Aug. 31, 1948. F. C. HINCKLEY 2,448,030

MANUFACTURE OF PHONOGRAPH RECORDS

Filed Aug. 18, 1945 3 Sheets-Sheet 1

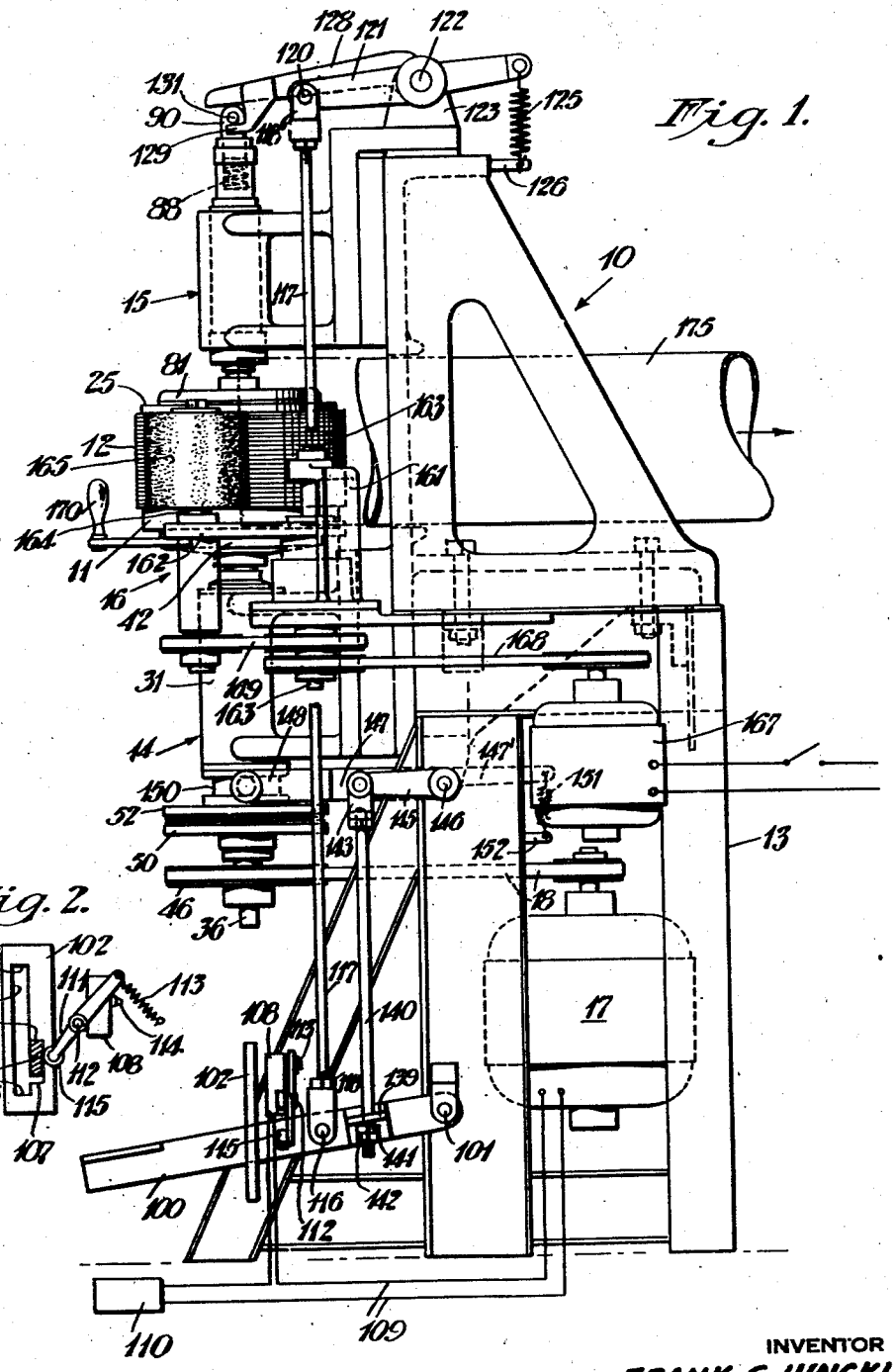


Fig. 1.

Fig. 2.

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Fig. 3.

