

April 13, 1943.

J. G. KURZEN, JR

2,316,175

SOUND REPRODUCING DEVICE

Filed Dec. 7, 1940

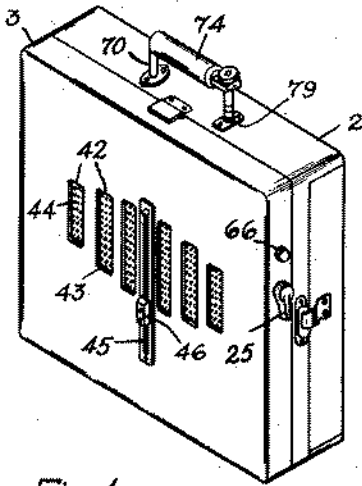


Fig. 1

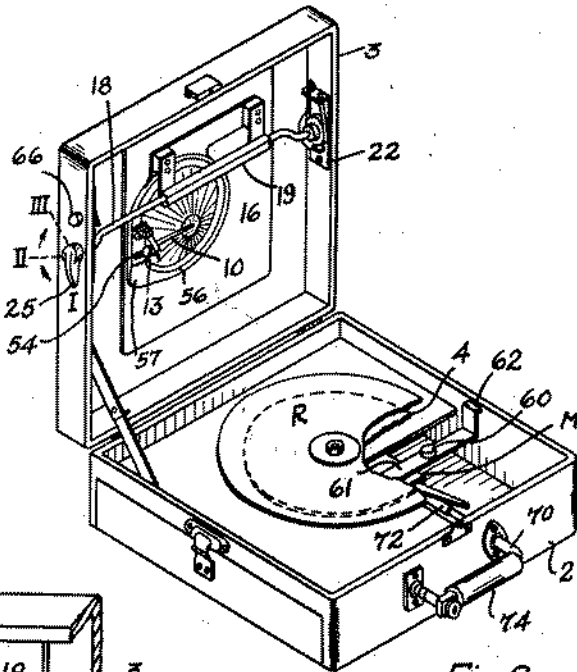


Fig. 2

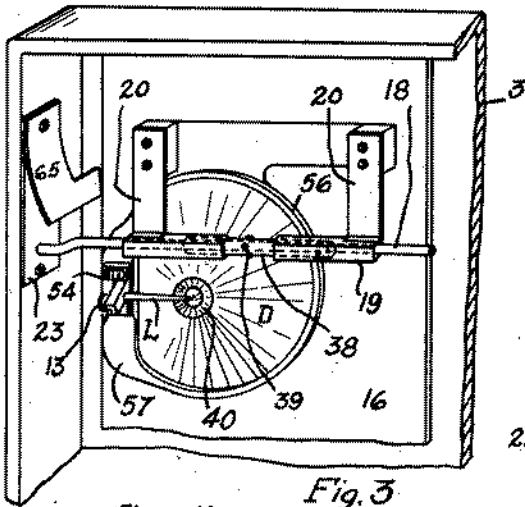


Fig. 3

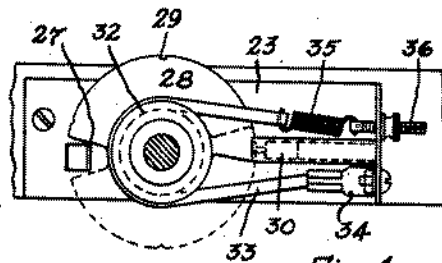


Fig. 4

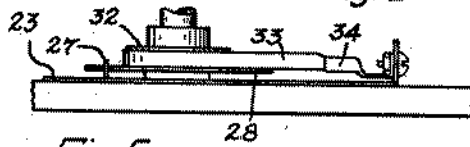


Fig. 5

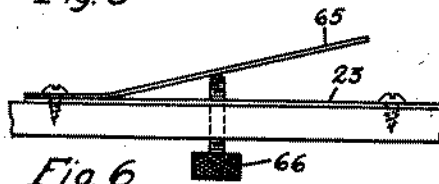


Fig. 6

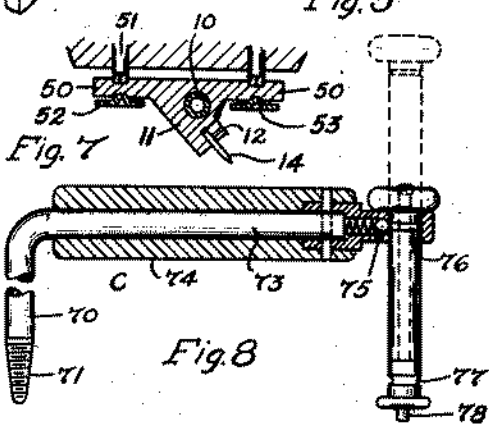


Fig. 8

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UNITED STATES PATENT OFFICE

2,316,175

SOUND REPRODUCING MEANS

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Application December 7, 1940, Serial No. 368,994

26 Claims. (Cl. 274—2)

This invention relating as indicated to sound reproducing devices, has more particular reference to construction actuated by a stylus or a needle operating in a sound record track, and involving improved structural characteristics and mounting and control. Other features and advantages will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a perspective view of one illustrative embodiment of the invention; Fig. 2 is a perspective of the same, with the container open; Fig. 3 is a fragmentary perspective detail on larger scale; Fig. 4 is an enlarged fragmentary elevational view of a detail; Fig. 5 is a plan view of the same; Fig. 6 is a similar view of the margin correlating gage; Fig. 7 is an enlarged section axial of the fulcrum of the diaphragm lever; and Fig. 8 is a side elevation of the winding crank.

In the form illustrated, Figs. 1, 2, etc., there is shown a container 2 with a closure or lid 3, and a turn-table 4 with a motor M, of construction as desired. A sound record disc R is suitably rotated by the turn-table. Arranged to be brought into relation with the sound record is a diaphragm assembly or sound head, and this comprises a diaphragm D which has a diaphragm actuating lever L with one arm 10 connected to the diaphragm and another arm 11 with a holding chuck 12 and set-screw 13 for a stylus or needle 14. The diaphragm is mounted in an opening in a diaphragm plate or baffle 16, the diaphragm lever being fulcrumed in relation, and when the supporting frame or lid is set down the assembly can traverse a sound record, with the needle in the sound track. Thus, a guide rod or rail 18 is mounted in the carrying frame or lid, and upon such rail the sound head travels, being guided on the rail by a member or shoe 19 which is connected to the baffle board assembly by arms 20. Preferably, the latter are slightly resilient, such as to allow taking up of shock in relative movement. The rail 18 is off-set or eccentric, being mounted at each end in a suitable plate, whereby the rail as a slightly eccentric member may be turned in its mounting to relatively raise or lower the sound head assembly with relation

