Nov. 19, 1929. K. F. GALLIMORE 1,736,493

SWITCH

Original Filed Jan. 18, 1926 2 Sheets-Sheet 1

Fig. 1

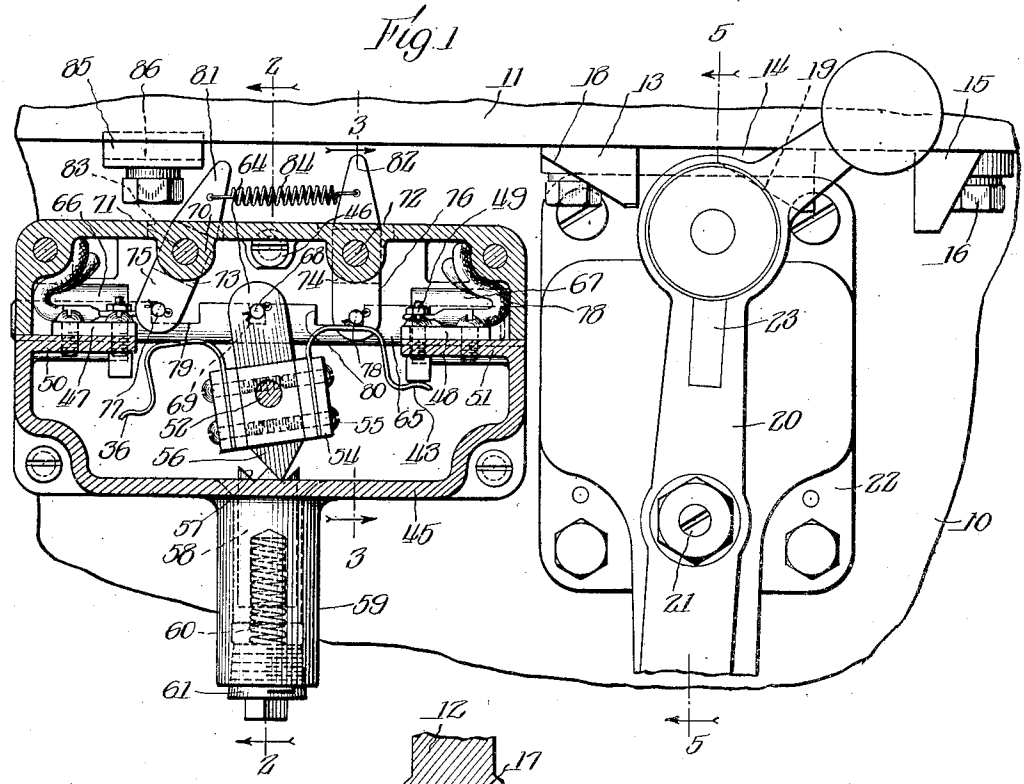


Fig. 2.

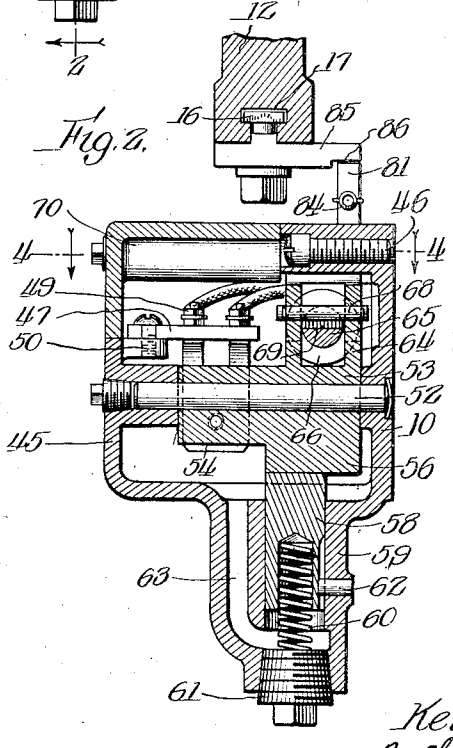
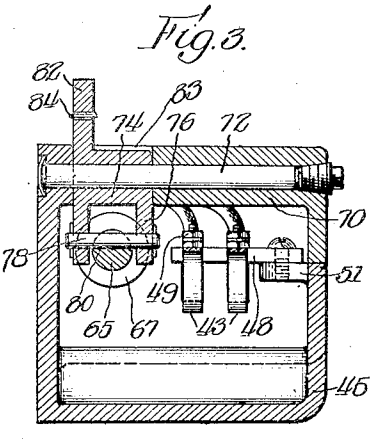


Fig. 3.



