

Nov. 25, 1941.

W. A. BRUNO

2,263,979

ART OF PHONOGRAPH RECORDING

Filed Feb. 19, 1940

2 Sheets-Sheet 1

Fig. 1

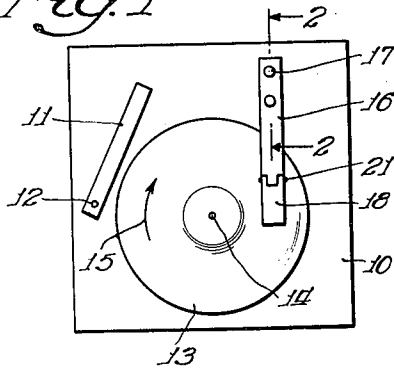


Fig. 2

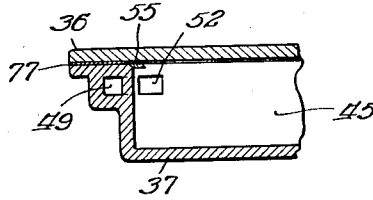


Fig. 5

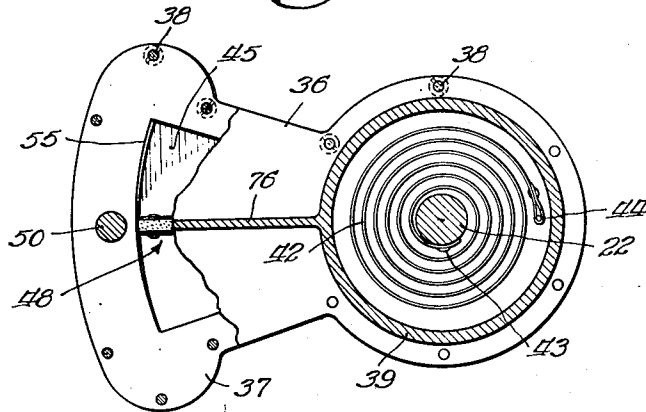


Fig. 6

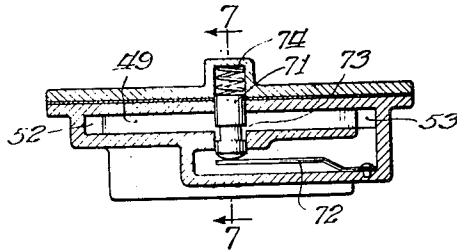
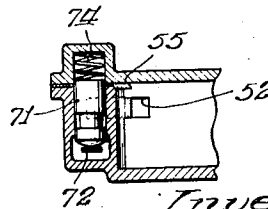


Fig. 7



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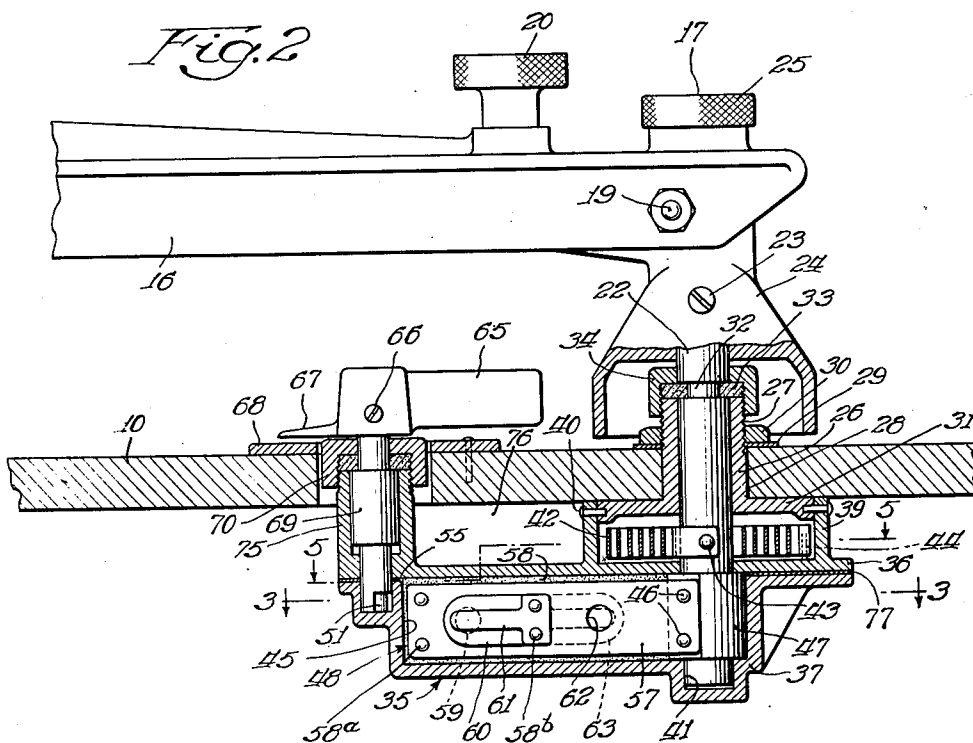
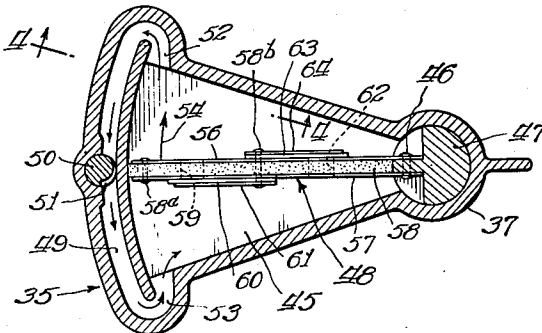
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ART OF PHONOGRAPH RECORDING

