

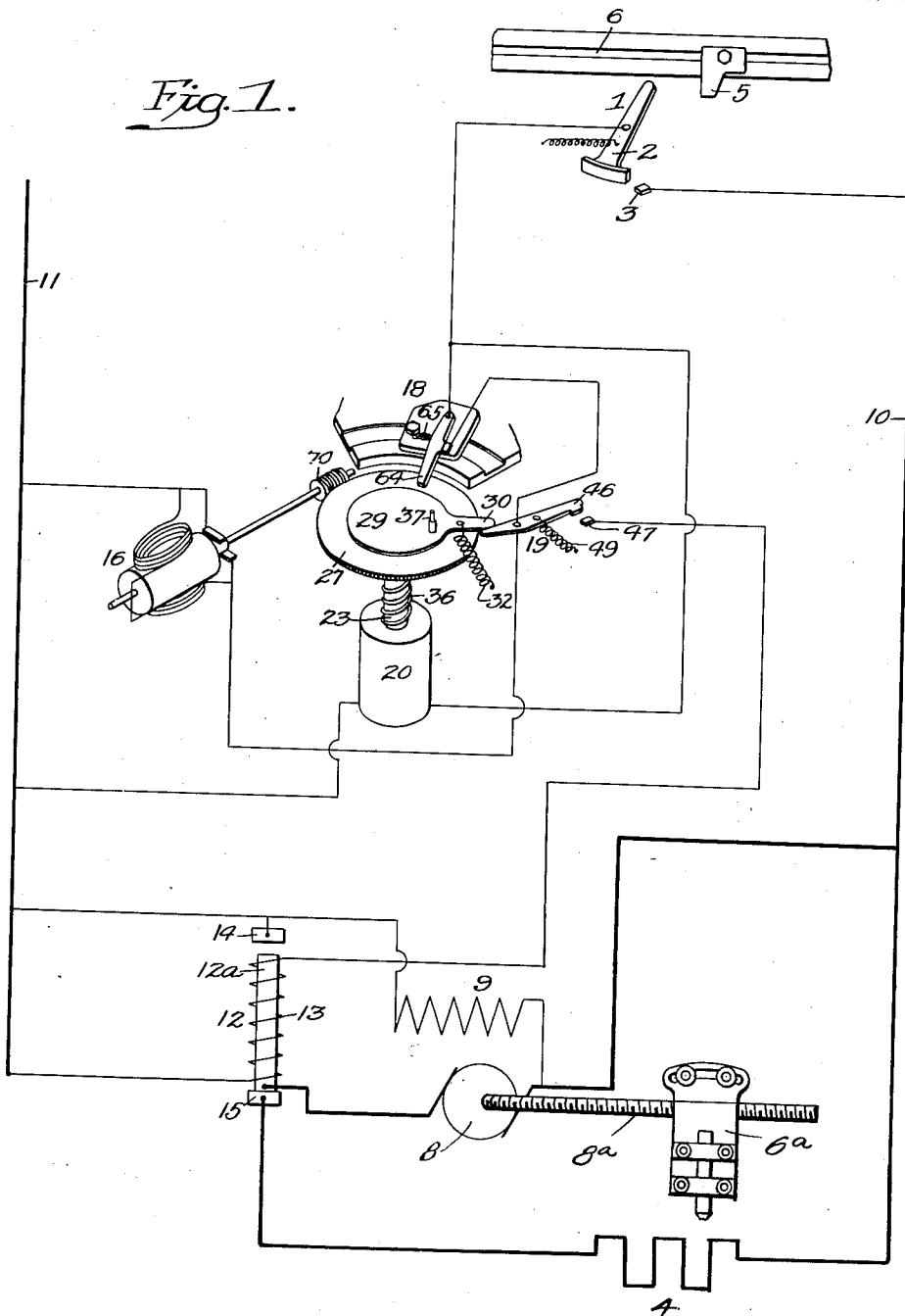
S. P. JOHNSON.
ELECTRIC FEED MECHANISM FOR PLANERS AND CURRENT CONTROLLING SYSTEM THEREFOR.
1,342,915.

APPLICATION FILED MAR. 16, 1916.

Patented June 8, 1920.

5 SHEETS—SHEET 1.

Fig. 1.



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Sven P. Johnson
by his Attorneys
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Fig. 2.

