is limited by a stop pin 117 upon the side of the disk 108, and the pivoted end of the said arm is preferably beveled as at 118 to adapt it for coaction with a gravity detent which is indicated by the numeral 119 and which is pivotally mounted as at 120 upon the said side of the disk 108. The pivot 120 for the gravity detent 119 is located nearer one end than the other of the said detent so that the detent has a normal tendency to overbalance in one direction, its heavier end being indicated by the numeral 121. The opposite end of the detent is provided with a shoulder 122 and this end of the detent is likewise preferably beveled as at 123, in advance of the shoulder. Stop pins 124 and 125 upon the face of the disk 108 at opposite sides of the portion 121 of the detent 119 serve to limit the movement of the detent upon its pivot in either direction. Preferably a counterweight element 126 is provided upon the end 118 of the arm 115.

In disposing the records R upon the record storage table 95, the desired number of records are placed upon the table in shingled relation, and the table will be adjusted longitudinally of the rails 101 of the supporting frame structure 102 to such initial position that the uppermost record of the stack will project beyond the deflected portions 105 of the said rails and will rest at its periphery in engagement with the eccentric peripheral portion 109 of the disk 108 as shown in Figure 7 of the drawings, one or more of the records immediately beneath the uppermost record of the stack resting at their peripheries against the deflected portions or retaining fingers 105 of the rails 101. When the member 107 is at rest it will occupy approximately the position shown in Figure 7 except that it will, through a slight rotation of the shaft 106 in

a counter-clockwise direction, be rotated a short distance backwardly from this position and in the direction the reverse of that indicated by the arrow in the said Figure 7. In the period in the cycle of operation of the apparatus where the records are to be transferred, the shaft 106 will be rotated in a counter-clockwise direction correspondingly rotating the member 107, and the eccentric peripheral portion 109 of the member will ride against the periphery of the uppermost record and because of the eccentric curvature of the same, will act against the record to slightly move or shuck the pile of records upon the record storage table thus influencing the legs 98 and 99 of the record storage table to move downwardly a short distance along the rails 101 of the supporting frame structure 102. The rotation of the member 107 in the direction stated is continued until the nose 112 of the member rides past the periphery of the said uppermost record and the engaging face of the jaw 113 is brought into the plane of the under side of this record whereupon the record will slip or slide downwardly and rest at its peripheral portion upon the engaging face of this jaw. In the meantime the detent 119 has assumed by gravity a position with its portion 121 resting in engagement with the stop pin 125, and the jaw 114 and its supporting arm 115 will at this time drop by gravity to such position that the jaw 114 will overlap the peripheral portion of the jaw 113. In this movement of the jaw 114 and its arm 115, the beveled end 118 of the arm will ride over the beveled end 123 of the detent 119 and engage behind the shoulder 122, and in this manner the jaw 114 is locked in gripping engagement with the peripheral portion of the record. The shaft 106 is then rotated in a clockwise direction as indicated by the arrow in Figure 6 of the drawings and therefore in the general direction of the record supporting turn table 1 carrying with it the record which has been gripped and depositing the same upon the said turn table. When the shaft 106 has been rotated to the limit of its movement in this direction the member 107 will assume the position shown in Figure 7 of the drawings, having been moved thereto from the position shown in Figure 6. During the period of transfer of the record the leverage exerted by the weight of the same against the jaw 114 has served to bind the end 118 of the arm 115 against the shoulder of the detent 119 with sufficient force to maintain the parts in their engaged relation but at the moment the record is deposited by the record supporting turn table, the jaw 114 and its arm 115 are relieved of this stress and the detent 119 will then swing by gravity into position resting against the stop

pin 124 and out of restraining engagement with the arm 115 thus permitting this arm and the jaw 114 to swing downwardly by gravity out of gripping engagement with the record. Through the operating means for the shaft 106 which, as before stated, will presently be described, the shaft and consequently the member 107 is now given a slight rotation in a counter-clockwise direction, bringing the jaw 113 clear of the record.

The record receiving table is indicated in general by the numeral 127 and its construction and the manner in which it functions will presently be specifically described. The means provided for removing from the turn table 1 a record which has been reproduced, and depositing said record upon the receiving table functions between the record supporting turn table and receiving table which latter is located at that side of the turn table opposite the side at which the record storage table 95 is located. This means comprises a shaft 128 which is rotated in consonance with and by the same mechanism which operates to rotate the shaft 106, and mounted upon the said shaft 128 is a record gripping means comprising a relatively fixed jaw which is indicated in general by the numeral 129 and a movable jaw for coaction therewith indicated in general by the numeral 130. These jaws are of arcuate form and have substantially the same degree of curvature as the periphery of the record to be handled and they are designed to coact in substantially the same manner as the jaws 113 and 114 previously described. The numeral 131 indicates arms which are fixed in spaced relation upon the shaft 128 and which are provided upon their opposing sides each with a pair of spaced supporting and guiding pins 132 arranged parallel to one edge of the respective arm 131. The fixed jaw 129 is provided at its ends with cams 133 preferably integral therewith and provided with rearwardly extending shanks 134 each formed with a slot 135 receiving the pins 132 on the respective arm 131. In this manner the fixed jaw 129 is supported between the arms 131 for bodily swinging movement with said arms, and the pins 132 furthermore support this jaw for sliding movement upon the arms so that it may be moved inwardly toward the shaft 128 or outwardly from said shaft. Springs 136 are connected to the ends of the shanks 134 and to the arms 131 near the outer ends of the said arms and yieldably hold the jaw 129 shifted in an outward direction, inward shifting movement of the jaw being against the tension of these springs. Each of the cams 133 is provided with a cam edge indicated by the numeral 137, and these cam edges are eccentric to the axis of the shaft 128. The cams 133 pro-

ject from the plane of the jaw 129 and their cam edges 137 are curved from points coincident with the outer edge of the said jaw and in fact merge with said edge, the high points of the cam edges being indicated by the numeral 138 and the low points by the numeral 139.

