June 18, 1946. C. B. DALE 2,402,150

PHONOGRAPH TONE ARM MOUNTING

Filed Aug. 30, 1943 2 Sheets-Sheet 1

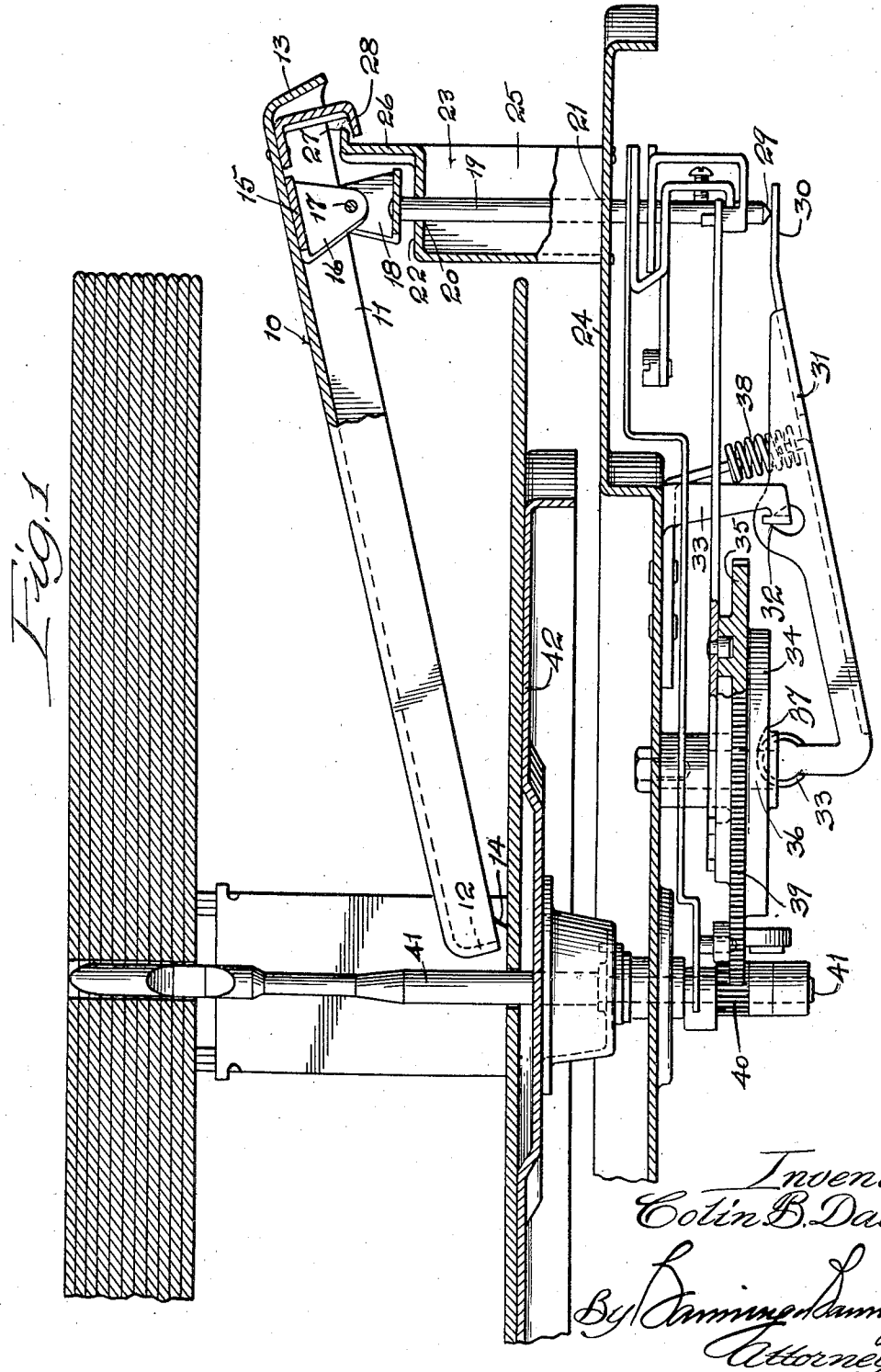


Fig. 1

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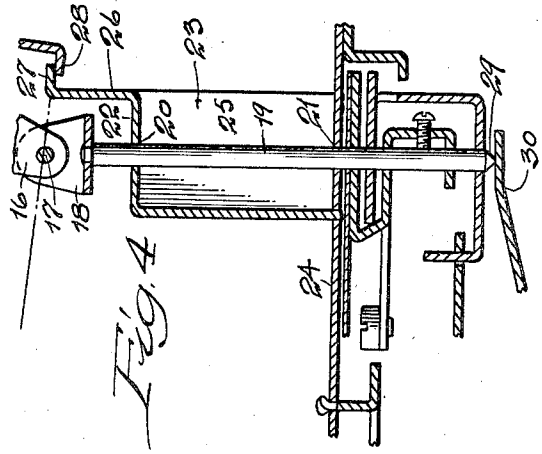


