

March 18, 1930.

H. E. KEMPTON ET AL

1,751,204

SWITCH

Original Filed March 16, 1925

3 Sheets-Sheet 1

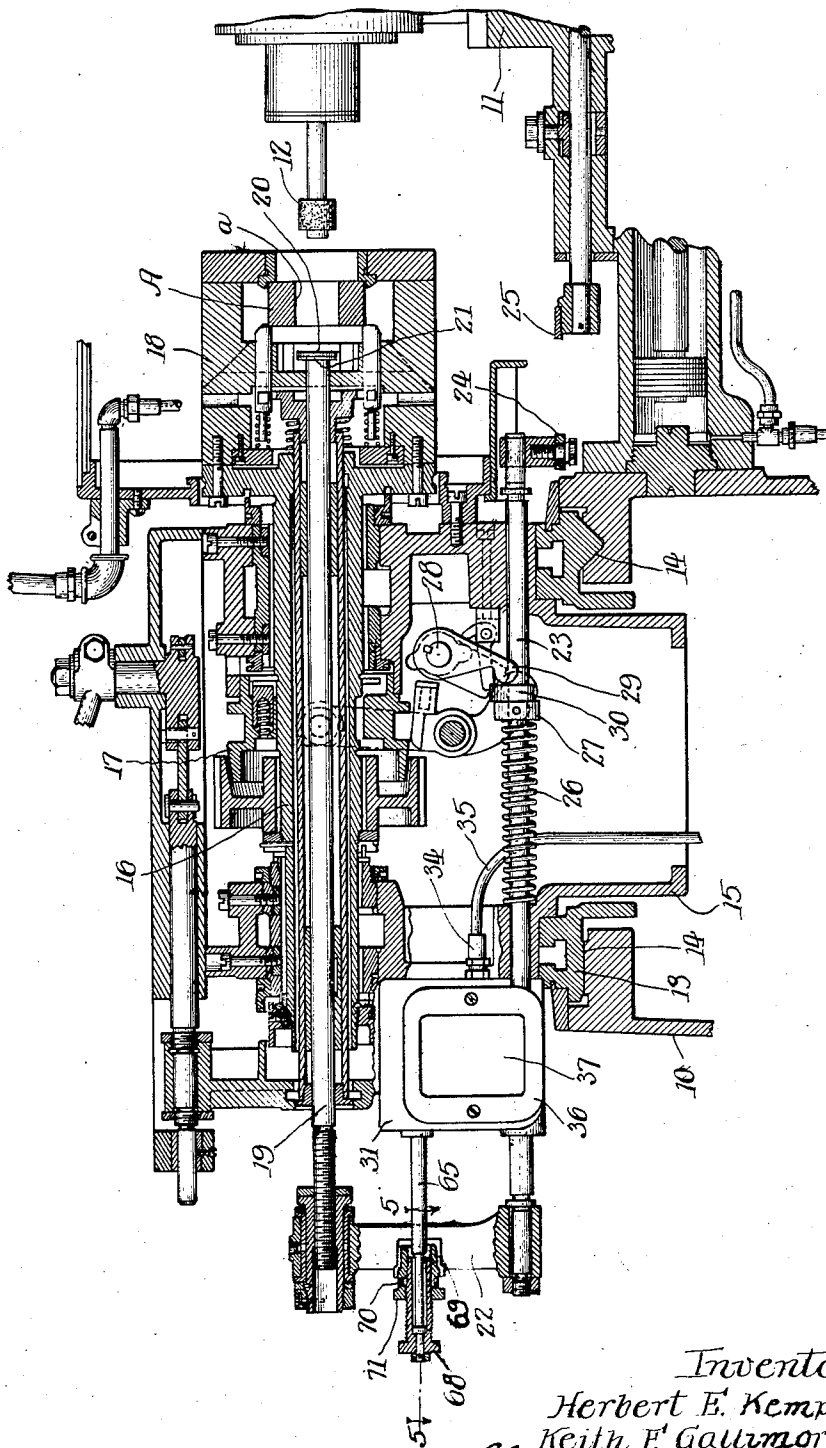
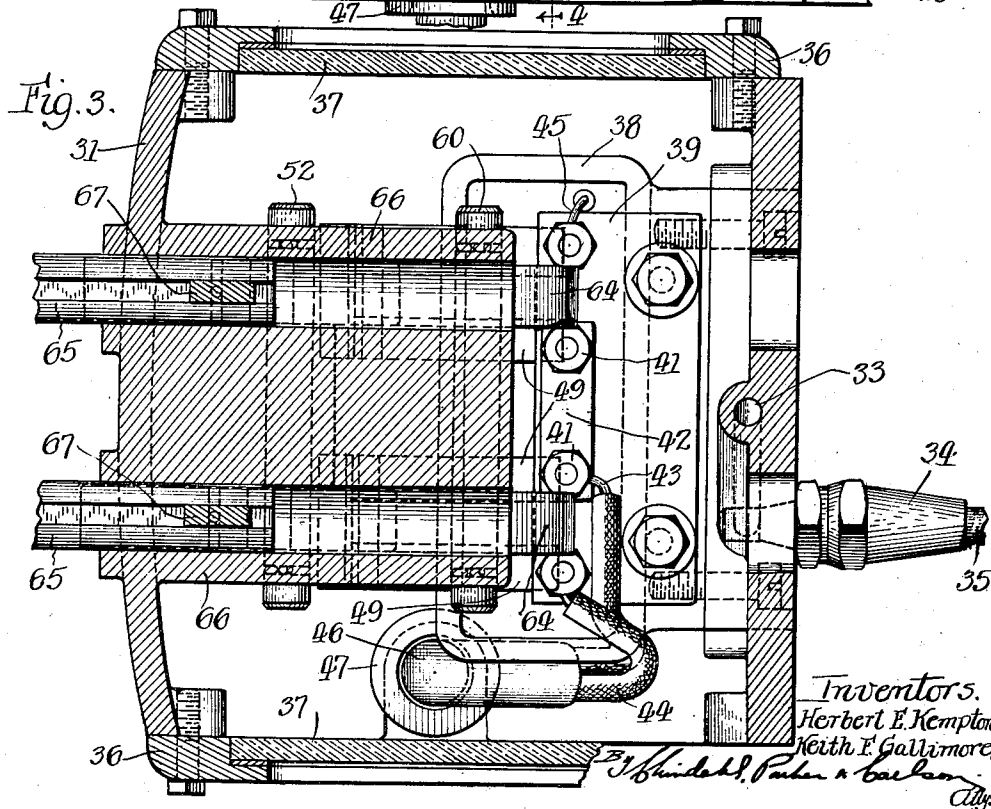


