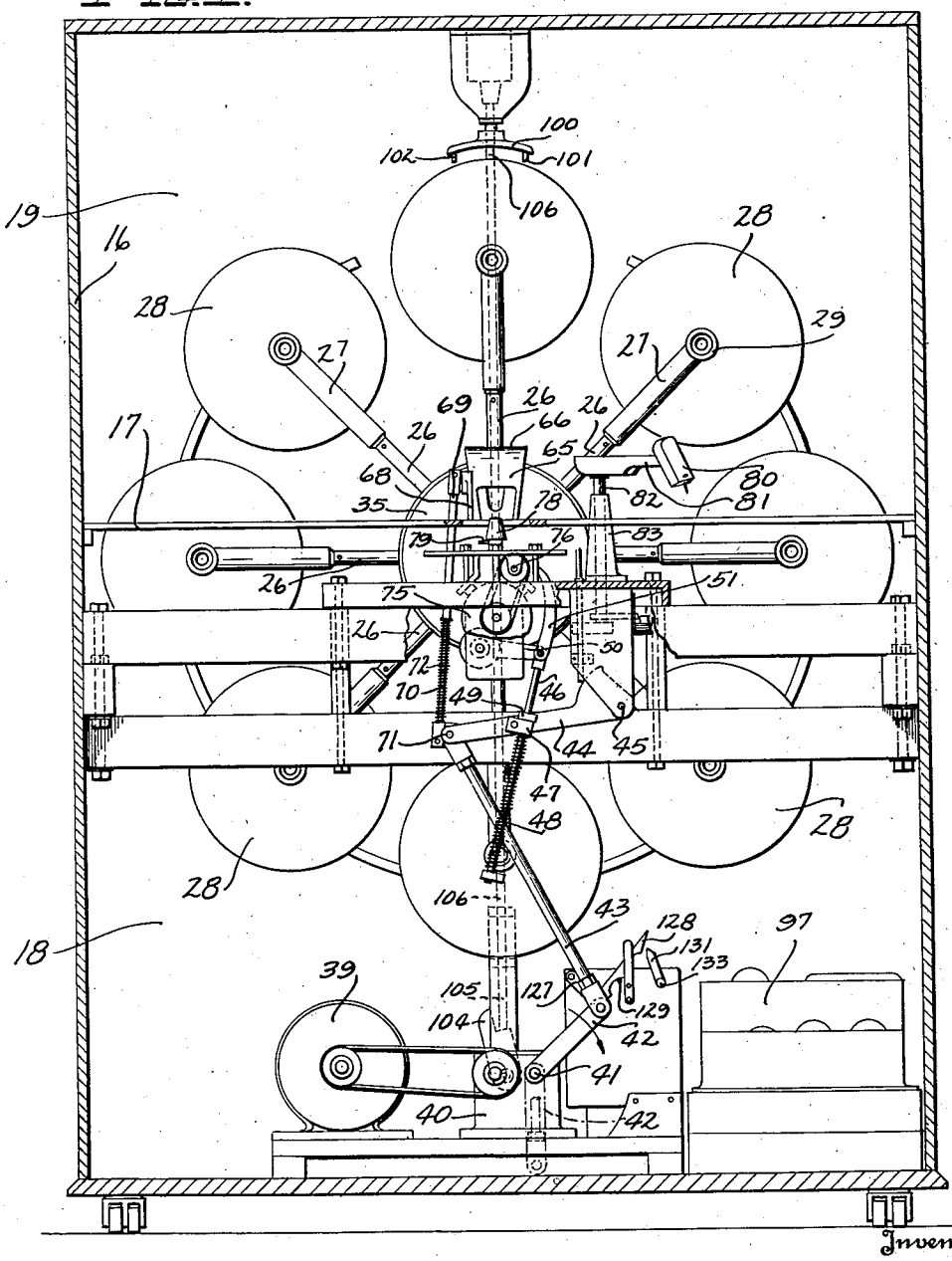
Nov. 20, 1934. C. HORN 1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Filed May 27, 1929 6 Sheets-Sheet 1

FIG. 1.



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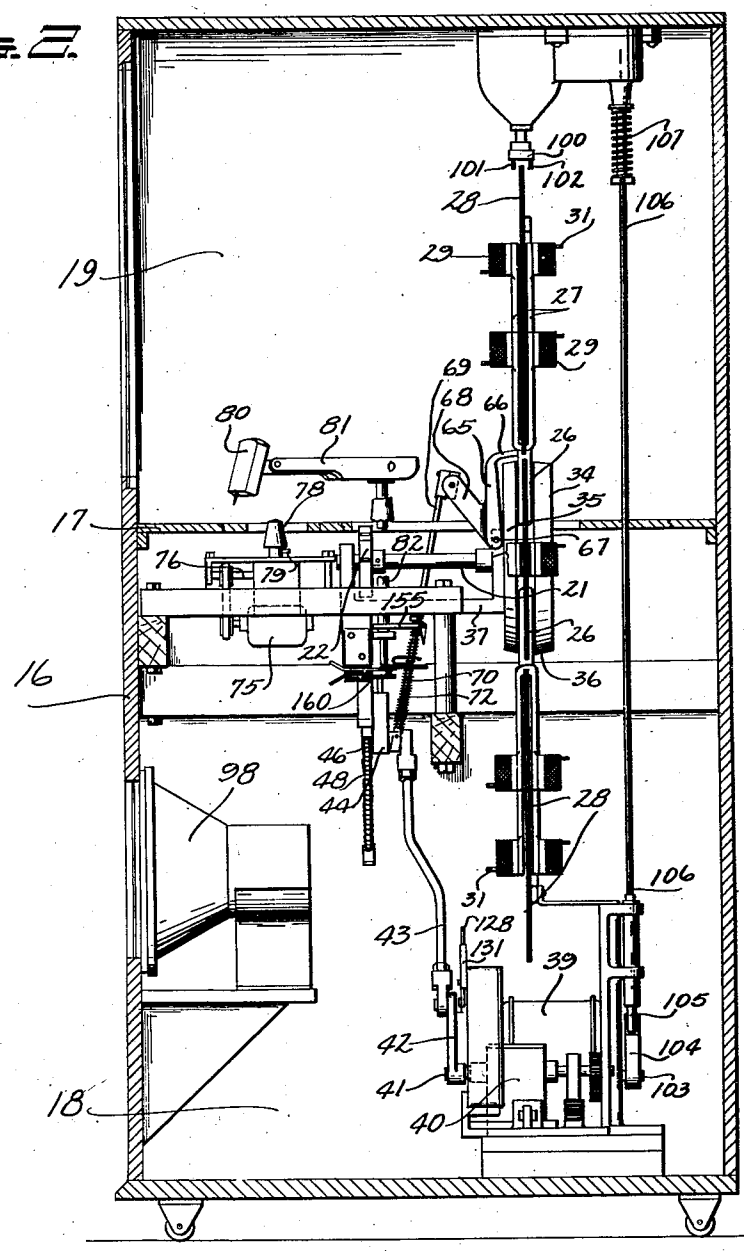
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Nov. 20, 1934. C. HORN 1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Filed May 27, 1929 6 Sheets-Sheet 2

FIG. 2.



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Nov. 20, 1934. C. HORN 1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Filed May 27, 1929 6 Sheets-Sheet 3

FIG. 4.

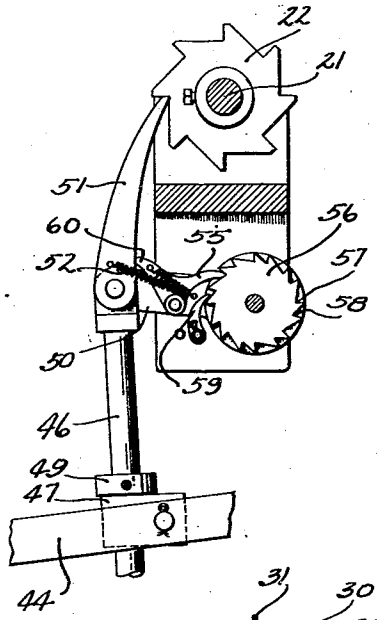


FIG. 5.

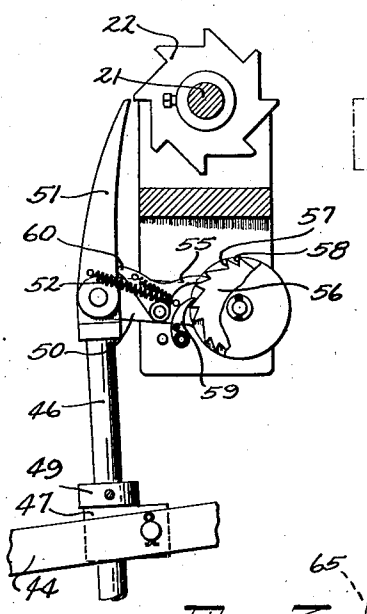


FIG. 3.

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Nov. 20, 1934. C. HORN 1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Filed May 27, 1929 6 Sheets-Sheet 4

FIG. 6.