to the sound record R. As seen in Figs. 2 and 3 etc., the ends of the rail 18 are mounted in the bearing plates 22, 23, respectively, and the end extending through the plate 23 is provided with an operating handle 25 on the exterior, whereby the rail may be turned in partial rotative movement as afore-noted in slight raising and lowering movements. Thus, the operating handle 25 and correspondingly the eccentric rail, may be in any one of the positions I, II and III, Fig. 2; correspondingly, the sound head assembly, when the lid 3 is closed down, may be in position I locked against the top of the lid, as shown particularly in Fig. 2, or by a 90° turn may be in a position II freeing the baffle plate from locking or frictional engagement with the top of the lid whereby the baffle plate assembly or carriage is free to run back or forth on the guide rail 18; or by another arcuate turn to the position III the baffle plate or sound head assembly is set still lower so that the needle 14 will then engage the sound record. To check and hold the respective positions with precision, a stop member 27, Fig. 4, is provided on the mounting plate 22, and a semi-circular cam 28 secured to the rod or rail 18 comes into contact with the stop at the positions I and III. The intermediate position is maintained by a small notch 29 in the cam 28, and this is engaged at the appropriate location by a spring-urged detent 30, the pressure thereon being such that as the notch 29 is turned into position opposite the detent, the latter snaps into the notch with sufficient pressure to retain the cam and the rail position against accidental jarring loose. At the same time, there is a sufficiently audible "click" to indicate the position to the operator even though the movement of the handle is not observed. Since in the movements of the guide rod or rail and correspondingly the movements of the sound head, the stylus or needle is brought into engagement with the sound record, a preferred construction includes a shock-absorbing means preventive of accidentally abrupt engagement. For this, a pulley or sheave 32 may be secured on the rod or rail 18, and cooperating with the sheave is a friction band 33 of suitable material, for instance rubberized fabric, etc. The band 33 is suitably secured at one end 34, as by a holding screw and clamp, and the other end is provided with a tensioning spring 35 and a take-up screw 36. The tension or friction on the pulley and correspondingly upon the turning movement of the rod 18 may thus be adjusted as desired and the spring 35 in all cases is available to take up any impact shock which may be intro-

