Oct. 13, 1936. L. D. NORTON 2,057,621

DICTATING MACHINE

Filed July 24, 1934 2 Sheets-Sheet 1

Fig. 1.

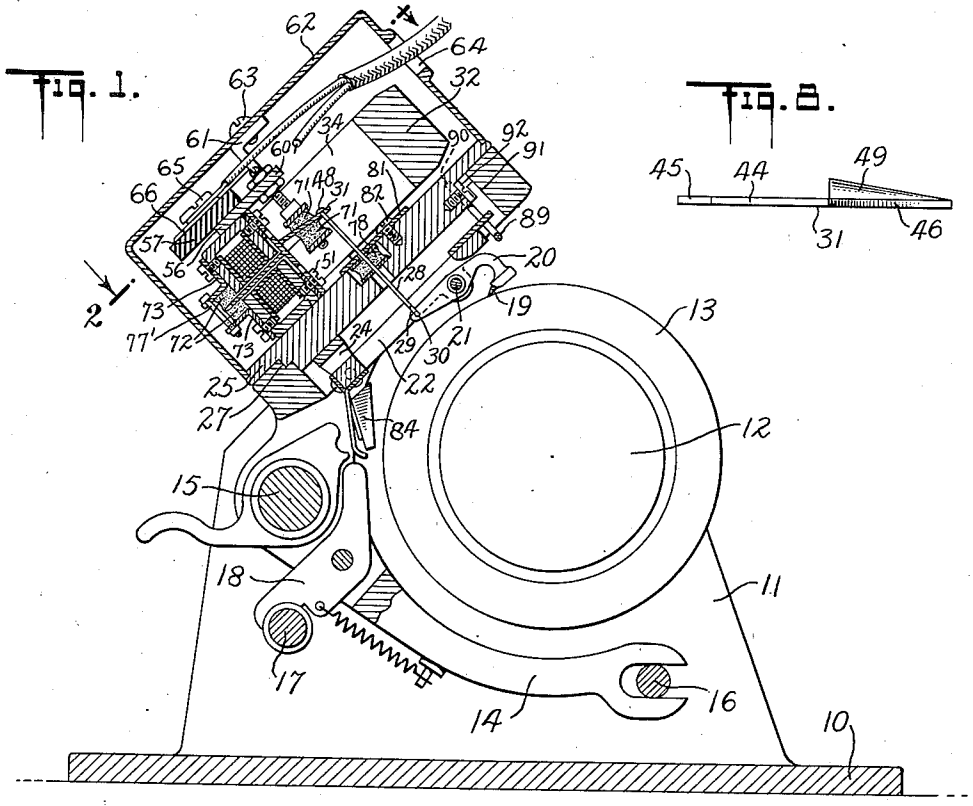
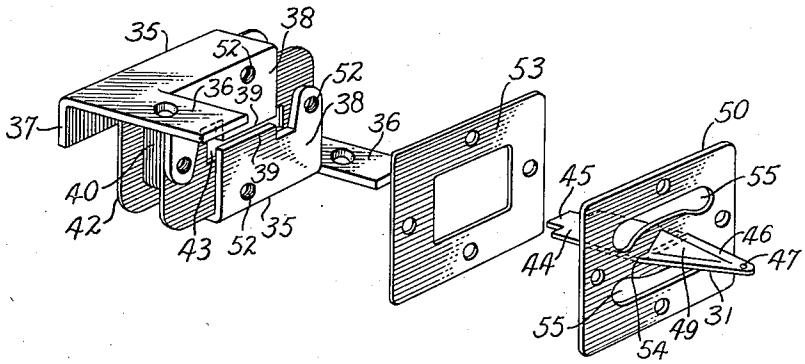



Fig. 8.




Fig. 7.




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Fig. 2.

