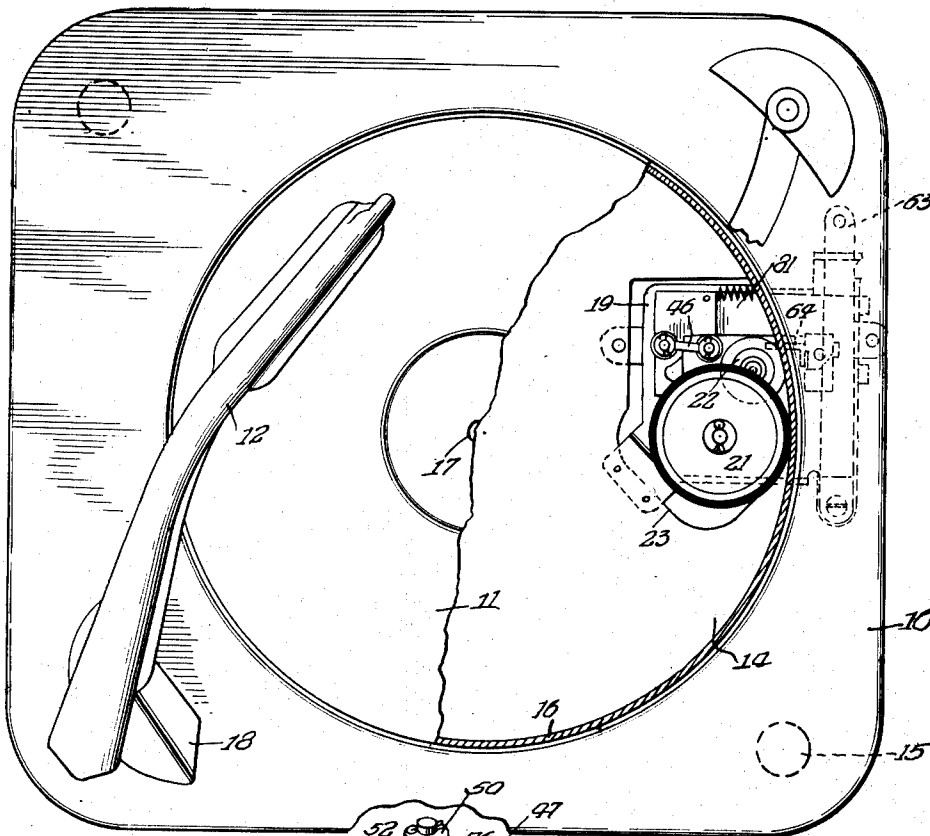
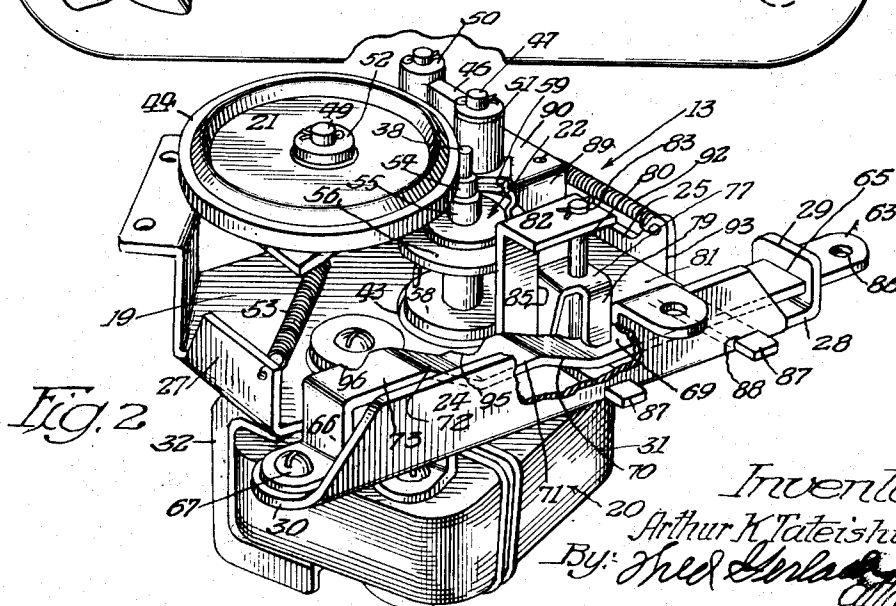


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2,650,504

3 Sheets-Sheet, 1

Fig. 1



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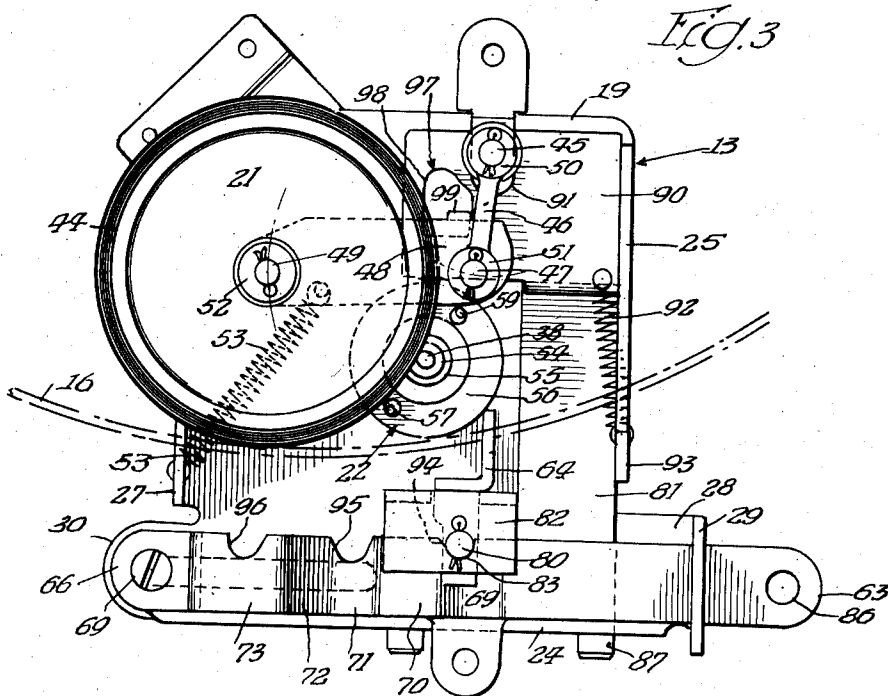
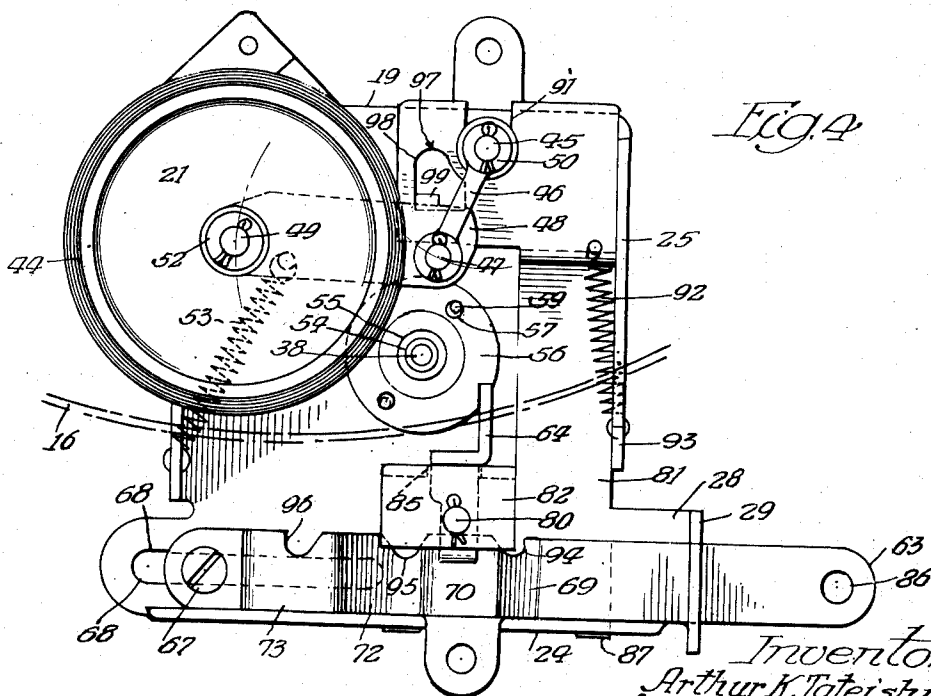
Sept. 1, 1953

