

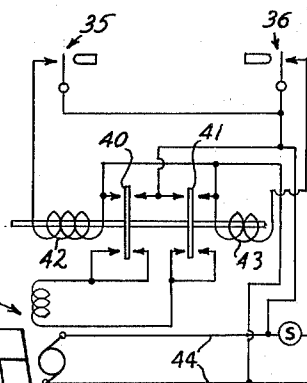
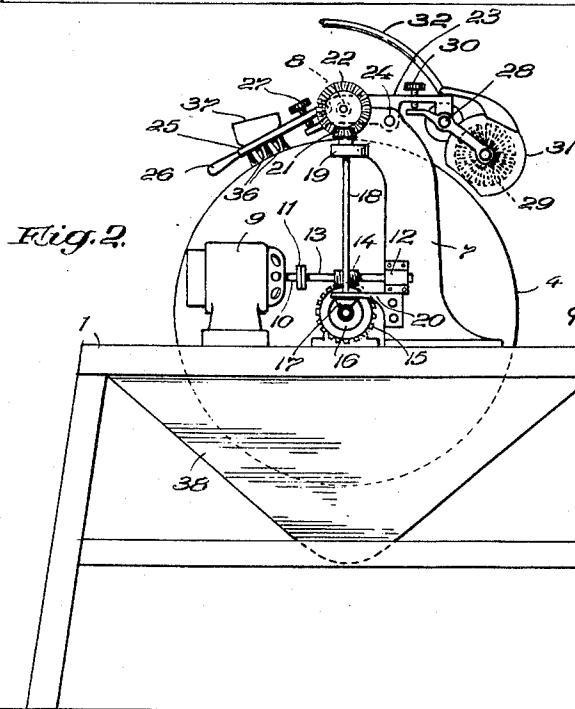
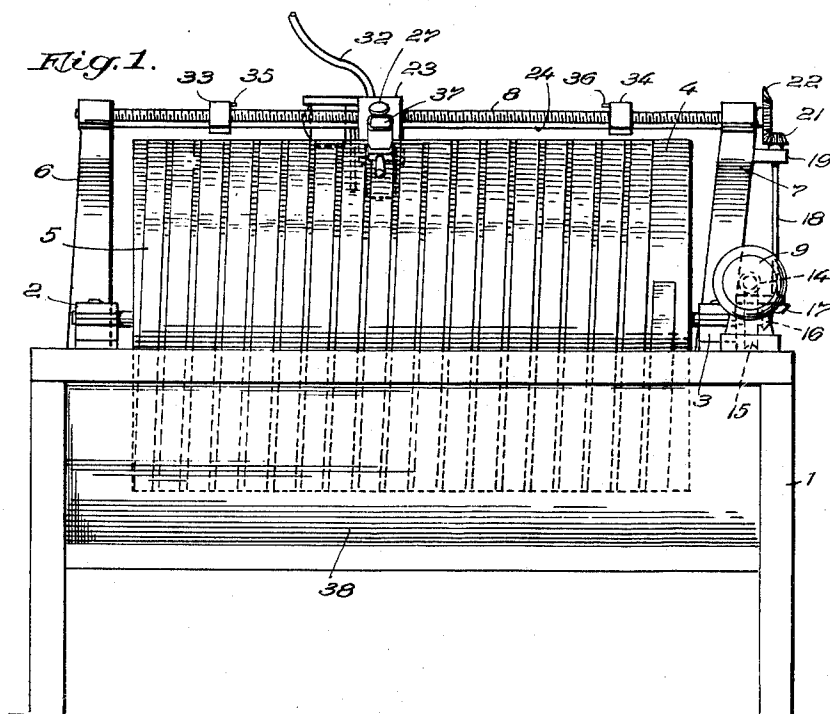
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METHOD OF COATING WAX BANDS, BEARING A MECHANICAL SOUND RECORD,
WITH GRAPHITE, AND A DEVICE FOR CARRYING OUT THIS METHOD

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METHOD OF COATING WAX BANDS, BEARING A MECHANICAL SOUND RECORD, WITH GRAPHITE, AND A DEVICE FOR CARRYING OUT THIS METHOD

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10 Claims. (Cl. 117—21)

The invention relates to a method of coating wax bands, bearing a mechanical sound record, with graphite, and to a device for carrying out this method. It relates particularly to a method and a device for coating bands consisting of a flexible carrier layer with a thin wax layer deposited thereon and bearing the sound record, a number of coadjacent sound grooves being cut into the surface of said wax layer, by means of a stylus, parallel or nearly parallel to the edge of the band. In the present case, the coating with graphite serves the purpose, known per se, of making the recorded surface of the original sound carrier electrically conductive so that it is possible to produce a matrix thereof in a galvanic bath.

