Oct. 15, 1935. G. J. UHLIG 2,017,641

SAFETY DRIVING MECHANISM AND CURRENT BREAKER THEREFOR

Filed Dec. 30, 1933 6 Sheets-Sheet 1

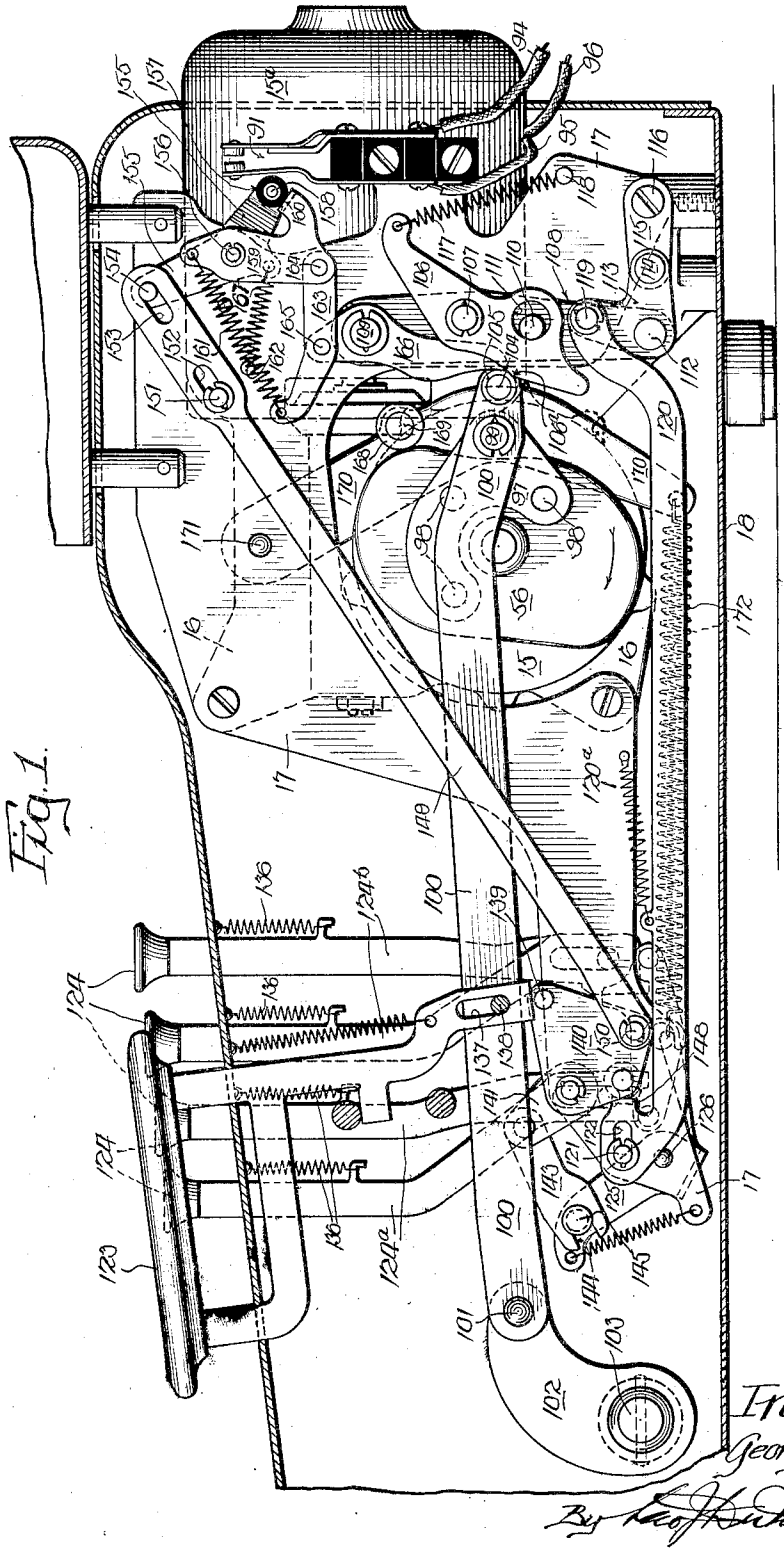

Fig. 1.

Inventor:
George J. Uhlig
By Leo J. Dubois Atty.

Oct. 15, 1935. G. J. UHLIG 2,017,641

SAFETY DRIVING MECHANISM AND CURRENT BREAKER THEREFOR

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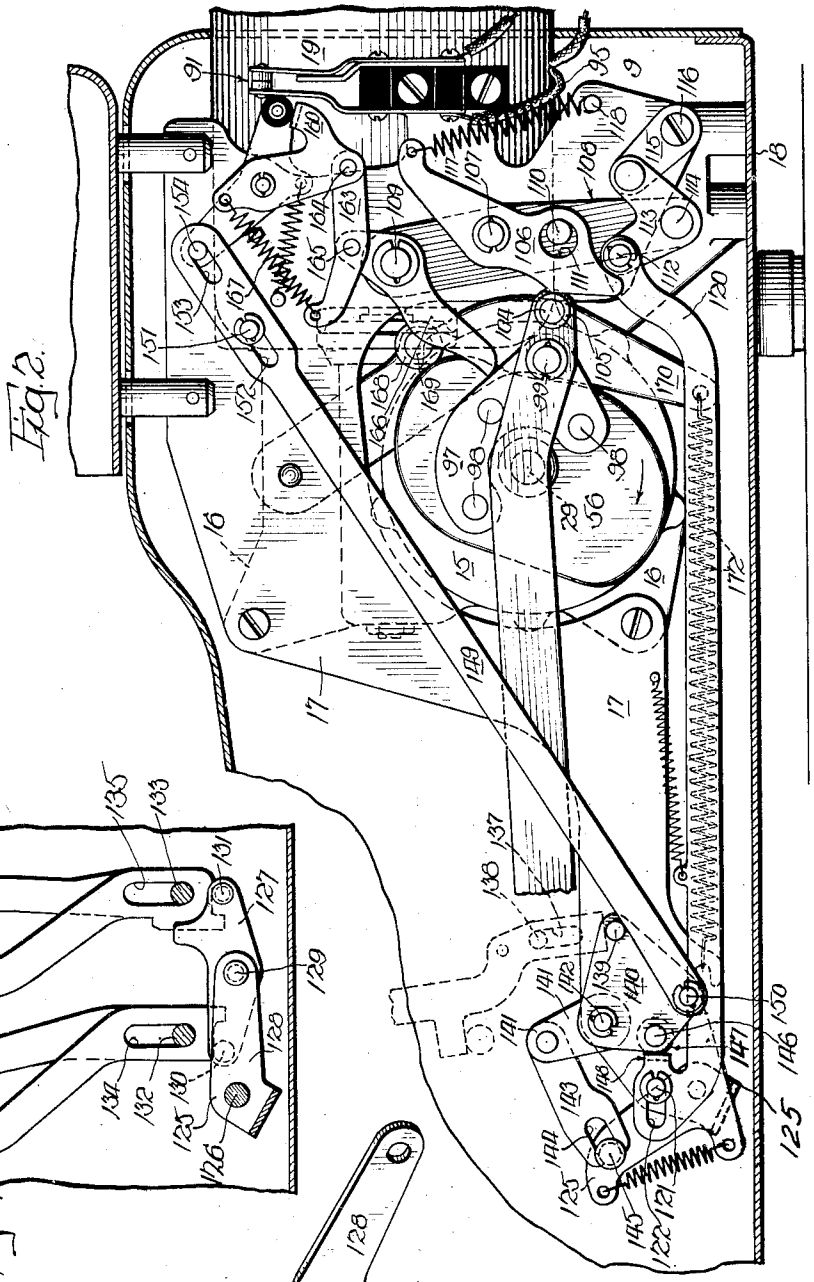

Fig. 2.

Fig. 10.

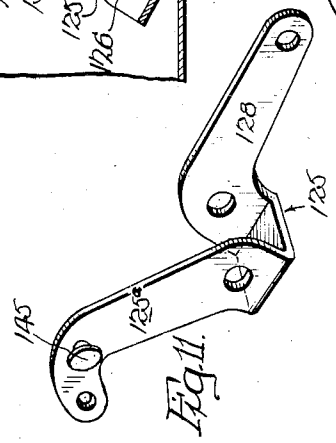

Fig. 11.