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,263,979

ART OF PHONOGRAPH RECORDING

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Application February 19, 1940, Serial No. 319,607

12 Claims. (Cl. 274—1)

This invention relates to the art of phonograph recording, and among other objects aims to provide simple and inexpensive recording means which may be readily adapted to phonographs for use in the home, for example, whether new or old, and which can be operated at a minimum expense and by amateurs in practice.

Other objects and advantages will be apparent from the following description, taken together with the accompanying drawings by which my invention may be readily understood, and in which—

Figure 1 is a diagrammatic view of a phonograph assembly with which my invention may be associated;

Figure 2 is an enlarged fragmentary axial section taken on the line 2—2 of Fig. 1;

Figure 3 is a plan section taken on the line 3—3 of Fig. 2;

Figure 4 is a fragmentary vertical section taken on the line 4—4 of Fig. 3;

Figure 5 is another plan section taken on the line 5—5 of Fig. 2;

Figure 6 is a sectional view of a modified form of by-pass valve; and

Figure 7 is a section taken on the line 7—7 of Fig. 6.

Referring in detail to the illustrative construction shown in the drawings, the numeral 10 represents the horizontal top panel of a conventional home phonograph assembly, upon which is mounted in the usual way the pick-up arm 11 pivoted at 12 for co-action with the conventional disk 13, rotatable on a turntable (not shown) having the record centering stud 14, by the usual motor (not shown) which is a part of the assembly, as is well known and need not be here described. The disk 13 will rotate in the direction of the arrow 15, and may be either a completed record having the usual spiral sound track thereon or may be a blank record upon which a sound track is to be impressed, the present invention being concerned with the use of the assembly for rotating a blank record and thereon cutting a sound track or other vibration record.

For the latter purpose, I have here shown the conventional cutter arm 16 pivoted at 17 on the panel 10 for swinging movement, similarly to the pick-up arm 11, on an arc extending somewhat radially of the disk 13 and having the usual cutter head 18. Since my invention is directed to the mounting of and control for the conventional cutter arm 16, the details of the cutter arm itself need not be here described beyond mentioning that it is swingable not only in a horizontal plane on the axis 17, but also vertically movable on the usual pivot 19, the arm carrying the conventional adjustment screw 20 for varying the angle of the cutter head 18, which is hinged to the main cutter arm as at 21 and is pro-

vided with the usual cutting needle, as is well known.

As best shown in Fig. 2, the pivot 17 for the cutter arm 16 comprises a vertical shaft 22 which is keyed as by a set-screw 23 to the turret 24 upon which the cutter arm 16 is mounted, and a knurled threaded cap 25 completing the assembly of the turret and cutter arm. With the pivot shaft of the cutter arm is associated a unitary housing therefor and control box for automatically swinging the cutter arm independently of the motor which rotates the phonograph disk, thus avoiding placing an extra load on this motor.

