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RECORDER SYSTEM WITH ELECTROMAGNETICALLY ATTRACTED ELECTRIC STYLUS

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FIG. 1

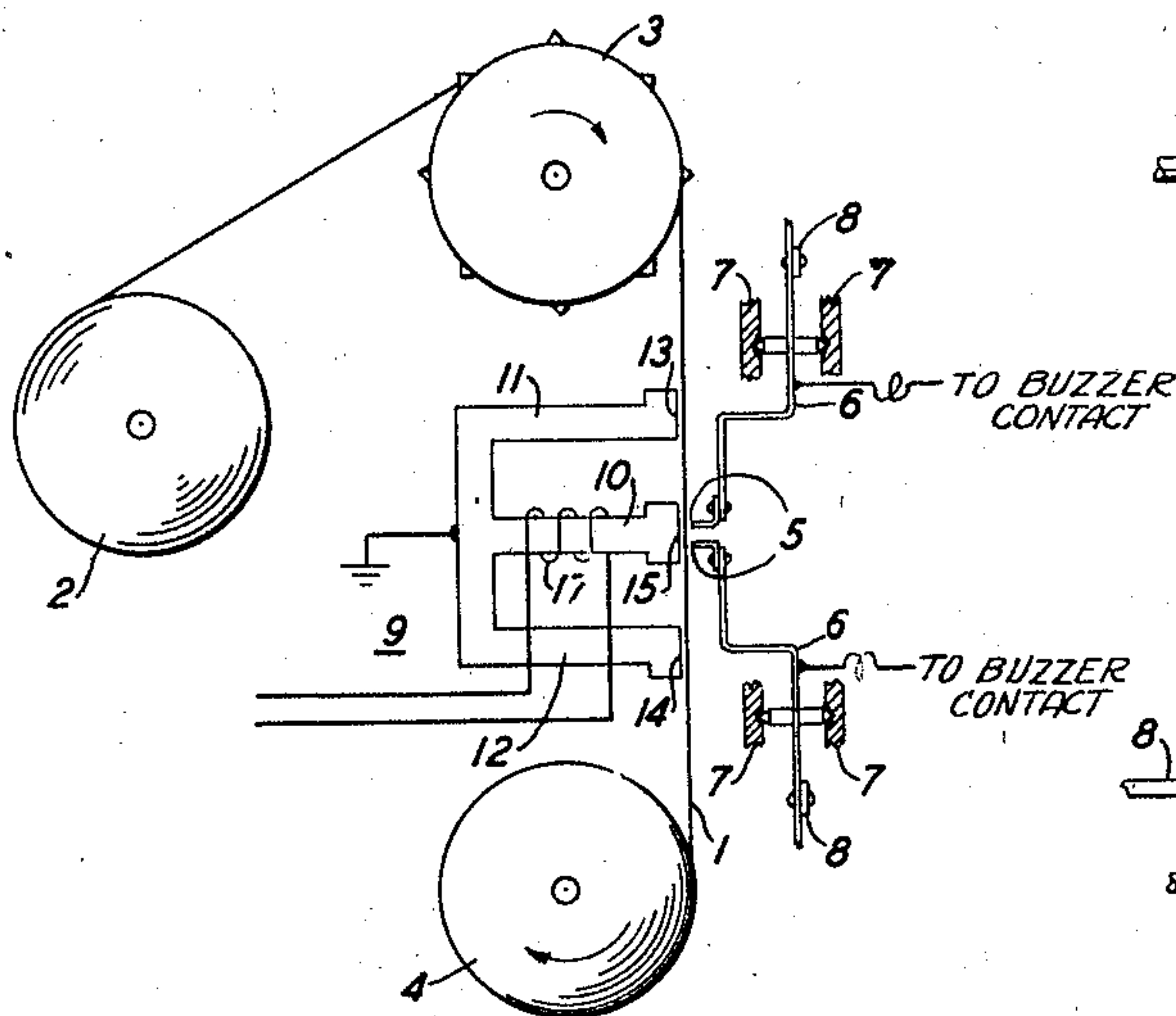


FIG. 2

