

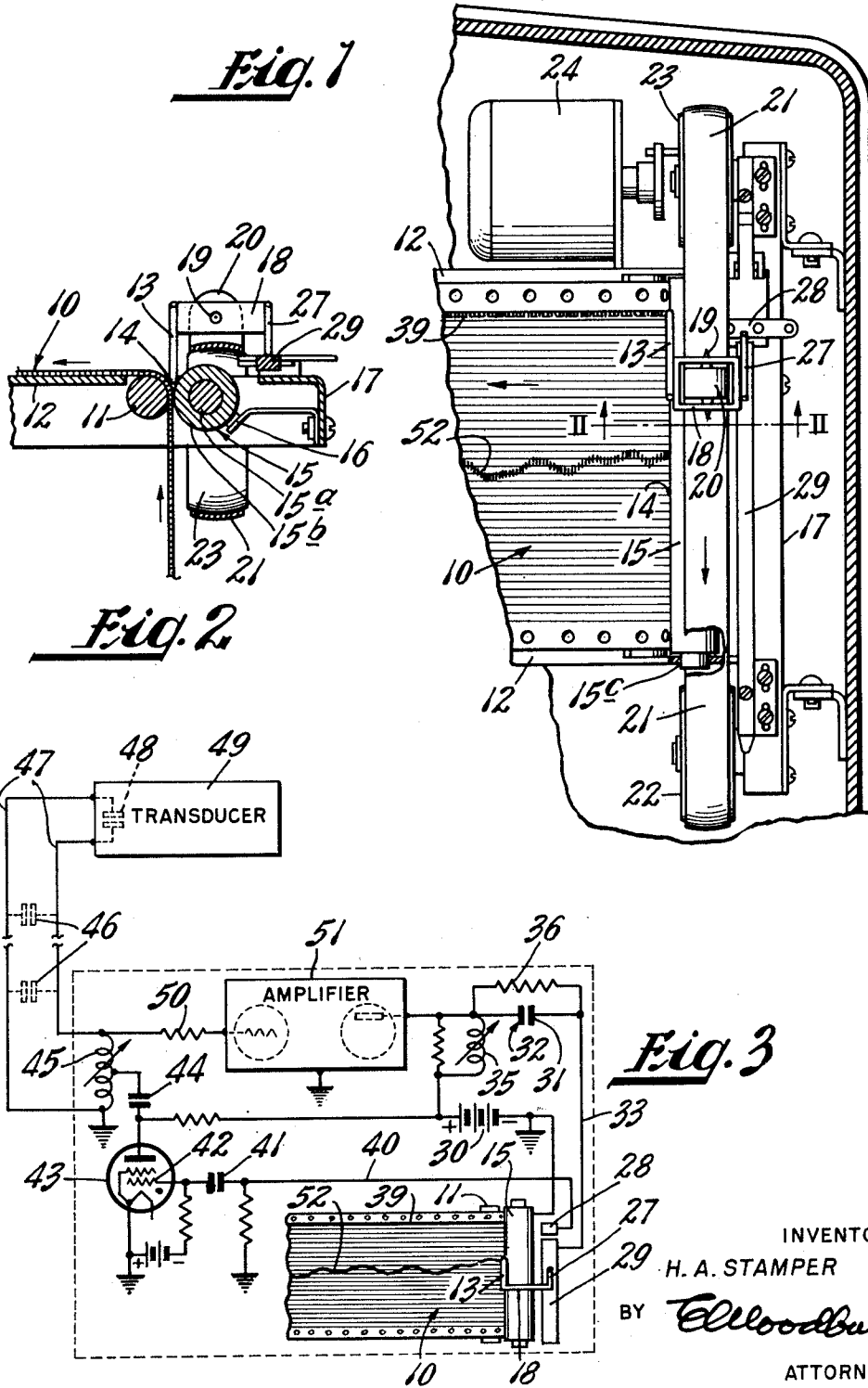
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ELECTRIC RECORDING APPARATUS

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ELECTRIC RECORDING APPARATUS

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This invention relates to marking on paper by an electric discharge and has as an object to provide a practicable and inexpensive apparatus for electrically marking ordinary paper.

