Dec. 7, 1948. G. P. BRUBAKER 2,455,466

COMBINATION PHONOGRAPH RECORDING AND REPRODUCING MECHANISM

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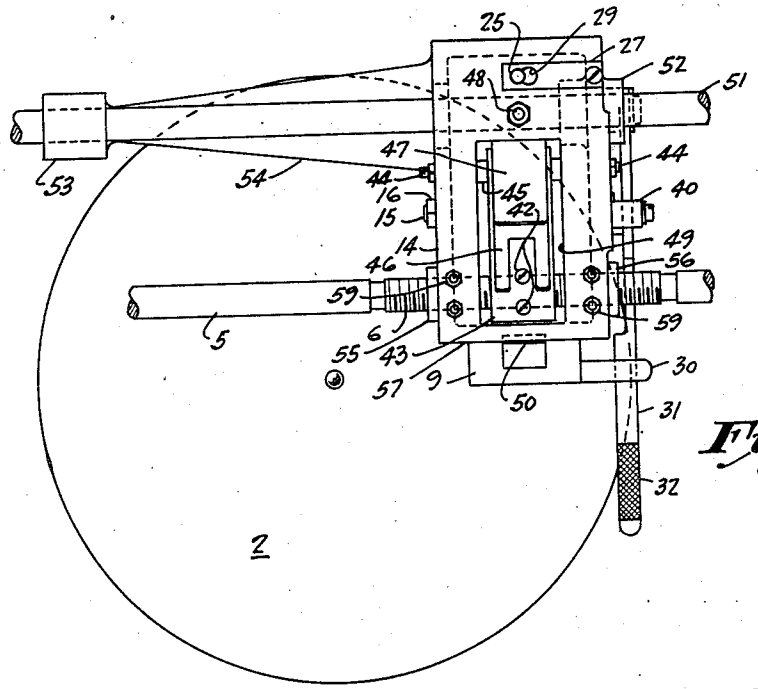