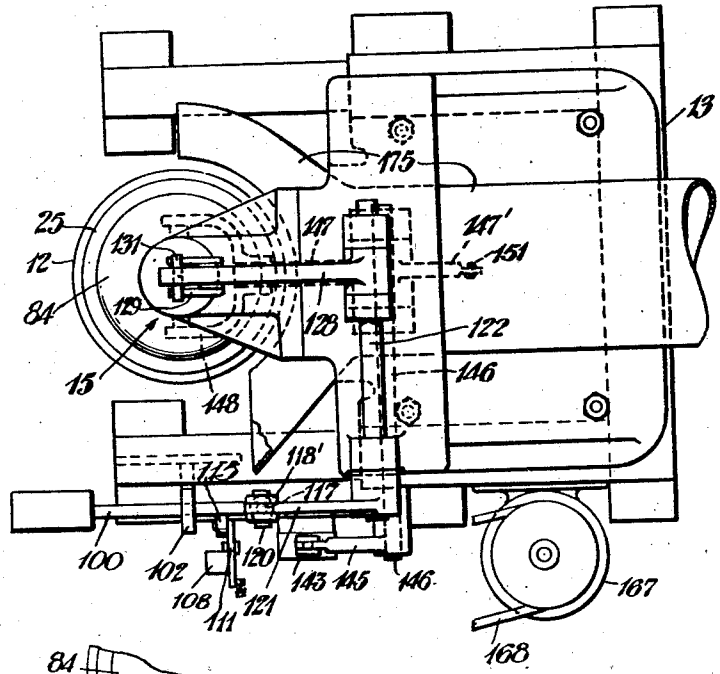
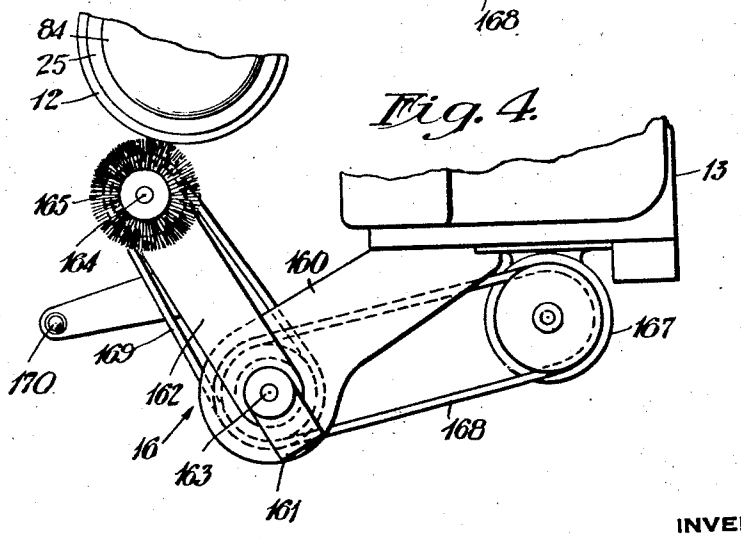


Fig. 4.



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Fig. 6.

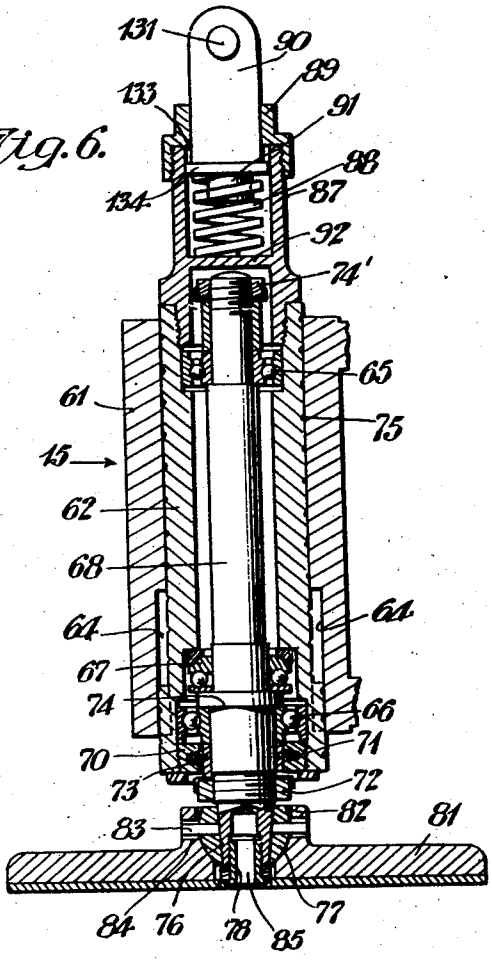


Fig. 5.

