Oct. 3, 1944. L. Z. LA FOREST 2,359,370

PHONOGRAPH

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Fig. 1

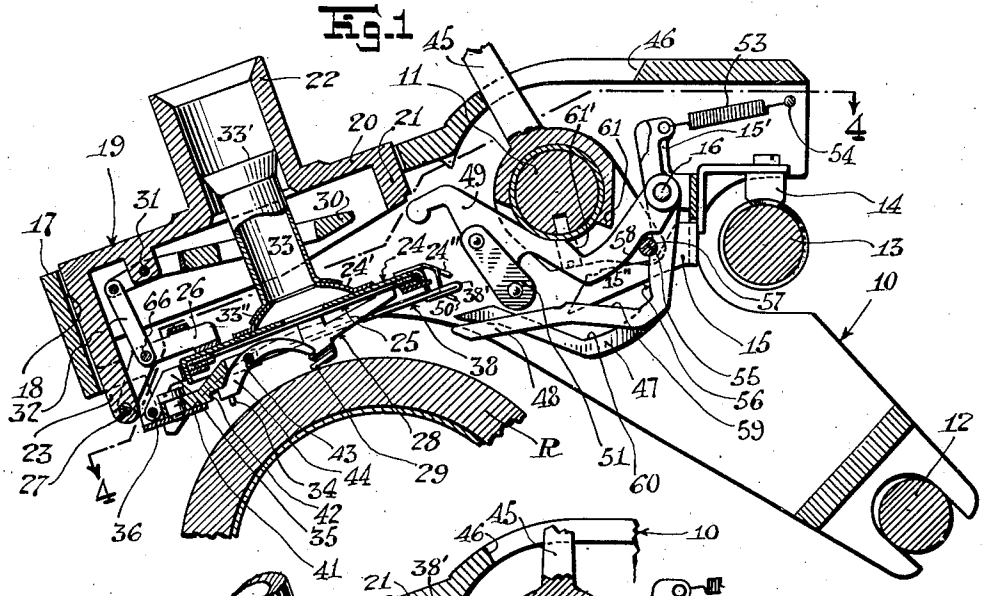


Fig. 2

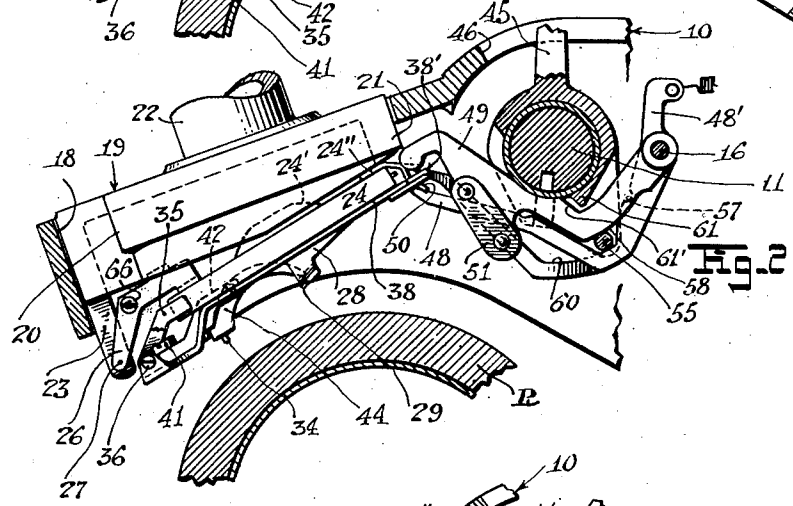
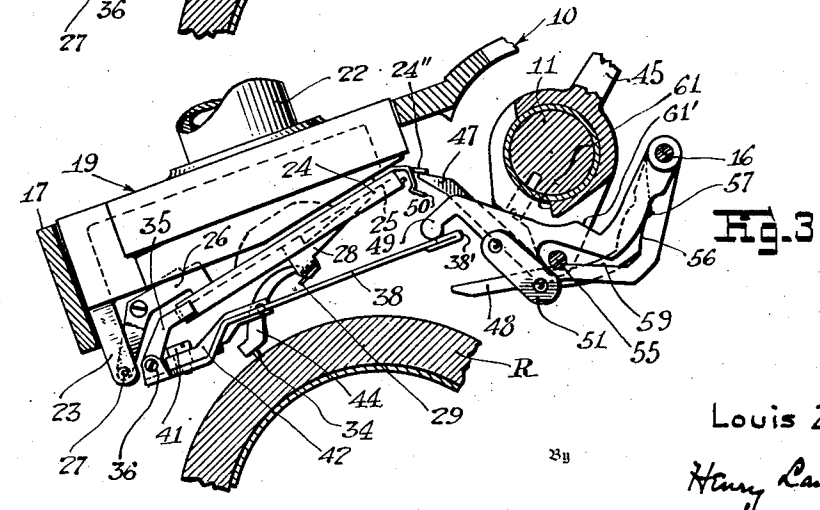