In accordance with my invention, the shaft 22 is shown journaled in a sleeve 26, threaded at its top as at 27, and which after being passed upwardly through the circular opening 28 in the panel 10, is clamped thereto by a washer 29 and clamping nut 30, the clamping nut 30 when screwed on the threads 27 drawing the flanged base 31 of the sleeve 26 tightly against the lower face of the panel 10. Intermedially within the turret 24, shaft 22 may be reduced as at 32 adjacent the upper end of the sleeve 26 to receive an annular packing gasket 33, which is clamped against the annular joint between the shaft 22 and the sleeve 26 by an interiorly threaded packing cap 34, which is also screwed on the threads 27.

The flanged base 31 of the sleeve 26 secures to the under side of the panel 10 the automatic control box, indicated generally by the numeral 35, for the cutter arm 16, and which control box may be conveniently formed of an upper section 36 and a lower section 37, secured together as by screws 38 passing through their mating peripheral flanges. The control box upper section 36 by which the box is suspended is here formed with an integral annular spring housing 39, which is secured as by drive pins 40 to the perimeter of the sleeve base 31, and shaft 22 is continued downwardly through both the spring housing 39 centrally thereof and still further downwardly through the lower control box section 37, where it has a bearing as at 41. A torsion spring 42 which is desirably of the clock spring type within the spring housing 39 is secured at one end as at 43 to the shaft 22, and at its other end as at 44 to the wall of the housing.

Beneath the spring 42 the shaft 22 adjacent its lower end and within the oil chamber 45, has anchored thereto as at 46 to an enlarged part 47 of the shaft 22 a rigid vane 48 which acts within the chamber 45 and is moved by the shaft 22 as a piston, which under the retarding action of the oil in the chamber 45, retards the movement of the shaft 22 and consequently the horizontal swinging movement of the cutter arm 16.

So as to permit movement, though thus retarded, of the vane 48 in the oil chamber 45, a

by-pass 49 is provided at the opposite end of the fan-shape or sector shape control box 35 for the oil from one side of the chamber to the other under the influence of the vane 48. The rate of flow of the oil through the by-pass 49 may be controlled by a plug valve 50, which may be, as here shown, in the form of a stub-shaft having a spiral cut 51 therein and which, as best shown in Fig. 3, may be rotated counterclockwise to afford an increasingly larger passage for the oil, or rotated clockwise to provide a smaller passage, and thus permit more or less oil to pass in a given time and consequently accelerate or further retard the movement of the vane 48 under the influence of the spring 42. It will be noted that the by-pass 49 is in communication with the main oil chamber 45 through the ports 52 and 53 communicating respectively with the opposite ends and adjacent sides of the by-pass and chamber, as best shown in Fig. 3. Looking at this figure of the drawings, it is to be understood that in this instance the spring 42 is arranged to be wound and thus have its maximum tension when the shaft 22 is so turned that the vane 48 is nearest the port 53. Then the torsional unwinding force of the spring moves the vane 48 in the direction of the arrow 54 and toward the port 52, so that when the vane is nearest the port 52 the spring is unwound or decreasingly tensioned. This progress of the vane 48 is permitted by the displacement of the oil through the by-pass from one side of the vane to the other progressively and by regular increments of distance during successive equal intervals of time. To accomplish this and to compensate for the lesser force of the spring as it approaches its minimum of tension, I provide means for permitting the vane to pass by an increasing though minute amount of oil in the chamber 45, as for example by a tapered slot formed by a chamfer 55 at the upper edge of the chamber wall adjacent the free end of the vane. This chamfer is best shown in Figs. 4 and 5, being gradually increased in size in the direction of the port 52.

The vane 48 is desirably comprised of two metal plates 56 and 57, which clamp between them as by rivets 58a, a slightly flexible body 58 of rubber, leather or other suitable material, which fits within the vertical longitudinal section of the chamber 45. The plates 56 and 57 are slightly smaller in area than the body 58 so as to permit free movement of the vane in the chamber with the flexible body 58 in contact with the walls of the chamber snugly but with a minimum of friction.

