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PHONOGRAPH TONE-ARM SUPPORTING AND ADJUSTING ARRANGEMENT

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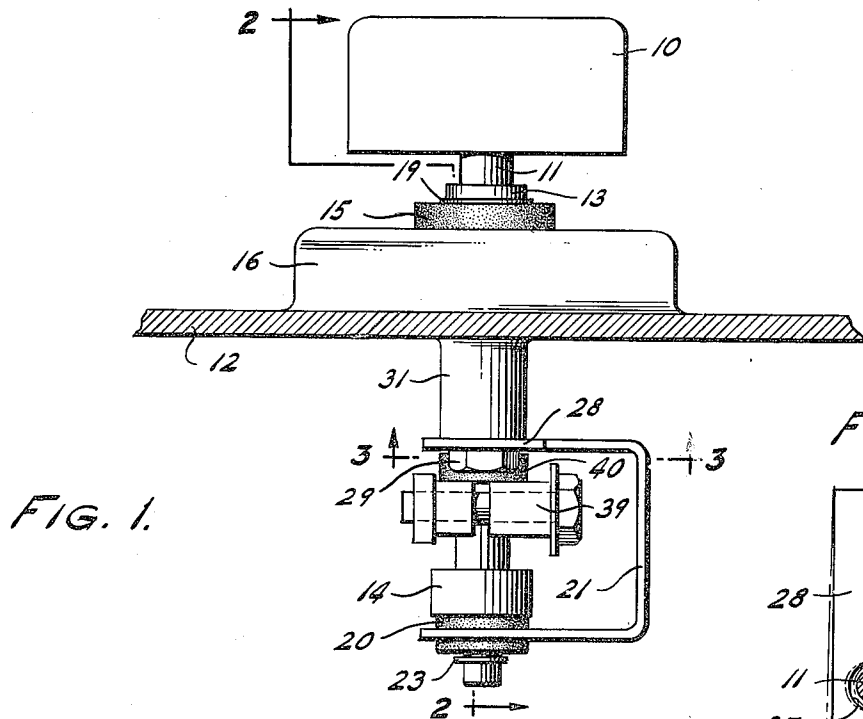


FIG. 1.

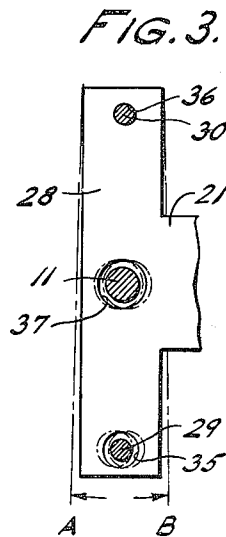


FIG. 3.