Fig. 3



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Fig. 4

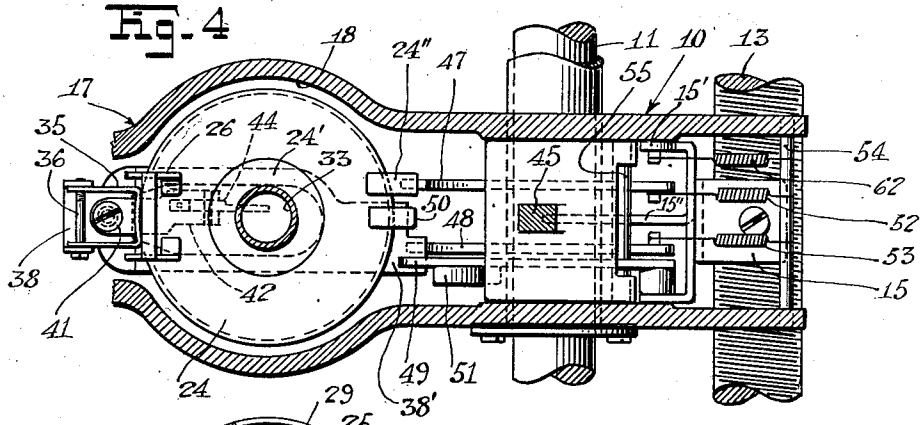
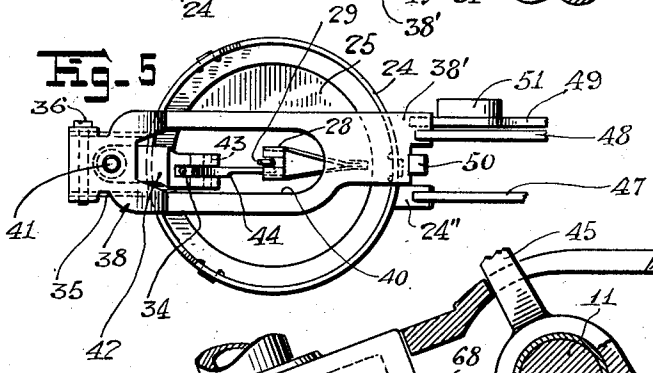