Inventor:
George J. Uhlig
By Lucius J. DuMais Atty.

Oct. 15, 1935. G. J. UHLIG 2,017,641

SAFETY DRIVING MECHANISM AND CURRENT BREAKER THEREFOR

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Fig. 3.

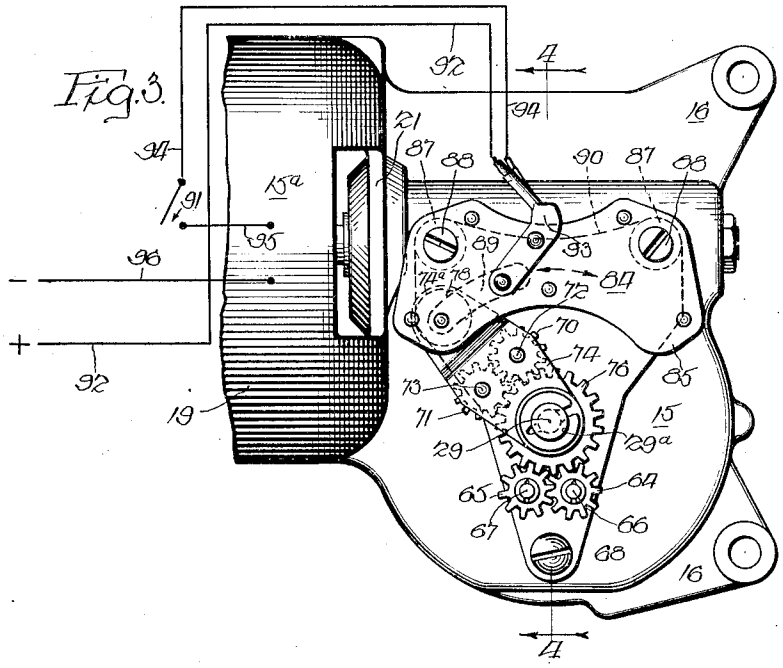
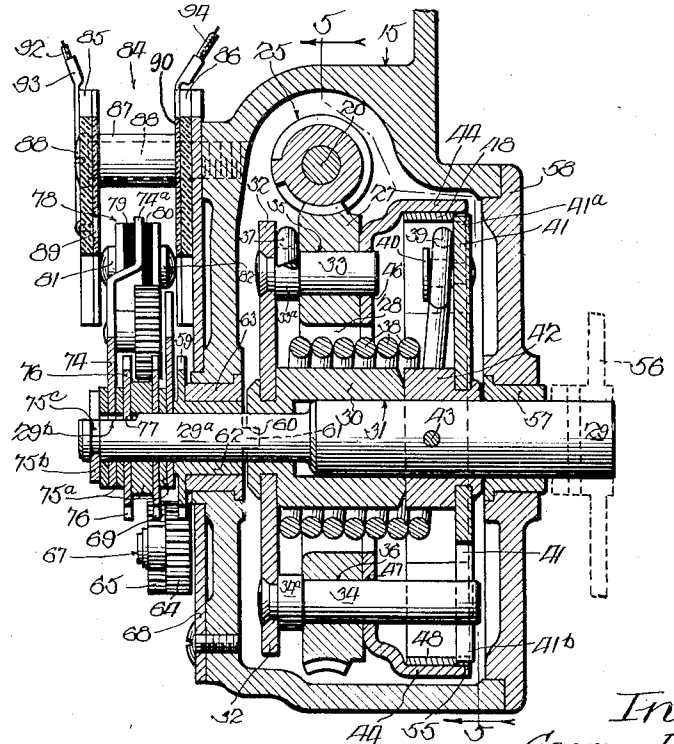


Fig. 4.



Inventor.
George J. Uhlig.
By Leo J. Dalmais Atty.

Oct. 15, 1935. G. J. UHLIG 2,017,641

SAFETY DRIVING MECHANISM AND CURRENT BREAKER THEREFOR

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Fig. 5.

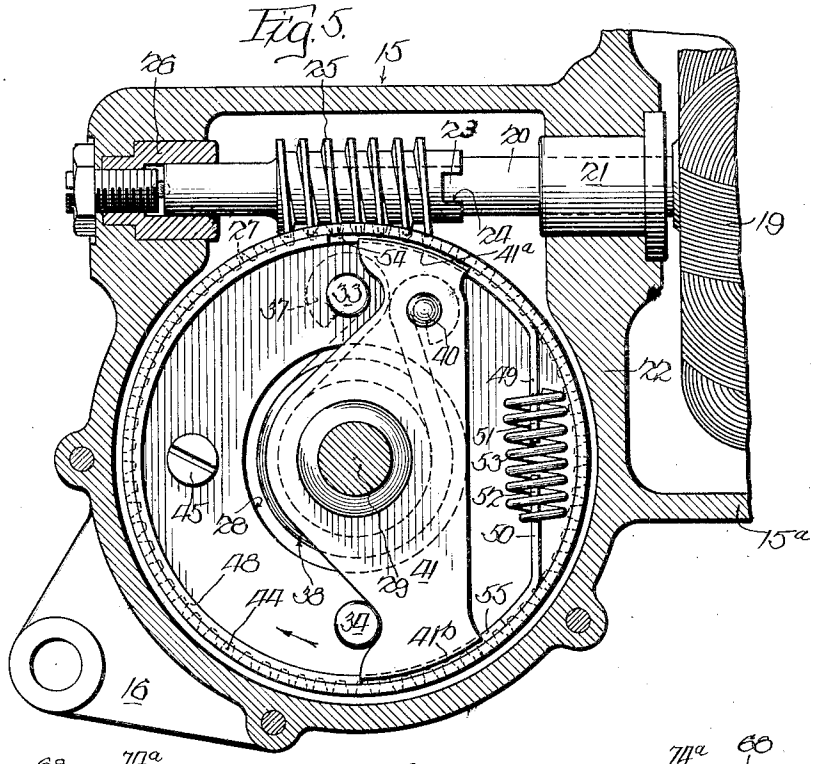


Fig. 6.

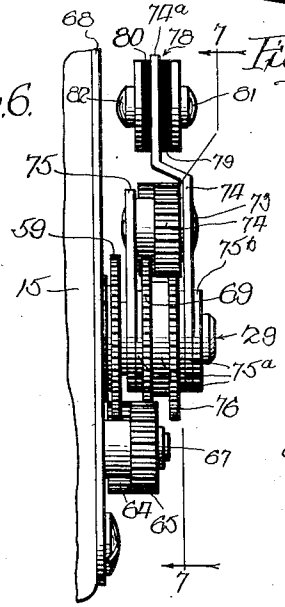


Fig. 7.

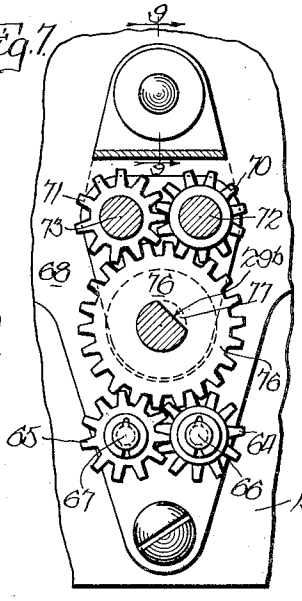


Fig. 8.

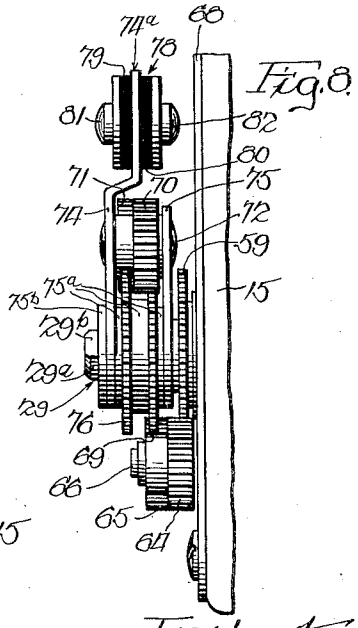
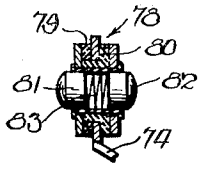


Fig. 9.