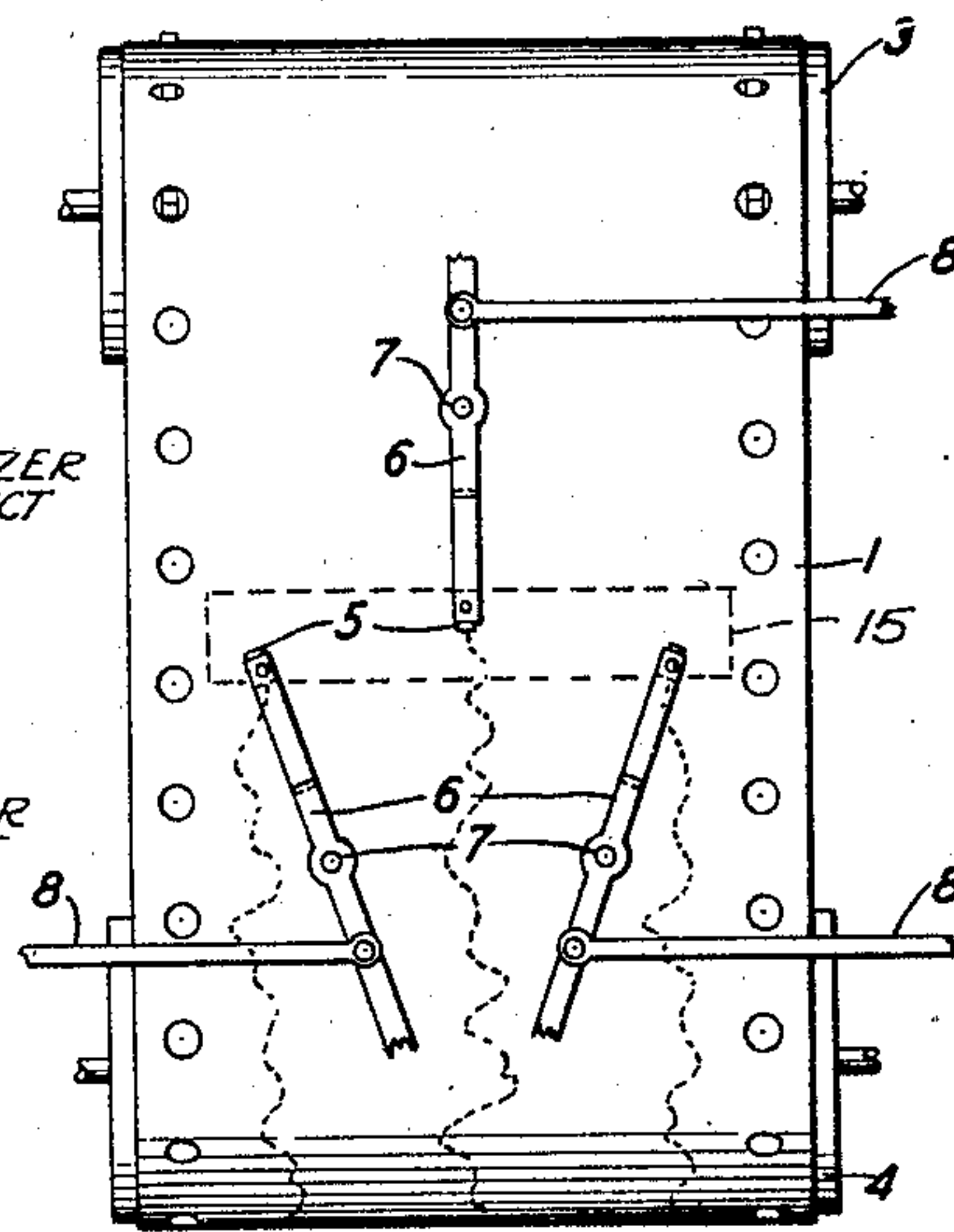


FIG. 3

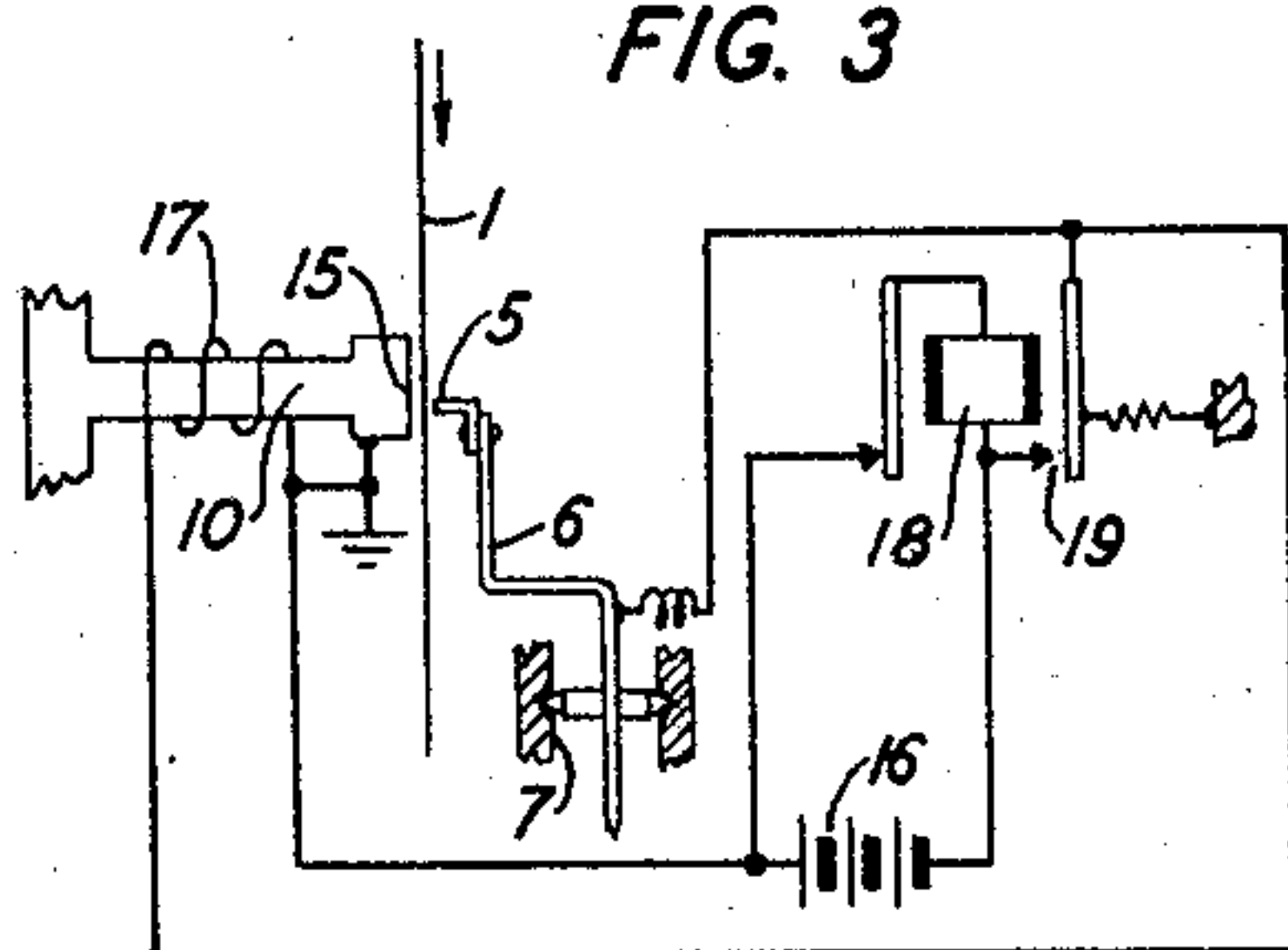
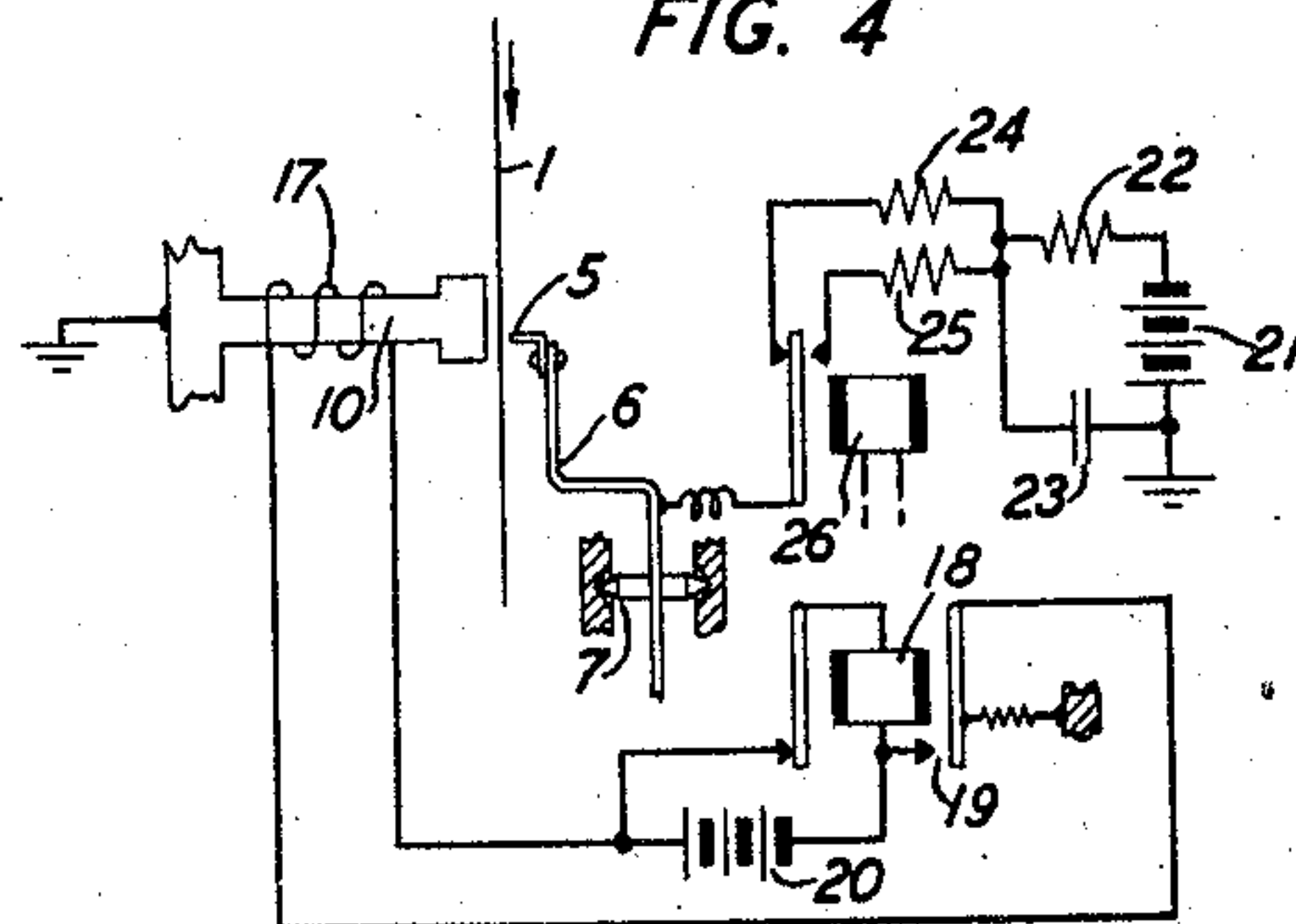