For a long time, a known proposal has been to coat the surface of original sound bands, whose sound record layer consists of wax, with graphite; but a suitable method of carrying out such coating with graphite is lacking. Hitherto, coating short pieces of sound bands with graphite could be carried out manually so as to make it possible to produce a matrix in a galvanic bath; but in coating long sound bands with graphite, it was found that certain portions of the surface would not readily take the galvanic coating although the graphite coating of these portions of the wax band showed a glossy, metallic black surface.

Investigations have proved that this difficulty is due to the fact that said portions of the surface of the wax band have been overpolished, that is, the graphite has been pressed so much into the wax and has been smeared over with fine wax to such an extent that the individual graphite particles have become highly isolated. Since the adhesion and stickiness of wax is very considerable, it is impossible, even by repeatedly brushing over, to remove a graphite particle, surrounded by wax, out of its position.

According to the present invention, this difficulty is obviated in coating the sound band with graphite by continually and uniformly polishing the graphite powder applied to the recorded surface of the sound band by uniform strokes extending over the entire length of the band until the latter has acquired a glossy, metallic black appearance. By the polishing strokes extending over the whole length of the band, the result is attained that all parts of the surface of the sound band are treated for a certain uniform period by the graphite coating tool, which advantageously consists of a camels-hair brush; and when the surface of the wax band has acquired a glossy,

metallic black appearance, the polishing with graphite powder is finished and the wax band is ready for the galvanic treatment. To continue the polishing with the graphite coating tool after this state has been reached is not only useless but detrimental because it leads to said overpolishing of the band.

In order to save space, the invention provides for winding the recorded original sound band helically upon a drum in a manner known per se, and for moving a polishing brush, which is continuously supplied with graphite powder, along the drum in accordance with the rotation of the drum and with the pitch of the helical line formed by the sound band. The excess of graphite particles between the contours of the sound grooves is removed according to the invention by means of a rotating brush and is carried off from the surface of the sound band by means of a suction device.

For carrying out the said method, the invention provides a device having, parallel to the axis of a drum and serving to helically wind upon it the original sound band, a guide upon which there is arranged, shiftable in longitudinal direction, a polishing brush serving to spread the graphite powder applied to the surface of the wax band. The device for supplying the graphite is preferably built into the polishing brush. Advantageously, the polishing brush is movable and adjustable in a radial direction relative to the drum. In addition, the invention provides that the guide running parallel to the axis of the drum carries, besides the polishing brush, also the rotating brush for removing the excess of graphite particles and the suction device required therefor. The polishing brush, the rotating brush, and the suction device are advantageously fixed to a common slide.

In order to simplify the driving of the graphite coating device, the guide lying parallel to the axis of the drum may consist of a screw spindle having a common drive with the drum. It is advisable to effect the driving by a direct current motor provided with a pole reversing device controlled by the slide of the graphite coating device and serving to change the direction of rotation of the motor, said pole reversing device comprising two contacts adjustable along the spindle, so that it is possible to bring the reversing points of the graphite coating brush in the simplest manner into positions to correspond to the length of the band to be coated with graphite.

A constructional example of a graphite coating device according to the invention is illus-

trated in the accompanying drawing, in which:

Fig. 1 is a front view of the device,

Fig. 2 is an elevational view as seen from the right in Fig. 1, and

Fig. 3 is a circuit diagram.

On a frame 1 there is supported in two bearings 2, 3 a drum 4 upon which the wax band 5 with the sound grooves is wound in a helical line. The frame 1 also carries two bearing brackets 6, 7 holding a screw spindle 8 parallel to the axis of the drum 4. This spindle and the drum are driven by a common motor 9, advantageously a direct current motor, whose shaft 10 is connected via a coupling 11 with a shaft 12 supported at 12 in the bearing bracket 7. On the shaft 12 there is a worm 14 engaging a worm wheel 15 carried by the shaft 2 of the drum. The shaft of the drum carries a bevel wheel 16 engaging a bevel wheel 17 attached to the lower end of a vertical shaft 18, which is supported in lateral projections of the bearing bracket 7. At the upper end of shaft 18 there is a bevel wheel 21 engaging a bevel wheel 22, which is attached to the spindle 8.

