

May 4, 1943.

B. ROBERTS

2,318,183

PORTABLE PHONOGRAPH

Filed Nov. 1, 1941

3 Sheets-Sheet 2

Fig. 3:

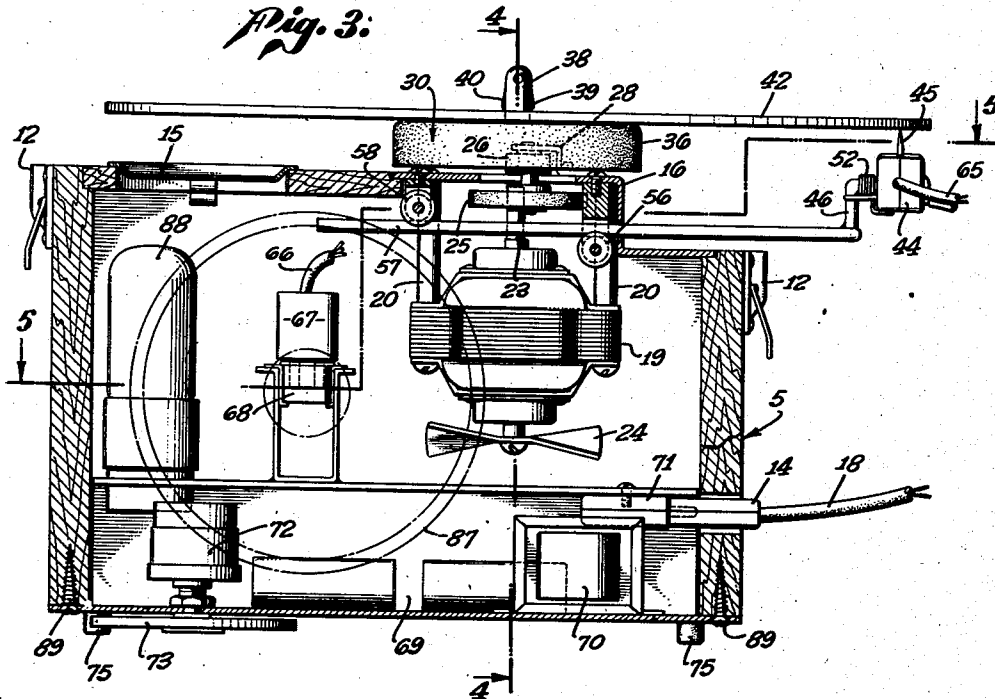


Fig. 4.

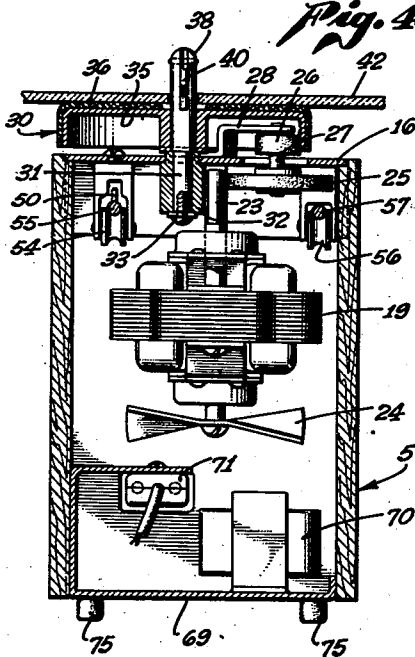
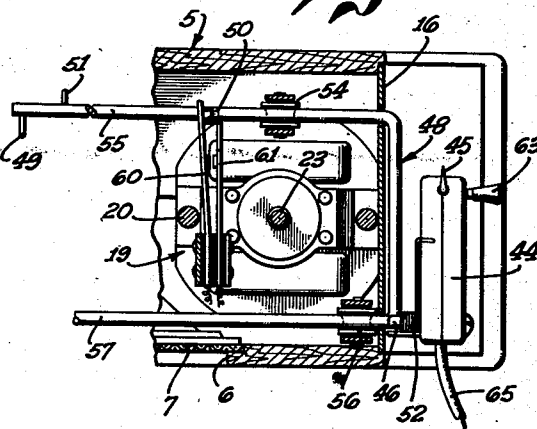


Fig. 6.



BRUCE ROBERTS,
INVENTOR

BY *Wm. R. Goshaw*
ATTORNEY.

May 4, 1943.

