Feb. 7, 1928. 1,658,036

T. S. BINDSCHEDLER

MAKE AND BREAK SWITCH FOR ADDING MACHINES

Filed Oct. 4. 1924 3 Sheets-Sheet 1

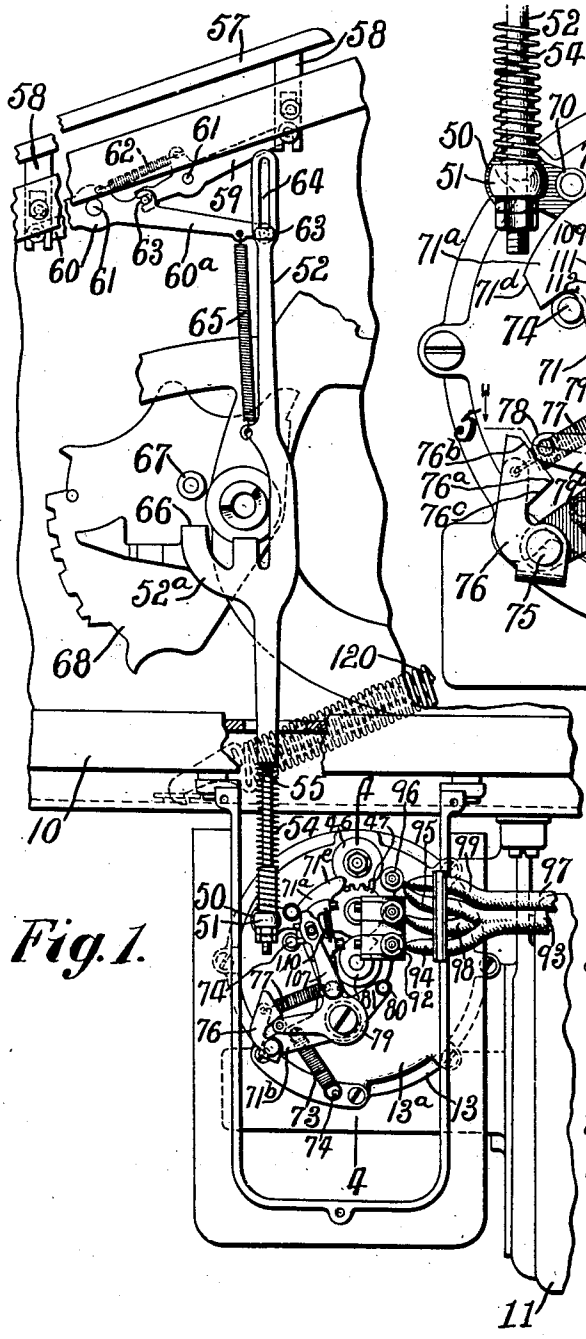

Fig. 1.

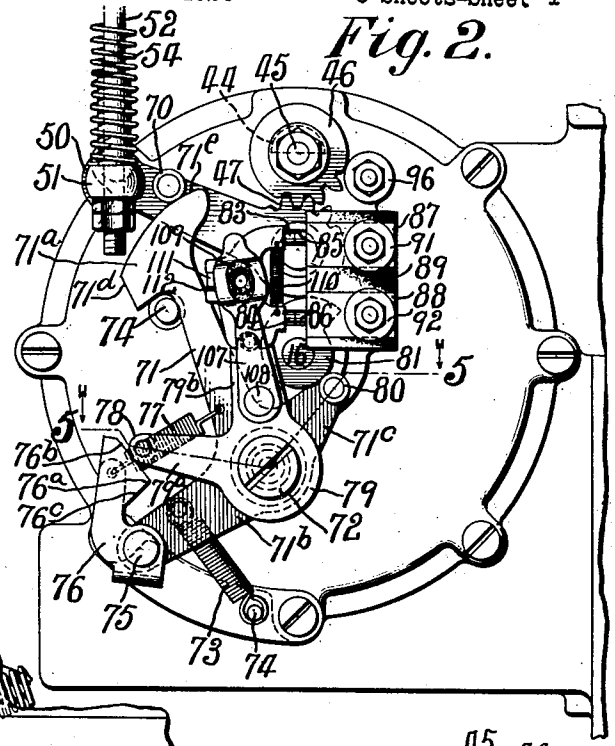

Fig. 2.

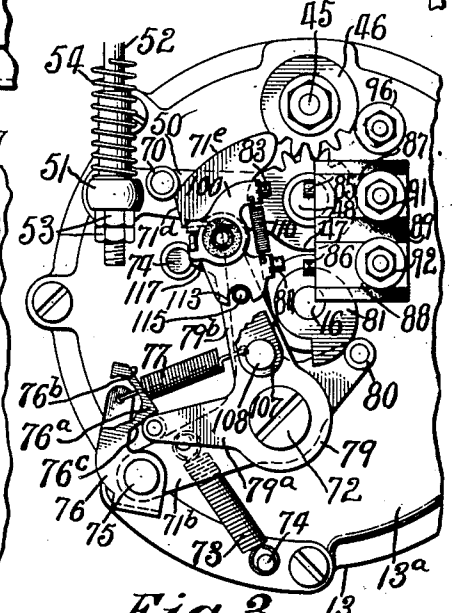

Fig. 3.

