April 25, 1933. J. A. MILLER 1,905,732

SOUND RECORD BLANK

Filed Oct. 7, 1931

Fig. 1,

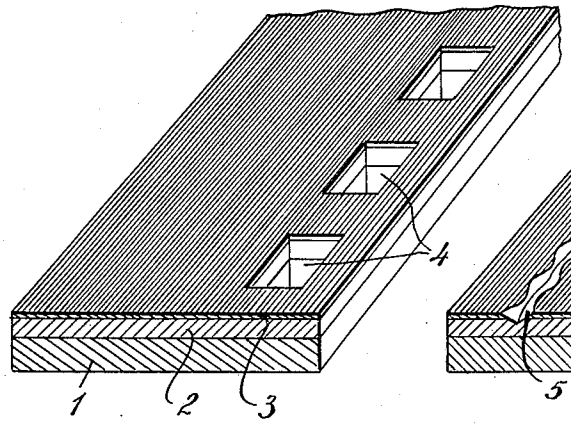


Fig. 2,

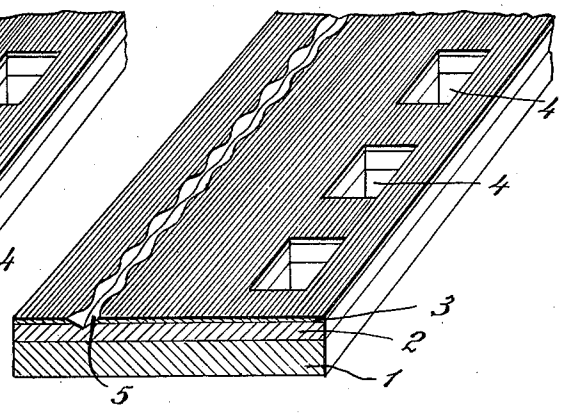


Fig. 3,

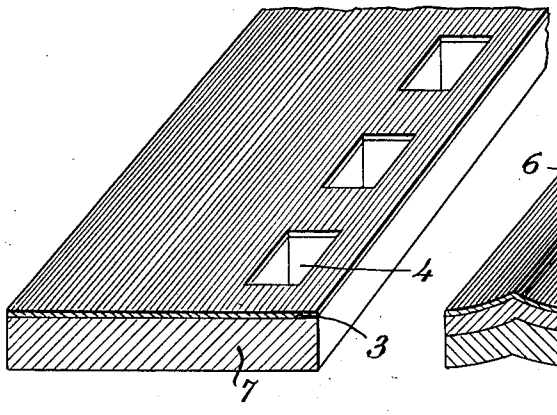
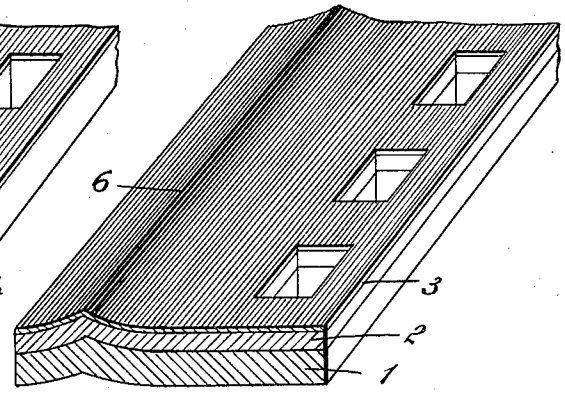


Fig. 4,



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UNITED STATES PATENT OFFICE

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SOUND RECORD BLANK

Application filed October 7, 1931. Serial No. 567,439.

This invention relates to the art of recording sound. More particularly it relates to record blanks on which sound may be recorded.

