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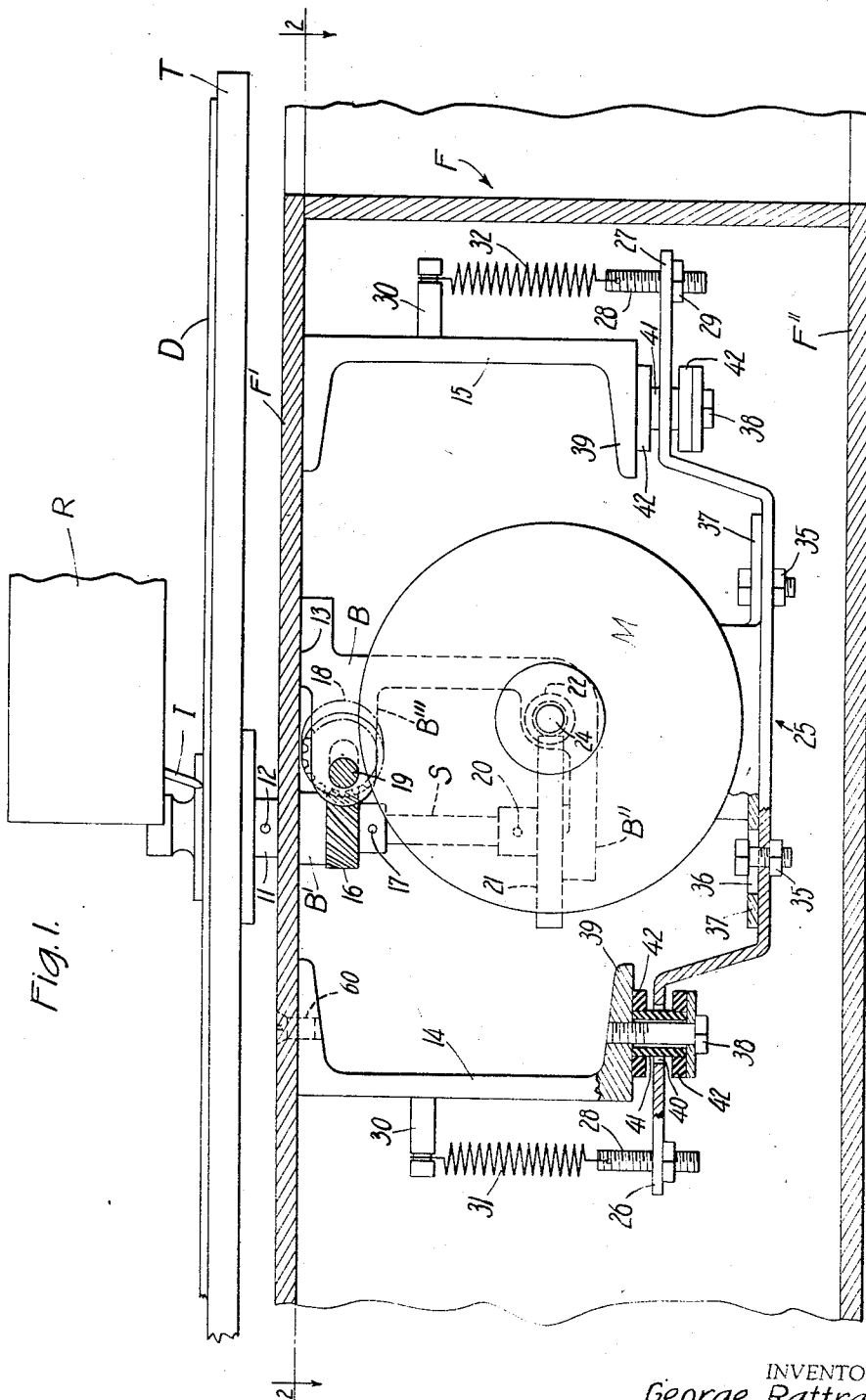
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2,174,168