Fig. 1

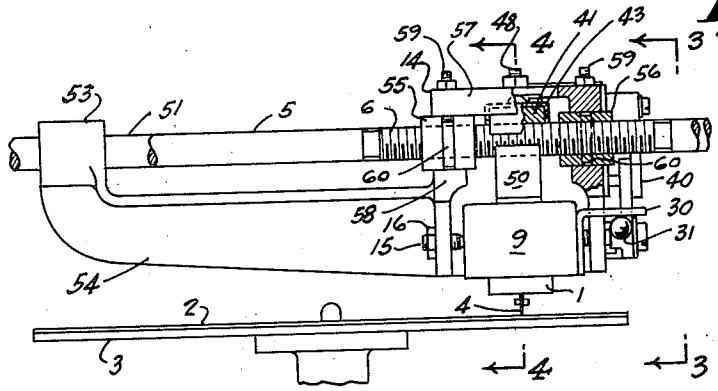


Fig. 2

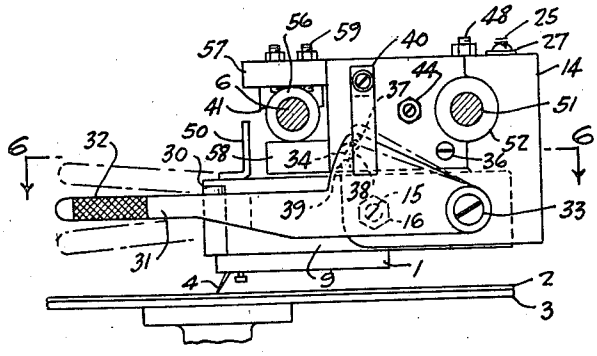


Fig. 3

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Fig. 4

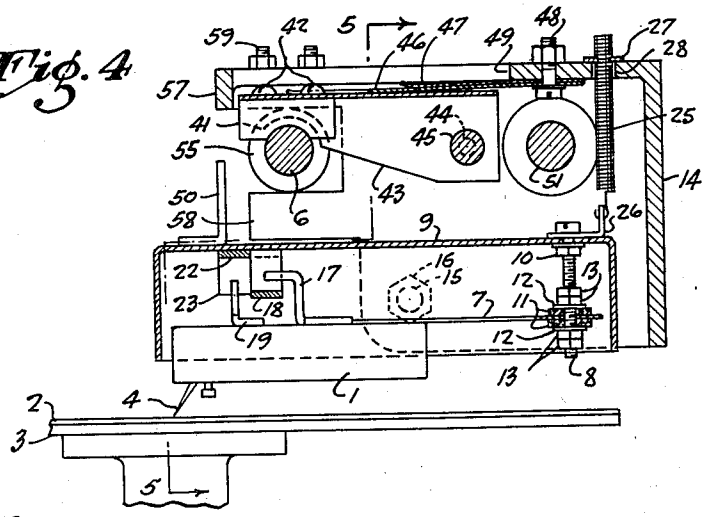



Fig. 5

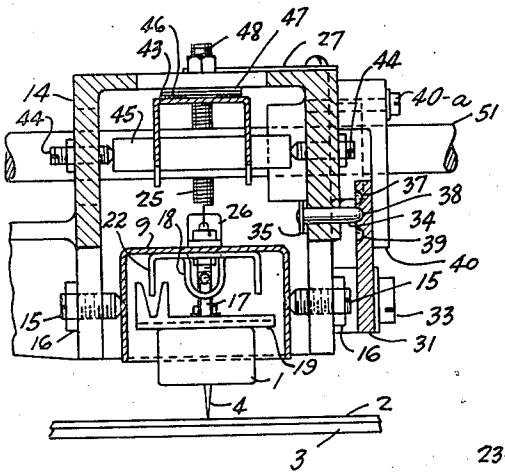
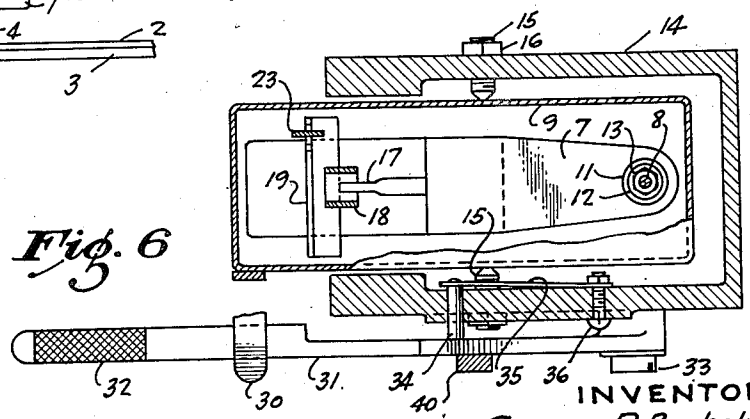



Fig. 6




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Fig. 7

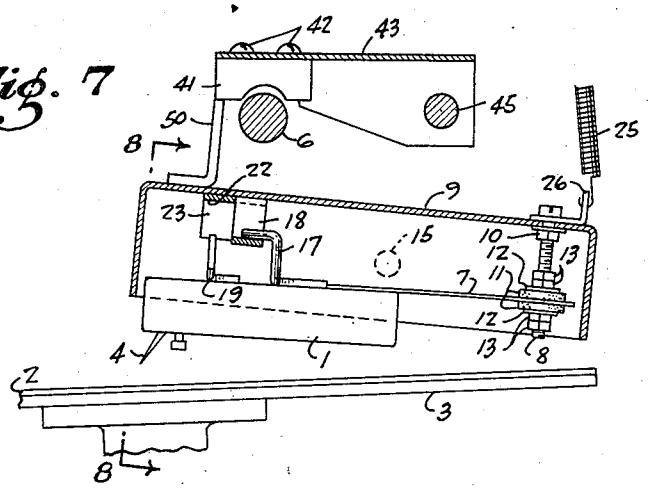
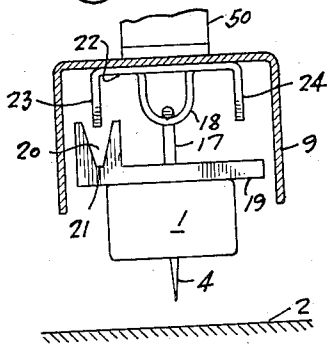



