Oct. 22, 1946. G. G. A. ERICSSON 2,409,745

RECORDING APPARATUS

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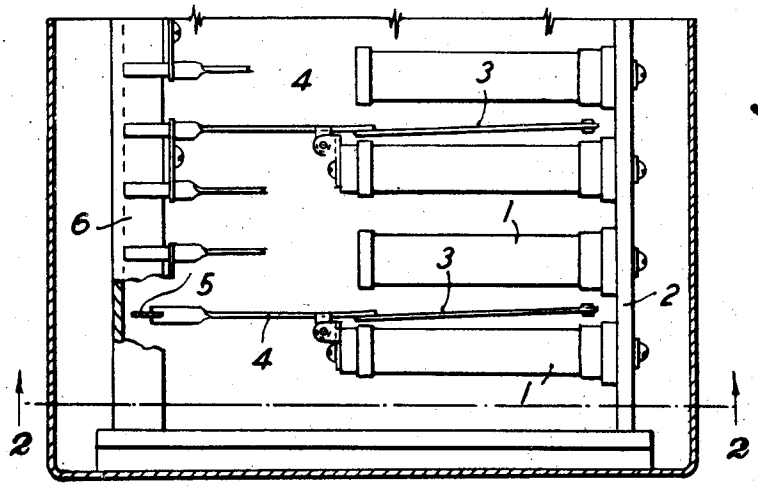