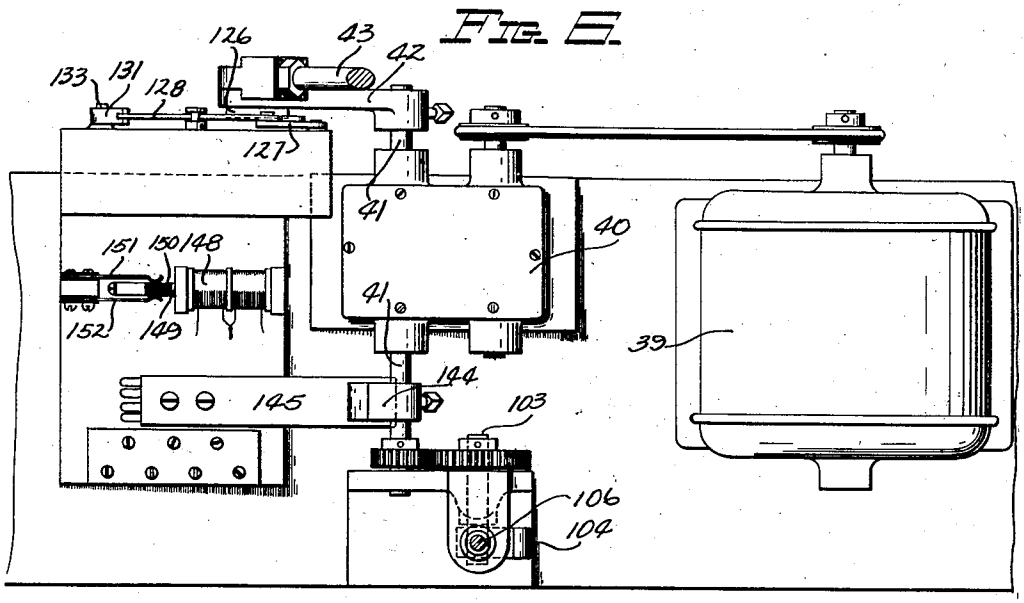


FIG. 7.

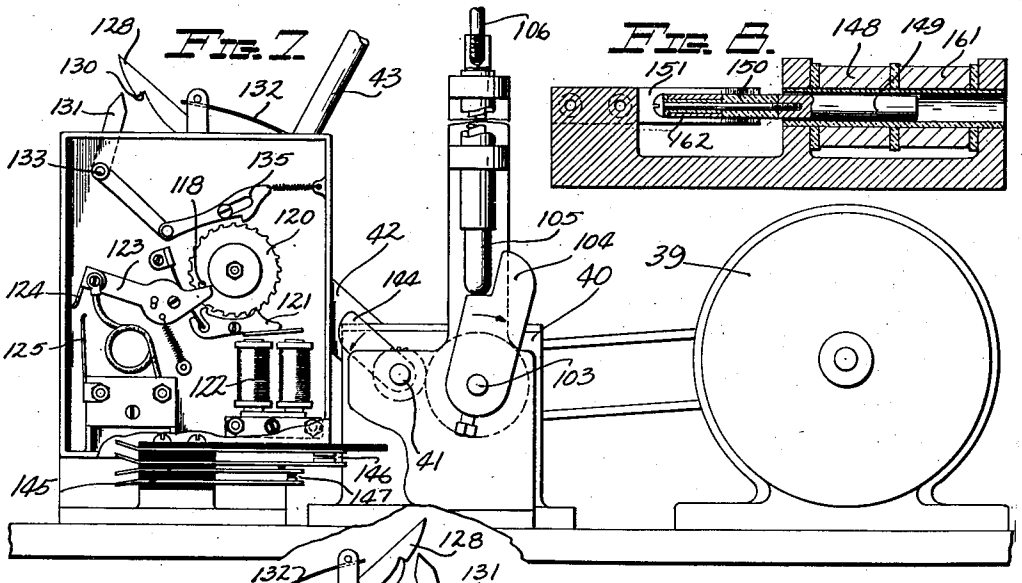
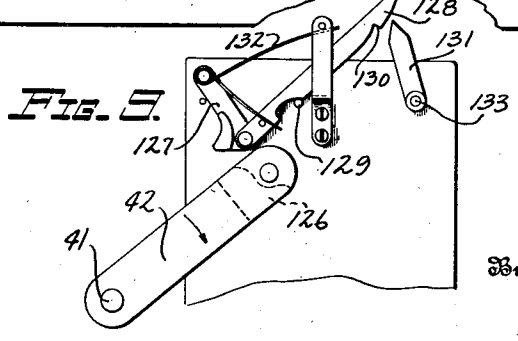


FIG. 8.

FIG. 9.



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Nov. 20, 1934. C. HORN 1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Filed May 27, 1929 6 Sheets-Sheet 5

Fig. 10.

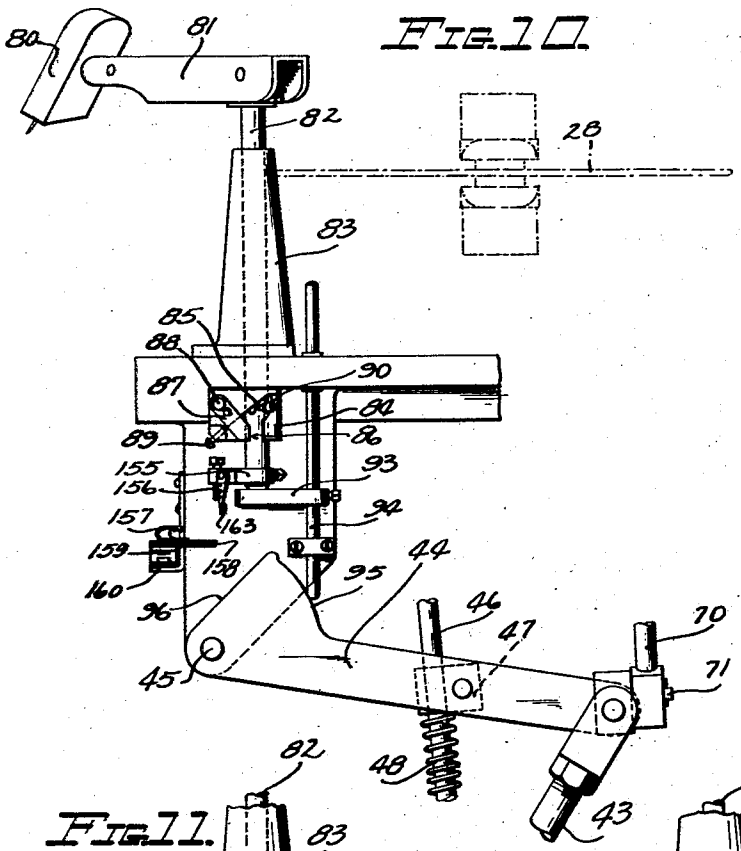


Fig. 11.

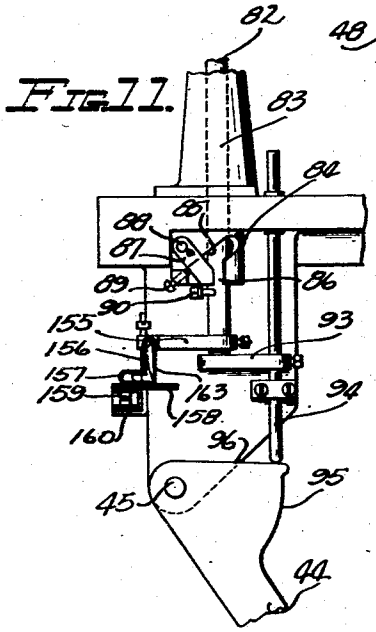
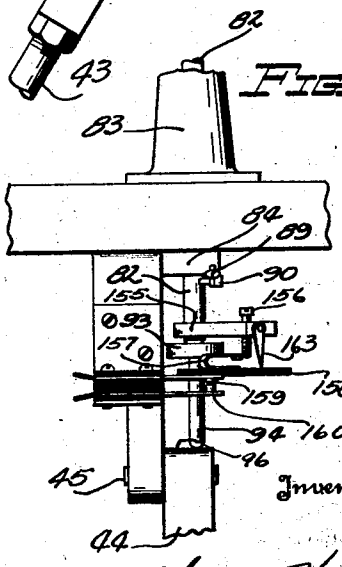


Fig. 12.



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Nov. 20, 1934. C. HORN 1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Filed May 27, 1929 6 Sheets-Sheet 6

FIG. 13.

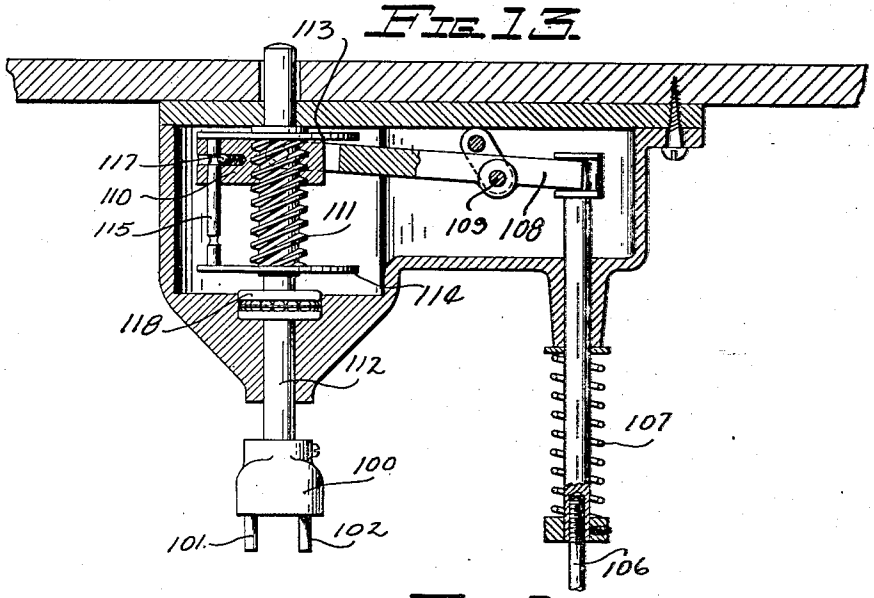


FIG. 14.