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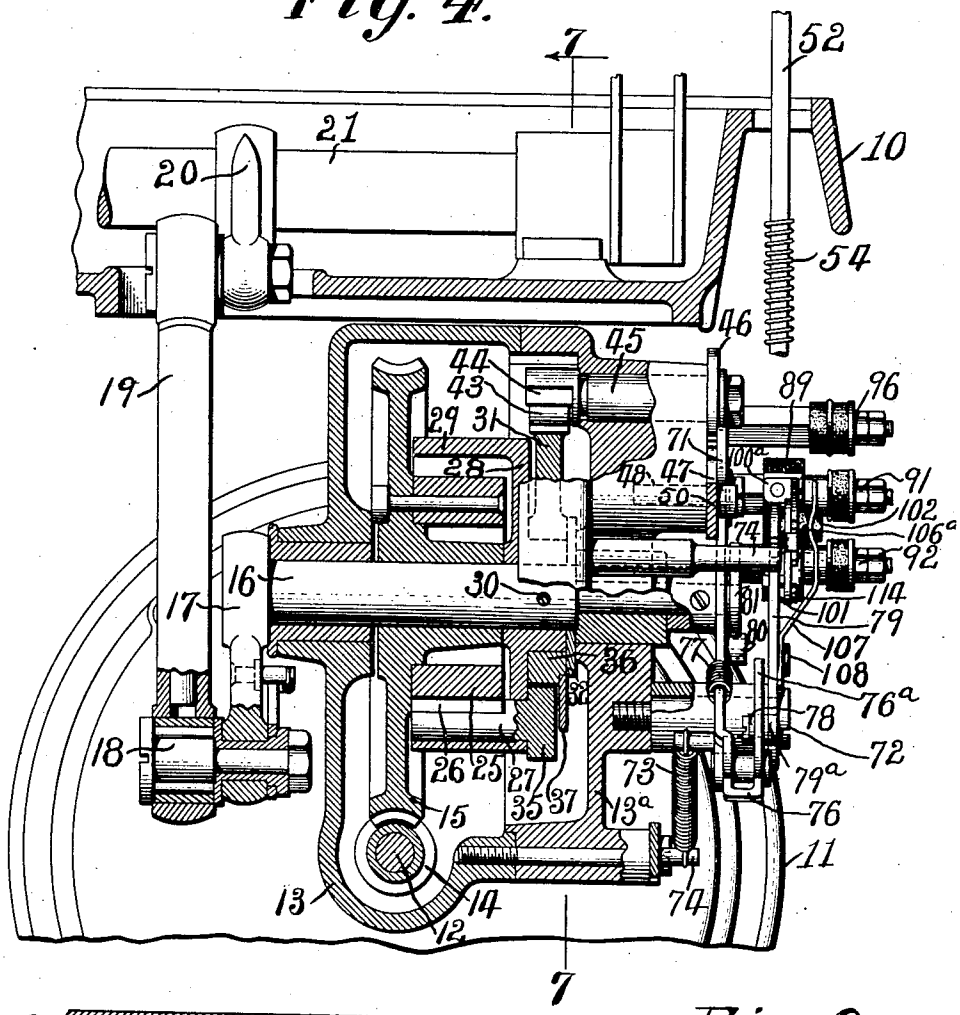
Fig. 4.



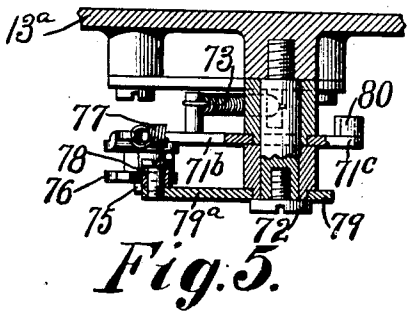


Fig. 5.

Fig. 6.