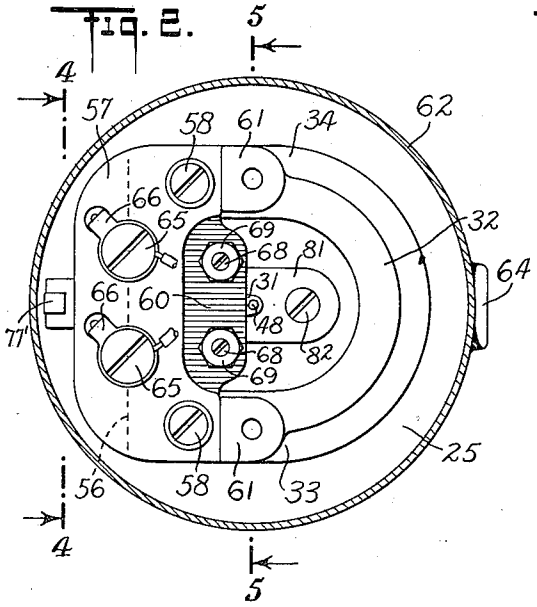



Fig. 3.

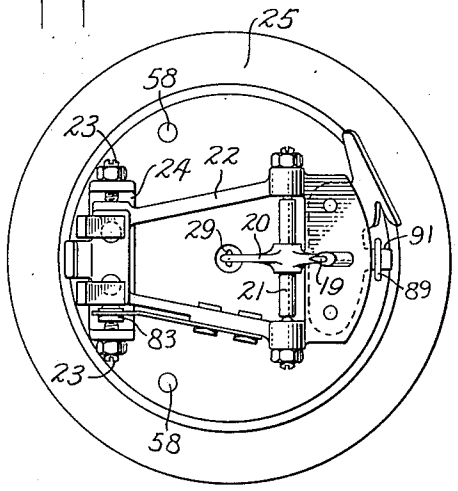



Fig. 4.

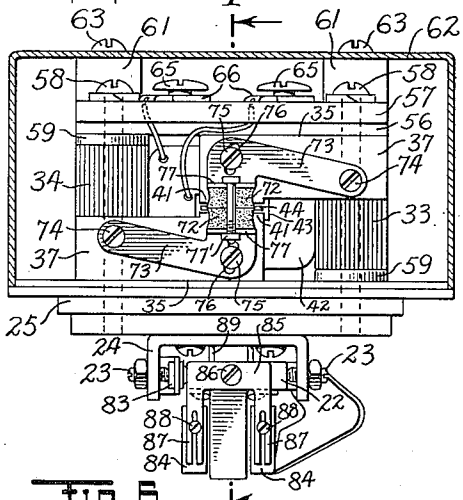



Fig. 5.

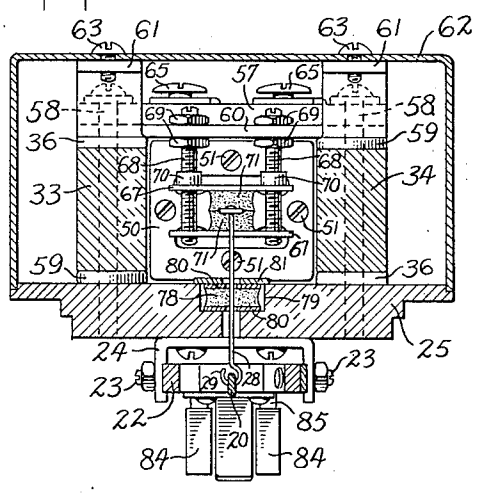
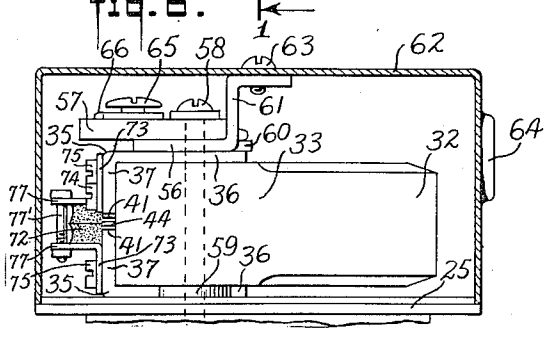



Fig. 6.