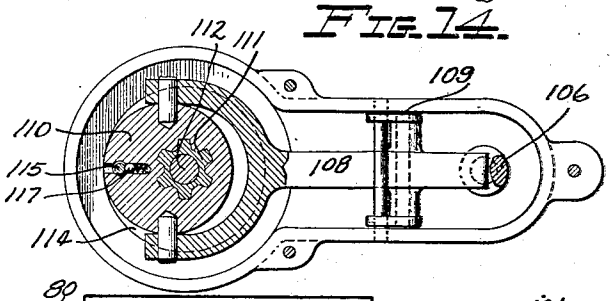
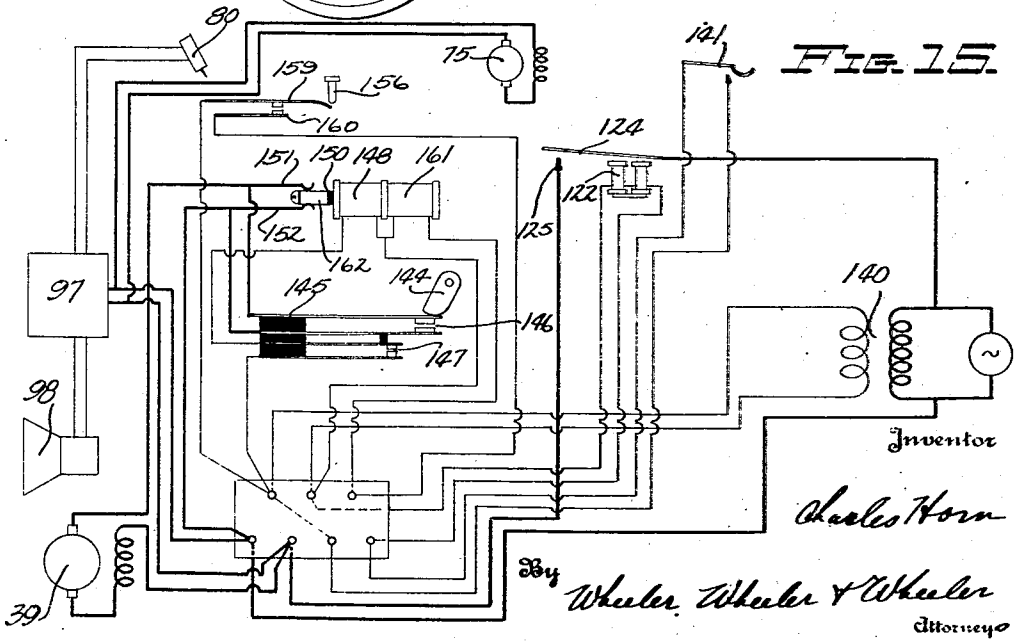


FIG. 15.



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Patented Nov. 20, 1934 1,981,175

UNITED STATES PATENT OFFICE

1,981,175

AUTOMATIC PHONOGRAPH MECHANISM

Charles Horn, Fond du Lac, Wis., assignor to Sylvester Adrian, Fond du Lac, Wis.

Application May 27, 1929, Serial No. 366,242

51 Claims. (Cl. 274—10)

This invention relates to improvements in automatic phonograph mechanisms.

It is the object of the invention to provide a novel and improved phonograph, particularly adapted for coin control, which is adapted to play successively a relatively large number of records and to repeat as often as may be required the playing of the same series of records. It is important to note that the present invention contemplates playing of both sides of each record and provides means for playing the two sides in an immediate sequence. Frequently the selections on opposite sides of the record are related to each other in some way and it is desirable to play one immediately following the other rather than to wait until all the other records have been played on one side before turning them to play their other sides.

Another extremely important object of the invention is to support the records in such a way that they do not warp while in the machine. In a device embodying this invention the normal position of the records is vertical so that, regardless of any ordinary range of atmospheric temperatures, there is no tendency whatever for the records to become distorted.

Further objects of the invention have to do with simplicity and compactness and reduction of expense in connection with the operating parts; the elimination of the usual turn table with which most phonographs are provided for the support of the record; the provision of a novel and simple record turning device adapted to act directly upon the record and to turn it as the human fingers would turn it in order that the other side may be played; the provision of novel and simple means for enabling the record lowering mechanism to function to bring the record to playing position twice in each dwell of the record conveyor whereby to permit both sides of each record to be played with no intermediate advance of the conveyor; the provision of a novel and improved means for adjusting the record from its normal vertical plane to a horizontal position for playing; the provision of novel and simple mechanism for controlling in properly timed sequence the operation of the various parts; and particularly the provision of a novel and improved record holder or conveyor.

In the drawings—

Figure 1 is a front elevation of mechanism embodying this invention, its cabinet being shown in section;

Fig. 2 is a side elevation of the mechanism illustrated in Fig. 1;

Fig. 3 is an enlarged detail view partially in elevation and partially in vertical section through portions of the record conveying, turning, and actuating parts;

Fig. 4 and Fig. 5 are details of the record conveyor actuating device illustrating in elevation the means whereby provision is made for a dwell in the operation of such device, these views being taken on the section indicated at 4—4 in Fig. 3;

Fig. 6 is a detail view in plan of the speed reducing drive mechanism at the bottom of the cabinet;

Fig. 7 shows the same parts in side elevation;

Fig. 8 is a detail view in section illustrating on an enlarged scale the solenoid switch appearing in Fig. 6;

Fig. 9 is a detail view of a portion of the coin control mechanism as viewed in side elevation from the rear of Fig. 7;

Fig. 10 is a detail view in side elevation of the parts for operating the tone arm and reproducer;

Fig. 11 and Fig. 12 are detail views of portions of the parts illustrated in Fig. 10 showing such parts in different positions assumed successively by the parts during the operation of the device;

Fig. 13 is a detail view in vertical section through the record turning device;

Fig. 14 is a detail in horizontal section through the record turning device;

Fig. 15 is an electrical circuit diagram of the complete machine.

Like parts are identified by the same reference characters throughout the several views.

The cabinet 16 is preferably divided by a horizontal partition 17 into a base compartment 18 in which the operating mechanism is housed and a playing compartment 19, the latter being usually provided with a window whereby the operation of the machine will be visible.

Before describing the machine in detail, a brief general statement will be given in order that the functions of its various parts may be correlated.

The records are normally vertically supported upon a record carrier or conveyor in the form of a rimless wheel which turns intermittently to bring a new record to the uppermost or playing station. When the machine is set in operation, the record in the playing station is lowered to a horizontal position. The tone arm and reproducer automatically move into proper relation to the record and are lowered thereupon and the record is played. Sound reproduction is preferably accomplished electrically to permit of suitable amplification.

When the record has been played, the tone

arm and electrical pick-up device or reproducer is automatically swung out of the way and the record is restored to its normal vertical position. The record turning device then functions to rotate the record on a vertical axis for 180° after which the machine comes to rest. The next operation of the machine will involve the lowering of the same record to playing position for reproduction from the reverse side thereof. After this operation of the parts, the record carrier or conveyor advances one step to bring a new record to the playing station before the machine comes to rest.

It will be noted that the above operation contemplates the provision—first, of record holding and conveying mechanism; second, actuating connections for the intermittent operation of the record conveyor and the lowering and raising of the record to and from playing position; third, record rotating means functioning in the playing position of the record; fourth, the sound reproducing mechanism including the tone arm and reproducer or the electrical equivalents thereof as well as any sound amplifying means required; fifth, a device for automatically adjusting the tone arm to and from the record; sixth, the record inverting mechanism; and seventh, control means.

The component parts above listed will now be discussed specifically in the order named.

Record conveyor

The record conveyor is best illustrated in Figure 3, although it is also shown in Figures 1 and 2. It includes a hub portion 20 mounted upon a shaft 21 which carries the ratchet wheel 22 shown in Figures 3, 4 and 5.

Pivoted at 23 to the hub member 20 of the conveyor are blocks 24 provided with studs 25 for the support of individually rotatable tubular arms 26 which normally project from the hub-like spokes of a rimless wheel.

The tubular arms or spoke members 26 are provided with forks 27 at their extremities within each of which a record 28 is receivable. The record is supported and centered between identical fittings 29, each of which is journaled in an arm of the fork 27 and provided with a cone-shaped recess at 30 and a pin 31. The two fittings 29 are held together by a bolt 32 which passes through the central opening in the record 28. The support given the record by fittings 29 is such that no turn table is required and the record is freely rotatable for playing purposes within fork 27, motion being communicated to the record through the supporting fittings 29 from means hereinafter to be described.