A. K. TATEISHI
PHONOGRAPH WITH THREE SPEED
TURNTABLE DRIVING MECHANISM

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3 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,650,504

PHONOGRAPH WITH THREE-SPEED TURN-
TABLE DRIVING MECHANISM

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Application June 25, 1952, Serial No. 295,485

10 Claims. (Cl. 74—199)

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The present invention relates generally to phonographs. More particularly the invention relates to that type of phonographs which serves to reproduce sound from a disc type record and as its principal components comprises a horizontally disposed base plate, a turntable over the base plate and with a depending annular flange, a pivotally mounted needle carrying tone arm in associated relation with the turntable, a single speed electric motor beneath the base plate, a comparatively large, laterally movable, horizontally disposed, spring biased idler wheel adjacent the depending annular flange on the turntable, and a three speed driving mechanism between the armature of the motor and the idler wheel whereby the turntable may be selectively driven at a low speed (33 R. P. M.), an intermediate speed (45 R. P. M.) or a high speed (78 R. P. M.) depending upon the character or design of the record to be played.

One object of the invention is to provide a phonograph of this type which is an improvement upon, and has certain inherent advantages over, previously designed phonographs and is characterized by the fact that the three speed driving mechanism between the armature of the single speed electric motor and the idler wheel is of new and improved construction, embodies a simple and novel arrangement of parts and has extremely high efficiency.

Another object of the invention is to provide a phonograph of the type under consideration in which the single speed electric motor is mounted in substantially fixed relation with respect to the horizontally disposed base plate and has a vertically extending armature shaft the upper end of which terminates adjacent the periphery of the idler wheel and constitutes the low speed drive of the three speed driving mechanism, and such mechanism comprises in addition to the upper end of the armature shaft a drive wheel which is mounted for vertical sliding movement on the armature shaft, has an upper small diameter part for effecting intermediate speed drive of the turntable and a lower large diameter part for effecting high speed drive of the turntable, and is adapted, when slid partially upwards to have its upper small diameter part brought into an operative position wherein it surrounds the upper end of the armature shaft and is disposed adjacent the periphery of the idler wheel and, when slid fully upwards, to have its lower large diameter part brought into an operative position wherein it surrounds the upper end of the armature shaft and is disposed adjacent the periphery of the idler wheel.

Another object of the invention is to provide a phonograph of the type and character last mentioned in which the drive wheel of the three speed driving mechanism is of one-piece con-

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struction and has directly beneath the lower large diameter part an integral disc-like part of materially greater diameter than said lower large diameter part, and such mechanism, in addition to the parts heretofore mentioned, comprises: (1) a collar which is fixedly mounted on the armature shaft at a small distance beneath the vertically slidable wheel; and (2) two vertically extending laterally spaced wires which have the lower ends thereof anchored to the collar and their upper ends extending loosely through diametrically opposite holes in the disc-like part of the drive wheel and serve to cause the drive wheel to rotate conjointly with the armature shaft of the motor while at the same time permitting the drive wheel to be slid upwards and downwards.

Another object of the invention is to provide a phonograph of the last mentioned character in which the upper ends of the two upstanding laterally spaced wires are undulatory in shape in order to provide spaced apart arcuate recesses which coact with the whole defining portions of the disc-like part of the drive wheel yieldingly to retain the drive wheel in the various positions into which it is slid.

Another object of the invention is to provide a phonograph of the type and character under consideration in which the three speed mechanism for driving the turntable from the electric motor via the idler wheel embodies simple and novel manually operable cam type means for sliding the drive wheel upwards and downwards with respect to the armature shaft of the motor in order to bring the upper small diameter part and the lower large diameter part into and out of their respective operative positions.

A further object of the invention is to provide a phonograph of the aforementioned type in which the manually operable cam type means for sliding the multi-part drive wheel upwards and downwards with respect to the armature shaft has associated with it automatic means whereby as a preliminary to sliding movement of the drive wheel by the first mentioned means the idler wheel is shifted laterally against the force of its spring out of engagement with the turntable flange and away from the upper end of the armature shaft in order to permit free sliding movement of the drive wheel, and after shift of the drive wheel into one of its operative positions the idler wheel is released so that it returns by its spring to its operative position wherein it engages the turntable flange and the upper end of the armature shaft, the upper small diameter part of the drive wheel or the lower large diameter part of the drive wheel depending upon the position of the drive wheel with respect to the armature shaft.

A still further object of the invention is to pro-

vide a phonograph having variable speed turntable driving mechanism which is generally of new and improved construction, effectively and efficiently fulfills its intended purpose and is capable of being produced at a comparatively low cost.