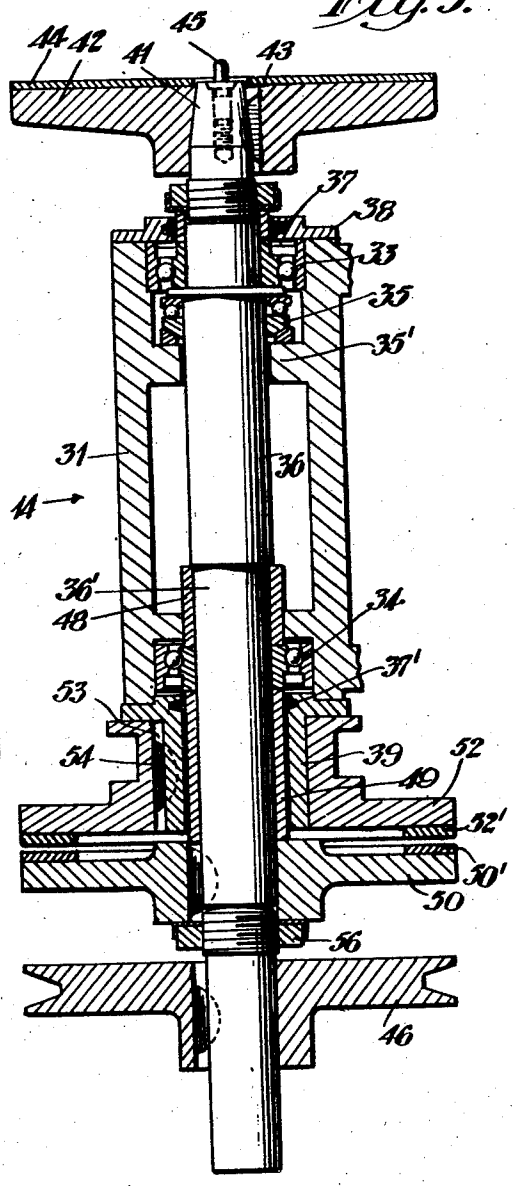
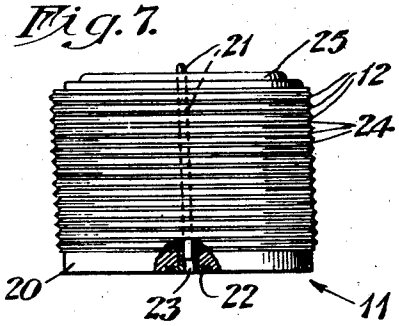


Fig. 7.



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2,448,030

MANUFACTURE OF PHONOGRAPH RECORDS

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Application August 18, 1945, Serial No. 611,393

6 Claims. (Cl. 29—76)

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This invention relates to the manufacture of phonograph records of the disk type and it refers particularly to the finishing of the edges of such records.

The principal object of the invention is to provide a machine for smoothing and polishing the edges of disk records rapidly and economically. It is also an object of the invention to provide a machine for finishing the edges of records of a type suitable for use with automatic record changers, such as, for example, the type disclosed in the co-pending application of James H. Hunter and the present inventor, Serial No. 611,392, filed August 18,1945.

The need for finishing the edges of disk records arises from the practice of flash-molding such records whereby a certain amount of excess plastic material, supplied to the mold to insure the production of perfect margins, is extruded around the edge of the mold. This excess material, in the form of a thin web or fin, is removed by being broken away along a parting line formed by the mold, leaving a rough edge which must be smoothed and polished. The smoothing and polishing operations are advantageously performed while rotating the records at a relatively high speed, for example, one giving a peripheral velocity of 1000 to 1500 ft. per minute.

It has been the practice, heretofore, to edge finish records one at a time while rotating the record on the spindle of a lathe or other general purpose machine. The starting and stopping of the rotating spindle, the mounting and removal of the records and the individual finishing operations required have made this procedure both tedious and expensive. There has also been an element of danger if the operator accidentally followed a wrong sequence in performing the several operations. The present invention provides a special purpose machine which operates on a plurality of records simultaneously and which greatly simplifies and speeds up the edging or edge-finishing of the records. The invention also provides safeguards for the operator preventing his following a wrong and possibly dangerous sequence of operations.