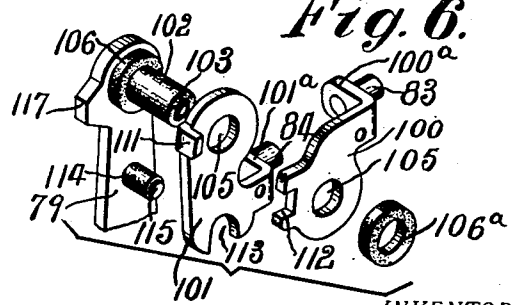


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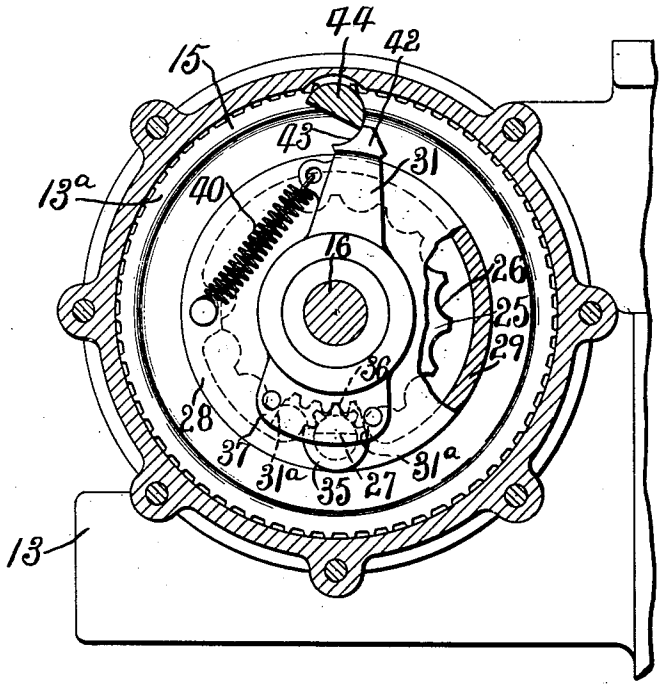
Fig. 7



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Patented Feb. 7, 1928. 1,658,036

UNITED STATES PATENT OFFICE.

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MAKE AND BREAK SWITCH FOR ADDING MACHINES.

Application filed October 4, 1924. Serial No. 741,525.

This invention relates to power-driven machines and its purpose is to provide improved means for controlling the connections of the machines with the source of power. In an adding machine of the Burroughs type, for example, the first half or forward stroke of each operation of the machine is effected by a motor and the last half or return stroke of the operation is effected by springs in which energy is stored during the forward stroke, the connection of the motor with the operating mechanism of the machine being made and broken at the beginning and ending, respectively, of the operation by means of a clutch, but in such machines, as constructed prior to the present invention, the driving motor remains in operation throughout the series or succession of operations of the adding machine. The principal object of the present invention is to provide means whereby the operation of the driving motor is rendered intermittent, the connection of the motor with the source of power being made and broken intermittently so that the motor idles and comes to rest during each return stroke of the machine operation.

A further object of the invention is to provide means whereby the motor circuit is closed and the motor started in operation by the depression of the finger bar which is manipulated by the operator in starting the operation of the machine. A feature of the invention is the provision of means whereby a complete operation of the clutch mechanism is insured even when the manipulation of the finger bar by the operator is incomplete or faulty. Still another object is to provide means whereby the connection of the motor with the source of power is made simultaneously with the operation of the clutch by which the connection of the motor with the operating mechanism of the adding machine is controlled. The invention is capable of being employed with particular advantage in connection with series wound electric motors of the universal type, since the automatic circuit control prevents the motor from acquiring excessive speed and the armature thereof slows up or comes to rest after each forward stroke of the adding machine mechanism.

Still another object of the invention is to provide an improved make and break switch for controlling the circuit of an electric motor. A particular advantage of the improved switch lies in the provision of means for obtaining a positive contact and for effecting a relative movement of the contacting parts so that dirt and sediment are removed therefrom when the switch is operated. A further feature is the provision of an improved switch comprising means for effecting a quick or instantaneous action of the means by which the movable contacts are actuated.

Although the present invention is capable of application to various power-driven machines, it has been illustrated in connection with an adding machine of the type disclosed in the United States patent to J. G. Vincent, No. 866,750, granted September 24, 1907, to which reference is made for a more complete disclosure of the adding machine. The various objects and advantages of the present invention will appear more fully from the following specification taken with the accompanying drawings in which Fig. 1 is a side elevation of so much of an adding machine proper as is necessary to an understanding of the present invention, parts thereof being broken away to illustrate the construction more clearly. Fig. 2 shows an enlarged side elevation of a portion of the machine, including the controlling mechanism, showing the position of the parts at the moment of closing the electric switch for starting the motor; Fig. 3 shows a partial side elevation similar to Fig. 2, illustrating the positions of the parts at the moment of opening the switch and breaking the circuit of the motor. Fig. 4 is an elevation of the driving mechanism shown in Fig. 1, the view being taken at right angles to that of Fig. 1, and a portion thereof being shown in section on the lines 4—4 of Fig. 1; Fig. 5 is a section on the line 5—5 of Fig. 2, showing the mounting of the control lever and the switch lever illustrated in Figs. 1, 2 and 3; Fig. 6 is a perspective view showing various parts which make up the yielding contact portion of the switch, and Fig. 7 is a sectional view taken on the line 7—7 of Fig. 4, showing the means for controlling the operation of the clutch by which the motor is connected to the operating mechanism of the adding machine.