Fig. 1.

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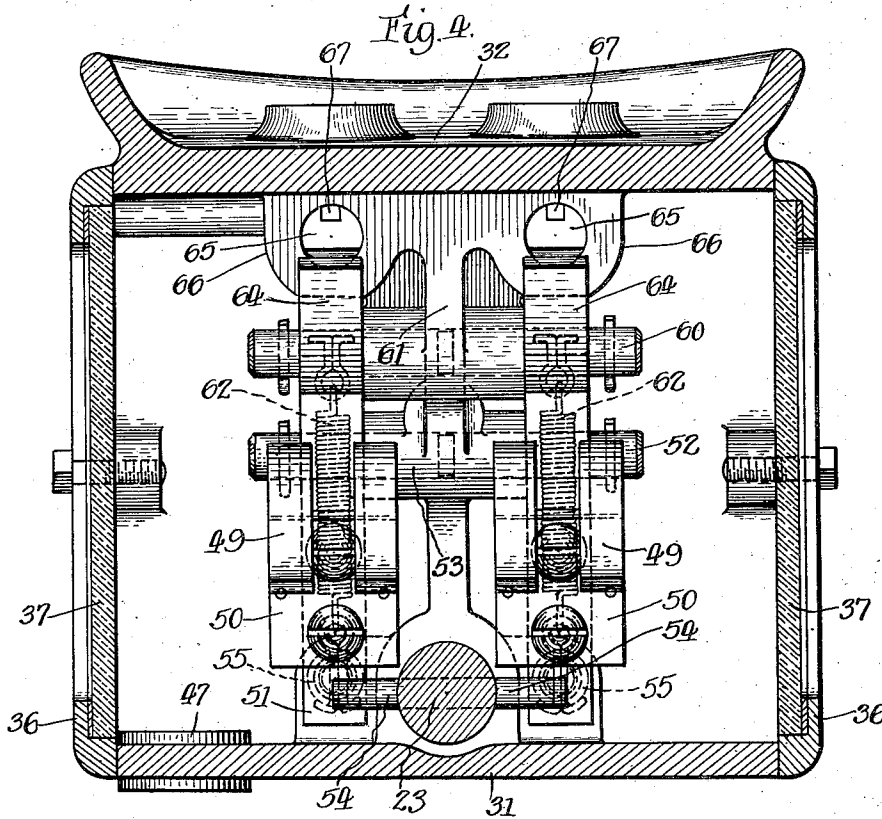
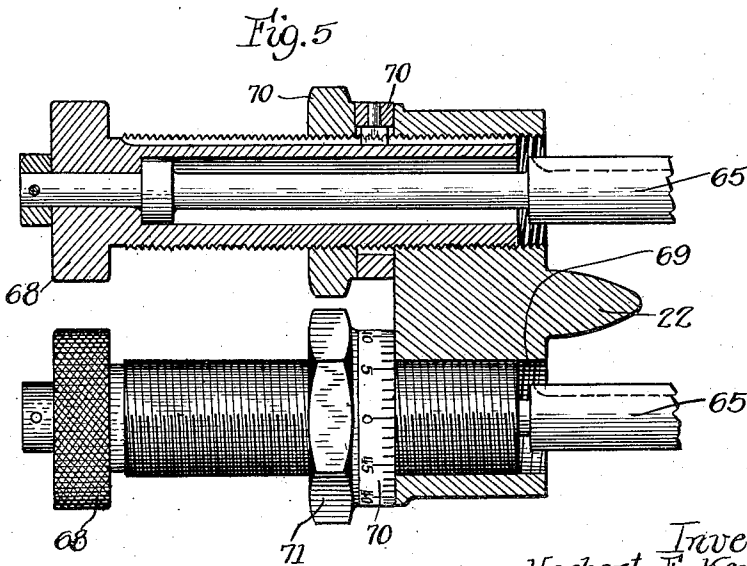
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SWITCH

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

HERBERT E. KEMPTON, OF CHICAGO, ILLINOIS, AND KEITH F. GALLIMORE, OF FOND DU LAC, WISCONSIN, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE HEALD MACHINE COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

SWITCH

Application filed March 16, 1925, Serial No. 15,849. Renewed August 24, 1929.

The invention relates to improvements in electric switches, and more particularly in switches that are automatically operable.

A general object of the invention is to provide a novel electric switch which is mechanically operable, simple in construction and reliable in use.

A further object is to provide a novel double switch, in which the switches are adapted to be closed in a predetermined and adjustable order, and in which electrical contact is quickly and efficiently made.

Another object is to provide a switch having a trip mechanism, and an actuator which upon movement in one direction acts to set said mechanism, and upon movement in the other direction serves to trip said mechanism.

A more specific object is to provide a novel double switch which is adapted to form part of electrically controlled automatic machine tools, and in which the switches are adapted to be operated simultaneously or consecutively as desired by an actuator forming part of the machine tool to periodically open and close a plurality of control circuits.

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

In the accompanying drawings, Figure 1 is a vertical section of the headstock of a grinding machine to which a switch embodying the features of our invention has been attached.

Fig. 2 is a side view of the switch.

Fig. 3 is a horizontal section taken along line 3—3 of Fig. 2.

Fig. 4 is a vertical section taken substantially along line 4—4 of Fig. 2.