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2,057,621

## DICTATING MACHINE

Leland D. Norton, Bridgeport, Conn., assignor to Dictaphone Corporation, New York, N. Y., a corporation of New York

Application July 24, 1934, Serial No. 736,639

15 Claims. (Cl. 179—100.41)

This invention relates to apparatus of the electro-magnetic type for use in recording or reproducing sound, and is more particularly concerned with the cutting of cylindrical wax records. One of the objects is to provide such a device which will be free from distortion due to resonant points in the vibrating system over a broad range of audible frequencies. A further object is to provide effective means for damping or otherwise absorbing vibrations to offset the effects of resonance not only in the vibrating system as a whole but also in the several elements thereof.

In devices of the character described it is usual to support a vibratory stylus-carrier upon a floating weight of such mass that it tends to be resonant at certain alternating current frequencies inherent in the recording system, which frequencies fall within the lower range of audibility. It is a further object of this invention to provide simple and efficient means for so adjusting the natural period of such a floating weight as to render it substantially non-resonant at the frequencies mentioned. A further object is to provide means for absorbing the energy of vibrations at the natural period of the floating weight system. A further object is to provide a simple and rugged device of the character described, the several parts of which may be easily assembled or removed for repair or substitution.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention:

Fig. 1 is a side view of a recording phonograph, showing the recording mechanism embodying the present invention in section on line 1—1 of Fig. 2;

Fig. 2 is a top plan view of electromagnetic operating mechanism for the recorder, the top of the casing being cut away substantially on line 2—2 of Fig. 1;

Fig. 3 is a bottom plan view of the recorder unit showing the recording mechanism that is actuated by the electromagnetic mechanism;

Fig. 4 is a section taken substantially on line 4—4 of Fig. 2 showing the magnet and armature assembly in left side elevation, referring to Fig. 1;

Fig. 5 is a section taken substantially on line 5—5 of Fig. 2 showing some of the special damping features of the present invention;

Fig. 6 shows in front elevation features of the invention shown in section in Fig. 1, the cover being cut away;

Fig. 7 is a disassembled view of a unit assembly comprising magnet pole-pieces with an armature actuating coil seated therein together with the magnet armature and the means for mounting the latter upon the pole-pieces; and

Fig. 8 is a side elevation of the armature on the same scale as the same appears in Fig. 1.

Similar reference characters refer to similar parts throughout the various views of the drawings.

The phonograph shown in the accompanying drawings comprises a base 10 which by means of suitable standards 11 supports a mandrel 12 for rotation. The mandrel 12 supports a record 13 which may receive an undulating helical groove, the undulations of which correspond with the sound waves recorded. The recording device is supported by a carriage 14 mounted to slide transversely of the machine on guide rods 15 and 16, under the influence of a rotating feed-screw 17 engaging a feed-nut 18 carried by the carriage. The record is engaged by a stylus 19 carried by a stylus lever 20 pivotally mounted, as at 21, on a support comprising a floating weight lever 22. Weight lever 22 is supported by pivot screws 23 upon a bracket 24 depending from a plate 25, the latter being adapted to rest in a socket 27 in the carriage frame 14. The weight lever 22 functions to hold the stylus 19 against the record and the bracket 24 and pivots 23 support the weight lever and permit free up and down movement so that the stylus may accommodate itself to records of different diameter or to slight variations or eccentricities of the record blank.