As illustrated in the accompanying drawings, the adding machine is shown as one of the well known Burroughs type, for a more

complete disclosure of which reference may be had to the above mentioned Vincent patent and the United States Patents Nos. 504,963 and 505,078, granted to W. S. Burroughs, on June 12, 1893. The machine comprises a frame 10 having mounted thereon an electric motor 11 which may preferably be a series wound electric motor of the Universal type having a relatively low inertia and a high acceleration. The armature of the motor is mounted on or connected to a shaft 12 which extends into and is journaled in the walls of the clutch housing 13, as shown particularly in Fig. 4. A worm 14 is fixed on the shaft 12 and meshes with a worm wheel 15 rotatably mounted on a shaft 16 which is journaled in suitable bearings in the walls of the housing and which has fixed on the projecting end thereof a crank arm 17 pivotally connected by a pin 18 with a link or connecting rod 19 which is in turn pivotally connected with a crank arm 20 fixed on the rock shaft 21 of the adding machine. The worm wheel 15 is adapted to be connected to the shaft 16 in order to effect the operation of the rock shaft 21 by the motor, through the operation of a clutch comprising an annulus 25 secured to the side of the worm wheel 15 concentrically with the shaft 16. The outer periphery of the annulus 25 is provided with a series of semi-cylindrical recesses 26 any one of which may be engaged by a clutch pin 27, of semi-circular cross section, which has the cylindrical end portion thereof rotatably mounted in a clutch disc 28 having an annular flange 29 surrounding the annulus 25. The disc 28 has its hub secured to the shaft 16 by means of a pin 30 and this hub also serves as a bearing for a clutch operating lever 31 which is secured on the hub by a plate 32 mounted at the end of the hub. The clutch pin 27 carries a segmental gear 35 on the outer end thereof and this gear meshes with another segmental gear 36 which is formed on the hub of the operating lever 31 so that when this lever is rocked on its bearing the clutch pin 27 is rotated to bring it into or out of engagement with one of the clutch recesses 26 in the annulus 25. The clutch operating lever 31 is provided with arms 31[a] extending downwardly at each side of the segmental gear 35 to limit the movement of the lever and a plate 37 extending between these arms serves to maintain the clutch pin 27 in its bearing in the clutch disc 28. The upper end of the operating lever 31 is normally moved toward the left as viewed in Fig. 7 by means of a coil spring 40 which is connected at one end to the lever and at the other end to a pin attached to the clutch disc. The extremity 42 of the lever 31 is provided with a curved surface 43 adapted to coact with a detent 44 of semi-circular cross section which is secured to one end of a pin or shaft 45 journaled in the cover 13[a] of the clutch housing. When the curved surface of the detent contacts with the curved surface 43 of the operating lever, the lever is held in the position illustrated in Fig. 7 against the tension of the spring 40 and the clutch pin 27 is then out of engagement with any of the notches 26, but when the shaft 45 is rotated to permit the end of the lever 31 to pass beneath the flat face of the detent 44, the lever 31 moves toward the left, as viewed in Fig. 7, under the influence of the spring 40, thereby rotating the clutch pin 27 and bringing it into engagement with one of the notches 26 in the annulus 25.

The shaft 45 of the detent 44 is actuated to control the clutch by certain mechanism comprising a segmental gear 46 secured to the shaft 45 and arranged to mesh with another segmental gear 47 mounted on a pin 48 secured to the cover 13[a] of the clutch housing. The segmental gear 47 is formed on or secured to the hub of an arm or lever 50, the outer end of which carries an eye-bolt 51 slidably engaged by a rod 52, the lower threaded extremity of which is engaged by nuts 53 while the lower reduced portion thereof is surrounded by coil spring 54 contacting at one end with the eye-bolt 51 and at the other end with the shoulder 55 on the rod. The rod 52 is adapted to be elevated by the manual operating of the finger bar 57 which is manipulated by the operator at the commencement of each operation of the adding machine. The finger bar 57 is connected by members 58 with the extremities of levers 59 and 60 which are pivoted at the points 61 and connected by a coil spring 62 so that they normally tend to maintain the finger bar 57 in its uppermost position. The levers 59 and 60 have a loose pin and slot connection at 63 and the lever 60 is provided with an extension 60[a] carrying a pin 63 which engages a slot 64 in the upper end of the rod 52. A coil spring 65 connects the extension 60[a] of the lever with the rod 52 at a point below the slot 64. It will be apparent that the depression of the finger bar 57 operates to elevate the bar 52 and thereby rock the arm 50 through which the detent 44 is actuated. The rod 52 is provided with a lateral extension 52[a] having a shoulder 66 adapted to be engaged by a roller 67 mounted on the sector 68 which moves downwardly during the forward stroke or first half of the operation of the machine, the engagement of the roller with the shoulder 66 being utilized to restore the member 52 to its normal position, and thereby operate the lever 50 to effect a disengagement of the clutch, due to the action of the detent 44 in obstructing its lever 31 and thereby causing angular movement of the clutch pin, as hereinafter more fully described.