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

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

To illustrate the invention, it is applied to a grinding machine of the type illustrated in Patent No. 1,534,302, issued April 21, 1925, to Prentice Conradson and ourselves. The grinding machine disclosed in that patent comprises a headstock carriage having a chuck in which the work to be ground is mounted, a spindle carriage reciprocable toward and from the headstock carriage and having a grinding wheel adapted to operate on the work, and means for effecting a relative graduated cross feed between said carriages. The feeding means comprises a coarse feed pawl and a fine feed pawl adapted to operate through a ratchet wheel to rotate a cross feed screw through unequal degrees. A pair of gages mounted on a gage rod extending axially through the chuck spindle are adapted to coact with the work, and control a double switch which serves to successively render the coarse and fine feed pawls ineffectual to rotate the feed screw. The present invention is concerned with the character of the switch, the switch however not being limited to the above adaptation. In the drawings certain means for interlocking the draw bar for the chuck, and the clutch and gauge mechanisms are shown, but these are claimed in our prior copending application Serial No. 742,509, filed October 9, 1924.

Referring to the drawings, 10 represents the base of a grinding machine on one end of which a spindle carriage 11 having grinding wheel 12 is longitudinally reciprocable, and on the other end of which a headstock carriage is mounted for lateral adjustment. The headstock carriage consists of a base section 13 slidably engaging transverse ways 14 on the base 10, and a body section 15 rotatably adjustable on said base section. Rotatably journaled in the body section 15 is a hollow spindle 16 which can be driven through the clutch 17 by any suitable means (not shown), and which is provided on its front end with a chuck 18 adapted to hold a work blank A.

The grinding wheel 12 is reciprocated through a bore *a* in the work blank A, and the headstock carriage is given a transverse feeding movement at each reciprocation of

said wheel to grind said blank. Any suitable means (not shown) can be provided for feeding the headstock carriage, but preferably the feeding mechanism disclosed in our
 5 copending application, Serial No. 619,774, filed February 17, 1923, which serves to automatically slow down and finally discontinue the cross feed as the grinding operation nears completion, is employed.

10 The cross feed is controlled by a gage mechanism which comprises a gage rod 19 extending slidably and axially through the spindle 16 and having two gages 20 and 21 on its front end adapted to successively co-
 15 act with the work blank A. The rear end of the gage rod 19 is connected by a vertical bracket 22 to the rear end of a parallel push rod 23 extending slidably through the body section 15. A roller abutment 24 on the forward end of the push rod 23 is adapted to be
 20 periodically engaged by an adjustable abutment 25 on the carriage 11 to withdraw the gages 20 and 21 from the blank A each time the grinding wheel 12 moves into the bore a.
 25 Forward movement of the gage rod 19 is induced by a coil spring 26 mounted on the push rod 23 and abutting at its opposite ends against the body section 15 and a collar 27 on the rod 23. The gage rod 19 is adapted to
 30 be moved into its inoperative position to permit reloading of the chuck 18, by actuating shaft 28 having a dog 29 which engages a block 30 loosely mounted on the rod 23 next to the collar 27.

35 A switch mechanism forming the preferred embodiment of our invention is provided which serves to successively close a pair of control circuits for slowing down and finally discontinuing the cross feed when
 40 the gage 20 and later both gages 20 and 21 enter the bore a, respectively. This mechanism comprises a switch box 31 which is secured to the body section 15 of the headstock, and through the lower portion of
 45 which the push rod 23 slidably extends. The upper wall of the switch box forms an inclined trough 32 from which oil is adapted to be withdrawn through an inclined port 33 connected by a fitting 34 to conduit 35,
 50 and the side walls are each closed by a removable cover 36 having a glass 37.

Rigidly bolted to the front end wall of the switch box 31 and extending substantially across the same is an oil trough 38 on which a
 55 terminal holder 39 of suitable insulating material and partially closing said trough is mounted. Four fixed terminals or contacts 40 are secured to the holder 39 by binding nuts 41, and extend downwardly into the oil
 60 trough 38. The two central terminals are connected through a conducting plate 42 on the holder 39 to a single lead wire 43, and the outer terminals have separate lead wires 44 and 45 attached thereto. The three lead
 65 wires pass out of the box 31 through a con-

duit 46 which extends through a bushing 47 in the bottom of the box.

To bridge each pair of terminals respectively, a pair of movable spring contacts 48 are provided. Each of these contacts is
 70 formed with forked arms 49 which extend into the oil trough 38 and are therein movable into open and closed position relative to the terminals 40 with which they are associated.