Other objects of the invention and the various advantages and characteristics of the present phonograph will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a plan view of a phonograph embodying the invention, certain parts being broken away and other parts being shown in section for purposes of illustration;

Figure 2 is a perspective of the assembly of mounting plate, electric motor, idler wheel and three speed driving mechanism;

Figure 3 is a plan view of the assembly illustrating the idler wheel in its operative position wherein the periphery thereof engages the depending flange on the turntable and the upper end of the armature shaft, the upper small diameter part of the drive wheel or the lower large diameter part of the drive wheel, depending upon the position of the drive wheel with respect to the armature shaft;

Figure 4 is a plan view like Figure 3 except that it illustrates the idler wheel after it has been swung into its inoperative position as a preliminary to shift of the multi-part drive wheel into one of its three positions;

Figure 5 is a side view of the assembly showing the drive wheel of the three speed driving mechanism in its lowermost position wherein its upper small diameter part and lower large diameter part are beneath the upper end of the armature shaft and said upper end of the armature shaft is operative to effect low speed drive of the turntable via the idler wheel;

Figure 6 is a vertical section of the assembly showing the drive wheel in its intermediate position wherein its upper small diameter part surrounds the upper end of the armature shaft and is operative to effect through the medium of the idler wheel intermediate speed drive of the turntable;

Figure 7 is a vertical section like Figure 6 except that it shows the drive wheel of the three speed driving mechanism in its uppermost position wherein the lower large diameter part surrounds the upper end of the armature shaft and is operative to effect through the medium of the laterally movable spring biased idler wheel high speed drive of the turntable; and

Figure 8 is a perspective of the bifurcated plate constituting a part of the manually operable cam type means for sliding the drive wheel upwards and downwards with respect to the armature shaft.

The phonograph which is shown in the drawings constitutes the preferred form or embodiment of the invention. It is adapted to reproduce sound from disc type records and comprises a horizontally extending, substantially rectangular base plate 10, a turntable 11, a tone arm 12 and, in addition, a unitary assembly 13 which, as hereinafter pointed out in detail, serves to drive

the turntable at low speed, intermediate speed or high speed depending upon the character or design of the record to be played. The various parts of the phonograph, with the exception of the turntable driving assembly, are conventional or standard. The base plate 10 is in the form of a one-piece sheet metal stamping and has in its central portion a depressed circular part 14 which is of slightly greater diameter than the turntable 11. The corner portions of the base plate 10 are provided with fixed depending legs 15 for supporting the base plate in an elevated position on the housing structure (not shown) for the phonograph. The turntable 11 is located for the most part within the depressed part 14 of the base plate 10 and embodies on its central portion a depending hub (not shown) and on its outer marginal portion a depending annular flange 16. The aforementioned hub on the central portion of the turntable surrounds the base of an upstanding spindle 17 and serves to support the turntable rotatably. The depending annular flange 16 extends at right angles to the turntable and provides on its inner periphery a friction type driving surface. The spindle 17 is adapted to support a stack of records in elevated and centered relation with the turntable and has associated with it conventional ejector mechanism (not shown) for automatically permitting the lowermost record of the stack to drop toward the turntable after playing of a previously dropped record on the turntable. The tone arm 12 of the phonograph is disposed above the turntable and has one end thereof connected to the upper end of a pedestal 18 on one corner of the base plate 10 so that it is capable of swinging laterally relatively to the turntable. The distal end of the tone arm is provided with a needle for engaging the sound track of the record to be played.

The unitary assembly is located under the outer portion of the turntable 11 and comprises a mounting plate 19, an electric motor 20, a laterally movable idler wheel 21, a vertically slidable drive wheel 22, manually operable cam type means for sliding the drive wheel upwards and downwards, and automatic means whereby as a preliminary to sliding movement of the drive wheel the idler wheel is temporarily shifted out of its hereinafter recited operative position.

The mounting plate 19 of the assembly 13 is in the form of a one-piece stamping and is substantially square. It is located beneath a cut-out 23 in the depressed part 14 of the phonograph base plate 10 and embodies at its edge portions four upwardly extending right angle flanges 24, 25, 26 and 27 which are arranged in rectangular relation and are shaped or contoured as best shown in Figure 2 of the drawings. The flanges 24 and 26 are provided at the upper portions thereof with integral outwardly extending apertured ears which fit against the bottom surface of the base plate 10 and are fixedly secured to the superjacent portions of the base plate by rivets, bolts or other suitable attaching devices (not shown). The flanges 24 and 26 are positioned one opposite the other and the flanges 25 and 27 are positioned one opposite the other and extend at right angles to the flanges 24 and 25. The flange 24 is a full length flange in that it extends throughout the entire length of the mounting plate edge portion to which it is connected. The ends of the flanges 25 and 27 that face in the direction of the flange 24 are spaced from the ends of the flange 24. The corner portion of the mounting plate 19 that is between

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the adjacent ends of the flanges 24 and 26 is provided with an integral outwardly extending coplanar extension 28, the outer end of which is bent upwards to form an integral, right angle ear 29 which is disposed in parallel relation with the flange 25. The corner portion of the mounting plate 19 that is between the adjacent ends of the flanges 24 and 27 is provided with an integral outwardly extending coplanar extension 30.

The electric motor 20 of the assembly 13 is disposed a small distance beneath the mounting plate 19 (see Figures 2 and 5) and consists of a horizontally extending, substantially rectangular, laminated stator 31, a field coil 32 around one end of the stator and an armature 33 in an opening in the other end of the stator. The laminated stator 31 of the motor 20 is provided at the sides thereof with a pair of upstanding posts 34, the upper ends of which are connected by screws 35 to a horizontal plate 36. The latter (see Figure 5) is disposed a small distance beneath the mounting plate 19 of the assembly and is connected thereto by members 37 of rubber or other suitable resilient material. The armature 33 constitutes the rotor of the motor 20 and extends around, and is fixedly secured to, the lower portion of a vertically extending shaft 38. The lower end of the armature shaft is journaled in a bearing 39 and the central portion of the shaft is journaled in a bearing 40. The bearing 39 underlies the laminated stator 31 and is secured thereto by a U-shaped bracket 41 and the bearing 40 overlies the stator and is connected thereto by an inverted U-shaped bracket 42. The upper portion of the armature shaft extends through a large sized hole 43 in the central portion of the mounting plate 19 and the upper end of the shaft, i. e., the upper end extremity, terminates a small distance inwards of the depending annular flange 16 on the record supporting turntable 11 of the phonograph. The electric motor 20 is of the single speed type and operates when electric current is supplied to the field coil 32 to drive the shaft 38 through the medium of the armature 33.

The idler wheel 21 of the assembly extends horizontally and is disposed directly beneath the turntable 11. It is located a small distance above the mounting plate 19 and is horizontally aligned with the upper end of the armature shaft 38 and the depending annular flange 16 on the turntable 11. The rim portion of the idler wheel is provided with a circumferential groove in which is seated a tire-like tread member 44 of rubber or like material having a high coefficient of friction. The idler wheel is supported so that it is movable laterally back and forth between an operative position wherein a portion of its tread member is in frictional engagement with the inner periphery of the depending annular flange on the turntable and another portion of its tread member is in engagement with, or in close proximity to, the upper end of the armature shaft 38 of the electric motor and an inoperative position wherein such portions of the tread member 44 are a small distance away from the inner periphery of the turntable flange and the upper end of the armature shaft. The means whereby the idler wheel is supported so that it is movable laterally into and out of its operative position comprises a vertically extending post 45, a horizontally extending link 46, a vertically extending pin 47, a horizontally extending arm 48 and a vertically extending spindle 49. The vertically extending post 45 is located directly inwards of the