The movement of the rod 52, which con-

trols the engagement and disengagement of the clutch, serves also to control the closing of the switch by which the motor is connected to its supply circuit. This control is effected by a roller 70 which is mounted on the lever 50 and adapted to coact with the head 71[a] of an inverted T-shaped switch control lever 71 pivotally mounted on a stud 72 secured in the cover 13[a] of the clutch housing. The lever 71 has two oppositely directed arms 71[b] and 71[c] at the lower end thereof and the head 71[a] is provided with a flat end face 71[d] and a curved cam surface 71[e], these surfaces 71[d] and 71[e] being adapted to coact with the roller 70 for controlling the movement of the lever 71 and for insuring a complete movement of the lever 50 after it has been actuated by the depression of the finger bar 57. A coil spring 73 is connected to the arm 71[b] of the lever and to a pin 74 secured to the clutch casing, this spring serving normally to move the lever 71 toward the left as viewed in Figs. 1, 2 and 3, the limit of this movement being determined by a stationary pin or abutment 74 which is secured to the cover of the clutch casing. The outer end of the arm 71[b] of the lever also carries a stud 75 having pivotally mounted thereon a yoke-shaped pawl 76 provided with a V-shaped head 76[a] having an upper inclined surface 76[b] and a lower inclined surface 76[c]. The pawl 76 is connected by a coil spring 77 with the body portion of the lever 71 so that the pawl is normally moved toward the right, as viewed in Figs. 1, 2 and 3, thereby tending to maintain one or the other of the inclined surfaces of the pawl in contact with a roller 78 mounted on a pin attached to the arm 79[a] of the switch lever 79 which is pivotally mounted on the stud 72 at one side of the switch control lever 71. The other arm 71[c] of the lever 71 is provided at its outer ends with a roller 80 which is adapted to coact with the periphery of a snail cam 81 secured to the end of the clutch shaft 16 and adapted to control the opening of the electric switch, as hereinafter described. The upwardly extending arm 79[b] of the switch lever 79 carries the movable switch contacts 83 and 84 which are adapted to coact with the stationary contacts 85 and 86, respectively, when the switch lever is operated to close the switch. The stationary contacts 85 and 86 are carried by L-shaped plates 87 and 88, respectively, which are secured to an insulating plate 89 and connected with binding posts 91 and 92, respectively, secured in position in the insulating plate. An insulated cable 93, leading from a source of supply of electrical energy, carries a pair of line conductors, one conductor 94 being connected to the binding post 92, while the other conductor 95 is connected to a binding post 96 connected to and insulated from the casing 13 of the clutch housing. Another insulated cable 97, carries a pair of conductors leading to the motor, one of these conductors 98 being connected to the binding post 91 while the other conductor 99 is connected to the binding post 96. It will be apparent that when the switch is operated to bring contacts 83 and 84 into engagement with the contacts 85 and 86 the circuit is completed between the conductor 94 and the conductor 98 so that the circuit of the motor is then closed, the other side of the supply circuit being completed between the conductors 95 and 99 through the common binding post 96.

The parts by which the movable contacts 83 and 84 of the switch are connected are preferably so constructed that the contacts have relative movement when they engage the stationary contacts 85 and 86, thereby removing carbon and other deposits from the surfaces of the contacts and insuring a perfect connection. For this purpose, the contact 83 is mounted on a transverse flange 100[a] of a plate 100 and the contact 84 is mounted on a transverse flange 101[a] of a plate 101, these plates being pivotally supported on an insulating bushing 102 which is secured on a pin 103 projecting laterally from the upper end of the switch lever 79, as shown particularly in Fig. 6. The bushing 102 engages the apertures 105 which are formed in the plates 100 and 101 and the plates are maintained out of contact with the lever 79 by an insulating washer 106. The plates are secured in position against the washer and in contact with each other by means of a spring plate 107 which is secured to the switch lever 79 by a rivet 108 and which is provided at its upper end with an elongated slot 109 adapted to fit over the end of the bushing 102 in contact with another insulating washer 106[a]. The projecting arms of the plates 100 and 101 which carry the flanges 100[a] and 101[a], respectively, are connected by a coil spring 110 which tends normally to move the contacts 83 and 84 toward each other, this movement being limited by the engagement of a transversely extending lug 111 on the plate 101 with the notch 112 formed in the plate 100, the notch being slightly larger than the width of the lug 111 so that a limited relative angular movement of the plates is permitted. The connected plates 100 and 101 also have a limited angular movement with respect to the lever 79, this movement being limited by the notch 113 formed in the lower end of the plate 101 and adapted to be loosely engaged by an insulating bushing 114 mounted on a pin 115 projecting laterally from the lever 79. When the switch contacts 83 and and 84 are brought into engagement with the stationary contacts 85 and 86, respectively, the contacts 83 and 84 spread apart slightly against the tension of the spring

