

Nov. 11, 1941.

F. E. RUNGE

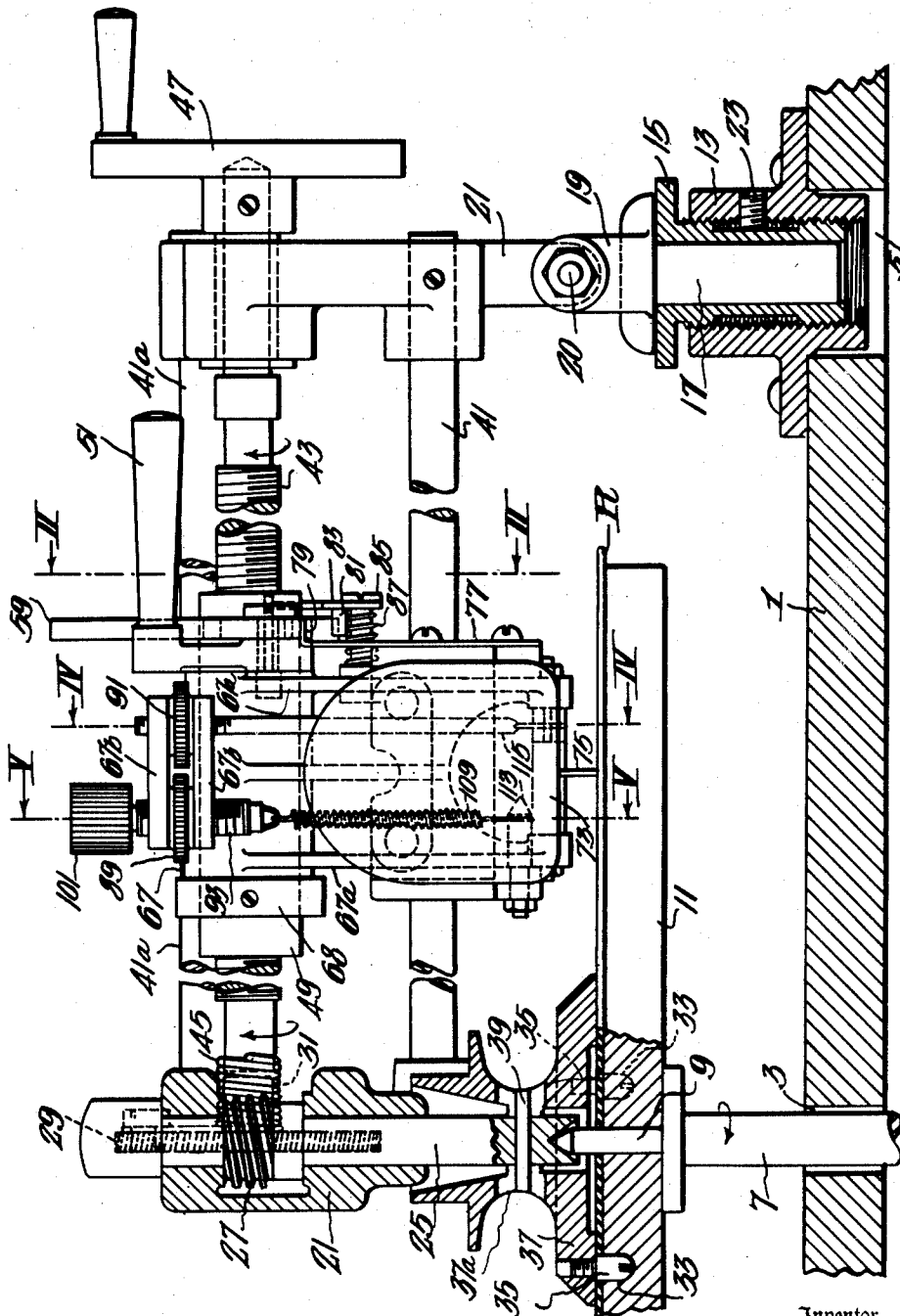
2,262,148

PHONOGRAPHIC APPARATUS

Filed June 29, 1940

3 Sheets-Sheet 1

Fig. 1.



Inventor

Frank E. Runge

By

G. J. Huff

Attorney

Nov. 11, 1941.