Fig. 5



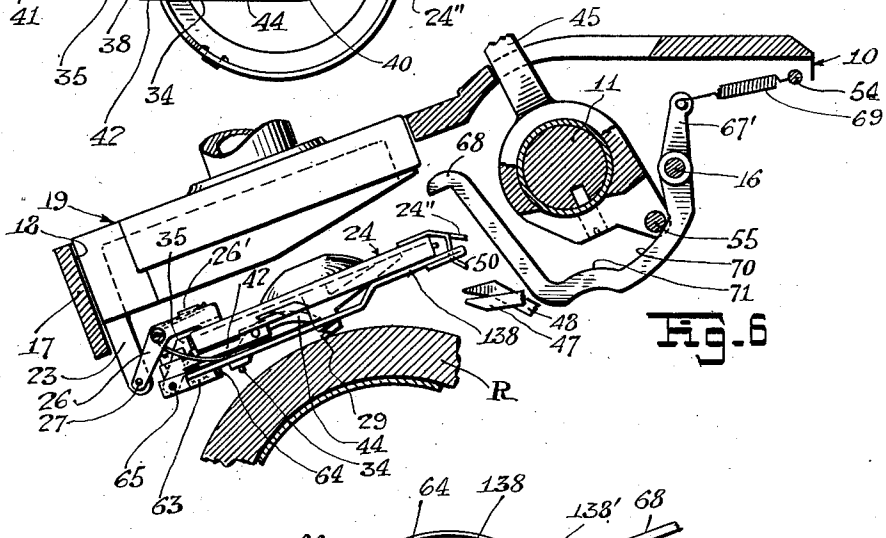


Fig. 6

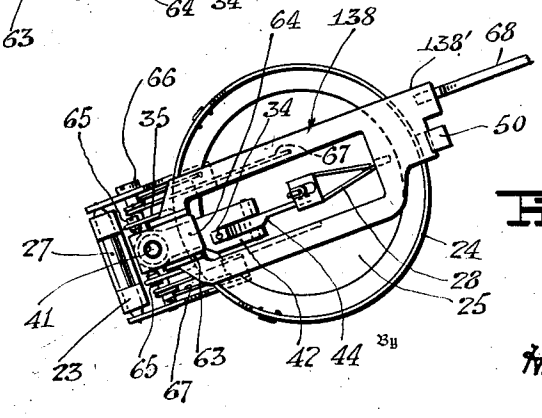


Fig. 7

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2,359,370

UNITED STATES PATENT OFFICE

2,359,370

PHONOGRAPH

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Application September 11, 1942, Serial No. 457,902

10 Claims. (Cl. 274—30)

This invention relates to phonographs and more especially to phonographic translating devices of the combined recording and reproducing type. My invention is herein illustrated and described in terms of a combined recording and reproducing translating device of the acoustical form such as conventionally used in dictating machines; but it will be understood that I intend no unnecessary limitation of my invention to this form of translating device.

It is a general object of my invention to provide a combined recording and reproducing translating device wherein the recording and reproducing elements are correlated in a novel and improved manner to effect new and improved results.

In combined recording and reproducing devices of the form abovementioned, there has been provided a recorder unit and a separately mounted reproducer stylus which is operatively associated with the translating element of the recorder unit when the device is conditioned for reproducing, the recorder unit being then held fixed in a position out of contact with the record. During recording, the reproducer stylus mounting has been let to drag on the record through the medium of an advance ball. The advance ball has however the disadvantage that it may smear the record particles which are cut from the record body during recording, and thus possibly mar the record surface. Various proposals in the past for supporting the reproducer stylus mounting free of the record during recording have not been very satisfactory, especially because of the complication which they have generally involved. I have found though that by making only minor revisions in translating devices as are conventionally provided, the stylus mounting can be maintained free of the record during recording with little complication in structure.

According to my invention, I provide a stylus mounting which is relatively light in weight—for example, one which has insufficient weight to provide the desired bias of the reproducer stylus against the record—and attach this mounting bodily to the recording unit during recording, the recording unit being adapted to exert a proper pressure of the recorder stylus against the record when the mounting is attached thereto. In conditioning the translating device for reproducing, the mounting is freed or detached for movement relative to the recorder unit, and a supplementary bias is applied thereto to effect the desired pressure of the reproducer stylus against the record.

It is accordingly an object of my invention, in combined recording-reproducing devices, to support the reproducer stylus mounting during recording through the medium of the recorder stylus.

It is another object in combined translating devices to bodily attach a reproducer stylus mounting to a recorder unit coincidentally to conditioning the deivce for recording and to free the mounting for movement when the device is conditioned for reproducing.

It is another object to provide an improved control arrangement, for a translating device fulfilling the object last stated above, for placing the device selectively into recording and reproducing conditions.

Another object of my invention is to movably connect a rerpoducer stylus mounting, in combined recording-reproducing devices of the type herein concerned, to the recorder unit whereby to permit the mounting to be held stationarily to the unit during recording.

Another object of my invention is to provide, in combined recording-reproducing devices, novel and improved means and arrangements for producing the desired bias of the reproducer stylus on the record.

It is a further object in combined recording-reproducing devices to utilize the weight of a reproducer stylus mounting for biasing the recorder unit into coaction with the record during recording.

Still other objects and features of my invention will more fully appear from the following description and the appended claims.

In the description of my invention reference is had to the accompanying drawings, of which:

Figure 1 is a fractional vertical sectional view of a phonograph into which my invention has been incorporated, the translating device being in this view shown in condition for recording;

Figure 2 is a partially elevational and partially sectional view of the structure of Figure 1 showing the translating device in neutral condition;

Figure 3 is a view similar to Figure 2 but showing the translating device in condition for reproducing;

Figure 4 is a substantially horizontal sectional view taken on the line 4—4 of Figure 1;

Figure 5 is a bottom view of the translating device shown in the above figures;

Figure 6 is a partially elevational and partially sectional view illustrating a second embodiment of my invention; and

Figure 7 is a bottom view of the translating device shown in Figure 6.

