Jan. 19, 1932. H. S. BYRD 1,841,937

PHONOGRAPH ATTACHMENT FOR MOVING PICTURE MACHINES

Filed Feb. 21, 1929 2 Sheets-Sheet 1

Fig. 1.

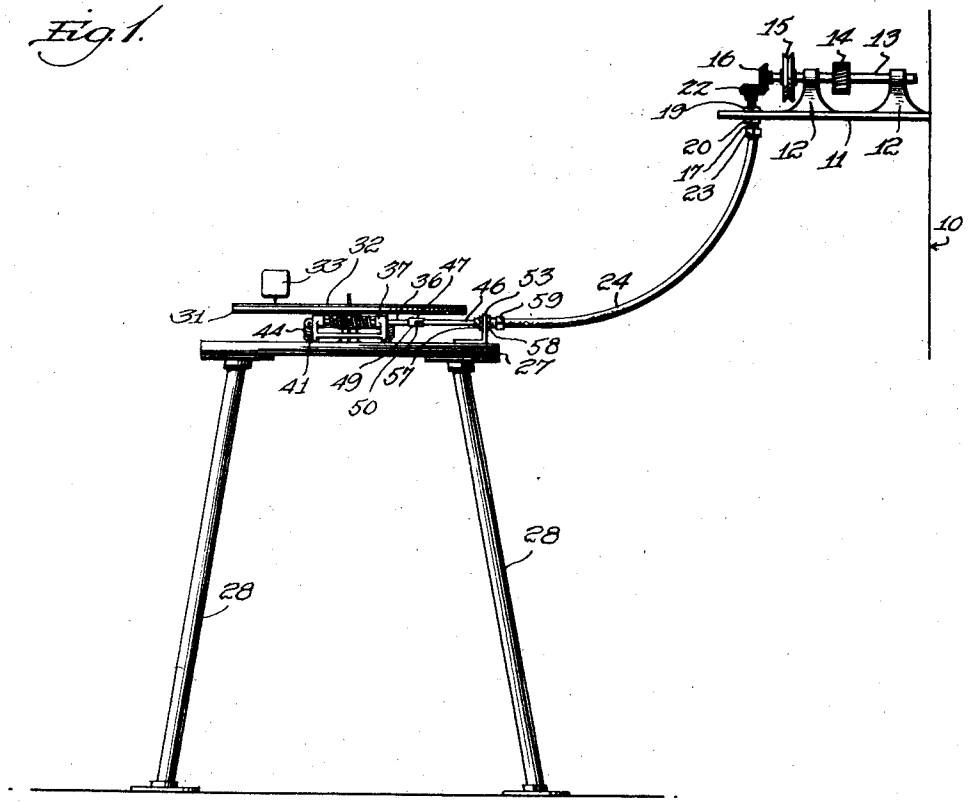
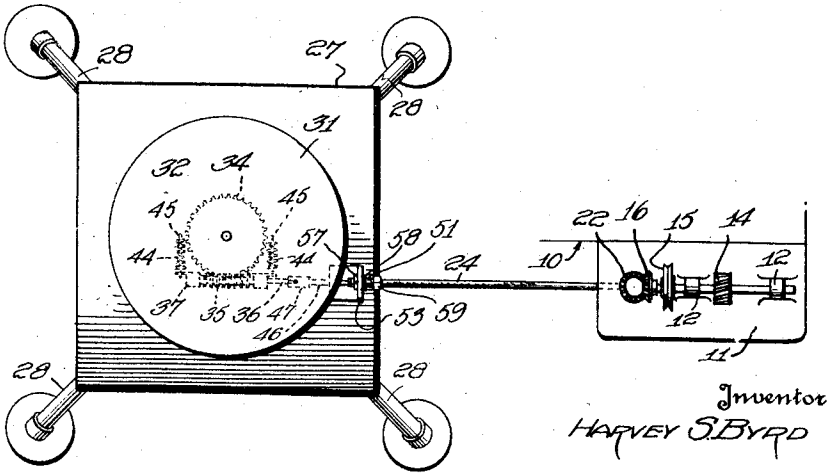


Fig. 2.