F. E. RUNGE

2,262,148

PHONOGRAPHIC APPARATUS

Filed June 29, 1940

3 Sheets-Sheet 2

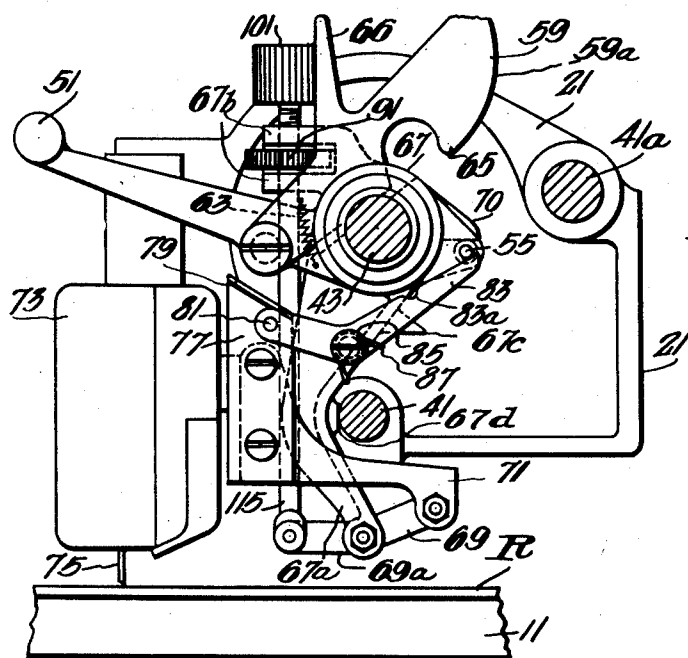


Fig. 2.

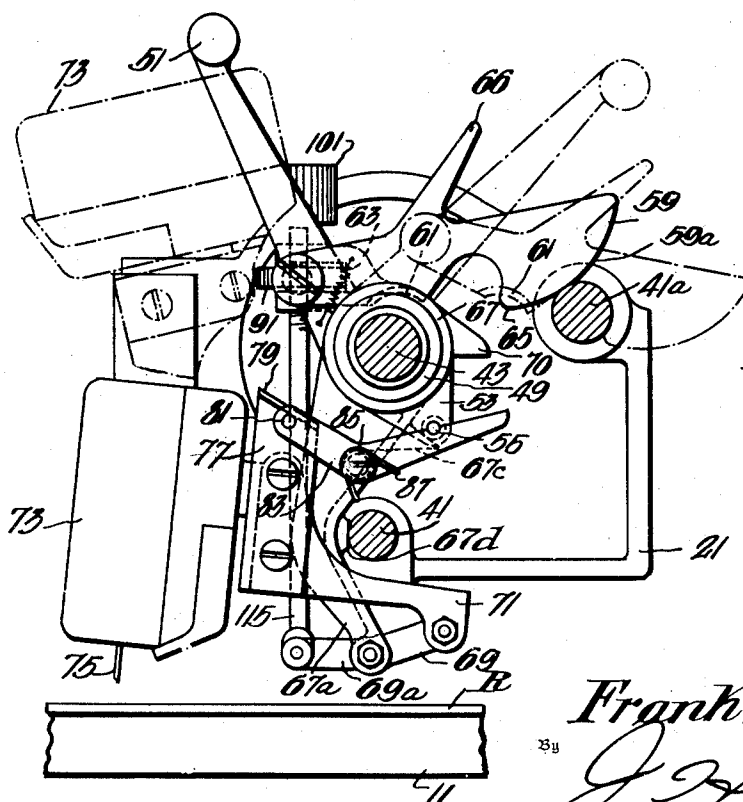


Fig. 3.

Inventor

Frank E. Runge

By

J. J. Huff

Attorney

Nov. 11, 1941.