Fig. 8



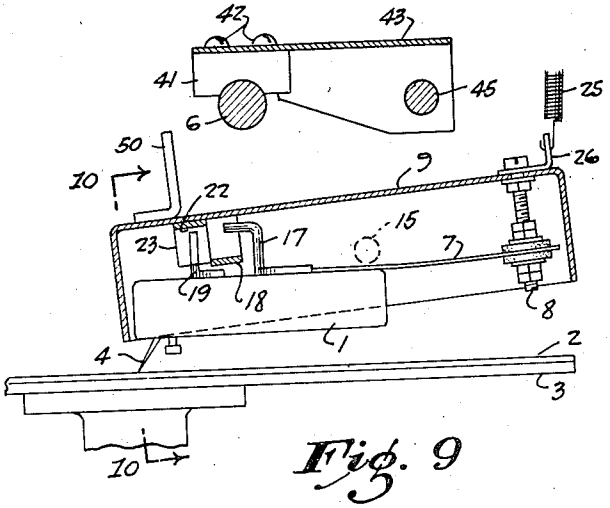
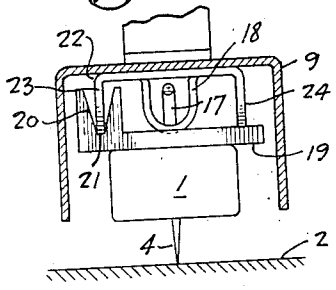




Fig. 9

Fig. 10




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# UNITED STATES PATENT OFFICE

2,455,466

## COMBINATION PHONOGRAPH RECORDING AND REPRODUCING MECHANISM

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Application July 17, 1943, Serial No. 495,175

9 Claims. (Cl. 274—24)

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This invention relates to a phonograph, and more particularly to a phonograph that uses a stylus for co-operation with a mechanical record groove.

It is common to use a stylus head that may be conditioned either for recording or for reproducing. For performing the recording function, the stylus is pressed against the moving record blank, and it is vibrated in accordance with the sound impulses to be recorded. At the same time, the head is moved in a direction transverse to the motion of the blank, to form a continuous record groove.

For performing the reproducing function, the stylus is pressed more lightly against the record carrying member, and the stylus is arranged to have lateral compliance with the record groove. In this way, excessive groove wear is obviated.

It is one of the objects of this invention to improve in general phonographs of this character.

It is another object of this invention to provide a simple mechanism by the aid of which the change of the stylus head from recording position to reproducing position, or vice versa, can be effected.

In order to effect these results, use is made of an adjustable structure that supports the stylus head. The structure can be caused to assume any one of three positions, corresponding to recording position, reproducing position, and neutral or inactive position. It is another object of this invention to provide such a support and its controlling elements, that form a simple and effective mechanism.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. The form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is a top plan view of a mechanism incorporating the invention;

Fig. 2 is a front elevation of the mechanism illustrated in Fig. 1, a part of the structure being broken away;

Fig. 3 is a side view taken along plane 3—3 of Fig. 2;

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Fig. 4 is an enlarged sectional view taken along plane 4—4 of Fig. 2;

Fig. 5 is a sectional view taken along plane 5—5 of Fig. 4;

Fig. 6 is a sectional view taken along plane 6—6 of Fig. 3;

Fig. 7 is a view similar to Fig. 4, but illustrating another position of the stylus head;

Fig. 8 is a sectional view taken along plane 8—8 of Fig. 7;

Fig. 9 is a view similar to Fig. 4, illustrating still another position of the stylus head; and

Fig. 10 is a sectional view taken along plane 10—10 of Fig. 9.

In the present instance the stylus head 1 is shown as embodied in a phonograph structure similar to that disclosed in a prior application filed in the name of George P. Brubaker on June 28, 1943, Serial No. 492,538, and entitled Sound recorder. Thus, there is shown a record member 2 adapted to be mounted upon a rotary table 3 in any desired manner. Co-operating with the record member 2 there is shown a stylus 4 carried adjacent the front portion of the head 1. The stylus 4 is adapted to be used both for recording and for play-back operation.

