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DEVICE FOR MECHANICAL RECORDING

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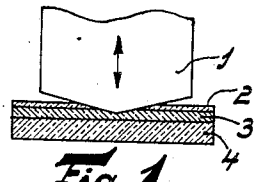


Fig. 1

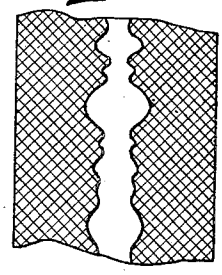


Fig. 2

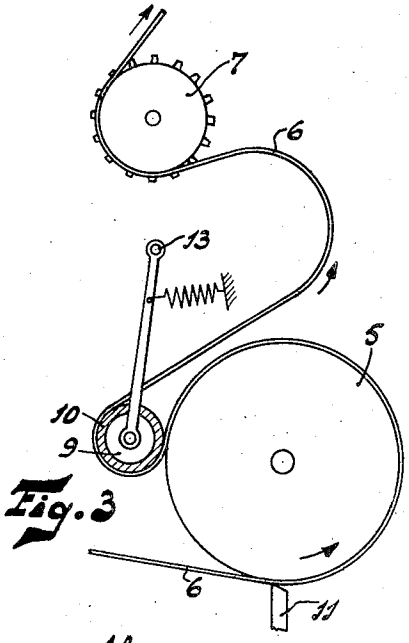


Fig. 3

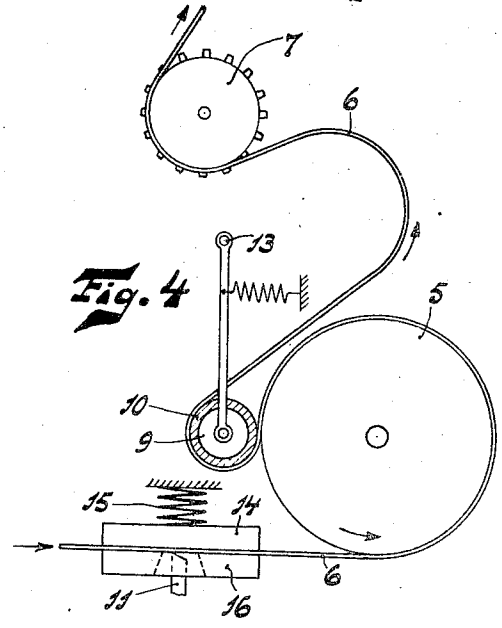


Fig. 4

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DEVICE FOR MECHANICAL RECORDING

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1 Claim. (Cl. 274—11)

Our invention relates to a device for mechanical recording oscillations, particularly sound vibrations, on a film. Our invention is particularly advantageous in connection with mechanical recording systems in which a recording member is vibrated normally or substantially normally to the surface of a film to produce therein an optically-reproducible track whose width variations are an enlargement of corresponding depth variations.

For this purpose it is known to use a recording tool having a V-shaped cutting edge enclosing an angle of about 174°, which tool cuts through an opaque top-layer into a transparent recording layer which is preferably applied to a likewise transparent carrying layer. The track so produced has width variations which are about 40 times larger than the depths variations whereby oscillations of small amplitudes, more particularly those of the higher frequencies, can also be recorded in a satisfactory manner.

In such recording the maximum enlargement is about 40 times, and if the track has a maximum width of about 2 millimeters, the maximum cutting depth will be about 50μ, the average cutting depth will be about 25μ, and the width of the chisel about 2.5 millimeters. There will be a high cutting resistance in recording such a track which will tend to move the film with respect to the member driving same.

To eliminate this drawback the film is usually moved past the recording point by a cogged driving drum, and the recording takes place either on this drum or by means of a special device. According to the U. S. Patent #2,063,560 to Willem Six the influence of the thickness variations of the film is eliminated by moving the film in the vicinity of the recording point over a support located on the side of the recording member. The surface of the film in which the record is formed is in contact with the support, and the film is pressed against the support with a force exceeding the force exerted on the film by the recording member.

With the use of such devices, the cogs of the driving drum are a source of trouble as they do not exactly correspond to socket holes with the result that the film is periodically displaced on the drum.

According to the invention, the above difficulties are eliminated by moving the film, at the point of recording or in the neighbourhood thereof, by means of a smooth (uncogged) drum provided with an unyielding surface and driven by a driving mechanism so as to rotate at a substantially constant speed. Furthermore we provide at least at the point at which the film leaves the drum, a pressing roller which presses the film against the drum with a force of preferably about 1000 grams. The surface of the pressing roller should preferably be not smooth but may be provided with a coating of a material such as rubber, to increase friction between the surface of the roller and the film.