Reference being had to the figures, there will be seen a carriage 10 supported slidably on upper and lower rods 11 and 12 for traveling movement along a record R, which record may for example be cylindrical in form as is shown. Movement of the carriage along the record is effected by a feed screw 13 and a cooperating feed nut 14, the feed nut being carried by a bracket 15 which is pivotally secured to the carriage by a cross rod

16. On the forward part of the carriage there is an arm 17 which overhangs the record R and which is provided with a mounting hole 18 for a translating device 19. This translating device is of the combined recording and reproducing type; and it is with this device that my invention is particularly concerned, wherefore the device is now described in detail.

The translating device has a circular member 20 for its frame, which is provided with a depending annular flange 21 and with a central upstanding tubular part 22, the flange 21 being provided with a lug 23 at the front. Below this frame there is a hollow circular casing 24 which carries a diaphragm 25 at its bottom, this structure being commonly referred to as a sound box. The sound box is pivotally held to the frame by a pair of spring arms 26 which are pressed by a screw 66 into engagement with the conical ends of a pin 27 that is carried by the lug 23. Secured to the diaphragm is a stirrup 28 into which there is mounted a recorder stylus 29. When the sound box is free on its pivots its weight serves to hold the recorder stylus into engagement with the record. Normally the weight of the sound box is greater than is needed to effect a normal pressure of the stylus against the record, and this excess weight is counterbalanced by a weight 30 which is pivoted at 31 to the frame and coupled by a link 32 to the spring arms of the sound box. In the present instance, the counterbalancing is made a little greater than is normally done since the effective weight of the sound box on the record is augmented incidental to conditioning the device for recording, as will hereinafter appear.

Sound communication to and from the sound box is had through the tubular part 22 of the frame 20 and through an inner connecting tube 33. This inner tube 33 has an upper flanged end 33' fitting the interior of the tube 22, and a lower spherically flanged end 33'' which fits swivellingly on an apertured dome 24' provided on the sound box, the connecting tube being retained to the sound box by any suitable means not herein necessary to show. This connecting tube is free to slide within the tubular part 22 of the frame and thus the sound box is rendered free to track the surface of a moving record and to be raised from and lowered onto the record.

It will be understood that the diaphragm 25 serves as the active translation element of the translating device both for recording and reproducing. Also, it will be noted that the casing 24 of the sound box serves as a holder for the translating means and that the unitary assembly of sound box, diaphragm and recorder stylus constitutes a self-contained recorder unit.

Below the sound box there is provided a movable mounting for a reproducer stylus 34. This mounting is preferably fastened to the casing 24 of the sound box and to this end there is secured a bracket 35 to the forward part of the sound box casing. Pivoted to this bracket, by a pin 36, is a light mounting member 38 formed preferably by stamping from sheet metal, for example, of aluminum. This member has its rearward portion offset upwardly in close proximity to the bottom of the sound box and terminating at the rear of the sound box, the member extending between the sound box and the record. In the mounting member 38 there is a large central opening 40 through which the stirrup 28 extends. Threaded into the forward part of the mounting member 38 is a stud 41 onto which there is pivoted a short rearwardly extending arm 42. This arm has pivoted thereto, as at 43, a short lever 44 which is held just ahead of the stirrup 28. The lower forward end of this lever carries the reproducer stylus 34 and the rearward end portion thereof engages the stirrup 28.

It will be seen that the above-described mounting of the reproducer stylus has an up and down freedom of movement about the pivot pin 36 and a lateral freedom of movement about the stud 41. In conditioning the translating device for reproducing, the sound box is held fixed in a raised position and the reproducer stylus mounting is suspended between the sound box and the record, the weight of the mounting acting on the pivot 43 and being taken up by the stirrup 28 at one end of the stylus lever 44 and by the record through the reproducer stylus at the other end of the stylus lever. The mounting itself is thus a biasing means for holding the reproducer stylus into coaction with the record; also, it holds the reproducer stylus into operative association with the sound box, or more specifically with the diaphragm 25, during reproducing.

According to the present invention the mounting for the reproducer stylus is made quite light and is attached bodily to the sound box during recording; during reproducing, the mounting is however released for pivotal movement relative to the sound box, and the biasing action of its own weight on the reproducer stylus is augmented by supplementary means. These results are accomplished automatically as an incident to conditioning the translating device for recording and reproducing as is now explained.

