June 11, 1940. G. R. EATON 2,204,346

TIME RECORDER SYSTEM

Filed Dec. 3, 1936

Fig. 4.

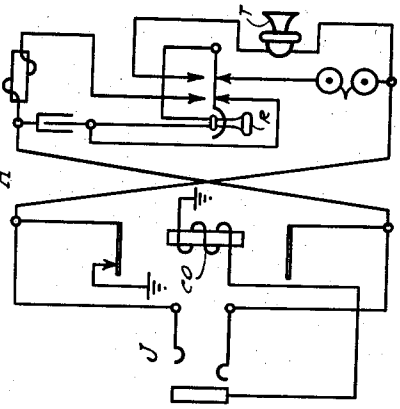


Fig. 3.

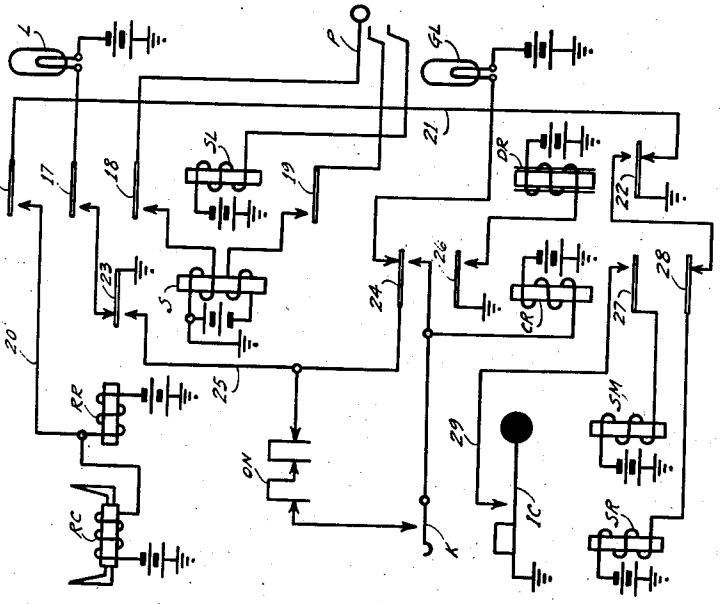


Fig. 1.

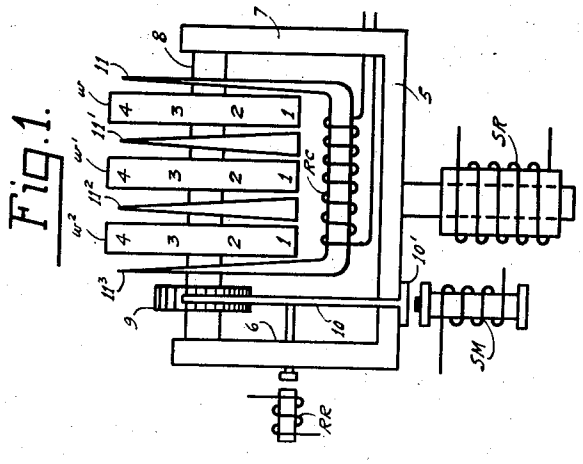
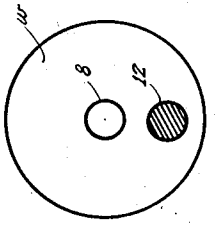


Fig. 2.



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2,204,346

TIME RECORDER SYSTEM

George R. Eaton, Oak Park, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill., a corporation of Illinois

Application December 3, 1936, Serial No. 113,980

7 Claims. (Cl. 179—7.1)

This application is a continuation-in-part of my copending application, Serial No. 571,055, filed October 26, 1931.

My invention relates to means and methods for automatically timing the use of electrical circuits such as telephone systems and more particularly to an automatic time recording device associated with a toll circuit or a local circuit for measuring and recording the duration of a toll or local call. However, the invention may be utilized with various other electrical systems. Heretofore it has been necessary for an operator to compute the time of a call by means of a Calculagraph which method required the noting of the time of the commencement of the conversation and repeated supervisions of the connection to determine as nearly as possible the time at which the conversation terminated and then calculating the elapsed time.