Inventor:
George J. Uhlig.
By Leo J. Du Mais Atty.

Oct. 15, 1935. G. J. UHLIG 2,017,641

SAFETY DRIVING MECHANISM AND CURRENT BREAKER THEREFOR

Filed Dec. 30, 1933 6 Sheets-Sheet 5

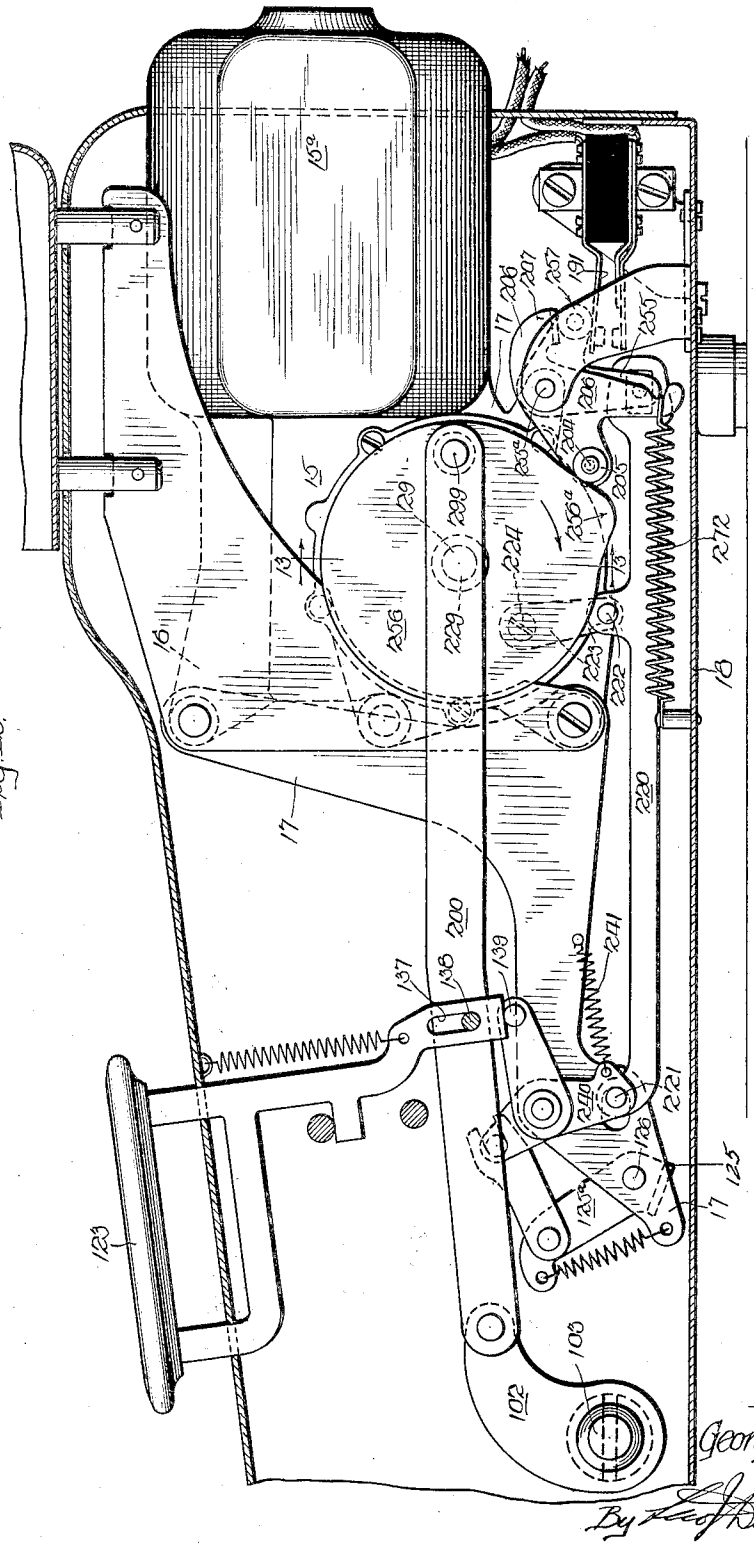


Fig. 12.

Inventor:
George J. Uhlig
By Louis J. Bertram's Atty.

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Fig. 14.

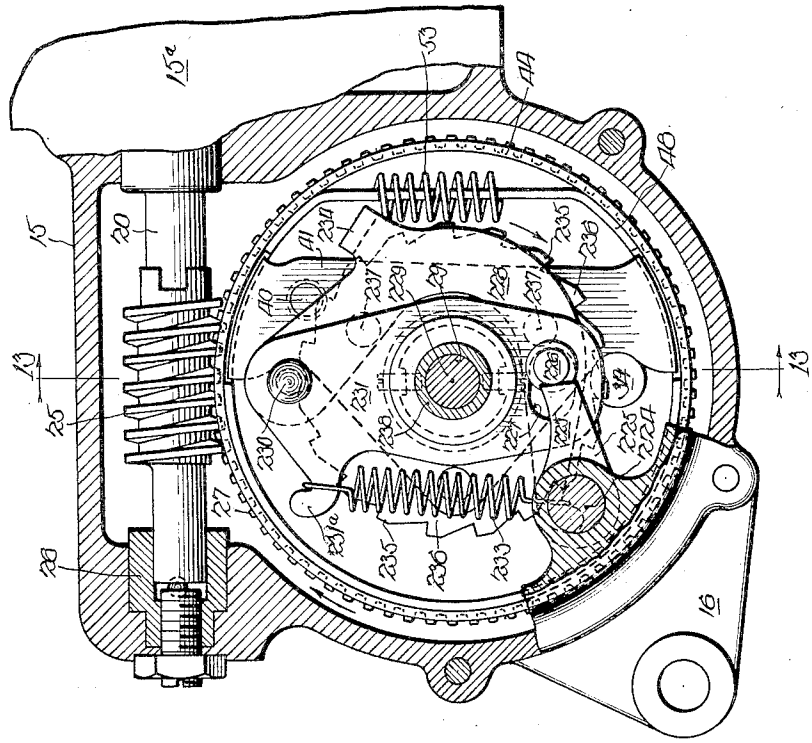
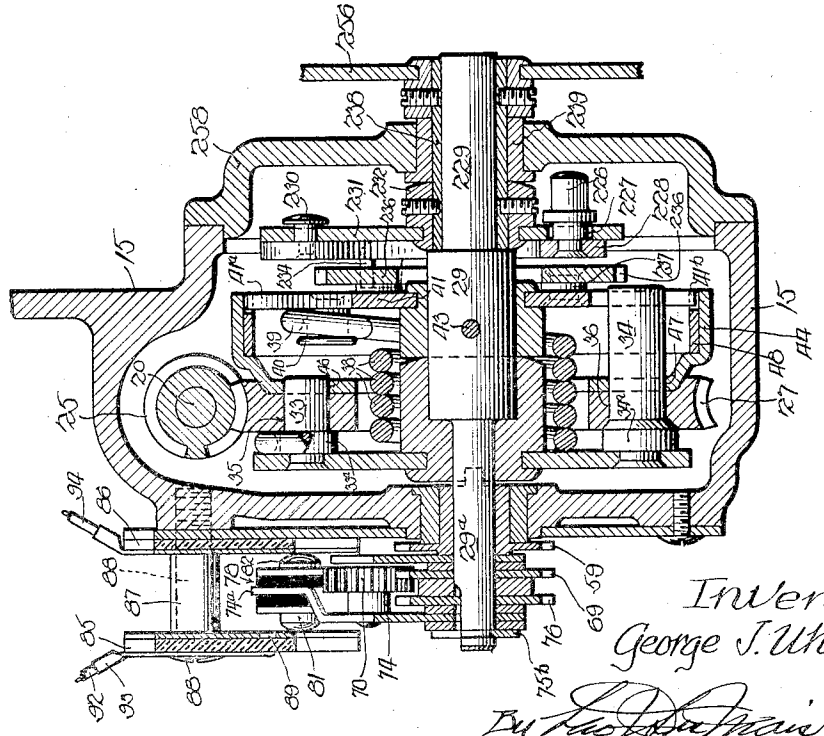


Fig. 13.