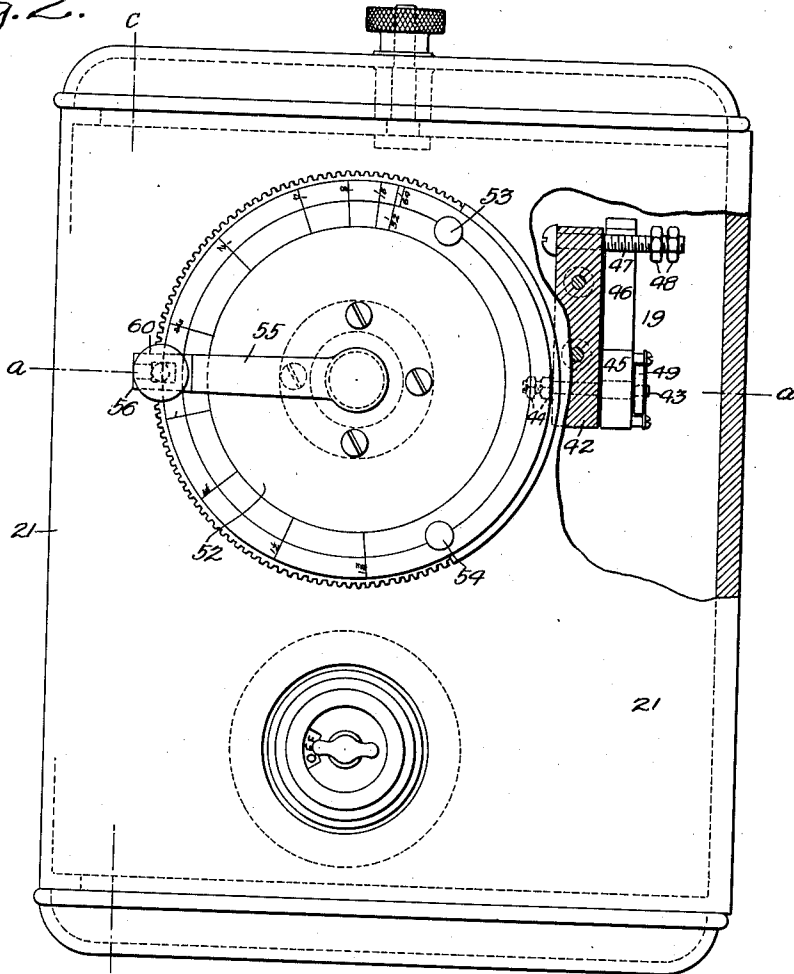
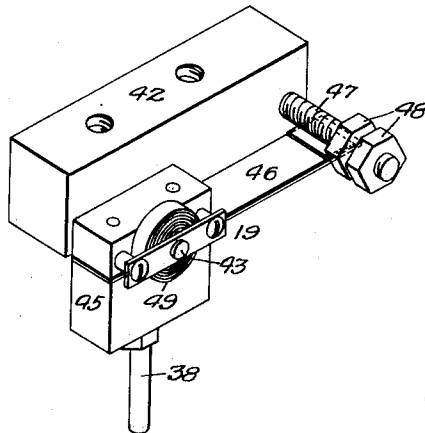


Fig. 8.



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Fig. 3.

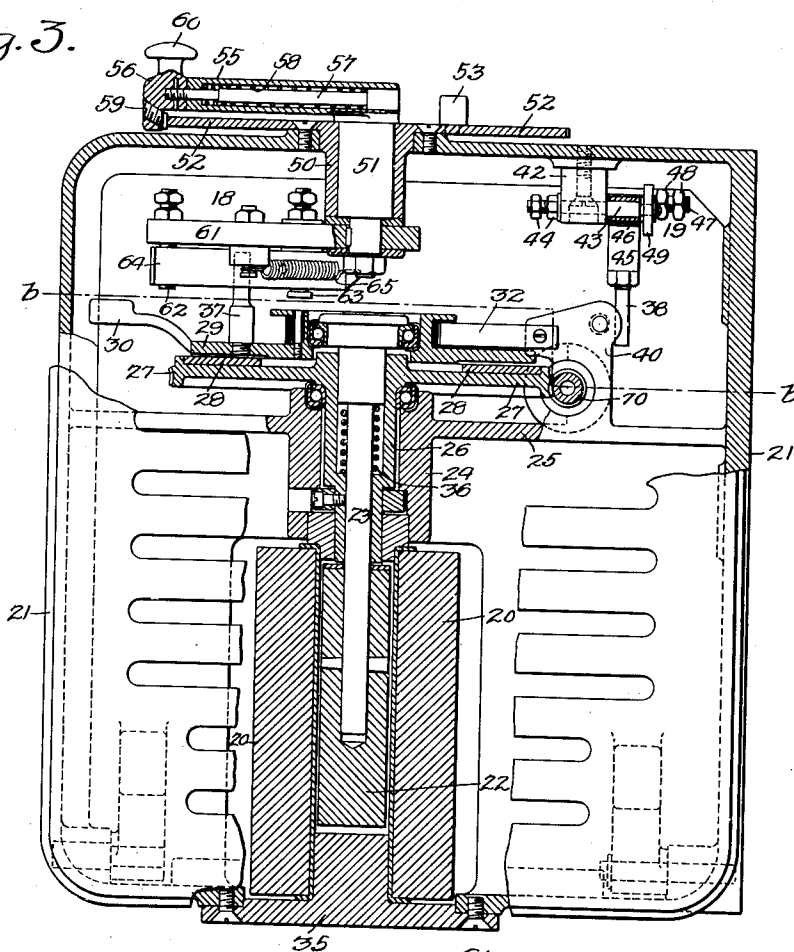


Fig. 7.

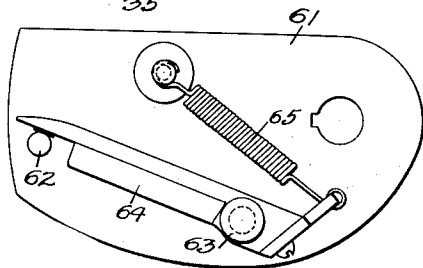
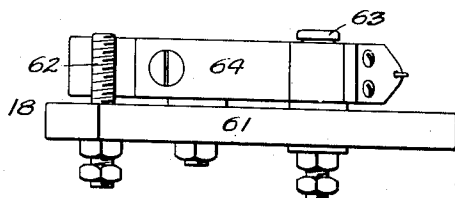


Fig. 6.



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Fig. 4.

