Sept. 28, 1943. A. RUTTIMAN ET AL 2,330,387

ELECTRICALLY OPERATED WORKMAN'S TIME RECORDER

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Fig. 1.

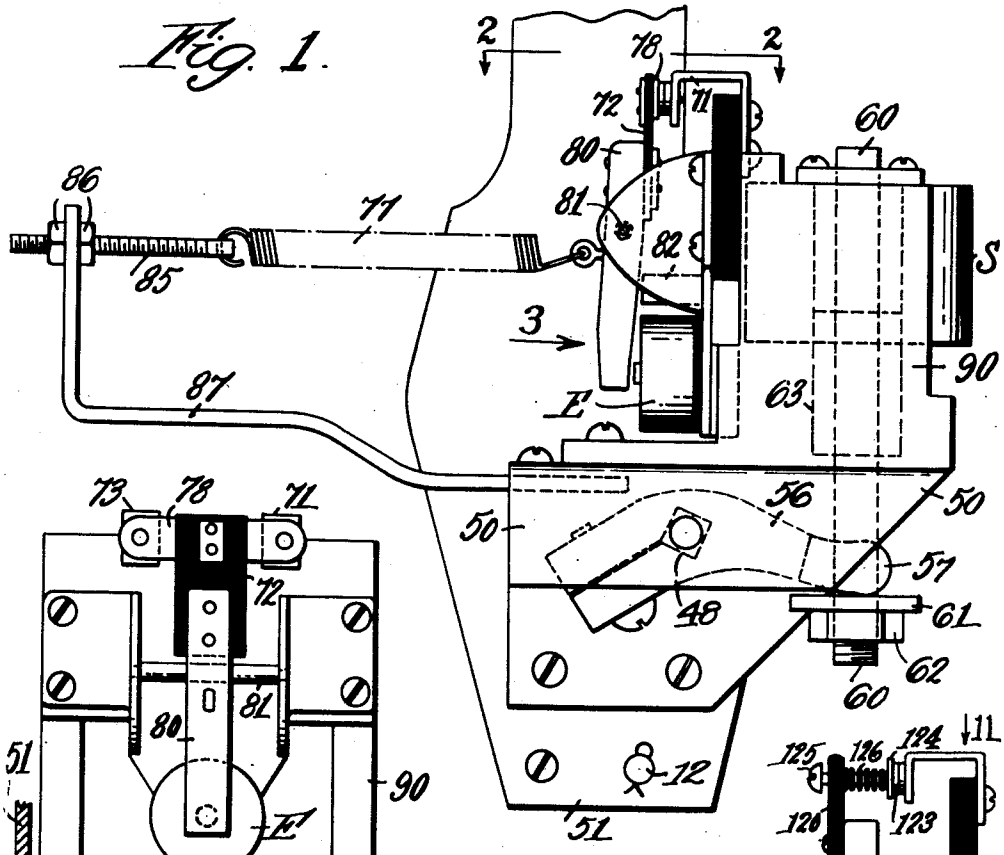


Fig. 3.

Fig. 7.

