

July 17, 1934.

F. SOCHOR

1,966,873

MANUFACTURE OF SOUND FILMS

Filed Nov. 21, 1932

3 Sheets-Sheet 1

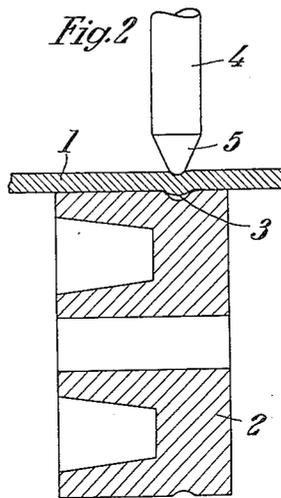
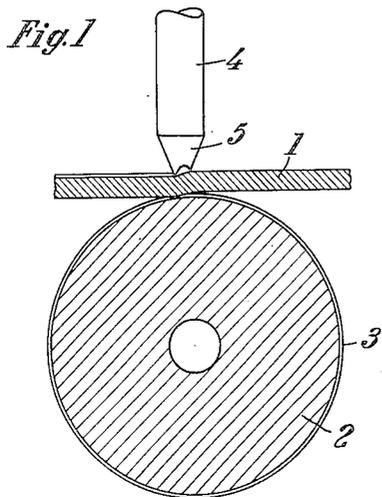


Fig. 8 Fig. 9

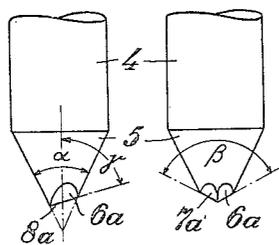


Fig. 10 Fig. 11

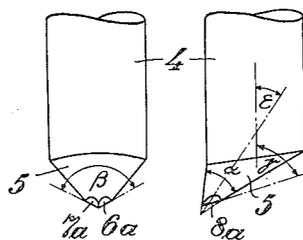


Fig. 13

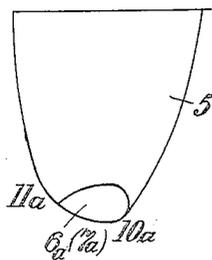


Fig. 14

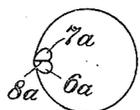
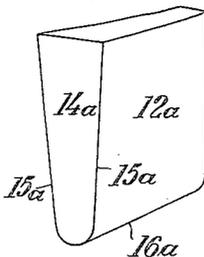


Fig. 12

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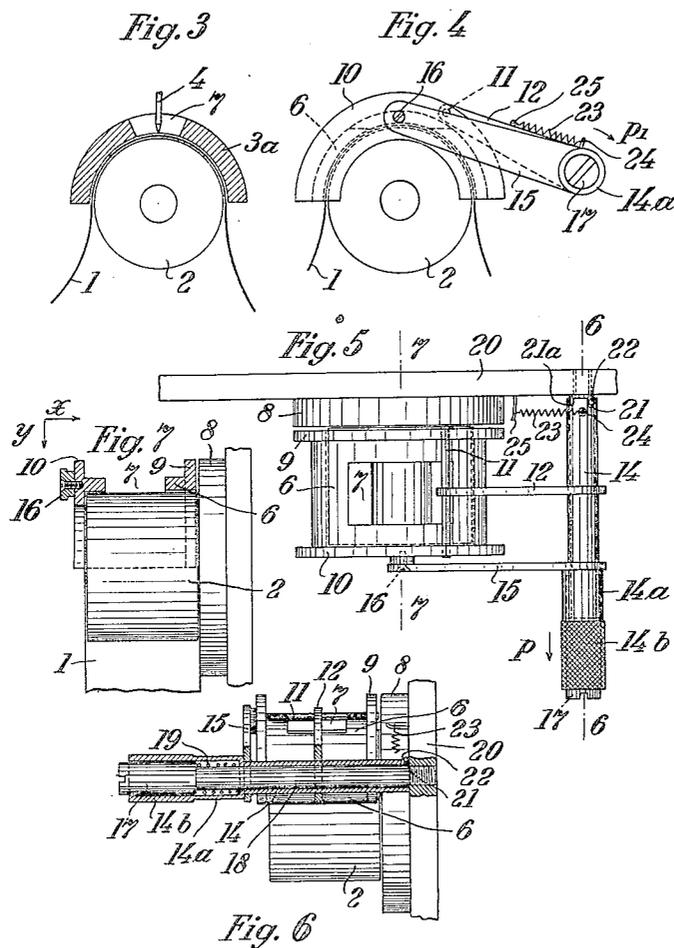
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Fig. 15