The record supporting arms or spokes 26 are normally confined between two opposing flanged disks 34 and 35. The flange 36 on disk 34 is continuous and disk 34 is anchored to the hub 20 to turn therewith and to provide a stop for the pivotal movement of arms 26 about fulcrum pins 23. Disk 35 is stationary, being bolted to the frame member 37. At its top, disk 35 is provided with a notch at 38 in which an arm 26 registering therewith is receivable so that the arm may oscillate about its fulcrum at 23 from its normal, almost vertical, position to a substantially horizontal playing position in which the parts are illustrated in Figure 3. Aside from notch 38, disk 35 is likewise continuous to provide at all other points support for the record carrying arms 26, whereby such arms are maintained in their normal position approaching a radius drawn from hub 20 through fulcrum 23. The arrangement is such, however, that the spokes or arms 26 are almost imperceptibly inclined so that gravity always tends to cause the arm and the record carried thereby to fall toward playing position when the arm registers with notch 38 permitting oscillation in that direction.

Conveyor actuating mechanism

In order to understand the manner in which the conveyor is rotated intermittently on the axis of shaft 21 and the records are successively lowered and raised twice to and from playing position during the dwell of the conveyor, it will be necessary to describe briefly how motion is derived from the source of power of the machine comprising a motor 39 and a speed reducer 40 for the operation of drive shaft 41. From a crank 42 carried by this drive shaft, all of the principal parts of the machine derive motion.

A single connecting rod 43 pivoted to crank 42 actuates the record conveyor, the record lowering device, and the tone arm. The step by step rotation of the record conveyor will first be described.

The connecting rod 43 is pivoted to a lever 44 which oscillates about a fulcrum at 45. Intermediate the end of lever 44 a rod 46 is connected thereto in a manner to provide a certain amount of lost motion, the rod 46 being extended through a block 47 and carrying a compression spring 48 tending to hold a stop 49 against block 47.

Rod 46 is pivoted to a link 50 and provided at its end with a pawl 51, these parts being best illustrated in Figures 3, 4, and 5. The pawl interacts with ratchet wheel 22 on the conveyor shaft 21, being held to the ratchet by a tension spring 52 under the control of a special control pawl 55.

Mounted concentrically with the center of oscillation of link 50 is a control ratchet 56 having alternatively relatively deep teeth 57 and relatively shallow teeth 58. The ratchet 56 is rotated in a step by step movement by the control pawl 55 mounted on link 50. The detent pawl 59 prevents reverse movement of the ratchet 56.

The control pawl 55 in addition to engaging in the teeth of ratchet 56 is provided with an arm at 60 against which rests the operating pawl 51. The arrangement is such that when the control pawl 55 is engaged in a deep tooth 57 of the control ratchet 56 the operating pawl 51 will be allowed to engage tooth of ratchet 22 on shaft 21. When, however, the control pawl 55 is engaged in one of the shallow teeth 58 of the control ratchet 56 the control pawl will be held in such a position of oscillation that its arm 60 will prevent the operating pawl 51 from engaging ratchet 22.

The purpose and effect of the mechanism just described is such that during each reciprocation of the rod 46 during a single complete rotation of shaft 41 and crank 42, the control pawl 57 will be advanced one step and the operating pawl 51 will reciprocate past the ratchet 22. Only every other reciprocation of the parts, however, will operate ratchet 22 since it is only alternate teeth of the control ratchet which are sufficiently deep so that control pawl 55 will engage therein to a depth such as to permit contact between the operating pawl 51 and ratchet 22.

This arrangement is necessary because of the fact that the lowering and raising of the record is accomplished through the same connecting rod 43 which operates the conveyor and it is necessary to lower and raise each record twice to play the opposite sides thereof before moving the

conveyor to present a new record at the record playing station represented by the slot 38.

I shall now describe how the record is lowered and raised at the record playing station.

As above indicated, the record supporting arms 26, upon coming into registry with slot 38 in the confining disk 35, tend to fall toward a horizontal position in which the record is rotated for playing. In order to support arms 26 in their normal upright position pending commencement of the operation of the machine, there is provided a carrier including a finger 65 having a flange 66 presented to the conveyor arms 26 and of sufficient width, as shown in Figure 1, to more than span the slot 38.

This carrier is in the form of a bell crank fulcrumed at 67 and provided with an arm 68 pivoted to a socket member 69 into which a rod 70 is telescopically receivable. This rod is pivoted at 71 to the connecting rod 43 above described and serves as a guide for a compression spring 72 adapted for yieldable transmission of motion to the end of the socket member 69 whereby to initiate without shock the elevating movement of the record carrying arm 26 of the conveyor.

Figures 1 and 2 show the parts in their normal inoperative position in which the flange 66 on the carrier member 65 is elevated to provide that support for the conveyor arm 26 which is lacking in disk 35 by virtue of slot 38. The initial movement of crank 42 from its Figure 1 position is clockwise as viewed in that figure and continues to a point where the crank 42 projects straight downwardly. This movement oscillates the carrier 65 about its fulcrum at 67 thereby lowering toward record playing position the arm 26 resting upon flange 66. The movement of connecting rod 43 and rod 70 beyond that required for this operation of carrier 65 is permitted by the telescopic disengagement of rod 70 from the socket member 69.

Mechanism hereinafter to be described provides for a dwell of shaft 41 and crank 42 in the playing position. When movement of these parts is resumed in a clockwise direction as viewed in Figure 1, rod 70 is caused to move upwardly into the socket member 69 to the point where spring 72 ultimately picks up the socket member and lifts the conveyor arm 26 and record 28 from record playing position, ultimately restoring these parts to their nearly vertical position normally maintained with the machine at rest.

Record rotating means

A separate motor may conveniently be provided at 75 for rotating the record when the record is in playing position. The means for controlling the operation of this motor will be described later. This motor is built connected with a shaft 76 geared to a driving spindle 77 provided at its end with a conical plug 78 complementary to the tapered sockets 30 in the record supporting fittings 29. Projecting laterally from the spindle 77 is a pin 79 adapted in the lowermost position of either fitting 29 to intersect the plane of movement of pin 31 carried by each of the fittings 29.

The taper of plug 78 and the complementary taper of sockets 30 not only assists in centering the fittings 29 respectively with the driving spindle 77, but also makes possible the frictional transmission of motion between the parts before they reach ultimate driving position. Thus, in the final movement whereby the record 28 is lowered toward playing position, it receives movement frictionally from plug 78 and after such movement is initiated the pin 31 carried by its supporting fitting 29 ultimately projects into the path of rotation of pin 79, thus insuring positive drive of the record from the motor 75. The taper of plug 78 is preferably such as to permit of the ready disengagement of the parts when it becomes necessary to lift the record toward its normal upright position.

Sound reproducing mechanism and actuating connections

Although it is obviously possible to use a mechanical reproducer and hollow tone arm leading to a horn for sound delivery, I prefer to use electrical equipment and hence I shall describe the specifically illustrated electrical reproducer and amplifier as follows:

An electrostatic or electromagnetic pick-up device or needle carrier 80 is mounted on a tone arm 81 supported for axial and oscillatory movement upon shaft 82 (see Figures 10, 11 and 12). This shaft is guided in a fitting 83 providing an elongated bearing and having at 84 a sleeve portion with an inclined notch 85 downwardly opening at 86. The notch has a yieldable wall comprising a lever 87 pivoted at 88 and normally seated against a stop 89 from which the lever is yieldable in an upward direction. A pin 90 projecting laterally from shaft 82 cooperates with the slot and lever in a manner hereinafter to be described.

The lower end of shaft 82 rests upon a support 93 carried by a vertically reciprocable rod 94 constituting a cam follower coacting with the cam 95 formed on the lever 44 through which the record conveyor and the record carrier are operated as aforesaid.

Figure 10 illustrates the parts in the position normally occupied by them when the machine is at rest, the pick-up mechanism and tone arm being oscillated out of the zone of association with the record 28. During the initial movement of crank 41 in a clockwise direction and the initial downward movement of connecting rod 43 and lever 44 as above described, the arcuate portion of cam surface 95 will pass beneath the cam following rod 94 without effect thereon, Eventually, however, the arcuate portion of the cam will leave the rod and the rod will ride onto the flat portion 96 of the cam, as shown in Figure 11. With the parts in this position, the continued downward oscillation of lever 44 will result in lowering rod 94 and the tone arm 91 and pick-up device 80 carried thereby, thereby causing pin 90 to move downwardly in the inclined slot 85.

The inclination of slot 85 will be productive of oscillation of shaft 82 upon its axis in a direction tending to swing tone arm 81 and pick-up device 80 over the record into registration therewith. This oscillation will be limited, however, by the stop lever 87 which ultimately restricts pin 90 to downward vertical movement whereby the pick-up device will be lowered onto the record to bring its needle into operative engagement therewith. The adjustment of the set screw at 89 will determine the point of engagement of the needle upon the record. When the needle finally reaches the record, the pin 90 will be disposed below the level of the free end of lever 87, as shown in Figure 11.