The principal object of the invention is to provide sound blanks adapted for use in certain of the improved methods of recording sound disclosed in my copending application Serial No. 566,152, filed September 30, 1931. By the use of any of the methods disclosed in that application a sound track such as that now used in "sound-on-film" talking moving pictures and intended for reproduction in an optical system, can be produced by an initial recording of the sound on a film strip in a purely mechanical fashion as distinguished from an optical or photographic recording of the sound. The methods disclosed in the above mentioned application are of two general kinds, one for producing a sound track of the so-called "variable-area" type and the other for producing a sound track of the so-called "variable-density" type. The record blanks to be herein described are intended for use in the method which produces the variable-area type of sound track. For that method the blank should have an opaque coating or surfacing through which the recording stylus may cut, and immediately below the opaque coating there should be a layer of transparent material into which the recording stylus may cut after it has penetrated the opaque coating. The recording stylus in its preferred form has a wedge-shaped cutting edge arranged with the point of the wedge directed toward and adapted to cut part way into the blank on which the sound is to be recorded. When the record blank is fed through the recording machine and the recording stylus is vibrated in accordance with the sound to be recorded and in a direction normal to the surface of the blank, the stylus cuts through the opaque coating and into the transparent layer leaving in the opaque coating a transparent track, the width of which varies in accordance with the recorded sound. The sound track thus formed or a photographic counterpart of it is capable of reproducing sound when used in an optical reproducing system because it is capable, by reason of its varying width, of controlling and varying the amount of light passing through it and falling upon the photoelectric or other light sensitive cell forming a part of all optical sound reproducing systems.

Several forms of blanks suitable for use in the above described method are illustrated in the accompanying drawing. The illustrated blanks are all in the form of flexible film strips because sound-on-film talking moving pictures is now believed by me to be one of the principal fields of use of my invention, but the blanks may take other forms such as discs, cylinders, etc., depending upon how the sound records made from the blanks are to be used.

In the drawing—

Fig. 1 is an enlarged perspective view partly in section, of a portion of a film strip so made as to constitute a record blank capable of use in the above described method of mechanically recording sound.

Fig. 2 represents the record blank of Fig. 1 after a sound track has been formed thereon in accordance with my method of mechanically recording the sound.

Fig. 3 is an enlarged perspective view partly in section, of a portion of a film strip constituting a record blank made in a different way from that illustrated in Fig. 1.

Fig. 4 is an enlarged perspective view partly in section, of a portion of a film strip constituting a record blank that is preformed to a certain shape in order that the sound track may be produced thereon by an alternative recording method to be hereinafter described.

Referring first to Fig. 1, the film strip illustrated therein comprises a base 1 of transparent material such as celluloid. On the base 1 there is an intermediate layer 2 of another transparent material which is softer than celluloid and which has a degree of softness such that it can be cut into by the recording stylus. This material may be gelatin, soap, wax or the like. The layer 2 has an opaque surfacing 3 which may be produced by paint, dye or the like.

The openings shown at 4 are the usual sprocket wheel openings for guiding the film strip through the sound recording machine.

When sound is recorded on a blank of the kind shown in Fig. 1 by the mechanical recording method described above a transparent sound track of the kind shown at 5 in Fig. 2 will be formed. Of course the configuration of the sound track will depend upon the nature of the recorded sound, the particular sound track illustrated having a configuration such as might be caused by a single frequency note of say 60 cycles. The sound track is of the hill-and-dale type due to the fact that the wedge-shaped cutting stylus is vibrated in a direction normal to the surface of the blank but this movement of the stylus will also vary the width of the sound track, the width being greater when the depth is greater and vice versa. In reproducing the sound the hill-and-dale characteristic of the sound track, i. e., its varying depth, is not made use of. It is only the transparent nature of the sound track and its varying width that are made use of in the reproduction of sound in the optical reproducing system. It can be seen from the nature of the sound track in Fig. 2 that the recording stylus cuts through the opaque coating 3 and into the intermediate layer 2 of transparent material. If it were not for the intermediate layer 2 which is of softer material than the celluloid base 1, the point of the stylus would have to cut into the celluloid and this might offer too much resistance to the movement of the stylus. The intermediate layer 2 is preferably of such thickness that for the maximum movement of the recording stylus the groove will not reach the celluloid base 1. I have found it preferable to make the layer 2 at least ½ mil. in thickness, the best results thus far having been obtained with a thickness of 1½ to 2 mils. If desired, a record blank of the kind shown in Fig. 1 can be made from a strip of moving picture negative film. Such a film has a celluloid base similar to that shown at 1, a layer of gelatin similar to that shown at 2 and a surface coating of photographic emulsion. By exposing and developing such a strip of negative film the photographic emulsion is rendered opaque. If a record blank made in this way is to be used, the groove made by the recording stylus should be shallow if the celluloid base 1 is not to be cut into because the intermediate layer of gelatin in the moving picture negative films now in use is not very thick. To permit of a sound track of greater depth, a specially prepared negative film may be made having a gelatin layer 2 of the required thickness, say ½ to 2 mils. The photographic emulsion on the surface of the gelatin layer may be exposed and developed to render the surface opaque and a quite satisfactory record blank can thus be obtained.

