May 7, 1929. E. W. ADAMS 1,711,666

SOUND REPRODUCING AND RECORDING DEVICE

Filed Oct. 24, 1925 3 Sheets-Sheet 1

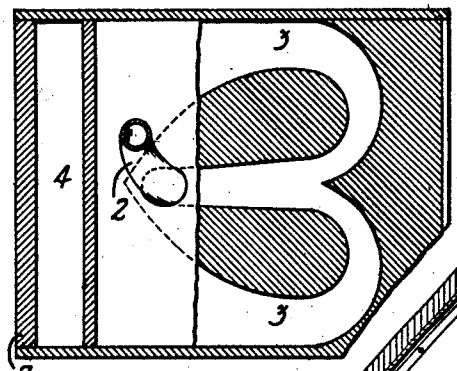


Fig.1a

Fig.1

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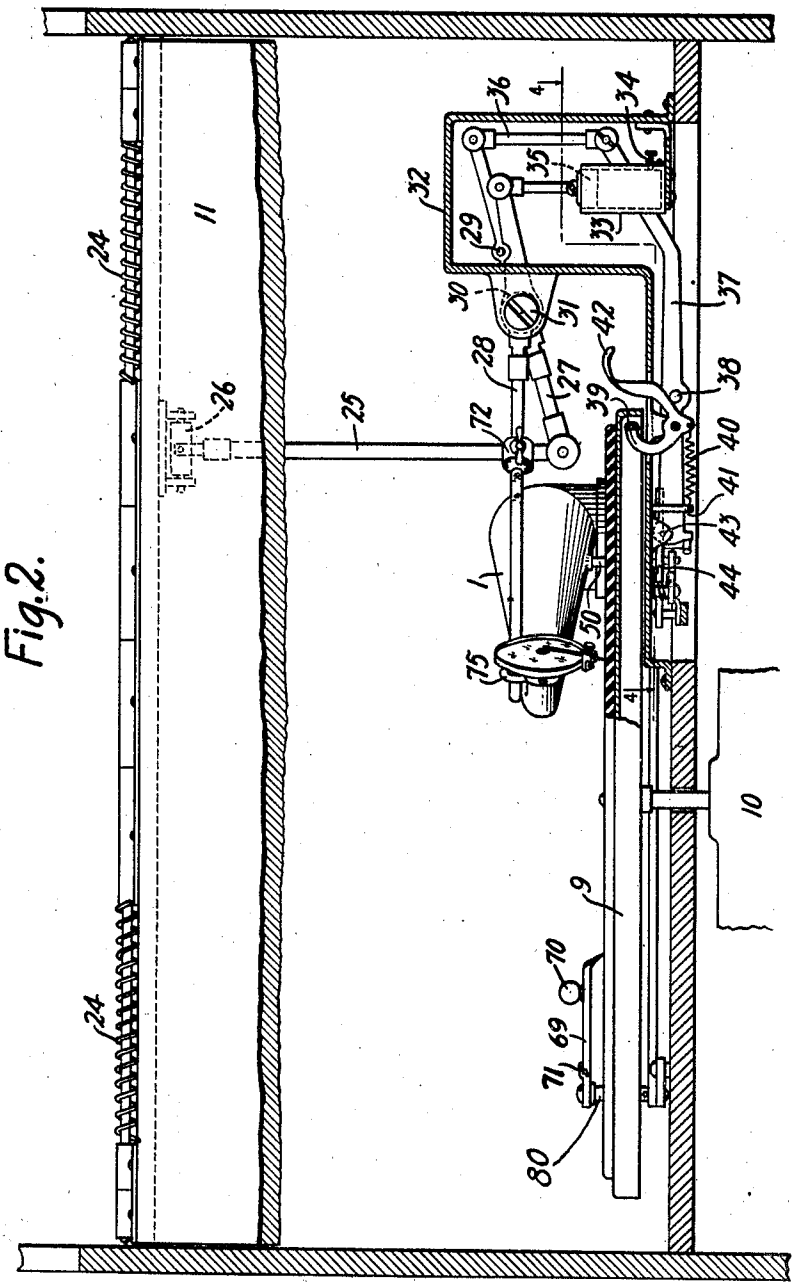


Fig.2.

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Fig. 3.