An arm 140 is fixed upon the shaft 128 between the arms 131 and supports a cam 141 the working edge of which is indicated by the numeral 142 and has its high point indicated by the numeral 143 and its low point by the numeral 144. The movable jaw 130 is supported at its intermediate portion by an arm 145 pivotally mounted as at 146 upon one side of the arm 140 near the outer end of the latter, and the arm 145 is adapted to be swung upon its pivot to bring the jaw 130 into coactive relation to the jaw 129 or to move the jaw 130 out of such relation, the movement of the arm in this latter direction being limited by a stop pin 147 upon the side of the arm 140. The arm 145 is preferably provided with a counterweight 148 at one side of its pivot 146 and this pivot is located nearer one end of the arm than the other, the shorter end of the arm being beveled as at 149. A detent 150 is pivotally mounted near one end as at 151 upon the side of the arm 140 and at its said end is beveled as at 152 and formed with a shoulder 153. The opposite end portion of the detent is longer than the shoulder and is indicated by the numeral 154 and has sufficient weight to over-balance the detent. The pivotal movement of the detent is limited by stop pins 155 and 156 upon the side of the arm 140.

When in a position of rest the parts comprising the gripping device above described will assume approximately the positions shown in Figure 9 except that the shaft 128 and the parts supported thereby will be rotated in a counter-clockwise direction a short distance. At the proper period in the cycle of operation of the apparatus, the gripping device described operates automatically to grip the record which is supported upon the record supporting turn table and which has been reproduced, and to remove this record from the said table and deposit the same upon the receiving table 127. The first operation involves rotation of the shaft 128 in a counter-clockwise direction through an arc of substantially 180° and as the shaft rotates in this manner the cam edges 137 of the cams 133 will ride against the periphery of the record upon the turn table and these cams and the relative fixed jaw 129 which is supported between them, will be shifted inwardly toward the shaft 128 against the tension of the springs 136 until the edge of the jaw 129 passes the edge of the record whereupon the said jaw will be projected by the springs 136 to position lying

beneath the periphery of the record. As the shaft is rotated in the manner stated the detent 150 will assume a position resting by gravity against the pin 156 substantially as illustrated in Figure 8 and by the time the shaft reaches the position shown in said figure, the jaw 130 and the arm 145 by which it is supported will drop by gravity into engagement with the upper side of the peripheral portion of the record. In this movement of the jaw 130 and arm 145, the beveled end 149 of said arm will ride past the beveled end 152 of the detent 150 and seat behind the shoulder 153. In this manner the jaw 130 is locked in gripping engagement with the periphery of the record. The shaft 128 is then rotated in a clockwise direction and the record gripped between the jaws 129 and 130 will be carried over and deposited upon the surface of the table 127 or upon the uppermost record upon this table if other records have previously been deposited thereon. Up to this time the engagement between the end 149 of the arm 145 and the shoulder 153 of the detent 150 has been maintained through the leverage exerted by the record against the jaw 130 but when the record is deposited upon the receiving table 127, the jaw 130 and arm 145 are relieved of this stress and the detent 150 then immediately swings by gravity to position resting against the stop pin 155 and disengages from the end of the arm 145 thus permitting this arm and the jaw supported thereby to swing downwardly out of gripping engagement with the record as illustrated in Figure 9 of the drawings.

The receiving table 127 is designed to be depressed a distance equal to the thickness of a record as each succeeding record is deposited thereon and this movement of the table, which will presently be more specifically described, is effected through the pressure exerted against the upper side of the record by the jaw 129, this jaw being located a sufficient distance in advance of the jaw 130, when the jaws are in coactive relation, to adapt it to exert such pressure at a point above the peripheral portion of the table 127 before the jaw 130 has cleared the periphery of the said table.

It is intended that the records shall be deposited upon the table 127 in stacked relation, and the said table is preferably equal in diameter to the diameter of the records, and in order that the records may be maintained in a uniform stacked relation, abutment and guiding pins 157 are arranged in vertical position beside the periphery of the table at spaced points in said periphery and serve as abutments for the peripheries of the records when deposited upon the table. However at the moment of its deposition upon the table 127, the record will project at its periphery a

short distance beyond the periphery of the table and it is therefore necessary to shift the record upon the table to bring its periphery into engagement with the stop pins 157 and thereby cause it to assume its proper stacked position and this is effected through the medium of the cam 141 upon the rotation of the gripping means to remove another record from the record supporting turn table. By reference to Figure 10 it will be observed, in this connection, that as the gripping means is rotated in the direction stated the cam edge 142 will ride from its low point 144 to its high point 143 against the periphery of the record which has been deposited upon the receiving table 127 and will shift the record in the manner stated.

The record receiving table 127 is supported upon the upper end of a standard 158 supported for vertical sliding movement in any suitable manner as for example by guide bearings 159 and 160. The lower portion of the standard 158 which works in the bearing 160 is reduced in diameter as indicated by the numeral 161, and a spring 162 is fitted onto this portion of the standard and bears at its lower end upon the bearing 160 and at its upper end against a collar or shoulder 163 upon the said standard. This spring 162 serves to yieldably support the table 127 in an elevated position but as previously stated the table is to be depressed a distance equal to the thickness of a record as each succeeding record is deposited thereon, and in order that the table may be restrained against upward or return movement after each depression thereof, means is provided which will now be described. The numeral 164 indicates a rocker which is pivotally supported as indicated by the numeral 165 at one side of the standard 158 and is provided at one end with a yoke 166 embracing said standard and seating beneath a collar 167 thereon. The other end of the rocker 164 is provided with a similar yoke 168 which engages beneath a collar 169 upon a locking bar 170 which bar is mounted in any suitable manner for vertical sliding movement. The bar 170 is provided along one side with a series of rack teeth 171, and a pawl 172 is pivotally mounted as at 173 beside the bar 170 and has a tooth 174 for coaction with the rack teeth 171. It will now be evident that when the table 127 is displaced against the tension of the spring 162, movement will be imparted to the rocker 164 to shift the bar 170 upwardly a distance of one tooth whereupon the tooth 174 of the pawl 172 will, by its engagement with the teeth 171, hold the bar in this position and thus restrain the standard 158 from upward or return movement under the action of the spring 162. The pawl 172 is preferably provided with a finger piece 175 whereby it