The stylus 4, co-operating with the record member 2, can be vibrated, as is well understood, by the aid of electrical current impulses, for performing the recording operation. On the other hand, by appropriate adjustment, the stylus 4 can be vibrated by a record previously made on the record member 2; and the vibration of the stylus sets up electrical impulses that may be amplified and caused to operate a sound reproducer or loud speaker. As is usual, while the turntable 3 is in motion, a lead screw shaft 5 is also rotated to operate a lead screw 6 to trace a spiral pattern with respect to record member 2. Lead screw 6 is operated in a manner to be hereinafter described.

The mounting of the stylus head 1 may best be explained by the aid of Figs. 4, 5, and 6. The support for the head is a spring arm 7. This spring arm 7 is so mounted that it urges the stylus head 1 downwardly toward the record member 2 with a relatively light pressure. For this purpose, the right hand end of the spring arm 7 is shown as supported on a post 8 (Figs. 4, 5, 7, and 9). This post 8 is in the form of a screw or bolt. It is supported on the top wall of a supporting structure 9 of shell-like configuration open at the bottom. The head 1, in any of the three positions, as illustrated in Figs. 4, 7, and 9, projects below the open bottom of the structure 9.

The screw 8 passes through an appropriate aperture in the top wall of structure 9 and is fastened thereto, as by the aid of the nut 10. The spring arm 7 has an aperture through which the post 8 passes. On either side of the spring arm 7 are provided the felt washers 11. These washers are prevented from separating movement by the aid of the metal washers 12 and the nuts 13. The felt washers 11 are so arranged that they offer no material resistance against angular movement of the arm 7 about the axis of post 8.

Thus, for playback or reproducing operation, the spring arm 7 permits lateral compliance, by freedom of angular movement about the axis of post 8.

The supporting structure 9 is adjustably mounted on a frame 14. As will be described hereinafter, this frame 14 is moved by the lead screw 6 in a direction toward the axis of turntable 3.

The adjustment of structure 9 is provided by the aid of pivot screws 15, shown to best advantage in Figs. 5 and 6. These pivot screws have tapered ends received in correspondingly tapered recesses in the sides of the support 9. These screws may be supported in the sides of frame 14 and held in adjusted position by lock nuts 16.

Adjustment of the structure 9 to any one of three optional positions is provided to adjust the mechanism for playback operation, for recording operation, or for rendering the head 1 neutral. Thus, for the playback position illustrated in Fig. 4, the adjustable structure 9 is maintained in such position that it permits head 1 to follow the vagaries of the record groove, the spring arm 7 being, in this position, freely movable angularly about the post 8.

If it is desired to lift the stylus out of co-operative relation with the record member 2, the structure 9 is moved in a clockwise direction about the pivot screws 15 to attain the position illustrated in Figs. 7 and 8. In order that this adjusted position of the structure 9 be effective to lift the head 1, the head 1 is provided with a lifting arm 17. This arm has a forwardly projecting portion extending into a lifting yoke 18 depending below the top wall of the structure 9. In the reproducing position of Figs. 4 and 5, the arm 17 and yoke 18 are out of co-operative relation with each other. However, in the neutral position of Figs. 7 and 8, the yoke 18 has lifted the arm 17 and thereby the head 1.

To attain the recording position illustrated in Figs. 9 and 10, the supporting structure 9 is rotated in a counter-clockwise direction from the playback position illustrated in Fig. 4. In this position there are inter-engaging co-operating elements carried by the structure 9 and head 1 that restrain the head 1 against lateral compliance. These elements are shown to best advantage in Figs. 9 and 10.

Thus, the head 1 carries a member 19 provided with a tapered slot 20. The bottom of the slot, as shown most clearly in Figs. 8 and 9, has a straight portion 21. The adjustable structure 9 has a co-operating element 22 provided with a downwardly extending arm 23. This downwardly extending arm 23 enters into the tapered slot 20 until its lower end contacts the flat portion 21. This position is illustrated in Fig. 10. The width of the flat portion 21 is the same as the width of arm 23. Thus, a snug fit between these elements is assured on full engagement. The co-operating members in the position of Fig. 10 prevent lateral



movement of the stylus head 1 with respect to the supporting structure 9.

The tapered slot 20 serves as a guide for the arm 23, ensuring that the full engagement illustrated in Fig. 10 can be obtained even when the head 1 happens to be slightly displaced laterally from that required for the fully engaged position, resulting in a misalinement between slot 20 and arm 23.

