March 27, 1934. A. BOSCO 1,952,359

PHONOGRAPHIC APPARATUS AND PHONOGRAPHIC RECORD

Filed Dec. 2, 1930

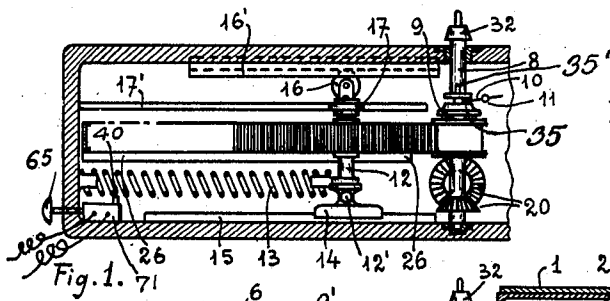


Fig. 1.

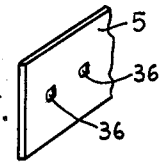


Fig. 5.

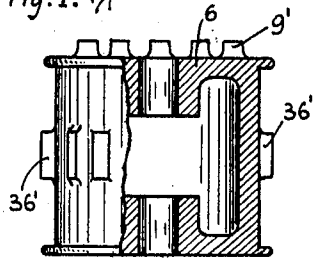


Fig. 6.

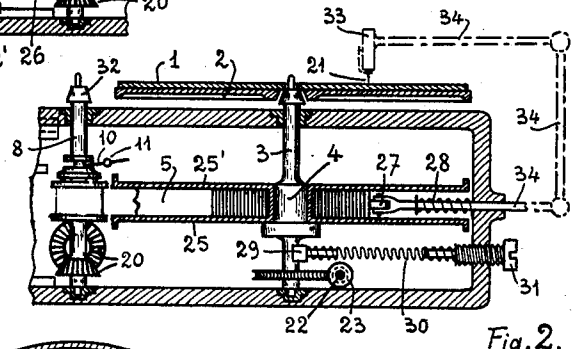


Fig. 2.

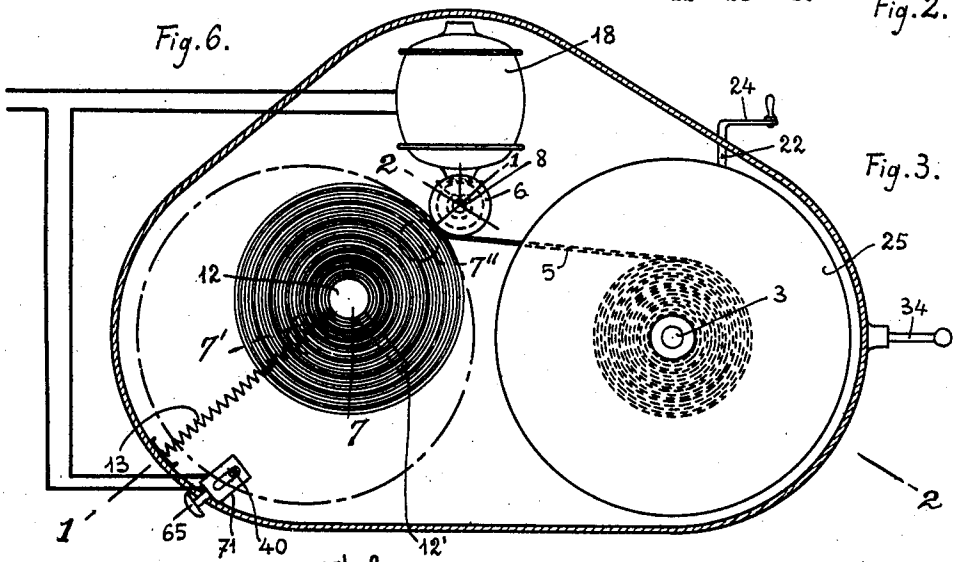
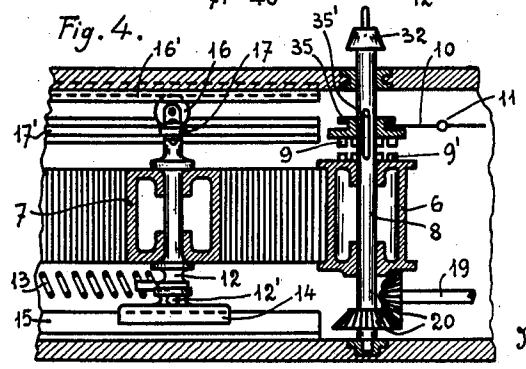


Fig. 3.