Inventor:
George J. Uhlig
By Thos. J. Sherman Atty.

Patented Oct. 15, 1935 2,017,641

UNITED STATES PATENT OFFICE

2,017,641

SAFETY DRIVING MECHANISM AND CURRENT BREAKER THEREFOR

George J. Uhlig, Chicago, Ill., assignor to Victor Adding Machine Company, Chicago, Ill., a corporation of Delaware

Application December 30, 1933, Serial No. 704,648

18 Claims. (Cl. 192—150)

This invention relates to improvements in safety driving mechanism and current breaker therefor, and being more particularly adapted for controlling the connections of machines with their source of power. As for example, the device is illustrated as being attached to an adding machine for driving the same, wherein a single revolution or cycle is required for the normal operation of the setting up of the parts of the machine to make an impression thereof, and for restoring them to their normal positions during the cycle, and wherein provision is made whereby a number of successive revolutions may be had at the will of the operator.

The chief objects of the invention are the provision of unitary driven actuating mechanism for automatically rendering the driving action of the machine effective for a complete cycle under the driving power of a motor and for cutting off the current supply to the motor upon the completion of the cycle and the parts being automatically brought to rest in a predetermined position, being caused to move under the control of a touch-bar and also under the control of the feature keys of the adding machine.

Another object is the provision of means for cutting off the current supply to the motor when the machine is operated and the parts thereof become locked due to some cause or other or of interference in the mechanism and thereby relieving the strain on the driving parts and preventing the burning out of the motor.

A further object is the provision of means for controlling and to even out the load in the machine in each cycle of operation.

In the accompanying drawings embodying my invention, I show the device as being attached to an adding machine, but do not wish to be limited to the operation and action solely to an attachment while all of the features embodied in these improvements will be substantially the same.

Figure 1 is a side elevation illustrating my device as attached to an adding machine, showing the casing of the machine in cross-section and the control parts extending from the device to operate the machine.

Figure 2 is a side elevation similar to Fig. 1, illustrating the control parts in a changed position.

Figure 3 is a side elevation showing a portion of the driving unit and the planetary gearing thereon for controlling the safety switch and also the wiring circuit being shown diagrammatically therewith.

Figure 4 is an enlarged detail cross-sectional view taken on the line 4—4 of Fig. 3, showing the interior mechanism of the driving unit.

Figure 5 is a longitudinal sectional view taken on the line 5—5 of Fig. 4.

Figure 6 is an enlarged detail side elevation of the planetary gearing for operating the safety switch.

Figure 7 is an enlarged detail cross-sectional face view taken on the line 7—7 of Fig. 6.

Figure 8 is an enlarged detail side elevation similar to Fig. 6, showing the other side of the planetary gearing.

Figure 9 is a detail cross-sectional view of the contacting member taken on the line 9—9 of Fig. 7.

Figure 10 is a fragmentary detail side elevation of the lower end of the feature keys, showing their connection to control the driving mechanism.

Figure 11 is an enlarged perspective detail view of the feature key rocker member.

Figure 12 is a side elevation of a modified form of driving mechanism as attached to an adding machine.

Figure 13 is an enlarged detail cross-sectional view taken substantially on the line 13—13 of Figs. 12 and 14.

Figure 14 is an enlarged longitudinal sectional view of the driving mechanism with parts thereof being partially in elevation.

In the preferred embodiment of the invention, the mechanism includes a housing 15 provided with a plurality of ears 16 for attaching and supporting the device in position on a plate or wall 17 which is secured to the bottom wall 18 of the adding machine. The housing 15 is provided with a horizontally extending portion 15*a* for housing a motor 19 which has its shaft 20 journaled in a bearing 21 supported on the wall 22 positioned between the housings 15 and 15*a*. The shaft 20 of the motor 19 is provided with a transverse tongue portion 23 fitting into a transverse slot opening 24 milled in one end of a worm 25 for driving the same and having its other end journaled in an adjustable bearing 26 at the outer end of the housing 15. The bearing 26 also serves as an end-thrust bearing for taking the driving thrust of the worm 25 while it is driving the mechanism by means of a worm-wheel 27 carried in the housing 15. The worm-wheel 27 is in the form of a ring-gear, being provided with a central bore 28 which is supported for turning movements with and independently of a shaft 29 by means of a collar 30 provided with a central bore 31 through which the shaft 29 extends. A disc 32 is fixed to one end

of the collar 30 and has the studs 33 and 34 fixed thereto with their free ends extending through openings 35 and 36 respectively in the worm-wheel 27 for supporting the same on the shaft 29. Each of the studs 33 and 34 is provided with a shoulder 33a and 34a respectively adjacent the disc 32 for spacing the worm-wheel 27 therefrom and with the shoulder 33a of one of the studs providing for the attachment of one leg 37 of a torsion spring 38 which has its body portion encircling the collar 30 and being disposed within the bore 28 of the worm-wheel 27. The other leg 39 of the torsion spring 38 is fixed to a stud 40 on a lever member 41 which is fixed for turning movements with the shaft 29 by means of a collar 42 fixed thereto with a pin 43 and has the lever member 41 secured thereto for turning movements with the shaft 29.

The studs 33 and 34 are arranged substantially diametrically opposite each other in fixed position on the disc 32 with the stud 34 relatively longer than the stud 33 to extend into the path of the lever member 41 which is normally urged against the stud 34 by means of its connection with the torsion spring 38 secured thereto.

It will be noted that a flexible drive between the worm 25 and the driven shaft 29 will be had by means of the connection of the torsion spring therebetween, and to relieve the driving strain on the torsion spring 38, a drum 44 is secured to the worm-wheel 27 by means of a screw 45 and is driven therewith by means of the studs 33 and 34 respectively extending through openings 46 and 47 respectively in the drum 44. A band 48 extends within the drum 44 engaging its inner periphery and is provided at its free ends with inwardly disposed portions 49 and 50 having reduced portions 51 and 52 which form opposed shoulders and tongues between which a compression spring 53 is interposed and guided to exert an expanding pressure on the band 48. This band 48 is provided with substantially diametrically opposed cut-away portions 54 and 55 respectively on one edge thereof to receive the ends 41a and 41b of the lever member 41 therein for turning movements therewith.

As the worm-wheel 27 is being turned by means of its driving connection with the worm 25, the drum 44 fixed thereto will frictionally drive the lever 41 by means of its connection with the band 48 which is in frictional contact with the inner periphery of the drum 44 and by means of the torsion spring 38, the shaft 29 will be yieldingly and frictionally driven with the worm-wheel 27. This constitutes the driving mechanism for the driven shaft 29 which is connected to the parts of the machine to drive the same by means of a speed control cam 56 fixed to one end of the shaft 29 outwardly of its bearing 57 in a cover plate 58 which is secured to the housing 15. The other end of the shaft 29 is provided with a reduced portion 29a that is journaled in the housing 15 and extends outwardly thereof being provided with a flattened portion 29b adjacent its free end portion to which mechanism is supported, arranged for turning movements with the driven shaft 29 as the worm-wheel 27 is turned.

The mechanism supported outwardly of the housing 15 on the reduced portion 29a of the driven shaft 29, constitutes the safety switch mechanism for cutting off the current supply to the motor 19 as the driven shaft 29 is suddenly caused to be stopped from its turning movements during the time the device is being operated. The switch mechanism comprises planetary gearing which is caused to turn with the shaft 29 and the worm-wheel 27 for retaining the switch closed in the circuit and for causing a differential movement between the driven shaft 29 and the worm-wheel 27 under the tension of the spring 38 when the driven shaft 29 is suddenly stopped during its operating movements, permitting the worm-wheel to be driven in advance of the driven shaft 29 to open the circuit.

The collar 30 is directly connected to a gear 59 of the planetary gearing which is carried on the extension 29a of the shaft 29 by means of a transverse slot 60 milled into the end of the collar 30 adjacent the inner end of the housing 15. The gear 59 is provided with a tongue 61 extending from a relatively long hub 62 and extends into the slot 60 for turning movements with the collar 30. The hub 62 of the gear 59 provides a bearing for the reduced end portion 29a of the shaft 29 and is journaled in the bearing 63 fixed to the housing 15 with its driving connection with the collar 30 by means of its engagement with the slot 60 thereof into which its tongue 61 extends. The gear 59 is in meshing engagement with a gear 64 which in turn is in meshing engagement with the gear 65 and being carried on the studs 66 and 67 respectively fixed to a plate 68 which is secured to the housing 15.