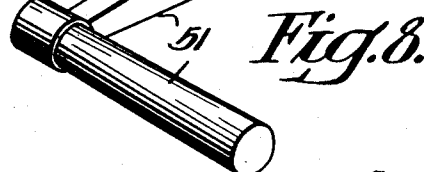
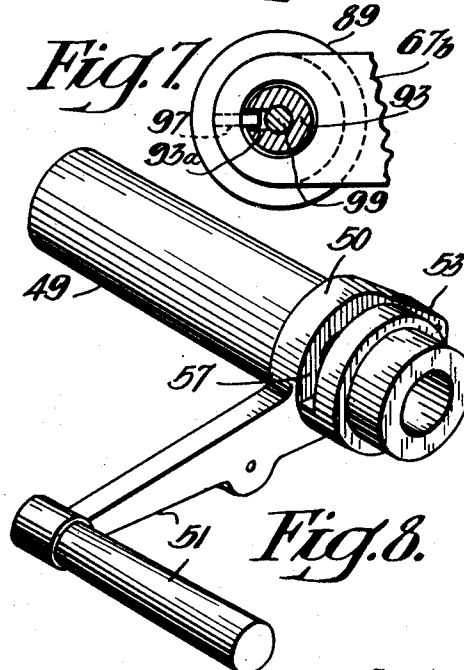
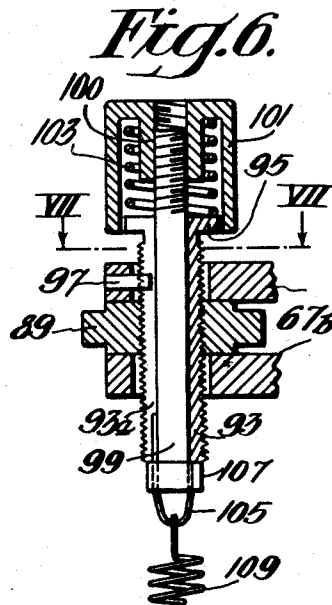
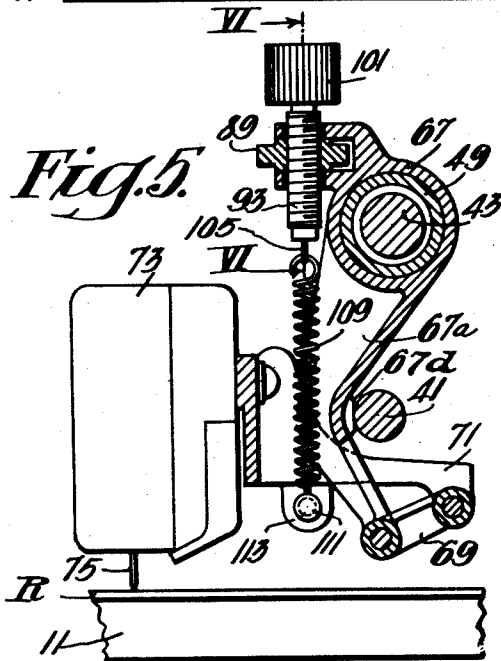
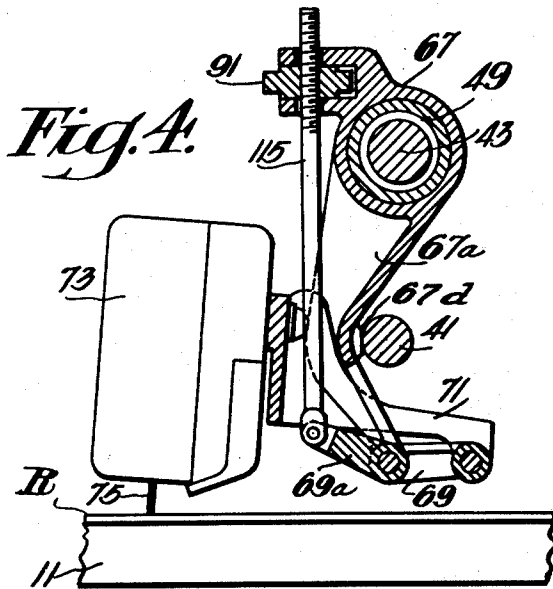
F. E. RUNGE

2,262,148

PHONOGRAPHIC APPARATUS

Filed June 29, 1940

3 Sheets-Sheet 3



Inventor
Frank E. Runge
By *J. J. Huff* Attorney

UNITED STATES PATENT OFFICE

2,262,148

PHONOGRAPHIC APPARATUS

Frank E. Runge, Oaklyn, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application June 29, 1940, Serial No. 343,116

8 Claims. (Cl. 274—13)

This invention relates to phonographic apparatus, and more particularly to the carriage mechanism for supporting and driving the cutter head in recording machines of the type adapted to record sound upon a blank disk for immediate playback, the present invention being in the nature of an improvement over that disclosed in my copending application Serial No. 337,994, filed May 31, 1940.