may be manually disengaged from the rack teeth 171 so as to permit of upward movement of the standard 158 and the receiving table 127 supported thereby. This will of course be done when a pile of records which have been deposited upon the receiving table are removed or when a greater or less number of the pile or stack are removed and in order to in either event limit the upward movement of the table 127 to the extent that its upper surface, or the upper surface of the uppermost record remaining thereon will be brought to the proper level to receive subsequently deposited records, a gage device such as illustrated in Figures 1 and 2 of the drawings is employed. This device is indicated in general by the numeral 176 and comprises an arm 177 extending radially from the upper end of a spindle 178 whereby it is adapted to be swung in a horizontal plane. The spindle 178 is mounted beyond the periphery of the table 127, and the arm is adapted to be swung to position overlying the table as shown in dotted lines in Figure 1 or to position clear of the table as shown in full lines in said figure. The arm is provided at its free end with a head 179 having a flat under-surface 180 adapted to be engaged by the upper surface of the table 127 or the upper side of the uppermost record upon said table, when the table is permitted to rise through the influence of the spring 162. Thus all of the records may be removed from the record receiving table at any time or any desired number of records may be removed and after such removal the arm 177 will be swung to position overlying the table and the pawl 172 will then be disengaged to permit the spring 162 to elevate the table until its upper surface or the upper side of the uppermost record thereon is brought into engagement against the flat face 180 of the head 179 at which time the table will be in proper position for the deposition thereon of subsequently reproduced records. Of course after the table has been adjusted in the manner stated and before the apparatus is again set in operation, the arm 177 will be swung to position clear of the table so as not to interfere with records being deposited thereon.

The means whereby the shafts 106 and 128 are rotated in timed relation so as to actuate the record transferring devices associated therewith, will now be described. Pinions 181 and 182 are fixed respectively upon the shafts 106 and 128 and mesh respectively with a series of rack teeth 183 and 184 formed upon a shiftable rack bar 185. The pinion 181 is of slightly larger diameter than the pinion 182, the pinions being thus proportioned for the reason that while the shaft 128 is to be rotated through an arc of substantially 180° in order to effect transfer of the record from the rec-

ord supporting turn table to the record receiving table which tables are located in the same horizontal plane, the shaft 106 requires to be rotated a less angular distance inasmuch as the record storage table is inclined with relation to the plane occupied by the record supporting turn table. Reciprocation of the rack bar 185 is effected through the cam 38 and an intermediate connection comprising a rock lever 186 pivotally supported for rocking movement as at 187 and provided below its pivot with an arm 188 having a longitudinal slot 189 in which works a pin 190 upon the face of the said cam 38. The pin 190, working in the slot 189, acts as a crank to impart rocking motion to the lever 186 and the upper end of this lever engages a fork 191 provided at the end of one arm 192 of an angle lever 193 which is supported for rocking movement as at 194. The other arm of this lever indicated by the numeral 195, is formed with an opening 196 rotatably and slidably receiving a connecting pin 197, this pin being provided at its upper end with a preferably milled head 198 whereby it may be adjusted in the opening 196. The wall of the opening is formed with a longitudinally extending groove 199, and the pin 197 is provided with a laterally projecting stud 200 which is adapted to seat in said groove 199 when the pin is rotated to a predetermined position and lowered in the opening 196. The pin in this position projects at its lower end into a slot 201 formed transversely in a broadened portion of the rack bar 185. It will now be evident that as the cam 38 makes a complete revolution, the lever 186 will be rocked to the limit of its movement in one direction and then in a reverse direction. The angular movement thus imparted to the angle lever 193 will result in a reciprocation of the rack bar 185 first in one direction and then in the opposite direction. Therefore the shafts 106 and 128 will be rotated first in a counter-clockwise direction to adapt the record gripping means which are associated therewith, to respectively grip records located upon the record storage table and record supporting turn table, the said shafts being then rotated in a clockwise direction to transfer the said records and deposit them respectively upon the record supporting turn table and receiving table. Should it be desired to temporarily discontinue the automatic operation of the apparatus as, for example, when it is desired to repeatedly reproduce any particular record, this may be accomplished by elevating the pin 197 in the opening 196 until the stud 200 is located above the plane of the upper side of the arm 195 whereupon the pin may be rotated to bring the stud out of registration with the upper end of the groove 199 and to position resting upon

the upper side of the said arm and thus supporting the pin in its elevated position and with its lower end out of engagement in the slot 201. The parts having been thus adjusted, no motion will be imparted to the rack bar 185 and consequently there will be no transfer of the records from one table to another.