duced in the movements of the sound head relative to the sound record or to the locked position in the lid.

The sliding member or shoe 18, in the preferred construction, involves ball-bearing engagement with the rail 18. Thus, for instance, a ball cage or sieve 38, Fig. 3, within the member 19 which is shown centrally broken away for clearness, may carry bearing balls 39, in such number of sets as may be desired. With this, the member 19 and the entire diaphragm assembly carried by it, slide particularly freely on the guide rail 18.

The detail construction of the diaphragm in the mounting as indicated may vary. Desirably however, the diaphragm may be of non-metallic character and of conical form, and of large diameter in contrast to the customary phonograph type diaphragms. Fiber diaphragms of 4 to 6 inches diameter, as of a type suitable for radio loud speaker amplifiers are thus directly applicable in the present mounting. Preferably also, the diaphragm is provided further with a small inverse cone 40 at its apex, the diaphragm lever arm 10 being connected to such apex, and the conical diaphragm generally being directed toward the sound-emitting grille 42 in the lid 3. To control the volume, a shutter 43 is arranged in slidable relation over the perforations or grille 42. Desirably, the shutter may be a thin plate of suitable material, and it may be finely perforated as at 44 through about half of its area. An advantageous mounting for the slidable shutter is a slot guide-way 45 with an actuator button or knob 46 secured to the shutter and forming a cooperating guide and holding means, as moved into desired adjusted position by the operator.

The mounting of the diaphragm lever is desirably sufficiently rugged, yet sensitive, to withstand usage under drastic conditions; and an advantageous form involves fulcrum projections 50, Figs. 3 and 7, the diaphragm lever arm 10 and the needle carrying arm 11 being at right angles thereto. The fulcrum projections 50 bear against chisel-pointed studs 51, slight recesses or grooving being provided in the projections 50. And bearing against the projections 50 are clips 52 having slight bosses or indents 53 which engage in cooperating recesses in the fulcrum projections. The clips 52 are secured in position at the side of the diaphragm by suitable screws 54. Desirably the diaphragm lever arm 10 is hollow and tapering. Particularly light weight with strength is thus attained. The needle-carrying arm 11 preferably is set at an angle to the fulcrum axis. An angle of about 20° is advantageous. Surrounding the diaphragm and affording also clamping means is an annular metallic inertia member 56, and this by an extension 57 may provide the additional space upon which the diaphragm lever fulcrum is mounted. The proportions of the diaphragm clamping member 56, etc., are so arranged that a compensating weight effect is provided on the record-engaging needle, and substantially the same pressure, desirably around 5 oz., is attained for either horizontal or vertical position of the sound record. Playing of a record can accordingly be carried on with the mechanism in the horizontal or vertical position as preferred.

To control the movement of the turn-table and motor, a brake is provided. This may be in the form of a brake block or shoe 60, Fig. 2, on an arm 61 extending from a suitable anchorage, as for instance the motor frame. The arm 61 is desirably somewhat resilient. Its free end 62,

near the container wall, is in alignment with the cam 28 on the rod 18. The cam may, when in one position, lid 3 being closed, engage the end 62 of the brake arm 61, thereby depressing the latter such as to hold the brake block 60 away from engagement with the under-surface of the turn-table 4. Conversely when the lid is open or when the cam 28 is in its other position even with the lid closed, the brake 62 is not contacted or pushed down, and the brake block 60 then engages against the underside of the turn-table and holds it against movement.