The primary object of my present invention is to provide improved recording apparatus which possesses most of the advantages of the apparatus disclosed in my aforementioned copending application but which is of considerably simpler construction.

More particularly, it is an object of my present invention to provide an improved, compact carriage mechanism which is positive in action and which is capable of various adjustments necessary to the recording of a completely satisfactory record.

Another object of my present invention is to provide an improved cutter head supporting carriage which may be easily manipulated by the user either to remove the cutter from engagement with the record blank or to bring it into engagement therewith.

Still another object of my present invention is to provide an improved cutter head supporting carriage mechanism by means of which the depth of the cut of the recording element can be easily and quickly adjusted either for gradual and fine adjustments or for abrupt and quick, relatively great adjustment to enable the cutting of (a) a signal groove of requisite depth, and (b) a relatively deep terminal groove which may be availed of to operate a suitable stop mechanism, automatic record changing mechanism, or the like.

Another object of my present invention is to provide an improved cutter head mounting by means of which the cutter head can be easily and quickly adjusted on its carriage to ensure a proper angular relation between the cutting stylus and the surface of the record blank.

A further object of my present invention is to provide an improved mounting for the recording mechanism by means of which it may be easily and rapidly adjusted as a whole with reference to the plane of the turntable.

Still a further object of my present invention is to provide an improved shaving collector for collecting the shavings cut in the blank disc by the cutting stylus.

It is also an object of my present invention to

provide an improved cutter head mounting and feeding mechanism as aforesaid which is relatively simple in construction, is easy to adjust and operate, is comprised of a minimum number of parts, and is highly efficient in operation.

In accordance with my present invention, I provide a lead screw on a frame member one end of which is mounted on the motor-board in a manner to permit vertical adjustment thereof relative to the plane of the turntable, the other end of the carriage resting on the turntable and carrying the driving mechanism which couples the rotating turntable to the lead screw for delivering power thereto. Rotatably and slidably mounted on the lead screw which acts as a guide therefor is a sleeve provided with an operating handle on which is mounted eccentrically to the axis of the lead screw a pivoted lever having a half-nut or other suitable follower which co-operates with the lead screw and through which longitudinal movement is imparted to the supporting sleeve by the lead screw. A mounting yoke is freely mounted on the aforementioned sleeve, so that the sleeve is rotatable not only on the lead screw, but also within the mounting yoke, the mounting yoke pivotally carrying the cutter head. The mounting yoke is also provided with two adjusting devices which are connected to the cutter head, one of the adjusting devices being arranged to alter the depth of cut of the recording stylus either gradually for fine adjustment, or abruptly and quickly for sudden, greater adjustments, and the other adjusting device being arranged to change the angularity of the cutting stylus relative to the record blank.

The novel features which I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description of one embodiment thereof when read in connection with the accompanying drawings, in which

Figure 1 is a front elevation, partly in section, showing a recording machine in accordance with my present invention,

Figure 2 is a sectional view thereof on the line II—II of Fig. 1 and showing the cutting stylus in engagement with the record blank,

Figure 3 is a view similar to Fig. 2 but showing the cutter head in various positions elevated from the record blank,

Figure 4 is a sectional view taken on the line IV—IV of Fig. 1.

Figure 5 is a sectional view taken on the line V—V of Fig. 1.

Figure 6 is an enlarged sectional view on the line VI—VI of Fig. 5.

Figure 7 is a sectional view on the line VII—VII of Fig. 6, and

Figure 8 is a prospective view of the supporting sleeve carried by the lead screw.