During the period of operation of the apparatus to effect transfer of the records, it is of course essential that the record supporting turn table be stationary and it is equally essential that at the termination of this period motion shall again be imparted to the said turn table to effect reproduction of the record which has been placed thereon. In order that this may be accomplished means is provided for automatically actuating the rod 19 which is connected to the bearing 11 for the shaft 9 so as to move the friction wheel 15 into and out of engagement with the friction face 8 of the worm gear 6 and likewise into and out of engagement with the brake shoe 25. This means comprises a control cam which is indicated in general by the numeral 202 and which is fixed upon the shaft 128 for rotation therewith. This cam is best illustrated in Figures 12 and 13 of the drawings and is provided with a groove 203 formed in one face thereof and extending on an arc concentric to the axis of rotation of the cam. This groove 203 comprises a portion 204 which is of uniform depth from one end 205 of the groove to substantially the point indicated at 206. From this point to the point indicated by the numeral 207, the bottom wall of the groove is inclined as at 208 to gradually increase the depth of the groove, the groove terminating in a portion 209 of greater depth than any other portion of the groove. The groove is provided adjacent the point 206 with an eccentric branch 210 of the same depth as the portion 204 of the groove. A gate 211 is pivotally mounted as at 212 between the groove and its branch 210 substantially at the point 206 and adapted to assume by gravity substantially the position shown in Figure 12 when the cam is in the position shown. The gate 211 extends between the groove 203 and its branch 210 and from its pivot 212 in a direction away from the portion 208 of the groove. A second gate 213 is mounted for swinging movement within the branch 210 at a point near the end thereof and opposite the point 207 and is yieldably held by means of a spring 214, associated with its pivot, in substantially the position shown in Figure 12 of the drawings, it being adapted to have pivotal movement against the tension of the spring 214 in the direction indicated by the arrow in Figure 12 under conditions which will presently be described. The cam 202 is designed to act upon a rock arm 215 which is pivotally

mounted between its ends as at 216 and has one end pivotally connected as at 217 with the rod 19. Near its other end the rock arm 215 is formed in sections and the outer section, indicated by the numeral 218, is pivotally connected with the main or inner section as at 219 in such manner that the section 218 may have swinging movement about an axis at right angles to the axis of the pivot 216. The free end of the section 218 of the rock arm 215 is deflected laterally as at 219^a and provided with a rounded terminal 220 which rides against the surface of the bottom wall of the groove in the cam 202. During the period of reproduction of any record, the record transferring devices and therefore the shaft 128 and cam 202, will be at rest, and under these conditions the end 220 of the rock arm 215 will rest in the deep portion 209 of the cam groove so that the spring 16 will be free to maintain the friction wheel 15 in driving contact with the face of the gear 6. However upon initial rotation of the shaft 128, the cam 202 will be rotated in a counter-clockwise direction causing the portion 208 of the bottom wall of the groove to ride against the said end of the rock arm 215 rocking this arm and acting upon the rod 19 to shift the shaft 9 and move the friction wheel 15 out of driving engagement with the face of the gear 6, the periphery of the said friction wheel being at the same time brought into contact with the brake shoe 25. As the cam 202 continues to rotate, the bottom wall of its portion 204 will ride against the end of the arm 215 until the end 205 of the groove substantially reaches the said end of the arm whereupon the cam will be rotated in the reverse or a clockwise direction until the free end of the gate 211 has been brought opposite the said end 220 of the rock arm 215. This gate will now deflect the end of the arm, and because of the joint 219 therein, the section 218 of the arm may swing upwardly the required distance to permit the extremity of the arm to travel in the branch 210 of the cam groove. In the continued rotation of the cam, the gate 213 will ride beneath the end of the section 218 of the arm and the gate will be deflected against the tension of the spring 214, and after the said end of the said section of the arm has past the said gate it will drop into the deep portion 209 of the cam groove thus permitting the spring 16 to act immediately to shift the shaft 9 to bring the friction wheel 15 into driving contact with the face 8 of the gear 6 and thus setting the turn table in motion.

The operation of the apparatus is as follows:

If the record receiving table 127 has been depressed or is not in proper position for functioning of the apparatus, the arm 176 is swung to position to extend above the

said table, and the pawl 172 is then disengaged from the rack 171, permitting the spring 162 to act to elevate the table until its upper surface strikes against the flat face 180 of the head 179 whereupon the pawl is released for reengagement with the rack, and the table will be locked in this position. The arm 176 is then swung clear of the table and the table will then be in position to receive the first record reproduced. Any desired number of records are then placed upon the storage table 95 in the shingled relation heretofore described and shown in Figures 6 and 7 of the drawings, and the apparatus is set in operation by starting the motor. As the stylus of the reproducer approaches the center of the record or in other words nears the end of the period of reproduction, the arm 48 will ride against the trip arm 91 tripping the detent 83, releasing the arm 80, and permitting the spring 79 to actuate the rocker 74 and, by the intermediate connections 71 and 67, effect movement of the friction wheel 65 into driving engagement with the worm gear 6 thus setting in motion the cam 38. As the cam rotates and its portion 42 rides beneath the lower end of the supporting standard 43, this standard will be gradually elevated and the tone arm will be bodily moved in a corresponding direction. However the reproducer is connected with the tone arm, as previously stated, in such manner as to permit of swinging movement with relation to the said arm, and therefore the stylus will be maintained in reproducing engagement with the record groove until the inner end of the groove passes the stylus and the reproduction of the record is thus completed. By this time the high part of the cam 38 will ride beneath the lower end of the standard 43 thus further elevating the standard and the tone arm and finally bringing the stylus of the reproducer clear of the record. In this movement of the standard the arm 48 will be moved upwardly along the guiding edge portion 51 of the member 49, and striking the edge portion 52, will be influenced by the inclination of this edge portion to swing laterally thus effecting bodily swinging movement of the tone arm outwardly to position clear of the record. In the meantime, and in the rotation of the cam 38 the rack bar 185 will be shifted so as to effect operation of the record gripping devices associated with the shafts 106 and 128 in the manner previously described. Thus the record which has been reproduced will be lifted from the record supporting turn table, which in the manner previously explained has been brought to rest, and will be deposited upon the receiving table, and a new record will be lifted from the stack upon the storage table and deposited upon the turn table.

After deposition of the record upon the record supporting turn table, the tone arm will be swung inwardly and gradually lowered due to the travel of the arm 48 down the guiding edge portion 53 of the member 49, and the stylus of the reproducer will be brought into contact with the smooth portion of the record between the record groove and the periphery of the record, and, as the arm 48 passes down the edge portion 54, the lowering movement of the tone arm will be completed and likewise the arm will be further swung inwardly a sufficient distance to move the stylus across the said smooth portion of the record and into the outer end of the record groove. At this time the record transferring devices have been restored to normal position and the engaging end of the rock arm 215 has dropped into the deep portion 209 of the groove in the cam 202 and the shaft 9 has been shifted so as to bring the friction wheel 15 into driving engagement with the gear 6 whereupon the turn table will be set in motion and the operation above described will be repeated.

