

March 12, 1940.

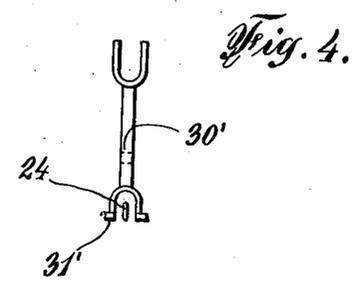
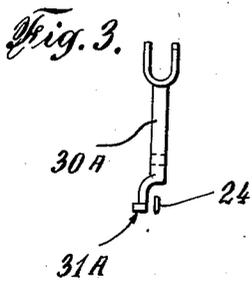
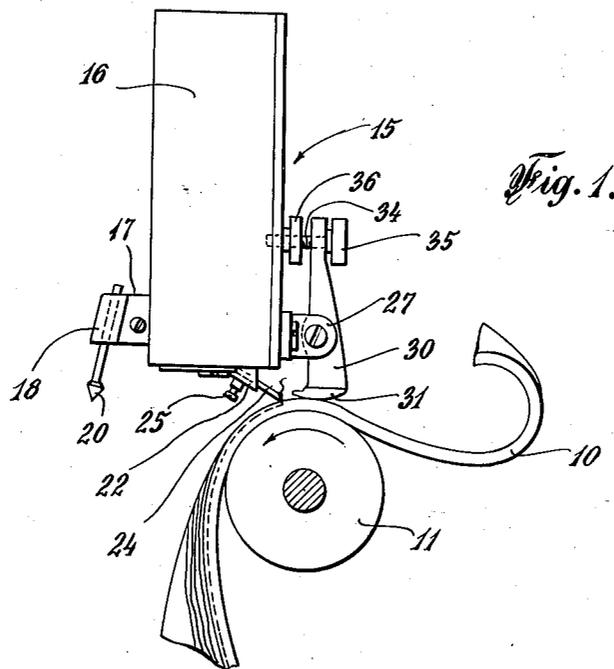
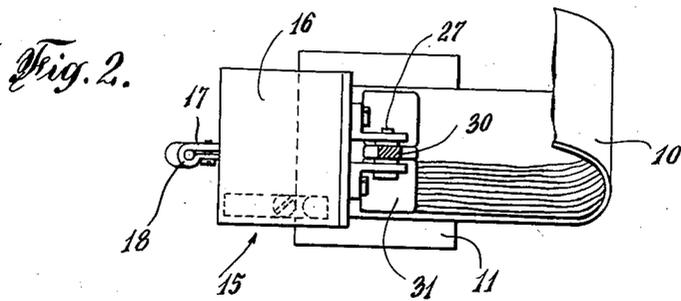
M. BENDER