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Fig. 4.

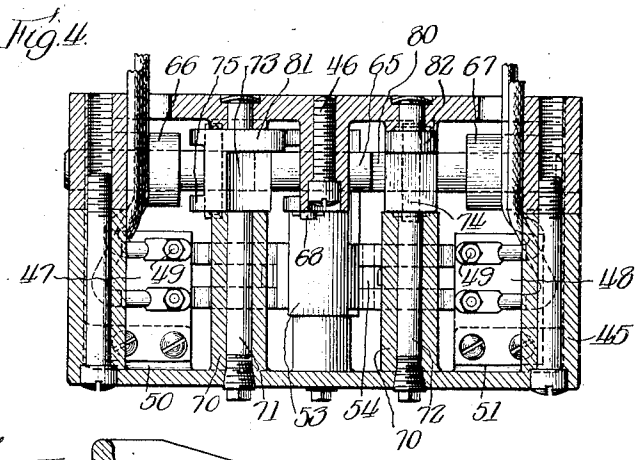


Fig. 5.

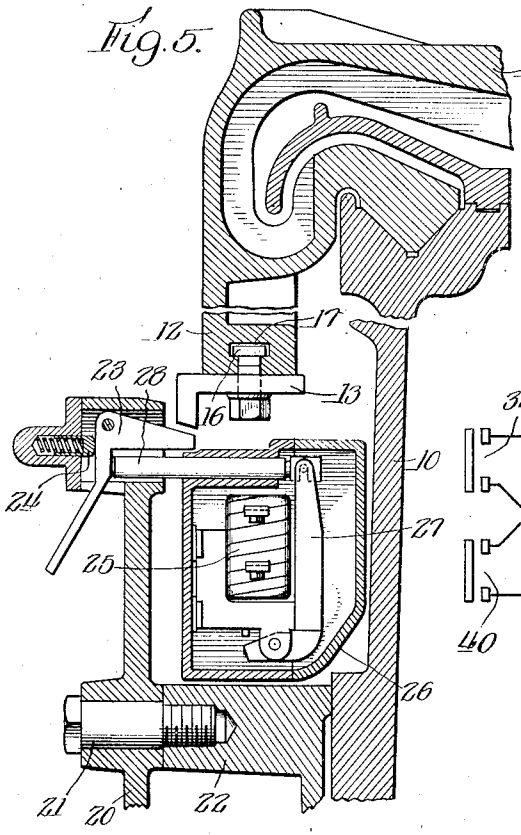
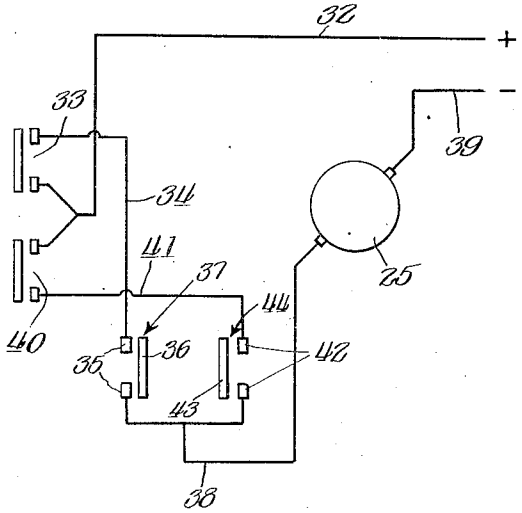


Fig. 6.



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UNITED STATES PATENT OFFICE

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SWITCH

Application filed January 18, 1926, Serial No. 81,970. Renewed September 13, 1929.

The present invention relates to improvements in electrical switches adapted to be automatically actuated to control the movements of machine parts, and has particular reference to switches of the character described in a copending application, Serial No. 6,689, filed February 4, 1925, by Herbert E. Kempton and Keith F. Gallimore.

In the machine disclosed in that application, the work is mounted in a rotatable chuck. The grinding wheel for operating on the work is mounted on a sliding carriage which has an operative position in which it reciprocates with the grinder in contact with the work, and an inoperative position remote from the work. The reciprocation of the carriage is controlled through a plurality of coacting dogs mounted on the carriage and on a driving mechanism. One of the dogs is adapted to be moved into and out of operative position relative to the other dogs by means of an electromagnet which is adapted to be successively excited by a gage coacting with the work. Two electrical circuits respectively controlled by the gage are adapted to be selectively connected to the electromagnet by a switch which is automatically operable through the carriage movements. Upon the first excitation of the electromagnet the stroke of the carriage in a direction toward its inoperative position is prolonged to effect a separation of the grinding wheel and the work. By this separation, the carriage reverses the switch thereby breaking the initial circuit through the electromagnet and preparing the other circuit for closure by the gage. A supplemental dog on the carriage immediately thereafter returns the latter to its operative position. Reciprocation of the carriage then continues until the second excitation of the electromagnet, whereupon the carriage is moved into its remote inoperative position, without affecting the switch. On the return movement of the carriage to operative position in the following operation, the switch is again actuated to prepare the initial circuit for closure by the gage.