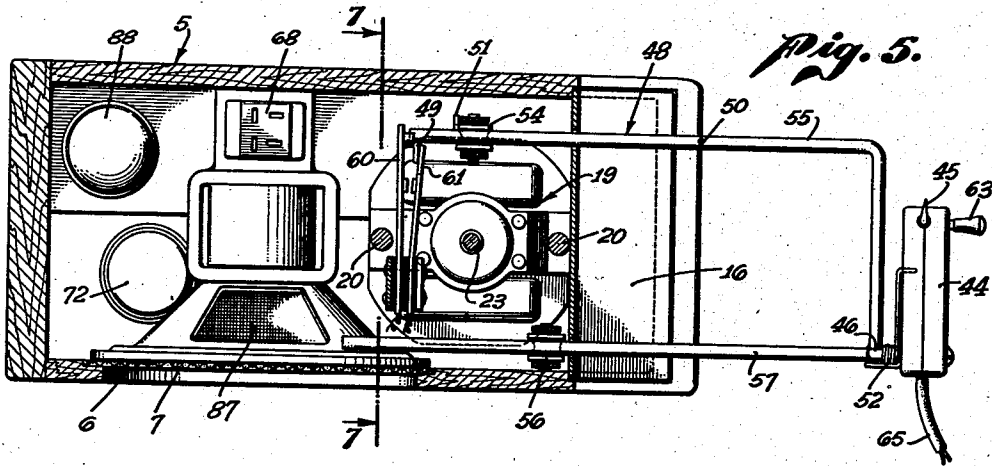
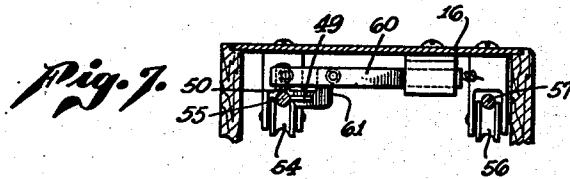
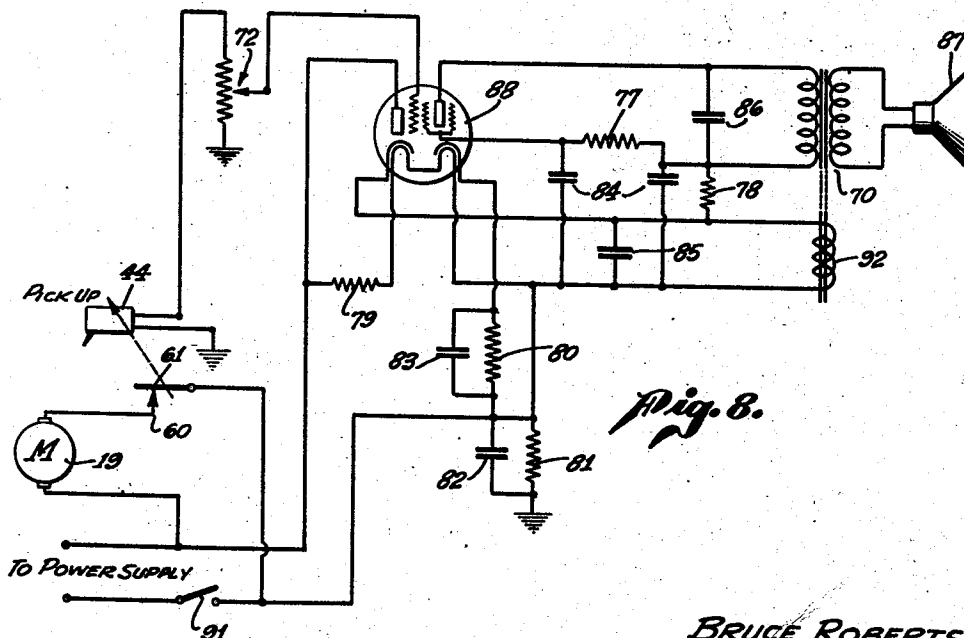
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PORTABLE PHONOGRAPH

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3 Sheets-Sheet 3



BRUCE ROBERTS,
INVENTOR

BY *Chas. R. Lockaw*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,318,183

PORTABLE PHONOGRAPH

Bruce Roberts, Los Angeles, Calif., assignor, by
mesne assignments, to Radio Corporation of
America, a corporation of Delaware

Application November 1, 1941, Serial No. 417,436

14 Claims. (Cl. 179—100.4)

This invention relates to sound reproducing apparatus and particularly to a portable type of disc phonograph wherein the complete motor mechanism and reproducing apparatus are contained within small dimensions.