The machine of the invention, while not limited in its application to operation on any one type of record, will be described herein with particular reference to the finishing of the edges of the improved record for use with automatic record-changers described in the above referred to application, Serial No. 611,392 This type of record has an edge which is molded to a V-shape instead of having the conventional rounded contour. A

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suitable parting line is formed by the mold so that in breaking away the extruded peripheral fin a minimum amount of the excess molding material is left adhering to the record.

According to the general features of the invention a horizontal table, rotatable about a vertical axis, is provided for rapidly revolving a stack of rough-edged records while finishing means are brought to bear against the edges of the records. A quantity of records, usually of the order of forty or more, is first stacked on an open-ended carrying spool or spindle with protecting material between adjacent records and over the top of the stack, and the assembly centered on the rotatable table of the machine. By operating a foot pedal a rotatable clamp is brought to bear against the top of the stack to clamp the stack to the table. The table is then rotated rapidly, under the control of the same foot pedal while sanding, buffing and other finishing means are brought to bear against the record edges. After the finishing operations are completed the rotative power is shut off, the table braked to a stop and the clamp released, all by operation of the one foot pedal to different positions. The stack of finished disks on the carrying spindle may then be removed from the machine.

According to the invention the several functions of the machine are automatically controlled as to the sequence in which they can be performed or as to the combinations of functions which can be performed at one time, by interlocking means which prevent the possibility of the operator following a wrong sequence or setting up a wrong combination that might involve danger to himself or damage to the machine or stack of records. Moreover, the clamping of the stack, the application of rotative power to the table, the removal of this power and the braking of the table being all controlled by a foot pedal, the hands of the operator are left free to manipulate the finishing means and to load and remove the stacks of records. This simplified control and the removal of the danger of improper control result in a greatly increased production per operator.

Objects and advantages of the invention other than those referred to above will be apparent upon consideration of the following description and accompanying drawings, in which:

Fig. 1 is an end elevational view of a phonograph record edge finishing or edging machine, according to the invention;

Fig. 2 is a front elevational view of the foot lever guide and motor control switch;

Fig. 3 is a plan view of the machine of Fig. 1, not including the buffing mechanism;

Fig. 4 is a fractional plan view showing the buffing mechanism;

Fig. 5 is an enlarged cross-sectional view, in elevation, of the lower spindle assembly;

Fig. 6 is an enlarged cross-sectional view in elevation, of the upper spindle assembly;

Fig. 7 is an elevational view of a carrying spool or spindle with a stack of record disks thereon.

In Fig. 1 numeral 10 designates, generally, a self-contained transportable record-edging machine which may be located in a production line adjacent a conveyor bringing to the operator a succession of spindles or spools 11 stacked with unfinished disks 12, more clearly seen in Fig. 7, for insertion in the machine. The edging or edge finishing machine 10 includes a frame 13 of built-up construction having sufficient rigidity to withstand and to reduce vibration due to dynamic unbalance of a rotating record stack, a lower spindle assembly 14 adapted to support and to rotate a spool 11 with a stack of disks 12 thereon, an upper spindle assembly 15 adjustable vertically for the purpose of clamping the record stack to the lower spindle assembly, finishing devices to engage the edges of disks 12 such as buffing mechanism 16 and appropriate control means. Power for rotating the lower spindle assembly is provided by a motor 17 through a belt drive 18.

Referring now to Fig. 7, there is shown one of the spools 11 with unfinished disks 12 stacked thereon. Spool 11 has a base 20 and a vertical pin 21, the lower end of which is pressed into a flanged sleeve 22 mounted in the base. The hole 23 in base 20 into which pin 21 is pressed has a lower portion not occupied by the pin which serves as a recess to receive a centering pin on the table of the lower spindle assembly, to be described in connection with that assembly.

Unfinished disks 12, each having a central aperture slightly larger than pin 21, are stacked upon base 20 and centered thereon by the pin. Adjacent disks are spaced by paper spacers 24 to prevent scratching of the faces of the disks carrying the sound grooves and over the top disk there is disposed a cover plate 25. Approximately forty disks may be loaded on one size of spool which has been used with the edging machine of the invention.

In the machine, lower spindle assembly 14 for rotating spools 11 comprises a housing 31 bolted to frame 13 having a bore in which are retained a pair of annular ball bearings 33, 34, Fig. 5, and a thrust bearing 35 seated against a shoulder 35', providing anti-friction bearing means for the lower spindle assembly shaft 36. A pair of felt grease-retaining washers 37, 37' is provided to keep sand and record dust out of the bearings, the former in a cap 38 and the latter in a flanged sleeve 39, respectively closing the upper and the lower end of the bore in housing 31. The bearings themselves may be of the sealed type.