The spindle 8 also carries a slide 23 with a corresponding internal thread, said slide being prevented from turning with the spindle by a rod 24, around which it extends, the rod 24 running parallel to the spindle 8 between the bearing brackets 6, 7. The slide carries a brush 25 with camel hair bristles, the brush being linked to the slide and folding upwards by means of a handle 26 or downwards into an end position, in which it is suspended over the drum 4 and may be accurately adjusted with respect to the drum by means of an adjusting screw 27.

The slide also carries a disc-shaped brush 29 having bristles at its circumference and being rotatably supported at 28. The brush 29 may be driven in any suitable manner, for example via a flexible shaft or by means of an auxiliary motor, and is also adjustable by means of an adjusting screw 30 with respect to the drum 4. The brush 29 is disposed in a housing 31 which is open towards the drum 4 in order to give the brush access to the drum. A suction piping 32 is attached to the housing 31.

On the screw spindle 8, at both sides of the slides 23, there are arranged runners 33, 34 shiftable along the spindle and adjustable, each runner being provided with a switch 35 and 36 respectively. These switch runners form a part of a pole reversing device of the direct current motor 9 and are inserted in the circuit of the motor in such a manner that, when the brush slide, in its movement along the spindle 8, knocks against one of the switches, the direction of rotation of the armature of the motor is reversed.

A suitable pole-reversing arrangement is shown in Fig. 3, in which the electric motor 9 has its field connected to contactors selectively engaged by the conductive bridges 40, 41 of a relay having the opposed energizing coils 42, 43. A source of current 44 is connected to the armature of the motor, to other contactors cooperative with the bridges 40, 41, and to the blade elements of the normally-open switches 35, 36. The fixed contactors of the switches 35, 36 are connected to the coils 42, 43. In operation, when the switch 35 is actuated by the slide 27 at the intended end of its travel toward the left in Fig. 1, an energizing circuit is established through the coil 42 and the relay reverses the contact or connection so that the field of the motor 9 is reversed, and

the motor is brought to a standstill and then to reversed rotation, so that the slide travels back toward the right. Ultimately, switch 36 is actuated, coil 43 is energized, and the relay acts again to reverse the direction of motor rotation. It will be understood that this conventional showing illustrates one form of reversing means known in the art, and that other forms may be employed.

When starting the graphite coating device, all brushes are at first screwed up. Then the wax band is wound upon the graphite coating drum, during which operation it should be absolutely avoided to touch the wax surface with the hand. At certain distances the wax band is fixed at its unwaxed edge to the drum by means of clips (not illustrated). When the wax band is completely wound upon the drum, the motor 9 is switched on and the wax band is slightly polished with some wadding. Thereupon some graphite is strewn on wadding, and the band is once more polished slightly. After this preliminary treatment, the switch runners 33, 34 are adjusted to the length of the band, and the brush 25 is carefully screwed down so far that the points of the bristles are only slightly bent. Into the brush 25 there is built a funnel 37 having a number of outlets 36a between the bundles of bristles. The funnel 37 is continually fed with graphite powder, which the brush spreads uniformly over the wax surface. Since the drum 4 rotates without interruption and the brush slide is moved along the drum according to the pitch of the helical line formed by the wax band, the brush performs a polishing stroke extending from the beginning (at the left in Fig. 1) to the end (at the right in Fig. 1) of the wax band. When the brush arrives at the end of the band, the brush slide knocks against the switch 35 and causes the direction of rotation of the motor 9 to be reversed, which also reverses the direction of rotation of the drum 4 and of the screw spindle 8. Then the brush 25 performs the next polishing stroke from the end towards the beginning of the wax band. When the brush arrives at the beginning of the band, the slide knocks against the switch 36, which again causes the direction of rotation of the motor 9 to be reversed, etc.

The time required for the graphite coating operation depends upon the length of the band and the circumferential velocity of the graphite coating drum. The band is properly coated with graphite when its surface has a glossy, metallic black appearance. When this state is reached, it is absolutely necessary to stop the coating with graphite, as otherwise the band will be overpolished.