Portable types of radios and phonographs are well known in the art, the present invention being of that general type but embodying features which permit the unit to be of a particularly small size. The unit also embodies features which provide a quality of reproduction at least as good as, if not better than, that obtainable with the larger portables.

One of these features is the arrangement of the pickup carriage so that the needle has a substantially constant or fixed angle of contact with the record groove regardless of its position along the groove. It is well known that most records are cut with a stylus that travels along a radius of the record. In present types of phonographs, however, the pickup unit is mounted on an arm pivoted at one end so that the angle of the needle with respect to the record groove varies as the needle travels along the groove, which means that the pickup needle does not follow the same radius as the cutting stylus, but follows an arc along the radius. This is conducive to excessive wear on the record and needle. In the present invention the pickup unit follows substantially along the radius of a record in the same manner as the recording stylus.

Another feature of the invention is the automatic switching arrangement controlled by the pickup carriage when at each end of its path of travel. That is, the carriage disconnects the motor switch when in its outside terminal position so that the records may be placed on and taken off the turntable, while the motor is automatically disconnected when the record groove brings the pickup to its inner terminal position. At intermediate positions of the pickup, the switch is closed to energize the motor.

Another feature is the manner of positioning the pickup needle with respect to the record. Contrary to the usual practice of having the pickup above the record, the pickup is placed below and the needle is resiliently held in the groove by spring tension which permits a light, constant, predetermined pressure to be obtained. The motor is preferably of the vertical-shaft type operating through a plurality of resiliently mounted pucks to turn a flanged, small-diameter turntable. The pickup may be of the magnetic or crystal type, the latter being preferred, while the electrical reproduction is provided by a sin-

gle combination rectifier-amplifier tube, although it is to be understood that other circuits may be employed to provide greater amplification, if desired.

The principal object of the invention, therefore, is to facilitate the reproduction of disc-type phonograph records.

Another object of the invention is to increase the portability of a disc record phonograph.

A further object of the invention is to provide a pickup unit for a phonograph which will travel substantially along a radius of the record.

A further object of the invention is to provide automatic control of the starting and stopping of the phonograph motor by the pickup carriage.

Although the novel features which are believed to be characteristic of this invention will be pointed out with particularity in the appended claims, the manner of its organization and the mode of its operation will be better understood by referring to the following description read in conjunction with the accompanying drawings forming a part thereof, in which

Fig. 1 is a perspective view of the invention with a record in playing position;

Fig. 1A is a perspective view of the cover for the unit;

Fig. 2 is a plan view of the invention;

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a plan view taken along the line 5—5 of Fig. 3;

Fig. 6 is a plan view of the carriage and pickup unit of the invention;

Fig. 7 is a detail view of the motor switch; and
Fig. 8 is a schematic drawing of the reproducing circuit of the invention.

Referring now to the drawings in which identical numerals identify like elements, a casing 5 of any suitable material is shown with an opening 6 covered by a decorative fabric 7 behind which is located the speaker unit of the phonograph. The case has a cover section 9, as shown in Fig. 1A, the cover having a handle 10 and clip locks at the ends thereof, as shown at 11 and 12. An opening at one end of the case 5 is provided for the insertion of an electrical supply connection 14. As shown in Figs. 2 and 3, a screened air vent is provided at 15 to provide ventilation for the cooling of the interior of the phonograph mechanism. Sufficient room is provided under the vent 15 to accommodate the connecting supply cord 18.

Referring now particularly to Figs. 2, 3 and 4, an angle plate 16, fastened by screws such as 17 to the case 5, has a motor 19 suspended therefrom on resiliently mounted posts 20. The shaft 23 of the motor has mounted at its lower end a fan 24, while the upper end of the shaft contacts a puck 25 which rotates a smaller puck 26 on a shaft 27, the upper end of shaft 27 being supported on a bracket 28 (see Fig. 4). The smaller puck 26 is adapted to contact the inner circumference of a flanged turntable 30, the turntable having a shaft 31 rotatable in a bearing sleeve 32 and maintained in the sleeve by a screw 33.

The turntable comprises an inner metallic section 35, which contacts the puck 26, and a cover section 36, preferably of rubber or other similar material. The turntable has a spindle 38, the upper end of which has spring-tensioned dogs 39 and 40 mounted therein for holding a disc record 42 on the turntable when pressed on the spindle. The edges of the dogs are tapered so that the record may be placed on and removed from the turntable by a slight pressure on the rim of the record, while the tension is sufficient to maintain the record firmly against the upper side of the turntable during reproduction of the record. The diameter of the turntable is within the groove area of the record and may be appreciated by comparing it with the diameter of a ten-inch record, the circumference of which is shown by the broken line in Fig. 2.