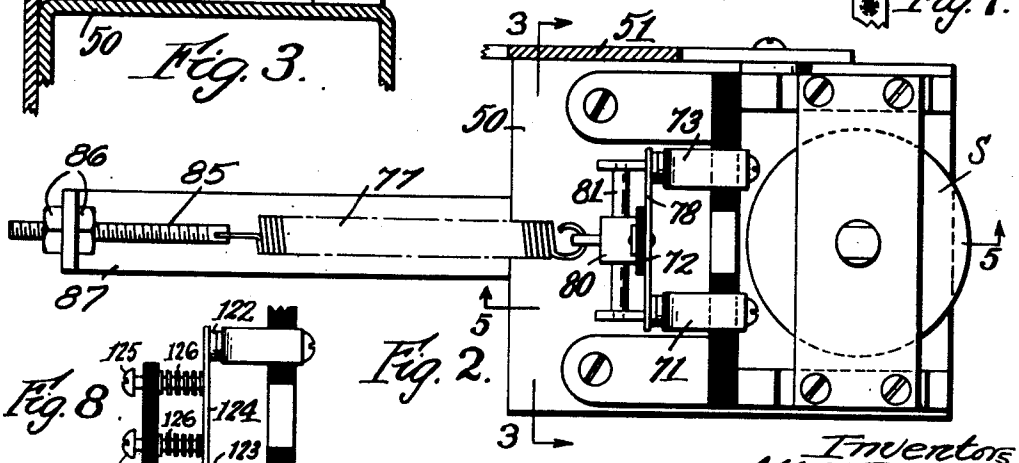


Fig. 2.

Fig. 8.

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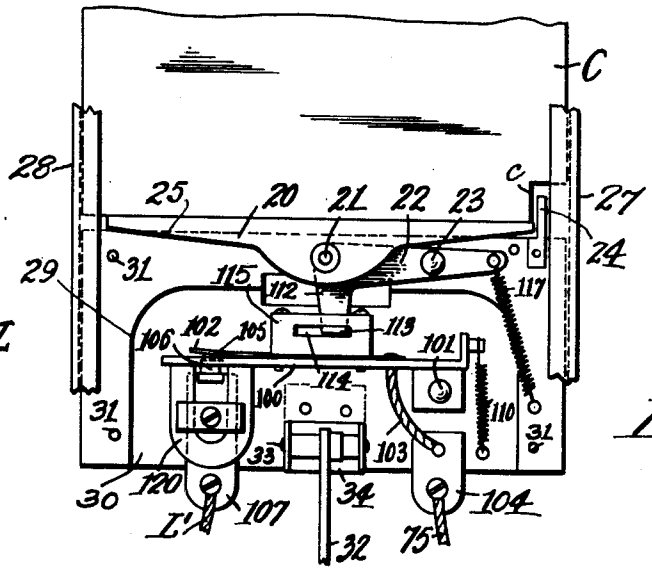


Fig. 4.

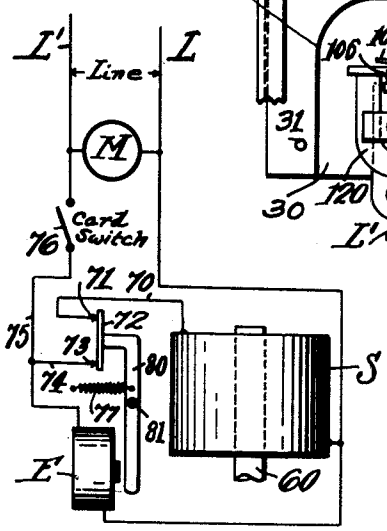


Fig. 6.

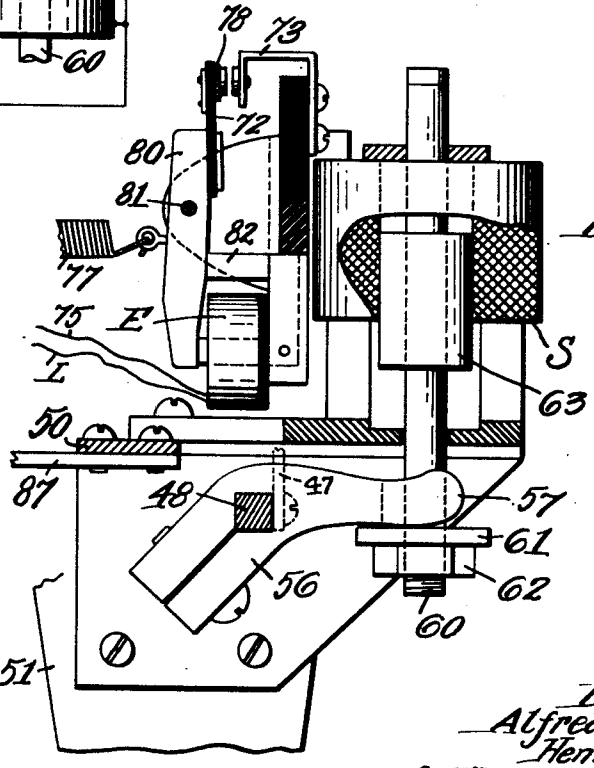


Fig. 5.