110 with the result that a wiping contact is obtained. The movement of the switch lever 79 away from the stationary contacts 85 and 86 is limited by a lug 117 formed on the lever and adapted to engage the stop pin 74 by which the movement of the control lever 71 is limited.

In the operation of the adding machine, after the number to be entered has been set up in the keys, the finger bar 57 is depressed, thereby elevating the rod 52 and producing an upward movement of the crank or lever 50 from the normal position shown in Fig. 1, which throws the clutch detent 44 in such a position that the end of the clutch control lever 31 is permitted to pass beneath the flat face of the detent under the influence of the spring 40. This movement of the clutch control lever 31 rotates the clutch pin 27 into engagement with one of the notches 26 in the annulus 25, thereby forming a driving connection between the motor driven worm wheel 15 and the shaft 16 by which the rock shaft 21 of the adding machine is operated. The initial upward movement of the lever 50 carries the roller 70 out of engagement with the flat end face 71^d of the lever 71 and into engagement with the curved surface 71^e of the lever so that the lever is then free to move toward the left, as viewed in Figs. 1, 2 and 3, under the influence of the coil spring 73. This movement of the lever 71 insures a complete upward movement of the lever 50 due to the engagement of the inclined cam surface 71^e with the roller 70 and it also brings about the closing of the switch simultaneously with the engagement of the clutch, the closing of the switch being caused by the downward movement of the arm 71^b of the switch control lever which carries with it the pawl 76 until the apex of the head 76^a of the pawl rides past the roller 78 and the roller 78 contacts with the upper inclined surface 76^b of the pawl, as shown in Fig. 2, whereupon the inclined surface 76^b forces the lever 79 upwardly and inwardly, under the influence of the spring 77, until the switch contacts 83 and 84 engage and form a wiping contact with the stationary contacts 85 and 86. The switch remains closed during the forward stroke or first half of the cycle of operation of the adding machine proper, during which time the rock shaft 21 is operated by the power of the motor and energy is stored up in the coil spring 120 by which the subsequent return stroke of the adding machine mechanism is effected. During the forward stroke, the snail cam 81, mounted on the shaft 16, rotates in a counterclockwise direction until at the end of the forward stroke, the projection of the cam forces the roller 80 on the control lever 71 downwardly to such an extent that the apex of the V-shaped head 76^a of the pawl 76 is carried upwardly over the roller 78, whereupon the lower inclined surface 76^c of the pawl operates to force the switch lever 79 toward the left, as viewed in Figs. 1, 2 and 3, thereby snapping the switch into open position. This position of the parts of the switch is illustrated in Fig. 3 where the switch is shown in open position and the lever 50 is shown approaching the normal position illustrated in Fig. 1. The return of the lever 50 to its normal position with the roller 70 engaging the end face 71^d of the lever 71 is brought about by the downward movement of the sector 68 of the adding machine which moves the roller 67 into engagement with the shoulder 66 on the elevated rod 52 which moves the rod downwardly and creates a compression in the spring 54 so that the lever 50 is in readiness to return to its normal position under the influence of the spring 54 as soon as the head 71^a of the switch control lever has moved toward the right, as viewed in Fig. 3, to a sufficient extent by the snail cam 81 during the forward stroke of the adding machine. The parts are so constructed and arranged that the downward movement of the rod 52 returns lever 50 to the normal position shown in Fig. 1, during the forward stroke, so that the detent 44 is turned into a position to obstruct the end of the clutch control lever 31 during the first half cycle or forward stroke of the adding machine and when the lever 31 completes its rotation at the end of the return stroke, the detent 44 engages the curved surface 43 on the end of the lever 31 and produces a movement of this lever on its bearing sufficient to disengage the clutch pin 27 from its notch 26. Thus the electric power is cut off simultaneously with the ending of the forward stroke and the armature of the motor is permitted to idle and come to rest during the return stroke of the adding machine mechanism which is effected by the spring 120. In this way the operation of the electric or other driving motor is rendered intermittent and the connection of the motor circuit is made in synchronism with the engagement of the clutch.