Fig. 4

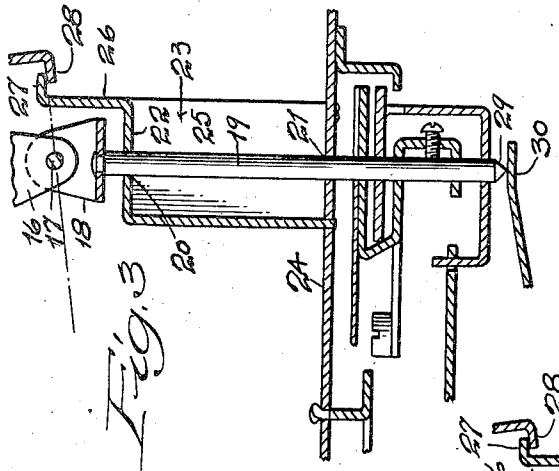


Fig. 3

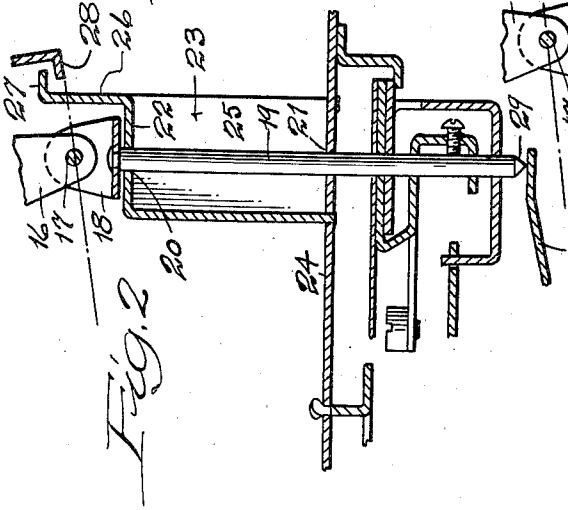


Fig. 2

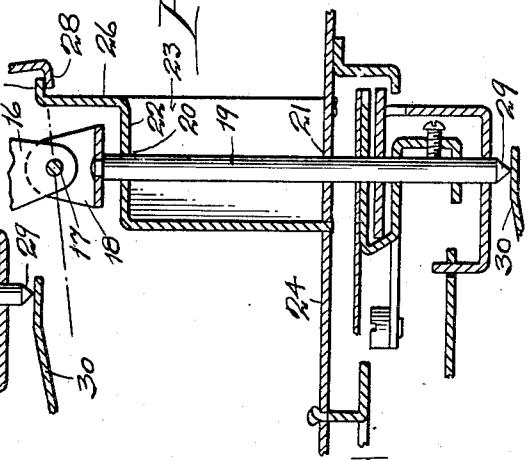


Fig. 5

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PHONOGRAPH TONE ARM MOUNTING

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Application August 30, 1943, Serial No. 500,483

8 Claims. (Cl. 274—23)

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This invention is directed to the means provided for mounting a phonograph tone arm in such a way as to permit it to swing inwardly under the guidance of the needle which engages the record groove of a disk without appreciable restraint due to friction in the bearing which supports the shaft upon which the tone arm is pivoted. This result is attained by employing but a single point bearing for the lower end of the shaft which is subjected to a direct vertical thrust under the weight of the tone arm, so that, while playing, side bearing pressures are eliminated together with all friction or cramping occasioned thereby. This method of support not only avoids wear on the parts and simplifies the construction, but also prevents mechanical noises in the tone reproduction and reduces wear on the record line.

Further objects and details will appear from a description of the invention in conjunction with the accompanying drawings wherein:

Figure 1 is a sectional detail showing those portions of a record changing phonograph which relate to the construction and operation of the present invention; and

Figs. 2, 3, 4 and 5 are sectional details showing the tone arm and its mountings in successive stages of adjustment.

The tone arm with its mountings and associated mechanisms is here shown as embodied in the structure of a record changing phonograph which is the subject of a patent application filed of even date herewith, but it will be understood that the present invention is capable of general employment in connection with phonographs, and that its use is in no way conditioned by the presence or absence of record changing features or of special mechanisms employed for imparting rotation to the turntable, or other features not having special relation to the tone arm and its mountings. It will therefore be understood that any disclosure of such additional features serves merely to illustrate one type of phonograph with which the present invention may be advantageously employed, and is not to be regarded as a limitation on the more general use to which the invention is adapted.