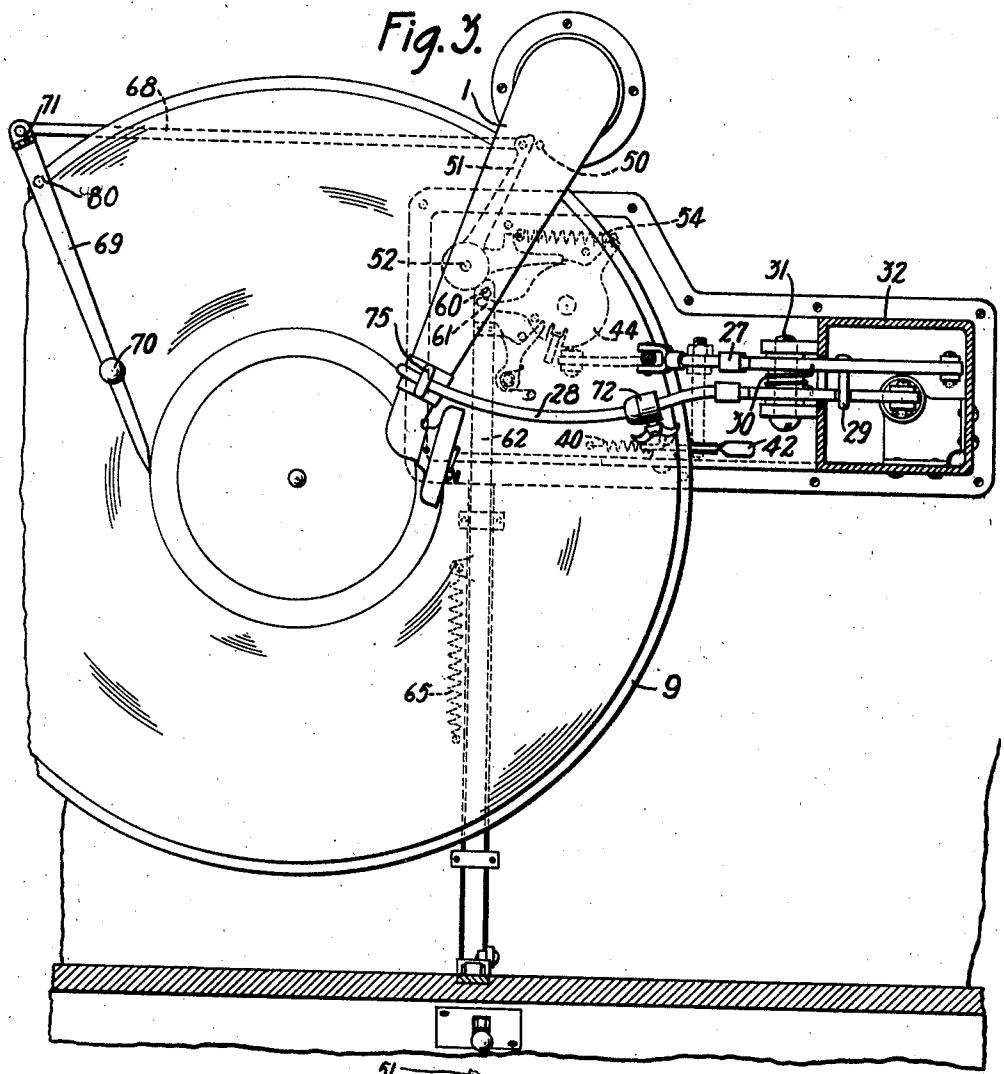
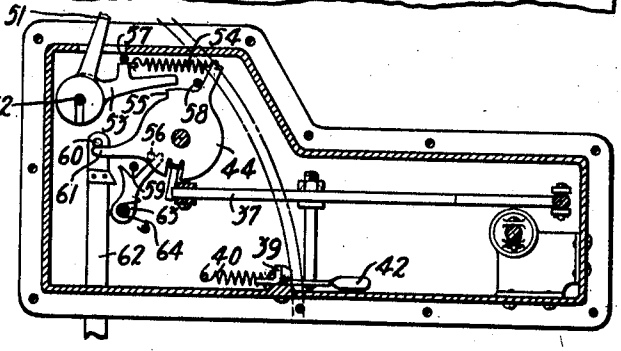


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SOUND REPRODUCING AND RECORDING DEVICE.