Referring more particularly to the drawings, I have shown, in Fig. 1, a motorboard 1 provided with a pair of openings 3 and 5 through the former of which extends a motor shaft 7 terminating in a spindle 9 to which a turntable 11 is suitably secured, and the latter of which has extending therein an internally threaded sleeve 13 which is secured to the motorboard. Threaded into the sleeve 13 is a bushing 15 which rotatably receives a downwardly extending pin 17 on a yoke 19, the yoke 19 carrying a pair of conically tipped bearings 20 which pivotally support one end of a frame 21. By turning the bushing 15 in the threads of the sleeve 13, the bushing 15 can be raised or lowered and locked in any desired position by means of a set screw 23, and since the yoke 19 is rotatable horizontally within the bushing 15 and the frame 21 is rotatable vertically on the bearings 20, it is obvious that the frame 21 is universally adjustable relative to the turntable 11 to cause the frame to assume any desired angular relation with respect to the turntable.

The upper end of the spindle 9 is conically tipped and has resting thereon a shaft 25 journaled in the frame 21 and formed with a conical seat or bearing in its lower end. The shaft 25 carries a worm 27 which meshes with a gear 29 fixed to a short shaft 31. The turntable 11 is provided with a plurality of circumferentially distributed openings 33 which are radially spaced from the spindle 9 and which receive driving pins 35 threaded into a somewhat spool-shaped coupling member 37 having a neck or central portion 37a intermediate its length for a purpose presently to be set forth.

The shaft 25 extends down through the coupling member 37 and is connected thereto by means of a diametrically extending cross pin 39, the lower conical seat of the shaft 25, which is formed on a greater angle than the conical tip of the spindle 9, resting on the spindle tip. The construction is generally similar to that disclosed and claimed in the copending application of Raymond F. Brady, Serial No. 276,604, filed May 31, 1939, and assigned to Radio Corporation of America. It will be obvious from the foregoing description that power may be transmitted from the motor shaft 7 to the turntable 11, thence through the pins 35, the coupling member 37 and the cross pin 39 to the shaft 25 and its worm 27 which, in turn, drives the gear 29 and its shaft 31.

The frame member 21 includes a pair of tie bars 41 and 41a and rotatably carries a lead screw 43 which is connected to the shaft 31 by a one-way spring clutch 45 one end of which is fixed to the shaft 31 and the other end of which is wound loosely on the adjacent end of the lead screw 43. The spring clutch 45 is so arranged that when the shaft 31 begins to turn it tends to wind the spring 45 tightly around the lead screw and thereby drives it. The opposite end of the lead screw 43 extends beyond the frame member 21 and has secured thereto a handle 47 by means of which the lead screw 43 may be

turned manually in the same direction as the spring 45 tends to turn it, this being provided for a purpose to be hereinafter set forth.

Mounted on the lead screw 43 for both rotation and longitudinal sliding movement thereon is a combined supporting and operating sleeve 49 (see Fig. 8) provided with a forwardly extending operating handle 51 and with a rearwardly extending projection 53 which carries a pin 55. The sleeve 49 is also provided with a slot 57 which extends radially inwardly thereof a distance sufficient to expose the lead screw 43. A lever 59 which is pivotally mounted on the handle 51 in eccentric relation to the axis of rotation of the lead screw 43 is provided with a half nut 61 or other suitable follower which extends through the slot 57 and cooperates with the lead screw 43, the follower 61 being always constrained toward the lead screw 43 by a spring 63 one end of which is fixed to the handle 51 and the other end of which is secured to the lever 59. The lever 59 is also provided with a toe 65 which is adapted to cooperate with the tie rod 41a for a reason to be shortly set forth.

Freely mounted on the supporting sleeve 49 is a mounting sleeve 67 within which the sleeve 49 is rotatable on the lead screw 43, the latter acting as a support for the entire assembly, and the sleeve 67 being confined between a shoulder 50 on the sleeve 49 and a locking ring 68 fixed to the sleeve 49 so as to prevent longitudinal movement thereof along the sleeve 49. The sleeve 67 is provided with a pair of downwardly extending arms 67a constituting a vertically extending yoke, and with a pair of parallel, forwardly extending plates 67b constituting a horizontal yoke. Pivotally mounted on the lower ends of the yoke arms 67a and extending rearwardly therefrom is a tiltable rocker 69 having a forwardly extending arm 69a thereon, a bracket or carriage 71 being pivotally mounted on the rocker 69 and secured to a signal transducing device 73, such as a cutter head carrying a cutting stylus 75. It will be clear from the foregoing description that the rocker 69 is free to rock on the yoke arms 67a and that the carriage 71 and the cutter head 73, in turn, can tilt or swing on the rocker 69.

