

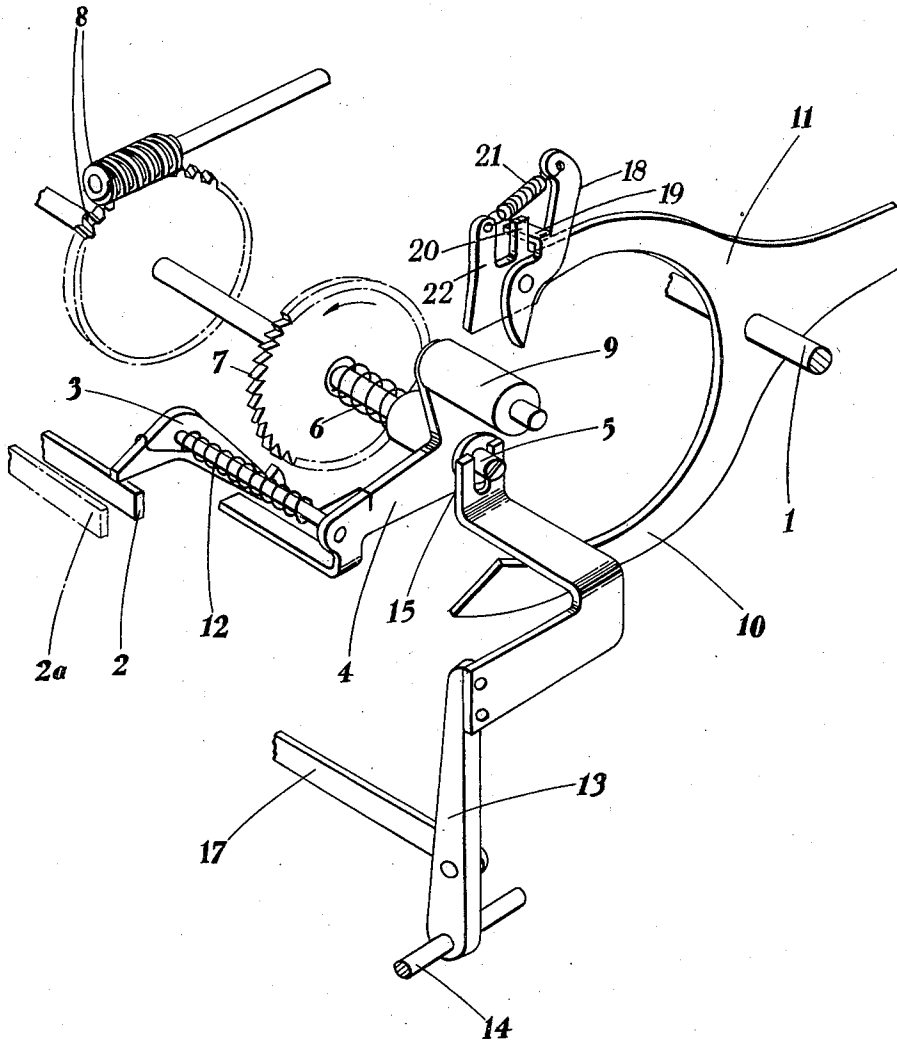
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AUTOMATIC ELECTRIC MOTOR STARTING DEVICE FOR TELEGRAPH APPARATUS

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AUTOMATIC ELECTRIC MOTOR STARTING
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This invention relates to automatic starting devices for electric motors employed in connection with telegraph apparatus. The invention is particularly applicable to automatic starting gear for the driving motors used in apparatus such as start-stop telegraphs; such automatic starting devices are usually arranged to start the driving motor under the control of the signal impulses transmitted and are actuated to stop the motor by means of power derived from the driving motor itself.

The main purpose of the present invention is to provide such an automatic starting apparatus arranged so that minimum interference is caused to the signal recording member or equivalent member co-acting directly mechanically with the signal recording member, which, in a single-magnet receiver, will usually consist of the armature of the single magnet. The invention also aims at providing a starting device which will cut off the electrical supply from the driving motor following upon an idle interval of predetermined length, which in practice is the interval following the last impulse received, in such a manner that the idle period is always of practically the same length.

The usual practice is to arrange for the signal recording or equivalent member owing to its movement to prevent the starter device from being operated to interrupt the electrical supply to the driving motor; there are, however, other known arrangements arranged so that the signal recording or equivalent member co-operates with a crawling device at a convenient point before the latter reaches the switching off position so as to cause the said crawling device to return to its on position, this co-operation imposing an extra load on the signal recording member. The present invention enables a motor starting device to be arranged so that it only co-operates with the signal recording or equivalent member after the electrical supply to the motor has been interrupted. The result of this is that the signal recording member is not interfered with by the starting device while the motor is running.