Fig. 4.



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PHONOGRAPHIC APPARATUS AND PHONOGRAPHIC RECORD

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10 Claims. (Cl. 274—9)

In the ordinary phonographic apparatus in current use, whether they are for engraving records or for phonographic reproduction, the element which supports the disk has a constant angular speed of rotation; while the element which carries the sound box and its stylus is displaced rectilinearly in such a manner as to make the stylus travel along a radius of the disk, also with a constant speed; and consequently the relative speed between the stylus and the surface of the disk varies continually, little by little, while the stylus varies its distance from the axis of rotation. As this relative speed has a minimum practical limit, below which it is impractical to go bearing in mind that the object is to increase the number of bar lengths of music which may be engraved upon a definite length of spiral groove and in a record disc, it follows that in the case of disks as commonly known, this minimum relative speed takes place only when the stylus is at its minimum distance from the center of the disk. It follows also that in the other positions of the stylus, this practical minimum speed is exceeded with the result that upon a disk of established dimensions, the stylus will engrave a lesser length of music measured in bar lengths than could be engraved, if the stylus were operated at a speed equal to the minimum practical rate.

The present invention has for its object the provision of a device of the above character in which in each position of the stylus this latter will have a relative speed, in relation to the disk, constant and equal to this useful minimum value; to obtain said result it is evidently sufficient for the disk holder to rotate with continuously variable angular speed and for the sound box and its stylus to displace radially on the disk with a continuously variable speed, increasing or decreasing proportionally to the angular speed of the disk.

In this specification the term "apparatus" shall signify either a device for simple engraving of records, or an apparatus for a simple reproduction of music, or an apparatus which may to serve both for the incision or engraving of records and for the reproduction of music or other sounds.

The present invention also refers to the records obtained, or to be used with, the above mentioned apparatus, that is to say, to the disks which have been engraved, and to those which are used with, a constant relative speed between the stylus and the disk.

The apparatus, object of the present invention, contains therefore two essential parts:

(*a*) The assemblage of members for giving motion to the record-holder an angular speed continually variable. The resulting apparatus then will consequently serve either for the engraving upon the disk or as a speaking device, for the reproduction of music or other sounds.

(*b*) The assemblage of the members for giving motion to the stylus of the sound box on a radius of the disk with a speed also continually variable. It will serve only for the engraving because for the reproduction of the tones, it will be sufficient to apply to the above mentioned part, employed as a speaking machine, a usual sound box.

With reference to the disk-holder the present invention has been preferably realized with a device provided with a dragging flexible ribbon having a thickness which depends on the pitch of the spiral described by the stylus of the sound box, and which winds or wraps on and becomes unwound from the shaft disk-holder; said thickness will be preferably equal to the pitch of the above said spiral, and, in this case, the gearings of multiplication or demultiplication are not needed; with such preferred practical embodiment, is attained the possibility to employ an apparatus of engraving and of reproduction of a simple nature.

The apparatus is furthermore characterized by the mechanism serving to give motion to the ribbon with a constant and linear speed, and, preferably by two cylinders between which passes the dragging ribbon; these two cylinders being submitted to a pressure directed normally to their axes, in manner as to drag the ribbon, one of the two cylinders being driven by the motor and rotating with a constant angular speed.

The ribbon which within this device is dragged and unrolled from the little shaft disk-holder will in general, wrap itself on any other cylinder, but preferably it shall be directly wrapped on the pressure cylinder above mentioned, which cylinder, then, shall have its axis predisposed in such a manner as to be displaced parallelly to itself little by little as the ribbon is wound.

In reference to the device adapted to displace the stylus of the sound box in a radial direction, and with a speed continually variable, the present invention is characterized by the fact that the stylus is carried by an apparatus driven in relation to the maximum radius of the spiral, according to which the ribbon is wrapped each instant, and that in manner as to realize, during the operation of the disk, that the relation speed between these two members is constant.

The apparatus is, furthermore, characterized by the fact that the shaft of the driving cylinder presents preferably a record-holder for the use upon itself, of the ordinary disk engraved by the usual method.