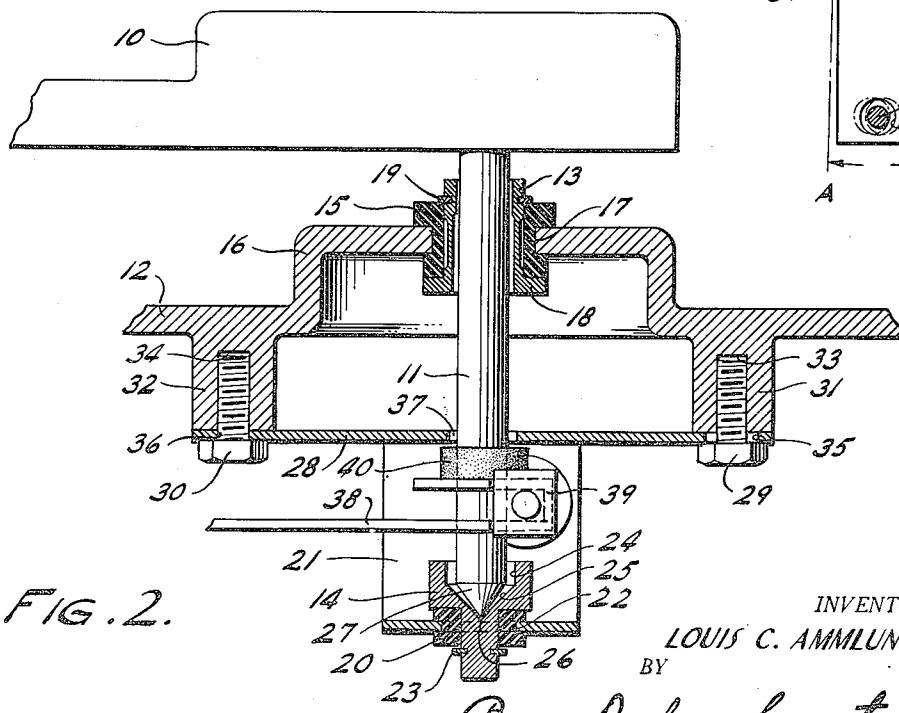


FIG. 2.

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PHONOGRAPH TONE ARM SUPPORTING AND
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The present invention relates to phonograph tone-arms and, particularly, to an improved arrangement capable of supporting the tone-arm in proper position to insure adequate tracking engagement of the pickup needle with the modulated groove of a record. Specifically, the invention has to do with improvements in the bearing support structure for the tone-arm shaft which provides for swinging movement of the tone-arm about an axis perpendicular to the playing surface of a record.

It is well known in the art that, in order to insure proper tracking and high fidelity reproduction, the tone-arm should be supported in a definite angular relationship with respect to the record, and the tone-arm supporting structure should be capable of damping out and eliminating undesirable vibrations, so as to prevent the effects of resonance occurring in the tone-arm during normal use of the phonograph. In many cases, arrangements used for the above stated purposes are objectionable because of the complicated and expensive structure they require. For example, known arrangements for the mentioned purposes necessitate accurate machining and skillful assembly techniques, which result in increasing manufacturing and production costs.

It is, therefore, the primary object of the present invention to provide a tone-arm supporting arrangement which realizes the above-mentioned desirabilities, and which eliminates the aforesaid objections. To that end, the supporting arrangement is of such character that the bearing means for the pivot-providing shaft of the tone-arm consists of easily made parts which are capable of being readily associated with the phonograph structure to support and to maintain said shaft in proper position, and which are further capable of absorbing undesirable vibrations.

It is also an object of the invention to provide a tone-arm supporting arrangement of the above-mentioned character, in which the parts are associated in such a manner that the tone-arm may be quickly and accurately adjusted in proper operative position. For that purpose, the supporting arrangement includes two separate bearings which are adapted to be mounted in approximate alignment on the phonograph structure and which, when so mounted, are capable of being relatively adjusted in the required relationship to support the tone-arm for operative tracking engagement of the pickup needle with the record groove.

Another and more specific object of the invention resides in the provision of a tone-arm sup-

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porting arrangement including bearing means which, when the arrangement is mounted on the phonograph, can be adjusted to determine the precise angular position of the tone-arm in said bearings, and which is associated with shock absorbing means so as to prevent undesirable vibrational effects. An arrangement of this kind is especially advantageous when used for supporting tone-arm and pickup assemblies which are characterized by their light weight and their ability to operate at exceedingly low needle-pressure, that is, a needle-pressure of the order of 5 grams, because with assemblies of this character, the support of the tone-arm in proper angular relationship to the playing surface of the record is most critical, and the elimination of undesirable vibrations is most essential.

These and other objects, and the manner in which they are obtained, will be apparent from the following description based on the accompanying drawing which illustrates a preferred embodiment of the invention. In the drawing,

Figure 1 is an end elevational view of a tone-arm supporting arrangement constructed in accordance with the invention;

Figure 2 is an elevational sectional view looking in the general direction of arrows 2—2 in Figure 1; and

Figure 3 is a fragmentary view, on a reduced scale, looking in the general direction of arrows 3—3 in Figure 1, and illustrating the adjustable feature of the bearing means for the tone-arm shaft.