According to the present invention, in a starting device an actuating member is arranged so that when tripped by the signal recording member or equivalent member, for example, the armature of the single magnet telegraph receiver, it actuates by the resulting impact, the switch for connecting the electrical supply to the driving motor, while the said actuating member is moved, only after the driving motor is switched off, into the set position in which it is latched

by the signal recording member. The impact for closing the switch may take place under the weight of the parts or under the action of a suitable spring. The member which is tripped carries a pawl which is at that stage brought into engagement with a ratchet wheel geared to the driving motor so as to be constantly rotated when the motor is running. The tripped member is then slowly turned about its axis by the ratchet wheel engaging the pawl and therefore is caused, so to speak, to crawl around the ratchet wheel. This tripped crawling member or, in the case of spring actuation, the ratchet wheel itself, is mounted to be capable of sliding along the axis of the ratchet wheel, but the parts may be held in the position in which the pawl can engage with the ratchet wheel under the influence of a suitable spring, such as a coiled compression spring surrounding the axis of the ratchet wheel. In order to prevent the crawling member from rotating into the position in which it can switch off the motor while impulses are being received, it is arranged that the receiving mechanism imparts a mechanical impulse to the crawling member at each operation of the receiving mechanism thereby bringing the pawl out of the plane of the ratchet wheel and allowing the crawling member thus to be restored to the full on position, whereupon it is enabled to commence its crawling process afresh. It is only when the interval between impulses exceeds a predetermined amount, such as occurs when the last impulse has been received, that the crawling member is not interrupted in its crawling process and is actually moved sufficiently far to switch off the motor; then the pawl carried by the crawling member again is latched by the signal recording member, that is to say, the armature of the single receiving magnet ready for fresh operation when the next signal character commences to be received. When the crawling member is actuated solely by the weight of the parts so that the energy producing the switching on of the motor is entirely kinetic, the crawling member preferably commences its crawling process from the point at which the weight of the parts is in the lowermost position.

In order that the invention may be clearly understood and readily carried into effect, a form of construction in accordance therewith will now be more fully described with reference to the accompanying drawing which is a perspective view showing the main parts of the automatic starting apparatus.

In this drawing the switch arm, not shown, is

connected to a pivot 1 through a toggle so that the toggle is straightened for closing the switch, but is tripped when the switch is to be opened.

The armature of the single receiving magnet is shown at 2 and when the start impulse arrives this armature is drawn into the position shown in dotted lines at 2^a. It thus releases a pawl 3 carried by an actuator or crawling member 4 which latter is mounted to turn freely about the spindle 5. The member 4 is normally held by a spring 6 so that the point of the pawl 3 lies in the plane of the ratchet wheel 7 mounted on the spindle 5 and slowly rotated through worm gearing 8 when the motor is running.

In the position shown, the apparatus is illustrated as ready to be tripped by the armature 2 with the weight 9 carried by the crawling member 4 slightly to the front of the axis of the spindle 5. Thus, when the pawl 3 is released by the armature 2, as described above, the weight 9 falls sharply forward and gives a sharp blow to the lower limb 10 of a fork 11 fixed to the pivot 1. The result of this is that the pivot 1 is rotated and straightens the toggle which closes the switch.