Fig. 1

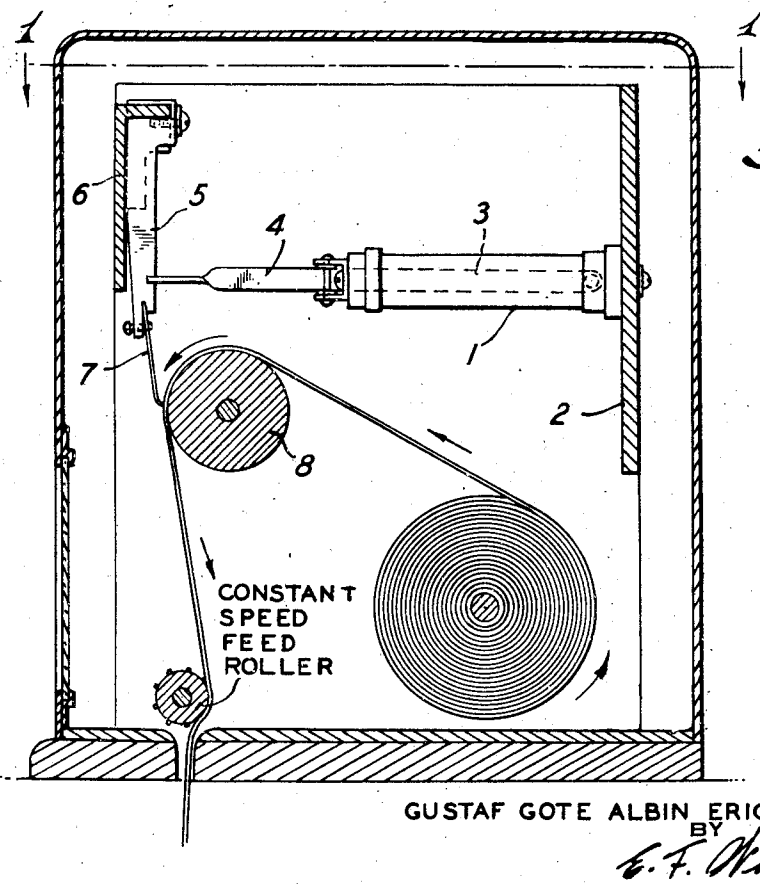


Fig. 2

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Fig. 4

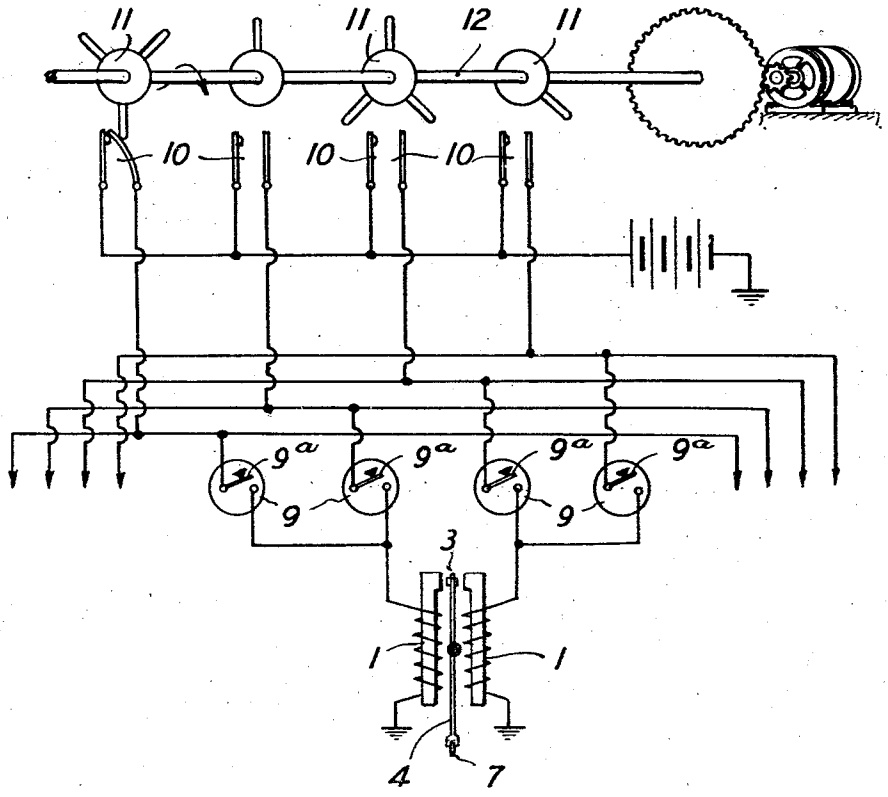
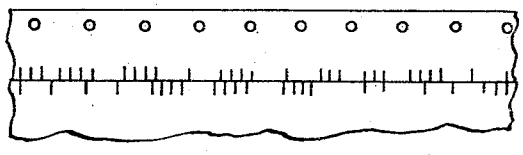


Fig. 3



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Patented Oct. 22, 1946 2,409,745

UNITED STATES PATENT OFFICE

2,409,745

RECORDING APPARATUS

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Application September 15, 1942, Serial No. 458,412
In Sweden June 10, 1939

2 Claims. (Cl. 234—1.5)

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The present invention refers to improvements in recording apparatus for controlling working-machines and has for its object to increase the capacity of such apparatus.

A primary object of the present invention is the embodiment of recording apparatus whereby it is possible, with a relatively compact device, to obtain a complete graphical record of the individual operation of a plurality of working-machines.

This is realized, briefly stated, by a novel relationship of parts, hereinafter described in detail, and including traveling record strips, electromagnetically operated styli and an electromechanical arrangement for correlating the working-machines, the styli and the record strips, as hereinafter more fully set forth.

Further objects and advantages of the invention will be evident to the expert in the art from the following disclosure.

The invention will be more particularly described in a preferred embodiment with reference to the accompanying drawings, in which:

Fig. 1 is a fragmentary plan view partly in section of a recording apparatus in which the invention is incorporated, the section being along line 1—1 of Fig. 2, and parts being omitted for the sake of clearness,

Fig. 2 is a fragmentary view, partly in section along line 2—2 of Fig. 1, illustrating the mounting of a stylus and its relationship to adjacent parts of the apparatus,

Fig. 3 shows a record made by means of the apparatus, and

Fig. 4 is a circuit diagram of the device according to the invention.

Referring to the drawings, the apparatus partly shown in Figs. 1 and 2 comprises a number of rows or groups of horizontal electromagnets 1 which, at their rear ends, are mounted in a supporting plate 2. On every alternate electromagnet, in the space between this and one of the adjacent magnets, there is provided an armature 3 which is carried by an arm 4 which is pivotally mounted at the front end of the electromagnet, so that it can swing back and forth in a horizontal plane, and extends into engagement with a vertical leaf spring 5 which is fixed with its upper end in the frame 6 of the apparatus. The arm 4 is made of sheet material and is mounted as shown on the drawings. The front end of the arm 4 is twisted a quarter of a revolution and provided with a notch by which it freely embraces the edge of the leaf spring 5 near its free end, as will clearly be seen from Figs. 1 and 2. At its

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free end the leaf spring 5, as is shown in Fig. 2, carries a stylus 7 which makes a record on a strip of paper fed at a constant speed over a roller 8. Each armature 3 in its position of rest has its inner free end situated at equal distances from both electromagnets between which it is situated, so that it is attracted by either of these magnets that is energized by current impulses and makes an equal deflection at one side or the other, the leaf spring 5 and the stylus carried thereby making corresponding deflections at one side or the other of a median position. At each deflection the stylus 7 makes a horizontal dash on the paper strip, so that the record will get the appearance shown in Fig. 3.