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2,330,387

UNITED STATES PATENT OFFICE

2,330,387

ELECTRICALLY OPERATED WORKMAN'S TIME RECORDER

Alfred Ruttiman and Henry N. Deane, Gardner, Mass., assignors to Simplex Time Recorder Co., Gardner, Mass., a corporation of Massachusetts

Application April 1, 1939, Serial No. 265,554

1 Claim. (Cl. 175—335)

This invention relates to a workman's time recorder of the type in which the time record of each workman is stamped on a separate record card. More specifically, the invention relates to that class of time recorders in which a stamping hammer or other impression device is electrically operated.

It is an important object of our invention to provide improved means for automatically breaking the electric circuit after a single actuation of the impression device, so that the circuit cannot be held closed by the workman for an extended period and thus possibly disable the time mechanism.

A further object of our invention is to provide electrical operating mechanism for an impression device, in which mechanism a stamping coil and a circuit-opening coil are mounted in parallel branch circuits. Preferably, the stamping and circuit-opening coils are rendered operative in a predetermined time sequence, largely by reason of certain innate characteristics of the coils.

More specifically, the circuit-opening coil and armature are arranged with a magnetic lag, which delays effective operation thereof until after the impression device has been actuated.

We also provide improved means for regulating the force of the stamping blow, and an improved construction by which slight movements or vibrations of the record card are rendered incapable of causing a second hammer movement.

Our invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claim.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is an end elevation of impression mechanism embodying our invention;

Fig. 2 is a sectional plan view, taken along the line **2**—**2** in Fig. 1;

Fig. 3 is a sectional rear elevation, taken along the line **3**—**3** in Fig. 2 and looking in the direction of the arrows **3** in Fig. 1;

Fig. 4 is a rear elevation of certain card-controlled switch mechanism shown in closed position;

Fig. 5 is a sectional side elevation, taken along the line **5**—**5** in Fig. 2 and showing certain parts appearing in Fig. 1 but in a different position;

Fig. 6 is a diagram of an electric circuit preferably used in my improved recorder; and

Fig. 7 is a partial side elevation showing a modified auxiliary switch structure; and

Fig. 8 is a plan view, looking in the direction of the arrow **8** in Fig. 7.

Our invention relates particularly to means for supporting a card in a workman's time recorder and to mechanism for making an impression thereon. The mechanism herein shown is particularly designed to be set in operation by the pressure of the card upon a movable card C support or abutment **20** (Fig. 4).

The card support or abutment **20** is pivoted at **21** on a lever **22**, which lever in turn is pivoted at **23** to an abutment slide **25**. The edge portions of the slide are guided and slidable in the grooved side members **27** and **28** of the card chute. A projection **24** (Fig. 4) near one edge of the slide **25** extends upward by the end of the card support **20** and prevents depression of the support relative to the slide **25** unless one corner of the card C is cut away as indicated at *c* (Fig. 4) to clear the projection **24**. This insures that the card is inserted right end up and right side out, before a record can be made.

The middle portion of the slide **25** is cut away as indicated at **29** in Fig. 4, and a plate **30** of fibre-board or other insulating sheet material is secured to the front face of the slide **25** in any convenient manner, as by rivets **31**.

The upper end of a link **32** (Fig. 4) is pivoted at **33** to a bearing bracket **34**, which bracket is secured to the lower edge of the plate **30**. The lower end of the link **32** is connected to be operated by suitable automatic timing mechanism (not shown and forming no part of the present invention).

The printing or stamping blow is given by a hammer not shown but actuated by a square cross shaft **48** (Figs. 1 and 5).