The point of the pawl 3 is brought into contact with the teeth of the ratchet wheel 7 by a light torsion spring 12 but during the falling of the weight 9, the pawl 3 simply rides quickly over the teeth of the ratchet wheel 7. At this stage, however, the driving motor is started and drives the worm gearing 8 so that the ratchet wheel 7 is now slowly turned in the counter-clockwise direction as indicated by the arrow. The weight 9 is now in its lowest position, but the pawl 3 is in engagement with the teeth of the ratchet wheel 7 so that the member 4 begins to crawl round and lift the weight 9. The weight 9 strikes the lower arm 10 of the fork 11 with sufficient force to move the arm 10 downwards sufficiently for the weight 9 to clear the end of the arm as the weight is lifted by the motor drive. At each actuation of the receiver mechanism, however, when a further current impulse arrives, a connecting rod 17 connected to the receiver mechanism swings over an arm 13 pivoted at 14 and thereby moves a fork 15 attached to the arm 13 to the left. During this time it pushes the member 4 also to the left, compressing the spring 6 until the pawl 3 is moved out of the plane of the ratchet wheel 7, whereupon the weight 9 is released and falls again to its lowest position. The pawl 3 is lifted by engaging a suitable cam surface (not shown in the drawing) so that, under the influence of the spring 6, the pawl can re-engage with the ratchet wheel 7. However, when the final impulse of a character has arrived, there is a sufficient time interval for the actuator 4 to crawl around under the drive of the ratchet wheel until it lifts the weight 9 until the latter engages and passes the upper limb 16 of the fork 11. The result is that the motor is switched off by the pivot 1 tripping the toggle, and this happens after a predetermined time delay after the last impulse is received. Furthermore, as the weight 9 on the member 4 passes the upper arm 16 and has thus switched off the driving motor, it has just passed its highest position and falls into the position shown in the drawing so that everything is in the position for fresh starting of the motor when the pawl 3 is again released by the armature 2.

It will be appreciated that the member 4 turns through one complete revolution during each complete cycle of operations; that is to say, the member 4 moves in an anti-clockwise direction

to effect the closing of the switch, moves further in an anti-clockwise direction to effect the opening of the switch and then continues under the influence of the weight 9 in an anti-clockwise direction to the set position shown in the drawing. However, the member 4 swings in a clockwise direction when it is released through the medium of the fork 15. This clockwise movement is necessary, sometimes, even when the member 4 has been turned so far that the centre of gravity of the combined member 4 and weight 9 has reached a position vertically above the axis of the spindle 5. The actual movement for opening of the switch does not take place until the centre of gravity has passed this top dead-centre position to a sufficient extent to ensure that when released friction will not prevent the weight 9 falling to carry the member 4 into the set position shown in the drawing. Thus, it will be seen that when this top dead-centre position is approached and the member 4 is released from the motor drive as a result of an impulse received by the telegraph apparatus, it is necessary to provide means for giving the member 4 a bias which will prevent it from staying at or near the top dead-centre position and will insure that it swings back in a clockwise direction. For this purpose, a lever 18 is pivoted to the upper limb 16 of the fork 11. The lever 18 is normally held in the position shown in the drawing, in which a projection 19 on the lever 18 is held against a projection 20 on the limb 16 by a spring 21 connected between the lever 18 and a lug 22 formed on the limb 16. When the member 4 approaches the top dead-centre position, the weight 9 bears on the lower end of the lever 18 and swings it in a clockwise direction. Now, if the member 4 is carried on to the switch-opening position, the weight 9 snaps past the lever 18 before this position is reached. If, however, the pawl 3 is released from the ratchet wheel 7 before the switch-opening position is reached, the energy stored in the spring 21 is sufficient to swing the lever 18 in an anti-clockwise direction with the result that the lower end of the lever 18 pushes the combined weight 9 and member 4 in a clockwise direction until a position is reached in which the member 4 can swing under the action of gravity towards the switch-closing position.

Obviously, the weight 9 can be replaced by a spring, or the weight 9 may be supplemented by the action of a spring. When a spring is employed, it is sometimes more convenient, however, to mount the ratchet wheel 7 so as to be slidable in the direction of its axis of rotation so that the mechanically actuated arm 13 can shift the wheel 7 out of the plane of the pawl 3. Such an arrangement makes it easier for the spring which replaces the weight 9 to work across the axis of the shaft 5.

I claim:—

1. An automatic device for actuating a starting switch of an electric motor in telegraph apparatus including an electrically-operated signal recording member and a mechanically-operated member arranged to move as a result of each impulse of a signal received by the telegraph apparatus, said device comprising in combination a spindle in operative connection with the motor, switch operating means, a switch-actuating member freely mounted for rotation upon said spindle and arranged normally to be held in a set position but to be released under the control of the recording member as a result of an incoming signal so that said actuating member swings to a

position in which it strikes said operating means and thereby effects the closing of the switch, a pawl carried by said actuating member, a ratchet wheel mounted upon said spindle to be driven thereby and disposed so as to be engaged by said pawl when said actuating member moves to said switch-closing position and to carry said actuating member towards a position in which it acts on said switch-operating means to effect the opening of the switch, and mechanism operatively connected to said mechanically-operated member and arranged to effect the disengagement of said pawl from said ratchet wheel as a result of each impulse received by the telegraph apparatus during signalling so that said actuating member is carried to the switch-closing position only after a substantial lapse of time following the receipt of the last impulse of a signal.