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ear equipped flange 26 and has the lower end thereof connected by a rivet or other suitable attaching device to the subjacent portion of the mounting plate 19. The upper end of the post 45 is of reduced diameter and terminates at approximately the same level as the idler wheel 21. The link 46 extends in the direction of the upper end of the armature shaft 38 and is provided at one end thereof with a vertically extending tubular member 50 which extends loosely around the upper end of the post 45 in order that the link is permitted to swing laterally relatively to the post. The other end of the link, that is, the end that is nearer the upper end of the armature shaft, is provided with a vertically extending tubular member 51. The vertically extending pin 47 extends through, and is rotatably mounted in, the vertically extending tubular member 51 and is suitably held against axial displacement relatively to the link 46. The horizontally extending arm 48 extends substantially tangentially with respect to the upper end of the armature shaft and has one end thereof suitably fixedly connected to the lower end of the pin 47. The spindle 49 extends upwards with respect to the arm 48 and has its lower end fixedly connected to the other end of said arm. The idler wheel 21 is provided with an enlarged hub 52 and this extends around, and is rotatable with respect to, the upper portion of the spindle. A spiral tension spring 53 serves yieldingly to urge the idler wheel 21 into its aforementioned operative position. One end of the spring 53 is suitably connected to the end of the flange 27 that is adjacent the extension 30 and the other end of the spring is suitably connected to the distal end of the arm 48. When the arm 48 is swung against the force of the spring 53 in a direction away from the flange 24 as hereinafter described, the idler wheel 21 assumes its aforementioned inoperative position wherein its tread member 44 is out of contact with the inner periphery of the depending flange of the turntable and the upper end of the armature shaft 38.

The drive wheel 22 of the assembly extends around, and is mounted for vertical sliding movement on, the upper portion of the armature shaft 38. It is of one-piece construction and consists of an upper small diameter part 54, a lower large diameter part 55 and a disc-like part 56 beneath the lower part. The disc-like part 56 of the drive wheel 22 is of materially greater diameter than the lower large diameter part 55 and has a pair of diametrically opposite holes 57 in its outer marginal portion. The drive wheel together with the upper end of the armature shaft constitutes part of a three speed driving mechanism whereby the turntable 11 is driven from the electric motor 20 via the idler wheel 21. It is slidable vertically on the upper portion of the armature shaft into a lowermost position (see Figure 5), an intermediate position (see Figure 6) and an uppermost position (see Figure 7). When the drive wheel 22 is in its lowermost position the upper small diameter part 54 of the wheel is disposed beneath the upper end of the armature shaft and such end of the armature shaft operates in connection with drive of the electric motor 20 and while the idler wheel 21 is in its operative position to drive the turntable at low speed. When the drive wheel 21 is in its intermediate position the upper small diameter part 54 surrounds the upper end of the armature shaft and in connection with drive of the motor while the idler wheel is in its operative position operates to effect intermediate speed drive of the turntable. When the

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drive wheel is in its uppermost position as shown in Figure 7, the lower large diameter part 55 surrounds the upper end of the armature shaft and while the idler wheel 21 is in its operative position effects high speed drive of the turntable. The upper end of the armature shaft is of such diameter that when it is operative to effect low speed drive of the turntable it drives the turntable at approximately 33 R. P. M.; the upper small diameter part of the drive wheel is of such diameter that when it is operative to effect intermediate speed drive of the turntable it drives the turntable at approximately 45 R. P. M.; and the lower large diameter part of the drive wheel is of such diameter that when it is operative to effect high speed drive of the turntable it drives the turntable at approximately 78 R. P. M. By sliding the drive wheel up and down into any of its three positions the three speed driving mechanism may be set to drive the turntable at the desired speed depending on the type of record that is to be played.

In addition to the parts heretofore mentioned, the assembly 13 comprises a collar 53 and two vertically extending laterally spaced wires 59 over the collar. The collar 53 is disposed loosely in the large sized hole 43 in the central portion of the mounting plate 19, surrounds the armature shaft 33 and is keyed or otherwise fixedly secured to the shaft to the end that it rotates therewith. The lower ends of the wires 59 are suitably anchored to diametrically opposite side portions of the collar 53, and the upper ends of the wires extend loosely through the diametrically opposite holes 57 in the outer marginal portion of the disc-like part 56 of the drive wheel 22. The purpose of the wires 59 is to cause the drive wheel 22 to rotate conjointly with the armature shaft 33 while at the same time permitting the drive wheel to slide upwards and downwards relatively to the armature shaft. The upper ends of the wires 59 are undulatory in shape in order to provide a lower pair of arcuate recesses 60, an intermediate pair of arcuate recesses 61 and an upper pair of arcuate recesses 62. When the drive wheel 22 is in its lowermost position as shown in Figure 5, the arcuate recesses 60 coact with the hole defining portions of the disc-like part 56 yielding to hold the drive wheel in such position; when the drive wheel is shifted upwards into its intermediate position for intermediate speed drive of the turntable the arcuate intermediate recesses 61 coact with the hole defining portions of the disc-like part 56 yielding to hold the drive wheel in such position; and when the drive wheel is shifted further upwards into its uppermost position the upper recesses 62 coact with the hole defining portions of said disc-like part 56 yielding to hold the drive wheel in such position as shown in Figure 7.

The manually operable cam type means for sliding the drive wheel into any of its three aforementioned positions in order to change as desired the driving speed of the turntable 11 comprises a slide bar 63 and a bifurcated plate 64. The slide bar 63 is in the form of a one-piece metallic stamping, as best shown in Figure 2 of the drawings, and overlies the mounting plate 19. It is located directly inwards of the flange 24 of the mounting plate and extends lengthwise of the flange. One end of the slide bar extends slidably through a horizontal slot 65 in the central portion of the ear 29 on the outer end of the extension 28 and the other end of the slide bar is bent downwards and then out-