A pressing roller may also be provided on the side at which the film engages the drum. However, if the recording operation takes place at the point at which the driving drum is situated, it is sufficient to have the required pressure between the film and the drum exerted by the recording member, which is mounted in this case as close as possible to the point at which the film first comes into contact with the driving drum.

We have found that the invention eliminates not only the harmful influence of the cog frequency but also the danger of slippage between the roller and the film, in spite of the fact that it was believed necessary to use a cogged driving drum when the film was loaded to such an extent.

The invention renders it possible to ensure with the aid of simple means a faultless mechanical sound recording by means of a smooth roller, which has not been possible up to now in any way.

We are aware that in the optical recording and reproducing of sound vibrations, it has been proposed to eliminate the disadvantages of cogged driving drums by using a smooth-faced driving drum. Furthermore, it has been proposed to use a smooth-faced driving drum in mechanical recording and to hold the film against the drum by means of suction or by magnetic force, or by pressing the film against the drum with a cap member having a surface corresponding to the surface of the drum; however such means have been complicated and ineffective especially in mechanical recording of the above-mentioned type.

In the device according to the invention the recording member need not be mounted so that the recording takes place on the driving drum, but it is also possible to mount before the driving drum, viewed in the direction of travel of the film, a device as described in the above-mentioned patent in which the recording operation takes place.

Not only the cogs of the film rollers but also those of cog wheels, worm wheels and the like may give rise to the production of disturbing

frequencies in the record. It is therefore advisable to avoid in the drive of the smooth drum, toothed or similar gearings which produce periodical disturbances.

The invention will be explained more fully with reference to the accompanying drawing in which

Figure 1 is a sectional view of a carrier and shows a recording tool cutting a track therein;

Fig. 2 is a plan view of the carrier of Fig. 1 with a mechanically-recorded track;

Fig. 3 is a diagrammatic view of a recording device according to the invention in which the recording is effected on the driving drum.

Fig. 4 is a diagrammatic view of a recording device in which the recording operation takes place at a point near the driving roller.

The film shown in Fig. 1 consists of a carrying layer 4, e. g. of Celluloid, to which is applied a cutting layer 3 which is provided in its turn with a top layer 2. The recording member 1, which is formed as a chisel having a V-shaped cutting edge, vibrates in the direction of the arrow, i. e. normally to the surface of the film in accordance with the oscillations to be recorded. The film travels normally to the plane of the drawing at a uniform speed whereby tool 1 produces an oscillation track as shown in Figure 2. This track shows depth variations and similar width variations which are about 40 times larger than the depth variations owing to the fact that the angle between the limbs of the V-shaped cutting edge of the chisel differs only slightly from 180°. As shown in Figure 1, the angle of the cutting edge is considerably less than actual size to clarify the illustration.

In Figure 3, reference numeral 5 denotes the driving drum which is driven at a uniform speed. A film 6, which may be the film shown in Figure 2, is caused by drum 5 to travel to a driven cogged roller 7 via a pressing roller 9 mounted behind the drum in the direction of travel of the film. The pressing roller 9 is preferably provided with a rubber sheath 10. Reference numeral 11 indicates the recording member which may be the cutting tool of Fig. 1, whereas reference numeral 13 denotes the fixed pivot of the spring-biased lever for the pressing roller.

In Figure 4 the members corresponding to those shown in the form of construction of Figure 3 are denoted by the same reference numerals. Contrary to the construction shown in Figure 3, the recording operation takes place before film reaches the smooth drum 5. For this purpose the film passes over a cover plate 14 backed by a compression spring 15 and is forced with the side in which the record has to be formed against a stationary support 16. Owing to this arrangement, the mutual positions of the film surface and of the recording member 11 are completely determined and variations of the mutual positions due to variations in the thickness of the film are completely avoided.

What we claim is:

A device for mechanically recording sound on a film comprising means for moving the film at a substantially constant speed comprising a driving drum having a smooth cylindrical surface, said film being in contact with a portion of said surface, recording means for producing in said film before it reaches said drum a sound track having width variations which are a proportional enlargement of the depth variations, said recording means comprising a cutting tool having a V-shaped cutting edge, a stationary member provided with an aperture for the passage of said tool, and means including a movable pressing member to press the film against said stationary member, and means to prevent slippage of said film upon said surface comprising a roller pressing the film against the surface at the point at which the film leaves the surface.

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