The apparatus lastly, is completed by devices of usual employment (motors, brakes, regulators, circuit brakers of safety devices etc.) capable to complete and to realize a safe operation of the device. In the annexed sheet of drawing is illustrated, only by way of example, a practical realization of the object of the present invention, and in particular: Fig. 1 is a vertical section on the line 1—1 of Fig. 3 of the left side of the apparatus; Fig. 2 is a vertical section on the line 2—2 of Fig. 3 showing the right side of the apparatus; Fig. 3 is a plan view of the apparatus with the cover removed; Fig. 4 is a view on a larger scale partly in section and partly in side elevation of a detail of the device, and Fig. 5 is a perspective view of a modified form of ribbon perforated uniformly throughout its length, and Fig. 6 shows an enlarged elevational detail partly in section of a modified form of drum to be used in connection with the ribbon shown in connection with Fig. 5.

The disk 1 and the disk-holder 2 are mounted in the ordinary way, on the upper end of the shaft 3, upon which there is the drum 4 for the wrapping of the dragging ribbon 5, which has a thickness equal to the pitch of the spiral engraved on the disk. This ribbon passes between the two cylinders 6 and 7. The cylinder 6 is mounted loosely upon the motor shaft 8, being able to be connected or disconnected with it by means of the movable clutch member 35 provided with teeth 9 and slidably mounted by means of a key 35' on a shaft 8. The clutch member 35 is controlled by a fork 10 of a lever pivotally mounted at 11 and working externally on the housing. The clutch member 35 with its teeth 9 may or may not engage with the teeth 9' carried by the cylinder 6 which also constitutes a clutch member. The cylinder 7 is carried loosely on the small shaft 12 which by means of an adjustable spring 13, or the like, is continually pushed, with a proper force, against the cylinder 6. The shaft 12 is supported below by a sliding member 14 which slides upon rail 15 and at its top carries a little vertical guide roller 16 and two little rollers 17 as lateral guides, which slide on the rails expressly provided therefor at 16' and 17' and cooperate to maintain vertical the shaft 12.

The sound box 33 for the engraving is displaced in a radial direction by means of the members 34, using,—for instance,—the same little pressure roller 27, or the like which will be able to give to the sound box 33 the radial displacement so that the point of the sound box will, in every moment, be distant from the center of a length which is proportional to the distance between the rotation axis and the point which divides the ribbon in the two portions, the still spiral wound portion and the rectilinear portion which goes to the cylinder 6. The sound box 33 for the engraving of the disks is carried by the element 34 which lies beneath and ends with a fork and a pressure roller 27 whilst a spring 28 or the like maintains the roller 27 always in contact with the last coil of the portion of the ribbon which is wound on the drum 4. In this manner the displacement in radial direction of the stylus 21 is in every moment proportional to the variation of the exterior radius according to which the wound portion of the ribbon is wound.

The operation of the device is as follows:

The motor 18, by means of the shaft 19 and of the pinions 20, sets into rotation, at a constant angular speed, the shaft 8 and the cylinder 6 fixed thereto by means of the clutch member 35; and through the cooperation of the cylinder 7, pushed against cylinder 6 by the spring 13, the cylinder 6 drags the ribbon 5 with a constant speed which is equal to the useful minimum for the reproduction of the tune. The ribbon which was entirely wound around the drum 4, imparts a variable angular speed to the axis 3, so that the stylus 21 of the sound box will have, with regard to the record 1 a constant speed which is equal to the useful admissible minimum.

When the stylus has reached the minimum radius of the spiral, the ribbon 5 will be entirely unwrapped or unwound, while it will be completely wound around the drum 7 which, reacting against the spring 13, is displaced to the position 7'. For this position, the shaft 12, or any other member as arm 12' applied thereto, will cut off by means of suitable devices such as a conventional switch 71 having a pin 40 to engage the arm 12' the current to the motor 18 and the apparatus will stop automatically or it may be stopped by the manual operation of push button 65 of the said switch 71.

In order to wind again the ribbon around the drum 4, it is necessary to release the cylinder 6 from the shaft 8 by means of the clutch member 35 and then to impart a rotating motion to the shaft 3 in a direction contrary to the preceding, this operation being performed by operating manually the shaft 22, by means of the gears 23, and the crank 24. During this winding operation, the shaft 12, under the action of the spring 13 shifts to the position shown in 7'' the arm 12' operates as described to effect stopping of the apparatus.