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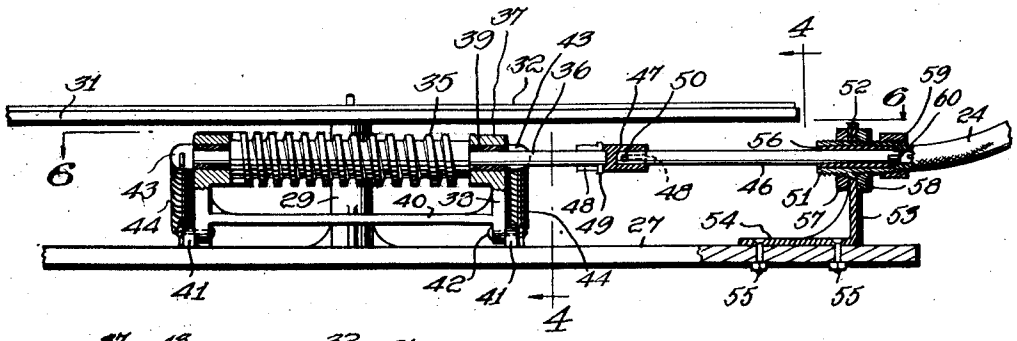
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PHONOGRAPH ATTACHMENT FOR MOVING PICTURE MACHINES

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Fig. 3.



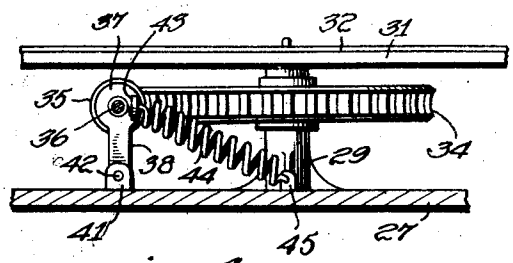


Fig. 4.

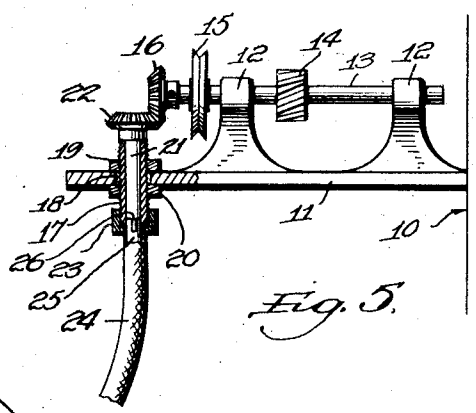


Fig. 5.

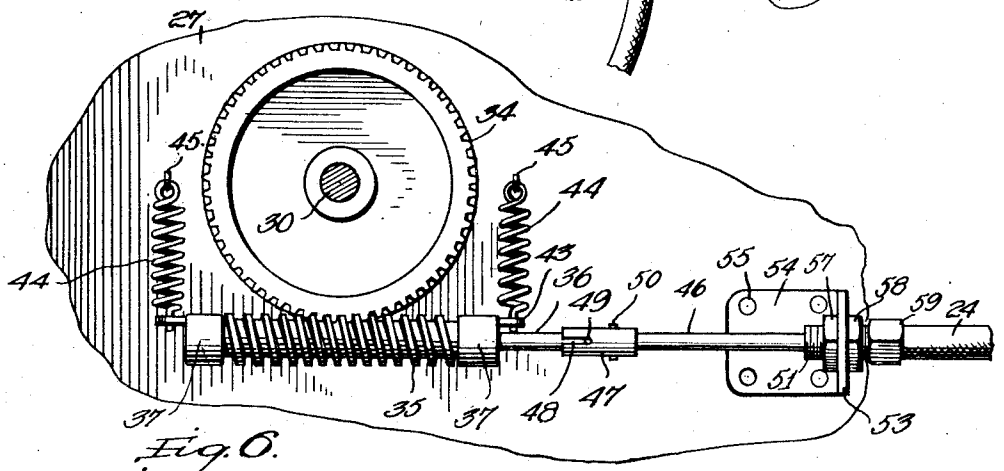


Fig. 6.

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UNITED STATES PATENT OFFICE

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PHONOGRAPH ATTACHMENT FOR MOVING PICTURE MACHINES

Application filed February 21, 1929. Serial No. 341,824.

This invention relates to phonograph attachments for moving picture machines, and more particularly to a novel sound reproducing machine and drive means therefor associated with a moving picture machine to provide synchronized action between the two machines.