The gear 65 is in meshing engagement with a gear 69 pivotally carried on the extension 29a of the shaft 29 and is in spaced relation with the gear 59 and being also in meshing engagement with a planet gear 70 that meshes with a similar planet gear 71. The planet gears 70 and 71 are journaled on the studs 72 and 73 respectively, carried on an arm 74 supported for rocking movements on the reduced portion 29a of the shaft 29 near the free end thereof, and are also supported at their other ends in a relatively small plate 75 which is mounted for rocking movements with the arm 74 on the reduced portion 29a of the shaft 29 adjacent the gear 59. The planet gear 71 is in meshing engagement with a gear 76 fixed for turning movements with a shaft 29 on the reduced portion 29a thereof by means of the flattened portion 29b engaging the key 77 of the gear 76. All of the gears 59, 69 and 76 are arranged in spaced relation by means of the collars 78a and are securely held on the end of the shaft 29 by means of a lock washer 75b extending into an annular groove 75c at the extreme end of the reduced portion 29a of the shaft 29.

During the normal driving operation of the device, the shaft 29 will be driven with the worm-wheel 27, which will cause the gear 76 keyed thereto to turn with the shaft 29 and the gear 59 to be turned with the collar 30 by means of its engagement at 60—61. The positive turning movements of the gears 76 and 59 will cause the turning movements of the gears 64 and 65 and the free turning movements of the planet gears 70 and 71 which will cause an idling movement of these gears without affecting the movement of the arm 74.

The upper portion 74a of the arm 74 carries a contacting member designated as a whole as 78 which is insulated from the arm 74 by means of the insulation strips 79 and 80 on each side thereof and is provided with the plungers 81 and 82 which are normally forced outwardly by means of the compression spring 83 and are normally held between a guide member 84 comprising side plates 85 and 86 of the guide member 84. The side plates 85 and 86 are of insulation material held in spaced relation with each other by means

of the sleeves 87 through which the screws 88 extend being threaded into the housing 15 for supporting the guide member 84 in position with respect to the arm 74. The insulated side plate 85 is provided with a segmental contacting member 89 fixed on its inner face below the screw 87 and adjacent that portion 15a of the housing 15 and being concentric with the shaft 29 to be engaged by the spring pressed plunger 81 carried in the arm 74. The insulated plate 86 is provided with a surface contact plate 90 adapted to be constantly engaged by the plunger 82 of the contacting member 78 carried in the arm 74. The plungers 81 and 82 form the safety switch by means of their engagement with the segmental member 89 and the plate 90 which are connected in series to the motor 19 and to a contact switch 91 from a common source of supply.

As illustrated diagrammatically in Fig. 3, the wiring circuit consists of an inlet wire 92 extending to a terminal 93 fixed to the segmental contacting member 89 and through the contacting member 78 to the plate 90 which has a lead 94 extending to the contact switch 91 and a lead 95 from the switch 91 to the motor 19 and a return wire 96 from the motor 19 to the common souce of supply.

The device as positioned and attached in an adding machine, has its speed control cam 56 provided with a member 97 fixed thereto by means of the rivets 98 and which is provided with an outwardly extending stud 99 forming a crank to which an arm 100 is pivotally connected and which extends forwardly and is pivoted at 101 to a main drive lever 102 fixed to an actuator shaft 103 for causing a rocking movement of the main drive lever 102 during one cycle of the speed control cam 56. The arm 100 extends outwardly of the stud 99 and is provided with a stud 104 which carries a follower 105 adapted to extend into the path of a stop lever 106 carried on a stud 107 fixed to a toggle-lever 108 which is mounted for rocking movements on a stud 109 fixed to the side plate 17 of the machine. The toggle-lever 108 also carries a pin 110 that extends through an opening 111 in the stop-lever 106 and normally engages the forward edge thereof for retaining a shoulder 106a of the stop-lever 106 normally in the path of the follower 105 forming a rest thereof and preventing its continuous motion. The lower end of the toggle-link 108 is provided with a pin 112 fixed thereto on which a relatively small bell-crank 113 is mounted for rocking movements therewith and independently thereof and having its horizontally extending leg pivotally connected by means of a pin 114 to a link 115 which is supported on the side plate 17 by means of a shoulder screw 116. The connection of the bell-crank 113 and the link 115 by means of the pin 114 forms a toggle of these two members for causing the swinging movement of the toggle-lever 108 on the stud 109 which positions the stop-lever 106 either in or out of the path of the follower 105 carried on the arm 100.

While the parts are in their normal positions, the stop-lever 106 will be forced rearwardly by the engagement of the follower 105 therewith, so that the opening 111 therein will engage the pin 110 of the toggle-lever 108 and will be normally urged in the other direction by means of a tension spring 117 fixed to the free end of the stop-lever 106 and to a pin 118 fixed to the side plate 17.

The bell-crank 113 has a pin 119 fixed to its upwardly extending leg to which a relatively long link 120 is pivotally connected and extends forwardly toward the actuator shaft 103, being carried at its forward end on a pin 121 fixed to the side plate 17 and extending through a slot opening 122 in the link 120. The link 120 is connected to a touch-bar 123 and to the feature keys designated as a whole as 124 for causing the toggle action of the bell-crank 113 and link 115 for releasing the parts for the starting movements of the device.

The feature keys 124 are operatively connected with the link 120 by means of a rocker 125 carried on a stud 126 secured to the side plate 17 and having an equalizer 127 pivotally connected to one arm 128 thereof by means of a pin 129. The equalizer 127 is supported for rocking movements on the arm 128 of the rocker 125 and has pins 130 and 131 respectively, fixed in each end thereof for engagement by the stems 124a and 124b respectively of the feature keys guided on the pins 132 and 133 that extend through the slot openings 134 and 135 respectively of the feature keys which are normally held in raised position by means of the tension springs 136 fixed thereto and to the casing of the machine.

The touch bar 123 is provided with a stem 123a which is provided in its lower end portion with a vertical slot opening 137 through which a pin 138 extends to guide the lower end of the stem 123a into the path of a pin 139 fixed to the upper right-hand corner of a plate 140 which is pivotally supported on the side plate 17 for rocking movements with an integral arm 141 on the stud 142. The arm 141 has pivotally connected thereto a link 143 provided with a bifurcated end portion 144 that straddles a headed pin 145 fixed in the leg 125a of the rocker 125 for permitting of a free movement of the arm 143 with respect to the rocker 125. The plate 140 is provided with a stud 146 fixed thereto on which a follower 147 is pivotally mounted for engagement with an inwardly bent portion 148 of the link 120 as the plate 140 is rocked in one direction on the stud 142.

The depression of the touch bar 123 or of any one of the feature keys 124 will cause the plate 140 to rock on the stud 142 and cause a forward pull on the link 120 by means of the engagement of the follower 146 with the inturned end 148 of the link and collapse the toggle, causing a rocking movement of the toggle-lever 108, removing the pin 110 thereof from engagement with the opening 111 in the stop-lever 106 and rendering the driving mechanism free thereof to be propelled by means of the driving motor 91 as the contact switch 19 is closed.

The depressing of the touch-bar 123 causes the stem 123a thereof to engage the stud 139 of the plate 140 and causes a downward rocking movement of this plate 140 which carries with it the arm 141 that causes the bifurcated end 144 of the link 143 carried thereon to slide on the headed pin 141. The sliding action of the link 143 on the pin 145 will not effect a movement of the rocker 125, but will permit the plate 140 to be rocked independently thereof.

Upon the depression of any of the feature keys 124, the stems 124a or 124b thereof will engage the pins 130 or 131 carried on the equalizer 127 which is pivotally carried on the arm 128 of the rocker 125 by means of the pin 129. The downward movement of the equalizer 127 will cause the arm 128 of the rocker 125 to rock downwardly therewith on the stud 126 and cause its other

leg 125a to rock rearwardly with the headed pin 145 thereon engaging the innermost edge of the bifurcated end of the link 143 and carry it rearwardly therewith and rock the plate 140 with the arm 141 on the stud 142. The downward rocking movement of the plate 140 causes the follower 147 thereof to engage the inwardly turned portion 148 of the link 120 and causes this link 120 to be moved forwardly to collapse the toggle and swing the toggle-lever 108 on the stud 109.