For preventing the stylus 7 from being actuated by both electromagnets 1 simultaneously there is provided a special impulse generator which is constructed so as to deliver the impulses to the electromagnets at different times. This impulse generator at the same time serves to produce a plurality of different impulse series for actuating the same electromagnet, so that the latter and the associated stylus may be used for controlling a number of working-machines. This is illustrated diagrammatically in Fig. 4. On each working-machine to be controlled by means of the recording instrument a contact 9 is provided so as to be closed, by the closing of the corresponding switch 9a, at the starting of the corresponding machine and remain closed as long as the machine is operating. Each contact 9 is connected in a circuit together with a normally opened impulse contact 10, preferably at least two or, if desired, more such circuits being connected in parallel with one end of the winding of one of the electromagnets 1, while the other end of said winding is connected to a source of current. The impulse contacts 10 are actuated by cam means comprising a number of cams 11 which are mounted on a common shaft 12 which is driven at a constant speed, for example by a synchronous motor. When an impulse contact 10 is momentarily closed by the operation of a passing raised portion of the associated cam 11 and if the machine contact 9 connected in the same circuit as this impulse contact is closed, the corresponding electromagnet 1 will attract its armature, the stylus making a horizontal dash on the paper strip. The cams 11 which actuate impulse contacts 10 connected in circuits associated with the same electromagnet are provided with a different number of raised portions mounted in different angular positions, so that the circuits through the electromagnets can never be closed

at the same time and so that they are closed an equal number of times per unit of time, whereby a density of recording dashes on the paper strip which is characteristic of each circuit or working-machine is obtained. These recordings indicate what machine or machines have been in operation at a certain time. If a plurality of machines are in operation simultaneously the recording dashes for the various machines will be intercalated without coinciding, so that a diagram of the appearance which is seen in Fig. 3, e. g. to the left of the median line, is obtained. The simple strokes correspond to the cams 11 which have but a single raised portion or cam element. The triad strokes correspond to those with three raised portions or cam elements. Furthermore, the raised portions of all the cams 11 which govern the circuits of two electromagnets 1 having a common armature are angularly offset in such a way that these electromagnets can never actuate the armature simultaneously. On the other hand, cams which are not associated with the same electromagnet can very well have the same number of raised portions, since there is nothing to prevent the recording from taking place with the same density of dashes at both sides of the median line.

It will be evident that with the apparatus shown in Fig. 4 one may control four working-machines by means of a single stylus controlled by two electromagnets 1. Theoretically, the number can be further increased by providing a plurality of circuits for each electromagnet together with associated cams having raised portions arranged in different ways. In the case of a number greater than four it will be found difficult however to distinguish the recordings by means of the density of the dashes.

The impulse contacts 10 and the cams 11 not only cooperate with a single pair of electromagnets but are common to all electromagnets in the

apparatus, each impulse contact being connected in a circuit through each pair of electromagnets as indicated in Fig. 4, so that each of the various impulse series is common to several machines but are recorded at a particular place on the paper strip for each machine. Where four machines are controlled with each stylus thus only four impulse contacts and four cams are needed.

What I claim and desire to secure by Letters Patent is:

1. A recording system of the character described, comprising a stylus for recording on a travelling strip, an electromagnet for operating said stylus, a pair of machine controlled switches connected in parallel in the circuit of said electromagnet, and a corresponding number of cam controlled impulse contacts connected in series each with one of said machine controlled switches in the circuit of said electromagnet, each cam control comprising a different number of lobes, the lobes of the different cams for the different impulse contacts being out of phase with one another.

2. A recording system of the character described, comprising a stylus for recording on a travelling strip, two electromagnets for operating said stylus by resiliently moving it to one side or the other from a normal median position upon energization of one or the other of the two electromagnets, each of the two electromagnets having an energizing circuit comprising a pair of machine controlled switches connected in parallel in the circuit, and cam controlled impulse contacts connected in series each with one of the machine controlled switches in the circuits of the two electromagnets, each cam control comprising a different number of lobes, the lobes of the different cams for the different impulse contacts being out of phase with one another.

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