Referring again to Fig. 1, it will now be understood that if the disk 13 is a blank upon which is desired to be recorded sound or other vibrations, the cutter arm 16 is first placed in a position so that the cutter head 18 is at the outer edge of the disk 13. Then when the disk is rotated the cutter head 18 will cut a generally spiral groove in the disk, the cutter arm progressing as described from the outer edge of the disk toward its center in a generally radial direction; the adjacent segments of the groove at each side of the disk will be substantially equally and uniformly spaced apart. Since, as is well known to the art, a great number of grooves must be cut per inch of radial distance of the disk, it is apparent that movement of the cutter arm and resulting uniformity of the spacing of the grooves is important, and that I have shown

simple and efficient means for accomplishing this.

Frequently, and particularly for example to accommodate record disks of different diameters, it is desirable to be able to move the cutter arm manually from its outermost position to an intermediate position without waiting for the device to reach that position automatically under the retarded spring action, and for this purpose I may provide an orifice 59 in the vane 48 which is normally covered by a flexible flap 60 pressed to closed position by a leaf spring 61 secured to the face of the vane on its plate 57. Thus, if the cutter arm is moved manually inward radially of the disk, the force of the leaf spring 61 is overcome and the flap 60 will swing away from the vane to open the orifice 59 and permit relative movement of a quantity of the oil there-through, thus permitting more rapid movement of the vane in the oil. The strength of the leaf spring 61 is such that the orifice 59 is not open during normal retarded movement of the vane under the influence of the spring 42.

Somewhat similarly, when the cutter arm has reached its innermost radial position with respect to the disk 13, and it is desired to move the cutter arm radially outward without having to do so slowly while displacing the oil in the opposite direction through the by-pass 49, I have provided another orifice 62 normally closed by a flexible flap 63 held in closed position by a leaf spring 64 on the opposite face of the vane. The leaf spring 64 may be lighter than the leaf spring 61 since there is no tendency for the action of the spring 42 to open the orifice 62. However, on return movement to wind the spring 42 the vane may be moved rapidly through the oil, a quantity of oil moving relatively of the vane through the port 62 for this purpose. Rivets 58b may secure the leaf springs 61 and 64 to opposite faces of the vane.

In order to vary the speed I may provide means for manually regulating the valve 50 in the by-pass 49. In this instance the plug valve 50 has its shaft continued upwardly through the panel 10 to terminate in a handle 65 secured thereto as by the set-screw 66. The handle may carry an indicator 67 which plays over the dial 68 secured upon the upper face of the panel, and which may carry the legends "Slower" at one end and "Faster" at the other, corresponding respectively to positions of the plug valve 50 in which the spiral cut 51 therein provides a smaller or greater passage, as the case may be, for the oil through the by-pass. The shaft 50 may be intermedially enlarged as at 69 for the purpose just described, and may be provided with a packing gland arrangement 70 similar to that already described for the shaft 22. Thus, greater or fewer grooves per radial inch of the disk 13 may be cut as desired, or the same number may be maintained even though variations in the room temperature may cause the oil to be less or more sluggish. If it be desired to prevent manual variation of the grooves per inch to be cut, and merely to compensate for varying states of the oil as affected by temperature, I may provide a thermostatic control, for example, as illustrated in Figs. 6 and 7, in which the plug valve 71 may be moved upwardly in its bearing by a bi-metallic heat responsive member 72 to present an enhanced passage thereby as at 73 for the oil in the by-pass 49, if the room temperature drops. The valve 71 may be moved against the action of the compression coil spring 74 which will automatically

return it to original position if the room temperature rises, and the heat responsive member flexes downwardly, as will be readily understood.

For reinforcement purposes, the spring housing 39 and the bearing 75 for the plug valve part 69 may be joined by a web 76 on the upper control box section.

In order to insure an adequate supply of oil in the chamber 45, this chamber may be advantageously filled to overflowing so that the oil runs up into the spring housing 39 through the space about the shaft 22, there being no packing between the chamber 45 and the interior of the spring housing 39, while a peripheral gasket 77 may be otherwise interposed between the control box sections 36 and 37.

It will be understood that movement of the cutter arm 16 outwardly is provided for to an extent sufficient to permit the cutter arm to entirely clear the largest record which might be used with the phonograph, so that the cutter arm may be moved out of the way when not wanted.

It will be apparent that my invention is not limited to the exemplary construction shown, and that such changes may be made as fall within the scope of the following claims without departing therefrom.