From the description thus far, the manner of use of the device will be readily understood. With a sound record R in position and the motor wound up, and the lid 3 closed, on turning the control handle 25 from its normal position I (in which the baffle assembly or sound head is held in frictional engagement or locked position against the top of the lid) to the position II, the sound head is released such as to allow traverse movement on the guide rail 18, and by slightly tilting the device toward the control handle 25, the sound head or carriage slides over to the "start" position. On now turning the control handle 25 on to position III, the sound head assembly is lowered still further so that the needle engages in the sound track of the record, and playing begins. The position of the container during such playing may be horizontal or vertical as preferred. At the conclusion of the record, on turning the control handle 25 back from position III to II, the needle is raised from the sound record, and at the same time the brake is thrown on, stopping the motor. To accurately control the position of the needle for a "start" of a sound record, a gage 55, Figs. 3 and 6, is provided. If this be slightly resilient, as particularly desirable, movement of the sound head there-against into "start position" requires no particular care or attention, and shock is absent. Precise adjustment of the gage 55 to co-relate to a record may be accomplished by an adjusting screw 66 which is screw-threaded through the mounting plate 23.

The winding crank C for the motor for more particular convenience may involve a combined function of carrying handle. The shaft 70, Fig. 8, of the crank may have a screw-threaded end 71 to engage in the receiving sleeve 72, Fig. 2, of the motor for winding. Turning in reverse, of course permits removal of the crank entirely. The end of the arm 73 of the winding crank is provided with a handle 74 which is slidably mounted and retained in either "in" or "out" position by suitable detent means, as for instance a spring-pressed ball 75 co-acting with grooves 76, 77 in the handle member. As readily seen, when the handle member 74 is in "out" position as shown in dotted lines in Fig. 8, the winding crank may be used as such to wind up the motor. When the handle member 74 is pushed into "in" position, a stud 78 on the end can engage in a recess in a holding plate 79 and prevent movement in carrying.

This application is a continuation, in part and as to common subject matter, of my application Serial No. 342,335 filed June 25, 1940.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such, be employed.

I therefore particularly point out and claim as my invention:

1. A mechanical sound reproducing device,

comprising support means, a diaphragm movable over a sound record, a rod carried by said support means for guiding such movement, a ball-bearing slide on said rod and carrying such diaphragm, said rod being eccentrically mounted with respect to the support means to raise and lower the diaphragm from and to a sound record, a handle controlling the position of said rod to locked position, released position for return to "start" and down position for engaging the needle with a sound record, and combined snap-hold and audible position-indicating means for said control handle.

2. A mechanical sound reproducing device, comprising support means, a diaphragm movable over a sound record, a rod carried by said support means for guiding such movement, a slide on said rod and carrying said diaphragm, said rod being eccentrically mounted with respect to the support means to raise and lower the diaphragm from and to a sound record, and shock-absorbing means for cushioning turning movement of said rod.

3. A mechanical sound reproducing device, comprising support means, a diaphragm movable over a sound record, a rod carried by said support means for guiding such movement, a slide on said rod and carrying said diaphragm, said rod being eccentrically mounted with respect to the support means to raise and lower the diaphragm from and to a sound record, and a pulley on said rod and a spring-tension friction band over said pulley.

4. A mechanical sound reproducing device, comprising a container having a lid, a diaphragm movable over a sound record, a rod for guiding such movement, a connection from said diaphragm traveling on said rod, said rod being eccentrically mounted to raise and lower the diaphragm from and to a sound record, bearing plates for the rod on the inside of the container lid, and a control handle on the end of said rod externally of the lid for turning the rod to raise or lower the diaphragm assembly from and to a sound record.

5. A mechanical sound reproducing device, comprising support means, a diaphragm movable over a sound record, a rod carried by said support means for guiding such movement, a ball-bearing slide on said rod and carrying such diaphragm, said rod being eccentrically mounted with respect to the support means to raise and lower the diaphragm from and to a sound record, and a control handle for the positioning of said rod.