Secured to one side of the carriage 71 is a plate 77 provided with a laterally extending inclined projection 79 constituting a cam with which a pin 81 cooperates, the pin 81 extending laterally from a lever 83 which is pivotally mounted on a pin 85 carried by one of the yoke arms 67a. A coil spring 87 which is coiled around the pin 85 and has one end secured to its mounting arm 67a and its other end secured to the lever 83 constantly constrains the lever 83 against the pin 55.

When the cutting stylus 75 is in operative engagement with a disk record blank R on the turntable 11, the parts are in the position shown in Fig. 2 with the right hand end of the lever 83 held against the pin 55 by the spring 87 and the pin 81 out of engagement with the projection or cam plate 79. To move the cutter 73 to an inoperative position, it is merely necessary to raise the handle 51. During initial movement of the handle 51, the sleeve 49 rotates on the supporting lead screw 43 and within the yoke sleeve 67 and the pin 55 acts on the right hand end of the lever 83 (as viewed in Figures 2 and 3) to turn the lever 83 on its pivot pin 85 in a clockwise direction against the action of the spring 87. This initial rotation of the operat-

ing sleeve 49 causes the play between the pin 81 and the cam plate 79 to be taken up, and when the pin 81 engages the cam plate 79, it raises the bracket or carriage 71 about its pivot, thereby raising the cutter head and its stylus 75 slightly from the record blank R. By this time, the pin 55 has reached a notch 83a in the lever 83 to temporarily lock the lever 83 in its new position and has also engaged a rearward projection 67c on one of the arms 67a. This ties the sleeve 49, the bracket 71 and its cutter 73, and the yoke sleeve 67 together for movement as a unit, and continued raising of the handle 51 rotates the entire assembly, as a unit, around the lead screw 43 to further raise the cutter 73 from the record.

As soon as initial raising of the handle 51 from the position shown in Fig. 2 toward the solid line position of Fig. 3 is begun the lever 59 quickly moves over toward the tie rod 41a until its cam edge 59a engages this tie rod after which, as the handle 51 is moved toward the solid line position of Fig. 3, the rod 41a, acting on the cam edge 59a, cams the lever 59 away from the lead screw 43 so that the half nut 61 is disengaged from the lead screw. Thereafter, since the sleeve 49, the cutter 73 and the yoke sleeve 67 are all tied together for movement as a unit, continued clockwise rotation of the handle 51 about the lead screw 43 (as viewed in Fig. 3) will raise the cutter 73 to the dot-and-dash line position of Fig. 3, the lever 59 being further cammed upwardly by the rod 41a until the toe 65 thereof passes it, whereupon the spring 63 pulls the toe 65 down around the tie rod 41a and the assembly becomes locked in its fully raised position. To release the assembly from this position, the thumb may be placed against the handle 51 and the index finger against an extension 66 on the lever 59 and the two pressed together. This releases the toe or latch 65 from the tie rod 41a and permits lowering of the assembly until a bumper 67d on one of the arms 67a engages the rod 41, whereupon further counter-clockwise rotation of the assembly as a unit is arrested. However, the handle 51 and its sleeve 49 can continue such rotation until the pin 55 abuts against a rearward extension 70 on the sleeve 67 at which time the stylus 75 is already back in engagement with the record blank R.

Mounted between the plates 67b of the horizontal yoke of the sleeve 67 are a pair of thumb nuts 89 and 91, the thumb nut 89 threadedly receiving a hollow screw 93 formed with a longitudinal slot 93a and provided with a head 95. A pin 97 extending through the upper plate 67b and into the slot 93a prevents rotation of the screw 93. A rod or plunger 99 is slidably received in the screw 93 and has its upper end threaded for reception by the internally threaded central hub 100 of a hollow manipulating cylinder 101, the head 95 of the screw 93 being received within the cylinder 101, and a coiled compression spring 103 being interposed between the head 95 and the upper end of the cylinder 101 around the hub 100. A loop of wire 105 is secured to the lower end of the plunger 99 and extends into the slot 93a of the screw 93 whereby the plunger 99 is prevented from rotating in the screw 93, a sleeve 107 being also secured to the lower end of the plunger 99 and providing a shoulder which abuts against the lower end of the hollow screw 93.

