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RECORDING APPARATUS

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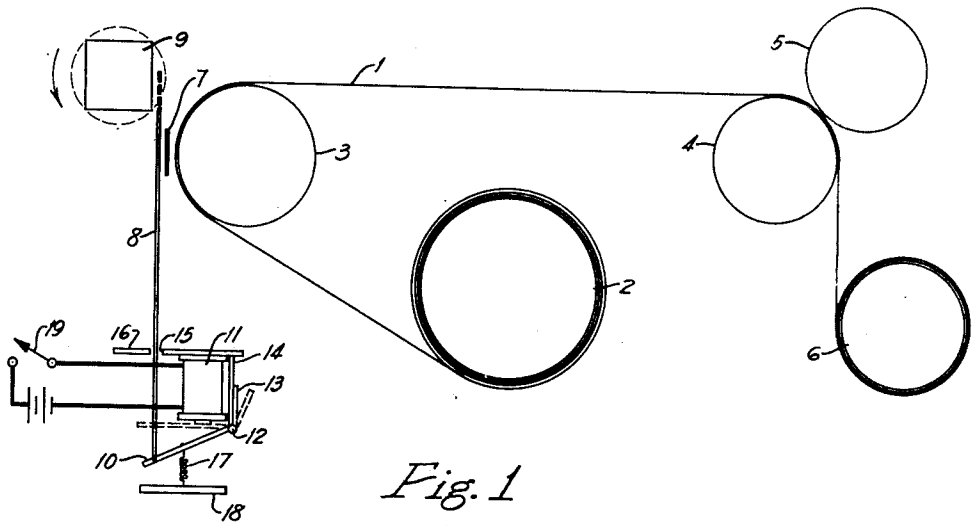


Fig. 1

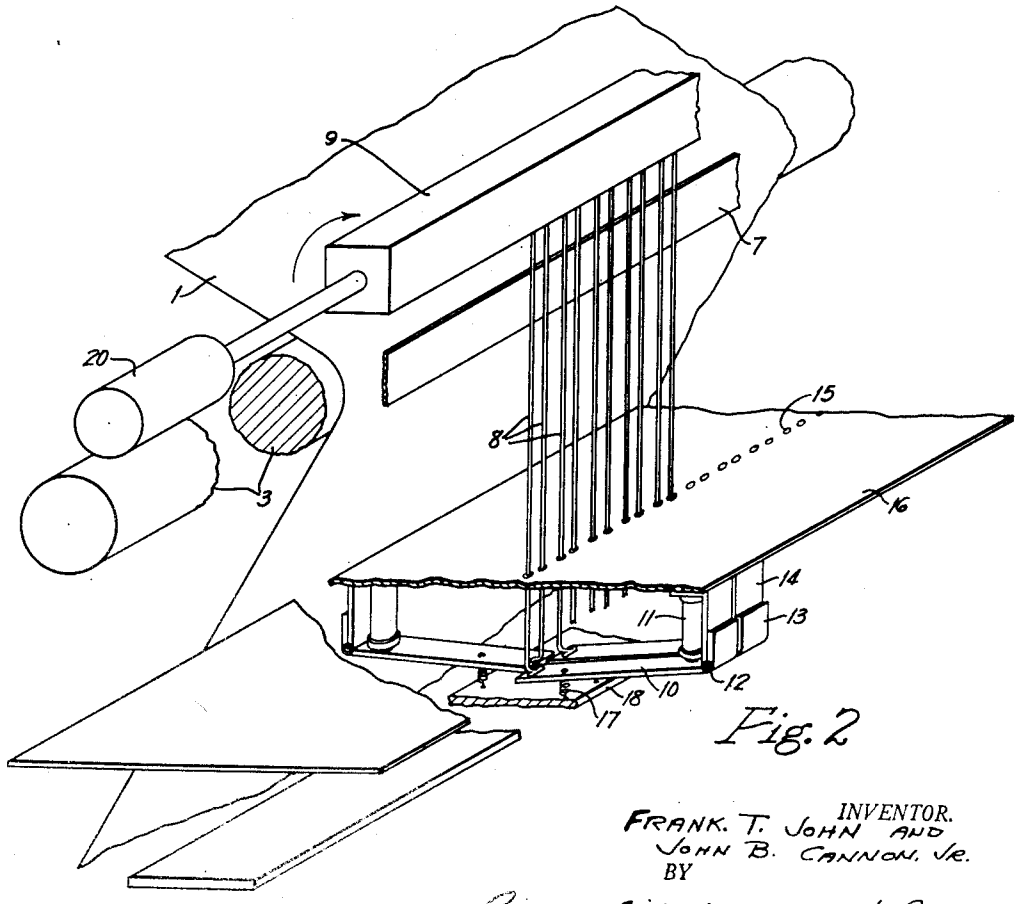


Fig. 2

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RECORDING APPARATUS

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9 Claims. (Cl. 346—49)

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This invention relates to a recording apparatus, and more particularly, to a printing mechanism for use in a multiple channel polygraph for selectively marking on a record receiving member data from one or more datum originating sources.