6. In a sound record operated sound reproducing device having a diaphragm movable over a sound record, a rail for directing such movement, a member carrying said diaphragm and traveling on said rail, and means permitting free movement, including a ball-bearing cage between said member and said rail within said member.

7. In a sound record operated sound reproducing device having a diaphragm movable over a sound record, a guide for such movement and a connection between said diaphragm and said guide having unattached bearing elements which are rotatable in different directions.

8. A mechanical sound reproducing device, comprising a container having a lid, a diaphragm therein movable over a sound record, a turntable for supporting a sound record, a motor for driving the turn-table, a lever carrying a brake block normally in engagement with the turn-

table, and a cam carried by the container lid to operate the brake arm.

9. In a sound record operated sound reproducing device having a diaphragm, an actuating lever having a mounting fulcrum and diverging therefrom an arm connected to the diaphragm and an arm having a needle chuck, the latter arm being inclined at an angle to the line of the axis of the mounting fulcrum.

10. A mechanical sound reproducing device, comprising a hornless sound diaphragm, and diaphragm-actuating means including a lever having a record-operated needle-carrying arm and a hollow tapered actuating arm connected to the diaphragm.

11. A mechanical sound reproducing device, comprising a conical diaphragm with the concavity in the direction in which sound is to be projected, and having its apex as a small reverse cone, and an actuating lever having a needle-carrying arm and a diaphragm-actuating arm the latter connected to said reverse apex cone.

12. In a sound record operated sound reproducing device having a container, a sound record actuator tone arm eliminating diaphragm therein, a grille in the container, a volume control shutter slidable over said grille, an actuating knob therefor in a plane normal to the plane of the shutter and accessible externally of the container, and a slot-way guiding said knob.

13. In a sound record operated sound reproducing device having a container with a lid, a tone arm eliminating sound record operating diaphragm within, a grille in the container lid, and an inconspicuous volume control shutter slidable over said grille, one section of said shutter being imperforate and another section having sound emitting perforations smaller than the grille openings.

14. In a sound record operated sound reproducing device having a container and sound record driving means including an L-shaped crank for winding said motor having a handle piece slidable in its free end into outward position for winding and into inward position against the container for the carrying of the latter.

15. In a sound reproducing device having a container with a motor and turn table therein and a crank for winding the motor with a turning handle on said crank movable to one position for winding and to another position to convert the crank into a carrying handle for the container, a tone arm eliminating diaphragm movable over a sound record on said turn table, a hollow tapered diaphragm-actuating lever having fulcrum projections and a needle chuck arm and an arm connected to the diaphragm, the needle chuck arm being inclined at an angle to the line of the axis of the fulcrum projections, a sound-emitting grille opposite the diaphragm in the container, a volume control shutter slidable over said grille, a guide within the container for guiding the diaphragm movement, a slide contacting with said guide for carrying said diaphragm, said guide being mounted to raise and lower the diaphragm from and to a sound record, means providing free movement longitudinally and rotatably between said slide and said guide, including unattached rolling bearing elements, a handle for controlling the position of said diaphragm, position-retaining means for said guide, shock-absorbing means including a resilient member for cushioning the movements of said guide and diaphragm relative to a sound

record, means for cushioning and stopping longitudinal movement of said slide and diaphragm toward one end of the guide, including an adjustable resilient abutment for gauging the diaphragm to "start" position on the record, a brake normally restraining rotation of the turn table, a hand control for said brake, and a projection actuated by closing the container for releasing said brake.

16. In a sound reproducing device having a container with a lid and a motor and turn table therein, a hornless diaphragm movable over a sound record on said turn table, a sound-emitting grille opposite the diaphragm in the container, a volume control shutter slidable over said grille, an actuator button for said shutter externally of the container, a slot guide-way for said actuator button, a guide within the container for guiding the diaphragm movement, a slide coaxing with said guide for carrying said diaphragm, unattached friction-eliminating rolling elements between said slide and said guide, said guide being mounted to raise and lower the diaphragm from and to a sound record, a handle for controlling the position of said guide, shock-absorbing means cushioning the movements of said guide, an adjustable abutment for gauging the diaphragm to "start" position on the record, a brake normally restraining rotation of the turn table, and combined cam and lid-operated means for controlling said brake.