An object of my invention is the provision in a toll or local circuit of the type used in interconnecting telephone lines of an automatic time recording device which is set in operation the moment one of the telephone subscribers is connected to the cord circuit and which ceases to operate as soon as the subscriber replaces his receiver.

Another object of my invention is the association with a toll or local cord circuit of an automatic time recording device which is automatically operated by the subscriber upon the termination of the conversation to record the duration of the connection.

A further object of my invention is to provide an automatic time recording device which is automatically returned to normal and which normal position is checked each time the cord circuit with which it is associated is used without requiring any additional operations or movements by the operator.

Another feature of my invention is the provision in a telephone system of the type described of one automatic time recording device, which is simple and economical in construction, for each toll circuit.

Other features will become apparent upon a further perusal of the specification and together with the features pointed out, will be explained fully hereinafter, reference being had to the accompanying drawing in which like reference characters in the several views represent like parts and in which

Fig. 1 is a schematic representation of the time recording device of my invention;

Fig. 2 is a side view of one of the stamping wheels of my time recording device;

Fig. 3 is a preferred circuit arrangement of my system including my device; and

Fig. 4 shows the subscriber's substation and line circuit arrangement.

The time recording device of my invention as shown in Fig. 1 of the drawing comprises a supporting member 5 having legs 6 and 7 extending at right angles therefrom. A rotatable shaft 8 is supported between said legs 6 and 7 and secured thereto is a ratchet wheel 9 which has associated with it a pawl member 10 connected to the armature 10' of a stepping magnet SM. A plurality of stamping wheels W, W' and W^2 are provided with numbers 0 to 9 inclusive placed at suitable distances along their periphery. The wheel W is secured to the rotatable shaft 8 and is adapted to rotate therewith under the influence of the ratchet wheel 9 and pawl-member 10. The stepping magnet SM operates intermittently at one-tenth minute intervals under the influence of an impulse clock IC.

Each time the magnet SM operates the pawl member 10 causes the ratchet wheel 9 to move and it in turn moves the wheel W one space from its normal or zero position. The wheel 9 and pawl 10 cooperate to hold the wheels in their off-normal or off-zero position. Ten steps are necessary to move the wheel W one revolution which indicates the passing of one minute. Upon making the last movement necessary to complete one revolution the wheel W causes the wheel W' to step one division and the wheel W' upon making one complete revolution causes the wheel W^2 to step one division in a manner well known to those skilled in the art. The wheels W' and W^2 are loosely supported upon the shaft 8.

A restoring coil RC is provided and is associated with a plurality of iron wedge shaped members 11, 11', 11^2 and 11^3 associated with the stamping wheels in such a manner that the wheels W, W' and W^2 are each situated between two of the wedge shaped members the surfaces of which form tapered air gaps.

As shown in Fig. 2 the wheels W, W' and W^2 are each provided with a piece of soft iron 12. This piece of iron 12 is so placed within the wheel that when the wheel is in its normal or zero position the iron 12 will be within the narrowest portion of the tapered air gap formed by the wedge shaped members 11, 11', 11^2 and 11^3. When the restoring coil RC is energized

the wedge members 11, 11', 11^2 and 11^3 become activated and the soft iron 12 in each of the wheels is attracted by the members 11, 11', 11^2 and 11^3 and as the attraction of the wedge members for the iron mass 12 has a greater effect at the point where the iron 12 is closest to the wedge members the iron mass 12 assumes its normal position in the narrowest portion of the air gap, where the attraction is greatest, to return the wheels to their normal or zero position. It is well known by those skilled in the art that electromagnetic attraction increases as the distance between the iron members decreases and consequently when the wedge shaped iron core members are activated the iron mass 12 is attracted thereto. The mass 12 will be attracted more at its lower side because the wedge shaped members are closer to it at that place. This greater attraction at the lower side tends to move the iron mass 12 downwardly and this movement continues until the narrowest part or lowermost part of the wedge is reached at which point the magnetic attraction is equal on all parts of the mass 12 and it comes to rest with the wheel associated therewith in its zero position. A release magnet RR operates simultaneously with the coil RC to disengage the pawl member 10 from the ratchet wheel 9 to permit the wheels to rotate freely. A stamping magnet SR is also provided for the purpose of shifting the stamping wheels to cause them to contact with a card not shown in the drawing to stamp the number corresponding to the position to which the wheels have been moved.