The translating device is selectively conditioned by manually shifting a control lever 45 which pivots on the cross rod 11, the control lever extending up above the carriage 10 through an opening 46 in the latter. This lever controls three different fingers 47, 48 and 49 which are pivoted to the carriage on the cross rod 16 aforementioned. The two fingers 47 and 48 are lifting fingers for the sound box and the mounting member 38 of the reproducer stylus, there being tabs 24'' and 38' on the sound box and the member 38 against the under sides of which the fingers act. When both of the fingers 47 and 48 are raised the sound box is held up against the frame 20 and the member 38 is pressed against the bottom of the sound box. This pressure of the member 38 against the sound box places the member under the influence of a spring clip 50 which is secured to the casing of the sound box and which serves to stationarily hold the mounting member 38 to the casing 24 and thus latch the reproducer stylus mounting bodily to the sound box or recorder unit. The finger 49 however engages the upper side of a tab 38' on the member 38 to detach the reproducer stylus mounting from the sound box. Also, this finger 49 is let to rest on the member 38 during reproducing to increase the bias of the reproducer stylus against the record, the finger 49 being for this reason weighted by a suitable mass 51.

The fingers 47 and 48 have extensions 47' and 48' above their pivot axes which are connected through respective tension springs 52 and 53 to a pin 54 on the carriage, these springs serving to effect a clockwise or upward biasing of the fingers. Under the influence of these biasing springs the fingers bear against a cross pin 55 provided on the hub of the control lever 45. When the control lever is in a neutral position—which is the central position it occupies in Fig-

ure 2—all the fingers occupy their uppermost positions, the lifting fingers **47** and **48** being held raised by their biasing springs and the weighted finger **49** being held up by the engagement of the pin **55** with the under side thereof. Under these conditions both the styli are held out of contract with the record to place the translating device into neutral condition and the mounting member **38** is placed into engagement with the spring clip **50** to attach the reproducer stylus mounting bodily to the casing of the sound box or recorder unit.

When the control lever **45** is moved from neutral position to recording position—which is the forward position it occupies in Figure 1—the pin **55** is slid along cam surfaces **56** on the fingers **47** and **48** to cam both of these fingers downwardly into their lowermost positions, the pin coming to rest in notches **57** in these fingers to detent the control lever in its recording position; the pin **55** however slides along a dwell **58** provided on the weighted finger **49** and no movement is thus imparted to this finger, it remaining in its raised position the same as when the control lever was in neutral position. When the fingers **47** and **48** are in their lowermost positions they are free of the sound box and of the member **38**, and the sound box is held in engagement with the record through the medium of the recorder stylus by the force of its own weight and that of the reproducer stylus mounting, the translating device being thus in condition for recording. When the control lever is returned to neutral position, the reverse actions of course take place, the fingers **47** and **48** being cammed upwardly to raise the sound box and reproducer stylus mounting off from the record and the weighted finger **49** being yet held fixed in its raised position.

When the control lever **45** is however moved from neutral position to reproducing position—which is the rearward position it occupies in Figure 3—the pin **55** engages a cam **59** on the finger **48** to cam this finger again downwardly to its lowermost position, but the pin **55** passes along a dwell **60** on the finger **47** and leaves this finger in raised position to hold the sound box in its uppermost position against the bottom of the frame **20**; also, as the control lever moves to reproducing position, the finger **49** is first freed for downward movement, by the pin **55** moving off from the dwell **58** aforementioned, and then the finger **49** is cammed downwardly by the engagement of a tooth **61** on the hub of the control lever with a cam face **61'** on the finger **49**. Since the sound box is held fixed in raised position, the effect of this downward camming of the finger **49** is to disengage the mounting member **38** from the spring clip **50** and thus free the reproducer stylus mounting for movement relative to the casing of the sound box. When once freed, the mounting will fall downwardly by its own weight and move the reproducer stylus into engagement with the record and cause the stylus lever **44** to bear against the stirrup **28**. Also, the weighted lever **49** will come to rest on the member **38** and will augment the biasing action of the reproducer stylus mounting, bringing the pressure of the reproducer stylus against the record to a desired value. The pressure tending to hold the stylus lever **44** into contact with the stirrup **48** and the inertia means associated with the reproducer stylus mounting tending to hold fixed the pivot axis **43** all serve to operatively couple the reproducer stylus to the diaphragm **25** and to condition the translating device for reproducing. When the control lever is returned to neutral position, the fingers **48** and **49** are raised, the raising of the finger **48** serving to press the mounting member **38** back into engagement with the spring clip **50** and to reattach the reproducer stylus mounting bodily to the casing of the sound box.