As the record rotates, it will feed the needle of the pick-up device through its helical groove toward the center of the record until ultimately the pin 90 will reach a position immediately be-

neath the end of lever 87. The control mechanism, still to be described, now functions to cause crank 41 to continue its clockwise rotation whereby connecting rod 43 and lever 44 move upwardly. This upward movement causes the flat portion 96 of the cam 95 to lift rod 94, support 93 and the shaft 82 carrying the pick-up mechanism. Due to the fact that the stop lever 87 is upwardly yieldable, pin 90 moves directly upwardly until it encounters the upper inclined margin of slot 85, at which point the needle will be clear of the record.

The continued upward movement of shaft 82 will necessarily cause a counter oscillation of tone arm 81 and pick-up mechanism 80, whereby these parts will swing free of the record toward the position in which they appear in Figure 10, and the lever 87 will ultimately fall back against stop 89 leaving the parts in readiness for another cycle of operations. Since the tone arm and pick-up device are now free of the record, it is possible for the record to move upwardly, either to be turned over or replaced in the playing position by a subsequent record, as the case may be. The electrostatic or electromagnetic impulse received from the record by the pick-up device 80 while the needle thereof contacts with the record passes through an amplifier diagrammatically illustrated at 97 to a sound reproducing speaker diagrammatically illustrated at 98.

The record inverting mechanism

Means is provided for automatically turning each record reaching its normal elevated position following the playing operation. This means acts directly upon the record itself and comprises a chuck 100 provided with spaced pins 101 and 102 so positioned that when the chuck is lowered upon the record the pins will engage opposite sides thereof in a direction offset in the plane of the record from the axis of stud 25 upon which the record rotates for this purpose. It is desired that the chuck should move non-rotatably into engagement with the record, should then rotate the record exactly 180° and should then return non-rotatably to a position clear of the record, after which its subsequent rotation to its initial position will not affect the record. These objectives are achieved in the following way:

Driven by gears from the power shaft 41 is a shaft 103 carrying a cam 104 which, in the original position of the parts, will be disposed as illustrated in Figure 7. The cam rotates clockwise as viewed in Figure 7 and is provided with a cam follower 105 adapted when engaged by the nose of the cam to operate push rod 106 (Figures 7, 2 and 13). The motion transmitted to the push rod 106 against the compression of spring 107 is delivered through a rocker arm 108 fulcrummed in the floating hanger 109 to the nut 110.

Nut 110 meshes with a screw 111 fast upon the shaft 112 which carries the record inverting chuck 100. The screw is confined between upper and lower plates 113 and 114 which are connected together by a support 115 with respect to which the nut 110 is in sliding engagement. Suitable grooves illustrated in Figure 13 are provided at the two extremes of movement of the nut with respect to the support for engagement by a detent ball 117 with which the nut is equipped. A thrust bearing at 118 has anti-friction means for supporting the lower end of screw 111 in the operation about to be described.

It will be noted that the arrangement is such that cam 104 does not act upon its follower 105 until it has almost completed a rotation. As illustrated the gearing connecting shaft 103 to shaft 41 involves a 1 to 2 reduction so that the record inverting mechanism will only operate once upon each record and will not restore the record to its original position after it has played the second time. It is obviously immaterial, broadly, whether this reduction gearing be employed or whether the cam 104 is caused to rotate once for each rotation of shaft 41 whereby to turn each record to its original position after it has played the second time.

The specific arrangement disclosed has the advantage, however, that it functions only during the alternate periods when the record conveyor is stationary, thus making it unnecessary to design the apparatus to handle both the record turning and the record conveying operations in a single cycle.

In any event, the cam 104 lifts its cam follower 105 at or near the completion of a cycle of operations and the resulting movement causes nut 110 to travel downwardly as above indicated. During the initial downward movement of the nut the carriage consisting of plates 113, 114, and support 115, moves with the nut, being held thereto by the detent device 117. Thus there is no interaction between the nut 110 and the screw 111. This downward movement of the entire assembly causes shaft 112 (to which the screw is attached) to move downwardly also and chuck 100 is lowered thereby into operative engagement with the edge of the record which happens to be upright in the playing station at the time.

During the continued upward movement of push rod 106 and the continued downward thrust on nut 110 the end of screw 111 utimately engages the anti-friction thrust bearing 118 whereby it and the carriage are brought to rest, fixed against further axial movement. Detent 117 now releases and the continued downward movement of the nut in threaded engagement with screw 111 produces rotation of shaft 112 whereby the pins 101 and 102 of its chuck 100 turn the record. The extent of rotation is so calculated that the record will be turned exactly 180° upon the completion of the cam induced movement of push rod 106. In this final position of the parts the detent 117 will be engaged with the lower groove in the support 115.

As the cam passes from beneath cam follower 105, spring 107 acts to thrust the push rod 106 downwardly thereby oscillating rocker arm 108 in a direction to lift nut 110. The initial upward movement of the nut is adapted by reason of the detent device above described to lift the carriage and screw 111, shaft 112, and chuck 100 vertically without producing rotative interaction between the nut and screw. When the carriage reaches its upper limit of movement, however, the detent ball 117 is forced to release itself from the lower groove on the support 115 thus permitting the nut independent axial movement with respect to the screw and restoring the chuck through 180° of rotative movement to its original position.

From the foregoing it will be understood that the chuck moves vertically into operative relation to the record before it rotates and after having rotated the record it moves vertically out of engagement therewith before commencing its reverse rotation.

Control means

It is obviously immaterial from a broad standpoint whether the machine herein disclosed operates continuously subject to manual control or whether it is provided with means for mechanically or electrically controlling its operation. As above indicated, however, I have preferred to illustrate an embodiment of the invention in which coin operated electrical control means are employed.

In Figure 7 there is illustrated a well known device adapted to receive electrical impulses occasioned by the deposit of a coin in the remote box and to open and close the switch for a period determined by the number of such impulses received. This device includes an escapement wheel 120 tending to rotate clockwise as viewed in Figure 7, and controlled by the escapement lever 121 which comprises an armature for the magnet 122 through which impulses occasioned by the deposit of coins are received. A single impulse releases wheel 120 permitting it to rotate one tooth and upon such rotation its pin 118 is disengaged from the switch lever 123 permitting contact 124 to close in engagement with fixed contact 125. Contacts 124 and 125 comprise the main switch for the control of the machine herein disclosed.

The main crank 42 of the machine carries a cam block illustrated at 126 in Figure 9 and adapted to engage in the course of crank rotation a lever 127 carrying a link 128 guided upon a stud 129 and notched at 130 for hooked engagement with finger 131. The arrangement is such that upon completion of each rotation of crank 42 cam 126 operates to hook link 128 over finger 131 and after the cam 126 has passed lever 127 the pressure of spring 132 on the parts oscillates finger 131 and rock shaft 133 to actuate the winding device 135 which winds up the escapement wheel 120 one notch.

If a single electrical impulse has been received, the pin 118 will only be distant from lever 123 the equivalent of one notch of the escapement wheel. If more than one coin has been deposited and more than one coin received, the distance of pin 118 from the switch lever 123 will be correspondingly increased. Whenever the rotations of the operating crank 42 of the machine are sufficient in number to restore the escapement wheel 120 to its original position pin 118 will open the main switch by lifting contact 124, thus bringing the entire machine to rest.

The effect of closing the contacts 124 and 125 may be seen in Figure 15. It will be noted that these contacts are included in series in a line voltage circuit supplying current to motor 39, amplifier 97, and the record turning motor 75. The initial effect of closing the main switch therefore is to render the amplifier operative, to set the crank 42 into rotation, and to operate spindle 77 through which the record is rotated for reproduction.

It is necessary, however, to provide means for stopping the main motor 39 with crank 42 in a downwardly depending position to permit the playing of the record before the cycle is resumed. Current for this purpose is derived from a transformer 140 which also supplies current for the energization of coil 122 when the deposit of a coin closes switch 141.

Mounted on shaft 41 to turn therewith is a switching cam 144 coacting with a double switch 145 including contact pairs 146 and 147. The cam first closes contacts 146 without effect on the operation of motor 39. When contacts 147 are closed, however, a circuit is established through the transformer secondary which energizes solenoid element 148 (Figure 8) whereby the solenoid armature 149 is projected to its Figure 8 position carrying the insulating portion 150 of its plunger between contacts 151 and 152. When cam 144 leaves switch 145 immediately thereafter so that contacts 146 spring open, the circuit through motor 39 is broken. The actuating connections are now entirely at rest but the amplifier and the record playing motor 45 continue in operation.

As the sound reproducing needle traverses the record groove, shaft 82 is oscillated as above pointed out. This shaft carries an arm 155 in which an adjustable screw 156 is fixed. When the playing of the record is complete, the screw will encounter the beveled end of a cam member 157 carried by the dielectric plate 158 of the movable contact 159 of a switch 160. The adjustment of the screw 156 will determine the degree of rotation required to effect the closing of the switch 160 thereby making it possible to adjust the device for the length of the records to be played.