One end of a tension spring 109 is secured to the loop 105, and its other end is secured to a

pin 111 carried by a projection 113 on the carriage bracket 71. By turning the thumb nut 89 one way or the other, the hollow screw 93 is raised or lowered correspondingly. When the screw 93 is lowered, it pushes down against the sleeve 107 to lower the plunger 99 and its loop 105, thereby releasing some of the tension in the spring 109 to permit the carriage 71 and the cutter 73 to move downwardly toward the record blank R somewhat and thereby increase the depth of cut made by the cutting stylus 75. When the thumb nut 89 is turned in the opposite direction, the hollow screw 93 is raised, thereby compressing the coil spring 103 somewhat and causing the latter to correspondingly raise the plunger 99 and its loop 105 to thereby increase the tension on the coil spring 109 somewhat and thus raise the stylus 75 slightly from the record blank to cause it to cut a more shallow groove. Manipulation of the thumb nut 89 provides a very fine and very gradual adjustment of the cutting depth of the stylus 75. If it is desired to form a deep groove in the record blank R very quickly, such as a terminal groove used for actuating an automatic stop device or the like, the cylindrical head 101 is pressed down quickly to force the plunger 99 down suddenly and to an extent determined by the spacing between the top of the upper plate 67b and the lower end of the cylindrical head 101. Thus, the tension in the spring 109 is greatly relieved very quickly and the stylus 75 is permitted to cut deeply into the record blank R. The depth of the relatively deeper groove can be varied by adjusting the cylindrical member 101 on the plunger 99 which will determine the distance between the upper plate 67b and the lower end of the member 101. The second thumb nut 91 receives the threaded end of a link 115, the lower end of which is pivotally connected to a forwardly extending arm 69a of the rocker 69. Rotation of the thumb nut 91 will raise or lower the link 115 and this, in turn, will rock the rocker 69 on the yoke arms 67a. When the link 115 is lowered (as viewed in Fig. 4) the opposite end of the rocker 69 will be raised, and this will raise the bracket 71 and the cutter head 73 to bring the cutting stylus 75 into a more vertical position. On the other hand, when the thumb nut 91 is manipulated to raise the link 115, the rocker 69 is rotated in a clockwise direction to lower the bracket 71, whereupon the cutter head is tilted to cause the cutter 75 to assume a smaller angle with respect to the record blank R. In any case, the parts are so related that the angular adjustment of the needle takes place substantially about the point of contact of the needle 75 with the record blank R as a center. Once the proper angular adjustment of the needle 75 is obtained, the thumb nut 89 may be manipulated to provide the proper cutting depth therefor, and the recording may be made.

When the recording is completed, the lead screw handle 47 may be manipulated by hand to turn the lead screw 43 more rapidly than during the recording so as to cut a coarser spiral in the blank (this being permitted by the clutch 45) and at the same time, if desired, the cylinder 101 may be pressed down to cause the stylus 75 to cut deeply into the blank R to form the well known terminal groove. The shavings cut from the blank R by the cutter 75 wind up in helical fashion and tend to move toward the center of the disk due to the springiness thereof. By making the coupling member 37 spool-shaped,

as shown in Fig. 1, the shavings wind themselves somewhat loosely around the neck 37a as the turntable rotates and collect on the coupling member. When the recording operation is finished, the handle 51 is raised to the dot-and-dash line position of Fig. 3 whereupon the entire mechanism may be lifted from the record by pivoting around the pivots 20, and the shavings can easily be slipped off from the spool-shaped member 37 in the form of a ring.

From the foregoing description, it will be apparent to those skilled in the art that I have provided an improved cutter head mounting and shaving collector which have many advantages not found in prior art devices. Although I have shown and described but one embodiment of my invention, I am fully aware that many other modifications thereof are possible. I therefore desire it to be understood that my invention is not to be limited except insofar as is made necessary by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In phonographic apparatus, the combination of guide means, a supporting member slidably and rotatably carried on said guide means, a mounting carried by said supporting member, said supporting member being rotatable on said guide means relative to said mounting, a sound translating device pivotally carried by said mounting, means for effecting pivotal movement of said sound translating device relative to said mounting, and means for locking together said supporting member, said mounting and said sound translating device for rotation as a unit on said guide means.