It will be observed that by pivotally connecting the reproducer stylus mounting directly to the frame or casing of the sound box, and by latching it securely thereto when the translating device is conditioned for recording, all as is above explained, the reproducer stylus mounting is supported wholly by the casing of the recording unit during recording. In so attaching the mounting directly to the casing of the recorder unit, the mounting does not affect the free pivoting of the recorder unit, or have any play relative to the recording unit, to interfere with the operation of the unit in recording.

It may be further mentioned that the control lever **45** also serves to disengage the feed nut **14** from the feed screw **13** when the lever is moved to neutral position and to engage the feed nut with the feed screw when the lever is moved to recording or reproducing position. This is accomplished by biasing the feed nut into engagement with the feed screw, by a tension spring **62** connected between the pin **54** and an arm **15'** of the bracket **15**, and by camming the feed nut out of engagement with the feed screw, when the control lever is moved to neutral position, by action of the pin **55** against a cam **15''** provided on the bracket **15**.

It will be noted from the foregoing description that I provide a relatively light reproducer stylus mounting—one which can be carried by the recorder unit during recording to provide a proper bias of this unit against the record for recordation—and that I augment the biasing action which this mounting has on the reproducer stylus during reproducing by applying a weighted member thereto as the translating device is conditioned for reproducing. I may however alternatively augment the biasing action of the reproducer stylus mounting by a spring means such as is accomplished in the second embodiment of my invention shown in Figures 6 and 7.

In this second embodiment, those corresponding parts which are modified are given their prior reference characters with the prefix number **1** while identical parts are given the same reference characters and new parts are given new reference characters. The member **38** of my first embodiment is herein modified, and referred to as **138**, for instance in that it is slotted and secured, as at **63**, to a short block **64** at its forward end. This block is held by pivots **65** to the bracket **35** provided on the sound box casing; and pivoted by the stud **41** to the block is the arm **42** carrying the stylus lever **44**. Between the mounting member **138** and the sound box there is interposed a spring means **67** which acts to bias the reproducer stylus mounting downwardly relative to the sound box. This spring means may for example be provided as two identical springs, each of which may be coiled about the adjusting screw **66** and have its ends bearing respectively against the member **138** and a bar **26'** which bridges across the spring arms **26**.

For freeing the reproducer stylus mounting from the sound box when the translating device is conditioned for reproducing there is provided a finger **68** which is pivoted again on a cross

rod 16 of the carriage. This finger has an upward extension 67' connected through a spring 69 to the pin 54 to subject the finger to an upward bias against the pin 55 of the control lever 45. As the control lever is moved between recording and neutral positions the pin 55 traverses an arcuate dwell 70 on the finger and the finger is held fixed in its raised position. When the control lever is however moved to reproducing position, the pin 55 engages a cam face 71 on the finger and cams the finger downwardly. The lifting fingers 47 and 48 have the same action as in my previous embodiment. Thus, as the control lever is moved to reproducing position the sound box will be retained in raised position, and the downward camming of the finger 67 will serve to disengage the reproducer stylus mounting for movement relative to the casing of the sound box. In this case though the finger 68 is held raised, by the spring 69, out of contact with the reproducer stylus mounting during reproducing, and the additional biasing which is needed for the reproducer stylus, over that provided by the weight of the mounting, is supplied by the spring 67 aforementioned.

The embodiments of my invention herein shown and described are intended to be illustrative and not limitative of my invention, as the same are subject to various changes and modifications without departure from the scope of my invention, which I endeavor to express according to the following claims.

I claim:

1. In a phonograph operable to record on and reproduce from a record and including a translating device having a frame and recorder and reproducer styli movably connected to said frame for selective engagement with the record: the combination of means associated with said reproducer stylus and urged towards the record to bias the reproducer stylus into coaction with the record; control means operable to place said styli selectively into and out of engagement with the record to condition the translating device for recording and reproducing respectively; and means, associated with said control means and rendered effective incidental to conditioning said device for recording, for causing said biasing means to be held from the record by said recorder stylus.