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wards to form an L-shaped leg 66. The horizontal part of the leg 66 fits slidably against the portion of the mounting plate 19 that is inwards of the left hand end of the flange 24 as viewed in Figures 2, 3 and 4. A vertically extending bolt 67 extends through a hole (not shown) in the horizontal part of the L-shaped leg 66 and a slot 68 in the last mentioned portion of the mounting plate 19 and coacts with the slot to confine the slide bar to longitudinal sliding movement and also to limit sliding movement of the slide bar. As shown in Figures 3 and 4, the slot 68 is disposed in parallel relation with the flange 24 and has the outer end thereof formed in the extension 30 of the mounting plate 19. The central portion of the slide bar is shaped to form in sequence a flat low level part 69, an upwardly inclined cam part 70, a flat intermediate level part 71, an upwardly inclined cam part 72 and a flat high level part 73. The flat low level part 69 is spaced a small distance above the subjacent portion of the mounting plate 19 and is located directly inwards of the end of the slide bar 63 that extends slidably through the horizontal slot 65 in the ear 29. The flat high level part 73 of the slide bar is located directly inwards of the L-shaped leg 66. The upwardly inclined cam part 70 extends between and connects the adjacent ends of the low level and intermediate level parts 69 and 71 and the inclined cam part 72 extends between and connects the adjacent ends of the intermediate and high level parts 71 and 73. The bifurcated plate 64 is disposed vertically and is in the form of a one-piece metallic stamping. It extends between the central portion of the slide bar 63 and the disc-like part 56 of the drive wheel 22 and embodies at its upper inner corner a pair of horizontally extending, vertically spaced furcations 74 which, as shown in Figures 5, 6 and 7, are arranged in loosely straddled relation with the disc-like part 56 of the drive wheel 22. The outer portion of the bifurcated plate 64, i. e., the portion that faces in the direction of the flange 24, is bent at right angles in one direction and then outwards toward the flange 24 in order to form vertically extending parts 75 and 76. The upper end of the part 75 is bent at right angles in the direction of the part 76 to form a horizontal lug 77 and the lower end of the part 76 is bent at right angles in the same direction to form a horizontal lug 78. The outer end of the lug 77, i. e., the end that faces in the direction of the flange 24, is bent downwards at right angles to form a vertically extending depending cam follower part 79. The outer end of the lug 78 and the lower end of the cam follower part 79 are in straddled relation with the inner margin of the central portion of the slide bar 63, as shown in Figures 5, 6 and 7, and consequently the bifurcated plate 64 is caused positively to slide upwards and downwards in response to back and forth sliding movement of the slide bar. The lug 78 constitutes, in effect, a second or coating cam follower. The bifurcated plate 64 is mounted for vertical sliding movement by way of a vertically extending rod 80 which extends through vertically aligned holes in the horizontal lugs 77 and 78. The pin 80 is mounted on an elongated plate 81 which rests on the mounting plate 19 and is disposed directly inwards of, and extends directly lengthwise of, the flange 25. The central inner portion of the plate 81 is cut and bent to form an upstanding inverted L-shaped bracket 82, the horizontal part of which extends in the direction of

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the flange 24 and overlies the slide bar 63. The upper end of the rod 80 fits within a hole 83 in the horizontal part of the bracket 72 and the lower end of the rod fits within a hole 84 in the subjacent portion of the plate 81. The vertically extending part of the L-shaped bracket 83 is provided with a vertically extending slot 85 through which the inner ends of the lugs 77 and 78 project and in which said inner ends of the lugs are slidable vertically. When the slide bar 63 is positioned so that the lower end of the cam follower part 79 and the outer end of the lug 78 are in straddled relation with the flat low level part 69 of the slide bar, as shown in Figures 2 and 5, the bifurcated plate 64 is positioned so as to retain the drive wheel 22 in its lowermost position wherein, as previously pointed out, it exposes the upper end of the structure shaft so that it operates to effect low speed drive of the turntable 11. When the slide bar 63 is slid a predetermined distance to the right as viewed in Figures 2, 3 and 4, the lower end of the cam follower part 79 first rides up the inclined cam part 70 and then comes to rest on the flat low level part of the slide bar. This results in the bifurcated plate 64 sliding upwards a predetermined distance (see Figure 6) and causing the drive wheel 22 to slide upwards into its intermediate position wherein, as previously pointed out, the upper small diameter part 54 surrounds the upper end of the armature shaft and effects intermediate speed drive of the turntable. When the slide bar 63 is slid further to the right the lower end of the cam follower part 79 first rides up the inclined cam part 72 and then comes to rest on the flat high level part 73 of the slide bar. This results in the bifurcated plate 64 sliding further upwards (see Figure 7) and causing the drive wheel 22 to slide further upwards into its uppermost position wherein, as previously pointed out, the lower large diameter part 55 of the drive wheel surrounds the upper end of the armature shaft and effects, through the medium of the idler wheel 21, high speed drive of the turntable. Sliding movement of the slide bar in the opposite direction to its fullest extent results in the bifurcated plate 64 first sliding downwards to a predetermined extent and causing the drive wheel 22 to slide downwards into its intermediate position and then sliding downwards to its fullest extent and causing the drive wheel to assume its lowermost position. The extremity of the end of the slide bar that extends slidably through the slot 65 in the ear 29 is provided with a hole 66 in order that it may be connected to any suitable normally operable mechanism (not shown) for sliding the slide bar back and forth. It is contemplated that such mechanism will be mounted on the base plate 10 so that it will be readily accessible from above.

The plate 81 is lengthwise slidable on the mounting plate 19. The end of such plate that faces in the direction of the flange 24 underlies the central portion of the slide bar 63 and is provided with tongues 87 which extend slidably through slots 88 in the lower portion of the flange 24 and coast with the slot defining portions of the flange to hold the plate against sideways displacement while at the same time permitting the plate to slide back and forth. The other end of the plate 81 is bent upwards and then outwards to form a vertically extending part 89 and a horizontally extending part 90. The horizontal part 90 is provided with an elongated notch 91 for accommodating the lower end of the post 45.

A spiral tension spring 92 serves to urge the plate 81 in the direction of the flange 24. One end of this spring is anchored to an upstanding ear 93 on the end of the flange 25 that is adjacent the flange 24, and the other end of the spring is anchored to one of the inner corners of the horizontally extending part 90 of the plate 81. As shown in Figures 2, 3 and 4, the inner marginal portion of the slide bar 63 is provided with notches 94, 95 and 96. The notch 94 is located at the end of the flat lower level part 69 that is adjacent the lower end of the inclined cam part 70; the notch 95 is located in the central portion of the flat intermediate level part 71; and the notch 96 is located in the flat high level part 73 adjacent the upper end of the inclined cam part 72. The three notches are adapted to receive the central portion of the rod 80 when the latter is aligned with any one of them. When the pin is aligned with any one of the notches the tension spring 92 operates to urge the plate 81 together with the bifurcated plate 64 towards the flange 24. When the slide bar 63 is slid so as to disengage the pin from any one of the notches the pin together with the plate 81 and the bifurcated plate 64 is slid a small distance away from the flange 24. A hole and tongue connection 97 serves automatically to swing the idler wheel 21 into its aforementioned inoperative position each time the plate 81 is shifted away from the flange 24 due to disengagement of the rod 80 from any one of the three notches 94, 95 and 96 in connection with sliding movement of the slide bar 63 and also to release the idler wheel so that it is swung into its operative position by the spring 53 each time the plate 81 is slid toward the flange 24 when, as previously pointed out, the rod registers with any one of the three notches. This connection, as shown in Figures 3 and 4, comprises a hole 98 in the horizontal part 90 of the plate 81 and a depending tongue 99 on the end of the arm 48 that carries the vertically extending pin 47. The tongue 99 engages the portion of the horizontal part 90 that defines the portion of the hole 98 that faces in the direction of the flange 24. When the plate 81 is shifted away from the flange 24 the hole and tongue connection 97 operates through the medium of the arm 48 to swing the idler wheel 21 into its inoperative position and when the plate 81 is slid by its spring 92 towards the flange 24 such connection releases the idler wheel so that the spring 53 swings the idler wheel into its aforementioned position. The rod 80, the plate 81, the notches 94, 95 and 96 and the hole and tongue connection 97 constitutes automatic means whereby, as a preliminary to sliding movement of the drive wheel 22 by the slide bar 63 and the bifurcated plate 64, the idler wheel is shifted laterally into its inoperative position in order to permit free sliding movement of the drive wheel and, after shift of the drive wheel into one of its three positions, the idler wheel is released so that it returns by its spring 53 to its operative position wherein it engages the turntable flange 16 and the upper end of the armature shaft, the upper small diameter part 54 of the drive wheel or the lower large diameter part 55 of the drive wheel depending upon the position of the drive wheel with respect to the armature shaft.