The present invention has to do with a new and improved switch for controlling the excitation of said electromagnet. One of the objects of the invention is to provide a switch of the above character which is simple and inexpensive in construction, which can be readily applied to existing machines, which is simple and certain in operation, and which assures a quick and sure make and break.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawings, Figure 1 is a fragmentary view partly in section of a machine tool to which my invention has been applied.

Fig. 2 is a sectional view taken substantially along line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken along line 3—3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken along line 4—4 of Fig. 2.

Fig. 5 is a fragmentary sectional view taken substantially along line 5—5 of Fig. 1.

Fig. 6 is a wiring diagram of the circuits controlled by the switch.

While my invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the particular form disclosed but aim to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawings, a fragment of a machine tool carriage slidably mounted on a machine base 10 is shown at 11. The carriage preferably has overhanging sides 12 of which only one is shown. Suitably secured to the latter are a plurality of carriage control dogs, comprising in the present instance dogs 13, 14 and 15. Preferably these dogs are secured by bolts 16 engaging a T-slot 17 formed in the under side of the overhanging side 12. The dogs 14 and 15 are reversing dogs for effecting the reciprocation of the carriage 11 in operative position and the dog 13 is a temporary reversing dog for returning the carriage to operative position after a limited movement of the carriage beyond the range of reciprocation and toward its inoper-

ative position. The dogs 13 and 14 are positioned to the left of the dog 15, and are beveled at their left ends to provide cam surfaces 18 and 19 respectively.

An actuator in the form of an upright lever 20 is pivoted between its ends at 21 on a casting 22 rigidly secured to the front wall of the machine base 10. The lever controls a suitable driving mechanism and when moved to the extreme right or left as viewed in Fig. 1, effects movement of the carriage 11 to the left or right respectively. The specific driving mechanism is not shown since it forms no part of the present invention, and since a suitable driving mechanism is shown in the copending application referred to above. Pivotally mounted in the upper end of the lever 20 is a dog 23 which is normally maintained by a spring follower 24 in operative position in the path of the reversing dogs. The cam surfaces 18 and 19 are adapted to successively engage and depress the pivotal dog 23 upon movement of the carriage 11 from right to left to position the dog between the dogs 14 and 15. The latter serve to oscillate the lever 20 to automatically reciprocate the carriage 11.

Means is provided for automatically tripping the pivotal dog 23 to permit movement of the dog 14 or the dogs 13 and 14 past the dog 23 from left to right. This means comprising an electromagnet 25 having a suitable housing 26 secured to the base 10, and having a pivotal armature 27. A slidable pin 28 is attached to the free end of the armature 27, and is arranged to engage the dog 23 and swing it out of the path of the dogs 13 and 14 when the electromagnet 25 is excited. The control circuits (see Fig. 6) through the electro-magnet 25 preferably are as follows: From the positive terminal through wire 32, switch 33, wire 34, fixed contacts 35 and movable contact 36 of switch 37, wire 38, the electromagnet 25 and wire 39 to the negative terminal; and from wire 32, through switch 40, wire 41, fixed contacts 42 and movable contact 43 of switch 44, the wire 38, the electromagnet 25 and the wire 39. The switches 33 and 40 preferably are controlled by gages which serve to close them automatically and successively at predetermined points in the grinding operation. The gages are not shown since they are fully illustrated in the copending application referred to above, and since their specific character forms no part of the present invention.