2,193,443

SOUND RECORDER AND REPRODUCER

Filed May 11, 1936

2 Sheets-Sheet 1



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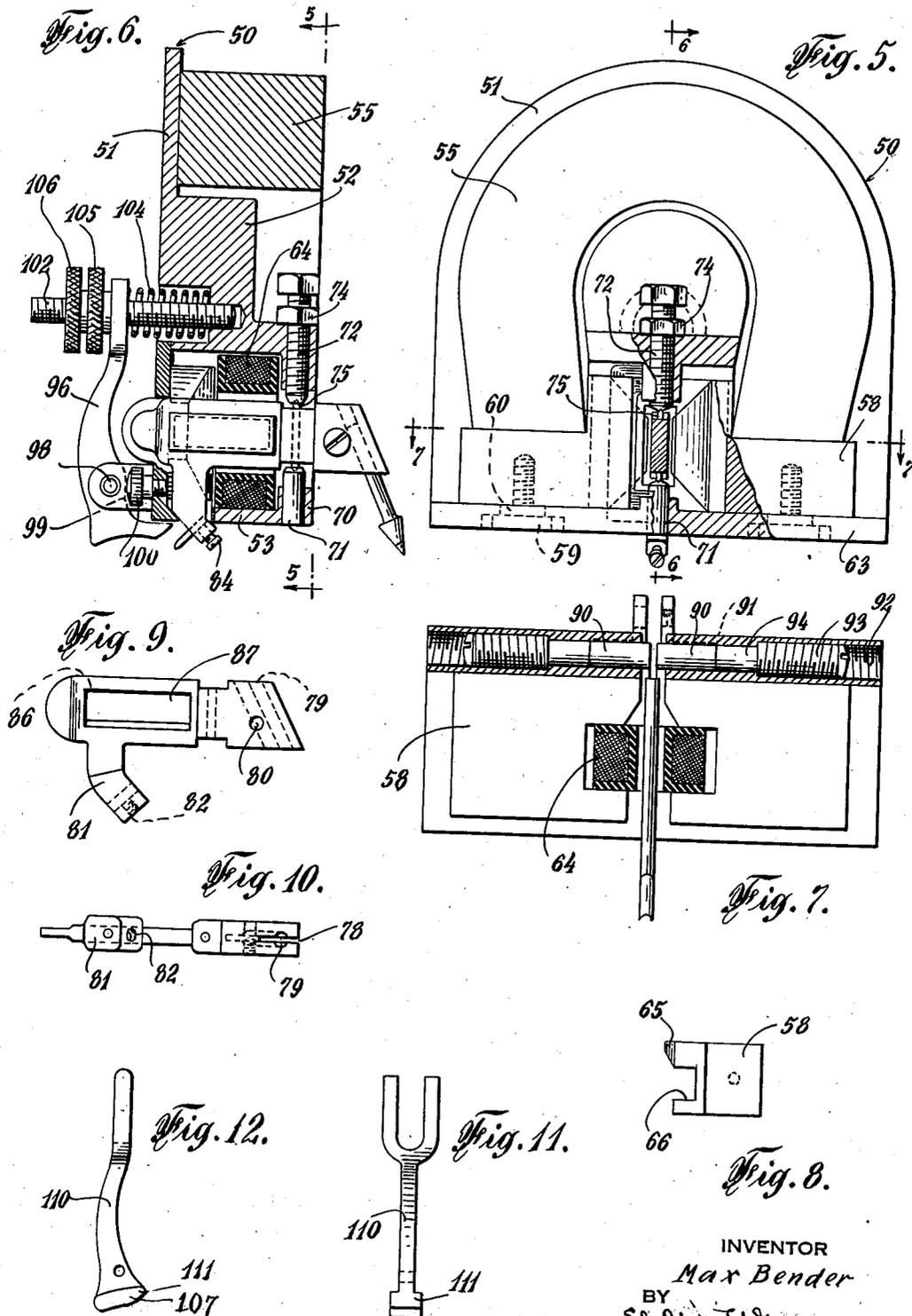
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SOUND RECORDER AND REPRODUCER

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2 Sheets-Sheet 2



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SOUND RECORDER AND REPRODUCER

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Application May 11, 1936, Serial No. 79,019

2 Claims. (Cl. 179—100.41)

This invention relates to recording sound in a relatively hard material such as Celluloid or motion picture film.

One suggested method of forming such a record is by drawing the film against the cutting edge of a recording stylus while vibrating the stylus in accordance with the sound to be recorded. With hard material such as film, there is a tendency of the needle to dig itself into the film and the principal object of the present invention is to provide an improved means for preventing this and at the same time controlling the depth of groove cut.