When the slide bar 63 is positioned as shown in Figures 2 and 3, the drive wheel 22 is positioned in its lowermost position wherein the upper end of the armature shaft 38 is operative to effect low speed drive of the turntable 11.

through the medium of the idler wheel 21. In such position of the slide bar 63 the lower end of the cam follower part 79 of the bifurcated plate 64 rests on the flat low level part of the slide bar and the central portion of the rod 80 is disposed in the notch 94. As a result of the central portion of the rod being disposed in such notch the plate 81 is shifted to its fullest extent in the direction of the flange 24 and hence the spring 53 maintains the idler wheel 21 in its operative position wherein the tread member 44 engages the upper end of the armature shaft and the inner periphery of the depending flange 16 on the turntable. When it is desired to effect intermediate speed drive of the turntable the slide bar 63 is shifted to the right as viewed in Figures 2, 3 and 4 until the central portion of the rod 80 is aligned with the notch 95. In connection with initial shift of the slide bar the notch 94 operates by a cam action to dislodge the central portion of the rod 80 from it, thus resulting in the rod, the plate 81, the hole and tongue connection 97 and the arm 48 swinging the idler wheel 21 into its inoperative position wherein it is disposed a small distance away from the upper end of the armature shaft and the depending annular flange on the turntable. In connection with further shift of the slide bar the lower end of the cam follower part 79 of the bifurcated plate 64 rides up on the inclined cam part 70 on the slide bar and thus, as previously pointed out, results in the bifurcated plate sliding the drive wheel 22 into its intermediate position wherein the upper small diameter part 54 of the drive wheel surrounds the upper end of the armature shaft and is aligned with the tread member 44 of the idler wheel. In connection with further right hand sliding movement of the slide bar the rod 80 becomes aligned with the notch 95 and the spring 92 slides the plate 81 towards the flange 24 thereby causing the idler wheel 21 to be swung into its operative position by the spring 53. When it is desired to effect high speed drive of the turntable 11 the slide bar 63 is shifted further to the right as viewed in Figures 1, 2 and 3. In connection with initial sliding movement of the slide bar the rod 80 is cammed out of the notch 95 and operates as hereinafter mentioned, to swing the idler wheel 21 into its inoperative position. In connection with further right hand shift of the slide bar the lower end of the cam follower part 79 of the bifurcated plate 64 rides up on the inclined cam part 72 of the slide bar and results in the bifurcated plate 64 shifting the drive wheel 22 upwards into its uppermost position wherein the lower large diameter part 55 surrounds the upper end of the armature shaft and is in alignment with the tread member 44 of the idler wheel. As soon as the slide rod 63 is shifted so that the rod 80 is aligned with the notch 96 the spring 92 retracts the plate 81 thereby resulting in the idler wheel 21 returning to its operative position wherein its tread member engages the drive wheel part 55 and the inner periphery of the depending annular flange on the turntable. Predetermined sliding movement of the slide bar 63 in the opposite direction results in downward sliding movement of the drive wheel into its intermediate position and further opposite sliding movement on the part of the slide bar results in downward sliding of the drive wheel into its lowermost position. Initial shift of the slide rod in either direction from one of its three positions results in swinging of the idler wheel into its inoperative

position and completion of sliding movement of the slide bar in either direction after sliding movement of the drive wheel results in automatic return of the idler wheel to its operative position. When the plate 81 slides towards the flange 24 after the bifurcated plate 64 shifts the drive wheel 22 into one of its three positions the bifurcated plate is not in gripping relation or contact with the disc-like part 56 of the drive wheel, as shown in Figures 5, 6 and 7 of the drawings. The drive wheel, however, remains in its shifted position as the result of the action of the undulatory upper ends of the wires 59.

The herein described phonograph is simple in design and construction and efficient in operation and this is directly attributable to the design, arrangement and mode of operation of the particular three speed driving mechanism therefor. In view of the fact that the three speed driving mechanism of the phonograph is in the form of a unitary assembly it may be installed and removed with facility and makes it possible to produce the phonograph as a whole at a comparatively low cost.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending flange on its outer margin; mechanism operative to drive the turntable at three different speeds and comprising mounting means beneath the turntable, a horizontally disposed idler wheel mounted on said means so that it is held against vertical displacement while at the same time it is movable laterally into and out of engagement with the flange of the turntable, spring means arranged to urge the idler wheel into engagement with the turntable flange, a single speed electric motor mounted substantially fixedly on the aforesaid means and embodying an armature arranged to rotate about a vertical axis and a vertically extending armature shaft having the lower end thereof fixedly connected to the armature and its upper end terminating adjacent the idler wheel and adapted when in direct engagement with said idler wheel while the motor is in operation to effect low speed drive of the turntable through the medium of said idler wheel, a rigid drive wheel extending directly around, and mounted for vertical sliding movement on, the upper portion of the armature shaft, provided with means between it and the shaft for causing it at all times to rotate conjointly with the armature shaft, embodying an upper small diameter cylindrical driving part and a lower large diameter cylindrical driving part, adapted when the upper end of the armature shaft is in direct driving relation with the idler wheel to assume a neutral position wherein its upper part is below the upper end of the armature shaft, and further adapted when slid partially upwards from its neutral position to have its upper part brought into an operative position wherein it surrounds said upper end of the armature shaft and serves when in direct engagement with the idler wheel and while the motor is in operation to effect intermediate speed drive of the turntable through the medium of the idler wheel and when slid fully

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upwards to have its lower part brought into an operative position wherein it surrounds said upper end of the armature shaft and serves when in direct engagement with the idler wheel and while the motor is in operation to effect high speed drive of the turntable through the medium of said idler wheel, and manually operable means for sliding the drive wheel up and down into its various positions.

2. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin; mechanism operative to drive the turntable at different speeds and comprising mounting means beneath the turntable, an idler wheel mounted on said means and normally engaging the flange of the turntable, an electric motor mounted on the aforesaid means and provided with a vertically extending armature shaft the upper end of which terminates adjacent the idler wheel, a rigid drive wheel extending loosely around said armature shaft, embodying in sequence a small diameter cylindrical driving part, a large diameter cylindrical driving part and a disc-like part of greater diameter than the large diameter driving part and with a vertical hole in its outer marginal part, and slidable vertically in order selectively to bring said driving parts thereof into operative positions with respect to the idler wheel, manually operable means for sliding the drive wheel vertically, a collar mounted fixedly on the armature shaft of the motor beneath the drive wheel, and a vertically extending wire-like element having the lower end thereof connected to the collar and its upper end extending through the hole in the disc-like part of the drive wheel, and operative to cause the drive wheel to rotate conjointly with the armature shaft while at the same time permitting said drive wheel to be slid vertically.

3. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin; mechanism operative to drive the turntable at different speeds and comprising mounting means beneath the turntable, a laterally movable idler wheel mounted on said means and normally engaging the flange of the turntable, a single speed electric motor mounted substantially fixedly on the aforesaid mounting means and provided with a vertically extending armature shaft the upper end of which terminates adjacent the idler wheel, a rigid drive wheel extending loosely around said armature shaft, embodying in sequence a small diameter cylindrical driving part, a large diameter cylindrical driving part and a disc-like part of greater diameter than the large diameter part and with a vertical hole through its outer marginal part, and slidable vertically on the upper portion of the armature shaft in order selectively to bring said driving parts thereof into operative positions with respect to the idler wheel, manually operable means for sliding the drive wheel into its different operative positions, a collar mounted fixedly on the armature shaft of the motor beneath the drive wheel, and a vertically extending wire having the lower end thereof connected to the collar and its upper end extending loosely through the hole in the disc-like part of the drive wheel, operative to cause the drive wheel to rotate conjointly with the armature shaft while at the same time permitting said drive wheel to be slid vertically, and having its said upper end of undulatory shape in order to provide vertically spaced arcuate re-

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cesses which coact with the hole defining portion of said disc-like part yieldingly to retain the drive wheel in the different operative positions into which it is slid.

4. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin, and a base plate positioned beneath the turntable and provided with a cut-out adjacent one portion of the turntable flange; a unitary assembly operative to drive the turntable at different speeds and comprising a horizontally disposed mounting plate connected to the base plate and extending under and across said cut-out, a laterally movable idler wheel mounted over the mounting plate and normally engaging the flange of the turntable, a single speed electric motor mounted substantially fixedly beneath the mounting plate and provided with a vertically extending armature shaft the upper portion of which extends through the mounting plate and terminates adjacent the idler wheel, a rigid drive wheel extending loosely around said upper portion of the armature shaft, embodying an upper small diameter cylindrical driving part, a lower large diameter cylindrical driving part and a disc-like part beneath, and of greater diameter than, the lower driving part and with diametrically opposite vertical holes in its outer marginal part, and slidable vertically on the upper portion of the armature shaft in order selectively to bring the upper and lower driving parts thereof into operative positions with respect to the idler wheel, manually operable means for sliding the drive wheel into its different operative positions, a collar mounted fixedly on the armature shaft of the motor beneath the drive wheel, and a pair of laterally spaced vertically extending wires having the lower ends thereof connected to diametrically opposite portions of the collar and their upper ends extending loosely through the holes in the disc-like part of the drive wheel, and operative to cause the drive wheel to rotate conjointly with the armature shaft while at the same time permitting said drive wheel to be slid vertically.

5. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin, and a base plate positioned beneath the turntable and provided with a cut-out adjacent one portion of the turntable flange; a unitary assembly operative to drive the turntable at different speeds and comprising a horizontally disposed mounting plate connected to the base plate and extending under and across said cut-out, a laterally movable idler wheel mounted over the mounting plate and normally engaging the flange of the turntable, a single speed electric motor mounted beneath the mounting plate and provided with a vertically extending armature shaft the upper portion of which extends through the mounting plate and terminates adjacent the idler wheel, a rigid drive wheel extending loosely around said upper portion of the armature shaft, embodying an upper small diameter cylindrical driving part, a lower large diameter cylindrical driving part and a disc-like part beneath, and of greater diameter than, the lower driving part and with diametrically opposite holes in its outer marginal part, and slidable vertically on the upper portion of the armature shaft in order selectively to bring the upper and lower driving parts thereof into operative positions with respect to the idler wheel, manually

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operable means for sliding the drive wheel into its different operative positions, a collar mounted fixedly on the armature shaft of the motor beneath the drive wheel, and a pair of laterally spaced vertically extending wires having the lower ends thereof connected to diametrically opposite portions of the collar and their upper ends extending loosely through the holes in the disc-like part of the drive wheel, operative to cause the drive wheel to rotate conjointly with the armature shaft while at the same time permitting said drive wheel to be slid vertically, and having their said upper ends of undulatory shape in order to provide vertically spaced arcuate recesses which coact with the hole defining portions of said disc-like part yieldingly to retain the drive wheel in the different operative positions into which it is slid.

6. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending flange on its outer margin; mechanism operative to drive the turntable at three different speeds and comprising mounting means beneath the turntable, a laterally movable idler wheel mounted on said means and normally engaging the flange of the turntable, a single speed electric motor mounted substantially fixedly on the aforesaid means and provided with a vertically extending armature shaft the upper end of which terminates adjacent the idler wheel and is adapted when in engagement with said idler wheel while the motor is in operation to effect low speed drive of the turntable, a rigid drive wheel extending around, and mounted for vertical sliding movement on, the armature shaft, embodying an upper small diameter cylindrical driving part, a lower large diameter cylindrical driving part and a disc-like part beneath, and of greater diameter than, the lower driving part and with a vertical hole in its outer marginal part, adapted when the upper end of the armature shaft is in driving relation with the idler wheel to assume a neutral position wherein its upper part is below the upper end of the armature shaft, and further adapted when slid partially upwards from its neutral position to have its upper part brought into an operative position wherein it surrounds said upper end of the armature shaft and serves when in engagement with the idler wheel while the motor is in operation to effect intermediate speed drive of the turntable and when slid fully upwards to have its lower part brought into an operative position wherein it surrounds said upper end of the armature shaft and serves when in engagement with the idler wheel while the motor is in operation to effect high speed drive of the turntable, manually operable means for sliding the drive wheel up and down into its various positions, a collar mounted fixedly on the armature shaft of the motor beneath the drive wheel, and a vertically extending wire having the lower end thereof connected to the collar and its upper end extending loosely through the hole in said disc-like part, operative to cause the drive wheel to rotate conjointly with the armature shaft while at the same time permitting said drive wheel to be slid vertically, and having said upper end of undulatory shape in order to provide vertically spaced arcuate recesses which coact with the hole defining portion of said disc-like part yieldingly to retain the drive wheel in the different positions into which it is slid by said manually operable means.