Shaft 36 at its upper end has a tapered portion 41 on which is coaxially mounted a circular table 42 secured to the shaft by a round key 43. Table 42 carries a pad 44 of frictional material adapted to engage the base of spool 11 which is centered on the table by means of a pin 45 secured to and extending axially from shaft 36, pin 45 being adapted to enter the central recess 23 in the spool base previously referred to. A grooved driving pulley 46 is secured to shaft 36 at the lower end thereof for rotating the shaft by means of motor 17 and belt drive 18, Fig. 1.

Shaft 36 has a section 36' of reduced diameter mounting a pair of spacing sleeves 48, 49 between which the inner race of bearing 34 is clamped. Sleeve 48 bears against the shoulder formed on shaft 36 by section 36' thereof while sleeve 49 bears against the upper face of a central hub formed on a lower circular brake plate 50 keyed to shaft 36 for rotation therewith. Surrounding sleeve 49 and spaced therefrom is stationary sleeve 39, previously referred to, on which an upper circular brake plate 52 is slidably mounted for limited axial displacement to apply and release the brake. Rotation of plate 52 about sleeve 39 is prevented by a vertical keyway 53 therein adapted to receive a key 54 mounted on and extending from the sleeve. A threaded collar or nut 56, with lock washer, engages a threaded portion of shaft 36 to clamp plate 50, and the members retained on the shaft thereby, against axial displacement. Brake plates 50, 52 have facings of friction material 50', 52', respectively, which come into mutual engagement upon downward displacement of plate 52 to provide a braking action tending to stop rotation of shaft 36 and table 42.

Upper spindle assembly 15, shown in detail in Fig. 6, comprises a housing 61 supported from the frame of the machine and having a bore, coaxial with that in lower spindle assembly housing 31, within which is slidably mounted a sleeve 62 restrained against rotation by diametrically opposite splines engaging corresponding keyways 64 in housing 61. Within sleeve 62 are retained annular ball bearings 65, 66 and thrust bearing 67 providing anti-friction bearing means for shaft 68. Ring 70, threaded into sleeve 62 serves as an axial adjustment for bearing 66 and also carries a grease-saturated felt washer 71 preventing dirt and dust from entering the bearings at the lower end of shaft 68. A clamping nut 72 with lock washer bears against a spacer 73 to clamp the inner race of bearing 66 against a shoulder 74 on shaft 68. At the upper end of shaft 68 a nut 74' and spacer clamp the inner race of bearing 65 against a corresponding shoulder on the shaft. A helical groove 75 in the outer surface of sleeve 62 is provided for lubrication purposes.

At its lower end shaft 68 has a tapered portion 76 on which a spherical member 77 is mounted and retained by a screw 78. A record clamping plate 81 has a recess 82 with a spherical bottom portion fitting over member 77. Pins 83 mounted on and extending from spherical member 77 register with openings 84 in the side wall of the socket which provide clearance around the pins to permit plate 81 to adjust itself to the plane of the upper face of top cover plate 25 of a stack of records. The head of screw 78 has an axial recess 85 adapted to receive the top end portion of the pin 21 of a record carrying spool.

At the upper end thereof sleeve 62 is threaded internally to receive an externally threaded end portion of a hollow spring-retaining housing 87 surrounding a compression spring 88. Housing 87 is closed at its upper end by a cap 89 having a central hole serving as a guide for a plunger 90 bearing against spring 88. A pilot projection 91 on plunger 90 maintains one end of spring 88 centered within spring retainer 87. The opposite end of spring 88 bears against a web 92 of member 87.

The interlocking mechanisms for actuating upper spindle assembly 15 to clamp a stack of records, for controlling the rotative power and for applying the brake will next be described. Operating foot pedal or lever 100 is pivoted to frame 13 at 101 and extends through a plate 102 having a notched opening 103 therein, Fig. 2. The lever is upwardly urged by spring means to be referred to later. Opening 103 in plate 102 serves as a guide for the lever and provides stops determining two positions in which the lever may remain without pressure from the foot of the operator. These positions are, a right-hand position in which edge 104 of guide 103 serves as an upper stop or latch for the lever, and an upper left-hand position in which edge 105 serves as the stop. A third operating position of lever 100 is defined by engagement of the lower surface of the lever with edge 106 of guide 103 at the left-hand portion thereof, due to pressure of the operator's foot. Engagement of the lever with the lower edge 107 of the notched right-hand portion of guide 103 is of no distinctive operative significance, the vertical length of the notch being greater than the vertical dimension of the lever merely to provide clearance for entrance of the lever into the notch. There is sufficient play at pivot 101 to permit the lever to be displaced laterally within guide 103.