Referring back to Figure 15, it will be noted that the switch 160, when closed, establishes a circuit through the secondary transformer 140 and the solenoid element 161, whereby the conductive portion 162 of the plunger carried by such element is interposed between contacts 151 and 152 thereby re-establishing the circuit to motor 39 and permitting the continued operation of crank 42 to remove the tone arm, lift the record, and either turn the record or advance the conveyor, as the case may be. The device will either continue in operation to again lower a record for playing it or it will altogether cease operation depending on whether or not the contact 124 is lifted due to exhaustion of the service purchased by the deposit of coins.

Where the device is used as a coin-operated machine its purpose would be defeated if it were possible to lift the reproducer and manually restore it to the beginning of a record before it operated the electrically controlled trip mechanism for initiating subsequent movements of the device. In order to anticipate any difficulty of this sort, the arm 155 connected to the shaft 82 of the pick-up mechanism carries a pivoted and sharply pointed trailing finger 163 which, in the position of the parts illustrated in Figures 11 and 12, is at all times available to engage its point in the dielectric plate 158 across which it trails during the oscillation of shaft 82. Obviously any reverse movement of the shaft will cause the point of finger 163 to catch in plate 158 and as the finger is forced to a vertical position by the counter movement of the shaft and arm 155, plate 158 will be depressed to close switch 160, thereby initiating the same sequence of movements which would occur had the tone arm been permitted to complete its movement across the record.

While it is believed that the operation of the device will be clearly understood from the foregoing description, a summary of the operation may be of convenience.

Summary

The operation of coin switch 141 causes, through intermediate mechanism, the closing of main switch 125 of the machine which energizes the power motor 39, amplifier 97, and record turning motor 75.

At this time all of the records are substantially vertical being so held by disk 35, flange 36, and the flange 66 of the carrier device 65. The carrier is effective only upon that record carrying arm 26 which registers with slot 38 and would fall toward a horizontal position but for the carrier

The initial movement of motor 39 rotates crank 42 from its Figure 1 position in a clockwise direction, thus simultaneously accomplishing a number of purposes. The carrier is caused to lower the record supporting arm 26 which happens to be in registry with the playing station at the time until the record supports 29 engage the driving cone 78 and are first frictionally and then positively driven by spindle 77. In the meantime, the rod 46 for the operation of the record conveyor has been retracted to a position where the control pawl 55 may engage a new tooth of control ratchet 56, thereby determining whether or not the operating pawl 51 is to operate the conveyor during the upward movement of the pawl. Following the completion of the lowering movement of the record, the portion 96 of cam 95 becomes effective to lower the tone arm and simultaneously to swing it over the record into a position for initiating the playing movement.

Upon the completion of the three principal operations above described, crank 42 reaches a position in which it depends downwardly, as illustrated in dotted lines in Figure 1, at which time the switching cam 144 will have closed switches 146 and 147 momentarily and opened them again. The closing of these switches opens the original circuit through motor 39 and closes a temporary circuit through switch 147 which is broken when cam 144 leaves the device, thus permitting the operating motor 39 to come to rest.

The pick-up device 80 now traverses the record playing the selection in the usual way and when the record has been completely traversed, the screw 156 carried by arm 155 connected with the pick-up device closes switch 160 thereby operating the relay which re-establishes circuit through contacts 151 and 152 to energize the operating motor 39.

During the present movement of motor 39 crank 42 moves upwardly, still in a clockwise direction and accomplishes the following principal objects:

The initial upward movement of the crank is communicated through cam surface 96, rod 94, to the shaft 82 carrying the tone arm and pick-up whereby the pick-up is lifted from the record and eventually is caused to swing clear of the record due to the engagement of pin 90 with the upper margin of inclined groove 85. About the time these movements are completed, the lost motion between spring 72 and tube 69 is taken up by the telescopic movement of rod 70 within the tube and the carrier 65 becomes operative to lift the record supporting arm 26 toward its original almost vertical position. During this period the lost motion between block 47 and collar 49 has been taken up and rod 46 will be caused to move upwardly. The question as to whether control pawl 55 is engaged in a deep groove 57 or a shallow groove 58 of the control ratchet wheel 56 will determine whether or not the operating pawl 51 will be effective to rotate the record conveyor to bring a new record to the playing station. In any event, the operating pawl 51 will move upwardly and the crank 41 will act through the intervening mechanism illustrated in Figures 7 and 9 either to open switch contacts 124 and 125 or to advance the mechanism one step toward the opening of such contacts.

If the final movements of the cycle have resulted in advancing the record conveyor by one step of rotation, the record turning mechanism will not act in the present embodiment of the machine. If, however, the control pawl 55 is engaged in a shallow groove of control ratchet 56 to hold pawl 51 clear of ratchet 22, as shown in Figure 5, the rotation of shaft 41 communicated through reduction gearing to shaft 103 will have rotated cam 104 to the point of operating the record inverting device which, like a pair of human fingers will descend into engagement with the record, turn the record 180°, and withdraw from the record before resuming their original rotative position.

Since the record turning device and the conveyor actuating device operate in alternate cycles of the equipment, it will be obvious that the present machine will play both sides of each record on the conveyor and will then repeat the reproduction of all the records on the conveyor playing first as to each record that side of the record which was last played in the first series of reproductions.

Experience in the use of this machine has demonstrated that the records are carried in such position that they do not warp under any ordinary service conditions and are not subject to material breakage. It is of material advantage to be able to play successively the two sides of any given record. The parts of the machine as disclosed function smoothly and simply, being almost entirely operated, with the exception of the record inverting device, from a single crank at 42.

I claim:

1. In a device of the character described, the combination with record rotating means, of a conveyor rotatable on an axis at an angle to said means adapted to move records in a path remote from said means, said conveyor comprising record supports movable through said angle to engage their respective records in operative driven engagement with said means, and a record carrier adapted to act on supports registering therewith to adjust individual records to and from said means.

2. In a device of the character described, the combination with a record conveyor adapted to advance records upon a circuitous path in a given plane and including disk record supports angularly adjustable independently of said conveyor for moving individual records to and from said path, of pivotally movable means at a predetermined point on said path for controlling the independent movement of a record support at said point, and a record rotating spindle substantially parallel to said plane and with respect to which said means is adapted operatively to adjust a record in controlling the movement of a support.

3. In a device of the character described, the combination of a record conveyor including relatively movable record supports provided with means mounting records for rotation while supported, a record rotating power driven spindle operatively arranged for the rotation of an individual record while so supported, and means for swinging a particular record support into registry with said spindle and engaging its record mounting means therewith.

4. In a device of the character described, the combination with a record conveyor including record supports provided with record carrying

means permitting of the rotation of records while supported, actuation connections for the step by step advance of said conveyor to bring records and their supports successively to a predetermined record playing station, mechanism at said station for adjusting out of the path of conveyor movement a support registering with the station, and a power driven spindle into operative driving connection with which said mechanism is adapted to bring the said record in the course of such adjustment.

5. In a device of the character described, the combination with a record conveyor including independently adjustable record supports disposed approximately radially with respect to a horizontal axis about which such supports are movable, means for moving individual supports toward said axis at a predetermined point in the travel of said conveyor, a record carrying device on each support adapted to permit of record rotation while supported, and a power driven means in the path of movement of said device toward said axis operatively adapted to transmit rotative motion to a record moved with said support out of the path of conveyor movement.

6. In a device of the character described, the combination with a power driven spindle disposed substantially upright and provided with a clutch element, a conveyor including record supporting arms movable upon a circuitous path approximately in a vertical plane near said spindle, means for holding said arms to their predetermined path except in a predetermined conveyor position, a lowering device at said position adapted to control the movement toward said spindle of an arm registering therewith, a rotatable part carried by each arm and provided with a clutch element complementary to that of the spindle, and record mounting means operatively associated with each such part whereby to permit of the rotation of a record from said spindle upon engagement of said clutch elements in the controlled movement of each arm.

7. In a device of the character described, the combination with a record conveyor and means for the intermittent advance of said conveyor to bring consecutive records to a predetermined station, means automatically operative for the rotation of each successive record brought to said station and means for the inverting of a record on the conveyor subsequent to its rotation, said record inverting means and conveyor advancing means being interconnected for alternative operation.

8. In a device of the character described, a record conveyor comprising a rotatable hub, arms radiating from said hub and pivotally connected therewith for movement to and from a normally retracted position in a plane to which the axis of said hub is substantially at right angles, and individual record receiving spindles carried by the respective arms and adapted to permit rotation of records supported by said arms, together with means for rotating a record receiving spindle when the arm thereof is in a position of pivotal adjustment remote from its retracted position.

9. In a device of the character described, a record conveyor comprising a rotatable hub, arms radiating therefrom and pivotally connected therewith for movement between playing position and a normally retracted position in a plane to which the axis of said hub is substantially at right angles, means for rotatably mounting a record secured to each of said arms for confining a record for movement therewith while permitting its independent rotation with respect thereto, means normally restricting the several arms to their retracted positions and means at a station with which said arms are successively registerable in the rotation of said hub for adjusting to record playing position an arm registering with said station.

10. In a device of the character described, a record conveyor comprising a rotatable hub, radiating arms pivoted to said hub, means for maintaining said arms normally in approximately radial positions with respect to said hub, a driving spindle, a rotatable record support mounted in an arm and means for adjusting said arm pivotally with respect to said hub toward a position of operative registration of its support with said driving spindle and in driving engagement therewith.