The present so-called "talking pictures" usually are either of two types, namely, the type wherein the sound waves are photographed on the edge of the picture film, and the type wherein a talking machine is employed and driven by a motor which is synchronized with the operation of the motor of the moving picture machine.

Both of the "talking picture" systems referred to above have been found successful in operation, but they are quite expensive to manufacture and install, and their cost prohibits their use in relatively small moving picture theatres, whose capacity and prices of admission do not warrant any great expenditure for apparatus.

An important object of the present invention is to provide "talking picture" apparatus which is simple in construction and cheaper to manufacture, thus rendering its use accessible to the owners of small moving picture theatres.

A further object is to provide novel means for utilizing the motor of the motion picture machine for driving a phonograph turntable.

A further object is to provide an apparatus of the character referred to wherein the drive means for the phonograph readily may be disconnected from the moving picture projecting machine.

A further object is to provide a device of the above mentioned character having novel means for preventing back lash or other uneven rotation of the phonograph turntable during its operation in conjunction with the moving picture projector.

A further object is to provide novel flexible shaft drive means for the phonograph turntable which is characterized by its simplicity and accessibility to permit repairs and replacements to be readily and cheaply made if it becomes necessary.

A further object is to provide a device of the above mentioned character which is adapted for ready connection with the picture projecting machine without material alteration of the latter, and without interference with its operation.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown one embodiment of the invention. In this showing,

Figure 1 is a side elevation,

Figure 2 is a plan view,

Figure 3 is an enlarged side elevation of a portion of the phonograph, parts being shown in section,

Figure 4 is a section on line 4—4 of Figure 3,

Figure 5 is a fragmentary side elevation illustrating the connection between the phonograph and picture projecting machine drive means, parts being shown in section, and,

Figure 6 is a section on line 6—6 of Figure 3.

Referring to the drawings, the numeral 10 indicates generally any standard type of moving picture projecting machine. This machine, in itself, forms no part of the present invention, and accordingly has not been illustrated in detail. The projecting machine includes a horizontal shelf or support 11 carrying a pair of bearings 12 in which a drive shaft 13 is journaled. The shaft 13 is provided with a worm gear 14 meshing with a worm wheel (not shown) for transmitting power to the moving picture projecting machine in the usual manner. The shaft 13 is driven by a belt passing around a pulley 15, and driven by a suitable electric motor. The operation of the belt and motor will be apparent from Figure 1, and these elements have not been illustrated.

The elements previously described form the conventional drive means for a picture projecting machine, and ordinarily the shaft 13 terminates adjacent the outer face of the pulley 15. In the present case a somewhat longer shaft 13 is substituted for the standard shaft, whereby it projects outwardly a substantial distance beyond the pulley 15,

and the shaft is provided at such end with a bevel gear 16, as clearly shown in Figures 1, 2 and 5.

Referring to Figure 5, the numeral 17 designates a sleeve externally threaded throughout its length and extending through a suitable opening 18 in the support 11. Clamping nuts 19 and 20 are threaded on the sleeve 17 and engage the upper and lower faces respectively of the support 11. The sleeve 17 forms a bearing for rotatably receiving a relatively short shaft section 21, provided at its upper end with a bevel gear 22 meshing with the gear 16.

An attaching nut 23 is threaded on the lower end of the sleeve 17 and serves to connect a shaft casing 24 thereto. A flexible shaft 25 is rotatable in the casing 24 and has a driving connection with the shaft 21 as at 26. It will be apparent that the clamping nuts 19 and 20 rigidly support the sleeve 17 in operative position whereby the gears 16 and 22 will be maintained constantly in mesh, but the gears are adapted to be disconnected, when desired, in a manner to be described.

The phonograph attachment comprises a suitable horizontal support 27 which may be mounted upon suitable legs 28. A vertical bearing 29 is arranged centrally of the support 27, and a shaft 30 is journalled in the bearing 29. The upper end of the shaft 30 carries a phonograph turntable 31 of the standard type, and the turntable is adapted to carry the usual talking picture phonograph disk 32. The phonograph disks are preferably of the type referred to, wherein proper operation is accomplished at a rotative speed of approximately 33⅓ revolutions per minute. The sound record is provided with the usual indicia whereby the operation of the sound reproducing means may be initially synchronized with the operation of the projector, as will be apparent. Any suitable reproducing means for the sound disks may be employed, and in Figure 1 I have illustrated a conventional pick-up 33 having a stylus engaging the sound groove of the record disk.