2. In mechanism for actuating the starting switch of an electric motor in telegraph apparatus, a horizontal spindle, a switch actuating member, including a weight normally held in a set position and pivotally-mounted upon said spindle about an axis remote from the centre of gravity of said actuating member, a signal-recording member arranged, upon the receipt of an impulse by the telegraph apparatus, to release said actuating member so that it is caused by said weight to swing about said spindle to a switch-opening position, ratchet and pawl mechanism operative positively to connect said actuating member to said spindle when said actuating member reaches said switch-closing position, driving mechanism interconnecting the motor and said spindle so that when the motor is started, said actuating member is carried by said spindle towards a switch-opening position and means actuated upon receipt of successive impulses by the telegraph apparatus to release said pawl from said ratchet so that said switch actuating member is permitted to swing back to the switch-closing position periodically while signals are being received and only reaches said switch-closing position after a substantial lapse of time subsequent to the receipt of the last impulse of a signal, said actuating member being independent of said signal-recording member except when in its set position.

3. An automatic device for actuating the starting switch of an electric motor in telegraph receiving apparatus wherein the signal recording of selecting mechanism operates under mechanical control of a single electro-magnet, said device comprising in combination, switch-operating means, an actuating member normally retained in a set position in a loaded condition by the armature of the single electro-magnet, the said armature moving to release said actuating member under the action of an incoming signal whereupon said actuating member strikes said switch-operating means to effect the closing of the switch, reduction gearing driven by said motor, a rotary member operatively connected to said motor through said gearing, a clutch device associated with said actuating member to clutch the same to said rotary member upon the closing of the switch to cause the motor to drive said actuating member slowly towards a switch-opening position, in which position said actuating member acts upon said switch-operating means to effect the opening of the switch, and means for returning said actuating member to said set position only after it has reached said switch-opening position.

4. An automatic device for actuating the start-

ing switch of an electric motor in telegraph apparatus embodying a signal recording member, said device comprising in combination, switch-operating means, a loaded actuating member normally retained in a set position by said signal recording member, the said signal recording member moving to release said actuating member under the action of an incoming signal, said actuating member being operative upon being so released to act by impact upon said switch-operating means to effect the closing of the switch, a spindle, means including reduction gearing interconnecting said spindle and the electric motor, clutch mechanism operatively connected with said actuating member to be engaged to connect said spindle to said actuating member to move the latter towards the switch opening position when the same has acted upon said switch operating member to start the motor, means operated upon the reception by the telegraph apparatus within a predetermined time of each successive impulse of a signal for disengaging said clutch mechanism so as to release said actuating member upon receipt of each impulse by the telegraph apparatus, and means for returning said actuating member to said set position only after it has been carried to the switch opening position through the medium of said spindle and said clutch mechanism.

5. In starting mechanism for an electric motor for use with telegraph apparatus, a switch, switch-operating means adapted to move between two positions in one of which the switch is opened and in the other of which the switch is closed, a loaded rotary actuating member, a pawl carried by said member, means arranged normally to hold said actuating member in a set position but operative as a result of an incoming signal to trip said actuating member and permit the latter to rotate to a position such that it strikes said switch-operating means and thereby effects the closing of the switch, a ratchet wheel mounted coaxially with said actuating member and arranged to be engaged by said pawl when said actuating member has struck said switch-operating means, a driving connection between said ratchet wheel and the motor so that when the motor starts, the ratchet wheel rotates said actuating member towards a switch-opening position in which it acts upon said switch-operating means to effect the opening of the switch, and means for returning said actuating member to said set position only after it has passed said switch-opening position.

6. An automatic device for actuating the starting switch of an electric motor in telegraph apparatus, embodying a signal recording member, said device comprising in combination a switch-operating fork formed with two prongs, a loaded actuating member arranged to rotate between the prongs and during such rotation to engage one of the prongs so as to move the fork to a position such that it effects the closing of the switch and subsequently to engage the other of the prongs to move the fork to a position in which it effects the opening of the switch, clutch mechanism operative to connect said actuating member automatically to the motor when said actuating member acts on the fork to effect the closing of the switch so that said actuating member is carried towards the position in which it engages the fork to effect the opening of the switch, and a clutch-actuating member adapted to move as a result of impulses received by the telegraph apparatus and upon said movement to act upon said

clutch mechanism so as to release said actuating member and permit the latter to return as a result of its loading towards the position in which it acts on the fork to effect the opening of the switch, said signal recording member being initially in operative engagement with said actuating member to retain the latter in a set position but moving under the action of the first signal impulse received by the telegraph apparatus to release said actuating member to permit the latter to move into engagement with said fork to effect the closing of the switch, and means for returning said actuating member to said set position only after said actuating member has effected the opening of the switch.