This improvement is of advantage in connection with any power driven adding machine or other machine but it is particularly advantageous where an electric motor of the Universal type is employed, particularly a series wound motor. With a motor of this type the speed which may be obtained is ordinarily variable and uncertain and may rise to unsafe limits if the power remains connected to the motor after the load is removed, and since the speed with which the adding machine may be successfully operated is limited, the present invention achieves the important result of preventing an undue speed of the motor by reason of the fact that the motor circuit is inter-

rupted intermittently and the armature brought to rest, or reduced greatly in its speed during the no-load condition of the return stroke, between successive operations of the finger-bar. In the cycle of operations of the adding machine, the forward stroke during which the machine in driven by the motor and energy is stored up in the spring 120, constitutes a working cycle while the return stroke of the machine which is effected by the energy stored up in the spring may be termed a no-load cycle since no power is then taken from the source of electric energy and the motor is disconnected. The disconnection of the motor not only prevents it from acquiring undue speed under the no-load condition but also effects a saving of the power required to operate a motor without load. The invention not only serves to operate the electric switch simultaneously with the operation of the clutch, thereby preventing damage to the machine, but it also insures a complete operation of the clutch control mechanism even when the finger bar is imperfectly or incompletely manipulated. A slight depression of the finger bar is sufficient to raise the roller 70 out of engagement with the end face 71^d of the switch control lever and, thereafter, a complete upward movement of the lever 50 is brought about by the inclined surface 71^e on the lever so that the detent 44 is moved to the proper extent to release the lever 31 and effect a proper engagement of the clutch pin before the parts are set in motion by the driving motor. The construction produces a rapid operation of the switch mechanism and the clutch control mechanism and the wiping contact of the switch contacts of relatively small area produce a more perfect circuit connection than can be obtained with switches of the type heretofore known.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments without departing from the scope of the appended claims.

I claim:

1. In combination, a machine, a motor for driving said machine, means for forming a driving connection between said motor and said machine, means actuated by a common control with said first named means for connecting said motor with a source of power, and means for disconnecting said motor from said source of power while permitting said driving connection to be maintained.

2. In combination, a machine, an electric motor for driving said machine, a clutch for forming a driving connection between said motor and said machine, a switch connecting said motor with a source of power, means having a common control for simultaneously operating said clutch and closing said switch, and means for permitting said last named means to be operated thereafter for opening said switch while continuing the engagement of said clutch.

3. In combination, a machine having a working cycle and a no-load cycle, a motor for driving said machine, a switch for connecting said motor with a source of power, and means for disconnecting said motor during said no-load cycle.

4. In combination, a machine having a cycle of operations including a working period and a no-load period, a series wound electric motor for driving said machine, a source of electrical energy connected to said motor, and means for automatically disconnecting said motor from said source during the no-load period of each cycle of operations.

5. In combination, a machine having a cycle of operations including a working period and a no-load period, a series wound electric motor for driving said machine, a clutch for forming a driving connection between said motor and said machine, a switch for connecting said motor with a source of power, means for closing said switch and engaging said clutch at the beginning of each working period, and means for opening said switch at the beginning of each no-load period.

6. In combination, a machine having a cycle of operations including a working period and a no-load period, a series wound electric motor for driving said machine, a clutch for forming a driving connection between said motor and said machine, a switch for connecting said motor with a source of power, means for simultaneously engaging said clutch and closing said switch at the beginning of each of said working periods, and means for automatically opening said switch at the end of each of said working periods.

7. In combination, a machine, a motor for driving said machine, a clutch for forming a driving connection between said motor and said machine, clutch operating mechanism, a manually manipulative member for actuating said clutch operating mechanism, and means actuated by the initial movement of said manually manipulative member for insuring a complete operation of said clutch operating mechanism.

8. In combination, a machine having a definite working period of operation, an electric motor for driving said machine, a clutch for forming a driving connection between said motor and said machine, a switch for connecting said motor with a source of power, means having a common control for closing said switch and engaging said clutch, and means operative automatically at the end of said period of operation for opening

said switch while permitting the continued engagement of said clutch.

9. In combination, a machine, a motor for driving said machine, a clutch for connecting said motor with said machine, a switch for connecting said motor with a source of power, means including a manually manipulative member for actuating said clutch, means actuated by said manually manipulative member for effecting the closing of said switch, and means actuated after a predetermined operation of said machine for automatically opening said switch.

10. In combination, a machine, a motor for driving said machine, a clutch for connecting said motor with said machine, a switch for connecting said motor with a source of power, means including a manually manipulative member for actuating said clutch, means actuated by said manually manipulative member for effecting the closing of said switch, and means actuated by said switch closing means for insuring a complete operation of said clutch actuating means.

11. The combination with a machine having a cycle of operations including a working period and a no-load period, of a motor for driving said machine, a clutch for connecting said motor to said machine, a clutch for connecting said motor to a source of power, means for simultaneously actuating said clutch and closing said switch at the beginning of said working period, means for opening said switch at the end of said working period, and means for disengaging said clutch at the end of said cycle of operations.