It is common in various recording instruments, such as are used in depth recording and picture transmission, to drag an electrically conductive stylus across a special paper, which responds to an electric discharge from the stylus to make a visible mark.

The present invention provides for electrical recording on ordinary paper by producing the electrical discharge, not between the stylus and the paper, but between the stylus and a special electrode positioned close to the paper surface. In practice, it is convenient to pull the paper (in the form of a tape) between a guide rod and a roller of carbonaceous material, the tape being bent around the guide rod so that a channel or groove is formed between the paper on one side and the carbonaceous roller on the other side. The stylus is moved along this groove in contact with the paper and with the roller, and the marking potential is applied between the stylus and roller. Because of the high contact resistance between the stylus and roller, the application of the potential produces a flash or arc therebetween which smudges the adjacent portion of the paper (which is separated from the flash by less than the width of the stylus wire).

A full understanding of the invention may be had from the following detailed description which refers to the drawing.

In the drawing,

Fig. 1 is a front elevation of a portion of a depth recorder incorporating the invention, the case being shown in section;

Fig. 2 is a horizontal section, looking upward in the plane II—II of Fig. 1; and

Fig. 3 is a schematic diagram showing the electrical circuit of the system.

Referring to Figs. 1 and 2, there is shown a paper tape 10 upon which a depth record is to be made. This paper is fed in the direction indicated by the arrow in Fig. 2, from a spool that is not shown, around a guide rod 11 which changes the direction of flow of the paper substantially 90°. Thereafter, the paper is drawn across a back plate 12, and the portion of the paper in the stretch extending in front of the plate 12 visibly displays the record that has been formed on the paper tape.

Marks are recorded on the paper tape by a stylus 13 that rides in a groove or channel 14 that is defined between the convex portion of the paper 10 where it is wrapped around the

guide rod 11, and a conductive element 15 which is juxtaposed to the rod 11 on the other side of the paper. The conductive element 15 is in the form of a cylinder which is supported for free rotation in bearings 15c at its opposite ends. The member 15 may consist of a metal core 15a surrounded by an envelope 15b of some relatively resistive material such as a compressed mixture of graphite and clay, or the like. The member 15 may be grounded by a brush 16 which bears against its periphery and is connected to the frame 17.

The mounting of the stylus 13 does not constitute a part of the present invention, but may consist of a carriage 18 pivotally supported on opposite ends of a pivot member 19 that extends through a rubber block 20 mounted upon a belt 21. The belt 21 is stretched between pulleys 22 and 23 respectively, one of which (23 in this instance) is driven by a constant speed electric motor 24. The stylus 13 is mounted upon one side of the carriage 18, and a brush 27 is mounted upon the opposite side of the carriage 18 and rides across a starting segment 28, and then across a conductive track or segment 29, the brush 27 remaining in contact with the segments 28 and 29 throughout the traverse by the stylus 13 of the paper tape 10.

The operation of the system will now be explained in connection with the schematic diagram of Fig. 3. Let it be assumed that the motor 24 is operating at constant speed to drive the belt 21 in such direction as to periodically sweep the stylus 13 through the channel 14 defined between the paper tape, and the conductive element 15, and simultaneously causes the brush 27 to traverse the segments 28 and 29. As the brush 27 passes from the starting segment 28 onto the segment 29, it momentarily connects them together. Referring to Fig. 3, this permits application of a positive potential from the plate 31 of a condenser 32, through a conductor 33, through the segment 29, the brush 27, the carriage 18, and the stylus 13, thence from the stylus to the conductive member 15, to ground. The electrode 31 of the condenser 32 is normally charged to a high potential, being connected to the positive terminal of a battery 39, through a reactance element 35 and a resistor 36. The described discharge from the stylus 13 to the conductive member 15 produces a baseline 39 on the paper tape 10. At the same time, the high potential of the segment 29 is applied to the starting segment 28 and thence over a conductor 40 and through a condenser 41 to the control grid 42 of a tube 43, causing the latter