7. An automatic device for actuating the starting switch of an electric motor in telegraph apparatus embodying a signal recording member, said device comprising in combination a switch-operating fork, a loaded actuating member normally retained in a set position by said signal recording member, the said signal recording member moving to release said actuating member under the action of an incoming signal, said actuating member being so released to act by impact upon one prong of the said fork to effect the closing of the switch, mechanism adapted and arranged upon starting of said motor to cause said actuating member to move slowly towards the switch-opening position in which said actuating member acts upon a second prong of said fork to effect the opening of the switch, and means for returning said actuating member to said set position only after it has reached said opening position.

8. An automatic device for actuating the starting switch of an electric motor in telegraph apparatus wherein the signal recording or selecting mechanism operates under mechanical control of a single electro-magnet, said device comprising switch-operating means, a loaded rotary actuating member normally retained in a set position by said signal electro-magnet, said signal electro-magnet moving to release said actuating member under the action of an incoming signal, said actuating member upon being so released being operative to actuate said switch-operating means to the switch-closing position, driving mechanism in operative connection with the motor, a clutch device engageable upon starting of the motor to effect driving connection between the motor and said actuating member to cause the latter to rotate in the same direction towards a position in which it acts on said switch-operating means to effect the opening of the switch, and means for turning said actuating member further in the same direction to the set position after reaching said switch-opening position.

9. An automatic device for actuating the starting switch of an electric motor in telegraph receiving apparatus wherein the signal recording or selecting mechanism operates under mechanical control of a single electromagnet, said device comprising switch-operating means, a loaded actuating member mounted for rotation in a vertical plane normally retained in a set position by said single electromagnet, and releasable to move said switch-operating means to the switch-closing position, said single electromagnet moving to release said actuating member under the action of an incoming signal, said actuating member upon being so released being operative to actuate said switch-operating means to the switch-

closing position, driving mechanism in operative connection with the electric motor, clutch means operatively associated with said actuating member and engageable upon the closing of the switch by said actuating member to clutch the latter to said driving mechanism to cause the latter to continue the rotation of said actuating member in the same direction towards the switch-opening position and towards a dead center position, release mechanism operative upon receipt and before said actuating member reaches said switch-opening position, of impulses by the telegraph apparatus to unclutch said driving mechanism from said actuating member to permit the latter to swing back towards the switch-closing position, and bias mechanism located in the path of movement of said actuating member to assist its backward movement when said actuating member is unclutched in the neighborhood of its said dead center position, but otherwise to permit said actuating member to pass to the switch-opening position.

10. An automatic device for actuating the starting switch of an electric motor in telegraph receiving apparatus wherein the signal recording or selecting mechanism operates under mechanical control of a single electromagnet, the said device comprising in combination a switch actuating member mounted for rotation and normally held in a set idle position in a loaded condition by the armature of the single electromagnet, but released thereby to rotate to the switch closing position, a switch-operating means operatively connected with the starting switch and located with respect to said actuating member so as to be moved to the opened and closed positions by said actuating member at different points in the rotation of the latter, reduction gearing connected to said motor, a clutch device associated with said actuating member and engageable on closing of the switch to cause the motor to continue the rotation of said actuating member in the same direction towards its switch-opening position, and means for continuing the rotation of said actuating member through the switch-opening position to the said set idle position.

11. An automatic device for actuating the starting switch of an electric motor in telegraph receiving apparatus wherein the signal recording or selecting mechanism operates under the control of the armature of a single electromagnet, said device comprising in combination, switch-operating means, a switch actuating member, means for normally retaining the said switch-actuating member in a set position in a loaded condition and operative by movement of the said armature under the action of the incoming signals, whereupon said switch actuating member strikes switch-operating means to effect the closing of the switch, a rotary member, means for slowly rotating said member operative by the said motor, a clutch device associated with said actuating member to clutch the same to said rotary member upon the closing of the switch to cause the motor to drive said actuating member slowly towards a switch-opening position, in which position said actuating member acts upon said switch-operating means to effect the opening of the switch, and means for returning said actuating member to the set position only after it has reached said switch opening position.

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