Other objects of my invention will appear from the following description taken in connection with the accompanying drawings wherein—

Figure 1 is a side elevation of a combined sound recorder and reproducer showing one form of my invention;

Figure 2 is a top plan view of the structure shown in Figure 1 with a portion shown in section taken on the line 2—2 of Figure 1;

Figure 3 is a front elevation of a modified form of spacer bar showing the relative position of the bar and cutting stylus;

Figure 4 is similar to Figure 3 but showing a modification;

Figure 5 is a front elevation partly broken away of a modified form of recorder and reproducer;

Figure 6 is a central vertical sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a horizontal sectional view taken on the line 7—7 of Figure 5;

Figure 8 is a top plan view of one of the adjustable pole pieces of the recorder shown in Figure 5;

Figure 9 is a detail side elevation of the armature with the means for attaching the recording and reproducing styluses;

Figure 10 is a bottom plan view of the structure shown in Figure 9;

Figure 11 is a front elevation of the slightly modified form of spacing and control bar; and

Figure 12 is a side elevation of the structure shown in Figure 11.

Referring more particularly to Figure 1, 10 represents a strip of tough material such as plasticized cellulose adapted to be drawn over an anvil or roller 11. The film may be formed as an endless band and the record may be helical in form thus covering a large part or the entire surface of the film. A convenient way of making such an endless band is to coat a cylinder with the plasticized cellulose in liquid form and allow the same to dry. A roller preferably having a

surface of hardened steel may then be passed around the coating under sufficient pressure and if desired at a somewhat elevated temperature in order to deform or stretch the Celluloid slightly so that its inner diameter is slightly greater than the outer diameter of the cylinder. The belt of Celluloid may then be readily removed from the cylinder.

Reference character 15 denotes a combined recorder and reproducer comprising a casing 16 enclosing electromagnets (not shown) which cooperate with an armature 17 to record or reproduce sound in a manner well understood. The armature 17 is formed at one end as a sleeve 18 adapted to receive a reproducing stylus 20 firmly held in position by a screw 21.

The opposite end of the armature 17 is formed as a sleeve 22 adapted to receive a recording stylus 24 secured in position by the screw 25. The stylus 24 is provided with a cutting edge directed against the motion of the film as is indicated by the arrow. In the recorder disclosed, the record groove cut is of the so-called lateral type, but the device may also be used to cut a groove of the hill and dale type.

Pivotaly mounted between brackets 27 secured to the casing 16 is a spacer member or bar 30 formed with an enlarged foot which is adapted to bear against the surface of the film 10 and adapted to span a number of adjacent sound grooves. The lower surface of the foot 31 is curved eccentric to the pivotal axis so movement of the foot toward the cutting stylus lowers the casing and permits the cutting of a deeper groove in the film, while movement of the foot away from the stylus raises the casing, thus decreasing the depth of the groove. It will of course be understood that the recorder and reproducer will be supported to rest on the film by gravity or in any other manner as is usual in the art.

For the purpose of adjusting the spacing member 30 and holding it in adjusted position, I provide a screwthreaded lug 34 secured in the wall of the casing 16 with an adjusting nut 35 and a locking nut 36, the upper end of member 30 being bifurcated and embracing the lug 34.

It will be noted that the foot 31 contacts with the film at a point adjacent to and in front of the cutting edge of the stylus 24. In this position it not only prevents excessive digging into the film by the cutting edge of the recording stylus but also holds the material of the film which lies in front of the edge between the upper cutting face of the stylus and the bottom of the

foot 31. This prevents disturbing vibrations and insures smooth and even cutting.

Suitable means not shown is provided for shifting the recorder so that the reproducing stylus may be made to engage the groove when it is desired to reproduce the sound recorded.

In certain cases I may position the foot of the spacing and control bar alongside of the recording stylus 24 and in such case I form the bar 36A as shown in Figure 3 with an offset foot 31A. The offset portion serves to throw off the shaving which is cut from the thermoplastic by the stylus. As an alternative construction, I may use the form of bar shown at 30' in Figure 4 having a bifurcated foot 31' which embraces the stylus.