11. In a device of the character described, a record conveyor comprising a rotatable hub, arms pivoted to said hub and provided with record supports, a circuitous guide for said arms restraining them to approximately radial positions and including a movable part at a predetermined record playing station adapted to lower an arm engaged therewith.

12. In a device of the character described, a record conveyor comprising a rotatable hub, arms pivoted to said hub and provided with record supports, a circuitous guide for said arms restraining them to approximately radial positions and including a movable part at a predetermined record playing station adapted to lower an arm engaged therewith, and record turning means, into operative relation with which said part is adapted to lower each successive arm.

13. In a device of the character described, a record conveyor comprising the combination with a rotatable hub and arms pivoted thereto, of a guide for said arms slotted at a predetermined record playing station to admit of the pivotal movement of an arm registering with the slot, record carrying means mounted on each arm and adapted to permit rotation of a record carried thereby, and a lowering device associated with said guide at said slot for the controlled support of an arm registering therewith.

14. In a device of the character described, a record conveyor comprising a rotatable hub and arms radiating therefrom pivoted for movement from their respective radial positions and each provided with a record carrying portion rotatable substantially upon the center line of the arm as an axis.

15. In a device of the character described, a record conveyor comprising a rotatable hub and arms radiating therefrom and each provided with a record carrying portion rotatable substantially upon the center line of the arm as an axis, and guide means restraining said arms normally to approximately radial positions and including a part movable upon registry of an arm therewith to move its record carrying portion from the normal arm position toward the axis about which said hub turns.

16. In a device of the character described, the combination with a record conveyor supporting records for translative movement, for rotation upon their axes, and for inversion about a transverse axis, of means directly engageable with the record independently of said supporting means and adapted to rotate it about its said last mentioned axis.

17. In a device of the character described, the combination with a record conveyor including in-

dividual record supports independently rotatable about an axis transverse to that of the record, of means mechanically operative in a predetermined position of each successive record to engage and rotate the record independently of said supporting means substantially 180 degrees about said transverse axis.

18. In a device of the character described, the combination with a rotary record conveyor and individually rotatable record supports, of means for the step by step advance of the conveyor to bring successive records into registry with a predetermined playing station, means for rotating each record successively at said station, and means for inverting each record at said station.

19. In a device of the character described, the combination with a rotary record conveyor and individually rotatable record supports, of means for the step by step advance of the conveyor to bring successive records into registry with a predetermined playing station, means for rotating each record successively at said station, and means for inverting each record at said station, said record inverting means comprising a chuck and actuating connections for adjusting said chuck into a position for record engagement and for rotating said chuck and record 180 degrees.

20. In a device of the character described, a record turning mechanism comprising the combination with means for supporting a record to rotate about an axis transverse to its own, of a chuck marginally engageable with a record so supported, and axially movable to and from a position for such engagement, and means independent of said supports for effecting the axial movement of said chuck and subsequently rotating it to turn said record approximately 180 degrees.

21. In a device of the character described, a record turning mechanism comprising the combination with means for supporting a record to rotate about an axis transverse to its own, of a chuck marginally engageable with a record so supported, and axially movable to and from a position for such engagement, and means for effecting the axial movement of said chuck and subsequently rotating it to turn said record approximately 180 degrees, said means comprising a shaft member connected with said chuck, a reciprocatory member associated with said shaft member, interacting screw and nut threads upon said members, and stops for said shaft member adapted to permit to it a range of axial movement sufficient for the engagement of the record by the chuck, said screw and nut threads being adapted to rotate said shaft member upon its being stopped from further axial movement.

22. In a device of the character described, a record rotating means comprising an axially reciprocatory shaft provided with a chuck and screw, a carriage upon said shaft, stops limiting the axial movement of the shaft, a nut threaded to said screw and provided with deterrent means yieldably engaging said carriage at a plurality of spaced points, and connections for reciprocating said nut, whereby to produce initial axial movement of said shaft in either direction followed by a corresponding rotative movement of said shaft and chuck.

23. In a device of the character described, a record conveyor comprising a hub, a fitting pivotally connected with said hub for movement in a plane including the hub axis, said fitting being provided with a stud projecting in said plane and an arm journaled on said stud and provided with record supporting means.

24. In a device of the character described, the combination with a rotatable hub of a plurality of fittings pivoted to said hub for movement in planes including the axis of said hub, each such fitting being provided with a stud in the respective plane in which it is pivotally movable, arms rotatably mounted on the respective studs and oscillatable about the pivot points of the respective fitting, record carrying means for said arms, and means normally operative to maintain said arms almost at right angles to the axis of said hub, said means including however, a part movable toward the axis of said hub whereby to be adapted to permit movement toward said axis of an arm registering therewith.

25. In a device of the character described, the combination with a rotatable hub, of a plurality of fittings pivoted to said hub for movement in planes including the axis of said hub, each such fitting being provided with a stud in the respective plane in which it is pivotally movable, arms rotatably mounted on the respective studs and oscillatable about the pivot points of the respective fitting, record carrying means for said arms and means normally operative to maintain said arms almost at right angles to the axis of said hub, said means including however, a part movable toward the axis of said hub whereby to be adapted to permit movement toward said axis of an arm registering therewith, each such record carrying means being rotatable with respect to its arm and provided with a clutch member, and a power operative means for the rotation of said record carrying means in the position of the respective arms to which they are moved under the control of said part.

26. In a device of the character described, the combination with a record conveyor, of a record supporting spindle mounted for rotation thereon and provided with driving connections at each of its ends, said spindle being supported from said conveyor for rotation in a plane including the spindle axis.

27. In a device of the character described, a record conveyor comprising a combination with a plurality of record carrying arms and means for supporting said arms for conveyor movement, of means mounting said arms on their respective supports for rotative movement and record mounting spindles mounted on and rotatable with respect to the individual arms and provided with clutch means at their opposite ends.

28. In a device of the character described, the combination with a driving spindle, of a driven spindle provided with means for carrying a record, a conveyor support for said driven spindle upon which said spindle is bodily rotatable end for end, clutch means carried by the respective spindles, and means for clutching either end of the driven spindle to the driving spindle in each of two positions of the former.

29. In a device of the character described, the combination with a driving spindle, of a driven spindle having a clutch at each end engageable with the driving spindle, an invertible support in which the driven spindle is rotatable and means for mounting a record on the driven spindle.

30. In a device of the character described, the combination with a rotatable record support, of a driving spindle with respect to which said support is movable, a record carrier mounted on said record support for rotation independently thereof and for movement therewith to and from

said driving spindle, and clutch means whereby said spindle may be engaged for the rotation of said record, said clutch means providing for an initial frictional engagement and a final positive driving connection.

31. In a device of the character described, the combination with a record support and a spindle with respect to which said support is movable, of a rotatable record carrier mounted on said support, and clutch means for engaging said carrier with said spindle, said clutch means comprising a cone member, a complementary socket member, and positive driving connections engageable upon the completion of the engagement of the cone and the socket.

32. In a device of the character described, a tone arm mounting comprising a shaft supported for axial and oscillatory movement, in combination with a support for such shaft provided with an inclined and downwardly opening slot, a projection on the shaft adapted for co-action with the margin of said slot, means effective in one direction of axial movement of said shaft for directing said projection through a particular part of the opening of said slot while permitting said projection to enter said slot at a different point in the other direction of axial reciprocation of the shaft, whereby in said first mentioned direction to fix the angular position of the shaft during its reciprocative movement.

33. In a device of the character described, a tone arm mounting comprising a sleeve having an inclined slot opening to the end of the sleeve, a tone arm support reciprocable and oscillatable in said sleeve and provided with a projection adapted for co-action with the margins of said slot, a movable member constituting a margin for said slot yieldable under the pressure of said projection in a direction of entry into said slot and fixed against yielding in the direction of movement of said projection in a direction of leaving said slot, said member being adapted to restrict said projection to a single path in leaving said slot, whereby to fix the angular position of the tone arm during its axial movement in said direction while permitting the tone arm to move oppositely irrespective of its particular angular position.

34. In a device of the character described, a tone arm mounting comprising a sleeve having an inclined slot opening to the end of the sleeve, a tone arm support reciprocable and oscillatable in said sleeve and provided with a projection adapted for co-action with the margins of said slot, a movable member constituting a margin for said slot yieldable under the pressure of said projection in a direction of entry into said slot and fixed against yielding in the direction of movement of said projection in a direction of leaving said slot, said member being adapted to restrict said projection to a single path in leaving said slot, whereby to fix the angular position of the tone arm during its axial movement in said direction while permitting the tone arm to move oppositely irrespective of its particular angular position, said sleeve being provided with an adjustable stop for said member whereby to determine the position at which the tone arm support is movable in a direction such that the projection thereon will leave the slot.

35. The combination with a needle carrier, a tone arm and a support therefor oscillatable and vertically movable, and means for supporting a record in a position where the needle carrier may be swung to and from registry therewith in the course of oscillation of said support and may be adjusted to and from contact with the record in the course of vertical movement of the support, of a guide for the support provided with an inclined slot downwardly opening, a peg upon said support interacting with the margins of said slot for the oscillation of said support in accordance with its axial movement, and a pivoted dog restricting the downward opening of the slot whereby to require said peg to follow a predetermined path therefrom, said dog being upwardly yieldable irrespective of the path followed by said peg.