In Fig. 3 the electrical circuit connections for the various electromagnets of the time recording device are shown associated with a toll cord circuit such as is commonly used for interconnecting two subscribers and comprising a plug P, a relay SL, a supervisory relay S, lamp L and guard lamp GL, a control relay CR, a slow-to-release relay DR, a key K and off-normal contacts ON. The operation of the system is as follows:

The operator being apprised of a desired connection will insert the plug P into a jack J associated with a toll line or to a subscriber's station A which will cause the operation of the sleeve relay SL over a circuit traced from battery through the winding of the relay SL, sleeve contact of the plug P and jack J, through the winding of cut-off relay CO to ground. The relay SL energizes and closes its alternate contacts 16, 17, 18 and 19. The closure of contact 16 establishes an energizing circuit for the restoring coil RC and release magnet RR over a circuit which may be traced from battery through the respective windings of RC and RR in parallel, conductor 20, alternate contact 16 of relay SL, conductor 21 to normal contact 22 of relay DR. The energization of the relays RC and RR causes the wheels W, W' and W^2 to be restored to their normal or zero position as above explained.

The closure of alternate contact 17 of relay SL causes the illumination of lamp L by current flowing from battery through lamp L, alternate contact 17, normal contact 23 to ground.

The closing of alternate contacts 18 and 19 of relay SL conditions an energizing circuit for the supervisory relay S, subject to a closed circuit at the common battery subscriber's station A. When the receiver R is removed from its switchhook at the common battery subscriber's station A an energizing circuit for the supervisory relay S is established which may be traced from battery through the lower winding of relay S, alternate contact 19, plug P and jack J, through the closed switchhook contacts at A, tip contacts of jack J and plug P, closed contact 18, and upper winding of S to battery, which relay energizes and attracts its armature 23 to interrupt the illuminating circuit of the lamp L and to close an energizing circuit for the guard lamp GL which circuit may be traced from battery through the lamp GL, normal contact 24 of connecting relay CR, conductor 25 to ground at alternate contact 23 of supervisory relay S.

The operator noting the lighted guard lamp GL will know that the common battery subscriber has been connected to the toll cord circuit and will operate the key K thereby establishing an energizing circuit for the connecting relay CR which circuit may be traced from battery through the relay CR, alternate contact of key K, normal contacts of the off-normal contacts ON, conductor 25 to ground at alternate contact 23 of supervisory relay S. The off-normal contacts ON are moved to their off-normal or open position by the first operation of the stepping magnet SM and remain in this position until the wheels W, W' and W^2 return to their zero indicating position at which time the contacts ON are again closed. The subsequent operation of the off-normal contacts ON opens the energizing circuit of relay CR but a substitute circuit is closed through its alternate contact 24 and the relay CR is held up over this circuit to ground at alternate contact 23. The attraction of contact 24 opens the illuminating circuit for the guard lamp GL which deenergizes. Alternate contact 26 establishes an energizing circuit for the slow-to-release relay DR which circuit is obvious. The attraction of armature 22 of relay DR opens the energizing circuits of the coil RC and relay RR which accordingly are deenergized.