Having thus described the invention what is claimed as new is:

1. In sound reproduction apparatus, a record supporting turn table, automatic means for delivering a record to said table prior to reproduction and removing it therefrom after reproduction, reproducing means including a bodily displaceable and swinging tone arm and a reproducer carried thereby, a supporting standard member for the said tone arm, means operating automatically to elevate the said standard and thereby elevate the arm at the completion of the period of reproduction, and means influencing swinging movement of the arm outwardly to position clear of the record upon its elevation comprising a relatively fixed member having an inclined guiding surface, and an arm extending from the standard member and coacting with said surface, the said relatively fixed member having a second inclined guiding surface for coaction by the arm upon the standard to influence inward swinging movement of the tone arm as the standard is permitted to lower.

2. In sound reproduction apparatus, a record supporting turn table, automatic means for delivering a record to said table prior to reproduction and removing it therefrom after reproduction, reproducing means including a bodily displaceable and swinging tone arm and a reproducer carried thereby, a relatively fixed guiding member having relatively inclined guiding surfaces, a standard member operatively connected with the tone arm, an arm projecting from the said standard member in operative relation to the guiding member and for coaction with the guiding surfaces thereof, and automatic

means coacting with the standard member for elevating the same prior to removal of the record and for lowering the same subsequent to deposition of a new record, the coaction of the arm upon the standard member with one of the inclined guiding surfaces effecting outward swinging movement of the tone arm upon elevation thereof, and coaction of the said arm upon the standard member with another of said surfaces influencing inward swinging movement of the tone arm upon lowering thereof.

3. In sound reproduction apparatus, a record supporting turn table, automatic means for delivering a record to said table prior to reproduction and removing it therefrom after reproduction, reproducing means including a bodily displaceable and swinging tone arm and a reproducer carried thereby, a relatively fixed guiding member having relatively inclining guiding surfaces, a standard member operatively connected with the tone arm, an arm projecting from the said standard member in operative relation to the guiding member and for coaction with the guiding surfaces thereof, and automatic means coacting with the standard member for elevating the same prior to removal of the record and for lowering the same subsequent to deposition of a new record, the coaction of the arm upon the standard member with one of the inclined guiding surfaces effecting outward swinging movement of the tone arm upon elevation thereof, and coaction of the said arm upon the standard member with another of said surfaces influencing inward swinging movement of the tone arm upon lowering thereof to position to bring the stylus of the reproducer into contact with the record surface, the coaction of the arm upon the standard member with another of said guiding surfaces influencing further inward swinging movement of the tone arm to move the said reproducer stylus across the peripheral portion of the surface of the record and into the record groove.

4. In sound reproduction apparatus, a record supporting turn table, automatic means for delivering a record to said table prior to reproduction and removing it therefrom after reproduction, reproducing means including a bodily displaceable and swinging tone arm and a reproducer carried thereby and capable of limited lowering movement by gravity independent of the tone arm, a standard connected with the tone arm, means for elevating and lowering the standard whereby to elevate and lower the tone arm, an arm projecting from the standard, and means influencing swinging movement of the arm in the raising and lowering of the standard comprising a relatively fixed guiding member having a surface along which the arm may travel in an upward direction

upon an initial elevation of the standard whereby to initially elevate the tone arm while the stylus of the reproducer remains in reproducing contact with the record surface, the said member having an inclined surface along which the arm is adapted to ride in the continued upward displacement of the standard whereby to influence swinging movement of the arm in a direction to swing the tone arm outwardly clear of the record, the said member having another guiding surface along which the arm is adapted to ride in the lowering movement of the standard and thereby influence swinging movement of the arm in a direction to effect inward swinging movement of the tone arm to coactive relation to the record surface.

5. In sound reproduction apparatus, a record supporting turn table, automatic means for delivering a record to said table prior to reproduction and removing it therefrom after reproduction, reproducing means including a bodily displaceable and swinging tone arm and a reproducer carried thereby and capable of limited lowering movement by gravity independent of the tone arm, a standard connected with the tone arm, means for elevating and lowering the standard whereby to elevate and lower the tone arm, an arm projecting from the standard, and means influencing movement of the arm in the raising and lowering of the standard comprising a relatively fixed guiding member having a surface along which the arm may travel in an upward direction upon an initial elevation of the standard whereby to initially elevate the tone arm while the stylus of the reproducer remains in reproducing contact with the record surface, the said member having an inclined surface along which the arm is adapted to ride in the continued upward displacement of the standard whereby to influence swinging movement of the arm in a direction to swing the tone arm outwardly clear of the record, the said member having another guiding surface along which the arm is adapted to ride in the lowering movement of the standard and thereby influence swinging movement of the arm in a direction to effect inward swinging movement of the tone arm to coactive relation to the record surface, the said guiding member having another guiding surface along which the arm upon the standard is adapted to ride and which is so disposed as to permit lowering of the arm and the standard by which it is carried and simultaneously effect further swinging movement of the arm in a direction to inwardly swing the tone arm and thereby move the stylus of the reproducer across the peripheral portion of the record surface and into the record groove.

6. In sound reproduction apparatus, a rec-

ord supporting turn table, reproducing means comprising a tone arm capable of being elevated and lowered and swung into and out of cooperative relation to a record upon the turn table, automatic means operable to deposit a record upon said table and remove the same therefrom, a member rigidly connected with the tone arm, a controlling actuating element, means for actuating the same, the said element coacting with the rigid member on the tone arm to elevate the arm and lower the same, means coacting with the said member to effect outward swinging movement of the tone arm upon its upward displacement and to effect inward swinging movement of the tone arm upon its lowering movement, and means controlled by the inward swinging movement of the tone arm during the period of reproduction to render the actuating means for the controlling actuating element active.