In their conventional form, these polygraphs use ink pens for recording the desired data and, as a result, have certain disadvantages. Not only must the ink reservoir be filled at intervals, but also the pens must frequently be cleaned, especially if they are used only intermittently. In addition, the pens may not function properly if the apparatus is mounted on a support that is subject to vibration or if mounted otherwise than in a particularly oriented position.

It is accordingly among the objects of this invention to provide a recording apparatus of the type referred to that will not be subject to the foregoing disadvantages and that, in addition, may be cheaply and ruggedly constructed to provide reliable operation under severe service conditions.

In the recording apparatus of this invention, the recording is made by one or more rapidly vibrating recording wires striking an inked ribbon and transferring an ink impression therefrom to a record receiving member on the other side of the ribbon. The vibration of each recording wire is effected by the impacts of a rapidly rotating cam, or other impact means, with which each recording wire can be selectively brought into impact engagement by electromagnetic or mechanical means that are responsive to a particular datum originating source, or event, that is to be recorded. If, as is usually the case, the record receiving member is continuously and uniformly moved during the operation of the device, the series of dots made thereon by a vibrating recording wire as it strikes the inked ribbon will merge into a solid line, the length of which is a measure of the duration of the recorded event.

The invention is illustrated in the accompanying drawings, in which Fig. 1 is a somewhat diagrammatic sectional elevation of a portion of a multiple channel polygraph embodying the invention, and Fig. 2 is an isometric view, partly in section, of the essential apparatus shown in Fig. 1.

Referring to the drawings, the record receiving member is represented as a web of paper 1, which is led from a supply roll 2 over a platen roll 3 and between the friction drive rolls 4 and 5 to a take-up roll 6. A conventional drive (not

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shown) is connected to the drive rolls to move them and the paper at a uniform speed. Other conventional means (likewise not shown) are used to drive the take-up roll and to maintain the proper tension on the paper strip. An inked ribbon 7 extends across the paper parallel to the platen roll 3 and is held by any suitable means in spaced printing relation to the paper.

A recording wire 8, usually one of a plurality of such wires, preferably made of stiff but resilient steel wire, such as piano wire, is mounted with its free upper end adjacent to the inked ribbon 7 and to an impact cam 9, but normally out of contact with both the ribbon and cam. The lower end of each recording wire is hingedly connected to an armature 10 of an electromagnet 11, there being a separate armature and electromagnet for each recording wire that is used. Integral with each armature 10, or attached thereto at its hinge 12, is a stop member 13, which makes an obtuse angle with the armature and comes in contact with a back plate 14 of the electromagnet 11 to support the armature in its down position. To provide intermediate lateral support for the recording wires 8, each wire passes through a separate hole 15 in a guide plate 16, which may be mounted on top of the electromagnets 11, or otherwise suitably supported in a plane normal to the plane of the recording wires. As a result of this construction, only the upper part of each recording wire is free to vibrate.

Each of the electromagnets 11 is controlled by a separate electrical circuit, which is normally open, so that each armature 10 is normally in its down position under the urging of a tension spring 17 extending between each armature and a spring support member 18. When any one circuit is closed by the occurrence of an event to be recorded, which for simplicity is here represented by the manual closing of a switch 19, the electromagnet included therein will be energized and attract its armature 10 to raise the recording wire 8 connected thereto a predetermined distance that will bring the free upper end of the wire into contact with the continuously rotating impact cam 9, which is supported parallel to the platen roll 3 and the inked ribbon 7 and at right angles to the plane of the recording wires. The impact cam is here shown as a square bar, but may be of any suitable cross-section; and it is rotated in the direction indicated by the arrow in each figure, so that its lower surface is rotated towards the recording wires. The speed of rotation of the cam is de-

sirably high; and, since it has a square cross-section, it will deliver four impacts to an engaged recording wire with each revolution, for example, 7000 impacts per minute when driven at 1750 R. P. M. by a standard electric motor 20. Since the upper end of each recording wire is otherwise unrestrained, when that end is brought into impact engagement with the cam 9, it will be vibrated with sufficient amplitude to strike the inked ribbon 7 and produce an inked dot or mark on the platen supported paper on the other side of the ribbon. These blows of the recorder wires are delivered so rapidly that, even if the paper is moving continuously at considerable speed, the marks printed thereon merge into a continuous line or trace, the length of which is a measure of the duration of the event recorded. When that event ends, as by the manual opening of switch 17, the electromagnet 11 in the responsive electrical circuit will be de-energized, and its armature 10 will drop down under the urging of spring 17 and withdraw the recorder wire out of engagement with the cam 9.