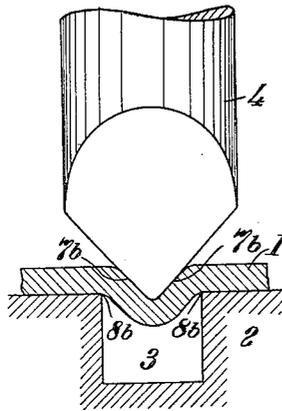


Fig. 16

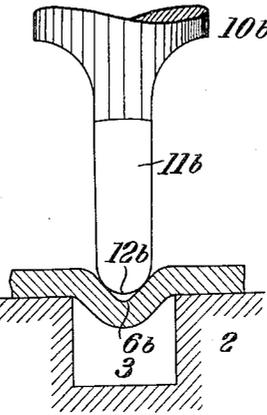


Fig. 17

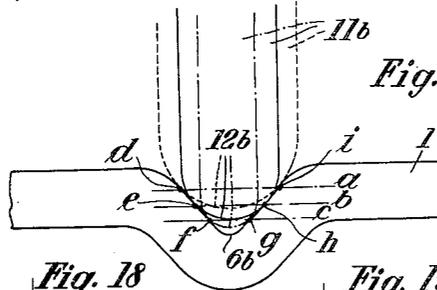


Fig. 18

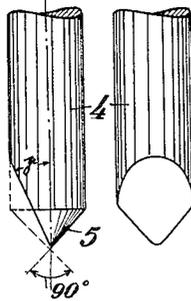
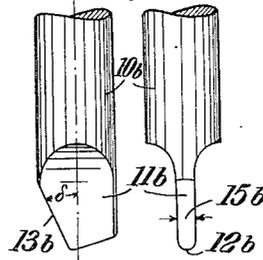


Fig. 19



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UNITED STATES PATENT OFFICE

1,966,873

MANUFACTURE OF SOUND FILMS

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In Austria March 19, 1931

5 Claims. (Cl. 274—11)

For the mechanical recording of sound records on narrow films or other supports of a material harder than wax, a number of processes is known. According to these processes the groove is either cut out in the material (cutting method) or impressed therein (impressing method). This latter process may be carried out with a cold stylus as well as with a heated one. In principle, this latter process consists in a displacement of the material so that the places adjacent the sound line obtain a greater density than those of the remainder of the material. Recording sounds in a cold way by means of a stylus, irrespective of whether it is carried through according to the cutting method or according to the impressing method, is associated with the essential drawback hitherto inevitable that the record line at its upper edges, i. e. at the place where it adjoins the surface of the film-band receives a more or less strong bur which gives rise to intense extraneous noises during the reproduction of the film. These extraneous noises may be so strong that it is quite impossible to arrive at a faultless reproduction of the sound. The application of the said known processes is particularly impossible in the case of narrow films which have been produced according to the reversal method.

The process according to this invention consists in producing a sound groove in such a manner that the material of the film displaced by depression of the groove stands out in form of a boss on the inversed side of the film without any molecular displacement being produced. Due to the solidity of the material employed and to its special properties which make it useful for the very purpose in question, the sound groove as well as the boss are preserved. The marginal regions of the sound groove produced are likewise employed for the record of sound. The particular advantage involved in the new process, lies in the fact that any formation of a bur at the upper edges of the groove is rendered impossible. Thus the walls of the record groove pass softly into the plane part of the support. Another advantage provided by the new process resides in the fact that the recording needles used need no longer have sharp edges, but can be provided with an active surface of an accordingly narrow and rounded form. This kind of needle will hereafter be described more fully.

In order to enable reproduction to be satisfactorily obtained from a groove in which the material stands out on the reverse side of the base, the dimensions of the groove are important when the record is to be reproduced with the aid of a stylus.

This invention comprises a method of mechanically recording sounds on a record base of preferably a band-like form, for instance on a cinematographic film for amateur purposes by depressing on the margin of the base a groove in such man-

ner that the material displaced stands out on the reverse side of the base in the form of a boss without molecular displacement, the dimensions of the impressed groove being such that the ratio of its depth to its breadth at the upper edges is between 1:1 and 1:2.