As thus far described, the mechanism is connected for driving movements with the actuator shaft 103 by means of the main drive lever 102 fixed thereto and connected to the arm 100 which extends therefrom and is pivoted to the stud 99 of the driving mechanism which is arranged for a single revolution upon the depression of the touch bar 123 or of the feature keys 124, and to be automatically relieved of the driving force of the motor 19 upon the completion of the cycle. To attain this end, the plate 140 is connected to the contact switch 91 by means of a link 149 pivotally connected to a stud 150 fixed to the plate 140 and extending upwardly and rearwardly to be guided for sliding movements on a stud 151 fixed to the side plate 17 and which extends through a slot opening 152 in the link 149. The link 149 is provided with a slot opening 153 rearwardly of the stud 151 through which a pin 154 extends, being fixed to the free end of a control lever 155 pivoted intermediate its length for rocking movements on a stud 156 on the side plate 17. The contact lever 155 is provided with an insulated roller 157 pivoted on a pin 158 at its other end and being normally positioned adjacent one leg of the contact switch 91 and adapted to engage this leg for making contact with its other leg during a pulling action exerted on the link 149 as the plate 140 is rocked. A contact switch lock 159 is also supported on the stud 156 adjacent the contact lever 155 and is provided with an extension 160 adapted to engage the insulated roller 157 by means of a tension spring 161 connected to the free end of the contact lever 155, and having its other end connecetd to a pin 162 fixed to the side plate 17. The contact switch lock 159 has a connecting link 163 pivotally connected thereto below the stud 156 by means of a pin 163 and is pivotally connected intermediate its length at 165 to the upper end of a contact-lock-lever 166 which is also supported for swinging movements on the stud 109 adjacent the toggle-lever 108. The free end of the connecting link 163 is connected to the free end of the contact-switch-lock 159 by means of a tension spring 167 which exerts a tension at the free ends of these members and normally retains the extension 160 of the contact-switch-lock 159 in engagement with the insulated roller 157. The connecting link 163 being pivotally supported above the stud 109 on the contact-lock-lever 166 on a pin 165, is permitted to swing therewith under the tension of the spring 167 as the lower end of the contact-lock-lever 166 is out of the path of the follower 105 carried on the arm 100. The tension of the spring 167 will normally urge the link 163 and the contact-switch-lock 159 to be drawn together on their pivotal centers 165 and 156 respectively and also urge a rocking upward movement of the lower end of the contact-lock-lever 166 on the stud 109 and position the lower end thereof into the path of rotation to be engaged by the follower 105 as the device is operated.

In the operation of the device effected by the depression of the touch-bar 123 or by the depression of the feature keys 124, a pulling action will be exerted to the link 120 leading to and connected with the toggle bell-crank 113 by means of the rocking movement of the plate 140. The pull on the link 120 will cause the bell-crank 113 and the link 115 to be collapsed (see Fig. 2), causing a rearward rocking movement of the toggle-lever 108 and rendering the stop-lever 106 free of the follower 105, permitting the mechanism to be free to be driven by the motor 19. During this time a pull is also exerted on the link 149 which causes a rocking movement of the contact-lever 155 on the stud 156 and positions the insulated roller 157 against one leg of the contact switch 91 causing it to engage its other leg forming a contact between the leads 95 and 94 and closing the circuit to the motor 19 which causes the turning movements of the worm 25 to drive the worm-wheel 27 and to drive the shaft 29 in a clockwise direction (see Figs. 1 and 2), and causing a rocking movement of the main drive lever 102 with the actuator shaft 103 to drive the machine.

The pull on the link 149 causes the roller 157 to be moved upwardly for closing the contact switch 91 to start the motor, and under the tension of the spring 167 the extension 160 of the contact switch lock 159 will be caused to follow the roller and by means of its connection with the link 163 will cause this link to be moved therewith and an outward rocking movement of the contact lock lever 166 on the stud 109 with its lower end portion into the path of the follower 105 the instant the follower has moved out of engagement therewith.

As the follower 105 is carried in a clock-wise direction during a cycle of the driving mechanism, it will again contact the lower end of the lever 166 carrying this lever downwardly for a swinging movement on the stud 109 and cause its upper end connected at 165 to the link 163 to carry the link forwardly and also carrying the contact-switch-lock 159 therewith by means of its connection 164 with the link 163. This movement of the contact-switch-lock 159 carries the extension 160 thereof away from the insulated roller 157 which is caused to follow the extension 160 under the tension of the spring 161 fixed thereto and will also cause a rearward pull on the link 149 restoring the plate 140 therewith to its normal position.

The speed control cam 56 has a follower 168 in contact therewith which is carried on a stud 169 fixed to a lever 170 pivoted at 171 on the side plate 17 and which is urged forwardly with the follower 168 into contacting engagement with the cam 56 by means of a relatively strong tension spring 172. The purpose of the follower 168 coacting with the cam 56 is to control or even out the load in the machine during each cycle, and to permit of a relatively easy starting of the device, and after about one-third of the cycle, the cam being provided with a rise for exerting a rearward pressure on the tension spring 172 for a given distance of its cycle at which time it will drop, and the tension of the spring 172 will assist the turning movements of the device for carrying the load to near the end of its cycle. At this time, the follower 168 will again be caused to move rearwardly against the tension of the spring 172 and exert a tension against the turning movements of the cam 56 to cushion the device near its limit stroke at the time the follower

105 engages the stop-lever 106 and preventing an abrupt stop thereof.

The restoring action of the link 119 is caused by the restoring action of the link 120 which has a spring 120a fixed thereto and to the side plate 17 for exerting a rearward pressure for resetting of the toggle 113—115 connected thereto and positioning the toggle-lever 106 to its normal position with the pin 110 thereof engaging the forward end of the opening 111 in the stop-lever 106 and retaining the stop 106 into the path of the follower 105 to form a permanent stop against which the follower 105 is brought to rest.

Should some obstruction occur in the machine to suddenly stop the actuator 103 during its operative movements, the worm 25 driven by the motor 19 will continue to drive the worm-wheel 27 while the shaft 29 is withheld from turning movements therewith due to its connection with the actuator shaft by means of the lever 102 and the arm 109. The torsion spring 38 will be increasingly wound up by means of one of its ends 37 being connected to the worm-wheel 27 and its other end connected with the shaft 29. The turning movement of the worm-wheel 27 causes the turning movement of the gear 59 connected therewith at 60—61 to the collar 30 which carries the disc 32 that supports the worm-wheel 27, while the gear 76 retained on the reduced portion 29b of the shaft 29 by means of the key 77 remains dormant with the shaft 29. The turning movement of the gear 59 causes the turning movement of the gear 64 which is in meshing engagement therewith and which in turn is in meshing engagement with the gear 65, causes this gear to turn therewith. The gear 65 is in meshing engagement with the gear 69 and causes this gear 69 to exert a turning pressure on the planet gear 70 which is in meshing engagement with the planet gear 71 and which in turn is in meshing engagement with the gear 76 which at this time, is prevented from turning due to the shaft 29 being in a locked position.

The turning movement of these gears 59 and 69 with the gears 66 and 65 will cause the planet gears 70 and 71 to turn and one of these planet gears being in meshing engagement with the dormant gear 76, will cause these planet gears to walk around the gear 76 carrying with them the arm 74 which will slidingly carry the contacting member 78 in sliding contact with the segmental contacting member 89 and the contact plate 90. The arm 74 will continue to move until the plunger 81 of the contacting member 78 has moved to the right (Fig. 3) off of the segmental-contacting-member 89 which will break the safety switch circuit between the inlet wire 92 and the lead 94 to the motor 19 and relieve the driving pressure of the worm 25 to the worm-wheel 27 and to the remaining parts which are withheld from turning movements.