As shown, the tone arm 10 is in the form of an elongated channel-shaped stamping having side flanges 11, an inner end wall 12, and an outer end wall 13. The inner end houses the mounting for a needle 14 which may be of any conventional type, or which may have connection with a radio amplifier or equivalent construction.

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The needle features are standard and need not be described in further detail.

The tone arm near its outer end has secured to its under face a bracket 15 having depending ears 16 which carry a horizontal pintle 17 upon which the ears are pivoted, so that the tone arm will have freedom of pivotal movement in a vertical plane but must swing laterally in unison with the mounting bracket 18. The mounting bracket is fixed upon the upper butt end of a vertical shaft 19 which is supported through aligned guide apertures 20 and 21, respectively, in the top wall 22 of a standard 23 and in a base plate 24 to which the standard is affixed. The standard has side walls 25 and an upstanding tongue 26 terminating in a stop flange 27 which coacts with a hooked finger 28 depending from the tone arm near its outer end and beyond the pintle on which the arm is pivoted. The connection between the hooked finger and the stop during various stages in the lifting of the pivoted end of the tone arm is illustrated in Figs. 2, 3, 4 and 5.

The lower end 29 of the vertical tone arm shaft is of pointed or conical formation, and is supported in thrust bearing contact upon the outer end 30 of a lever 31 fulcrumed at 32 upon a hanger 33 depending from the base plate. The inner end of the lever is upturned and carries a roller 33 which engages a cam track 34 on the lower face of a cam disk 35 journaled upon a stub shaft 36 depending from the base plate. The cam track has formed therein a notch 37 which is normally in register with the roller 33 during the playing of a record while the thrust of a spring 38 holds the outer end of the lever in lowered position and with it the tone arm shaft which lowers the hooked finger 28 sufficiently to break engagement with the stop flange 27. This is the position shown in Fig. 1 wherein the tone arm is free to follow the record line while supported only by the needle at its inner end, and by the vertical shaft with its cone bearing near its outer end. The thrust on the shaft is directly downward so that no side pressure is exerted against the sides of the apertures 20 and 21 which thus serve merely as guides to position and steady the shaft without serving in any true sense as bearings, so that frictional contact therewith is negligible.

The periphery of the cam disk is provided with spur teeth 39 which, while in train with a pinion 40 on the constantly rotating spindle 41 upstanding from the center of the turntable 42, will impart a single rotation to the cam disk to elevate the tone arm in preparation for its outward

swing to afford clearance for the positioning of a record disk, and the clearance will be maintained during the inswing of the tone arm until the needle engages the low pitched record groove. The outswinging of the tone arm may be performed manually or automatically, as described in the companion application aforesaid, or in any other desirable or convenient manner, and it is not deemed necessary to here describe such features, which form no essential part of the present invention. The same is true as regards the means provided for constantly rotating the turntable with its spindle, the means for automatically releasing record disks when such means are employed, the means for temporarily entraining the cam disk with the constantly rotating pinion on the turntable spindle during the record changing operations and other associated operations, all of which may be performed automatically in timed sequence as set forth in the companion application aforesaid, but are not required when single records are manually positioned and removed.

Operation

In operation, while the record is being played, the tone arm will maintain the lowered position shown in Fig. 1 with the needle supporting the free end of the tone arm and the tone arm shaft standing at a sufficiently low level to permit the finger 28 to clear the stop flange 27, so that the needle will follow the record groove without interference and the shaft will turn slowly on the single bearing point afforded by the outer end of the lever, which may be manually operated or controlled by automatic means of any suitable character.

When it becomes necessary to change record disks the lever, or other equivalent means, will be shifted to elevate the tone arm shaft which thus imparts a thrust against the outer end of the tone arm which brings the finger 28 into engagement with the fixed stop 27 (as in Fig. 3) so that a continuing upward thrust will elevate the inner free end of the tone arm to the position shown in Fig. 4, thereby affording clearance for the removal of a played record and the positioning of a new one. It will be seen that it is only during the record changing interval that the tone arm is in any way restrained in its free swinging movements, and that during the playing interval it is free to follow the record line without any restraint due to friction or cramping in the tone arm mountings.

Although the invention has been described with particularity, it will be understood that various modifications in detail may be made without departing from the spirit of the invention.

I claim:

1. In a tone arm mounting, in combination with a turntable, a tone arm adapted to carry a needle at its inner end, a vertical tone arm shaft, connections between the outer end portion of the tone arm and the shaft adapted to permit pivotal movement of the tone arm in a vertical plane and to impart a vertical thrust upon the shaft, a vertically adjustable support for the lower end of the shaft affording a thrust bearing therefor, a member contacting the side of the shaft in a manner free from bearing thrusts and adapted to steady the shaft and maintain it in vertical position and means for restraining the outer end of the tone arm beyond the aforesaid connections, and adapted to cause an angular uplift of the inner end of the tone arm when the vertical shaft is raised.