In order to avoid that during the recording and reproduction of sounds the film band not having the necessary degree of rigidity, and being in particular comparatively soft in comparison with the steel of the stylus is not displaced from its true path by the latter, thus giving rise to impure and confused tones, the film is guided at the place of record, for a considerable length between a roller and a tightening cap exactly fitting thereon. In a preferred form of construction according to this invention the guide of the film extends over about half the roller. Thus the film band, as already stated, is given an additional stiffness, so that the marginal portions of the sound groove can no longer give way to the reproducing stylus. On the other hand the film is prevented from bending too much, as it is the case in the reproducing devices fitted with grooved supports, for instance grooved rollers.

By the device according to this invention it is furthermore realized that the sound groove, owing to the film being bent, is somewhat enlarged so that the stylus can scan the track conveniently.

For the known processes of recording sounds, above referred to, use has already been made of styli having prism-shaped heads in the form of pyramids with three or four edges. The anterior and, if necessary, the posterior cutting edge of these pyramids form an angle with the plane of the record base which may raise to 45°. Moreover, these pyramid-shaped heads are provided with lateral imprinting edges of a distinct straight form, being inclined to one another to form an angle of between 90° and 135°.

As it is important that the structure of the film is not injured while the groove is produced, the stylus employed according to the invention is cone-shaped and is ground to produce one facet or two facets such that the stylus does not produce a sharp edge at the bottom of the sound groove which would give rise to fissures and cracks in the band-shaped sound base.

The process which is the object of this invention will be more fully explained with reference to the accompanying drawings which represent, by way of example, one form of construction of the device, of the recording stylus and of the reproducing stylus with which said process is carried out.

Fig. 1 shows diagrammatically a side view of an arrangement for recording sounds according to the present invention, part being shown in section.

Fig. 2 is a front elevation of the arrangement according to Fig. 1.

Fig. 3 is a diagrammatic representation of the device for guiding the film provided with the tightening cap.

Fig. 4 is a side view of the device according to Fig. 3.

Fig. 5 is a plan view of the device according to Fig. 3.

Fig. 6 is a section on the line 6—6 of Fig. 5.

Fig. 7 is a section on the line 7—7 of Fig. 5 of a particular form of construction which, however, is given only by way of example.

Fig. 8 is a side view of the recording stylus.

Fig. 9 is a front view thereof.

Figs. 10 to 12 show a modified form of the recording stylus according to this invention.

Figs. 13 and 14 show other two modified forms of the recording stylus.

Fig. 15 is a cross section through an arrangement of the bandshaped record base (film), its support and the recording stylus, drawn on a considerably enlarged scale.

Fig. 16 shows, equally on an enlarged scale, the end of the reproducing stylus.

Fig. 17 is a section through the record base and several forms of the reproducing stylus, all being represented on an enlarged scale.

Fig. 18 represents two views of the recording stylus.

Fig. 19 represents two views of the reproducing stylus.

In carrying out the process according to this invention the film travels over the usual propelling members (feed drums) driven in known manner so as to ensure a continuous feed of the film at the place where the sound is to be recorded, the film 1 being supported by a roller 2 of suitable size. The roller is provided with a groove 3. The depth and width of said groove must be such that the grooved part of the film material does not come into touch with the edges of the said groove 3. It is essential to give the pressed groove such a form that the proportion of its depth to its breadth is 1:1 to 1:2.

The film-band is guided preferably over half the circumference of the roller and pressed to said roller by means of a cap-like member 3a having a notch 7, so that the film receives an additional stiffness and the reproducing needle 4, during the reproduction of the sound, can easily scan the sound line, without the wall portions of the groove giving way to the needle any longer.