When the wax band is perfectly coated with graphite, the brush 25 is screwed up, the rotating disc-shaped brush 29 is screwed down, and the suction device is put into operation. The brush 29 exclusively serves to brush out the graphite particles between the contours of the recorded wax band, these particles being drawn out by the air current of the suction device so as to prevent them from settling again on the surface of the wax band. After the entire surface of the wax band has been brushed out and the excess of graphite particles has been sucked off, the whole graphite coating device is put out of operation.

The graphite coating drum is enclosed at the bottom by a box 38, in which the excess of the graphite powder, that has fallen off from the wax band, is collected. This waste of graphite

powder is suitable to a limited extent to be used again in the coating process. However, repeatedly used graphite has a considerably reduced conductivity, for which reason it is necessary to continuously add new graphite. The bad state of the graphite is caused by the burning of the pure graphite and the presence of impurities, such as soot, etc. Therefore, the graphite collected in the box 38 is passed through a very fine strainer and is then mixed with new graphite in the proportion of 1 to 3. The graphite employed must have a fineness of grain amounting to 0.6 to 0.8 of a thousandth part of a millimeter.

What is claimed, is:

1. A method of coating wax bands, which comprises supplying graphite powder onto the recorded surface of the wax band, and uniformly polishing the said powder into position by uniform strokes each extending substantially parallel to and for the whole length of the band until the band has assumed a glossy, metallic black appearance.

2. A method of coating wax bands, which comprises supplying graphite powder successively to restricted portions of the band, and brushing the graphite out of the band by continuous uniform strokes each extending substantially parallel to the end for the whole length of the band, alternated strokes being performed in opposite directions along the length of the band.

3. A method of coating a wax band with graphite, which comprises winding the band into a helix, applying graphite powder successively to restricted portions of the length of the band, and brushing the graphite onto the band by continuous uniform strokes each extending substantially parallel to and for the whole length of the band.

4. A method of coating a wax band with graphite, which comprises winding the band into a helix, rotating the helix about its axis, applying graphite powder to a restricted portion of the length of the band, traversing said application point uniformly along the length of the helix while the same is rotating, and brushing the graphite onto the band by continuous uniform strokes each extending substantially parallel to and for the whole length of the band.

5. A method as in claim 4, in which the turns of the band for forming the helix are spaced apart, and including the step of brushing the graphite from between the convolutions of the helix as it rotates.

6. An apparatus for graphiting a wax band,

comprising a frame, a support rotatable upon the frame and receiving the band in the form of a helix, means for applying graphite powder to the band, a guide extending parallel to the axis of the support, a slider on said guide, means for moving the slider back and forth on said guide, an arm pivoted to the slider, a brush mounted on said arm, and means for regulating the radial position of the arm and brush relative to the axis of the support.

7. An apparatus for graphiting a wax band, comprising a frame, a support rotatable upon the frame and receiving the band in the form of a helix, a guide extending parallel to the axis of the support, a slider on said guide, a polishing brush mounted on said slider, a rotating brush mounted on said slider for displacing excess graphite from between the turns of the helix, and coordinated means for rotating said support alternatively in opposite directions and for moving the slider back and forth along the length of the support at a rate proportioned to the pitch of the helix at a speed of rotation of the support so that the polishing brush is caused to perform strokes parallel to the length of the band and extending for substantially its whole length.

8. An apparatus as in claim 7, including a suction device having an inlet positioned adjacent the rotating brush for removing the displaced excess graphite.

9. An apparatus for graphiting a wax band, comprising a frame, a support rotatable upon the frame and receiving the band in the form of a helix, reversible drive means for rotating the support, a slider movable parallel to the axis of the support, a brush mounted on the slider a rotatable screw spindle engaged with the slider and positioned parallel to the axis of the support and connected to said reversible drive whereby to move the slider back and forth, the pitch of the screw and the speed ratio in said drive connection being coordinated with the pitch of the helix so that the brush is thereby moved back and forth along the length of the support and caused to perform strokes each of which is essentially parallel to the length of the band and extends for substantially the whole length thereof.

10. An apparatus as in claim 9, in which the reversible means includes switch devices adjustably positioned for engagement by the slider when the brush attains the ends of the bands and effective for producing reversal of the drive.

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