2. In a tone arm mounting, in combination with a turntable, a tone arm adapted to carry a needle at its inner end, a vertical tone arm shaft, connections between the outer end portion of the tone arm and the shaft adapted to permit pivotal movement of the tone arm in a vertical plane and to impart a vertical thrust upon the shaft, a vertically adjustable support for the lower end of the shaft affording a single conical point thrust bearing therefor, a member contacting the side of the shaft in a manner free from bearing thrusts and adapted to steady the shaft and maintain it in vertical position and means for restraining the outer end of the tone arm beyond the aforesaid connections, and adapted to cause an angular uplift of the inner end of the tone arm when the vertical shaft is raised.

3. In a tone arm mounting, in combination with a turntable, a tone arm adapted to carry a needle at its inner end, a vertical tone arm shaft, connections between the outer end portion of the tone arm and the shaft adapted to permit pivotal movement of the tone arm in a vertical plane and to impart a vertical thrust upon the shaft, a vertically adjustable support for the lower end of the shaft affording a thrust bearing therefor, a member contacting the side of the shaft in a manner free from bearing thrusts and adapted to steady the shaft and maintain it in vertical position, a stop member on the outer end of the tone arm beyond its point of support on the shaft, and a fixed stop member in adjacent relation thereto and adapted to engage the tone arm stop member during the lifting of the shaft to restrain the outer end of the tone arm while continuing upward movement of the shaft lifts the free inner end of the tone arm.

4. In a tone arm mounting, in combination with a turntable, a tone arm adapted to carry a needle at its inner end, a vertical tone arm shaft, connections between the outer end portion of the tone arm and the shaft adapted to permit pivotal movement of the tone arm in a vertical plane and to impart a vertical thrust upon the shaft, a vertically adjustable support for the lower end of the shaft affording a single conical point thrust bearing therefor, a member contacting the side of the shaft in a manner free from bearing thrusts and adapted to steady the shaft and maintain it in vertical position, a stop member on the outer end of the tone arm beyond its point of support on the shaft, and a fixed stop member in adjacent relation thereto and adapted to engage the tone arm stop member during the lifting of the shaft to restrain the outer end of the tone arm while continuing upward movement of the shaft lifts the free inner end of the tone arm.

5. In a tone arm mounting, in combination with a turntable, a tone arm adapted to carry a needle at its inner end, a vertical adjustable tone arm shaft and a member affording lateral non-frictional guiding contact therewith during vertical adjustment, bracket connections between the outer end portion of the tone arm and the shaft including a horizontally disposed pintle upon which the tone arm is pivoted near its outer end to permit movement in a vertical plane, said mountings being adapted to impart a vertical thrust upon the shaft, a lever one end of which affords a single conical point thrust bearing for the lower end of the shaft, a hooked stop finger depending from the outer end of the tone arm beyond its pivotal mounting, and a fixed stop member in adjacent relation thereto and adapted

to engage the stop finger during the lifting of the shaft to restrain the outer end of the tone arm while continuing upward movement of the shaft lifts the free inner end of the tone arm.

6. A tone arm mounting for phonographs and the like including a fixed support member, a spindle extending vertically therethrough, a tone arm adapted to carry a needle at its inner end and at its outer end supported during play solely by pivot means having a generally horizontal axis approximately intersecting the axis of the spindle whereby the weight of the tone arm carried by the pivotal support member during play is received by the spindle as an axial thrust, tilt means disposed to engage the tone arm at a point spaced from the axis of the spindle and from the inner end of the tone arm, and means to produce relative motion between the spindle and the tilt means in a direction axial of the spindle to raise the inner end of the tone arm from a record.

7. A tone arm mounting for phonographs and the like including a fixed support member, a spindle extending vertically therethrough, a tone arm adapted to carry a needle at its inner end

and at its outer end supported during play solely by pivot means having a generally horizontal axis approximately intersecting the axis of the spindle whereby the weight of the tone arm carried by the pivotal support member during play is received by the spindle as an axial thrust, and means spaced from said pivotal support effective upon axial movement of the spindle for restraining the tone arm to cause a tilting action of the tone arm about the pivotal support.

8. A tone arm mounting including a rigid supporting member, a spindle mounted thereon for axial movement and for rotation about a generally vertical axis, generally horizontal pivot means carried by the spindle and adapted to pivotally support the outer end of a tone arm therefrom and restraining means carried by the rigid support and adapted to restrain the tone arm at a point more remote from the axis of the spindle than the horizontal pivot means to cause a tilting of the tone arm upon axial movement of the spindle, the outer end of the tone arm being supported during play solely by said pivot means.

COLIN B. DALE.