DRIVING MEANS FOR PHONOGRAPHS

Filed Oct. 30, 1936

2 Sheets-Sheet 1



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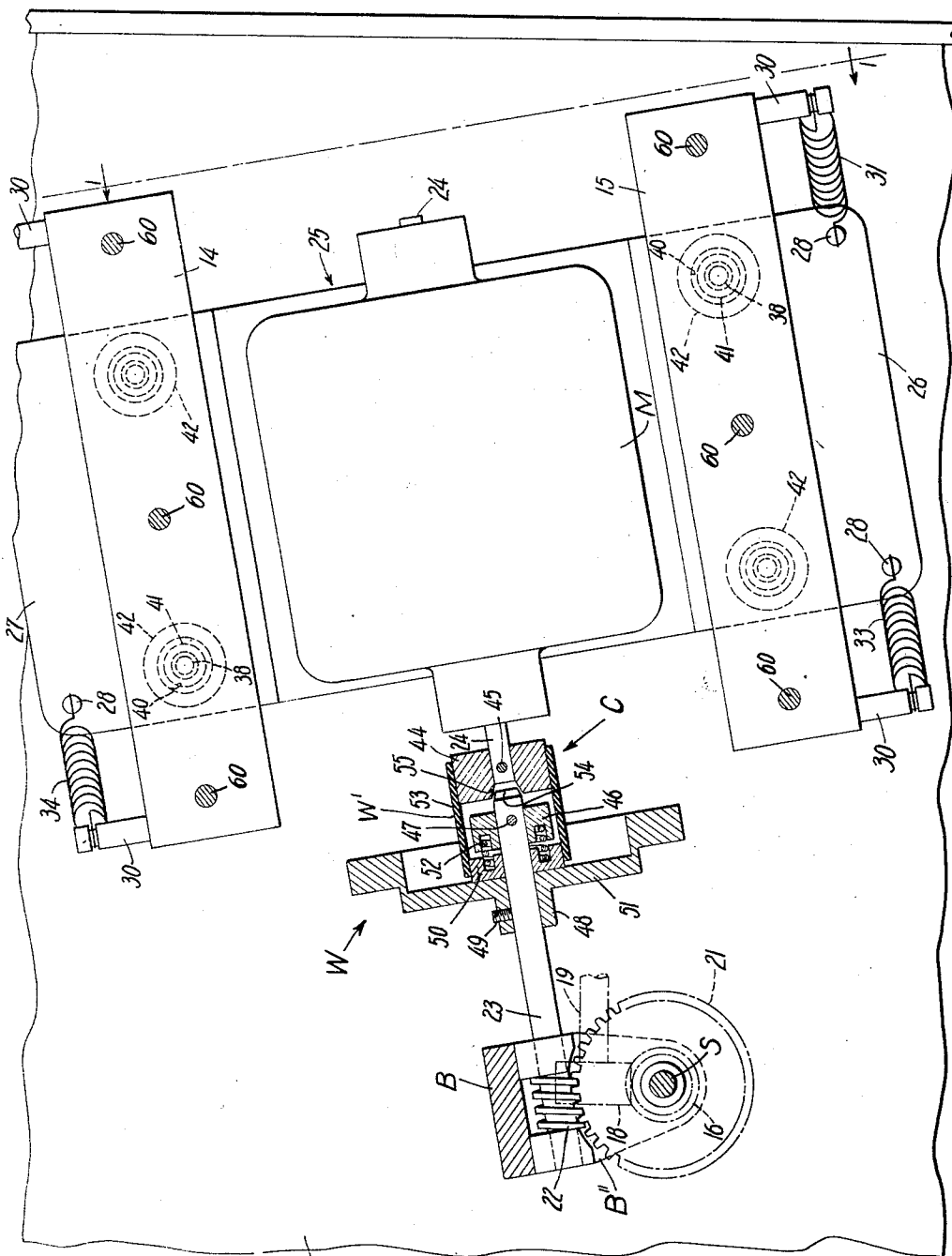
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DRIVING MEANS FOR PHONOGRAPHS

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Application October 30, 1936, Serial No. 108,463

2 Claims. (Cl. 185—1)

This invention relates in general to phonograph apparatus; especially to means for mounting a motor adapted to drive the mechanism for turning the table upon which the record is rotated, and more particularly to a mounting so designed as to avoid the intrusion of any vibrations other than those which it is desired to record or to reproduce.