A switch 108 positioned adjacent lever 100 for operation thereby is adapted to control the starting and stopping of motor 17 by suitable circuit means, such as means 109, including a source of voltage 110. Switch 108 has an operating arm 111 pivoted on the switch casing at 112 and normally urged by a spring 113 toward a position in which the switch is open-circuited, with power not being supplied to motor 17, this position of the arm being defined by a stop 114. Arm 111 carries at the operating end thereof a roller follower 115 adapted for engagement with lever 100, to operate switch 108 to a closed circuit condition and apply power to motor 17 causing rotation thereof when lever 100 is within the notched right-hand portion of guide 103, adjacent or in engagement with the right-hand edge thereof.

Pivoted to lever 100 to 116 is a vertically operating rod 117, with terminal clevises 118, 118' providing threaded adjustment of the effective length thereof, extending to the upper portion of the machine where it is pivotally connected at 120 to a rocker arm 121 fixedly mounted on and adapted to rotate, to a limited extent, a transverse shaft 122 journaled in bracket 123 attached to and extending from frame 13. A spring 125 exerts tension between a rearwardly extending portion of arm 121 and an extension 126 of frame 13 to exert an upwardly directed force on rod 117 and foot lever 100. A second arm 128 mounted on and rotated by shaft 122 has an end portion thereof bearing against the rounded upper end of plunger 90, while a bifurcated member 129 attached to and dependent from arm 128 engages the lower surface of a pin 131 fixedly secured in and extending beyond plunger 90 at opposite sides thereof. By engagement of the described members, arm 128 is adapted both to displace plunger 90 downwardly against the compressive force of spring 88 and to follow and assist upward movement of the plunger under the influence of springs 88 and 125, respectively, without appreciable lost motion. A stop for plunger 90 in its upward travel is provided by an internal shoulder 133 on cap 89, Fig. 6, against which a flange 134 on plunger 90 is adapted to bear.

The brake mechanism comprising lower brake plate 50 and upper brake plate 52 is arranged to be operated by the same foot lever 100 that operates upper spindle assembly 15 to clamp the record stack. To this end lever 100 has an angle bracket 139 attached thereto, at a location intermediate pivots 101 and 116, having a hole through which a threaded end of tie rod 140 extends with an adjusting nut 141 and locknut 142 forming an adjustable abutment against the lower face of the substantially horizontal leg of the bracket. On the upper end of rod 140 is threaded a second angle bracket 143 pivotally connected to an arm 145 mounted on transverse shaft 146, journaled on frame 13 for rotating said shaft. Shaft 146 mounts a second arm or lever 147 rotating therewith, having at the forward end thereof a yoke 148 formed by inwardly projecting portions which engage a peripherally-grooved portion 150 of a hub on upper brake plate 52. A spring 151 extending between the opposite and rearwardly extending end 147' of arm 147 and a projection 152 from frame 13 normally exerts a force tending to keep brake plates 50, 52 separated.

The spacing of the brake plates in the unoperated condition of the brake is very slight, as determined by the relative locations of plate 50 and flanged sleeve 39 on which plate 52 slides, the flange on sleeve 39 serving as a stop to upward travel of plate 52. The location in the downward travel of lever 100 at which the brake facings 50', 52' are engaged is adjustable by means of nuts 141, 142, the adjustment being such that engagement does not occur until the portion of the lower edge of lever 100 operating in guide 103 in plate 102 is below the lower edge 107 of the notched right-hand portion of the guide.

Referring now to the buffing mechanism shown in detail in Fig. 4, a bracket 160 extending laterally from frame 13 supports a pedestal 161 on which an arm 162 is mounted for limited rotation about the axis of a vertical countershaft 163 journaled on the pedestal. A vertical shaft 164 carrying a wire buffing brush 165 rotates in ball bearings mounted in arm 162 adjacent the outer extremity thereof.