The means for securing an exact winding of the ribbon 5 around the drum 7 and especially on the drum 4 may be varied. For this purpose the drum 4 is provided with a lower disk support 25, while under the ribbon wound around the drum 7 suitable bars 26 are provided in the direction of the lateral movement of the shaft 12. In cases where the device is transported with little care, it is possible to provide complementary parts at the top, such as is shown at 25'. Further it will be preferable to add a thrust roller 27 which is pressed by the spring 28 against the peripheral portion of the spiral wound around the drum 4. Furthermore it will be advisable to apply a small friction brake 29 adjustable by means of the spring 30 and the screw 31, in order to prevent the undue rotation of the shaft 3 and the undue unwinding of the ribbon 5.

Instead of the plain drum and ribbon reference is had to Fig. 5 showing the modified form of ribbon 5 provided with uniformly spaced holes 36 throughout its length in order to mesh and cooperate with teeth 36' which project from the cylinder 6 as clearly illustrated in Fig. 6.

With a view to utilizing this apparatus for the audition of the ordinary records, the shaft 8 (which, as already said, has a constant angular speed) is provided with the upper attachment 32 for a record-holder; and in this case it is necessary to first disconnect the clutch member 35 from the cylinder 6. When in operation, the arm 34 is pushed by the spring 28, in such a manner that its end roller 27 is always in contact with the portion of ribbon wound

around the drum 4, and carries at the top the stylus 21 of the sound box 33 which thus may be operated under the conditions previously described. If it is desired to engrave a record by means of the device, then the device itself will be disposed as illustrated in Figures 1 and 2 with the parts 21, 33 and 34 in position. If, on the contrary, the device is to be employed for reproduction purposes, then the parts 21, 33 and 34 are removed, and the parts 27 and 28 are retained which serve the purpose of always holding in suitable pressed relation the various coils of the spiral wound around the drum 4; for the reproduction of a record, an ordinary gramophone sound box can be employed.

Although the present invention has been described with reference to the accompanying drawing, it is understood that various practical changes and additions may be made in the device according to the present invention.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, what is claimed is:

1. In a phonographic apparatus having a disk-holder, a disk-holder shaft, a ribbon coiled on the axis of the shaft for revolving said shaft, and means for unwinding said ribbon from the shaft at a constant linear speed, for the purpose of operating the disk-holder at a continuously varying rate of angular speed.

2. In a phonographic apparatus having a stylus and a disk-holder, a disk-holder shaft, a ribbon for revolving the shaft coiled on the axis of the shaft, means for moving the ribbon at a constant linear speed for the purpose of operating the disk-holder at a continuously varying rate of angular speed, and means in engagement with and controlled by the ribbon coil for actuating the stylus in synchronized radial operating speed relation with reference to the rotary speed movement of the disk-holder.

3. In a phonographic apparatus having a stylus and a disk-holder, a revoluble disk-holder shaft, a coiled ribbon on the shaft for revolving the shaft, means for unwinding the ribbon at a constant linear speed, for the purpose of operating the disk-holder at a continuously varying rate of angular speed, and means for moving the stylus in synchronized radial operating relation with reference to the rotary movement of the disk-holder, comprising a radially movable stylus support, guide means therefor, and resilient pushing means for said support engaging the periphery of the portion of the operating ribbon which is still wound on the disk-holder shaft.

4. In a phonographic apparatus having a stylus and a disk-holder, a disk-holder shaft, a ribbon for revolving said shaft coiled on the axis of the shaft, means for unwinding the ribbon from said shaft at a constant linear speed, comprising a revoluble power driven shaft, a driving drum on said last-named shaft, a laterally movable ribbon receiving drum, in pressing engagement with the driving drum, for the purpose of holding the ribbon therebetween, means for resiliently advancing the ribbon receiving drum in a lateral direction towards the driving drum, and means actually controlled by the portion of the ribbon which is still wound on the coil on the disk-holder shaft, for moving the stylus in synchronized radial operating relation with reference to the rotary movement of the disk-holder.