In the record blank shown in Fig. 3 there is only one material below the opaque coating 3. This material shown at 7 may be cellophane, gelatin or the like and is soft enough to permit the cutting stylus to cut into it after the opaque coating has been penetrated and at the same time has sufficient body to act as a base. The opaque coating or surfacing may be produced by paint, dye or the like, or it may be a photographic emulsion which has been exposed and developed.

In the co-pending application above referred to there is described an alternative method of mechanically cutting the sound track in the film according to which the stylus has a cutting edge parallel with the general surface of the film strip and the film is pre-formed so that it will have a longitudinal rib or crest. Fig. 4 shows a record blank suitable for use in such a method. It may be similar in all respects to that shown in Fig. 1 or Fig. 3 except that it has been pre-formed to have a longitudinal rib or crest 6. The vibration of the stylus, even though it has a cutting edge parallel to the general plane of the record blank, will cut into the crest 6 to depths which vary in accordance with the sound being recorded and this will produce in the opaque coating 3 a transparent sound track of the same kind as shown at 5 in Fig. 2.

As stated above, the record blank need not be in the form of a film strip but may take other forms such as a disc or cylinder. It is, therefore, not essential that the base 1 be made of celluloid as it might be made of some other transparent material such as glass or cellophane.

I claim:

1. A sound record blank adapted to receive a sound track capable of optical reproduction, said blank having an opaque surfacing and a layer of transparent material below and adjacent to the opaque surfacing, the transparent material having a degree of softness such that it may be cut into by a recording stylus and having a thickness sufficient to receive a sound track having vertical undulations.

2. A sound record blank adapted to receive a sound track capable of optical reproduction, comprising a base of transparent material, an intermediate layer of transparent material on the base, and an opaque surfacing on said intermediate layer, the material comprising the intermediate layer being of softer composition than the material of the base and having a thickness sufficient to receive a sound track having vertical undulations.

3. A sound record blank adapted to receive a sound track capable of optical re-

production, said blank being in the form of a flexible strip and comprising a base of transparent material, an intermediate layer of transparent material, and an opaque surfacing, the material of the intermediate layer being of softer composition than the material of the base.

4. A sound record blank adapted to receive a sound track capable of optical reproduction comprising a layer of transparent material having an opaque surfacing consisting of an exposed and developed photographic emulsion, the material of the transparent layer having a degree of softness such that it may be cut into by a recording stylus.

5. A sound record blank adapted to receive a sound track capable of optical reproduction, said blank having the form of a flexible strip and comprising a base of transparent material, an intermediate layer of a transparent material which is of softer composition than the material of the base, and an opaque surfacing consisting of a photographic emulsion which has been exposed and developed.

6. A sound record blank in accordance with claim 5 in which the intermediate layer is at least ½ mil. in thickness.

7. A sound record blank adapted to receive a sound track capable of optical reproduction, said blank having the form of a flexible strip and comprising a base of celluloid, an intermediate layer of gelatin, and an opaque surfacing.

8. A sound record blank in accordance with claim 7 in which the opaque surfacing consists in a photographic emulsion which has been exposed and developed.

9. A sound record blank adapted to receive a sound track capable of optical reproduction, said blank having an opaque surfacing and a layer of transparent material below and adjacent to the opaque surfacing, said transparent material having a degree of softness such that it may be cut into by a recording stylus, and the record blank being pre-formed to provide it with a longitudinal rib.

10. A sound record blank adapted to receive a sound track capable of optical reproduction, said blank comprising a base of celluloid, an intermediate layer of gelatine, and an opaque surfacing.

11. A sound record blank adapted to receive a sound track capable of optical reproduction, said blank comprising a transparent base, an intermediate layer of gelatine, and an opaque surfacing.

In testimony whereof I affix my signature.

JAMES A. MILLER.