In the form of construction represented in Figs. 3-7 1 is the film-band provided or to be provided with the record groove and 2 is the drum or cylinder. 6 is the cap for tightening the film having an opening 7. 8 is a stationary flange mounted to the base plate 20. The cap 6 is provided with two lateral ridges 9 and 10, of which ridge 10 extends not only upwards as does likewise ridge 9, but also grips over the edge of the film roll 2. The ridges 9 and 10 form the bearing for an axle 11 having a lever 12 which, as represented in Figs. 5 and 6 is fastened to a casing 14, to which is mounted, for instance, by soldering, another lever 15, which by means of a screw 16 is connected to the wall 10. The casing 14 comprises a widened portion 14a and a portion 14b milled on its outer surface. Arranged between the frontal extension of the part 14a and the front of the extension 17 of the axle 18 which serves to carry the casing 14, is a spring 19 by the action of which the casing is permanently pressed

towards the wall 20, into which the axle 18 is mounted. The casing 14 provides notches 21 and 21a, which in various positions may engage with a pin 22 which is fixed to the axle 18. The notches 21, 21a are preferably chosen somewhat larger than the diameter of the pin 22. By this arrangement the cap can be kept in one of two positions, having some play in each position. A spring 23 fixed to the casing 14 at 24 and to the wall 20 at 25 tends to press the cap 6 against the roller 2 supporting the film.

As can be seen from Figs. 5, 6 and 7 neither the roller 2 nor the cap 9 is pressed against the stationary flange 8. The space left between the revolving roller 2 and the flange 8 is preferably very small. The lower edge of the flange 10 extending over the roller 2 is not in contact with said roller 2 but with the left edge of the film stripe 1 (Fig. 7). The right edge of the film stripe makes contact with the stationary flange 8. The cap 6, in consequence, is pressed against the film 1 by the springs 19 and 23 in the direction of the arrows x or y (Fig. 7), whereby the film is pressed against the flange 8 and the roller 2 respectively thus being securely guided.

In the device according to this invention insertion and removal of the film is very easy. After drawing the casing 14 with the members mounted thereon including the curved guide member 6, in the direction opposite the strain of the spring 19, i. e. in the direction indicated by the arrow p (Fig. 5), it can be turned in opposition to the strain of the spring 23, as indicated by the arrow p_1 (Fig. 4). To introduce the film, the casing together with the members is mounted thereon, as described, is moved in the direction described and kept in its tilted position by means of the pivot 22 which engages with the notch 21a. After having introduced the film, the casing is moved in the inverted sense so that, when the cap 6 embraces the film, the spring 23 transmits the pressure over the lever 12 to the said cap 6, while the spring 19 presses the cap 6 against the film in a horizontal direction.

It is of course to be understood, that modifications within the scope of the invention are possible. If, for instance, the cap 6 together with its lateral walls moves in special guide-rails which do not allow this member to be shifted sideways, the lever 15 as well as the spring 19 and the downwards extension of the wall 10 can be dispensed with. In this case the film is only pressed against the roller 2; this may be a sufficient guide for the film.

The roller 2, may, of course, also be provided with toothed edges and then serve as transporting roller (with driving means). In this case the cap 6 is provided with two grooves or slots of large dimensions, so that the cap may be moved in an axial direction to the roller without the teeth being injured.

The recording needle which serves for the production of the groove in the recording base and must accordingly be leaded with a suitable weight, chiefly consists of a cylinder 4 and a cone 5.

According to Figs. 8 to 12 the cutting edges of the cone with which the groove is produced are inclined to one another so as to form an angle α of between 47° and 57° (on an average 52°). Near its point this cone is ground in view of the production of a narrow recording line, the facets obtained being inclined to form an angle β of between 117° and 127° (on an average 122°). Thereby a body is obtained which comprises two

level facets 6a and 7a and a curved conic surface which does not face the line of record.

As the outlines of the ground facets 6a and 7a represent conic sections, the edge serving for the production of the sound record in the groove is curved. Since the curvature extends opposite the direction of movement of the record base, no formation of a bur at the edge of the sound groove is possible. To obtain a favorable result, the lower edge 8a of the grooving means may, with the axis of the recording stylus, form an angle γ of between 69° and 79° (on an average 74°), which, however, can be varied within small limits.

According to Figs. 10 to 12, representing a special form of the recording stylus, the cone 5 and the cylinder 4 are in an inclined position to each other, so that the axis of the cone and that of the cylinder form an angle ϵ of between 30° and 40° (on an average 35°). Small deviations of these values are, however, admissible.

As shown in Fig. 13 the rounded grooving facet provided on the recording stylus at the conic part 5 between the points 10a and 11a may be any curved line in the side view, the facets 6a and 7a forming the angle β above mentioned.