The element 22 may be provided with another arm 24 of the same length as arm 23 and adapted to engage the top surface of member 19 when the elements are in the co-operative position of Fig. 10. This serves to balance the pressure exerted upon the head 1 by the supporting structure 9.

Not only is the head 1 restrained in this position against lateral compliance, but the pressure exerted upon the stylus 4 is also increased. This increase in pressure is obtained by the aid of the tension spring 25 (Figs. 4, 5, 7, and 8). The lower end of the spring 25 is fastened to an anchor 26. This anchor is mounted on the top of the adjustable structure, as by the aid of the screw 8.

The upper end of the spring 25 passes through an aperture 28 in the upper wall of the frame 14. It also passes through an aperture in a thin plate 27 mounted on the frame 14 (Figs. 1 and 4). This plate 27 is provided with a keyhole slot. Only the larger portion 29 of the keyhole slot is large enough to pass this spring 25. Accordingly, the spring 25 may be anchored in plate 27 by passing the spring 25 through the larger opening 29 and then moving the spring 25 laterally toward the left, as viewed in Fig. 1, into the narrower portion of the keyhole slot. This manner of anchoring the upper end of the spring 25 also provides a means for adjusting its tension.

In the foregoing playback position of Fig. 4, the spring 25 is ineffective to impose a pressure upon the head 1. The pressure in this playback position is provided by the resilience of spring arm 7 and the weight of the head 1.

However, when the recording position of Figs. 9 and 10 is attained, the spring 25 is active on the right hand side of the pivot screws 15 to impose a pressure upon the head 1 through the structure 9 and the co-operating elements 19 and 22.

The adjustment of the structure 9 and the maintenance of that adjustment in any one of the three positions illustrated in Figs. 4, 7, and 9 are accomplished by the aid of mechanism shown most clearly in Figs. 1, 2, 3, 5, and 6.

The support 9 carries arm 30 that projects laterally of the support. This arm is engaged by a hand operated lever 31. This lever 31 is shown as having a knurled finger grip portion 32. The arm 31 is pivoted on the side of the frame 14, as by the aid of a pivot pin 33. This pivot pin 33 passes through a hub formed on the lever 31 and has a threaded portion engaged in a threaded aperture in the frame 14. Thus, the angular position of the lever 31 determines the angular position of the supporting structure 9.

The lever 31 may be held in any one of its three adjusted positions by the aid of an axially movable locking pin 34, shown most clearly in Figs. 5 and 6. This locking pin 34 is guided in an aperture in the side of frame 14. It is urged outwardly of the frame by a leaf spring 35 attached to the inner end of the pin 34. The right hand end of spring 35 is fastened, as by a bolt 36, to the frame 14.

The rounded end of the locking pin 34 is

adapted to be accommodated in any one of the co-operating recesses 37, 38, and 39 formed on the inner side of the lever 31. The pressure provided by the spring 35 is sufficient to maintain the lever 31 in any one of the three positions indicated in Fig. 3. However, by the aid of sufficient manual force applied to the grip 32, the pin 34 can be urged by the co-operating recess 37, 38, and 39, to be retracted as the lever 31 is angularly adjusted.

To form an adequate guide for the angular movement of the lever 31, the lever 31 may co-operate with a downwardly extending guide member 40, secured to frame 14 as by a screw 40–*a* passing through the upper end of member 40 and threadedly engaging frame 14 (Figs. 1, 3, and 5).

Motion of the frame 9 to carry the head 1 along the record member 2, as the table 3 is rotated, is secured, as heretofore stated, by the aid of the lead screw 6. This lead screw 6 is adapted to be contacted by a mutilated nut 41 (Figs. 2, 4, 7, and 9). This mutilated nut is fastened as by screws 42 to a supporting frame 43 carried by the frame 14. The supporting frame is angularly adjustable about the axis of pivot screws 44 (Fig. 5) that are supported by the side walls of frame 19. For this purpose the supporting frame 43 is mounted upon the pivot shaft 45.