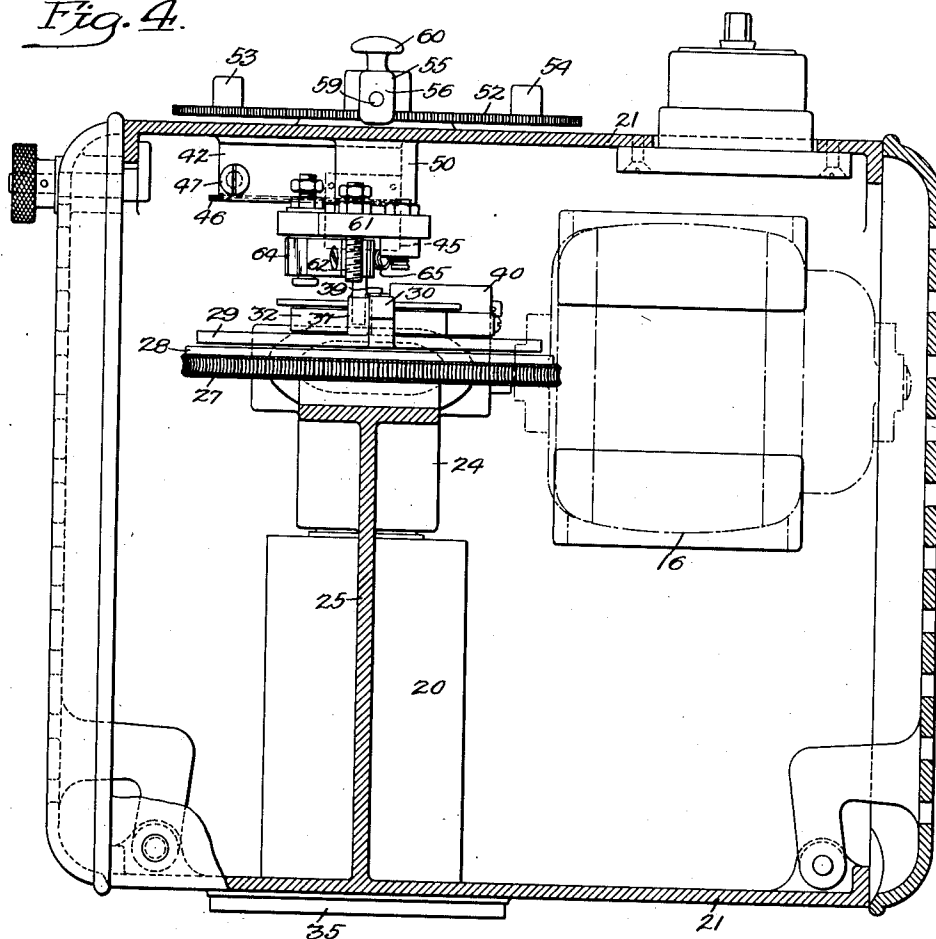
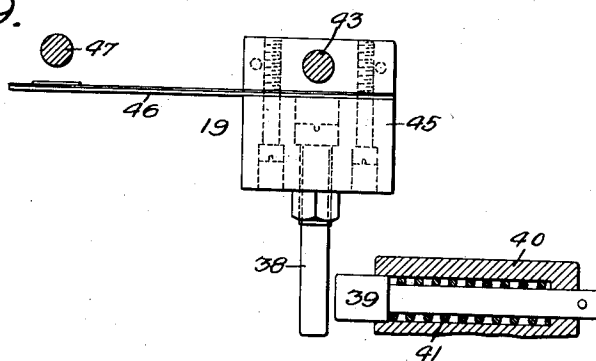
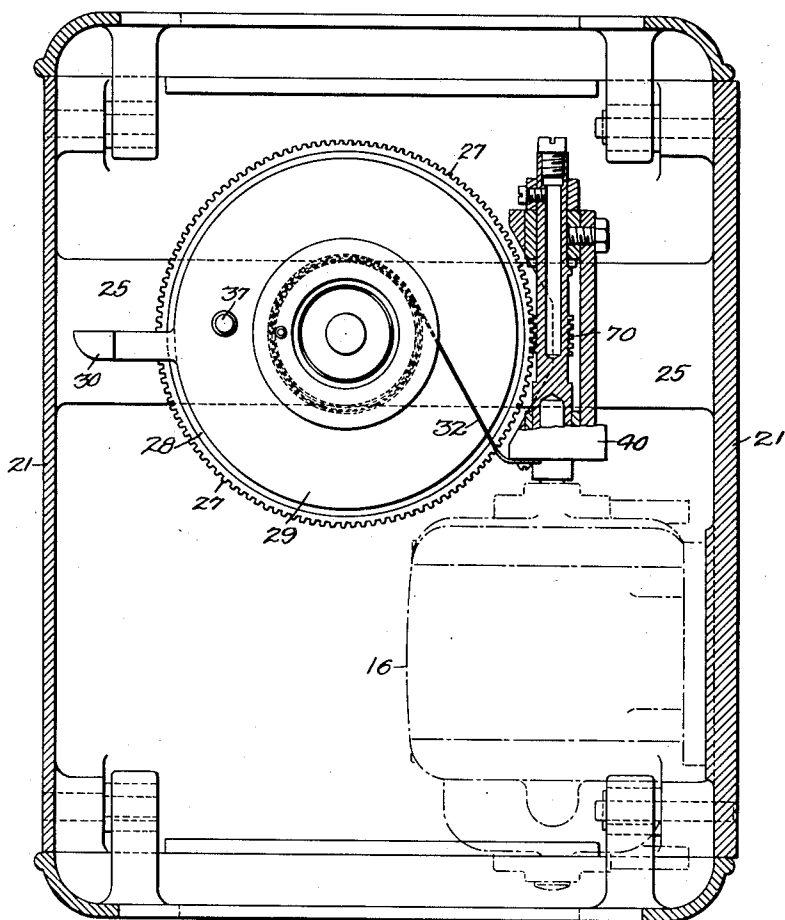


Fig. 9.