When held in engagement with the record blank the stylus 19 and its carrying lever 20 are vibrated to record thereon by a rod or link 28 having at its lower end an eye or hook 29 engaging a perforation 30 near the end of the stylus lever 20 opposite to that which supports the stylus 19. The link 28 passes upwardly through registering openings provided in the weight lever 22 and plate 25 to a position where it is secured to an armature 31 of an electromagnetic operating device or motor comprising, in addition to the armature 31, a U-shaped permanent magnet 32

having a pair of forwardly extending poles 33 and 34. Magnet poles 33 and 34 are provided each with a pole-piece 35, each of which pole-pieces has a plate-like portion 36 adapted to extend along the respective magnet pole 33 or 34 and be secured thereto, as will be described hereinafter. Each of the said pole-pieces 35 also comprises a pair of spaced flanges 37 and 38 extending at right angles from the body of the pole-piece and providing at the extremities of these flanges the pole tips 39 disposed upon one side of an actuating coil 40, and upon the opposite side of the coil 40 a pair of pole-tips 41.

The actuating coil 40 is mounted upon a coil spool 42 comprising insulating material formed and adapted to fit between the two pole-pieces and between the flanges of each pole-piece in a manner clearly shown in Fig. 7. This spool is provided with an opening 43 through which the magnetic field included portion 44 of the armature 31 is adapted to pass, the said portion of the armature being held as will be described later, centralized in the two air gaps formed respectively between the pole tips 39 and the pole tips 41. Armature 31 is further provided with a projection 45 at the end of the portion 44 beyond the pole tips 41 adapted to co-operate with adjustable damping means, as will be hereinafter described. The opposite end of the armature 46 tapers from the breadth of the portion 44 substantially down to a point at its end.

Adjacent the point the armature is perforated as at 47 to receive the upper end of the link 28, the latter preferably being composed of tinned copper wire or rod which may be attached to the armature by soldering as at 48 in Fig. 1. The armature itself is composed of magnetic material and the end 46 thereof has extending longitudinally an upwardly pressed or raised web 49 adapted somewhat to stiffen the armature and to provide means for giving security to the attachment of the armature to its semi-rigid supporting plate 50. The plate 50 is made of spring bronze and is secured to the opposing flanges 38 of the magnet pole-pieces 35 by means of cap screws 51 which engage threaded screw holes 52 in the pole tip flanges 38. Introduced between the pole-pieces and the bronze spring plate 50 is a fibre gasket 53. This gasket serves to space the bronze spring plate away from the pole-pieces a small distance sufficient to give some freedom of movement to the plate itself as the armature vibrates, thus avoiding setting up those extra mechanical vibrations which would exist if the two metal surfaces were in direct contact; and since fibre is a relatively non-elastic material a small amount of damping is applied by the gasket to the bronze spring plate. The armature is secured to the spring plate 50 by soldering at the point where the former passes through the latter.

The spring plate is provided with a slot 54 for receiving the armature; and it is further cut away as at 55 to provide a suitably resilient mounting for the armature. It has been found in practice that the stiffness and thickness of the spring plate and the disposition and extent of the cut-away portions 55 must be nicely determined to permit just the right degree of oscillatory movement of the armature when the latter is acted upon by the voice currents passing through the coil 40. This construction gives great vertical stiffness, holding the armature accurately between the pole-pieces, and at the same time permits the desired turning effect.

As disclosed in the various figures of the drawings a bracket plate 56 is supported upon the upper side of the permanent magnet 32 resting upon the pole-pieces 35, which bracket plate in turn supports a block 57 of insulation formed of "formica" or other suitable material. Two long bolts 58 pass downwardly through the formica block, the bracket plate, the respective magnet poles and the pole pieces, securely bolting the whole assembly to the bottom plate 25 of the recording unit. Beneath the bracket plate, between it and the magnet pole where there is no pole-piece plate 36, there is interposed a washer 59 and a similar washer 59 is interposed between the other pole of the magnet and the recorder base-plate 25, as will clearly appear by inspection of Figs. 4 and 5. These washers are preferably made of brass or some other non-magnetic material. The bracket plate is also made of such material. At its inner side the bracket plate is provided with an extension 60 overlying the space between the two poles of the magnet. This extension serves to support armature damping means, as will be more fully described hereinafter. The bracket plate is also provided with a pair of offset flanges 61 to which the cover 62 is secured by means of screws 63. The cover is provided with an opening 64 for the passage of the wires leading to the armature actuating coil. The ends of these wires are secured beneath cap screws 65 to the formica block 57 in contact with connectors 66 forming connections for the ends of the coil 40.