The mutilated nut 41 is urged toward engaging position with respect to the lead screw 6 by the aid of a leaf spring structure. This leaf spring structure, as shown most clearly in Figs. 4 and 5, includes a pair of flat springs 46 and 47. The right hand ends of these leaf springs 46 and 47 are fastened securely underneath the top wall of the frame 14, as by the aid of the bolt 48. The frame 14 is cut away, as indicated at 49, to permit the mutilated nut 41 and its co-operating elements to move upwardly out of engagement with the lead screw 6.

The adjustment of the support 9 to the neutral or lifted position of the stylus, as illustrated in Fig. 7, also results in a lifting of the nut 41 from the lead screw 6. For this purpose, the support 9 is provided with the arm 50 that engages underneath the lower edge of the nut 41 and lifts it against the pressure of the springs 46 and 47. However, when the support 9 returns to the playback position of Fig. 4, or the recording position of Fig. 9, the arm 50 moves away from the mutilated nut 41. The nut then re-engages the lead screw 6.

The frame 14 is guided for lateral movement above the turntable 3 by the aid of a guide rod 51 (Figs. 1 to 5 inclusive). This guide rod passes through an appropriate guiding boss 52 formed on the right hand side of the frame 14, as viewed in Fig. 1. It is also guided by the aid of the boss 53 (Figs. 1 and 2) carried on a bracket 54 formed integrally with the frame 14.

In order to restrain angular movement of the frame 14 about the rod 51, the lead screw 6 is utilized at a further guide for the frame 14. For this purpose, the lead screw 6 is shown in Figs. 2 and 3 as being guided in collars 55 and 56. These collars have internal cylindrical surfaces having a sliding fit with the external diameters of the threads on the lead screw 6.

These collars 55 and 56 are supported on frame 14 between arms 57 and 58 projecting from the front of the frame 14 (Fig. 3). Screws 59, passing through the upper arm 57, engage within the annular slots 60 formed externally on the collars 55 and 56. In this way movement of the collars with respect to frame 14 is effectively prevented.



The adjustment of the apparatus to neutral, playback, or recording position involves adjustment of the lever 31 to any one of the three positions illustrated in Fig. 3. In the full line position the apparatus is in condition for reproducing, lateral compliance being then permitted, as explained in connection with Fig. 4. Movement of the finger grip 32 upwardly to the dot and dash position places the apparatus in the neutral position of Fig. 7. Movement of the grip 32 to the lower dot and dash position conditions the head 1 for recording, as shown in Fig. 9.

The inventor claims:

1. In combination, a stylus head, a resilient arm for supporting the head and urging the stylus toward a record member, an adjustable supporting structure, mounting means for the arm on said adjustable structure, said mounting means providing freedom of motion for the arm with respect to said structure in a direction transverse to the axis of the stylus for permitting lateral compliance of the head with the record member, means for adjusting said structure, and means including elements respectively carried by the head and by said structure, co-operating when the structure is in a definite adjusted position, for restraining said head against said freedom of motion.

2. In combination, a stylus head, a resilient arm for supporting the head and urging the stylus toward a record member, an adjustable supporting structure optionally adjustable to any one of a plurality of positions, mounting means for the arm on said adjustable structure, said mounting means providing freedom of motion for the arm with respect to said structure in a direction transverse to the axis of the stylus for permitting lateral compliance of the head with the record member, means for adjusting said structure, and means including elements respectively carried by the head and by said structure, co-operating when the structure is in one of its definite adjusted positions, for restraining said head against lateral compliance.

3. In combination, a stylus head, a spring arm for supporting the head, an adjustable supporting structure optionally adjustable to any one of a plurality of positions, mounting means for the arm on said adjustable structure, said arm urging the stylus head toward a record member, said mounting means providing freedom of motion for the arm with respect to said structure in a direction transverse to the axis of the stylus for permitting lateral compliance of the head with respect to the record member, means for adjusting said structure, and means including elements respectively carried by the head and by said structure, co-operating when the structure is in one of its definite adjusted positions, for restraining said head against lateral compliance, and means also including elements respectively carried by the head and by said structure co-operating when the structure is moved to another of its definite adjusted positions, to lift said head from the record member.