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Fig. 5.



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UNITED STATES PATENT OFFICE.

SVEN P. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO NILES-BEMENT-POND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELECTRIC FEED MECHANISM FOR PLANERS AND CURRENT-CONTROLLING SYSTEM THEREFOR.

1,342,915.

Specification of Letters Patent.

Patented June 8, 1920.

Application filed March 16, 1916. Serial No. 84,696.

To all whom it may concern:

Be it known that I, SVEN P. JOHNSON, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented
5 Electric Feed Mechanism for Planers and Current-Controlling System Therefor, of which the following is a specification.

The invention relates to a planer feed mechanism which comprises an electric
10 motor suitably connected with the tool head or tool heads of the planer and adapted to be operated automatically from time to time to effect the moving of the tool heads and the feeding of the tools. The mechanism embodying the invention is especially
15 intended to replace the gearing and ratchet and pawl mechanisms commonly employed for effecting automatic feeding.

One object of this invention is to provide
20 a novel combination of elements primarily intended to so control the electric current in the motor circuit that after flowing for a predetermined time it will be automatically cut off. The apparatus includes an
25 adjustable element whereby the time during which the current flows may be varied between wide limits.

More particularly it is desired to provide a system for accurately predetermining the
30 time or extent of the operation of the electric motor.

A further object of the invention is to provide a substantial, reliable and relatively simple form of motor actuated switch, together with novel controlling means therefor.
35

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings,
40 in which I have shown the embodiment of the invention which I now deem preferable. It will be understood, however, that the drawings are intended for illustrative purposes only and that various departures from the embodiment illustrated may be made
45 without departing from the spirit of the invention as set forth in the appended claims.

50 Of the drawings:—

Figure 1 is a diagrammatic view illustrat-

ing a mechanism constructed in accordance with my invention;

Fig. 2 is a plan, partly in section, of the controller box and certain of the associated
55 elements;

Figs. 3 and 4 are vertical sections on the lines *a—*a** and *c—*c**, Fig. 2;

Fig. 5 is a horizontal section on the line
60 *b—*b**, Fig. 3;

Figs. 6 and 7 are respectively an elevation and an inverted plan of one of the motor controlled switches;

Fig. 8 is a perspective view of the safety
65 switch;

Fig. 9 is an elevation of the buffer for the safety switch with certain of its associated apparatus.

Referring particularly to the diagrammatic Fig. 1 of the drawings, 6 represents
70 conventionally the reciprocating table of a planer of any usual or preferred construction. The planer is provided with one or more tool heads which are adapted to
75 carry cutting tools and which are mounted adjacent the table in any suitable way so as to be capable of movement to effect feeding of the tools transversely of the lines of travel of the table. A single tool head is
80 conventionally indicated at 6^a. For moving the tool head there is provided a motor 8, the motor being connected with the tool head by any suitable mechanical connection
85 such for instance as the screw conventionally indicated at 8^a.

1 represents a pilot switch designed to be periodically operated by any desired means such as a dog 5 on the reciprocating table 6 of the planer, and so made that its movable contact 2 tends to remain in a neutral
90 or off position, from which it is moved by the table into engagement with a fixed contact 3. The motor 8 whose time or extent of operation is to be governed or determined, has a field winding 9 connected
95 directly across two current supply lines 10 and 11. The armature of the motor is adapted to be also connected between the two supply lines 10 and 11 and a suitable
100 controlling circuit is provided including switches whereby the motor may be started

and stopped. Preferably the controlling circuit is so arranged as not to receive the main current of the motor but is adapted to act through a suitable relay mechanism. As illustrated, one terminal of the armature is connected directly with the line 10 and the other is connected with the movable core 12^a of a solenoid 12. The solenoid has a winding 13 which is in the motor controlling circuit to be more fully described hereinafter, and when the winding is energized, the core is lifted into engagement with a fixed contact 14 connected with the line 11. In this way the main motor circuit is completed and the motor is started. When the winding 13 is deenergized, the core 12^a drops and comes into engagement with a fixed contact 15 which is connected with the opposite terminal of the motor armature through a bank of resistance 4. By means of the contact 15 a short circuit is completed, and in this way dynamic braking is effected.

The motor controlling circuit includes the aforesaid switch 2 which is normally open and also a switch 18 which is normally closed. Preferably also there is a supplemental safety switch 19, the purpose of which will be fully set forth hereinafter. In operation the motor 8 is started when the switch 2 is closed by the engagement therewith of the dog 5, and the motor is stopped when the switch 18 is opened in the way to be presently described.