Application filed October 24, 1925. Serial No. 64,559.

This invention relates to sound reproducing and recording devices, and particularly phonographs in which the reproducer means is contained within a cabinet.

An object of the invention is to provide a sound reproducing and recording device within a limited space which will faithfully and efficiently reproduce or record sounds within the audible range.

Another object of the invention is to provide an automatic operating mechanism which will simplify the manipulation and attention necessary in the operation of the ordinary phonograph.

In accordance with the first of these objects, the invention will be described as embodied in an instrument in which the cover enclosing the sound reproducing means forms also one wall of the amplifying horn. To help secure the desired length of horn within the limited space, the horn is preferably made convolute and the upper wall of the bell portion of the horn may, if desired, be formed by the raised lid of the cabinet.

A feature of the invention is the placing of the turn-table or record support and reproducing mechanism beneath or behind one wall of the exit portion of the horn. This separating wall is hinged to form a door or cover for the chamber housing the reproducing mechanism, and is so arranged that the phonograph will not operate unless the door is closed, thus preventing noise of the motor and needle from interfering with the reproduction.

Another feature of the invention is the provision of automatic means to trip the cover at the end of play of a record and also automatic needle positioning and starting mechanism operable upon closing the cover. In accordance with this feature, a series of levers, cams and springs are employed which operate at definite and predetermined positions of the tone arm as hereinafter described.

Other features and advantages of the invention will appear in the following detailed description in connection with the accompanying drawing, in which:

Fig. 1 is a vertical sectional view showing the relative position of the operating mechanism with respect to the horn.

Fig. 1^a is a top sectional view of the folded horn along the line 1^a—1^a of Fig. 1.

Fig. 2 is a front elevation of the mechanism for raising the tone arm and governing its speed of action.

Fig. 3 is a plan view of the tripping and starting mechanism.

Fig. 4 is a detailed section of the tripping mechanism in the tripped position along the line 4—4 of Fig. 2.

In Figs. 1 and 1^a the folded horn is shown in section, the horn being of the so-called folded type such as is described in patent applications of H. C. Harrison Serial No. 628,168, filed March 28, 1923, and No. 33,-619, filed May 29, 1925. From the tone arm 1, the sound passage extends forward and downward through throat 2, branching and returning horizontally through the two chambers 3 and then joining and rising through the back passage 4 to the exit in the upper bell or flare portion 5. This construction gives an efficient horn within a limited space. The cover 6 of cabinet 7 which is in a horizontal position, when closed, is shown raised to form the upper surface of the bell 5. At 8 is shown one of a pair of folding sectional side walls which complete the inclosure of the bell. When the cover is closed, these side walls of the horn are swung up against the lower side of the cover and held there by any suitable latch arrangement (not shown).

Fig. 1 also shows a turn table 9 which may be operated by mechanism situated in space 10, the turn table and operating motor mechanism being of any well known type. It is to be noted that the tone arm 1 and turn table 9 are located within the chamber joined under the cover or door 11 hinged at point 12, which forms the lower wall of the bell of the horn and provides access to the mechanism. As will be evident hereinafter, this door must be closed under ordinary conditions before a record can be played, thus preventing the needle scratch and the motor noises from interfering with the rendition

of the instrument. This location of the operating mechanism conceals it from view except during the act of changing records.

Fig. 1 also shows a trip and latch arrangement which comprises a slotted metal strip 14 attached to the cover 11 and an associate lever latch 15 pivoted at point 16. A hand control 17 is provided which is pivoted at 18 and upon which is a lug 19 adapted to bear against and actuate the latch in order to permit of access to the record at any time. A compression spring 20 maintains the latch 15 in locking position and returns it to this position after release of the cover 11.

In Fig. 2 is shown the coil springs 24 which provide the actuating power for opening the cover and raising the tone arm, the tone arm being constructed with any suitable joint to allow for this motion. A steel strap 25, universally jointed at 26, connects the cover to raising levers 27 and 28, both of which are pivoted at 31 and given a positive motion in one direction through pin 29 while motion in the other direction is translated by an interconnecting coil spring 30. Inside the metal housing 32 is located a dash pot 33 with an air valve speed control shown at 34 and a piston 35 attached to the tone arm raising lever 28. Similarly attached to the raising lever 27 is a rod 36 which actuates the horizontal angle lever 37. A lug 38 on lever 37 releases a brake 39 and alternatively allows the brake to be applied by action of an extension spring 40 which is fastened to the brake and to the frame projection 41. An arm 42 of the brake is provided to allow starting of the turn table by hand. It is to be noted that the lever 37 is hinged at the point 43 and provided with a projection so that movement of the lever actuates the arm of the irregular cam 44.