The mechanisms for actuating the spring contacts 48 are identical in construction and will now be described. Each spring contact 48 is rigidly secured between two bakelite
 80 plates 50 on the free lower end of a latch 51. The latches 51 are pivotally mounted on opposite ends of a pin 52 extending through a lug 53 on the rear end wall of the box 31, and extend across opposite sides of the push
 85 rod 23 carrying a transverse pin 54, the opposite ends of which are adapted to engage the lower ends of the latches to move the spring contacts 48 into open position when the gage
 90 rod is drawn into inoperative position. A pair of coil springs 55, one for each latch 51, are mounted on two pins 56 in the rear end wall of the box 31, and tend to move the latches forwardly to force the contacts 48
 95 into closed position.

The upper end of each latch 51 is formed with an upward extension having a sharp
 100 tooth 57 and a lateral arm 58. A pair of catches 59 are pivotally mounted on opposite ends of a pin 60 which extends through a rib 61 depending from the top wall of the switch box, and are adapted to engage the
 105 two teeth 57 respectively to hold the switch contacts 48 in open position. The catches 59 are resiliently pressed against the teeth 57 by two contractile springs 62 attached at their lower ends to shoulders 63 on the pins
 110 56 respectively, and are each formed with an upwardly extending arm 64, said arms being adapted to be engaged by the forward ends of two plungers 65 to selectively trip the catches.

The plungers 65 are slidably mounted in two parallel bearings 66 formed on the top wall of the switch box, and are held against
 115 rotation by two keys 67 extending into said bearings. The rear end of each plunger is rotatably secured to an adjusting screw 68 threaded into a nut 69 in one side of the bracket 22. A micrometer collar 70 and
 120 a lock nut 71 on the screw 68 serve respectively to indicate the degree of adjustment of the plunger and to clamp the plunger in adjusted position.

In operation, when the gages 20 and 21 are drawn into inoperative position to permit
 125 reloading of the chuck 18, the plungers 65 and push rod 23 are moved rearwardly, thereby releasing the arms 64 and moving the pin 54 into engagement with the lower ends of the latches 51. In moving the latches
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rearwardly against the force of the springs 55, the spring contacts 48 are moved into open position thereby breaking the circuits through the terminals 40, and the lateral arms 58 release the catches 59 thereby permitting the latter to be moved into engagement with the teeth 57 by the contractile springs 62. The catches serve to hold the two latches 51 in inoperative position after being released by the pin 54 upon subsequent forward movement of the gage rod 23. When the grinding operation has proceeded to a point permitting the first gage 20 to enter the bore *a* of the work, one of the plungers 65 will engage one of the arms 64 to release one of the latches 51 and effect a closure of one of the switches. In releasing the latch 51, the arm 58 raises the catch 59 to move the arm 64 out of the path of the plunger 65. When the grinding operation is completed and the second gage 21 enters the bore *a* of the work blank, the other plunger 65 will close the second switch in a manner similar to that just described. Thus upon each movement of the gage mechanism into inoperative position, the switch is set for operation, and in each operation the two switch mechanisms are automatically tripped in predetermined order to close the switches.

It will be evident that the time at which each switch is to close can be regulated by adjusting the plungers 65 in the bracket 22. If the plungers are positioned to engage the arms 64 simultaneously both switches will be closed at the same time. By tripping the movable parts, a sure and quick contact is effected at the closure of each switch. While the switch is herein shown as applied to an automatic internal grinding machine, it is to be understood that this is merely for purposes of illustration, and that the switch can readily be adapted to many other uses.

It will be noted that the invention provides a trip actuated switch which brings the contacts together very fast once the gage 20 or 21 enters a workpiece. With a switch of this type, in which the terminals are located in oil, the magnets of the machine, which control the operation thereof, can be energized with commercial high voltage current, because sparking at the switch contacts is entirely eliminated. Even without the use of the oil trough, however, the switch presents many features of advantage, for contact is made with a firm action which precludes the possibility of failure to carry the electric current.

We claim as our invention:

1. A switch having, in combination, a casing, an oil trough mounted in said casing, a plurality of fixed contacts mounted in said oil trough, two spring contacts movable in said oil trough and with said fixed contacts constituting a pair of switches, two pivotal

latches one for each spring contact and supporting the same, means for moving said latches to open said switches, spring means tending to move said latches to close said switches, two catch members one for each latch adapted to resiliently engage and to hold said latch in open position, and means for tripping said catches to close said switches.