The writing head of the recording stylus, however, may also be given the form represented in Fig. 14. The ground facets 12a, feebly inclined to one another, together with a back plane 14a form the grooving edges 15a, with which the sound records are produced in the impressed groove. In this form of construction the narrow-shaped active grooving facet is indicated by 16a.

In another form of construction represented in Fig. 18 the stylus for the production of the sound records consists, for instance, of a cylindrical part 4 and a cone 5 with an angle at the point of about 90° (between 80 and 100°). As represented in Fig. 18 the cone is provided, somewhat above its point, with a ground facet, the inclination γ of which with the axis of the stylus is about 22° to 32°, most advantageously 27°. As the ground facet does not begin at the point of the cone, but somewhat above, a better rounding of the recording member is arrived at, so that the record base, too, is rounded at the bottom at 6b. The recording edges of the recording member are marked 7b (Fig. 15). During the grooving as well as during the recording operation the film, within the reach of the groove provided in the roller, is supported only at the edges 8b, 8b thus hanging free in the groove 3 of the roller 2.

A film which has thus been provided with a sound record, for instance, a cinematographic film for amateur purposes, may be reproduced immediately after the record has been picked up to which end a special reproducing stylus is used. This reproducing stylus consists, for instance, of a cylindrical portion 10b with a lower extension 11b, the end of which is provided with a rounding 12b, the axis of which is, as represented in Fig. 19, inclined towards that of the stylus. The frontal surface of the portion 11b is provided with a ground facet 13b which is inclined towards the axis of the stylus by about 22° to 32°, most advantageously by 27°. In varying the breadth 15b of the portion 11, the sound groove of the film band 1 may be followed up by the reproduction stylus in different planes a, b, c, so that, by exchanging the stylus, sound may be reproduced, as represented in Fig. 17, at a, b, c alternately. The rounding of the portion 11b must in any case

have a greater radius than that of the recording stylus between the edges 7b. By this means the reproducing stylus, while running in the record line, does not reach down to the bottom of the groove of the record base 1. Scanning of the sound record groove of the record base 1 is only effected at the points d—i, or e—h, or f—g and c, never at the whole lines d—f and g—i at the same time. Thereby life of the sound record is considerably enhanced.

What I claim is:

1. A device for recording sounds on a record base of preferably band-like form, for instance, on a film for amateur purposes which comprises means for supporting said base, said means being provided with a groove, a record base on said supporting means, means for pressing said record base to said supporting means, and engaging with said base on a substantial distance, said means being provided with an opening, and recording means including a stylus for depressing on said base a groove engaging with said base through said opening.

2. A device for recording sounds on a record base of preferably band like form, for instance, on a film for amateur purposes which comprises a roller for supporting said base, said roller being provided with a groove, a record base on said roller, means for pressing said record base to said roller, and engaging with said base on a substantial distance, said means being provided with an opening, and recording means including a stylus for depressing on said base a groove engaging with said base through said opening.

3. A device for recording sounds on a record base of preferably band-like form, for instance, on a film for amateur purposes which comprises a roller for supporting said base, said roller being provided with a groove, a record base on said roller, a cap provided with a cut out fitting over said record base on said roller, means for pressing said cap on said record base, thus pressing the base against the roller, and recording means including a stylus for depressing on said base a groove and engaging with said base through said cut out.

4. A device for recording sounds on a record base of preferably band-like form, for instance, on a film for amateur purposes which comprises a roller for supporting said base, said roller being provided with a groove, a record base on said roller, a cap provided with a cut out fitting over said record base on said roller, a spring actuated lever system for pressing said cap on said record base, thus pressing the base against said roller, and recording means including a stylus for depressing on said base a groove and engaging with said base through said cut out.

5. A device for recording sounds on a record base of preferably band-like form, for instance, on a film for amateur purposes which comprises a roller for supporting said base, said roller being provided with a groove, a record base on said roller, a cap provided with a cut out fitting over said record base on said roller, an axle fixedly mounted, a casing rotatably mounted on said axle, two levers fixedly mounted on said casing and jointly connected to said cap, a first spring tending to shift said casing in the direction of axle, a second spring pressing said cap to on said record base, thus pressing the base against said roller, and recording means including a stylus for depressing on said base a groove and engaging with said base through said cut out.