Referring more particularly to the embodiment of the invention shown in Figures 5 to 10 inclusive, the combined recorder and reproducer includes a frame 50 of brass or similar non-magnetic material. Frame 50 comprises a side plate 51 formed with a central enlargement 52 and a lower flange portion 53 forming a base for the recorder. Suitably mounted on the frame 50 is a permanent magnet 55, the lower ends or poles of which are adapted to rest in contact with pole pieces 58 adjustably mounted on the base plate 53, the pole 58 being secured in position by means of screws 59 which extend through slots 60 in the base plate and thence into the pole pieces.

Also mounted on the base plate 53 is a coil 64 which serves to carry the recording or reproducing current. As will be seen from Figures 7 and 8, the pole piece 58 is formed with a half pyramidal extension 65 at one end forming a pole tip and is cut away as indicated at 66 so that in the adjusted position of the pole piece as shown, for example, in Figure 7, the pole piece substantially embraces the coil 64.

Mounted in a sleeve extension 70 of the base plate 53 is a pin bearing 71, shown at the right of Figure 6, and in alignment therewith and extending through the enlargement 52 of the frame 50 is an adjustable screwthreaded bearing 72 adapted to be held in adjusted position by a locking nut 74. Mounted to rotate in the bearings 71 and 72 is a pin 75 which extends through and is rigidly secured in the armature structure 76. This armature is formed of aluminum alloy preferably heat treated, and as may be seen from Figures 9 and 10 has one end inclined and split at 78 forming a tubular holding portion 78 for receiving the reproducing stylus which is clamped therein by a screw 80. Adjacent its opposite end the armature structure 76 is formed with a downward inclined portion 81 having an opening 82 therein for receiving the recording stylus 83 which is suitably secured in position by a screw 84.

The armature structure or frame 76 is cut away to form an opening 86 in which is received a plate

or armature 87 preferably of soft Norway iron. This plate as will be seen from Figure 6 extends from within the coil 64 outward between the tips 65 of the pole pieces 58.

For the purpose of damping the vibrations of the armature 76, I provide two damping pads 90 held in a cylindrical opening or boring 91 in the plate 51 of the frame 50. Portions 92 of this boring are screwthreaded for receiving an adjusting screw 93 and between the inner end of the screw 93 and the pad 90 is a cylindrical follower 94, preferably formed of brass. The pads 90 may be formed of rubber, felt or any elastic material.

The control and spacing bar or lever 96 in the form of invention shown in Figure 6 is provided with a foot 97 and this bar is pivoted at 98 in brackets 99 secured to the frame plate 51 by screws 100. The upper end of the bar 96 is bifurcated at 101 and embraces a screwthreaded rod 102 secured as shown in the enlargement 52 of the recorder frame. Surrounding the rod 102 is a helical spring 104 bearing at one end against the rear wall of an opening 105 in the enlargement 52 and at the other end against the bar 96. For adjusting the control bar 96, I provide a nut 105 screwthreaded on the bar 102 and a lock nut 106 adapted to bear against the nut 105.

The control bar 110 shown in Figures 11 and 12 is provided with a foot 111, the front 107 of which is cut on a radius eccentric to the pivoting point, to get the movement to raise and lower the head and providing a surface contact with the film. This is also true, it will be noted of the bar 96 shown in Figure 6. The radius of the arc at the foot of the lever is substantially greater than the radius of the anvil over which the film moves.

Having now described my invention, what I claim and desire to secure by Letters Patent is:

1. An electromagnetic recording device for cutting a sound record in a moving film of plasticized cellulose, said device comprising a casing, a stylus having a cutting edge positioned against the motion of the film, a spaced member pivotally mounted on said casing, said member consisting of a bar pivoted to said casing, said bar having a laterally enlarged foot formed with a curved lower surface eccentric to the pivotal axis of said bar, adapted to bear against said film and means for angularly adjusting the position of said bar so as to vary the depth of record cut in said film.

2. In a device of the character described, a permanent magnet, a coil between the poles of the magnet, an armature structure comprising a supporting frame of light non-magnetic material supported in said frame and being partly in said coil and partly between the poles of the magnet and styluses supported at opposite ends of the frame.

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