A motor 167 mounted on frame 13 drives brush 165 by means of belt drive 168 to countershaft 163 and belt drive 169 between shafts 163 and 164. Brush 165 may be swung about the axis of shaft 163, with arm 162, for engagement with a stack of unfinished record disks 12, by means of a handle 170 attached to the arm.

In operation, a stack of unfinished disks 12 mounted on a carrying spool or spindle 11 and having a protective cover plate 25 over the top of the stack is placed in the machine and positioned along the axis of rotation of table 42 by the entrance of locating pin 45 into recess 23 in the base of the spool. Foot lever 100 which has, during this operation, been positioned against upper edge or stop 105 of guide 103 in plate 102 is now depressed by pressure of the operator's foot to displace downwardly the upper spindle assembly 15 by the pressure thus exerted on the top of plunger 90 by way of rod 117, arm 121, shaft 122 and arm 128, and bring clamping plate 81 in contact with cover plate 25 of the stack. Plate 81 accommodates itself to minor variations of the plane of the upper surface of cover plate 38 by virtue of the ball and socket joint provided by member 77 and the spherical recess in plate 81.

Further depression of foot lever 100, to a posi-

tion in which the upper surface of the portion thereof operating in guide 103 is in alignment with or slightly below edge 104 of the guide, causes plunger 90 to compress spring 88 and transmit pressure to the stack of disks, to clamp the stack securely to table 42. Adjustment of the clamping pressure may be made by adjustment of the effective length of rod 117, by varying the threaded engagement of clevis or clevises 118, 118' therewith. The interposition of spring 88 between foot lever 100 and the stack of disks causes an adjustable predetermined pressure to be applied to the stack which is substantially the same regardless of minor variations in the thickness of the stack.

After actuation of the releasable rotatable clamp constituted by upper spindle assembly 15, lever 100 is swung laterally to the right and latched under edge 104 of guide 103. Lateral displacement of lever 100 from left to right at the specified height causes the lever to engage roller 115 and operate pivoted arm 111 to close switch 108, normally spring-biased to an open-circuit condition. The closing of switch 108 starts motor 17 and puts into rotation table 42 with the stack of disks 12 thereon. While the disks are rotating the operator applies a sandpaper pad or other abrading means to the edges of the stack disks to remove the fragments of the peripheral molding fins left adhering to the disks, the major portions of the fins having been broken away before the disks were stacked on the carrying spool.

It is to be noted that due to their stacked arrangement, when V-edged disks are operated upon by the sandpaper pad, which preferably, but not necessarily, has a flat surface adapted to extend over the edges of a number of or all of the disks, only the apex of the V is affected by the abrading operation, which is only carried far enough to produce a slight flat at this apex. This is entirely unlike the individual finishing, particularly of round-edge records, that has been customary heretofore, wherein a major portion of the edge of the record is abraded in the finishing operation without specific control of the abrasion produced, resulting in unlike edge contours as between different disks and a varying diameter of the disks.

The advantages of the machine of the invention, however, are not confined to its use with V-edge records nor is the abrasive-carrying member limited to a flat operating surface where some other form of surface is desirable.

After sanding, the edges of the disks are buffed by wire buffing brush 165, which is swung against the stack by means of handle 170. A further polishing operation in which wax is applied to the disk edges by means of a hand brush, may follow the buffing. To dispose of the dust and debris incident to the finishing operations, an exhaust pipe 175 having a flared mouth partially surrounding the rotating disks and connected to exhausting means, not shown, is provided.

Upon the completion of the above described operations foot lever 100 is unlatched from against stop 104 by being swung laterally to the left thereby permitting switch 108 to return to its normal open-circuit condition and remove the power from motor 17. The lever is then further depressed, preferably to engagement with the lower edge 106 of guide 103, to apply the brake formed by co-operating brake plates 50, 52 of the lower spindle assembly. Engagement of the frictional facings of the pair of brake plates rapidly brings shaft 36, with table 42 and the stack of

disks thereon, to a stop. By removing the downward pressure of his foot on lever 100 and allowing the lever to spring upward to engagement with stop 105 the operator causes upper spindle assembly 15 to move upwardly under the influence of spring 113, exerted by way of arms 112 and 108, and remove the clamp from the stack of disks.