2. In a phonograph including a recording-reproducing device having a frame, recorder and reproducer styli movably connected to said frame for movement respectively into record-engaging positions to condition said device for recording and reproducing, and biasing means for said reproducer stylus urged to engage the record when said device is conditioned for recording: the combination of a control means movable into recording and reproducing positions to effect the recording and reproducing conditions of said translating device; means, rendered effective upon placing said control means into recording position for associating said biasing means with said recorder stylus to cause the recorder stylus to hold the biasing means free of the record during recording; and means to render said biasing means effective on said reproducer stylus upon placing said control means into reproducing position.

3. A translating device for recording and reproducing comprising a frame, a translating means, a holder for said translating means movably connected to said frame, a recorder stylus operatively associated with said translating means, a reproducing means associatable with said translating means, a movable mounting member for said reproducer stylus biased to urge said reproducing means towards the record; and means for releasably retaining said mounting member stationarily to said holder.

4. In a phonograph including a translating device adapted for recording and reproducing on and from a record and including a frame, a recorder unit movably connected to said frame and having a translating member as its active element, a reproducer stylus, and a movable mounting for said stylus urged towards the record and releasable to place the stylus into engagement with the record and associate the same with said translating member: the combination of control means movable into recording and reproducing positions respectively to place said recorder unit into engagement with the record and to space the unit from the record and release said mounting means; and means to attach said mounting bodily to said recorder unit upon moving said control means from reproducing to recording position and to free the mounting for movement relative to said unit upon moving the control means back to reproducing position.

5. In a translating device adapted for recording and reproducing on and from a record and including a frame: the combination of a recording unit urged towards the record and including a translation element and a holder for said element movably connected to said frame; a reproducer stylus; a movable mounting for said stylus urged towards the record and effective when the same is movably free and said unit is held spaced from the record to operatively associate the stylus with said translation element; releasable spring means for supporting said mounting by said holder; control means operable selectively either to place said recorder unit into engagement with the record to condition said device for recording, or to space the unit from the record and place said reproducer stylus into engagement with the record and in operative association with said translation element to condition the device for reproducing; and means to place said mounting into and out of engagement with said spring means coincidentally to conditioning said device for recording and reproducing.

6. In a phonograph operable to record on and reproduce from a record and comprising a frame, a recording unit movably connected to said frame and including a translating member, reproducing means including a reproducer stylus associatable with said translating member, and movable mounting means for said reproducing means: the combination of control means movable into a neutral position to space both said recorder unit and reproducer stylus from the record, and movable into recording and reproducing positions to place said recording unit and reproducer stylus selectively into coaction with the record; and means associated with said control means and actuated in response to moving the control means into neutral and reproducing positions, for respectively attaching said mounting stationarily to said recording unit and freeing the mounting for movement relative thereto.

7. In a translating device adapted for recording and reproducing and including a frame: the combination of a recording unit having a translation member and a holder for said member movably connected to said frame, a reproducer stylus, and movable mounting means for said

reproducer stylus, said mounting means being supported by said holder.

8. In a translating device adapted for recording on and reproducing from a record and including a frame: the combination of a recording unit movably connected to said frame and including a translating member, a reproducer stylus, a mounting for said reproducer stylus movable relative to said recorder unit and adapted to operatively associate the stylus with said translating member, a weight separable from said mounting, and means movably mounting said weight for coaction with said mounting to urge the latter towards the record.

9. In a translating device adapted for recording on and reproducing from a record and including a frame: the combination of a recording unit movably connected to said frame and including a translating member, means to hold said recording unit out of coaction with the record, a reproducer stylus, a mounting for said reproducer stylus movable relative to said recorder unit and adapted to operatively associate the stylus with said translating member when the recording unit is held from the record, and spring means between said recording unit and said mounting for urging the latter towards the record.

10. In a phonograph comprising a translating device for sound recording and reproducing and including means for adjusting said device into recording and reproducing conditions; the combination of a sound translating element; a pivoted holder for said translating element; a recording stylus on said element; reproducing means associatable with said sound translating element; a member carrying said reproducing means and pivotally connected to said holder; and means controlled by said adjusting means to stationarily retain said carrying means to said holder when said device is conditioned for recording and to render said carrying means free to pivot in relation to said holder when said device is conditioned for reproducing.

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