Damping means are provided for damping vibrations in respect to the vibration system of the recorder, namely, the armature, the connecting link 28 and the stylus lever 20, at three different points in order more effectively to control resonance by providing a more uniform load and thereby obtaining a wider range of distortionless recording of the audible frequency current passing through coil 40. These damping means will be referred to now with regard to their specific structure while the effect of each and the effect of all together upon the recording system will be described later.

By reference to Figs. 1 and 5 it will be seen that a pair of spaced plates 67, preferably made of brass, are supported by a pair of studs 68 which pass through suitable openings in the portion 60 of the bracket plate and are secured to the bracket plate by means of nuts 69 disposed above and below the bracket plate threadedly engaging the studs. By means of these studs the plates 67, held in their spaced relation, as will presently appear, may be raised and lowered as a whole. Each of the studs is provided as at 70 with a rigid collar which serves as an abutment against the upper side of the upper plate 67. The lower plate 67 is threaded upon the studs 68. Between these two plates and surrounding the inner or link-actuating end 46 of the armature are two blocks 71 of rubber or other suitable damping material, which when compressed by the drawing together of the plates 67 completely surround the armature and serve as a damper for the armature, with greater or less effect depending upon the pressure applied. This will be more fully discussed hereinafter. Also it will be noted that the plates may be raised or lowered as a whole by means of the nuts 69 in order to centralize the armature in the air gap between the pole-tips.

At its outer end the armature is also damped by means of a pair of rubber blocks 72 which press against and in fact envelop the extension

45 at the said outer end of the armature. The damping blocks 72 lie between clamping levers 73, best seen in Fig. 4. Each of these levers is pivoted to one of the pole-pieces 35 by means of a screw 74 and its adjustment is made possible by means of a second screw 75 which passes through a slot 76 formed at the angle of the lever adapting the lever to swing about its pivot point 74 toward or away from the blocks 72. Each of these levers is provided with an outwardly extending flange 77 adapted to engage a side of one of the blocks 72. A bolt 77' passing through flanges 77 permits accurate adjustment of the pressure of the damping means on the outer end of the armature.

Before referring to the third damping means, note should be taken particularly of the fact that the fulcrum of the armature is at the inner face of the pole-pieces and that the armature extends from this fulcrum point in both directions, the extension to one side constituting the part subjected to the action of the varying flux in the magnetic field as the voice currents vary, while the outer extension provides a lever arm extending beyond the fulcrum and at the end of which the link 28 is attached. With this construction many advantages are gained in respect to controlling the relation of the natural period of vibration of the armature to the condition under which it is to operate. It should also be noted at this time that the armature with the magnet pole-pieces, the actuating coil, the damping means 72 and 71, and the bracket plate, may be first assembled as a unit after which they may be properly positioned with respect to the magnet 32, and the whole then secured to the recorder plate 25 by means of the bolts 58.

The third damping means mentioned above consists of a block 78 of sponge rubber, see Figs. 1 and 5, surrounding the link 28 substantially midway between the ends thereof. This block of damping material sets down in a recess 79 formed in the plate 25 and is interposed between paper gaskets 80. This damping means is held in a state of compression by means of a plate 81 secured to the upper side of the recorder plate 25 by means of a screw 82. The block of sponge rubber is normally of a greater depth than the depth of the recess 79 so that any degree of compression within the limits for which the elements are designed may be obtained by adjusting the screw 82.