It is well known that the primary source of unwanted vibrations in recording or reproducing sound records is in the means for rotating the table upon which the record is rotated; and the problem of eliminating these unwanted vibrations is a serious problem.

It is desirable to reduce these objectionable vibrations to as nearly as possible an absolute minimum, since, if they are not eliminated entirely at their source, they will be conducted to the record through the medium of the floor, or the table and floor.

It is customary to use a synchronous type of motor in sound recording and reproducing machines, for reasons that need not be described herein. It is, therefore, essential to take into consideration the fact that this type of motor tends to come up to speed with great rapidity, thus exerting a large force almost instantaneously. It is also essential that some form of flexible coupling be used between the driving and driven parts, for reasons hereinbefore stated.

In the conventional type of flexible coupling the resistance is not sufficient to withstand the force applied suddenly to it by the motor, nor to transfer an amount of said force, sufficient to overcome the inertia of the rotating table, fly-wheel, etc. The coupling, therefore, becomes greatly distorted and never resumes its normal shape even after all moving parts have come up to speed. Furthermore, this distortion of the coupling causes roughness of operation that may well cause imperfections in the recording or reproduction. This also causes excessive wear of the coupling, necessitating its frequent replacement.

An object of this invention is to provide, for mounting the motor of a sound recording or reproducing machine, a floating suspension of novel and improved structure whereby all vibrations originating in said motor are prohibited from reaching the supporting structure.

It is recognized that the principle of floating power is old, as this principle has long been used in mounting the motors of automobiles, refrigerators, etc. However, this principle, as applied in the above-mentioned art, has for its primary

purpose the reduction of noise, and to control to only a limited extent the amount of motor vibration reaching the body of the automobile, refrigerator, etc.

In sound recording and reproducing instruments, per contra, the problem is not to reduce the amount of motor vibration but to eliminate it entirely, and accordingly, the improvements herein disclosed are directed to that end.

Another object is to provide a sound recording and reproducing machine with a single supporting means for the motor and the recording and reproducing mechanism, said supporting means being free from all motor vibrations.

Still another object is to provide improved flexible coupling means between the motor and the rotating table, so as to prevent the transfer of motor vibration to the rotating table; and to incorporate in said flexible coupling a friction clutch so as to eliminate wear on the coupling and assure smoothness of operation.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses.

In the accompanying drawings, like characters of reference have been applied to corresponding parts throughout the several views making up the invention, in which:

Fig. 1 is a view in sectional elevation, taken on the line 1—1 of Fig. 2, of a sound recording and reproducing machine in the construction of which the present invention has been embodied;

Fig. 2 is a view in sectional plan, taken on the line 2—2 of Fig. 1.

In a now-preferred embodiment of the invention selected for illustration and description to permit ready and complete understanding of the present invention, the part designated generally by the reference character R is a carrier for an instrument I adapted to operate in contact with a record disc member D which derives its support from, and is rotated operatively by, a turntable T which is fixed, as by a hub-and-pin connection 11, 12, upon an upright shaft S mounted in the top plate F' and lower bearing B'' formed upon a bracket B which is secured, as at 13, to the top plate F' or member of a frame or supporting structure F.

This frame, illustrated somewhat schematically in the drawings, is of sturdy, rigid construction, and all of the operating parts, including the motor, the turntable, and their associated parts, are so organized as to be supported in compact

arrangement by the top plate, some above the latter, and others below it.

The various frame parts, such as the plates F, F' and F'', may desirably be composed of thick sheets of a suitable aluminum alloy, and channel section short members of that material are fastened to the plate F' as at 60.

The upright structure as F, serves to support the plate F' and form the sides of the case, it being noteworthy that the channel members 14 and 15, and the parts supported thereby, are free from engagement with the sides of the case.