Fig. 3 discloses the actuating mechanism for tripping the cover in its normal position and Fig. 4 shows the same mechanism the moment after it has been tripped. An actuating rod 50, rigidly fixed to the lower side of the tone arm, is sufficiently long to engage a lever arm 51 which is frictionally joined at 52 to a pawl 53. An extension spring 54 provides the motive power to rotate the cam 44 and return the pawl 53 to its locking seat 55. The stops and lugs 56, 57, 58, 59 and 60 prevent excess movement of the various parts or engage and actuate associate parts as will be explained hereinafter. The cam 44 is provided with an arm 61 used for restoring the trip rod 62 to its normal position where it is held by a small pawl 63 which acts under tension of the spring 64. An extension spring 65 provides the tripping power for the rod 62.

Fig. 3 further shows an adjusting device for record endings of various diameters comprised of a rod 68 interconnected between the friction lever 51 and a hand pointer 69 which is adapted to rotate about the pivot 80 as a center. The pointer 69 may be operated by a suitable hand button 70. The pointer 69 is hinged at 71 in order that it may be raised out of the way during the changing of records. The placing of the end of the pointer on the last few grooves of the record adjusts the friction arm 51 to the proper position for the actuating rod 50 to engage it at the end of play of a record. This device eliminates the necessity of removing the tone arm for making this adjustment. To start the needle at the proper position for records of various size, screw clamp 72, slidable along the arm 28, can be set to stop the tone arm at the proper playing position. The lever 28 which raises the tone arm is preferably made round and arcuate to facilitate the return of the tone arm and reproducer. A collar, fixedly attached to the tone arm, is provided with an eye 75, the inside diameter of which is made appreciably larger than the raising arm allowing for the angle of rise and preventing any interference between the lever 28 and the tone arm during the travel of the latter while in playing motion. It is to be noted that when the parts are in the playing position pin 29 is raised from its seat. This allows the coil springs 24 to start without load which insures positive operation of the springs.

In order better to understand the operation of the mechanism just described, the chronological sequence of events will be traced through a complete cycle.

At the end of play of a record, the actuating rod 50 engaging arm 51 raises the pawl 53 to stop pin 57 and allows the spring 54 to rotate the cam 44 to its stop pin 58. This rotation causes the lug 56 to engage the pawl 63, allowing the spring 65 to act on the rod 62 to operate the latch 15 and release the cover. At this instant the mechanism is in the position shown in Fig. 4. The cover now rises under the action of springs 24 taking with it the strap 25 and arm 27. A moment later, the pin 29 reaches its seat on arm 28 causing it to follow the associate arm 27. As the cover rises, lever 37 is lowered by connecting arm 36 carrying with it pin 38 and allowing the spring 40 to cause the brake 39 to engage the arm of the turn table, bringing the latter to a stop. At the same time, the piston 35 is lowered in the dash pot 33 at a definite speed predetermined by the air valve adjustment 34 until the bottom of the piston passes the valve, from which time the braking action is applied to the cover until the bottom of the dash pot is reached. Also, during this period, the tone arm returns to its starting position by the action of gravity. Also, dur-

ing these events, the rod 37 engages the arm of the cam 44 and rotates it in the opposite direction to its former motion, causing arm 61 to engage lug 60, and rod 62 to be moved back to such a position that pawl 63 can be returned by spring 64 to the locking position shown in Fig. 3. Pawl 63 is now reseated by spring 69 which puts all the tripping mechanism in its normal position.

To start the play of a record, all that is necessary is to close the cover 11. As the cover is lowered, the arm 37 is raised while the lug 38 engages the brake, and, acting against the spring 40, releases the turn table and allows it to start. Inasmuch as the arms 27 and 28 are only spring connected during this direction of motion, the tone arm returns slowly to its playing position, the time of replacement being determined by the adjustment of the dash pot control 33. This time interval is for the purpose of permitting the turn table to reach its playing speed of rotation in order to eliminate the unpleasant ascending pitch during acceleration. When the cover 11 is completely closed, the latch 15 springs into its locking position until again acted upon by the tripping rod 62.