7. In sound reproduction apparatus, a record supporting turn table, reproducing means comprising a tone arm capable of being elevated and lowered and swung into and out of cooperative relation to a record upon the turn table, automatic means operable to deposit a record upon said table and remove the same therefrom, a member rigidly connected with the tone arm, a controlling actuating element, means for actuating the same, the said element coacting with the rigid member on the tone arm to elevate the arm and lower the same, means coacting with the said member to effect outward swinging movement of the tone arm upon its upward displacement and to effect inward swinging movement of the tone arm upon its lowering movement, and means controlled by the inward swinging movement of the tone arm during the period of reproduction to render the actuating means for the controlling actuating element active, the said means comprising a clutch, a rocking member, operative connection between the rocking member and clutch to render the latter active when the rocking member is rocked in one direction and to render it inactive when the rocking member is rocked in the other direction, means influencing movement of the rocking member in the first mentioned direction, means carried by the controlling actuating element for coaction with the rocking member to influence movement of the same in the second mentioned direction and render the clutch inactive, and means controlled through the movement of the member which is rigidly connected with the tone arm, to effect disengagement between the said means upon the controlling actuating element and the said rocking member.

8. In sound reproduction apparatus, a record supporting turn table, reproducing means comprising a tone arm capable of be-

ing elevated and lowered and swung into and out of cooperative relation to a record upon the turn table, automatic means operable to deposit a record upon said table and remove the same therefrom, a member rigidly connected with the tone arm, a controlling actuating element, means for actuating the same, the said element coacting with the rigid member on the tone arm to elevate the arm and lower the same, means coacting with the said member to effect outward swinging movement of the tone arm upon its upward displacement and to effect inward swinging movement of the tone arm upon its lowering movement, and means controlled by the inward swinging movement of the tone arm during the period of reproduction to render the actuating means for the controlling actuating element active, the said means comprising a clutch, a rocking member, operative connection between the rocking member and clutch to render the latter active when the rocking member is rocked in one direction and to render it inactive when the rocking member is rocked in the other direction, means influencing movement of the rocking member in the first mentioned direction, means carried by the controlling actuating element for coaction with the rocking member to influence movement of the same in the second mentioned direction and render the clutch inactive, and means controlled through the movement of the member which is rigidly connected with the tone arm, to effect disengagement of the said means upon the controlling actuating element and the said rocking member, a trip element upon the rocking member engageable by the said means upon the controlling actuating element, the last mentioned means, which is controlled by the member which is connected with the tone arm, comprising a detent normally coacting with the trip element and restraining the same against movement, a trip finger in the path of movement of an element upon the said tone arm member, and operative connection between the trip finger and the detent.

9. In sound reproduction apparatus, a record supporting turn table, reproducing means comprising a tone arm movable into and out of cooperative relation to a record upon the turn table, means for effecting such movement of the tone arm including a rotatable cam, and a member upon the tone arm coacting with the cam, means for driving the cam including a drive gear, a driven gear, and a clutch for establishing driving connection between the said gears, a rocker, operative connection between the rocker and clutch to effect movement of the clutch to active position when the rocker is rocked in one direction and to effect movement of the clutch to inactive position when the rocker is rocked in the other direction, a trip element

upon the rocker, a detent coacting with the trip element to normally hold the same stationary, an element upon the cam engageable with the trip element to effect movement of the rocker in the last mentioned direction, means influencing movement of the rocker in the first mentioned direction, and means controlled through the movement of the tone arm when fed by the travel of its stylus in the record groove, to render the detent inactive.

10. In sound reproduction apparatus, record storage means, means for supporting a record for reproduction, and means operable to automatically transfer a record from the storage means to the supporting means, and including a fixed jaw member and a movable jaw member and means for guiding the peripheral portion of a record carried by the storage means onto the fixed jaw member, the movable jaw member being designed for movement automatically by gravity to coactive relation to the fixed jaw member to grip the said peripheral portion of the record when the jaw members are in receiving position and to automatically disengage from the record at the moment of delivery of the record to the supporting means.

11. In sound reproduction apparatus, record storage means, means for supporting a record for reproduction, and means operable to automatically transfer a record from the storage means to the supporting means, the transferring means comprising a rotatable member, means for rotating the member in the direction of the storage means and thence in the reverse direction toward the supporting means, a fixed jaw upon the said member engageable beneath the peripheral portion of a record carried by the storage means, a movable jaw member upon the said rotatable member adapted to assume by gravity a position coacting with the said peripheral portion of the record, and a detent automatically engageable with an element of the movable jaw member as the latter assumes the position stated whereby to retain the same in such position under the stress imposed through the leverage exerted by the engaged record, the detent being automatically disengageable by gravity from the said element of the movable jaw member when the latter is relieved of such stress through deposition of the engaged record upon the supporting means.

12. In sound reproduction apparatus, record storage means, means for supporting a record for reproduction, and means operable to automatically transfer a record from the storage means to the supporting means, the transferring means comprising a rotatable member, means for rotating the member in the direction of the storage means and thence in the reverse direction toward the supporting means, a fixed jaw upon the

said member engageable beneath the peripheral portion of a record carried by the storage means, a movable jaw member upon the said rotatable member adapted to assume by gravity a position coacting with the said peripheral portion of the record, and a detent automatically engageable with an element of the movable jaw member as the latter assumes the position stated whereby to retain the same in such position under the stress imposed through the leverage exerted by the engaged record, the detent being automatically disengageable by gravity from the said element of the movable jaw member when the latter is relieved of such stress through deposition of the engaged record upon the supporting means, the said rotatable member having a record engaging edge eccentric to the axis of rotation and formed to guide the record past the edge of the fixed jaw member and then clear the periphery of the record to permit the record to move by gravity into position peripherally overlapping the engaging face of the said fixed jaw member.