An actuating arm **56** (Fig. 5) is clamped to the square shaft **48**, and its forked outer end **57** embraces a solenoid plunger rod **60** and bears upon a flange **61**, mounted above a nut **62** threaded on the lower end of the rod **60**. The rod **60** extends upward through a solenoid coil S and is provided with a plunger **63** (Fig. 5) loosely slidable within the coil S.

When the coil is energized, the plunger **63** will be drawn upward into the coil and will act through the shaft **48** and hammer to force the card C against the usual type wheels with a sharp stamping blow, thus printing the time record on the card.

Having described those parts of our improved recorder which are directly involved in the stamping of the record, we will now describe the devices which control the solenoid circuit and prevent

the circuit from being maintained closed for any extended period.

Operating current is taken from line wires L and L', indicated diagrammatically in Fig. 6. If the type wheels in the time mechanism are electrically actuated, as by a small synchronous motor M, this motor will be separately connected across the lines as shown.

One terminal of the solenoid S is connected to the line wire L and the other terminal is connected through a wire 70 to one contact 71 of a double-break switch 72. The second contact 73 (Fig. 3) of the switch 72 is connected by a wire 74 to a return wire 75, which in turn is connected through a card-operated switch 76 to the line wire L'. The switch 72 is normally held closed by a spring 77 connected to a lever 80 on which the switch 72 and contact bar 78 are mounted.

The lever 80 is mounted on a pivot stud 81 (Fig. 5), and the lower end of the lever forms the armature for an electro-magnet E, having a U-shaped core or pole piece 82. The contact bar 78 of the switch 72 is insulated from the lever 80, as clearly shown in Fig. 5.

When the switch 76 is closed by insertion of a card, branch circuits are completed through the solenoid coil S and through the electromagnet E. The coil S is commonly wound with relatively large wire of low-resistance, while the magnet E is wound with fine wire of high resistance. As examples, the solenoid coil may contain some 700 turns of No. 24 wire, with a resistance of six or seven ohms, while the magnet coil E may contain some 600 turns of No. 39 wire, with a resistance of 600 ohms. With these comparative windings, such a large current will flow through the solenoid coil S that the coil will quickly overheat, while the comparatively small current in the magnet E may be maintained indefinitely without injurious effects.

A less evident result of the difference in windings is that the large solenoid coil, with its low resistance and heavy current, acts very quickly on the solenoid plunger which operates the hammer, while the magnet E, with its small current and high resistance, acts more slowly to attract the armature portion of the lever 80, thus opening the operating circuit of the solenoid.

This magnetic lag of the magnet E relative to the solenoid S is also increased by the fact that the magnet operates through a definite air gap when the parts are in the normal position shown in Fig. 1, whereas no such air gap is encountered in the operation of the solenoid.

The operation is as follows: When the card controlled switch 76 is closed, the solenoid S and E are both energized, but the solenoid acts enough quicker to operate the hammer before the magnet opens the solenoid circuit. The force of the hammer blow can be conveniently varied by adjusting the tension of the spring 77 (Fig. 2) by means of an adjusting screw 85 and lock nuts 86.

The screw 85 is mounted in a rearwardly and upwardly extending arm 87 (Fig. 1), the front end of which is secured to the fixed bracket 50, which bracket also supports a stand 90 for the solenoid S, the contacts 71 and 73, the magnet E and the lever 80 and pivot stud 81.

The more the spring 77 is tensioned, the greater the resistance of the lever 80 to movement by the magnet E. Consequently, the breaking of the solenoid circuit is delayed longer and the hammer blow is correspondingly more forceful. Adjustment of the tension of the spring 77 thus provides a very convenient and practical way of adjusting the force of the hammer blow in stamping the record.

The card controlled switch 76 is preferably of the special construction shown closed in Fig. 4, and this special construction will now be described.

A contact arm 100 is pivoted at 101 on the insulating plate 30 and supports a copper strip 102 connected by a wire 103 and plate 104 to the wire 75 shown in Fig. 6. A movable contact 105 is slidably mounted in the free end of the arm 100 and is in direct contact with the strip 102. A fixed contact 106 is mounted at the upper end of a bracket 107 carried by the insulating plate 30, and this contact is connected to the line wire L' (Fig. 6).