5. In a phonographic apparatus having a stylus and a disk-holder, a disk-holder shaft, a ribbon for revolving said shaft coiled on the axis of the shaft at a continuously varying rate of angular speed, comprising a revoluble power driven shaft, a driving drum loosely mounted on said driven shaft, means for rigidly connecting the driven shaft and driving drum together, a laterally movable vertically disposed shaft, a ribbon receiving drum loosely mounted on said last-named shaft, means for resiliently advancing the ribbon receiving drum, and vertically disposed shaft towards the driving drum, and means actually controlled by the portion of the ribbon which is still wound on the coil on the disk-holder shaft, for moving the stylus in synchronized radial operating speed relation with reference to the rotary movement of the disk-holder.

6. In a phonographic apparatus having a stylus and a disk-holder, a disk-holder shaft, a ribbon for revolving said shaft coiled on the axis of the shaft, means for unwinding the ribbon from said shaft at a constant linear speed, comprising a revoluble power driven shaft, a driving drum loosely mounted on said driven shaft, means for rigidly connecting the driven shaft and driving drum together, a laterally movable and vertically disposed shaft, a ribbon receiving drum loosely mounted on said last-named shaft, means for resiliently advancing the ribbon receiving drum towards the driving drum, comprising a sliding member on the base of the vertical shaft, a horizontal rail in engagement with the latter, and providing a supporting means therefor, a plurality of guide rollers mounted at the top of the said vertical shaft, rigidly mounted guiding means for the guide rollers, and a spring in engagement with the base of the vertical shaft, motor stopping means controlled by the movable vertical shaft, and means controlled by the portion of the ribbon coil which is still wound on the coil on the disk-holder shaft for moving the stylus in synchronized radial operating relation with reference to the rotary movement of the disk-holder.

7. In a phonographic apparatus for engraving spiral grooves of a desired constant pitch in a record mold, a disk-holder, a disk-holder shaft, a ribbon coiled on the shaft axis, having a thickness corresponding to the pitch of the record groove, and adapted to revolve the disk-holder shaft, and means for unwinding the ribbon from the shaft at a constant linear speed, for the purpose of operating the disk-holder and record at a continuously varying rate of angular speed.

8. In a phonographic apparatus for engraving spiral grooves having a desired constant pitch in a record mold, a stylus, a disk-holder, a disk-holder shaft, a ribbon coiled on the shaft having a thickness corresponding to the pitch of the record grooves adapted to revolve the disk-holder and record, means for unwinding the ribbon from the shaft at a constant linear speed for the purpose of operating the disk-holder and record at a continuously varying rate of angular speed, and means in engagement with and controlled by the ribbon coil, for actuating the stylus in synchronized radial operating speed relation with reference to the rotary speed movement of the disk-holder and record.

9. In a phonographic apparatus having a stylus, a first record-holder shaft, a ribbon for revolving said first record-holder shaft, coiled on the axis of the shaft at a continuously varying rate of angular speed, a second power driven

record-holder shaft revoluble at a constant rate of angular speed, a record-holder which may be displaced from the one on the other shaft, heads on the said shafts for applying the record-holder, and upon said record-holder are applied the usual records when the record-holder is mounted on the second aforementioned shaft, whilst upon said record-holder are applied the records engraved with constant speed moving stylus when the disk-holder is applied on the first named shaft, a driving drum loosely mounted on said driven shaft, means for rigidly connecting the driven shaft and driving drum together, a laterally movable vertically disposed shaft, a ribbon receiving drum loosely mounted on said last-named shaft, means for resiliently advancing the ribbon receiving drum, and vertically disposed shaft towards the driving drum, and means controlled by the portion of the ribbon coil which is still wound on the disk-holder shaft, for moving the stylus in synchronized radial operating speed relation with reference to the rotary movement of the disk-holder.

10. In a phonographic apparatus having a stylus and a disk-holder, a disk-holder shaft, a ribbon for revolving said shaft coiled on the axis of the shaft, means for unwinding the ribbon from said shaft at a constant linear speed, comprising a revoluble power driven shaft, a driving drum on said last-named shaft, a laterally movable ribbon receiving drum, in pressing engagement with the driving drum, for the purpose of dragging the ribbon, means for resiliently advancing the ribbon receiving drum in a lateral direction towards the driving drum, ribbon supporting means to secure a plain winding of the ribbon around either the one or the other of the two shafts, pressing means to secure an exact winding of the ribbon and in engagement with the portion of the ribbon coil which is wound on the disk-holder shaft, and means controlled by the portion of the ribbon coil which is yet wound on the disk-holder shaft, for moving the stylus in synchronized radial operating relation with reference to the rotary movement of the disk-holder.

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