36. In a device of the character described, the combination with a record conveyor, of a reciprocable pawl engageable with a conveyor portion for the intermittent advance of said conveyor, means for periodically reciprocating the pawl, and means rendering said pawl inoperative for the advance of the conveyor in alternative reciprocations of the pawl.

37. In a device of the character described, the combination with a record conveyor, of a reciprocable pawl engageable with a conveyor portion for the intermittent advance of said conveyor, means for periodically reciprocating the pawl, means rendering said pawl inoperative for the advance of the conveyor in alternative reciprocations of the pawl, said means comprising a control pawl connected for movement with said first mentioned pawl, a control ratchet having alternate teeth of differing depth, and means connected with the control pawl for determining the angular position of the first mentioned pawl, whereby to control the engagement thereof with said conveyor portion.

38. In a device of the character described, the combination with a rotatable conveyor for records, a ratchet connected with said conveyor to turn therewith; a pawl reciprocable with reference to said ratchet and engageable with the teeth thereof for the intermittent rotative advance of the conveyor, means for reciprocating the pawl, and a pawl displacing device automatically operative in alternate reciprocations thereof to thrust the pawl out of range of the ratchet, whereby said conveyor will be advanced only once in each two reciprocations of the pawl.

39. In a device of the character described, the combination with a rotary record conveyor and a ratchet connected thereto, of a reciprocable pawl for operating the ratchet, means for reciprocating the pawl, means for rendering the pawl inoperative during alternate reciprocations, rotatable record carriers on the conveyor, and means for rotating with respect to the conveyor records in said carriers during the dwell of the conveyor occasioned by failure of the ratchet to interact with the pawl.

40. In a device of the character described, the combination with a record conveyor adapted to advance records successively to a predetermined playing station, of a tone arm provided with a needle carrier adapted for operative association with a record adjacent said station, means for moving the tone arm to and from the record, a reciprocable part connected with said means for the operation thereof, and actuating connections from said part of said conveyor for the intermittent advance of said conveyor from said part, said last mentioned connections including means rendering said connections operative for conveyor advance only during alternative reciprocations of the parts.

41. In a device of the character described, the

combination with a record driving spindle, of a record conveyor including a plurality of record supports comprising a part thereof movable with respect to the remainder of the conveyor to an operative record driving relation to the spindle, a carrier for controlling the movement of a support registering therewith in the course of conveyor movement, a reciprocable part connected with said carrier, and actuating connections between said part and said conveyor for utilizing the motion of said part for the advance of the conveyor.

42. In a device of the character described, the combination with a record driving spindle, of a record conveyor including a record support movable with respect to the conveyor to an operative record driving relation to the spindle, a carrier for controlling the movement of said support, a reciprocable part connected with said carrier, and actuating connections between said part and said conveyor for utilizing the motion of said part for the advance of the conveyor, said connections including motion interrupting means whereby the operation of said conveyor is effected only in alternative reciprocations of said part, and means for inverting a record carried by said support during the dwell of said conveyor.

43. The combination with a driving spindle for records, of a conveyor provided with normally retracted means for supporting a plurality of records to be driven individually by said spindle, a carrier adapted to control the movement of a record support from its retracted position to and from record playing position, a reproducing device including a needle carrier adjustable to and from a record in playing position, means for operating said first-named carrier in a direction to move the record support toward its playing position, means for the power operation of said spindle for rotating the record, means for automatically delivering the needle carrier into operative relation upon the record, means controlled from said needle carrier in an ultimate position thereof for retracting said needle carrier from the record and moving said support from record playing position, and means for automatically advancing said conveyor with the record support in a retracted position.

44. In a device of the character described, the combination with a record driving spindle and a normally upright record support, of a conveyor to which said support is secured, means for lowering said support in a direction to move a record carried thereby into operative driven relation to said spindle, reproducing mechanism including a needle carrier, means synchronized with the movement of said support for adjusting said needle carrier into operative relation to the driven record, means synchronously controlled upon completion of the playing of the record for withdrawing the needle carrier and elevating the support, and means for turning the record.

45. In a device of the character described, the combination with a record driving spindle and a normally upright record support, of a conveyor to which said support is secured, means for lowering said support in a direction to move a record carried thereby into operative driven relation to said spindle, reproducing mechanism including a needle carrier, means synchronized with the movement of said support for adjusting said needle carrier into operative relation to the driven record, means synchronously controlled upon completion of the playing of the record for withdrawing the needle carrier and elevating the support, and means for turning the record, together with a device adapted upon the second playing of the record to advance the conveyor.

46. In a device of the character described, the combination with a driving spindle provided with record actuating means, of a record support provided with means adapted to carry a record for rotation by said spindle, a conveyor to which said support is connected, a carrier for controlling movement of said support, and a record carried thereby from a retracted position on said conveyor to and from operative association with said spindle, said support being adapted to permit said record to be rotated, either side up, by said spindle, means for actuating said carrier, said means being adapted to provide a dwell in the actuation of the carrier for the driving of the record by said spindle, reproducing mechanism provided with means for bringing it into operative association with the record during said dwell and for initating the withdrawal of the reproducing mechanism from the record and the return actuation of the carrier upon completion of the playing of the record, and means adapted in the retracted position of the record for turning the record.

47. In a device of the character described, the combination with a driving spindle provided with record actuating means, of a record support provided with means adapted to carry a record for rotation by said spindle, a conveyor to which said support is connected, a carrier for controlling movement of said support and a record carried thereby from a retracted position on said conveyor to and from operative association with said spindle, said support being adapted to permit said record to be rotated, either side up, by said spindle, means for actuating said carrier, said means being adapted to provide a dwell in the actuation of the carrier for the driving of the record by said spindle, reproducing mechanism provided with means for bringing it into operative association with the record during said dwell and for initiating the withdrawal of the reproducing mechanism from the record and the return actuation of the carrier upon completion of the playing of the record, and means adapted in the retracted position of the record for turning the record, together with conveyor advancing mechanism operatively connected with said carrier and provided with means rendering it intermittently operative only in connection with alternate return movements of the carrier.

48. In a device of the character described, the combination with a needle carrier and an oscillatory support, of an arm carried by the support, a switch including a movable contact disposed in the path of movement of said arm, and means controlled by said switch for moving said support, said switch including a plate and said arm being provided with a trailing dog engageable with said plate in the event of a reverse movement of said support in a direction to close said switch.

49. In a device of the character described, the combination with a record driving spindle provided with means for its power operation, a record conveyor including record supports adjustable to position their respective records operatively with respect to said spindle to receive motion therefrom, a carrier for controlling the movement toward said spindle of record supports registering therewith, means for advancing the record conveyor intermittently, a needle carrier and tone arm associated with said spindle for the reproduction of sound from a record actuated by said

spindle, means for lifting and lowering said tone arm and needle carrier, mechanism for oscillating said tone arm and needle carrier to and from registry with such a record in the course of vertical movement thereof, a crank provided with a connecting rod, and operative connections for the actuation of the vertical movement of said tone arm and needle carrier and for the advance of said conveyor and the actuation of said record support carrier, electrically controlled means for driving said crank in a direction to adjust said last named carrier for the movement of said support toward a record playing position and subsequently adjusting said needle carrier into operative relation to the record, means for interrupting the movement of the crank during playing of the record, a switch controlled by the position of said needle carrier upon completion of the playing of the record for continuing the movement of the crank in a direction to withdraw said needle carrier and elevate the record support, and means for setting into operation the means for advancing the conveyor.

50. In a device of the character described, the combination with a record driving spindle provided with means for its power operation, a record conveyor including record supports adjustable to position their respective records operatively with respect to said spindle to receive motion therefrom, a carrier for controlling the movement toward said spindle of record supports registering therewith, means for advancing the record conveyor intermittently, a needle carrier and tone arm associated with said spindle for the reproduction of sound from a record actuated by said spindle, means for lifting and lowering said tone arm and needle carrier, mechanism for oscillating said tone arm and needle carrier to and from registry with such a record in the course of vertical movement thereof, a crank provided with a connecting rod and operative connections for the actuation of the vertical movement of said tone arm and needle carrier and for the advance of said conveyor and the actuation of said record support carrier, electrically controlled means for driving said crank in a direction to adjust said last named carrier for the movement of said support toward a record playing position and subsequently adjusting said needle carrier into operative relation to the record, means for interrupting the movement of the crank during playing of the record, a switch controlled by the position of said needle carrier upon completion of the playing of the record for continuing the movement of the crank in a direction to withdraw said needle carrier and elevate the record support, and means for setting into operation the means for advancing the conveyor, said conveyor advancing means being operative only during alternative crank rotations and said crank being provided with actuating connections for the reversal of a previously played record during intervening rotations of the crank.

51. The combination in a reproducer providing a predetermined station, of record rotating means at said station, conveying means provided with individual supports upon which a plurality of records may be mounted for advancing records to and removing them from said record rotating means at said station, means for inverting records at said station, and driving means for alternatively actuating said conveying and inverting means and providing a dwell intermediate each such actuation, whereby a record delivered to said station and there rotated will be inverted for further rotation prior to removel from said station.

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