As a sudden lock-up occurs to prevent the shaft 29 from turning with the worm-wheel 27, the stud 34 carried thereby will be caused to move away from the end 41b of the lever member 41 against the tension of the torsion spring 39 and during this time, the drum 44 will be moved with the worm-wheel 27 in advance of the band 43 which is retained with the shaft 29 by means of the lever member 41. The band 43 offers a frictional resistance to the turning movements of the drum 44 with the worm-wheel 27 and prevents the stud 34 from being turned by the worm-wheel 27 to strike the end 41a of the lever 41 with a sudden jolt.

A modified form is illustrated in Figures 12, 13 and 14 of the drawings, in which the mechanism for operating the actuator shaft 103 includes the drive lever 102 fixed thereto and having an arm 200 pivoted to a cam disc 256 by means of a stud 299 forming a crank for the arm 200 to rock the actuator shaft 103 during each cycle of the cam 256 when driven by the mechanism in the same manner as in the preferred embodiment above described.

The housing 15 in the modified form contains the same mechanism as in the preferred embodiment and like numerals to like parts have been inserted in the drawings, and it is thought that a description of one will suffice for a description of all. The variation being the addition of a clutching member mounted on a reduced portion 229 of the shaft 29 and the cover plate 258 being of a cup-shaped formation to accommodate for the positioning of the additional mechanism within the housing 15.

While the device is in its normal position, the link 220 which is pivoted at 221 to the member 240 and extends therefrom and is pivoted at 222 to a depending lever 223 secured to a stud shaft 224 which extends through the housing 15 and has fixed to its inner end portion a stop-arm 225 adapted to be normally retained in the path of travel of a stud 226 and to abut the same. The stud 226 extends through an arcuate slot opening 227 in the member 231 and is fixed into a crescent shaped arm 228 which is pivoted for rocking movements on the stud 230 of the member 231 which is fixed to a collar 232 and supported for turning movements on the reduced portion 229 of the shaft 29. The crescent shaped arm 228 is also yieldingly connected to the member 231 by means of a tension spring 233 connecting their free ends for urging the stud 226 of the member 228 to the forward end of the slot opening 227 of the member 231. The crescent shaped arm 228 is also provided with an inwardly turned extension 234 adapted to normally overhang the teeth 235 of a wheel 236 while the stud 226 thereof is in abutting engagement with the stop-arm 225.

The wheel 236 is fixed for turning movements with the lever member 41 by means of spacing studs 237 which also secure the wheel 236 with the arm 41.

As the link 220 is urged forwardly by means of depressing the touch-bar 123, the depending lever 223 on the housing 15 will be caused to rock therewith, causing a downward rocking movement of the stop-arm 225 out of the path of the stud 226 and permitting the same to be drawn forwardly in the slot opening 227 under the tension of the spring 233 by means of its engagement with the crescent-shaped arm 228 to which the stud 226 is fixed. The rocking movement of the crescent-shaped arm causes the extension 234 thereof to be drawn inwardly therewith for engagement with the teeth 235 of the wheel 236. This constitutes a clutching device for the driving movements of the cam disc 256 which is connected to the member 231 by means of a sleeve 238.

It will be noted that the clutching mechanism carried on the sleeve 238 is also freely carried on the reduced end of the shaft 29 and is withheld from longitudinal movements within the cover 258 by means of a bearing 239.

With this clutching device as above described, it is possible to use a continuous running motor and to intermittently connect the same during its driving movements with the mechanism by means

of the extension 234 of the arm 228 being selectively positioned into the path of the teeth 235 upon the downward movement of the stop arm 225 effected by means of a pulling action on the link 220 upon the depressing of the touch-bar 123 at the will of the operator. Upon the release of the touch-bar, a spring 241 fixed to the link 220 and having its other end fixed to the frame 17, will cause this link 220 to be urged rearwardly swinging the depending lever 223 therewith and positioning the stop arm 225 into the path of rotation of the stud 226 carried on the arm 228. Upon the engagement of the stud 226 with the stop-arm 225, the arm 228 will be withheld from further rotating movements and the member 231 will move in advance thereof against the tension of the spring 233 until the stud 226 abuts the rearward end of the slot opening 227. This additional movement of the member 231 after the stud 226 has engaged the stop-arm 225 which is that distance permitted by the length of the slot opening 227, causes the inwardly extending portion 234 of the arm 228 to be moved out of the path of the teeth 236 on the wheel 235 and permitting its free movement independently of the arm 228.

As the machine is driven by means of the mechanism for driving the shaft 29 and a lock-up of the actuator shaft 103 should occur, the torsion spring 38 will be wound up as explained in the preferred embodiment and a differential action of the planetary gearing will occur for effecting a swinging movement of the arm 74 to position the contacting member 78 thereof out of contact with the segmental contacting member 89 and opening the circuit to the motor 19.

After the lock-up in the machine has been removed, the arm 41 will be restored to its normal at-rest position against the stud 34 under the tension of the torsion spring 38 during the time the worm-wheel 27 is withheld from turning movements against the worm 25. The restoring movement of the arm 41 will cause the shaft 29 to be moved therewith and cause the differential movement of the planetary gearing which will swing the arm 74 to its normal at-rest position and carry the contact member 78 therewith to be restored into contact with the segmental contact member 89 while in sliding contact with the plate 90 and closing the circuit to the motor and rendering the device to be again actuated at the will of the operator, upon the depression of the touch-bar or the feature keys for closing the circuit to the contact switch 91 which connects the motor with the source of supply.

In this modified form, the motor 19, the safety switch and the contact switch are wired in series to form a circuit with a common source of supply in the same manner as in the preferred form, as illustrated diagrammatically in Fig. 3. The contact switch 191 is adapted to be closed upon the depression of the touch-bar 123 which causes a forward pull of the link 220 against the tension of the spring 241 and also causes the rocking movement of a contact-lever 255 connected thereto and being mounted for rocking movements on a pivot 255a supported on the plate 17. The contact-lever 255 carries an insulated roller 257 which is adapted to engage one leg of a contact switch 191 to cause the same to contact with its other leg for closing the circuit to the motor 19. The pulling action of the link 220 also causes a rocking movement of the arm 223 and swings the stop-arm 225 out of engagement with the stud 226 permitting the mechanism within the housing 15 to drive the shaft 29 by means of the motor 19. The shaft 29 will be driven in a clockwise direction with the cam disc 256 and carry a cam portion 256a thereof (Fig. 12), out of the path of a follower 205 pivotally mounted at 204 on a rocker arm 206 which is pivotally supported on the pin 255a adjacent the contact-lever 255. The rocker arm 206 is provided with an extension 207 that overhangs the insulated roller 257 and is urged with the follower 205 thereon against the periphery of the cam disc 256 by means of a tension spring 272 connected thereto and having its other end fixed to the bottom wall 18 of the machine.

As the cam disc 256 is being rotated under the driving action of the motor 19 and the cam, portion 256a thereof is moved out of the path of the follower 205, which permits the rocker-arm 206 to rock on the stud 255a under the influence of the tension spring 272 and which will cause the extension 207 of the member 206 to engage the insulated roller 257 and retain the leg of the switch 191 with its other leg for holding the same closed in the circuit. The cam portion 256a of the cam disc 256 again engages the follower 205 upon the completion of its cycle and forces the follower arm 207 to rock on its pivot 255a against the tension of the spring 272 and permits the roller 257 to be rocked upwardly on the pivot 255a by means of its connection with the link 220 which is being urged rearwardly under the tension of the spring 241 which permits one leg of the contact switch 191 to follow the insulated roller 257 and open the circuit in the switch 191 to the motor 19. The momentum of the driving force exerted to the shaft 29 will be gradually reduced during the time that the cam portion 256a is riding over the follower 205 under the tension of the spring 272 and will come to rest immediately thereafter. As the cam is caused to rotate a little beyond the high point thereof, the follower will then retain the stud 209 on the cam disc 256 with the arm 209 pivotally connected thereto on dead center with respect to their horizontal axis and position the actuator shaft 103 in its at-rest position by means of the main drive lever 102 connected to the arm 209 (Fig. 12).

I contemplate as being included in these improvements all such changes, variations and departures from what is thus specifically illustrated and described as fall within the scope of the appended claims.

I claim:—

1. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient driving means connecting the motor with the driven shaft, a switch in series with the motor normally closing the circuit, and planetary gearing under the control of the motor and the driven shaft movably supporting the switch closed with the circuit, said resilient means forming means for a differential movement of the planetary gearing for moving the said switch to open the circuit when the driven shaft is withheld from turning movements.