An auxiliary brake (not shown) of any well known type is preferably provided to hold the turn table against rotation when the chamber cover is closed and further operation of the machine is not desired.

The folded wooden horn employed, the enclosing of the tone arm and turn table during the play of a record, and the automatic start and stop mechanism constitute a phonograph which is highly efficient for the space required, permits of good quality reproduction and reduces the manipulation to a minimum.

It is understood that while the cabinet and horn arrangement has been described in connection with a reproducing device, it is not limited to such but may be adapted to recording sound or for other similar purposes.

What is claim is:

1. In a phonograph having a horn, a record support and reproducing means, a chamber adjacent to said horn, enclosing said support and reproducing means, and a door providing access to the interior of said chamber, said door when in the closed position forming a part of the wall of the exit portion of said horn.

2. In a phonograph having a horn, a record support and reproducing means, a chamber adjacent to said horn, enclosing said support and reproducing means, and a door providing access to the interior of said chamber, said door being arranged so that when in the closed position it forms a part of the wall of the exit portion of said horn and when in the opened position it retreats into and substantially closes the exit portion of said horn.

3. In a phonograph, a cabinet, a horn, a partition in said cabinet, a record support and reproducing means, a chamber, adjacent to said horn, enclosing said support and reproducing means, the upper wall of said chamber being formed by said partition, said partition serving as a sound distributing surface for the exit portion of said horn and as a means of access to the interior of said chamber.

4. In a sound distributing device having a reproducing means, a chamber, adjacent to a horn, enclosing said reproducing means, and said horn associated with said reproducing means and substantially encircling said chamber, a portion of the exit wall of said horn forming a door of said chamber.

5. In a sound distributing device, the combination of a cabinet, a curved partition therein, a turntable mounted below said partition, a reproducer and a sound conveying passage connected with said reproducer and having an exit portion above said partition, said partition forming one wall of said exit portion of said passage.

6. A phonograph comprising a chamber, a record, a support therefor and reproducing means disposed in said chamber, a cover for said chamber, and means for automatically tripping and raising said cover at the end of play of the record.

7. A phonograph comprising a chamber, a record, a support therefor and reproducing means disposed in said chamber, a cover for said chamber, and means associated with said cover for automatically returning said reproducing means to the starting position at the end of play of a record.

8. A phonograph comprising a chamber, a turntable and reproducing means disposed in said chamber, a cover for said chamber, and means for automatically starting said turntable upon the closing of said cover.

9. A phonograph comprising a chamber, a record, a support therefor and reproducing means disposed in said chamber, a cover for said chamber, means for automatically tripping and raising said cover and returning said reproducing means to its starting position from its position at the end of play of a record, and means for automatically starting said record support upon the closing of said cover.

10. A phonograph comprising a record, a record support and sound reproducer, means for automatically positioning the reproducer on the record to initiate the play of the record, and means for automatically returning said reproducer to the starting position from its position at the end of play of the record, said positioning means being adjustable for records of various sizes.

11. A phonograph comprising a chamber,

a record, a support therefor and reproducing means disposed in said chamber, a cover for said chamber, and means for automatically tripping said cover at a position determined by the length of play of said record, said tripping means being adjustable for records of various length.

12. A phonograph comprising a chamber, a record, a support therefor and reproducing means disposed in said chamber, a cover for said chamber, and means for automatically tripping said cover at a position determined by the length of play of the record, and means for automatically returning said reproducing means to its starting position from its position at the end of play of the record, and means for adjusting said starting and ending positions for records of various size and length.

13. A phonograph comprising a chamber, a record, a support therefor and reproducing means disposed in said chamber, a spring operated cover for said chamber, a trip latch for holding and releasing said cover, a brake for controlling the rotation of said record support, means for automatically tripping said latch to release said cover at the end of play of a record, and meains controlled from the tripping means for applying said brake to said record support.

In witness whereof, I hereunto subscribe my name this 15th day of October A. D., 1925.

EDGAR W. ADAMS.