Means is provided for controlling the switches 37 and 44 to connect the electromagnet 25 in series first with the switch 33 and then with the switch 40. This means includes a housing 45 which is secured to the front wall of the base 10 by means of screws 46. The fixed contacts 35 and 42 are respectively mounted on the under sides of two horizontal insulating plates 47 and 48, and are provided with binding posts 49 to which the electric lead wires are secured. These insulating plates are supported by flanges 50 and 51 formed integral with opposite ends of the front wall of the housing 45. Extending transversely through the housing 45 is a shaft 52 on which a lever 53 is pivotally mounted. The movable contacts 36 and 43 are secured to opposite sides of the lever 53. In the present instance, each movable contact comprises a spring plate, one end of which is clamped between two insulating plates 54 secured to the lever 53 by screw bolts 55 and the other end of which is bifurcated to provide a pair of arms movable into and out of engagement with adjacent fixed contacts. The contacts constituting the switches 37 and 44 may be immersed in oil in the housing 45, the interior of which is adapted to serve as a reservoir.

To maintain the movable contacts 36 and 42 in one position or the other, the lever 53 is provided with a depending V-shaped tooth 56 which selectively engages either of two notches 57 in the upper end of a plunger 58, slidably disposed in a depending portion 59 of the housing 45. The plunger is pressed upwardly by a spring 60 resting on a plug 61 in the lower end of the depending portion 59. A pin 62 is feathered to the plunger 58 to hold the latter against rotation. The plug 61 also closes a drain passage 63 leading from the interior of the housing 45.

The lever 53 is formed on its rear end with two spaced upstanding arms 64 which embrace opposite sides of a sliding shaft 65 journaled in bearings 66 and 67 in opposite ends of the housing 45. A pin 68 mounted in the arms 64, extends through a transverse notch 69 milled in the upper side of the shaft 65, thereby connecting the latter to the lever 53. Mounted in tubular enlargements 70 in the upper wall of the housing 45 and at opposite sides of the lever 53 are two transverse shafts 71 and 72. Levers 73 and 74 are pivotally mounted on these shafts, and have depending spaced arms 75 and 76 respectively which embrace opposite sides of the shaft 65. Extending between the arms 75 and 76 respectively are two pins 77 and 78 which are positioned in relatively wide transverse notches 79 and 80 respectively. These notches are equally spaced from the notch 69, and are spaced substantially the same distance as the levers 73 and 74. They are of sufficient width to permit independent pivotal movement of the levers to a limited extent. The levers 73 and 74 are formed with upstanding dogs 81 and 82 respectively which extend through openings 83 in the upper wall of the housing 45 and which are connected by a coil spring 84. A cam 85 having a cam surface 86 is secured to the carriage 11 in position to engage the ends of the dogs 81 and

82 to oscillate the latter and thereby to move the shaft 65 longitudinally.

In operation, when the carriage 11 is moved to the right the cam 85 passes over the dog 81 and oscillates the dog 82 without affecting the position of the shaft 65, the width of the notch 80 permitting freedom of movement of the pin 78. Movement of the carriage to the left from its extreme right position is instituted by moving the lever 20 to the right. In this movement to the left, the cam surfaces 18 and 19 successively depress the pivotal dog 23 thereby permitting the latter to snap into position between the dogs 14 and 15, and the cam 85 engages the dog 82 and oscillates the latter to the left thereby shifting the shaft 65 to the right. As a result the switch 44 is opened and switch 37 is closed. Oscillation of the dog 81 to the left is permitted without affecting the position of the shaft 65. The dogs 14 and 15 automatically reverse the lever 20 to effect reciprocation of the carriage 11 in its operative position.

Upon closure of the switch 33, a circuit through the switch 37 and the electromagnet 25 is completed. Excitation of the electromagnet results in the tripping of the pivotal dogs 23, thereby rendering the dog 14 ineffectual to reverse the reciprocation, and consequently prolonging the stroke of the carriage to the right. Immediately after the dog 14 passes the pivotal dog 23, the cam 85 engages the dog 81, thereby shifting the shaft 65 to the left. As a result the switch 44 is closed and the switch 37 is opened, thereby breaking the circuit through the electromagnet 25, and releasing the pivotal dog 23 into position between the dogs 13 and 14. The dog 13 reverses the movement of the carriage 11 before the cam 85 passes over the dog 82. On the return movement the cam surface 19 again depresses the pivotal dog 23 to permit it to snap into position between the dogs 14 and 15, and the carriage continues to reciprocate. When the switch 40 is closed, the electromagnet 24 is again excited and the pivotal dog is again tripped. This time the cam 85 in moving over the dogs 81 and 82 does not affect the position of the shaft 65 so that the electromagnet 25 continues to hold the dog 23 inoperative while both dogs 13 and 14 move past, thereby causing the carriage to move to the right into its remote inoperative position.