Having described my invention, I claim:

1. In a device of the class described, the combination with a cutter arm, of a pivot shaft therefor, a housing for the pivot shaft, a control box unitary with said housing, a torsion spring of the clock spring type in the housing, one end of the spring being secured to the shaft and the other to the housing, an oil chamber in the control box, a vane anchored to the shaft to play in said chamber, by-pass means for the oil from one side of the chamber to the other whereby rotation of the shaft in one direction under the influence of the torsion spring is retarded by co-action of said vane and oil, and a flap valve carried by the vane to permit oil to pass from one side of the chamber to the other apart from said by-pass upon manual rotation of the shaft in the opposite direction.

2. The structure of claim 1 wherein the vane carries a pair of flap valves on its opposite faces for permitting accelerated manual movement of the cutter arm in either direction.

3. In a device of the class described, the combination with control means for a cutter arm comprising a spring driven member and fluid chamber retarding means, of means associated with said member and chamber for decreasing the retarding effect on the member as the spring approaches its minimum tension to effect uniformity of movement of the cutter arm.

4. In a device of the class described, the combination with a cutter arm control box having a sector shape oil chamber therein, the chamber having a pair of diverging walls and an arcuate wall, of a vane secured on the cutter arm shaft to play in said chamber between said diverging walls and in contact with said arcuate wall, and a tapered slot between said arcuate wall and said vane.

5. The structure of claim 4 wherein the vane is in the form of a pair of parallel plates riveted together and clamping between them a slightly flexible body fitting snugly within the said chamber.

6. In a device of the class described, the combination with a cutter arm control box having a sector shape oil chamber therein, the chamber having a pair of diverging walls and an arcuate

wall, of a vane secured on the cutter arm shaft to play in said chamber between said diverging walls and in contact with said arcuate wall, a tapered slot between said arcuate wall and said vane, and valves carried by the vane.

7. The structure of claim 6 wherein the vane is apertured for a plurality of valve openings and said openings are covered by leaf spring pressed valve flaps riveted to the vane.

8. In a device of the class described, the combination with a cutter arm control box receiving the cutter arm shaft therethrough and having an oil chamber therein, of a vane secured to said shaft to play in said chamber, means for rotating the shaft against the action of the oil in the chamber on said vane, a by-pass for the oil from one side of the chamber to the other whereby rotation of the shaft under the influence of said means is retarded by co-action of said vane and oil, and an additional by-pass actuated by manual operation of the shaft in the same direction.

9. In a device of the class described, the combination with a cutter arm, of a pivot shaft therethrough, a housing for the pivot shaft, a sector shape control box unitary with said housing, a torsion spring of the clock spring type in the housing for rotating said shaft, a sector shape oil chamber in the control box, a vane secured to the shaft to play in said chamber, by-pass means for the oil from one side of the chamber to the other when the vane is moving in one direction under the influence of the spring retarded by co-action of said vane and oil, an orifice in said vane communicating with both sides of the chamber, and a spring pressed valve normally closing said orifice but openable upon manual operation of the cutter arm in the direction movable by said spring.

10. The structure of claim 9 wherein said by-pass is manually controllable by a rotatable plug valve therein having a spiral cut to provide a selectively larger or smaller by-pass passage.

11. In a device of the class described, the combination with a cutter arm, of a pivot shaft therethrough, a housing for the pivot shaft, a sector shape control box unitary with said housing, a torsion spring of the clock spring type in the housing for rotating said shaft, a sector shape oil chamber in the control box, a vane secured to the shaft to play in said chamber, by-pass means for the oil from one side of the chamber to the other when the vane is moving in one direction under the influence of the spring retarded by co-action of said vane and oil, an orifice in said vane communicating with both sides of the chamber, a spring pressed valve normally closing said orifice but openable upon manual operation of the cutter arm in the direction movable by said spring, another orifice in said vane communicating with both sides of said chamber, another spring pressed valve normally closing said last mentioned orifice but openable on movement of the cutter arm manually in the opposite direction.

12. In a device of the class described, the combination with a pivotal cutter arm, of controllable spring means for swinging the cutter arm horizontally progressively and uniformly during an appreciable predetermined interval of time, said means including automatic compensation means for compensating for decreasing spring tension toward the end of the horizontal movement.

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