17. In a sound reproducing device having a container with a lid and a diaphragm movable over a sound record, a guide rod carried by said lid for guiding such movement, being turnable on its axis and mounted to raise and lower the diaphragm from and to a sound record, a pulley on said rod, a friction band about said pulley, a tensioning spring and screw-threaded take-up for adjusting said band to cushion movement with respect to the sound record, a cam on said guide rod, a brake for controlling the sound record and having a projection contactable by said cam, a handle controlling the position of said guide rod, and position-indicating means for said control handle.

18. In a record-actuated sound reproducing device having a record-tracking needle-carrying head movable into and out of contact with the record, a guide rod for carrying said head, being turnable on its axis to raise and lower the head, a pulley on said rod, a friction band about said pulley, a tensioning spring and screw-threaded take-up for adjusting said band for cushioning movement into contact with the record, a cam segment on said guide rod having positioning notches in its periphery, a resilient detent to coact with such notches, a slide on said rod having a connection to said record-tracking head, and means permitting relative movement axially and rotatably between said slide and said rod, including unattached rolling bearing elements in the slide.

19. In a record-actuated sound reproducing device having a record-engaging head movable over a sound record, a guide for said head movable to raise and lower said head relative to the sound record, a slide on said guide having a connection to said head, unattached rolling bearing elements caged between said slide and said guide, and a resilient gauge for cushioning and

stopping movement of said head toward one end of the guide to be in position to start playing.

20. In a record-actuated sound reproducing device having a record-engaging head movable over a sound record and an enclosure therefor, means for raising and lowering said head, including a guide for directing movement over the sound record, a resilient gauge for gauging said head to "start" position on a sound record, and an external regulating knob for said gauge.

21. In a record-actuated sound reproducing device having a sound-emitting diaphragm actuating assembly movable over a sound record, a guide on which said assembly is carried over the sound record, and an adjustable resilient abutment for gauging the diaphragm assembly to "start" position.

22. In a record-actuated sound reproducing device having a diaphragm actuating assembly movable over a sound record, a guide for directing the movement, means for raising and lowering said assembly relative to the sound record, including said guide and a member travelling on said guide, and slightly resilient arms connecting said diaphragm assembly with said member.

23. In a record-actuated sound reproducing device having a container with a lid and a turn table and a motor for driving the turn table within said container together with a record-engaging head movable over a sound record on said turn table, a guide for directing the movement of said head, said guide being mounted to raise and lower the head from and to the sound record, a brake normally restraining the movement of the turn table, and a cam on said guide optionally operable for releasing said brake.

24. In a sound record operated sound reproducing device having a container with a lid and a sound record operating means within and a record-engaging head movable over a sound record, a guide rod for directing the movement of said head and mounted in said lid to turn for raising and lowering the head relative to the sound record, a spring-setting brake for the record operating means, a projection from said brake, and a cam on said rod to engage said projection and release the brake when the rod is turned to playing position with the lid closed but not engaging the projection when in other positions.

25. In a sound record operated sound reproducing device having a container with a lid and a sound record operating means within and a record-engaging head movable over a sound record, a guide for raising and lowering the head relative to the sound record, a brake automatically setting when the lid is open and when the head is not in playing position, and brake-releasing means operated by placing the head in playing position.

26. In a sound record operated sound reproducing device having a sound record operating means and a record-engaging head movable over the sound record, a guide for raising and lowering the head relative to the sound record, a brake automatically setting when the head is not in playing position, and brake-releasing means operated by placing the head in playing position.

JOHN G. KURZEN, JR.

CERTIFICATE OF CORRECTION.

Patent No. 2,316,175.

April 13, 1943.

JOHN G. KURZEN, JR.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 62, claim 6, after the word "rail" strike out "within said member"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of May, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.