13. In sound reproduction apparatus, means for storing a plurality of records in a shingled stack and in inclined position whereby to adapt the records to successively feed by gravity, a turn table for supporting a record during reproduction, and means for transferring a record from the storage means to the turn table comprising a member rotatable between the storage means and the turn table and having a record engaging surface eccentric to its axis of rotation and moving in the path of feed of the record to be engaged by the periphery of the uppermost record of the stack, a fixed jaw carried by the said member, a movable jaw carried thereby and adapted to automatically assume by gravity a position coacting with the fixed jaw when the member is in position to receive the record to be transferred, and means operating automatically to rotate the member to position to bring the engaging face of its fixed jaw substantially in the plane of the under side of the said uppermost record of the stack and there be engaged by the movable jaw and to rotate the member in the opposite direction subsequent to engagement of the record whereby to transfer the record and deposit the same onto the turn table.

14. In a sound reproduction apparatus, means for storing a plurality of records in a shingled stack, means supporting the first mentioned means in inclined position and adapting it to feed downwardly by gravity to intermittently advance the stack, means restraining the stored records except the uppermost one, from downward displacement, a record supporting turn table, and

means operating between the storage means and the turn table for automatically gripping the peripheral portion of the uppermost record of the stack, transferring the gripped record, depositing the same upon the turn table, and automatically releasing the same.

15. In sound reproduction apparatus, means for storing a plurality of records in a shingled stack comprising a supporting structure including an inclined rail, a record supporting table slidably mounted upon the rail for downward feeding movement, means restraining the records of the stack except the uppermost record from downward displacement, a record supporting turn table, and means operating automatically between the record storage means and turn table for gripping the peripheral portion of the uppermost record of the stack, transferring the record, and depositing the same upon the turn table.

16. In sound reproduction apparatus, means for storing a plurality of records in a shingled stack comprising a supporting structure including an inclined rail, a record supporting table slidably mounted upon the rail for downward feeding movement, means restraining the records of the stack except the uppermost record from downward displacement, a record supporting turn table, and means operating automatically between the record storage means and turn table for gripping the peripheral portion of the uppermost record of the stack, transferring the record, and depositing the same upon the turn table, the last mentioned means embodying an element for coaction with the said uppermost record to "shuck" the stack and effect intermittent downward displacement of the table of the storage means.

17. In sound reproduction apparatus, a record supporting turn table, a record receiving table, and means operating automatically between the tables for gripping the peripheral portion of the record upon the turn table and transferring the record and depositing the same onto the receiving table, said means comprising a member rotatable between the tables successively in the direction of the turn table and then in the direction of the receiving table, a shiftable jaw member carried by the said rotatable member and having a cam portion adapted to ride against the periphery of the record upon the turn table to enable the said jaw to pass the periphery of the record, means for automatically projecting the jaw after it has passed the periphery of the record, and a jaw automatically coacting with the first mentioned jaw and carried by the said member and arranged to engage with the record at the time of engagement of the first mentioned

jaw beneath the record and to disengage from the record at the time of deposition of the record onto the receiving table.

18. In sound reproduction apparatus, a record supporting turn table, a record receiving table, and means operating automatically between the tables for gripping the peripheral portion of the record upon the turn table and transferring the record and depositing the same onto the receiving table, said means comprising a member rotatable between the tables successively in the direction of the turn table and then in the direction of the receiving table, a jaw slidably mounted upon the said member, means yieldably resisting inward sliding movement of the jaw and influencing its outward sliding movement, the jaw having a cam portion arranged to travel against the periphery of the record on the turn table whereby to shift the jaw inwardly and adapt it to pass the periphery of the said record and then be projected beneath the peripheral portion of the record, a jaw mounted upon the said member and movable by gravity to coactive relation to the first mentioned jaw and engagement with the upper side of the peripheral portion of the record, and means for locking the last mentioned jaw in engaging position and operable through gravity to release the said jaw upon deposition of the record upon the receiving table.

19. In sound reproduction apparatus, a record supporting turn table, operating in a single fixed horizontal plane, a record receiving table, means yieldably maintaining the receiving table in an elevated position, the said table being movable downwardly with a step by step motion, means for automatically locking the table at each step, and means operating automatically between the tables to grip a record upon the turn table and transfer the same to and deposit the same upon the receiving table and exert pressure upon said receiving table to lower the same a distance approximately equal to the thickness of the record.

20. In sound reproduction apparatus, a record supporting turn table operating in a single fixed horizontal plane, a record receiving table, means yieldably maintaining the receiving table in an elevated position, the said table being movable downwardly with a step by step motion, means for automatically locking the table at each step, and means operating automatically between the tables to grip a record upon the turn table and transfer the same to and deposit the same upon the receiving table and exert pressure upon said receiving table to lower the same a distance approximately equal to the thickness of the record, the locking means for the receiving table being adapted to be rendered inactive where-

by to permit of upward movement of the said table under the influence of its moving means.

21. In sound reproduction apparatus, a record supporting turn table operating in a single fixed horizontal plane, a record receiving table, means yieldably maintaining the receiving table in an elevated position, the said table being movable downwardly with a step by step motion, means for automatically locking the table at each step, means operating automatically between the tables to grip a record upon the turn table and transfer the same to and deposit the same upon the receiving table and exert pressure upon said receiving table to lower the same a distance approximately equal to the thickness of the record, the locking means for the receiving table being adapted to be rendered inactive whereby to permit of upward movement of the said table under the influence of its moving means, and means movable into the path of upward movement of the receiving table to limit such movement thereof.

22. In sound reproduction apparatus, a turn table, record supports at the sides of the turn table in spaced relation thereto, and oscillatory means arranged between the turn table and the record supports to grip opposite faces of a record at the margin thereof whereby to transfer a record from a support to the turn table and from the turn table to a support.