From the above description, it will be observed that rotation of the motor shaft 23 will transfer motion through the pucks 25 and 26 to the turntable 30, thus rotating the record 42.

Reproduction of the record is obtained by the use of a pickup 44 having a handle 63 and a needle 45 adapted to contact the spiral groove on the underside of the record 42. The pickup is mounted on the horizontal portion of an angle rod 46 attached to a U-shaped rod carriage 48 having switch control pins 49 and 50 and a stop pin 51 on arm 55 thereof. The needle 45 is maintained at a predetermined pressure against the record 42 by a coil spring 52 around the horizontal portion of the pickup support 46 and bearing against the pickup unit (see Fig. 6). The carriage 48 is adapted to translate the pickup needle 45 along a straight line substantially coincident with a radius of the record 42 by being mounted on three rollers, a roller 54 supporting the underside of section 55 of the carriage 48, a roller 56 supporting the underside of section 57 of the carriage 48, while a roller 58 bears against the upper side of section 57 of the carriage. Thus, the carriage is mounted on a three-point roller suspension which provides the minimum load on the needle and groove to permit the pickup needle to follow the groove in the record while maintaining substantially the same angle of contact with the groove at all times.

Referring now to Figs. 5, 6, 7 and 8, a pair of switch blades 60 and 61 are in the motor circuit, the pin 49 moving blade 61 to the right, breaking the motor circuit when the pickup 44 is at its extreme right-hand position, as shown in Fig. 5, while the pin 50 moves blade 60 to the left, breaking the motor circuit when the pickup 44 is moved to its left-hand position by the groove in the record or manually, as shown in Fig. 6. Thus, the position of the carriage 48 controls the motor circuit, the circuit being opened when the pickup 44 is moved by its handle 63 to its right-hand position, and the circuit being opened when

the record groove brings the pickup to its left-hand position. Dropping of a portion of the blade 61 below blade 60, as shown in Fig. 7, permits the switch to function in this manner.

The arrangement of the electrical reproducing elements is shown in Figs. 3, 4 and 5. As mentioned above, the plate 16 supports the motor and a cable comprising three conductors, two of which go to the motor 19 and the switch blades 60 and 61, and the other of which goes to the pickup, the latter being shown at 65. These three conductors are in the cable 66 and terminate in a connecting plug 67. Thus, the removal of the plug 67 from its socket 68 permits the turntable, motor carriage and pickup to be removed as a unit from the case 5. When these elements are replaced in the case, the plug 67 is connected in the socket 68 and the circuit is completed.

As shown in Figs. 3 and 4, an angle bracket 69 serves as a bottom for the case and as a mounting for the electrical elements of the reproducing circuit, such as a transformer 70, a connecting plug socket 71, and a potentiometer 72 with its hand wheel 73, the latter being free to rotate since the plate 69 is supported upon legs 75. Also mounted on the lower portion of the angle bracket 69 are the various resistance and condenser elements such as shown in Fig. 8 at 77, 78, 79, 80, 81, 82, 83, 84, 85 and 86, while the loudspeaker 87 and combination rectifier-amplifier tube 88 are mounted on the upper portion of the bracket 69. Thus, the electrical elements attached to the bracket 69 are exposed by removal of the bracket 69 from the bottom of the case 5 after removal of the screws 89. In this manner this portion of the system may be readily removed as a unit for inspection or repair.

Referring now to the electrical circuit as shown in Fig. 8, it will be observed that the power is supplied over a switch 91 which may be operated in conjunction with the gain control potentiometer 72. The closing of this switch will energize the tube 88, while the position of the pickup 44 determines whether or not the switch blades 60 and 61 connect the motor 19 to the power source for rotating the turntable 30, as explained above. The output of the pickup 44 is controlled by potentiometer 72 and is impressed upon the grid of tube 88, this tube being a combination rectifier-amplifier and preferably of the type known as RCA 70L7GT. The output of the amplifier stage is transmitted through transformer 70 to the loudspeaker 87. The field coil 92 of the speaker 87 and the condenser 85 provide the filtering of the rectified output for the amplifier anode of tube 88 through resistance 78, while the proper potential is impressed upon the screen grid of the amplifier stage over resistance 77. Grid bias for the amplifier stage is obtained over resistance 80 by-passed by condenser 83, while the resistance 81 and condenser 82 discharge the condensers after the power is disconnected from the system. The resistance 79 provides the proper voltage for the heater elements of the tube, while condensers 84 and 86 are by-pass condensers.