Referring more particularly to the drawing, the tone-arm 10 is provided with the usual shaft 11 which constitutes the pivot for swinging movement of the tone-arm about an axis perpendicular to the playing surface of a record. For that purpose, the tone-arm shaft 11 is rotatably supported on a base 12 which also supports the customary turntable (not shown).

In accordance with the present invention, the means employed for the purpose of rotatably supporting the tone-arm shaft 11 on base 12, includes two spaced cooperatively disposed bearings 13 and 14. One bearing 13 embraces the shaft at the upper portion thereof, that is, at a point adjacent its connection with the tone-arm. The other bearing 14 engages the lower portion of said shaft and serves as a thrust bearing.

As more clearly shown in Figure 2, the upper bearing 13 has a generally cylindrical shape and is advantageously mounted, by means of a rubber grommet 15, on an upstanding protuberance 16 on the base 12. The grommet tightly fits with-

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in and lines an aperture 17 in said protuberance, and snugly receives the bearing 13. In order to prevent undue relative movement between bearing 13 and grommet 15, one end portion of said bearing is provided with a marginal rim 13 which abuts the adjoining end of the grommet, and the other end of said bearing has means, in the form of a split ring 19, which overlies the adjacent end of the grommet.

As also clearly shown in Figure 2, the lower bearing 14 is generally T-shaped in cross-section, and is advantageously mounted by means of a rubber grommet 20 on a bracket 21 which depends from the base 12. This grommet 20 tightly fits within and lines an aperture 22 in said bracket, and snugly receives the shank of said bearing 14. Undue relative displacement between lower bearing 14 and associated grommet 20, is prevented by contact between the head portion of said bearing and the adjoining end of the grommet, and by means of a split ring 23 arranged on the shank portion of said bearing to overlap the adjacent end of said grommet. The head portion of lower bearing 14 is provided with a substantially circular recess 24 having an inwardly tapered portion 25 which terminates in a point to form a seat 26 for a correspondingly tapered tip portion 27 terminating the lower part of the tone-arm shaft 11.

The bracket 21, in accordance with the invention, includes means whereby said bracket may be adjusted on the base 12. This adjustable feature makes it possible to locate the lower bearing 14 in relation to the upper bearing 13, so that said bearings properly support the tone-arm shaft 11 in the correct angular position. For that purpose, the bracket, as shown in the drawing, is provided with a rigid elongated mounting plate 28 which is adapted to be secured, by means of screw-threaded elements 29 and 30, to a pair of studs 31 and 32 extending from the under surface of base 12. These studs are provided with internally screw-threaded bores 33 and 34 which receive the securing elements 29 and 30, respectively.

As more clearly seen in Figure 2, the studs are disposed, generally, in diametrically opposed relationship on opposite sides of the protuberance 16 on which the upper bearing 13 is mounted, so that said studs lie substantially in a plane traversing the axial plane of said bearing. The end portions of the mounting plate 28 are provided with openings 35 and 36 through which screw-threaded elements 29 and 30 pass to effect the connection of the bracket to the base. The intermediate portion of the mounting plate is also provided with an opening 37 disposed to accommodate the tone-arm shaft 11 supported in bearings 13 and 14. It is to be particularly noted that the opening 37, at the intermediate portion of the mounting plate is larger than the circumference of the tone-arm shaft, that the opening 35, at one end of said plate, is larger than the circumference of the associated screw-threaded element 29, and that the recess 24 of the lower bearing is larger than the tip portion 27 of the tone-arm shaft. As illustrated in Figure 3, this construction makes it possible, prior to tightening of the screw-threaded elements, to pivot the mounting plate about the axis of one of said screw-threaded elements, that is the screw-threaded element 30, so that said plate may be adjusted at a suitable point between extreme positions A and B. In this manner, the lower bearing 14, mounted on bracket 21 of

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which mounting plate 28 is a part, may be brought in the required position with respect to the upper bearing 13, for the purpose hereinbefore specified. It will be understood that, after the desired adjustment is made, the adjusted relationship between the bearings is secured by tightening the fastening elements 29 and 30.