4. In combination, a stylus head, a spring arm for supporting the head, a supporting structure, means mounting the arm on said supporting structure, said arm urging the head toward a record member, said mounting means providing freedom of motion for the arm with respect to the structure in a direction transverse to the axis of the stylus for permitting lateral compliance of

the head with the record member, a frame, means adjustably mounting said supporting structure on the frame, means for moving the frame in a direction to maintain the stylus head in proper position with respect to the record member, means for moving said supporting structure to any one of a number of optional adjusted positions with respect to the frame, means, including elements respectively carried by said head and by said structure, co-operating when the structure is in one of its definite adjusted positions, for restraining said head against lateral compliance, means also including elements respectively carried by the head and by said structure co-operating when the structure is moved to another of its definite adjusted positions, to lift said head from the record member, and means effective upon movement of said structure to said other position to render said frame moving means ineffective to move the frame.

5. In combination, a stylus head, a spring arm for supporting the head, a supporting structure, means mounting the arm on said supporting structure, said arm urging the head toward a record member, said mounting means providing freedom of motion for the arm with respect to the structure in a direction transverse to the axis of the stylus for permitting lateral compliance of the head with the record member, a frame, means adjustably mounting said supporting structure on the frame, means for moving the frame in a direction to maintain the stylus head in proper position with respect to the record member, means for moving said supporting structure to any one of a number of optional adjusted positions with respect to the frame, means, including elements respectively carried by said head and by said structure co-operating when the structure is in one of its definite adjusted positions, for restraining said head against lateral compliance, means also including elements respectively carried by the head and by said structure co-operating when the structure is moved to another of its definite adjusted positions, to lift said head from the record member, and means effective upon movement of said structure to said other position to render said frame moving means ineffective to move the frame, said supporting structure having an intermediate adjusted position in which the means for restraining the head and the means for lifting the head are ineffective to restrain or to lift the head.

6. In combination, a stylus head, a resilient arm for supporting the head and urging the stylus toward a record member, a supporting structure, a post carried by the structure whereby the resilient arm is mounted on said structure, said arm having freedom of motion about the post for permitting lateral compliance of the head with a record member, a frame, means pivotally mounting said supporting structure on the frame, means for adjusting said structure about its pivot with respect to the frame, means for moving the frame in a direction to maintain said head in proper position with respect to the record, and means having interengaging parts carried respectively by the head and by the structure for restraining said head against lateral compliance, said parts being capable of interengagement upon adjustment of said structure to a definite position.

7. In combination, a stylus head, a spring arm for supporting the head, a supporting structure,



a post carried by the structure whereby the stylus head is mounted on said structure, said arm having freedom of motion about the post for permitting lateral compliance of the head with a record member, a frame, means pivotally mounting said supporting structure on the frame, means for adjusting said structure about its pivot with respect to the frame, means for moving the frame in a direction to maintain said head in proper position with respect to the record, means having interengaging parts carried respectively by the head and by the structure for restraining said head against lateral compliance, said parts being capable of interengagement upon adjustment of said structure in one direction to a definite position, and means also having interengaging parts carried respectively by the head and by the structure adapted to engage for lifting the head from the record upon movement of said structure in the opposite direction.

8. In combination, a stylus head, a resilient arm for supporting the head and urging the stylus toward a record member, an adjustable supporting structure, mounting means for the arm on said adjustable structure, said mounting means providing freedom of motion for the arm with respect to said structure in a direction transverse to the axis of the stylus for permitting lateral compliance of the head with respect to the record member, means, including elements respectively carried by the head and by said structure, co-operating when the structure is in a definite adjusted position, for restraining said head against said freedom of motion, and means supplementing the force exerted by said arm when said structure is in said definite position.

9. In combination, a stylus head, a spring arm for supporting the head, a supporting structure, a post carried by the structure whereby the stylus head is mounted on said structure, said arm having freedom of motion about the post for permitting lateral compliance of the head with a record member, a frame, means pivotally mounting said supporting structure on the frame, means for adjusting said structure about its pivot with respect to the frame, means for moving the frame in a direction to maintain said head in proper position with respect to the record, means having interengaging parts carried respectively by the head and by the structure for restraining said head against lateral compliance, said parts being capable of interengagement upon adjustment of said structure to a definite position, and a tension spring anchored between the frame and said structure, and effective only upon engagement of said parts to supplement the force exerted by said arm.

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