From the above, it is observed that the unit is made particularly compact by segregating the motor portion from the electrical portion, which permits the dimensions of the entire unit to be less than the dimensions of a record to be played. In the usual type of small unit, quality is generally sacrificed to obtain the small dimensions, but in the present arrangement, high quality re-

production is also obtained. The mounting of the pickup unit is such that it may be operated outside the dimensions of the case, while its movement is substantially along a radius of the record providing a constant angular relationship between the groove and the needle. The pickup may be provided with any predetermined tension desirable for high quality reproduction and long life of the record. The position of the pickup controls the starting and stopping of the turntable automatically. Thus, the combination of these features provides a high quality portable phonograph. Although the above invention has been disclosed in connection with a power-operated circuit, it is realized that the reproducing system may be battery-operated and the turntable spring-driven, as is well known in the art.

What I claim as my invention is:

1. In a phonograph mechanism the combination of a turntable, a spindle, means for holding a record on said turntable, a carriage rectilinearly movable under said turntable, and a pickup unit mounted on said carriage, the stylus of said pickup being adapted to contact the groove in the underside of said record for moving said pickup substantially along a radius of said record.

2. A combination in accordance with claim 1 in which said pickup is resiliently mounted and adapted to reproduce the underside of said record.

3. A combination in accordance with claim 1 in which said means for holding said record on said turntable includes a pair of dogs resiliently mounted in diametrically positioned grooves in said spindle.

4. A phonograph comprising a vertical shaft motor, a turntable mounted above said motor, a plurality of pucks interposed between the shaft of said motor and the rim of said turntable to transmit rotary motion of said shaft to said turntable, means for holding a record to be reproduced on said turntable, a carriage, a plurality of rollers for supporting said carriage and permitting movement thereof substantially parallel to a radius of said record, and a pickup unit mounted on said carriage for reproducing the underside of said record.

5. A phonograph in accordance with claim 4 in which a switch is provided for said motor, said carriage being adapted to open said switch at each terminal position of said carriage.

6. A phonograph comprising a casing, a motor, a turntable, a pickup, a carriage for said pickup, a bracket for mounting said elements, said motor being positioned within said casing, and said carriage and pickup being adapted to move beyond the external boundaries of said casing, an energizing circuit for said motor, a switch in said

circuit for opening and closing said energizing circuit, and means on said carriage for automatically opening said switch at either of the terminal positions of said carriage.

7. A phonograph in accordance with claim 6 in which said casing is provided with a detachable bottom member, said member having attached thereto means for reproducing said record.

8. A phonograph in accordance with claim 6 in which a pickup is mounted on said carriage for translating a record into electrical currents, an electrical amplifier and loudspeaker are provided in said casing for amplifying and translating said electrical currents into sound waves, and a detachable bottom is provided for said casing on which said amplifier and loudspeaker are mounted.

9. A phonograph comprising a casing, a bracket at the top of said casing, a motor suspended from said bracket, a turntable mounted on top of said bracket, a carriage positioned intermediate said motor and said turntable and adapted to move rectilinearly, a pickup at one end of said carriage, and means for holding a record on said turntable, said turntable having a diameter less than the smallest diameter of the grooved portion of said record.

10. A phonograph in accordance with claim 9 in which means are provided at the other end of said carriage for controlling the energizing of said motor.

11. A phonograph in accordance with claim 9 in which are provided an energizing circuit for said motor, a switch in said circuit, and means on said carriage for controlling the opening and closing of said switch.

12. A phonograph in accordance with claim 9 in which said carriage is U-shaped and adapted to be moved rectilinearly on rollers, said pickup being mounted at the closed end of said carriage.

13. A phonograph for reproducing a disc record comprising a turntable having a diameter less than the grooved portion of said record, a motor for rotating said turntable, a carriage adapted to be moved rectilinearly and substantially coincident with a radius of said record when on said turntable, and a pickup unit mounted on said carriage and having a stylus adapted to contact the grooved underside of said record, rotation of said record moving said pickup substantially along a radius of said record.

14. A phonograph in accordance with claim 13 in which means are provided on said carriage for controlling the energization of said motor, said motor being deenergized at each terminal position of said carriage.

BRUCE ROBERTS.