For opening the switch 18 at the proper time, there is provided an operating member which is actuated by means mechanically and electrically independent of the motor 8. As illustrated, this member consists of a rotatably mounted disk 29 carrying an upward projecting post 37. Means is provided whereby relative adjustment can be effected between the switch 18 and the operating member so as to change the time at which the switch is opened. Preferably the switch 18 is bodily adjustable along an arcuate path, being suitably mounted in a manner which will be more fully set forth hereinafter. The disk is normally held in the position indicated in Fig. 1 by means of a spring 32. When a switch 19 is provided, as illustrated, the disk 29 carries an arm 30 which engages the switch to hold it open when the disk is held in its extreme right-hand position by the spring 32. When the disk is rotated in the counter-clockwise direction, the post 37 engages the arm 64 of the switch 18 and forces the switch open against the resistance of a spring 65.

For moving the operating member 29 I provide a controlling member 27 which is actuated by power means mechanically and electrically independent of the motor 8 and preferably also mechanically independent of

the reciprocating table 6. When the member 29 is in the form of a disk, as shown, the member 27 is in the form of a disk or wheel rotatable about the same axis. For turning the wheel 27 I preferably provide an electric motor 16 mechanically and electrically independent of the motor 8. The shaft of the motor carries a worm 70 which meshes with worm teeth formed on the periphery of the wheel 27. Means is provided for connecting the disk 29 with the wheel 27, and, as shown, this means comprises an electro-magnet 20, one of whose terminals is connected to the supply main 11 and the other to the movable member of the switch 1. Said magnet winding is preferably mounted in a controller box 21 and has a movable core 22 to which is pinned an axially extending rod 23. The winding itself is preferably held in place partly by the central projection of a flange 35 removably bolted to the bottom of the controller box and partly by a hub or collar 24 formed as part of a transverse partition 25 extending across the controller box. This collar serves as a bearing for a rotatable sleeve 26 projecting downward from the wheel 27. The wheel 27 has fixed to its upper face a ring 28 of some friction material such as leather designed to be gripped by the disk 29 rotatably mounted on and movable vertically with the rod 23 and the core 22 as this is moved toward and from said worm wheel.

Said disk is normally held out of engagement with the ring 28 by means by a spring 36 acting on the rod 23, although when the magnet winding 20 is energized, the magnetic flux set up thereby causes the disk to be clutched to the worm wheel 27 against the action of this spring.

As already stated, a spring 32 is provided for moving the disk 29 in the clockwise direction. This spring is indicated in Fig. 1 as being a simple tension spring, but in Figs. 2, 4 and 5 I have shown the form which I prefer, this being a coil spring surrounding the axis of the disk and having one end connected to a suitable projection on the partition 25.

For limiting the movement of the arm 30 as well as gradually stopping its motion, I provide a plunger 39 operative in a suitable recess of a bracket 40 carried by the partition 25. The plunger is normally held in its projected position by a coiled spring 41.

The showing of the safety switch 19 in Fig. 1 is merely diagrammatic, and as shown in Figs. 3 and 8, the switch consists of a supporting block 42 of insulating material screwed to the under surface of the cover or top of the controller box and carrying a projecting pivot spindle 43, one end of which is provided with nuts 44 for the attachment of an electrical conductor. The opposite end

of this spindle carries a block 45 from which projects a spring finger 46 electrically connected to said spindle and designed to cooperate with a terminal screw 47 also fastened to the supporting block 42. Said screw 47 likewise has threaded on it nuts 48 serving as a terminal for the connection of an electrical conductor. I mount on the spindle 43 a spring 49 whereby the block 45 and the contact finger 46 are normally held so as to tend to move into electrical engagement with the screw 47. Projecting downward from the block 45 is a post 38 adapted to be engaged by the aforesaid arm 30 and to open the switch.

The controller box has an opening in the top in which is removably mounted a sleeve 50 constituting a bearing for a spindle 51. The sleeve has its outer end flanged to provide a circular disk 52 whose edge is notched or toothed and which is provided with a pair of stops 53 and 54 to limit the movement of an arm 55 fixed to the outer end of said spindle so as to move over said disk. Said arm has a longitudinally extending cavity for the reception of a plunger 57 which carries a head 56 on its outer end and holds it against the outer end of said arm under the action of a spring 58 operative within the cavity. This head has a downward extending portion in which is mounted an inward projecting tooth 59 designed to coact with the teeth in the edge of the disk 52 with a view to retaining the arm with its connected parts in any position to which it may be adjusted. It is obvious that as the arm is turned, the head 56 may be drawn outward by means of its upward projecting knob 60 so as to clear said teeth, although being immediately moved into engagement therewith when released under the action of the spring 58.

The switch 18 is carried on a radially projecting arm in the form of a plate 61 of insulating material fixed on the lower end of the spindle 51. The switch comprises two terminal posts 62 and 63 having any suitable means, such as the nuts shown, whereby flexible electrical conductors may be attached. On the latter of these terminal posts is pivotally mounted a switch arm 64 of such length as to be capable of engaging the post 62 with which it is normally held in engagement by a spring 65. The length of this spindle and the construction of the arm or plate 61 are such that the switch arm 64 extends into the path of movement of the post 37 on the disk 29, so that the movement of the latter causes said post to move this arm out of engagement with the terminal post 62.

The top surface of the disk 52 is graduated and is marked to indicate the amount of feed corresponding to various positions

of the arm 55 and of the switch 18. As shown, the feed can be varied from one-sixty-fourth of an inch to one and three-quarters inches. When the arm 55 is in contact with the stop 53 the switch 18 is moved to such a position that the arm 64 thereof is in engagement with the post 37 when the post is in its extreme right-hand position. When the arm and the switch are in this "off" position, the motor 16 and the motor 8 are prevented from starting, notwithstanding the closing of the switch 2.