Upon the shaft S is fixed a helical gear 16, by a pin 17, said gear bearing against a collar B'. A complementary gear or pinion 18, is fixed upon a shaft 19 journaled in a bearing B'' of the bracket B, and which has suitable connections (not shown) adapted to drive a conventional feed screw, or otherwise suitable driving means, which may be like that illustrated in application No. 108,462 filed October 30, 1936, by which the instrument head R is actuated to traverse the turntable T and operate in contact with the record disc member D thereon.

On the lower end of the shaft S above the lower bearing member B'', is a worm gear 21 secured to the shaft S by a pin 20, and engaged (see Fig. 2) by a worm 22 on a worm shaft 23 which is disposed in axial alignment with the armature shaft 24 of a motor M, preferably of the synchronous type.

It is to be observed that the support of the parts thus far described, with the exception of the motor M and its armature shaft 24, is characterized preferably by maximum rigidity, whereby is gained an optimum degree of accuracy and sensitivity in the operation of the instrument I.

And now, in pursuance of the primary object of the invention, when considered in its broad, generic aspect, the structure of the support, particularly with relation to the mounting of the motor, is characterized by a maximum degree of flexibility and elasticity, in order to provide a floating suspension of optimum qualification to exclude vibrations originating in the motor from being propagated to the supporting structure F.

This structure, it is to be observed, constitutes the common and sole support of both the motor and the recording and reproducing mechanism.

The means for effecting the intended complete exclusion of all motor vibration from the support for the recording and reproducing elements may be described best by including the said means in two categories; viz., first the motor-mounting, and secondly, the flexible coupling of the motor M to the shaft system 23, S, etc., and these instrumentalities will now be described in the order stated, it being understood that the particular means herein disclosed is designed to be only illustrative of the best form of construction at present known, and not as exhausting the possible physical embodiments of the idea of means underlying the invention.

The motor M is mounted in a swinging cradle. This comprises, in the instance illustrated, a stirrup 25 having broad shoulders 26 and 27 (see Fig. 2) in the four corners of which are screwed adjustable posts 28, with lock nuts 29 (see Fig. 1) disposed in upright position below studs 30 which project laterally from the channel members 14 and 15, and from which coiled suspender springs 31, 32, 33 and 34 run to the posts 28, and as the distance between the studs 30 is greater than the space between adjacent posts 28 of a pair, as for example, the pair of springs 31 and 33

(see Fig. 2) connected with the shoulder 26, the springs are spraddled sufficing to bias the stirrup constantly to a mean medial position in which the armature shaft 24 lies parallel with, and midway between, the channel members 14 and 15, this spraddled disposition being also adapted to resist gyroscopic torque-induced aberrations of the armature shaft from its normal axial position.

The body 25 of the stirrup is provided with a set of bolts 35 (see Fig. 1) which extend through slots 36 in the base flanges 37 of the motor M, the latter being thereby held tightly in adjusted position upon the stirrup. By this means the correct adjustment of the motor shaft 24 may be effected easily, accurately and permanently.

The motor M, supported thus by its stirrup mounting 25 and springs 31-34, is thus suspended in floating, completely vibration-insulated position within the same supporting structure F, F', F'', etc., which serves for the support of the recording and reproducing mechanism, and it will be evident that in the normal position of the motor illustrated, all vibrations originating in the motor will be absorbed by the springs 31-34, which therefore, accomplish effectively the complete exclusion of such motor-originated vibrations from the main supporting structure, and consequently from the recording and reproducing mechanism.

Auxiliary means for preventing similar transmission of adventitious vibrations caused by movements of the motor bodily with its stirrup 25, may be provided, and in the instance illustrated such a provision, typical of others which can be readily made by persons skilled in the art, is exhibited in Fig. 1, where lag screws 38 are seated in the lower flanges 39 of the channel members 14 and 15, transfixing the shoulder 26, in which slots 40 are provided, of sensibly larger dimensions than the bolts.

Sleeves or bushings 41 of suitable yieldingly resistant or elastic material, such as rubber, pass through the slots 40, surrounding the bolts and are designed to afford an elastic checking means between adjacent metal parts of the arms 26, 27 and their inclosed bolts 38, and these again may be desirably supplemented by the provision of washers 42 of like material, wherever needed.