2. A switch having, in combination, a casing, an oil trough in said casing, fixed contacts supported in said oil trough, a latch supporting a spring contact movable in said oil trough, said spring contact with said fixed contacts constituting a switch, a rod reciprocable through said casing and having means thereon adapted to move said latch in a direction to open said switch, means tending to resist said movement, a catch spring pressed into engagement with said latch and adapted to hold said latch in open position, and means movable with said rod and adapted to trip said catch to release said latch after said rod has been moved from said latch.

3. A switch having, in combination, a casing, a plurality of fixed contacts in said casing, a pair of movable contacts in said casing and with said fixed contacts constituting a pair of switches, movable means in said casing adapted to move said movable contacts into open position, means adapted to hold said movable contacts in open position, and means rigid with said movable means adapted in movement in one direction to successively release said movable contacts.

4. A switch having, in combination, a casing, fixed and movable contacts in said casing, said contacts constituting a switch, a latch pivotally mounted in said casing, one end of said latch supporting the movable contact and the other end of said latch being formed with a tooth and a lateral arm, a catch pivotally mounted in said casing, one end of said catch overlying said arm and being adapted to engage said tooth, and the other end of said catch constituting an inclined arm, means for engaging said inclined arm to move said catch out of engagement with said latch, spring means tending to hold said catch in engagement with said latch, spring means tending to move said latch to close said switch, said last mentioned spring means becoming effective and said first mentioned arm serving to raise said catch when said catch is disengaged from said latch, and means for moving said latch to open said switch and permit re-engagement between said latch and said catch.

5. A switch having, in combination, a casing, a plurality of fixed contacts in said casing, a pair of movable contacts in said casing, means for moving said movable contacts into inoperative position, means for holding said contacts in inoperative position, and a

pair of plungers movable with said first mentioned means and adapted to engage said last mentioned means to release said movable contacts, said plungers being adjustable to provide means for controlling the relative time at which the switches are to close.

6. A switch having, in combination, a pair of fixed contacts, a movable contact, a pivotal latch supporting said movable contact, a movable member adapted to engage said latch to move said movable contact into open position, resilient means tending to move said latch in the opposite direction, a pivotal catch adapted to engage said latch to hold the latter in inoperative position upon being moved thereto, and means movable with said member and operable upon movement of the latter away from said latch to trip said catch and permit movement of said movable contact into closed position.

7. A switch having, in combination, a plurality of fixed contacts, two movable contacts constituting two switches with said fixed contacts, two mechanisms, one associated with each movable contact for moving the latter into and out of engagement with the associated fixed contacts, and adjustable means for selectively actuating said mechanisms to effect movement of said movable contacts successively toward said fixed contacts.

8. A switch having, in combination, a casing, a plurality of fixed contacts in said casing, a pair of movable contacts in said casing and with said fixed contacts constituting two switches, two switch mechanisms one for each movable contact and adjustable means operable upon movement in one direction to actuate said mechanisms to effect a closure of said switches in predetermined order.

9. A switch having, in combination, two switches each having a movable contact, two trip mechanisms one for each movable contact, and movable means for simultaneously setting said mechanisms and opening said switches, and for selectively tripping said mechanisms to selectively close said switches.

10. In a machine of the class described, a gage rod having a gage on the front thereof, means to urge said gage rod toward a workpiece held in a chuck, a secondary rod associated with said gage rod and adapted to move with it, a switch, a trip mechanism to operate said switch, said trip mechanism being operated from movement of said secondary rod.

11. In a machine of the class described, a gage rod having a gage on the front thereof, means to urge said gage toward a workpiece held in a chuck, a secondary rod associated with said gage rod and adapted to move with it, an independent switch member adapted to be moved to close the switch upon movement of said secondary rod, and means to reset said independent switch member coin-

cident with movement of said gage rod and secondary rod to non-gaging position.

In testimony whereof we have hereunto affixed our signatures.

HERBERT E. KEMPTON.
KEITH F. GALLIMORE.

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