When the apparatus is idle, the spring 36 holds the disk 29 out of engagement with the friction ring 28 of the worm wheel 27, so that even though the motor 16 be operated and caused, through the worm 70 on its armature shaft, to turn said worm wheel, this has no effect on any other part of the apparatus. Under the action of the spring 65 the arm 64 of the switch 18 engages the terminal post 62, while the disk 29 is so held by its spring 32 that the arm 30 engages the post 38, holding the arm 46 of the switch 19 out of engagement with the terminal screw 47.

If it be desired that the tool head of the planer be fed immediately after each cut is made, the dog 5 is properly adjusted on the table and the arm 55 of the controller box is moved from its off position in engagement with the stop 53 until it is opposite that one of the graduations on the face of the disk 52 corresponding to the amount of feed to be given to the tool after each forward movement of said table. In the present instance said arm is shown as set for a cut of about $\frac{1}{4}$ of an inch and obviously the arm 61 with the arm 64 of the switch 18 likewise occupies a position correspondingly displaced from the off position.

With this arrangement of parts the table of the planer, at the completion of its forward stroke, moves the element 2 of the pilot switch 1 into engagement with the contact 3, thus permitting current to flow from the positive supply main 10 through the magnet winding 20, and thence to the negative supply main 11. The core 22 with the disk 29 is thus drawn down so that the latter is clutched to the worm wheel 27 and as current is also free to flow from the positive supply main 10 through the switches 1 and 18 to the motor 16 and to the negative supply main, the operation of said motor turns the worm 70, the worm wheel 27 and the disk 29. Such rotation causes the arm 30 and the disk 29 to move from their off positions and thus disengage the post 38, whereupon the spring 49 causes the arm 46 of the switch 19 to engage the terminal screw 47, thus completing a circuit from the positive supply main through the switch 1, terminal 47, switch arm 46 and winding

13 to the negative main 11. The core 12 is thus raised, completing the armature circuit of the feed motor 8, whose shunt field is at all times energized, so that this latter motor at once begins to feed the tool head and move the tool carried thereby.

In the meantime the control motor 16 continues to turn the worm wheel 27 with the disk 29 until the post 37 finally comes into engagement with the arm 64 of the switch 18 and moves it out of engagement with the terminal post 62, thus breaking the circuit of said control motor and also that of the contactor winding 13. The core 12 is therefore allowed to fall, thus cutting off current from the armature of the feed motor 8 and immediately thereafter short circuiting said armature through the resistance 4, so that it is immediately brought to rest by the resulting dynamic braking action of the current which it generates. The various parts of the apparatus are so constructed and the speed and gearing of the control motor are such that during the time that the feed motor has been in operation it has moved the tool $\frac{1}{8}$ of an inch.

Reversal of the planer table thereafter causes the contact 2 of the switch 1 to disengage the contact 3, thus cutting off current from the winding 20 which consequently releases the disk 29 from the worm wheel 27. The spring 32 is therefore free to act and it at once returns the disk to its off position, permitting the arm 64 of the switch 18 to again come into engagement with the terminal post 62 and causing the arm 30 to engage the post 38 and separate the contacts 46 and 47 of the switch 19. The disk 29 is ultimately brought to rest by the spring supported plunger 39. At the end of the next forward movement of the planer table the contact 2 of the pilot switch is again moved into engagement with the fixed contact 3, causing the above described cycle of operations to be repeated, so that the tool head after each cutting stroke of said bed is fed through the distance determined by the adjustment of the arm 55.

Obviously the distance through which the tool head is fed may be varied by shifting the position of said arm 55, since if it be moved in one direction, a longer time elapses before the operation of the control motor brings the post 37 into engagement with the switch arm 64, and the feed motor 8 is thus permitted to operate for a correspondingly longer period to shift the tool head. If said arm 55 be moved in the opposite direction, the arm 64 of the switch 18 is sooner engaged by the post 37 and the feed motor is put out of operation after it has moved the tool head through a correspondingly less distance.

By providing the safety switch 19, I prevent the possibility of the accidental starting of the feed motor 8 in case the switch 18 after once being opened, is permitted to close while the switch is still closed. Such a closing of the switch 18 might be caused by a possible slipping of the clutch provided by the disk 29 and worm 27 or by the open circuiting of the winding 20. Obviously under these conditions the spring 32 at once turns the disk 29 into such position that its arm 30, by engaging the post 38, opens the switch 19.

Mechanisms have heretofore been proposed in which the feed motor is operatively connected with a limit switch so that the motor acts to stop itself after movement to a predetermined extent. In mechanisms of this sort it has been difficult to provide for the adjustment of the amount of travel, particularly when the motor is arranged to be operated always in the same direction without reversal. Furthermore, even when an adjusting means has been provided, it has been found that it was difficult to start the motor and thereafter stop it quickly enough to provide for the small feeds which are very frequently necessary. The feed motor necessarily moves relatively slowly, particularly when the desired feed is so small as not to allow the motor time to acquire its normal speed. The result has been that with limit switches operated by the feed motor itself it was impossible to secure the fineness of adjustment which is necessary for very small feeds.

In accordance with my invention, the stopping of the feed motor is effected entirely independently of the motor itself, and in this way the difficulties above referred to are avoided. The supplemental motor 16 and the parts connected therewith are small and light and can be very quickly set in motion. While the relatively large motor 8 is making a fraction of a revolution, as may be necessary for a very small feed, the smaller and lighter motor 16 may make several revolutions and thus effect the opening of the circuit for the feed motor to stop the motor.