FIG. 4



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RECORDER SYSTEM WITH ELECTROMAGNETICALLY ATTRACTED ELECTRIC STYLUS

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1 Claim. (Cl. 234—64)

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This invention relates to electrical recording systems and particularly to such systems in which the recording medium is electrosensitive and the motion of a stylus with respect thereto is recorded by using the stylus as an electrode in a circuit which produces current pulses through the medium at suitable intervals.

In many such systems the stylus is normally in firm contact with the paper or other recording medium with result that appreciable lateral forces are required to move the stylus against the force of friction and the additional adherence due to the stylus current.

The object of this invention is a recording system which is particularly well adapted for applications where only very small stylus driving forces are available.

According to this invention one or more recording styli are moved laterally of the recording medium in accordance with the variations to be recorded and are normally substantially free from contact friction with the recording medium except at instants of actual recording. To this end they may be mounted just out of contact with the medium or in very light grazing contact therewith but in any case the spacing should be kept as small as possible in order to permit operation at high speed. An electromagnet having a pole-piece extending laterally across and behind the recording surface to form a back electrode and platen for the recording medium is energized at suitable intervals to attract the styli into firm marking contact with the surface of the medium.

Both the electromagnet and the styli circuits may be energized from a single low voltage source of power, such as a small battery, by connecting the back electrode and styli to the terminals of the magnet winding and energizing the winding from the power source through a suitable low frequency contactor. When the circuit is closed to energize the magnet and attract the styli into contact with the paper, the voltage across the winding is too low to produce recording current but when the circuit is broken, a high peaked voltage is induced in the coil and this voltage applied between the styli and the platen produces correspondingly large current pulses of short duration which are effective to make the records.