to become conductive and permit discharge of a condenser 44, which shocks an oscillation circuit consisting of a reactance 45, the distributed capacitance 46 of the transmission line 47, and the internal capacity 48 of a transducer 49. A damped train of oscillations is set up in the circuit including the reactance 45, the transmission line 47 and the transducer 49, energizing the transducer to send out sonic waves of corresponding frequencies, which waves are reflected from an object, such as the bottom of a body of water. The reflected wave is received by the transducer, converted into electrical impulses, and transmitted over the transmission line 47 to the reactor 45 from which it is applied through a resistor 50 to the input of an amplifier 51. The output of the amplifier 51 is connected through the condenser 32, the segment 29, the brush 27, and the carriage 18, to the stylus 13, so that the impulse is discharged through the stylus 13 to the conductive member 15, causing another mark 52 to be produced on the tape 10, which mark is indicative of the distance from the transducer 49 to the point of reflection.

The marking of the paper may result from a smudging effect produced by the discharge between the stylus 13 and the conductive member 15 because of the close proximity of the paper tape 10 to the discharge. Thus, as shown in Fig. 2, the stylus 13 rests against the paper 10 forming one side of the groove 14, and against the member 15 forming the other side of the groove. The stylus wears in service, so that it becomes relatively sharp at the tip, thereby causing the space between the paper and the discharge to be very small. The marking may also be produced by the direct heating effect of the discharge on the paper, and this effect can be utilized to increased advantage by heat-sensitive coating on the paper. Such a coating may consist of equal parts of cuprous iodide and mercuric chloride in light varnish which turn from red to brown between 130° F. to 160° F.

The discharge produces a certain wearing or disintegration of the surface of the conductive member 15, and for this reason it is desirable to form this member as a cylinder and permit it to be rotated by movement of the paper tape 10 therepast, so that a new surface is being continually presented to the stylus 13.

A carbonaceous material has been found in practice to be suitable for the conductive element 15, because it produces a slight arc or burning effect at the time of discharge, without overheating the stylus and causing rapid wearing away thereof. However, while carbonaceous materials have been found especially satisfactory in practice, the invention is not limited to such materials. It appears that the important essential characteristic of the member 15 is that it have a relatively high resistivity compared to the stylus 13 so that the electrical discharge will produce a substantial heating of the surface of the member 15 at its point of contact with the stylus 13.

Although for the purpose of explaining the invention, a particular embodiment thereof has been shown and described, obvious modifications will occur to a person skilled in the art, 70

and I do not desire to be limited to the exact details shown and described.

I claim:

1. Electric recording apparatus comprising:
5 a record blank and means for supporting it and moving it through a predetermined path; a contact member independent of said record blank and of electrically conductive material having a stylus-contacting surface extending
10 transversely across said path parallel to and in close proximity to one face of said record blank; an electrically conductive stylus on the same side of said record blank as said contact member and means for traversing said stylus along
15 said stylus-contacting surface of said contact member; and means for applying a marking potential between said stylus and said contact member to produce a recording current between the stylus and the contact member.

2. Apparatus according to claim 1 in which said contact member has high resistivity relative to said stylus, whereby flow of said recording current in said stylus and contact member
20 at the point of contact thereof by said stylus generates more heat in said contact member than in said stylus.

3. Apparatus according to claim 1 in which said contact member is of carbonaceous material.

4. Apparatus according to claim 1 in which
30 said contact member is of curved cross section substantially in contact with said record blank, whereby it defines with said record blank a channel for guiding said stylus.

5. Apparatus according to claim 4 in which
35 said contact member is cylindrical.

6. Apparatus according to claim 5 in which said cylindrical contact member is rotatably supported.

7. Apparatus according to claim 6 in which
40 said rotatable cylindrical contact member is in contact with said record blank whereby it is rotated by movement of the record blank therepast.

8. Apparatus according to claim 1 in which
45 said means for supporting said record blank comprises: a guide member extending parallel to and on the opposite side of said record blank from said contact member, and means for drawing said record blank between said guide and
50 contact members and around said guide member away from said contact member, that portion of said record blank in closest proximity to said stylus-contacting surface of said contact member being backed by said guide member.

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