12. The combination with an adding machine, of a motor for driving said machine, a clutch for connecting said motor to said machine, a clutch operating member, a detent normally restraining movement of said member, means for actuating said detent, a manually manipulative member for operating said detent actuating means, and means actuated by the initial movement of said manually manipulative member for insuring a complete actuation of said detent actuating means independently of said manually manipulative member.

13. The combination with an adding machine, of a motor for driving said machine, a switch for connecting said motor with a source of power, a clutch for connecting said motor to said machine, clutch operating mechanism, means including a manually manipulative member for actuating said clutch operating mechanism, means actuated by the initial movement of said manually manipulative member for insuring a complete operation of said clutch operating mechanism, and means actuated by said last named means for closing said switch.

14. The combination with an adding machine, of a motor for driving said machine, a clutch for connecting said motor to said machine, a switch for connecting said motor to a source of power, a spring actuated switch controlling lever, and means actuated by said clutch operating mechanism for normally restraining said switch control lever and for permitting movement thereof to effect the closing of said switch on the initial movement of said clutch operating mechanism.

15. In apparatus of the class described, a controlling lever, a switch lever, a plurality of movable contacts actuated by said switch lever, means carried by said controlling lever for actuating said switch lever, and means for operating said controlling lever.

16. In apparatus of the class described, a controlling lever, a switch lever, contacts actuated by said switch lever, means carried by said controlling lever for actuating said switch lever, manually controlled means for effecting actuation of said controlling lever in one direction to produce a closing movement of said switch lever, and means actuated by the operation of said apparatus for producing a movement of said controlling lever in the other direction to effect an opening movement of said switch lever.

17. The combination with a machine of the class described, of a controlling lever having relatively inclined cam faces, a spring tending to move said lever in one direction, an actuating lever having a part adapted to co-act with said cam faces, and a switch actuated by said controlling lever, said part of said actuating lever being adapted normally to engage one of said cam faces to hold said controlling lever in a restrained position against the tension of said spring, said actuating lever being adapted by the initial movement thereof to bring said part into engagement with the other of said cam faces and thereby permit a switch closing movement of said lever under the action of said spring.

18. The combination with a machine of the class described, of a controlling lever, a switch lever mounted adjacent said controlling lever, a roller mounted on said switch lever, a detent having divergent inclined faces each adapted to co-act with said roller, switch contacts controlled by said switch lever, manually operated means for actuating said controlling lever to effect a contact closing movement of said switch lever by the engagement with said roller of one of said inclined faces, and means actuated by said machine for effecting a reverse movement of said controlling lever and the engagement of said roller with the other of said inclined faces for effecting a contact opening movement of said switch lever.

19. The combination in a machine of the class described, of a controlling lever, a

switch lever mounted adjacent said controlling lever, a pawl mounted on said controlling lever and having a pair of divergent cam faces adapted to co-act with a part of said switch lever, a spring tending normally to move said controlling lever in one direction, a manually releasable member acting normally to restrain said controlling lever from movement in said direction, switch contacts moved into circuit closing position by said switch lever through the operation of one of said cam surfaces upon actuation of said manually releasable member, and means for effecting a reverse movement of said controlling lever to disconnect said contacts by the movement of said switch lever through the action thereon of the other of said cam faces.

20. The combination in a machine of the class described, of a controlling lever, a switch lever mounted adjacent said controlling lever, a pawl mounted on said controlling lever and having a pair of divergent cam faces adapted to co-act with a part of said switch lever, a spring tending normally to move said controlling lever in one direction, switch contacts moved into circuit closing position by said switch lever through the operation of one of said cam surfaces upon actuation of said manually releasable member, a rotatable cam driven by said machine, and means carried by said controlling lever co-acting with said cam for effecting a reverse movement of said controlling lever and an opening movement of said switch contacts through the action on said switch lever on the other of said cam faces.

21. The combination in a machine of the class described, of a controlling lever having a laterally projecting arm, a pawl pivotally mounted on said arm and having a pair of divergent cam faces, a spring tending to move said pawl inwardly towards said lever, a switch lever having a part adapted to co-act with said cam faces, means for effecting relative movement of said controlling lever to bring one or the other of said cam faces into engagement with said switch lever, and switch contacts controlled by said switch lever.

22. The combination in a machine of the class described, of a controlling lever having a laterally projecting arm, a pawl pivotally mounted on said arm and having a pair of divergent cam faces, a spring tending to move said pawl inwardly towards said lever, a switch lever having a part adapted to co-act with said cam faces, means for effecting relative movement of said controlling lever to bring one or the other of said cam faces into engagement with said switch lever, a pair of switch contacts mounted on said switch lever and having a limited relative movement, and a pair of stationary contacts adapted to be engaged by said movable contacts.

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