7. In a phonograph of the type that embodies

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a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin, and a base plate positioned beneath the turntable and provided with a cut-out adjacent one portion of the turntable flange; a unitary assembly operative to drive the turntable at three different speeds and comprising a horizontally disposed mounting plate connected to the base plate and extending under and across said cut-out, a laterally movable idler wheel mounted over the mounting plate and normally engaging the flange of the turntable, a single speed electric motor mounted substantially fixedly beneath the mounting plate and provided with a vertically extending armature shaft the upper portion of which extends through the mounting plate and the upper extremity of which terminates adjacent the idler wheel and is adapted when in engagement with said idler wheel while the motor is in operation to effect low speed drive of the turntable, a rigid drive wheel extending around, and mounted for vertical sliding movement on, said upper portion of the armature shaft, embodying an upper small diameter cylindrical driving part, a lower large diameter cylindrical driving part and a disc-like part beneath, and of greater diameter than, the large diameter lower driving part and with diametrically opposite holes in its outer marginal part, adapted when the upper end of the armature shaft is in driving relation with the idler wheel to assume a neutral position wherein its upper part is below the upper end of the armature shaft, and further adapted when slid partially upwards from its neutral position to have its upper part brought into an operative position wherein it surrounds said upper end of the armature shaft and serves when in engagement with the idler wheel and the motor is in operation to effect intermediate speed drive of the turntable and when slid fully upwards to have its lower part brought into an operative position wherein it surrounds said upper end of the armature shaft and serves when in engagement with the idler wheel and the motor is in operation to effect high speed drive of the turntable, manually operable means for sliding the drive wheel up and down into its various positions, embodying a bifurcated member mounted to move vertically and having the furcations thereof in straddled relation with the outer margin of the disc-like part, a collar mounted fixedly on the armature shaft beneath the drive wheel, and a pair of laterally spaced vertically extending wires having the lower ends thereof connected to diametrically opposite portions of the collar and their upper ends extending loosely through the holes in said disc-like part, operative to cause the drive wheel to rotate conjointly with the armature shaft while at the same time permitting said drive wheel to be slid vertically, and having their said upper ends of undulatory shape in order to provide vertically spaced arcuate recesses which coact with the hole defining portion of said disc-like part yieldingly to retain the drive wheel in the various positions into which it is slide by said manually operable means.

8. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin; mechanism operative to drive the turntable at different speeds and comprising mounting means beneath the turntable, an idler wheel mounted on said means and normally engaging the flange of the turntable, an electric

motor mounted on the aforesaid means and provided with a vertically extending armature shaft the upper end of which terminates adjacent the idler wheel, a rigid drive wheel extending around said armature shaft, embodying in sequence a small diameter cylindrical driving part, a large diameter cylindrical driving part and a disc-like part of greater diameter than the large diameter driving part, and slidable vertically in order selectively to bring said driving parts thereof into operative positions with respect to the idler wheel, and manually operable means adapted positively to slide the drive wheel into its different operative positions and embodying a horizontal stamped metal bar mounted on said mounting means to slide longitudinally back and forth and having horizontal spaced apart different level flat parts and an inclined cam part between the flat parts, and a rigid one-piece stamped metal bifurcated member extending between the bar and the drive wheel, mounted to slide vertically in a rectilinear path, having the furcations thereof in straddled relation with the outer margin of the disc-like part, and provided with upper and lower cam follower parts arranged in straddled relation with the bar and adapted to have the aforesaid parts of the bar slide between them in connection with back and forth sliding movement of said bar.

9. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin; mechanism operative to drive the turntable at different speeds and comprising mounting means beneath the turntable, a horizontally disposed idler wheel positioned adjacent the flange of the turntable, an electric motor mounted on the aforesaid means and provided with a vertically extending armature shaft the upper end of which terminates adjacent the idler wheel, a rigid drive wheel extending loosely around said armature shaft, embodying a small diameter cylindrical driving part and a large diameter cylindrical driving part, slidable vertically in order selectively to bring said driving parts into operative positions with respect to the idler wheel, and having means between it and the shaft for causing it at all times to rotate conjointly with said shaft, manually operable means adapted to slide the drive wheel vertically into its different operative positions and embodying a horizontal cam type bar mounted on the mounting means to slide longitudinally back and forth and provided with laterally spaced notches in one side edge thereof, means for supporting the idler wheel so that it is movable into and out of a driving position wherein it engages the turntable flange and the driving part of the drive wheel that is in its operative position, spring means for urging the idler wheel into its driving position, and automatic means whereby the idler wheel is moved against the force of the spring means out of its driving position as a preliminary to sliding of the drive wheel from one operative position to another and then released for retraction of said spring means at the conclusion of sliding movement of the drive wheel, said automatic means embodying a horizontal plate mounted on the mounting means to slide horizontally to and from the bar, connected operatively to the idler wheel, having spring means for urging it towards the bar, and provided with a vertical rod arranged in sliding engagement with said one side edge of the bar, adapted to coact with the aforesaid notches, and forming means whereby the bifurcated member is mounted for vertical sliding movement.

ing engagement with said one side edge of the bar and adapted to coact with the notches.

10. In a phonograph of the type that embodies a horizontally disposed record-supporting turntable with a depending annular flange on its outer margin; mechanism operative to drive the turntable at different speeds and comprising mounting means beneath the turntable, a horizontally disposed idler wheel positioned adjacent the flange of the turntable, an electric motor mounted on the aforementioned means and provided with a vertically extending armature shaft the upper end of which terminates adjacent the idler wheel, a rigid drive wheel extending around the upper portion of said armature shaft, embodying in sequence a small diameter cylindrical driving part, a large diameter cylindrical driving part and a disc-like part of greater diameter than the large diameter driving part, slidable vertically in order selectively to bring said driving parts into operative positions with respect to the idler wheel, and having means between it and the shaft for causing it at all times to rotate conjointly with the shaft, manually operable means adapted positively to slide the drive wheel into its different operative positions, embodying a horizontal bar mounted on the mounting means to slide longitudinally back and forth, having horizontal spaced apart different level flat parts and an inclined cam part between the flat parts, and provided along one side edge thereof and in the flat parts with notches, and also embodying a bifurcated member extending between the bar and the drive wheel, adapted to slide vertically, having the furcations thereof in straddled relation with the outer margin of the disc-like part, and provided with upper and lower cam follower parts arranged in straddled relation with the bar and adapted to have the aforesaid parts of the bar slide therebetween in connection with back and forth sliding movement of said bar, means for supporting the idler wheel so that it is movable into and out of a driving position wherein it engages the turntable flange and the driving part of the drive wheel that is in its operative position, spring means for urging the idler wheel into its driving position, and automatic means whereby the idler wheel is moved against the force of the spring means out of its driving position as a preliminary to sliding of the drive wheel from one operative position to another and is then released for retraction by said spring means at the conclusion of the sliding movement of the drive wheel, said automatic means embodying a horizontal plate mounted on the mounting means to slide horizontally to and from the bar, connected operatively to the idler wheel, having spring means for urging it towards the bar, and provided with a vertical rod arranged in sliding engagement with said one side edge of the bar, adapted to coact with the aforesaid notches, and forming means whereby the bifurcated member is mounted for vertical sliding movement.

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