Referring to Fig. 3 it will be seen that the floating weight 22 is of well-known form and that it is pivoted in a known manner to the bracket 24 by means of a spring pivot 83. A novel feature of the present invention involves a counterweight or auxiliary weight secured to the short arm of this lever in order not only to counterbalance the weight of the floating lever and provide an adjustable means for determining the depth of cut made by the stylus, but to provide means also for varying the natural period of vibration of the floating weight system, and/or absorbing vibrations at the natural period of the said system. This means comprises, as best seen in Figs. 1, 3, 4 and 5, a pair of weights 84 adjustably secured to the lever 22 at a point adjacent the pivots 23 by means of a bracket 85 fastened to the weight lever by means of a screw 86. The said bracket 85 is provided with two depending arms 87 slotted to permit up and down movement of clamping screws 88 which pass through the slots into a threaded engagement with the respective auxiliary weights. The position of these depending bracket arms is such that the adjustable movement of the weights follows a path enabling the weights to be positioned with regard to their center of gravity almost beneath the pivots of the lever 22 or they may be carried downwardly and outwardly away from the pivots. Either or both of the weights may thus be adjusted at will to attain any desired effect. Any desired degree of springiness may exist in the said bracket, depending upon its dimensions and the material of which it is made.

As is well known in the art it has been customary to provide a U-shaped stirrup as indicated at 89, in Figs. 1 and 3, for the purpose of determining the lowest position to which the weight lever 22 may fall toward a record-cylinder mounted upon mandrel 12. In the past these stirrups have been of a fixed length and fixedly connected to the plate 25. In the present construction this stirrup is made adjustable as to length by making it possible to move it up and down in the plate 25. The ends of the stirrup are seated in holes provided to receive them in plate 25, as indicated at 90, and these seats open to the right, as seen in the figures referred to, laterally into a recessed portion 91 of the plate 25. A screw 92 is tapped into the plate 25 and when drawn down is so disposed that its head will overlie the legs of the stirrup 89 and hold them in any adjusted position.

As is well known, essential voice frequencies extend from about 100 cycles to something over 5000 cycles. In the past it has been practically impossible with a simple mechanism to record voice frequencies uniformly over this range of frequencies because of distortion produced by the resonance of portions of the vibrating system at voice frequencies, and also due to extraneous vibrations set up locally in the vibrating system. Various damping means have been provided heretofore, some of which have served to increase the range of substantially distortionless recording. None of them, however, have attacked the problem in such a way as to apply the damping means as a load distributed over the vibrating system and in such a way as to take care of various elements or reactions acting at different points in the system making the system resonant as a whole or in part to vibrations in an undesirable manner. By supplying damping at the points above described it has been found that the recorder may have a frequency characteristic that is substantially flat over an audible range from approximately 100 cycles to 6500 cycles. This has been done partially by reducing the moment of inertia of the moving recorder elements, particularly of the armature. To this end the armature has been made relatively short and rigid, its mounting has been made semi-rigid and is located between the ends of the armature upon the side of the magnet pole-pieces closest to the connecting link. Damping means has been provided in such a way as to raise the natural period of vibration of the system of moving elements. The armature itself is damped at the two points mentioned, and damping means has been provided which acts directly upon the wire link. The damping of the armature by means of the adjustable damping means 72 is most important as its adjustment provides considerable latitude in effecting changes of the natural period of vibration of the moving parts besides presenting a certain amount of load close to the point where the maximum force is exerted. The natural period of vibration of the armature

and its moving system can be controlled within practical limits from the natural period of the system with no damping, about 1700 cycles, to about 3500 cycles with very heavy damping at the outer end of the armature. Increasing the pressure of the damping means at this point tends to make the recorder reponse more and more uniform and raises both the high frequency response and the high frequency cut-off point. The damping means surrounding the other end of the armature, namely, the means 71, is useful in aiding centralization of the armature between the pole-pieces and it also functions to a degree as a load and tends to damp out local vibration. It places a load on the armature at a point where the mechanical stiffness is sufficient to prevent excessive bending, and vibration of individual parts of the mechanism is thereby largely prevented. The damping of the link by means of the rubber block 78 is principally useful to damp out any lateral vibration in this more or less flexible wire as the latter is alternately pushed and pulled during the process of recording. Lateral vibration of the wire tends to decrease the total recorder output and adds extraneous vibrations tending to distort the recording. Damping at this point is controlled by raising or lowering the pressure upon the damping medium. This damping also adds a slight load to the moving system. Thus the moving system is subject not only to the load of recording but also to the three loads imposed upon the system by damping at the points mentioned.