Summarizing the operating conditions imposed by the interlocking control provided by the co-operation of foot lever 100 and guide 103, there is one operating position of the lever, at the upper left portion of the guide, in which neither the clamp for the record stack nor the brake on the lower spindle assembly is actuated and an intermediate position at the left of the guide in which the clamp alone is actuated. No rotative power is applied to the lower spindle assembly shaft in either of the foregoing positions. In another position, in which the lever is in the right-hand notched portion of the guide, the clamp alone is actuated, with rotative power applied to the lower spindle assembly shaft. Finally, there is a position at the lower left portion of the guide in which both the clamp and brake are actuated and the power shut off. By these arrangements it is impossible for the operator to release the clamp or apply the brake while power is on, the former condition preventing possible damage to the records or personal injury due to the rotation of an unclamped stack of records and the latter condition preventing damage to the brake facings and motor.

While a preferred embodiment of the invention has been described herein and shown in the drawings, it will be understood that this is by way of illustration, the invention being limited only by the appended claims.

I claim:

1. In a disk edging machine a rotatable table, a removable arbor for mounting a plurality of disks on said table in coaxial stacked relation therewith, a rotatable clamp adapted to engage and to clamp said stack of disks to said table, a foot lever operatively connected for actuating said clamp, a driving motor for said table and control means for said motor operable by said lever only when said clamp is engaged.

2. In a phonograph record edging machine the combination of an operating lever mounted for vertical and horizontal displacement substantially about the same pivot point, a pair of members connected to said lever at unequal distances from said pivot point for unequal simultaneous vertical displacement thereby, record clamping means operated by said one member, brake means operated by said other member and switch means operated by said lever upon horizontal displacement thereof.

3. An edging machine for simultaneously finishing a plurality of phonograph record disks comprising a rotatable table, a removable spindle for mounting a plurality of record disks in coaxial stacked relation on said table, a brake for arresting rotation of said table, brake application means, a rotatable clamp adapted to engage and to clamp said stack of disks to said table for simultaneous rotation thereon, clamp engagement actuating means, a driving motor for rotating said table and a movable control member operable to a first position to actuate said clamp into engagement and thereupon to start said motor, operable to a second position to retain said clamp engaged and to stop the motor and to apply said brake, and operable to a third position to release

both said clamp and brake with the table at rest.

4. An edging machine for simultaneously finishing a plurality of phonograph record disks comprising a rotatable table having a supporting surface, a removable spool for mounting a plurality of record disks as a unit in coaxial stacked relation on said supporting surface of the table, said spool including a base adapted to rest upon said supporting surface of the table and to support thereon a stack of record disks and a pin extending from said base and adapted to pass through the central apertures of the record disks, said spool base and said table having cooperating means to center said spool and a stack of record disks carried thereby on said table, a rotatable clamp adapted to engage and to clamp said stack of record disks to said table for simultaneous rotation thereon, clamp-engagement actuating means, and a driving motor for rotating said table.

5. An edging machine for simultaneously finishing a plurality of phonograph record disks comprising a rotatable table having a supporting surface and a centering pin extending therefrom along the axis of rotation of the table, a removable spool for mounting a plurality of record disks in coaxial stacked relation on said supporting surface of the table and pin, said spool including a base adapted to rest upon said supporting surface of the table and to support thereon a stack of record disks and a pin extending from said base and adapted to pass through the central apertures of the record disks, said spool base having a recess to receive the pin of the rotatable table whereby said spool and a stack of record disks carried thereby may be centered on said table, a rotatable clamp adapted to engage and clamp said stack of record disks to said table for simultaneous rotation thereon, said rotatable clamp having an opening to receive the distal end of the spool pin, clamp-engagement actuating means, and a driving motor for rotating said table.

6. An edging machine for simultaneously finishing a plurality of phonograph record disks comprising a rotatable table having a supporting surface, a removable spool for mounting a plurality of record disks as a unit in coaxial stacked relation on said supporting surface of the table, said spool including a base adapted to rest upon said supporting surface of the table and to support thereon a stack of record disks and a pin extending from said base and adapted to pass through the central apertures of the record disks, said spool base and said table having cooperating means to center said spool and a stack of record disks carried thereby on said table, a translatable clamping plate spaced from and rotatable coaxially with said table, a displaceable, non-rotating operating member and resiliently coupled intermediate means between said member and said clamping plate for displacing the operating member to move the clamping plate into engagement with said stack of record disks and resiliently clamp the stack between said plate and said table, said clamping plate having a self-aligning bearing to adapt the clamping surface thereof to variations in the plane of the top surface of said stack, and a driving motor for said table.

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