These and other features of the invention are more fully described and shown in the following detailed specification and the accompanying drawing in which:

Fig. 1 is a side view of a recorder according to the invention;

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Fig. 2 is a front view of the recorder showing one possible stylus arrangement; and

Figs. 3 and 4 are typical circuits for the recorder.

In Fig. 1 the electro-sensitive recording medium 1 may be of any suitable type, such as the so-called "Teledeltos" paper which is said to have a carbon backing and a recording surface having a thin coating of titanium oxide. The passage of current through such a paper at any point produces a permanent change in color so that visible record traces may be made by applying marking potential between a stylus engaging the coated surface and a metal platen over which the paper is moved. In the recorder shown the paper is in the form of a perforated paper strip of suitable width which is drawn from a feed reel 2 by a drive sprocket 3 and wound up on the take-up reel 4. Each of the styli 5 is mounted on a light, magnetic, resilient armature 6 which is in turn pivoted in suitable low friction bearings 7, 7 supported by stationary structure (not shown). Each stylus is adapted to be positioned laterally of the recording strip by any suitable mechanism, such as a rod 8, which is driven in accordance with the variations to be recorded.

The core of the electromagnet 9 has a central pole-piece 10 extending laterally over the full useful width of the recording strip and similar lateral pole-pieces 11 and 12 having pole faces 13 and 14 aligned with the pole face 15 of central pole-piece 10 which is directly opposite the several styli to serve as the platen during recording.

As shown in Fig. 3, the battery or other power source 16 is connected across the terminals of the winding 17 of the electromagnet through the contacts 19 of the device 18. This device is intended to initiate the recording operation at suitable intervals and may consist merely of a simple buzzer as shown or more complicated timing mechanism as the case requires.

When the contacts 19 close, the current in the winding 17 sets up flux in the core 10 of the electromagnet and the stylus armatures 6 so that the styli 5 are drawn into contact with the record strip 1 which is thereby pressed against the pole face 15. An instant later when the contacts 19 are opened, the high voltage induced in the winding 17 produces a spark between each stylus and the pole face thereby making a record of the position of each stylus at that time. In order to obtain a clear record without burning the paper, the marking potential pulses should be highly peaked so as to provide adequate breakdown potential with minimum heating effect. It is therefore

important that the contactor device 18 be of the "quick break" type and in practice the contacts should be protected against burning in any suitable manner such as by the usual shunting condensers.

The use of the self-induced voltage in the coil 17 for recording purposes is particularly advantageous in portable apparatus since it minimizes weight by eliminating the necessity for a high voltage battery and in addition it has the further advantage of providing spark protection for the interrupter contacts 19.

When battery voltage high enough for direct recording is readily available, it may be desirable in some cases, particularly when using low paper speeds, to use separate low and high voltage batteries 20 and 21 for the magnet and recording circuits respectively, as shown in Fig. 4. In this case the battery 20 is periodically connected only to the magnet winding by a contactor device such as 18 of Fig. 3, and the high voltage battery 21 is used to charge a suitable condenser 23 through a resistor 22. The condenser is then discharged through the stylus circuit or circuits at the proper times by a relay 26 operating in timed relation with the contactor 18. This circuit gives the necessary highly peaked type of pulse which can be readily modified as required by proper choice of the resistor and condenser values to produce a clear record without excessive burning of the paper.

In a recorder of the type in which a single stylus is positioned successively to record two or more varying quantities, the several record traces

may be identified by discharging the condenser through resistors such as 24 and 25 of different values. In this case a separate resistor is provided for each record trace and the relay mechanism 26 is operated in conjunction with the stylus positioning devices to connect them into the stylus circuit in succession so that each recording trace is made with current pulses of a different intensity.

10 What is claimed is:

In a recorder, for marking a moving electro-sensitive record-receiving medium, a stylus adapted to be moved with respect to the medium, said stylus being normally substantially free of contact friction with respect to said medium, an electromagnet having a pole face disposed behind the medium to attract the stylus into firm, low-resistance, electrical contact with the medium, a source of low potential electrical energy and means including said source for energizing the electromagnet and producing a current pulse through the medium between the stylus and the pole face.

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The following references are of record in the file of this patent:

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