The semi-rigid armature mounting has been designed both as to form and material to give sufficient freedom of motion to the armature within its limits of oscillation and yet be rigid enough to raise the natural period of vibration of the armature, and it should be noted that the value of the rigidity of this mounting means must be held within comparatively close limits in order to obtain the desired frequency response. Taken as a whole, the system of damping disclosed herein can be so adjusted that within the latitude of movement required for a normal value of recording the movement of the parts is approximately proportional to the force applied, but beyond that latitude where blasting and an excessive cut would result the movement of the recording stylus is not proportional to the force applied but is much less; thus, in effect, limiting the maximum movement to a value which can be handled by the recorder without blasting or perceptible distortion.

It must be remembered, also, that the floating weight 22 has a natural period of vibration. Many practical limitations place this natural period in the range between 80 and 150 cycles, which is in the range of the lower voice frequencies. However, a natural period at 120 or 180 cycles is extremely undesirable because it tends to accentuate the hum obtained from a rectified 60-cycle alternating current power supply unit such as is frequently used with these recorders to provide current for an amplifier interposed between the microphone receiver for the recorder and the recorder electromagnetic system. In part the intensity of this vibration at the natural period of the floating weight is controlled by the friction in the pivot points. This is made as high as possible by adjusting the tension on the spring pivots to the value which will just allow the weights to move up and down freely. It is possible to vary the natural period of this floating weight by adding the auxiliary weights described above, or absorb energy at its natural period by coupling it to other vibrating systems properly tuned. As mentioned above, such weights may be adjusted to a point where they hang almost directly below the pivot of the lever and add to the moment of inertia of the lever about its pivotal center. These weights can also be supported on a spring member designed with the proper amount of elasticity which, combined with the mass of the weights will give a natural period which will counteract the natural period of the floating weight. In this way the natural period of the floating weight system can be adjusted so that it will be affected only slightly by frequencies such as 60, 120 or 180 cycles. Changing the stiffness of the bracket or substituting a different material changes the decrement of the vibrating system. This decrement should be high in order quickly to damp out any vibration set up in this resonant system and to make the resonant effect as broad as practical. By changing the mass of the weights or the distance they are placed from the fulcrum of the floating lever, it is possible to absorb energy in this vibrating system or systems at the natural period of the floating weight system preventing it from responding excessively to energy which is being supplied to it at its own natural frequency. Rigid direct attachment of the auxiliary weights to the floating weight has no absorption effect but merely lowers the period of vibration. If sufficient space were available the natural period of the floating weight system could be lowered to such a value that normal voice frequencies would not affect it. The limits in this direction are determined by the bearing pressures which the weight lever pivots will carry.

It will be seen that there is provided a construction of an essentially practical nature in which the several objects of this invention are attained.

As many possible embodiments may be made of the above invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. An electrical sound-recorder comprising, in combination, a frame, a floating support pivotally mounted on said frame, a lever pivotally mounted for oscillation on said floating support, a stylus mounted on one end of said lever, a link pivotally secured on the other end of said lever, a magnetic device mounted on said frame and comprising a vibratile armature and electromagnetic means for positively actuating said armature in either direction, means connecting said armature and said link, damping means acting directly upon said armature to control vibration thereof, and damping means acting upon said link at a point between its ends to prevent distortion in recording due to the lateral vibration of said link.

2. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point be-

yond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said one arm of said armature, damping means disposed to act upon the said other arm of said armature, damping means disposed to act upon said connecting member, and means providing a fulcrum for said armature at its said axis of oscillation.

3. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, adjustable damping means disposed to act upon the said one arm of said armature, adjustable damping means disposed to act upon the said other arm of said armature, adjustable damping means disposed to act upon said connecting member, and means providing a fulcrum for said armature at its said axis of oscillation.

4. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said one arm of said armature and damping means disposed to act upon the said other arm of said armature, and means providing a fulcrum for said armature at its said axis of oscillation.

5. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said one arm of said armature and damping means disposed to act upon said connecting member, and means providing a fulcrum for said armature at its said axis of oscillation.

6. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said other arm of said armature and damping means disposed to act upon the said connecting member, and means providing a fulcrum for said armature at its said axis of oscillation.

7. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said one arm of said armature and damping means disposed to act upon the said other arm of said armature, means providing a fulcrum for said armature at its said axis of oscillation, and independent means for adjusting each of said damping means.

8. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said one arm of said armature and damping means disposed to act upon said connecting member, means providing a fulcrum for said armature at its said axis of oscillation, and independent means for adjusting each of said damping means.

9. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, damping means disposed to act upon the said other arm of said armature and damping means disposed to act upon

the said connecting member, means providing a fulcrum for said armature at its said axis of oscillation, and independent means for adjusting each of said damping means.

10. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said other arm of said armature, and a semi-rigid spring plate mounted on said pole-pieces and rigidly secured to said armature at said axis of oscillation.

11. A vibration translating device comprising, in combination, a frame, a floating weight member pivotally supported by said frame, a stylus lever pivotally mounted on said floating member, means for vibrating said lever, and a pair of auxiliary weights mounted on said floating member, one to either side of a central vertical plane normal to the pivotal axis of said floating member, and means for independently adjusting each of said auxiliary weights relatively to said pivotal axis.

12. A vibration translating device comprising, in combination, a frame, a floating weight member pivotally supported by said frame, a stylus lever pivotally mounted on said floating member, means for vibrating said lever, a bracket secured to said floating member adjacent to and extending beneath the pivotal axis thereof, and an auxiliary weight adjustably mounted on said bracket below said pivotal axis.

13. A vibration translating device comprising, in combination, a frame, a floating weight member pivotally supported by said frame, a stylus lever pivotally mounted on said floating member, means for vibrating said lever, a vibratory system coupled to said floating member having a natural period of vibration lower than that of the floating member and comprising a resilient bracket secured to said floating member adjacent to and extending beneath the pivotal axis thereof, and at least one auxiliary weight adjustably mounted on said bracket below said pivotal axis.

14. In an electrical recording device, in combination, a base for supporting recording mechanism, a U-shaped magnet having the legs of the U disposed in a plane parallel to said base, a pair of pole-pieces enclosing an armature-exciting coil cooperatively mounted on the said legs, an armature secured to said pole-pieces in cooperative relation to said coil, a bracket adapted to be secured in fixed relation to said magnet for supporting damping means for said armature, and means comprising bolts passed through said bracket, pole-pieces and the legs of said magnet into threaded engagement with said base for clamping all of said elements together as a unit structure.

15. An electromechanical translating device comprising, in combination, a frame, a floating support pivotally mounted below said frame, a lever pivotally mounted on said support for oscillation thereon, a stylus mounted on one end of said lever, a magnet mounted on said frame, pole-pieces defining a pair of air gaps mounted on said magnet, an armature mounted between its ends for vibratory movement and having one arm extending from the axis of oscillation of the armature through said air gaps to a point beyond the pole-pieces and another arm extending from said axis in the opposite direction, a member connecting said lever with the said arm of said armature, a semi-rigid spring plate mounted on said pole-pieces and rigidly secured to said armature at said axis of oscillation, and damping means disposed to act upon said armature at a point remote from said spring plate.

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