I claim;—

1. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, table operated means for causing the closing of the circuit of the motor at each reciprocation, and movable means mechanically and electrically independent of the motor for causing the opening of the circuit of the motor after a predetermined interval.

2. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, table operated means for causing the closing of the circuit of the motor at each recip-

roca-tion, movable means mechanically and electrically independent of the motor for causing the opening of the circuit of the motor after a predetermined interval, and means for adjusting the last said means to vary the said predetermined interval.

3. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, table operated means for causing the closing of the circuit of the motor at each reciprocation, and movable means mechanically independent of the table and mechanically and electrically independent of the motor for causing the opening of the circuit of the motor after a predetermined interval.

4. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, a relay switch for closing and opening the circuit of the motor to start and stop it; a table operated switch for closing the relay circuit to start the motor at each reciprocation, and a switch operated independently of the motor for opening the relay circuit to stop the motor after a predetermined interval.

5. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, table operated means for causing the closing of the circuit of the motor at each reciprocation, and an electric motor mechanically independent of the table and mechanically and electrically independent of the feed motor for causing the opening of the circuit of the feed motor after a predetermined interval.

6. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, an electric motor mechanically independent of the table and mechanically and electrically independent of the feed motor for causing the opening of the circuit of the feed motor after a predetermined interval and, table operated means for causing the closing of the circuit of the feed motor at each reciprocation of the table and for starting the independent motor.

7. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, an electric motor mechanically independent of the table and mechanically and electrically independent of the feed motor for causing the opening of the circuit of the feed motor after opening its own circuit, and table operated means for causing the closing of the circuit of the feed motor at each reciprocation of the table and for starting the independent motor.

8. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head,

table operated means for causing the closing of the motor circuit to start the motor at each reciprocation, an electric motor mechanically independent of the table and of the feed motor, an operating member driven by the said independent motor, and means for causing the stopping of the feed motor after movement of the said operating member to a predetermined extent.

9. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, table operated means for causing the starting of the motor at each reciprocation, an electric motor mechanically independent of the table and of the feed motor, an operating member driven by the said independent motor, and means for causing the stopping of the feed motor after movement of the said operating member to a predetermined extent and for simultaneously causing the stopping of the independent motor.

10. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, a table operated switch for causing the starting of the motor at each reciprocation, an operating member operated independently of the motor for causing the stopping of the motor after a predetermined interval, and a second switch in series with the table operated switch and automatically closed by the operating member at the beginning of its movement.

11. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, a switch in the controlling circuit of the motor, a table operated switch connected in series with the first said switch, an operating member operated independently of the motor for opening the first said switch after movement to a predetermined extent, and means whereby the operating member is started upon the closing of the last said switch.

12. The combination with a reciprocating planer table and a movable tool head, of an electric motor for feeding the tool head, two switches connected in series in the controlling circuit of the motor, an operating member operated independently of the motor for closing one of the switches and after a predetermined interval opening the other, a third table operated switch connected in series with the first said switches, and means whereby the operating member is started upon the closing of the last said switch.

13. In a motor controlling system, the combination of an electric motor, a controlling member actuated independently of the motor, an operating member, means for starting the motor and for simultaneously connecting the operating member to the controlling member for movement there-

with, and adjustable means for stopping the motor including a switch operated by the operating member after travel to any desired extent.

5 14. In a motor controlling system, the combination of an electric motor, a controlling member actuated independently of the motor, an operating member, means for starting the motor and for simultaneously
10 connecting the operating member to the controlling member for movement therewith, and a bodily adjustable switch for stopping the motor, the said switch being operated by the operating member after travel to any
15 desired extent.

15 15. In a motor controlling system, the combination of an electric motor, a movable controlling member mechanically and electrically independent of the motor, an
20 operating member, means for starting the motor and for simultaneously connecting the operating member to the controlling member for movement therewith, and means for stopping the motor and for simultaneously
25 stopping the controlling member, the said means being operated by the operating member after travel to a predetermined extent.

30 16. In a motor controlling system, the combination of an electric motor, a movable controlling member mechanically and electrically independent of the motor, an operating member, means for starting the motor and for simultaneously connecting the
35 operating member to the controlling member for movement therewith, and adjustable means for stopping the motor and for simultaneously stopping the controlling member, the said means being operated by the operating member after travel to any desired
40 position.

45 17. In a motor controlling system, the combination of an electric motor, a controlling member actuated independently of the motor, an operating member automatically movable to an "off" position, means for starting the motor and for simultaneously connecting the operating member to the controlling member for movement therewith
50 away from the "off" position, the said means subsequently permitting the disconnection of the operating and controlling members whereupon the operating member returns to the "off" position, and means for stopping the motor, the said means being operated by
55 the operating member after travel to a predetermined extent away from the "off" position.