Accidental disengagement of the tone-arm shaft 11 from its bearings 13 and 14 is effectively prevented by the provision of a stop associated with said shaft to limit its outward longitudinal movement. This stop is also adjustable to take care of variations which may occur in manufacturing and assembling of the parts. In practice, the stop is advantageously provided by means of the so-called trip-arm, which is usually connected to and movable with the tone-arm shaft. A portion of this trip-arm is shown at 38 and, in accordance with the invention, said arm is rigidly attached, through its customary clamping portion 39, to the tone-arm shaft at a point below the mounting plate 28. A spacer 40 is conveniently interposed between said clamping portion of the trip-arm and the mounting plate 28 so as to provide a uniform abutting surface for contact with said plate, when outward movement of the tone-arm and its shaft occurs.

From the foregoing description, it will be appreciated that the invention provides a simple, yet effective, arrangement for supporting a tone-arm in proper operative position, and for absorbing vibrations which may result in undesirable frequency responses. Particularly, the adjustability of the arrangement is most advantageous in making it possible to obtain the best operating results by the simple expedient of adjusting the relationship between the bearings 13 and 14, without having to disassemble the parts. The rubber grommets, which conveniently serve to mount the bearings, act to absorb shocks, thereby minimizing the effects of undesirable vibrations.

I claim:

1. In phonograph apparatus, a tone-arm, a generally vertical shaft connected to the tone-arm to support it over and in a plane generally parallel to the playing surface of a record, a supporting base having an upstanding protuberance and depending studs, an upper bearing arranged on said protuberance and engaging the upper portion of said shaft, a bracket having an elongated mounting plate secured to said studs, a second bearing arranged on said bracket and engaging the lower portion of said shaft, the end portions of the mounting plate being provided with openings, and bolt-like fastening elements passing through said openings for engagement with the mentioned studs to effect the connection of said plate to said studs, the opening at one end portion of said plate being larger than the circumference of its associated fastening element to provide for lateral swinging displacement of the bracket and lower bearing, so as to adjust the angular position of said shaft in the bearings thereby adjusting the angular position of the tone-arm in relation to the playing surface of the record.

2. The arrangement set forth in claim 1, in which the upper bearing is resiliently mounted on said protuberance, and the lower bearing is resiliently mounted on said bracket.

3. In phonograph apparatus, a tone-arm, a shaft connected with and extending at a substantially right angle from said tone-arm to sup-

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port it over the playing surface of a record, a supporting base, a first bearing mounted on said base and engaging said shaft at a point adjacent its connection with the tone-arm, a second bearing also mounted on said base and engaging said shaft at a point remote from its connection with the tone-arm, the mounting of said second bearing including a bracket having a portion provided with a pair of relatively spaced openings, and fastening elements passing through said openings and attaching said member to the supporting base, one of said openings being larger than the cross-sectional dimension of the associated fastening element to provide for swinging displacement of said member and second bearing in a plane transverse to said shaft to adjust the angular position of the latter in the bearings thereby adjusting the angular position of the tone-arm in relation to said surface of the record.

4. In a phonograph apparatus, a tone-arm, a generally vertical shaft connected to the tone-arm to support it over and in a plane generally parallel to the playing surface of a record, an upper bearing engaging an upper portion of said shaft, a second bearing engaging a lower portion of said shaft, a supporting base carrying one of said bearings, a bracket secured to said base and carrying the other of said bearings, said bracket having a pair of relatively spaced openings, and fastening elements passing through said openings for engagement with said base, one of said

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openings being larger than the cross-sectional dimension of the associated fastening element to provide for lateral swinging displacement of the bracket and the bearing carried thereby, so as to adjust the angular position of said shaft in the bearings thereby adjusting the angular position of the tone-arm in relation to the playing surface of a record.

5. The arrangement set forth in claim 4, in which one bearing is resiliently mounted on said base, and the other bearing is resiliently mounted on said bracket.

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