It will be seen that I have provided an extremely simple and efficient switch for controlling the excitation of the electromagnet 25 to permit first a partial withdrawal of the carriage toward inoperative position, and subsequently a complete withdrawal of a carriage to inoperative position. By placing the switch in series with a pair of gages, this operation is effected automatically. The carriage itself serves to reverse the switch, and a quick make and break is effected.

I claim as my invention:

1. A switch having, in combination, a casing, two sets of fixed contacts mounted in said casing, a pivotal member supported between said sets of contacts, independent contacts mounted on said member for respective and selective engagement with said sets of fixed contacts, a shaft slidably mounted in said casing and pivotally connected to said member, two actuating members pivotally mounted in said casing and projecting therefrom, each of said actuating members having a lost motion connection with said shaft, and a spring connecting the projecting ends of said actuating members and tending to take up the lost motion between each actuating member and said shaft in one direction.

2. A switch having, in combination, two sets of fixed contacts, a movable support, two movable contacts mounted on said support and associated respectively with said fixed contacts, means for holding said movable support in either of two positions to close one or the other of said sets of fixed contacts, means for moving said support from one position to the other, a pair of actuating dogs having a lost motion connection with said last mentioned means, and spring means tending to take up the lost motion between said dogs and said last mentioned means in opposite directions, whereby upon movement of said dogs in one direction one dog will actuate said last mentioned means and the other will be ineffectual and upon movement in the other direction the other dog will actuate said last mentioned means, and said first dog will be ineffectual.

3. A switch having, in combination, a casing, two sets of fixed contacts mounted in said casing, a movable support between said sets of contacts, contacts mounted on opposite sides of said support for respective and selective movement into and out of engagement with said sets of fixed contacts, movable means connected to said support for the transmission of its motion thereto thus to actuate said support, a pair of actuating members mounted for independent movement in said casing and projecting therefrom, each of said actuating members having a lost motion connection with said means, and spring means secured to the projecting ends of said actuating members and tending to take up the lost motion of each actuating member with said first mentioned means in one direction.

4. A switch having, in combination, two sets of fixed contacts, a movable support, two movable insulated contacts mounted on said support and associated respectively with said fixed contacts, means for actuating said support to selectively close said sets of fixed contacts, a pair of pivotal actuating dogs each having a lost motion connection with said means, and spring means tending to take up

the lost motion between said dogs and said means in opposite directions.

5. A switch having, in combination, a casing, two sets of fixed contacts mounted in opposite ends of said casing, a lever pivotally mounted in said casing between said fixed contacts, two spring contacts mounted on opposite sides of said lever, one for each set of fixed contacts, means for holding said lever in either of its two extreme positions to hold either of said spring contacts in engagement with its fixed contacts, a shaft mounted for longitudinal sliding movement in said casing, means pivotaly connecting said shaft and said lever, said shaft having a plurality of lateral notches, one at each side of said lever and spaced equally therefrom, a pair of levers pivotally mounted in said casing and projecting therefrom, said levers being spaced substantially the same as said notches, and having pins movably positioned in the latter, and a spring connecting the projecting ends of said levers and tending to move them together and to move said pins against the outer sides of said notches, said projecting ends being adapted to be engaged by a movable dog to shift said shaft.

6. A switch having, in combination, a casing, two sets of fixed contacts mounted in opposite ends of said casing, a lever pivotally mounted in said casing between said fixed contacts, two spring contacts mounted on opposite sides of said lever, one for each set of fixed contacts, a sliding member in said casing, means pivotally connecting said member on said lever, said member having a plurality of lateral notches, one at each side of said lever, a pair of levers pivotally mounted in said casing and projecting therefrom, said levers carrying pins movably positioned in said notches, and a spring connecting the projecting ends of said levers and tending to move them together, said projecting ends being adapted to be engaged by a movable device to shift said member.

7. A switch having, in combination, a casing, two sets of fixed contacts mounted in said casing, a pivotal member between said sets of contacts, movable contacts mounted on said member for respective engagement with said fixed contacts to alternately close the latter, and a pair of independent actuating members pivotally mounted in said casing and projecting therefrom for actuation by a passing body, said actuating members being adapted alternately to move said pivotal member in opposite directions.

8. A switch having, in combination, two sets of fixed contacts, a movable support, two contacts mounted on said support and associated respectively with said fixed contacts, means for moving said support from one position to the other, and a pair of actuating dogs operatively connected to said means, said actuating dogs being adapted to be actuated by a passing body and being respectively effective upon actuation in opposite directions to alternately actuate said means in opposite directions.

In testimony whereof, I have hereunto affixed my signature.

KEITH F. GALLIMORE.