Instead of using electromagnets to actuate the recording wires, as described above, it will be obvious that equivalent electrical or mechanical actuating means may be used, as for example, a mechanically operated lever connected to the lower end of each recording wire.

It is among the advantages of the foregoing apparatus that it may be used in any position, even upside down from the position shown in the drawings, because the recording wires are brought into engagement with the impact cam by the positive action of the relay armatures, thrown against the inked ribbon by the operation of the cam, and withdrawn from engagement with the cam by the positive action of the springs attached to the relay armatures; in other words, the functioning parts operate independently of gravity. The recording apparatus is also adapted to very rugged construction and will operate reliably under extreme service conditions, involving vibration and shocks to the equipment. In addition, the apparatus will record simultaneously a large number of events on a minimum width of record receiving surface, because the recording wires and their actuating relays, especially if the latter are staggered as shown in Fig. 2, can be contained in a minimum of space.

According to the provisions of the patent statutes, we have explained the principles of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. A recording apparatus for printing data on a record receiving member through an inked ribbon, comprising impact means spaced from the inked ribbon, a recording member of resilient wire material, one end of said member being free to vibrate and being normally held adjacent to the impact means but out of engagement with it, engaging means connected to the other end of the recording member for moving it longitudinally to bring its free end into impact engagement with said impact means at a point between said means and the inked ribbon, whereby the free end of the recording member when engaged by said impact means will vibrate and strike the inked ribbon to mark the record receiving member.

2. Apparatus according to claim 1, in which said impact means includes a rotatable impact cam and means for rotating the cam.

3. A recording apparatus for printing data on a record receiving member through an inked ribbon, comprising a rotatable impact cam spaced from the inked ribbon, means for rotating the cam, a recording member of resilient wire material movably supported at an angle to the axis of the cam, one end of the recording member being free to vibrate and being normally held adjacent to the cam but out of engagement with it, engaging means connected to the other end of the recording member for moving it longitudinally to bring its free end into impact engagement with the cam at a point between the cam and the inked ribbon, whereby the free end of the printing member when engaged by the rotating cam will vibrate and strike the inked ribbon to mark the record receiving member.

4. Apparatus according to claim 3, in which the impact cam has a square cross-section and is mounted substantially parallel to the inked ribbon.

5. Apparatus according to claim 3 that includes the following additional elements: a rigidly mounted guide plate having a hole therethrough for slidably receiving the recording member to provide lateral support to an intermediate portion of that member.

6. Apparatus according to claim 3, in which the engaging means comprises an electromagnet and armature, the armature being connected to said other end of the recording member.

7. A printing mechanism for selectively printing data from a plurality of datum originating sources, the printing being made on a moving record receiving member through an inked ribbon interposed between said member and the printing mechanism, the latter comprising a rotatable impact cam spaced from and substantially parallel to the inked ribbon, means for rotating the cam, a plurality of spaced parallel recording wires movably mounted at right angles to the axis of the cam and substantially parallel to the plane of the inked ribbon, one end of the recording wires being free to vibrate and being normally held adjacent to the cam but out of engagement with it, separate electromagnetic means connected to the other end of each recording wire for selectively moving each wire longitudinally to interpose its free end between the cam and the inked ribbon into engagement with the cam, each electromagnetic means being responsive to an electric current controlled by a particular datum originating source, whereby the free ends of the recording wires when selectively engaged by the rotating cam will vibrate and strike the inked ribbon to mark the record receiving member in accordance with data from the datum originating sources.

8. Apparatus according to claim 4 that includes as an additional element a guide plate having a plurality of holes therethrough, each hole slidably receiving a recording wire to provide lateral support to an intermediate portion of that wire.

9. A printing mechanism for selectively printing data from a plurality of datum originating sources, the printing being made on a moving record receiving member through an inked ribbon interposed between said member and the printing mechanism, the latter comprising a rotatable impact cam spaced from and substantially parallel to the inked ribbon, means for continuously rotating the cam at high speed, a plurality of spaced parallel recording wires movably mounted

at right angles to the axis of the cam and substantially parallel to the plane of the inked ribbon, one end of the recording wires being free to vibrate and being normally held adjacent to the cam but out of engagement with it, a guide plate having a plurality of holes therethrough for slidably receiving the recording wires to support the wires against appreciable vibration at a point intermediate of their ends, a separate electromagnetic relay mounted adjacent to the other end of each recording wire and having an armature hingedly connected to said end of the wire for selectively moving each wire longitudinally to interpose its free end between the cam and the inked ribbon into engagement with the rotating cam, and a plurality of electrical circuits, each circuit including one of said relays and being controlled by a particular datum originating source, whereby the free ends of the

recording wires when engaged by the rotating cam will vibrate and strike the inked ribbon to mark the record receiving member in accordance with data from datum originating sources.

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