2. A device of the character described, comprising in combination, a main driven shaft, resilient means including a motor for driving the driven shaft, a switch in series with the motor normally closing the circuit, planetary gearing under the control of the motor and the driven shaft retaining the switch closed in the circuit, said resilient means permitting of a differential movement of the planetary gearing during the

turning movements of the motor in advance of the driven shaft and causing the switch to open.

3. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient means connecting the motor with the driven shaft, a switch in series with the motor normally closing the circuit, and planetary gearing under the control of the motor and the driven shaft for retaining the switch closed in the circuit, said resilient means permitting of a differential movement of the planetary gearing for moving the switch to open the circuit as the driven shaft is withheld from turning movements.

4. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient means connecting the motor with the driven shaft, a switch in series with the motor normally closing the circuit, planetary gearing under the control of the motor and the driven shaft retaining the switch closed in the circuit, said resilient means forming means for permitting of a differential movement of the planetary gearing as the motor is driven in advance of the driven shaft, and frictional means between the motor and the driven shaft arranged in such manner so as to partially resist the yieldable means for turning movements therewith during the normal operations of the device.

5. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient means connecting the motor with the driven shaft, a switch in series with the motor, planetary gearing under the control of the motor and the driven shaft retaining the switch closed with the circuit, said resilient means permitting the motor to turn in advance of the driven shaft as said shaft is withheld causing a differential movement of the planetary gearing and moving the switch to open the circuit, and frictional means between the motor and the driven shaft resisting the resilient means during the normal operations of the device.

6. A device of the character described, comprising in combination, a main driven shaft, yieldable means including an electric motor for driving the driven shaft, frictional means between the motor and the driven shaft, a switch in the circuit with the motor, planetary gearing, said planetary gearing being under the control of the motor and the driven shaft retaining the switch in the circuit, said yieldable means and frictional means between the motor and the shaft permitting the motor to move in advance of the driven shaft to cause a differential movement of the planetary gearing and move the switch to open the circuit as the driven shaft is withheld from turning movements.

7. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, yieldable means connecting the motor with the driven shaft, friction means coacting with the yieldable means to drive the driven shaft, a switch in series with the motor, planetary gearing under the control of the motor and the driven shaft retaining the switch closed in the circuit, said yieldable means and friction means permitting of a differential movement of the planetary gearing to open the circuit when said driven shaft is withheld from turning movements.

8. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient driving means including frictional means connecting the motor with the driven shaft, a switch in series with the motor normally closing the circuit, planetary gearing operatively connecting the switch with the motor and the driven shaft, said planetary gearing normally retaining the switch closed in the circuit, the said resilient driving means and frictional means permitting the motor to turn in advance of the driven shaft causing a differential movement of the planetary gearing and moving the switch to open the circuit as the driven shaft is withheld and the motor is driven in advance thereof.

9. A device of the character described, comprising in combination, a main driven shaft, resilient means including a motor for driving the driven shaft, frictional means between the motor and the driven shaft coacting with the resilient means to drive said driven shaft, a switch in series with the motor normally closing the circuit, planetary gearing cooperating with the switch under the control of the motor and the driven shaft retaining the switch closed with the circuit, said resilient means and frictional means permitting the motor to turn in advance of the driven shaft as the driven shaft is withheld and causing a differential movement of the planetary gearing moving the switch therewith to open the circuit.

10. A device of the character described, comprising in combination, a main driven shaft, yieldable means including a motor for driving the driven shaft, means independent of the yieldable means forming a driving connection between the motor and the driven shaft arranged in such manner as to resist the yieldable means during the normal operations of the device, a switch in circuit with the motor, planetary gearing, said planetary gearing under the control of the motor and the driven shaft retaining the switch closed in the circuit, said last mentioned means and yieldable means permitting of a differential movement of the planetary gearing during the turning movements of the motor in advance of the driven shaft and moving the switch to open the circuit.

11. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient driving means connecting the motor with the driven shaft, means between the motor and the driven shaft coacting with the resilient driving means to drive the driven shaft, a switch in series with the motor normally closing the circuit, planetary gearing operatively connecting the switch with the motor shaft and the driven shaft, said planetary gearing retaining the switch closed in the circuit and said means and resilient driving means permitting the motor to turn in advance of the driven shaft for causing a differential movement of the planetary gearing for moving the switch to open the circuit as the driven shaft is withheld and the motor is driven in advance of said driven shaft.

12. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, a switch in series with the motor normally closing the circuit, and planetary gearing under the control of the motor and the driven shaft retaining the switch closed in the circuit, yieldable means including clutching means connecting the motor with the driven shaft for causing a differential movement of the planetary gearing for

moving the switch to open the circuit when said driven shaft is clutched and withheld from turning movements.

13. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient driving means connecting the motor with the driven shaft, clutch means coacting with said resilient driving means, said clutch means being adapted to intermittently engage said resilient driving means, a switch in the motor circuit, planetary gearing operatively connecting the switch with the motor shaft and the driven shaft retaining the switch normally closed in the circuit, and manually manipulative means coacting with the clutch means engaging the same from the driving means and effecting the engagement thereof with the driven shaft and permitting of a differential movement of the planetary gearing for moving the switch to open the circuit as the driven shaft is withheld and the motor is driven in advance thereof.

14. A devise of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, resilient driving means connecting the motor with the driven shaft, clutch means coacting with said resilient driving means, said clutch means being adapted to intermittently engage said resilient driving means, a switch in the motor circuit, planetary gearing operatively connecting the switch with the motor shaft and the driven shaft retaining the switch normally closed in the circuit, manually manipulative means coacting with the clutch means for engaging and disengaging the same from the driving means the said resilient driving means permitting of a differential movement of the planetary gearing for moving the switch to open the circuit when said driven shaft is withheld from turning movements during the time said clutch means is engaged with said resilient driving means.

15. A device of the character described, comprising in combination, a driven shaft, an electric motor for driving the driven shaft, resilient driving means between the motor and the driven shaft, clutch means coacting with said resilient driving means for driving mechanism outwardly thereof, said clutch means being adapted to intermittently engage said resilient driving means, a switch in the motor circuit, planetary gearing operatively connecting the switch with the motor shaft and the driven shaft retaining the switch normally closed in the circuit, stop means coacting with the clutch means for disengaging the same from the driving means, the said resilient driving means permitting of a differential movement of the planetary gearing for moving the switch to open the circuit as the driven shaft is withheld during the time said clutch means is engaged with said resilient driving means.

16. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, a circuit for the motor including a switch normally retaining the circuit open, a switch normally closed in the circuit, the said driven shaft adapted to be permanently connected to the parts to be driven and intermittently connected with the motor, manually controlled means adapted for intermittently connecting the motor with the shaft and to close the open switch providing a driving connection between the motor and the driven shaft whereby said switch is opened in the circuit in timed relation with a revolution of the device, and planetary gearing operatively connecting the closed switch with the motor and the driven shaft, the said planetary gearing effecting a movement of the closed switch to open the circuit when the driven shaft is withheld from turning movements while the open switch is closed in the circuit.

17. A device of the character described, comprising in combination, a main driven shaft, an electric motor including a yieldable connection for driving the driven shaft, a circuit for the motor including a switch normally closing the circuit, planetary gearing retaining the switch closed in the circuit, a contact switch in the motor circuit, the said driven shaft being adapted to be driven with the motor as the contact switch is closed in the circuit, and yieldable means coacting with the motor and the driven shaft whereby said first-mentioned switch will be moved to open the circuit during the differential movements of the planetary gearing as the motor is driven in advance of the driven shaft.

18. A device of the character described, comprising in combination, a main driven shaft, an electric motor for driving the driven shaft, yieldable means including frictional means connecting the motor to drive the driven shaft, a circuit for the motor including a manually operated contact switch normally retaining the circuit open, a switch closed in the motor circuit, planetary gearing retaining the last named switch movably closed in the circuit, said yieldable means and frictional means forming means whereby the motor may turn in advance of the driven shaft and effect a differential movement of the planetary gearing whereby said last mentioned switch is moved to open the circuit during the time said first mentioned switch is closed in the circuit.

GEORGE J. UHLIG.