When the arm 100 is moved to the position shown in Fig. 4, the circuit is closed and the solenoid S and magnet E are rendered operative, as previously described. It will be noted that the strip 102 is resilient and free at its outer end, so that it may move slightly upward as shown in Fig. 4 as the circuit is closed. A light spring 110 acts normally to separate the contacts.

The lever 22 (Fig. 4) previously described has a depending arm 112 provided with an offset portion 113 extending loosely into a slot 114 in a block 115 of insulating material mounted on the arm 100. A spring 117 (Fig. 4) normally lifts the abutment 20 relative to the abutment slide 25 and simultaneously raises the arm 100.

A permanent magnet 120 is mounted on the plate 30 in such position as to engage and hold the arm 100 when the contacts are closed as shown in Fig. 4. The magnet 120 is of sufficient strength to hold the arm 100 against the tension of the light spring 110 but not against the combined tension of the two springs 110 and 117.

The lost motion of the projection 113 in the slot 114 permits slight movement of the abutment 20 and the card C without opening the circuit through the contacts 105 and 106, which circuit will remain closed unless the movement of the abutment is sufficient so that the lost motion is taken up and the spring 117 supplements the effort of the spring 110 to open the circuit.

This is a quite important advantage, as otherwise if the card is loosely held, a slight vibration of the card and abutment might cause a second blow of the stamping hammer. With the permanent magnet in operation, a quite definite upward movement of the card must take place before the two springs can cooperate to break the operating circuit.

From the foregoing description, it will be evident that we have provided novel means for controlling the solenoid circuit and for breaking the circuit promptly after a single actuation, which means is electrically controlled and entirely independent of the movement of the solenoid plunger. This is a very important advantage, as the circuit will be promptly broken, even if for any reason the plunger is restrained from movement. Under the same conditions in a mechanism under plunger control, the current will remain on the solenoid coil indefinitely and the coil will very probably be burned out.

In Figs. 7 and 8, we have shown a modified construction of the double-break switch which controls the solenoid circuit. In this modified construction, an extension 120 of insulating ma-

terial is mounted on the upper end of the pivoted armature 121, and the movable contacts 122 and 123 are mounted on a cross bar 124 which is carried by studs 125 slidable in bearings in the extension 120. Light coil springs 126 are interposed between the extension 120 and the cross bar 124.

With this construction, initial movement of the armature 121, when the magnet is energized, merely takes up the lost motion of the studs 125 until the headed ends of the studs engage the extension 120, whereupon the circuit through the contacts 122 and 123 and cross bar 124 is broken by outward movement of the contacts and bar. This provision of limited lost motion between the armature and the contacts slightly lengthens the period during which the solenoid can operate before the circuit is broken. In some cases this lengthened period is found desirable.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claim, but what we claim is:

In a mechanism comprising a solenoid coil, a solenoid plunger actuated thereby, an electric circuit for said solenoid coil and a control switch for said electric circuit, that improvement in control devices for said mechanism which comprises a normally closed auxiliary switch in said solenoid circuit, an electromagnet having a coil of substantially greater resistance than said solenoid coil, an armature for said electromagnet connected to said auxiliary switch and effective to open said auxiliary switch and to break said solenoid circuit when said magnet coil is energized and to maintain said solenoid circuit open until said control switch is opened, and an electric circuit for said magnet coil having the same source of current supply as said solenoid coil and initially operative in parallel with the circuit through said solenoid coil and auxiliary switch when said control switch is closed, said two circuits being thus simultaneously completed in parallel by closing said control switch but said magnet circuit being entirely free from control by said auxiliary switch, and said electromagnet from its greater resistance having an inherent delayed and slower action in comparison with the action of said solenoid coil when both are thus simultaneously energized, by reason of which delayed and slower action said solenoid circuit is opened by said electromagnet only after said control switch and the separate but parallel magnet and solenoid circuits have all been closed for a predetermined time interval.

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