The closure of alternate contact 27 of relay CR connects the stepping magnet SM to ground through the contacts of a one-tenth minute impulse clock IC over a circuit traced from battery through stepping magnet SM, alternate contact 27 of CR, and conductor 29, which is connected to contacts in the clock. Each time these contacts are closed the stepping magnet SM is operated thereby attracting its armature 10' which causes the pawl member 10 to move the ratchet wheel 9 and the associated rotatable shaft 8 and the wheel W one division. The stepping magnet SM is thus intermittently operated until the termination of the conversation at which time the subscriber replaces his receiver upon its switchhook thereby interrupting the energizing circuit of the supervisory relay S which deenergizes and opens its alternate contact 23 which breaks the locking circuit of the connecting relay CR. The connecting relay CR deenergizes and restores its contacts 24, 26, 27 and 28 to normal thereby disconnecting, at normal contact 27, the stepping magnet SM to prevent further actuation of the wheels W, W' and W^2 by the stepping magnet SM. The opening of contact 26 breaks the energizing circuit of the slow-to-release relay DR but due to its construction the relay DR does not restore until after an energizing circuit for the stamping magnet SR has been closed. This circuit may be traced from battery through the winding of the stamping relay SR, normal contact 28 of relay CR, and alternate contact 22 of relay DR. The stamping magnet energizes and causes the stamping of the elapsed time upon a ticket which has previously been placed in position by the operator.

The restoration of normal contact 22 of relay DR establishes energizing circuits for the restoring coil RC and releasing magnet RR as previously described which operate to place the timing device in its normal or zero position which position is again checked when the circuit with which the timing device is associated is again used.

While I have described my invention in certain particular embodiments, I desire that it be understood that modifications and alterations may be made and that I intend no limitations upon my invention other than those imposed by the scope of the appended claims.

Having described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. In a telephone system, subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, means for progressively actuating said recording device during the continuance of a conversational circuit over connected lines, means for releasing said recording device and means for actuating said releasing means upon connection of said cord circuit to a subscriber's line.

2. In a telephone system, subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, means for progressively actuating said recording device during the continuance of a conversational circuit over connected lines, means for releasing said recording device, means for actuating said releasing means incident to interruption of the talking circuit and for again operating said releasing means incident to joining said cord circuit to a subscriber's line.

3. In a telephone system, a plurality of subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, a stepping magnet for operating said recording device, an impulse device, a circuit including the winding of said magnet and said impulse device, a relay for closing said circuit operable upon completing a conversational circuit over two connected lines, a stamp magnet for said recording device, an electromagnet for permitting the restoration of said device to normal, operating circuits for the windings of said stamping magnet and said electromagnet and means for closing said operating circuits incident to interrupting the talking circuit at one of said connected lines.

4. In a telephone system, a plurality of subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, a stepping magnet for operating said recording device, an impulse device, a circuit including the winding of said magnet and said impulse device, a relay for closing said circuit operable upon completing a conversational circuit over two connected lines, a stamp magnet for said recording device, an electromagnet for permitting the restoration of said device to normal, operating circuits for the windings of said stamping magnet and said electromagnet, means for closing said operating circuits incident to interrupting the talking circuit at one of said connected lines and means for again closing the circuit for said electromagnet upon the connection of said cord circuit to another subscriber's line.

5. In a telephone system, a plurality of subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, a stepping magnet for operating said recording device, an impulse device, a circuit including the winding of said magnet and said impulse device, a relay for closing said circuit operable upon completing a conversational circuit over two connected lines, an electromagnet for restoring said device to normal, an operating circuit for the winding of said electromagnet and means for closing said operating circuit incident to interrupting the talking circuit at one of said connected lines.

6. In a telephone system, a plurality of subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, a stepping magnet for operating said recording device, an impulse clock, a circuit including the winding of said magnet and said clock, a relay for closing said circuit operable upon completing a conversational circuit over two connected lines, an electromagnet for releasing said recording device, an electromagnet for causing the restoration of said device to normal, operating circuits for the windings of said electromagnets and means for closing said operating circuits incident to interrupting the talking circuit at one of said connected lines.

7. In a telephone system, a plurality of subscribers' lines, a cord circuit for interconnecting said lines, a time recording device in said cord circuit, a stepping magnet for operating said recording device, an impulse device, a circuit including the winding of said magnet and said impulse device, a relay for closing said circuit operable upon completing a conversational circuit over two connected lines, an electromagnet for releasing said recording device, an electromagnet for causing the restoration of said device to normal, operating circuits for the windings of said electromagnets, means for closing said operating circuits incident to interrupting the talking circuit at one of said connected lines and means for again closing said operating circuits incident to connecting said cord circuit to another subscriber's line.

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