60 18. In a motor controlling system, the combination of an electric motor, a movable controlling member mechanically and electrically independent of the motor, an operating member, a magnetically actuated clutch interposed between the controlling

member and the operating member, a switch 65 for starting the motor and for energizing the clutch to connect the operating member to the controlling member for movement therewith, and adjustable means for stopping the motor, the said means being operated by the operating member after travel to any desired position. 70

19. In a motor controlling system, the combination of an electric motor, a controlling member actuated independently of the 75 motor, an operating member automatically movable to an "off" position, a magnetically actuated clutch interposed between the controlling member and the operating member, a switch for starting the motor and for energizing the clutch to connect the operating member to the controlling member for movement therewith, the said switch subsequently serving to deenergize the clutch whereupon the operating member returns to the "off" 85 position, and a switch for stopping the motor and for simultaneously stopping the controlling member, the said switch being operated by the operating member after travel to a predetermined extent. 90

20. In a motor controlling system, the combination of an electric motor, a controlling member, a second electric motor mechanically and electrically independent of the first motor for actuating the controlling 95 member, an operating member, means for starting both motors and for simultaneously connecting the operating member to the controlling member for movement therewith, and adjustable means for stopping the first 100 said motor, the said means being operated by the operating member after travel to any desired extent.

21. In a motor controlling system, the combination of an electric motor, a controlling 105 member, a second electric motor independent of the first motor for actuating the controlling member, an operating member, a magnetically actuated clutch interposed between the controlling member and the operating member, a switch for starting both 110 motors and for energizing the clutch to connect the operating member to the controlling member for movement therewith, and a switch for stopping the first said motor, the said switch being operated by the operating member after travel to a predetermined extent. 115

22. In a motor controlling system, the combination of an electric motor, a controlling 120 member, a second electric motor independent of the first motor for actuating the controlling member, an operating member, a magnetically actuated clutch interposed between the controlling member and the operating member, a switch for starting both 125 motors and for energizing the clutch to connect the operating member to the control-

ling member for movement therewith, and a switch for stopping both motors, the said switch being operated by the operating member after travel to a predetermined extent.

23. The combination of an electric motor; a switch controlling the operation thereof; a second motor mechanically and electrically independent of the first motor for operating said switch; and a magnetically actuated clutch interposed between the second motor and said switch; with an automatically actuated switch for governing the operation of said clutch.

24. In a motor controlling system, the combination of an electric motor, a controlling member, a second electric motor independent of the first motor for actuating the controlling member, an operating member automatically movable to an "off" position, a magnetically actuated clutch interposed between the controlling member and the operating member, a switch for starting the motor and for energizing the clutch to connect the operating member to the controlling member for movement therewith, and a switch for stopping the motor, the said switch being operated by the operating member after travel to a predetermined extent and the said operating member subsequently returning to "off" position upon the opening of the first said switch.

25. The combination in a current controlling system of two relatively adjustable structures; a switch on one structure; a device for operating the switch on the other structure; a motor connected to actuate one of the structures to operate the switch; with a second switch mounted to be operated by the motor actuated structure after the first switch has been operated.

26. The combination in a current controlling system of a switch; an operating device therefor; a motor for causing said device to operate the switch; a magnetically actuated clutch interposed between the motor and said device; and a second switch mounted to be actuated by the motor-operated member after said clutch has been deenergized.

27. The combination in a current controlling system of a switch; an operating device therefor; a motor for causing said device to actuate the switch; a magnetically actuated clutch interposed between the motor and said device; a second switch mounted to be actuated by the motor-operated member after said clutch has been deenergized; with an automatically actuated switch for controlling the flow of current to the clutch.

28. The combination in a current controlling system of a rotatably mounted switch; a rotatably mounted member for operating said switch; means tending to maintain said

member in a definite position; a motor for moving said member from said position to open the switch; with a second switch mounted to be acted on by the member when it is adjacent said position.

29. The combination of an electric motor; a switch in the controlling circuit of the motor; a movably mounted member for operating the switch; means normally holding said member in a definite position; a motor mechanically and electrically independent of the aforesaid motor for moving said member from said position to open the switch; and means for automatically disconnecting said member from the independent motor under predetermined conditions.

30. The combination of a switch; a movably mounted member for operating said switch; a spring normally holding the member in a definite normal position; a motor for moving said member from such position to operate the switch; a clutch interposed between the member and said motor; and a second switch normally held in an open position when said clutch is released.

31. The combination of a switch; a rotary member for operating the same; means for normally holding said member in a definite position; a motor for moving the member from said position to open the switch; means for adjusting the position of said switch to vary its angular distance from said member; a magnetically actuated clutch interposed between the motor and the member; and a second switch mounted to be operated by the member after said clutch has released it from the motor.

32. The combination of a motor; a switch in the controlling circuit of the motor; a member for actuating the switch; a motor mechanically and electrically independent of the first said motor for operating said member from a normal position to cause it to open the switch; and means for automatically disconnecting the member from the independent motor after the switch has been opened.

33. The combination of a motor; a switch in the controlling circuit of the motor; a member for actuating the switch; a motor mechanically and electrically independent of the first said motor for operating said member from a normal position to cause it to open the switch; and means independent of the second said motor for automatically returning said member to its normal position after it has opened the switch.

34. The combination of a feed motor; a switch controlling the operation thereof; a member for opening said switch; a second motor for actuating said member; means for varying the time elapsing between the starting of the second motor and the opening of said switch; a clutch; a second

switch in circuit with the feed motor; and means for holding the latter switch open when the clutch is released.

35. The combination of a support; a
5 structure rotatably carried thereby; a normally closed switch mounted on said structure; a rotary switch-operating member; means for angularly adjusting the position
of the switch relatively to said member; a

motor for turning the member toward the 10
switch from a normal position; a magnetically actuated clutch between the member and the motor; a spring tending to hold said member in a definite position; with a second switch in circuit with the first switch 15
and mounted to be held open by said member when this is in said normal position.

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