The shaft 30 is provided with a worm wheel 34 meshing with a worm 35 carried by a drive shaft 36. The shaft 36 is journaled in bearings 37 carried by depending arms 38, and the bearings 37 may be provided with bearing bushings 39 if desired. The bearing arms 38 are preferably connected by a rigid integral bar 40, as shown in Figure 3.

In order to prevent the presence of any play between the worm 35 and worm wheel 34, so as to eliminate back lash and the like, means is provided for maintaining these elements in firm mesh with each other. Referring to Figures 3, 4 and 6, the numeral 41 designates a pair of ears carried by the support 27 and arranged outwardly of the lower ends of the arms 38 and pivotally connected therewith by bolts 42. Each of the bearings 37 is provided with an outstanding ear 43 to which is connected one end of a coil spring 44. These springs are of the tension type and are connected at their opposite ends to ears 45, carried by the upper face of the support 27. It will be apparent that the springs 44 tend to swing the bearing arms 38 inwardly, whereby the worm 35 will be maintained firmly in mesh with the worm wheel 34.

Power is transmitted to the shaft 36 by a shaft 46 alined therewith, as shown in Figures 3 and 6. A sleeve 47 is arranged between the shafts 36 and 46, and is provided in opposite ends with diametrical slots 48, preferably arranged at right angles to each other and adapted to receive pins 49 and 50 carried respectively by the shafts 36 and 46. It will be apparent that the sleeve 47 and its connection with the pins 49 and 50 serve to provide positive drive means between the shafts 36 and 46.

The shaft 46 is journaled in a bearing sleeve 51 which is externally threaded throughout its length and is mounted in an opening 52 formed in a bracket 53. The opening 52 is slightly larger than the external diameter of the sleeve 51, for a purpose to be described. The bracket 53 is provided with a horizontal base portion 54 which is bolted or otherwise secured as at 55 to the support 27. If desired, the bearing sleeve 51 may be provided with a suitable bearing bushing 56, as shown in Figure 3.

Clamping nuts 57 and 58 are threaded on the sleeve 51 and are adapted to engage against opposite sides of the bracket 53 to rigidly support the sleeve 51. The lower end of the casing 24 is secured to the sleeve 51 by a suitable nut 59, and the flexible shaft 25, within the casing 24, has a driving connection with the shaft 46 as indicated at 60.

The operation of the device is as follows:

Power is transmitted to the shaft 13 through the medium of the motor and belt connection with the pulley 15 and the worm 14 transmits the driving power to the mechanical elements of the projecting machine in the usual manner. Obviously, the speed of operation of the projecting machine is directly dependent upon the speed of the shaft 13. Similarly, the speed of rotation of the phonograph turntable 31 is dependent on the speed of rotation of the shaft 13, and thus the operation of the phonograph and the projecting machine will be positively synchronized.

By loosening the clamping nuts 19 and 20, the sleeve 17 and shaft 21 may partake of limited lateral movement to properly position the gear 22 with respect to the gear 16, the opening 18 being somewhat larger than the sleeve 17 to permit such lateral displacement. It also will be apparent that by proper manipulation of the clamping nuts 19 and 20, the gear 22 may be brought into firm mesh

with the bevel gear 16, thus tending to minimize back lash of the power transmission elements. When it is desired to disconnect the phonograph from the projecting machine, it merely is necessary to rotate the clamping nut 19 to move it upwardly, whereupon the sleeve 17 and associated elements will move downwardly, thus disconnecting the gears 16 and 22.

If desired, the hub of the gear 16 may be provided with a set screw, as shown in Figure 5, which may be loosened to permit sliding movement of the gear 16 to disengage it from the gear 22.

The construction of the bearing means and associated elements for the shaft 46 are substantially identical with the similar means associated with the shaft 21, and need not be referred to in detail. The nuts 57 and 58 may be loosened to permit transverse adjustment of the shaft 46, whereby the latter is adapted to be brought into perfect alinement with the shaft 36. It also will be apparent that by proper operation of the nuts 57 and 58, play may be taken up between the connecting sleeve 47 and its associated shaft connections. The matter of eliminating play between the elements of the power transmission means is important since it is necessary to eliminate back lash in order to permit the sound reproducing means properly to operate.