23. In sound reproduction apparatus, a record supporting turn table, a record receiving table, centering means associated with the latter, and means operating automatically between the tables for transferring a record from the turn table and depositing the same upon the receiving table, the said means embodying a cam element for coaction with the periphery of the deposited record to shift the same upon the receiving table into engagement with the centering means.

24. In sound reproduction apparatus, record storage means, a record supporting turn table, means for transmitting motion to the turn table including coacting gear elements, means operating automatically and controlled through the rotation of one of said gear elements to transfer a record from the storage means to the turn table and from the turn table to the receiving means, and means operating automatically in consonance with the transferring means to shift one of said gear elements out of coactive relation to the other gear element and thereby control the transmission of motion to the turn table in consonance with the operation of the transferring means.

25. In sound reproduction apparatus, record storage means, a record supporting turn

table, means for transmitting motion to the turn table including coacting gear elements, means operating automatically and controlled through the rotation of one of said gear elements to transfer a record from the storage means to the turn table and from the turn table to the receiving means, means operating automatically in consonance with the transferring means to shift one of said gear elements out of coactive relation to the other gear element and thereby control the transmission of motion to the turn table in consonance with the operation of the transferring means, and a brake element in position for engagement by the last mentioned gear element when the same is shifted out of engagement with the other said gear element whereby at such time to effect cessation of rotation of the turn table.

26. In sound reproduction apparatus, record storage means, a record supporting turn table, means for transmitting motion to the turn table including coacting gear elements, means operating automatically and controlled through the rotation of one of said gear elements to transfer a record from the storage means to the turn table and from the turn table to the receiving means, and means operating automatically in consonance with the transferring means to shift one of said gear elements out of coactive relation to the other gear element and thereby control the transmission of motion to the turn table in consonance with the operation of the transferring means, the said means comprising a shiftable member operatively connected with the gear element, a rock arm connected with said member, and a cam rotatable in unison with the means for transferring the record from the turn table to the receiving means and coacting with the said arm.

27. In sound reproduction apparatus, record storage means, a record supporting turn table, means for transmitting motion to the turn table including coacting gear elements, means operating automatically and controlled through the rotation of one of said gear elements to transfer a record from the storage means to the turn table and from the turn table to the receiving means, means operating automatically in consonance with the transferring means to shift one of said gear elements out of coactive relation to the other gear element and thereby control the transmission of motion to the turn table in consonance with the operation of the transferring means, the said means comprising a shiftable member operatively connected with the gear element, a rock arm connected with said member, and a cam rotatable in unison with the means for transferring the record from the turn table to the receiving means and coacting with the said arm, and manu-

ally operable means connected with the shiftable member for manual operation thereof.

28. In sound reproduction apparatus, record storage means, a record supporting turn table, record receiving means, shafts mounted for rotation one between the storage means and turn table and the other between the turn table and the receiving means, means carried by the shafts and operable automatically in the rotation of the shafts in one direction to respectively grip records upon the storage means and the turn table, and in the rotation of the shafts in the opposite direction to respectively transfer the records to the turn table and the receiving means and disengage therefrom, pinions carried by the shafts, a reciprocating rack bar having rack portions meshing with the pinions, and means for reciprocating the said rack bar.

29. In sound reproduction apparatus, record storage means, a record supporting turn table, record receiving means, shafts mounted for rotation one between the storage means and turn table and the other between the turn table and the receiving means, means carried by the shafts and operable automatically in the rotation of the shafts in one direction to respectively grip records upon the storage means and the turn table, and in the rotation of the shafts in the opposite direction to respectively transfer the records to the turn table and the receiving means and disengage therefrom, pinions carried by the shafts, a reciprocating rack bar having rack portions meshing with the pinions, reproducing means, means for automatically moving the reproducing means into and out of cooperative relation to the record upon the turn table in consonance with the period of reproduction, and means operating in consonance with the movement of the reproducing means into and out of cooperative relation to the record to automatically shift the said rack bar.

30. In sound reproduction apparatus, record storage means, a record supporting turn table, record receiving means, shafts mounted for rotation one between the storage means and turn table and the other between the turn table and the receiving means, means carried by the shafts and operable automatically in the rotation of the shafts in one direction to respectively grip records upon the storage means and the turn table, and in the rotation of the shafts in the op-

posite direction to respectively transfer the records to the turn table and the receiving means and disengage therefrom, pinions carried by the shafts, a reciprocating rack bar having rack portions meshing with the pinions, reproducing means, means for automatically moving the reproducing means into and out of cooperative relation to the record upon the turn table in consonance with the period of reproduction, means operating in consonance with the movement of the reproducing means into and out of cooperative relation to the record to automatically shift the said rack bar, and means whereby the rack bar shifting means may be rendered inactive.

31. In sound reproduction apparatus, means for supporting a record for reproduction, means for supporting a stack of records in inclined position with the uppermost record of the stack displaced to project peripherally beyond the other records of the stack in the direction of the first mentioned means, record-receiving means, and automatic means operable to successively transfer the records from the stack to the first mentioned means and from said first mentioned means to the receiving means.

32. In sound reproduction apparatus, means for supporting a record for reproduction, means for supporting a stack of records in inclined position with the uppermost record of the stack displaced to project peripherally beyond the other records in the stack in the direction of the first mentioned means, record-receiving means, automatic means operable to successively transfer the records from the stack to the first mentioned means and from said first mentioned means to the receiving means, producing means including a bodily displaceable and swinging tone arm and a reproducer carried thereby, a supporting standard member for the said tone arm, means operating automatically to elevate the said standard and thereby elevate the arm at the completion of the period of reproduction, and means influencing swinging movement of the arm outwardly to position clear of the record upon its elevation comprising a relatively fixed member having an inclined guiding surface, and an arm extending from the standard member and coacting with said surface.

In testimony whereof I affix my signature.

FLOYD D. HUNT. [L. s.]