2. In phonographic apparatus employing a record, the combination of guide means, a supporting member slidably and rotatably carried on said guide means, a mounting carried by said supporting member, said supporting member being rotatable on said guide means relative to said mounting, a sound translating device pivotally carried by said mounting, means responsive to rotation of said supporting member relative to said mounting for effecting pivotal movement of said sound translating device on said mounting to effect disengagement of said device from the record, and means for thereafter locking together said supporting member, said mounting and said sound translating device for rotation as a unit on said guide means whereby continued rotation of said supporting member on said guide means will effect removal of said device from adjacent the record to a position remote therefrom.

3. In phonographic apparatus employing a record, the combination of guide means, a supporting member slidably and rotatably carried on said guide means, a mounting carried by said supporting member, said supporting member being rotatable on said guide means relative to said mounting, a sound translating device pivotally carried by said mounting, means responsive to rotation of said supporting member relative to said mounting for effecting pivotal movement of said sound translating device on said mounting to effect disengagement of said device from the record, means for thereafter locking together said supporting member, said mounting and said sound translating device for rotation as a unit on said guide means whereby continued rotation of said supporting member on said guide means will effect removal of said device from adjacent the record to a position remote therefrom, and

means for releasably latching said unit in said last named position.

4. In phonographic apparatus employing a record, the combination of guide means, a supporting member slidably and rotatably carried on said guide means, a mounting carried by said supporting member, said supporting member being rotatable on said guide means relative to said mounting, a sound translating device pivotally carried by said mounting, means responsive to rotation of said supporting member relative to said mounting for effecting pivotal movement of said sound translating device on said mounting to effect disengagement of said device from the record, means for thereafter locking together said supporting member, said mounting and said sound translating device for rotation as a unit on said guide means whereby continued rotation of said supporting member on said guide means will effect removal of said device from adjacent the record to a position remote therefrom, and means carried by said supporting member for releasably latching said unit in said last named position.

5. The invention set forth in claim 2 characterized in that said guide means is constituted by a rotatable lead screw, characterized further by the addition of means carried by said supporting member and normally cooperating with said lead screw to effect movement of said sound translating device across the record, and characterized still further in that said last named means is so arranged on said supporting member that rotation of said supporting member to disengage said sound translating device from the record will effect disengagement of said last named means from said lead screw.

6. The invention set forth in claim 2 characterized in that said guide means is constituted by a rotatable lead screw, characterized further by the addition of a pivoted lever on said supporting member having a follower normally cooperating with said lead screw to effect movement of said sound translating device across the record and having also a latch thereon, said lever being so pivoted on said supporting member that rotation of said supporting member to disengage said sound translating device from the record will effect disengagement of said follower from said lead screw, and characterized still further by the addition of means for cooperating with said latch when said unit is moved to said remote position for releasably locking said unit in said position.

7. In phonographic apparatus, the combination of a rotatable lead screw, a sleeve slidably and rotatably mounted on said lead screw, a yoke member loosely carried by said sleeve whereby said sleeve is rotatable within said yoke member, a sound translating device pivotally carried by said yoke member, means responsive to initial rotation of said sleeve on said lead screw in a predetermined direction relative to said yoke member for effecting pivotal movement of said sound translating device on said yoke member to disengage said sound translating device from the record, and means on said sleeve adapted to engage said yoke member to effect rotation of said sleeve, said yoke member and said sound translating device as a unit on said lead screw upon continued rotation of said sleeve in said predetermined direction to remove said sound translating device to a position remote from the record.

8. The invention set forth in claim 7 char-

acterized in that said sleeve is provided with an operating handle, characterized further by the addition of a lever pivoted on said handle eccentrically to said lead screw, said lever having a follower normally in engagement with said lead screw to effect movement of said sound translating device across the record, and also having

a latch thereon, said follower being disengaged from said lead screw upon said initial rotation of said sleeve, and a locking bar adapted to be engaged by said latch for releasably locking said unit in said remote position at the conclusion of said continued rotation of said sleeve.

FRANK E. RUNGE.