If breakage should occur in the flexible shaft 25, it will be apparent that this element and its associated casing 24 may be readily replaced merely by uncoupling the nuts 23 and 59 without disturbing any of the other transmission elements. It also will be apparent that by removing the nut 57, the shaft 46 may be removed without disturbing the worm 35 and wheel 34, or any of the elements directly associated therewith.

In actual practice, it has been found that the problem of back lash has been difficult of solution. This question is particularly important as applied to the means for transmitting power from the shaft 36 to the turntable, and it has been found that the elements described have been very effective for overcoming any play in the driving connections directly associated with the turntable. The use of the springs 44 causes the wheel 34 and worm 35 to be held firmly in mesh at all times regardless of any minor inaccuracies occurring in the manufacture and machining of the operating connections. Accordingly in actual practice it has been found that the turntable operates smoothly and efficiently without the introduction of any objectionable noises or the like which normally occur when any play or back lash is present in the operating connections.

From the foregoing it will be apparent that the use of the present device does not require any material alteration of the elements of the projecting machine, it merely being necessary to drill the opening 18 in the support 11, and to substitute a shaft 13 somewhat longer than that ordinarily employed. Very little power is required for the operation of the phonograph, and thus the motor usually employed in connection with projecting means has been found efficient for use in driving the phonograph. The driving means employed is positive in operation, and thus the operation of the projecting machine and phonograph is perfectly synchronized.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. Drive means for a phonograph turntable comprising a worm wheel connected to said table, a shaft mounted adjacent said worm wheel, a pivotally mounted bearing yoke rotatably supporting said shaft for movement toward and away from said worm wheel, a worm carried by said shaft and meshing with said worm wheel, an auxiliary shaft mounted in alinement with said first named shaft, coupling means for said shafts, a bearing for said second named shaft, a supporting bracket having an opening through which said bearing loosely projects, means for fixing said bearing with respect to said supporting bracket, and drive means for said second named shaft.

2. Drive means for a phonograph turntable comprising a worm wheel connected to said table, a shaft mounted adjacent said worm wheel, a pivotally mounted bearing yoke rotatably supporting said shaft for movement toward and away from said worm wheel, a worm carried by said shaft and meshing with said worm wheel, an auxiliary shaft mounted in alinement with said first named shaft, coupling means for said shafts, a bearing for said second named shaft, a supporting bracket having an opening through which said bearing loosely projects, nuts threaded on said bearing and adapted to engage against opposite sides of said bracket, and means for operatively connecting said second named shaft to a driving means.

3. Drive means for a phonograph turntable comprising a worm wheel connected to said table, a shaft mounted adjacent said worm wheel, a pivotally mounted bearing yoke rotatably supporting said shaft for movement toward and away from said worm wheel, a worm carried by said shaft and meshing with said worm wheel, an auxiliary shaft mounted in alinement with said first named shaft, coupling means for said shafts, a bearing for said second named shaft, a supporting bracket having an opening through which said

bearing loosely projects, nuts threaded on said bearing and adapted to engage against opposite sides of said bracket, a flexible shaft connected to said second named shaft, and detachable gearing for operatively connecting said flexible shaft to a driving means.

4. A device of the character described comprising a phonograph turn table and a support therefor, a gear connected to said table, a shaft mounted adjacent said table, a pivotally mounted bearing yoke rotatably supporting said shaft for transverse movement toward and away from said gear, a second gear carried by said shaft and meshing with said first named gear, springs secured at one end to opposite ends of said yoke, the opposite ends of said springs being secured to said support, said springs being tensioned to normally urge said shaft toward said first named gear whereby said gears will snugly mesh with each other, and means for driving said shaft.

5. A device of the character described comprising a phonograph turn table and a support therefor, a gear connected to said table, a shaft mounted adjacent said table, a pivotally mounted bearing yoke rotatably supporting said shaft for transverse movement toward and away from said gears, a second gear carried by said shaft and meshing with said first named gear, a pair of springs, one end of each spring being secured to opposite ends of said yoke above the pivot point thereof, the opposite ends of said springs extending downwardly from said first named ends and being secured to said support on opposite sides of said first named gear, said springs being tensioned to normally pull said shaft toward said first named gear whereby said gears will snugly mesh with each other, and means for driving said shaft.

In testimony whereof I affix my signature.

HARVEY S. BYRD.