These washers cushion the stirrup and motor against shock from contacts when the motor is subjected to vertical trepidations, or is handled carelessly in transporting the mechanism in use.

In further pursuance of the provision of vibration-excluding devices which characterizes the present invention, a novel form of flexible coupling, designated generally as C, is shown in horizontal section at the left hand side of Fig. 2.

In the form shown, illustratively, it includes a member 44 pinned at 45 on the armature shaft 24, and a collar or member 46 pinned at 47 upon the drive shaft 23. The latter also carries fixedly a fly-wheel W, having a hub 48 set to the shaft by a screw 49, while between these fixed abutment collars is disposed freely a collar 50 biased yieldingly toward the hub 48 by a coil spring 52 confined under compression within complementary sockets in the adjoining faces of the collars 46 and 50. In this manner, there is provided a friction clutch between the collar 50 and flywheel W.

A sturdy resilient sleeve 53 of resistantly yielding rubber extends between, and is secured suitably to, the periphery of the collar 44 on shaft 24, and the periphery of the loose coupling mem-

ber 50. The driven shaft 23 has a bevelled nose 54 adapted to be engaged at times with a complementary female counterbored seat 55 in the interior face of the collar 44 on shaft 24 of the motor M.

This improved flexible coupling operates in the following manner, viz.,

The parts being at rest, in the relative positions illustrated, when the synchronous motor M is started, the armature is accelerated with greater rapidity than can be immediately transmitted to the slower-starting fly-wheel W, shaft 23, gearing 22-21 and the arbor S and turntable T.

The torque of the starting armature shaft 24 is then applied by the collar 44 to the sleeve 53 and absorbed initially by the resistantly yielding medial waist of the sleeve, as at W'. However, exaggerated distortion of the sleeve 53 is prevented since the force applied to the coupling member 50 is sufficient to overcome the frictional engagement between it and the fly-wheel W, thereby allowing the coupling member 50 to rotate and thus gradually overcome the inertia of fly-wheel W, shaft 23, etc., insofar as this coupling is concerned.

The armature shaft 24, because of the floating mounting of the motor, is capable of a certain amount of endwise movement, and is accordingly, drawn forward by the contraction of sleeve 53 at its waist, so that the male and female parts 54 and 55 are brought together and co-operate for a moment as a powerful friction clutch, in known fashion, the application of such a clutch in the combination shown being, however, novel with the present invention. Thus, by means of this direct drive the inertia of the fly-wheel W, shaft 23, and their associated parts, is very rapidly overcome.

As the shaft 23 and its associated rotating masses including more particularly the fly-wheel W and turntable T, are accelerated to approximately the speed of shaft 24, the self-restoring action of the sturdy sleeve 53 asserts

itself, and it resumes its cylindrical normal form, as shown in Fig. 2, the coupling member 50 then acting in normal fashion to drive the flywheel W, shaft 23, gears 21, 22 arbor S and turntable T at the desired speed, which is communicated to the disc record member D. The sleeve 53 thereafter serves to transfer the torque of shaft 24 to shaft 23 with complete absence of vibration, thus carrying out the purpose of the invention in that respect.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. A flexible coupling for the purpose set forth, comprising in combination, a driving shaft capable of a limited axial movement while rotating, a shaft to be driven, in axial alignment with the driving shaft, a collar fixed on each shaft, a collar loose on the driven shaft and adapted to be engaged frictionally with the fixed collar on said driven shaft, and a sleeve of resistantly yielding material connecting said loose collar on the driven shaft with said fixed collar on the driving shaft, and adapted, when torque is applied thereto, upon starting the motor to bring adjacent ends of the two shafts into direct driving engagement with each other.

2. In a phonograph apparatus, of the class described, having a turntable and a turntable operating shaft, in combination, a motor, a motor shaft, and means including a flexible driving member for normally maintaining a flexible driving connection between the motor and turntable shafts, and means temporarily effecting a more direct and inflexible drive when excessive torque occurs, and means responsive to stress of the flexible driving member for at times disabling the normal driving connection between the shafts to enable the motor shaft to rotate independently of the turntable shaft.

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