No. 853,552. PATENTED MAY 14, 1907.

O. A. KENYON.

ELECTRIC TOOL.

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Fig. 1.

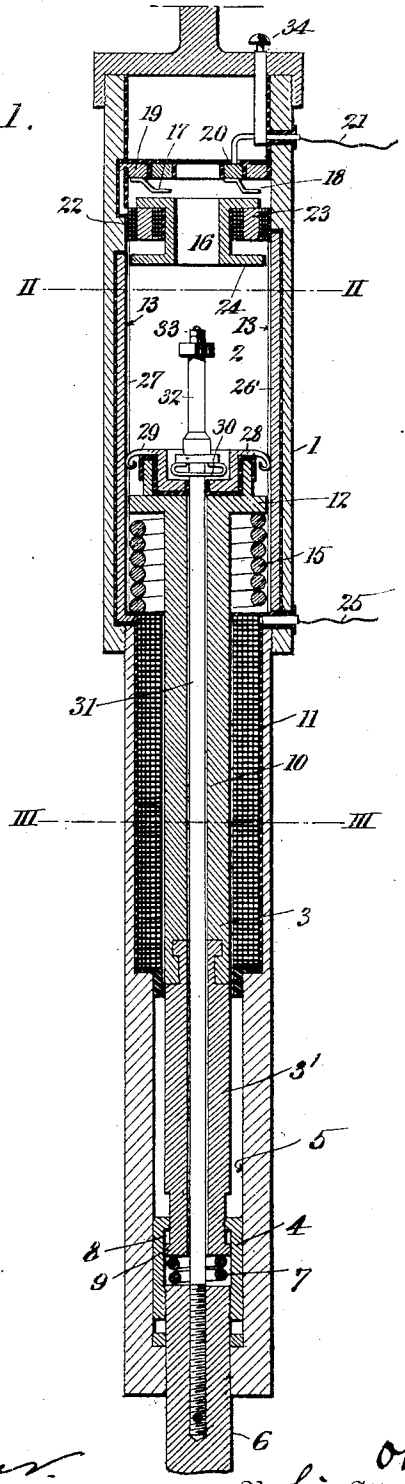


Fig. 2.

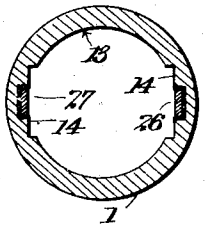
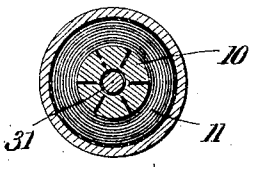


Fig. 3.



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ELECTRIC TOOL.

No. 853,552. Specification of Letters Patent. Patented May 14, 1907.

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To all whom it may concern:

Be it known that I, OTIS ALLEN KENYON, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Tools, of which the following is a full, clear, and exact description.

My invention relates to an electric tool of that class in which a part is given a reciprocating movement for the purposes of riveting, drilling, and similar functions.

The principal object is to provide a tool of this class in which the length of the stroke is automatically adjusted and varied to suit the requirements, and in which a hammer blow is exerted and is followed by immediate retraction of the tool from the work.

Other objects of the invention are to avoid injurious sparking at the contacts, and provide a strong and simple tool which is not liable to derangement in use, and which is easily assembled or taken apart when desired.

In the drawings: Figure 1 is a longitudinal sectional view of an electric hammer or tool embodying the principles of my invention; Fig. 2 is a section on the line II—II of Fig. 1; Fig. 3 is a section on the line III—III of Fig. 1.

Riveting hammers, rock drills, cement tampers, and a variety of other appliances used in the arts require the powerful reciprocation of a part under the control of an operator. So far as I am aware electric tools of this description have not been arranged to compensate exactly for the varying position of the work. In other words, electric hammers have ordinarily had a substantially fixed stroke, so that unless the position of the work corresponded exactly to the length of this stroke, a proper blow followed by the immediate retraction of the tool could not be obtained.

In carrying out my invention I provide means by which the tool is immediately retracted after it has made its impact against the work, and this is true whether the tool meets the work early or late in the path of its normal stroke. This result is secured by having a supplemental contact or switch broken by the impact of the tool with the work regardless of where this happens to occur with respect to the normal stroke.

Referring to the drawings, 1 denotes a frame or casing which is preferably cylindrical in form, and has a longitudinal chamber 2, throughout its length. The reciprocating part 3 is guided within the frame or casing 1 so as to have a longitudinal movement therein. For this purpose the lower end of the reciprocating part or plunger 3′ is received in a sliding collar 4, guided by the interior cylindrical wall 5 of the frame or casing. The tool or tool carrier 6 is fixed to the sliding collar 4, and a spring 7 is interposed between the plunger 3 and the tool, so that the latter is normally impelled outward from the plunger, but is capable of movement toward the plunger when sufficient force is exerted upon the spring. The outward movement is limited by the engagement of the shoulders 8 of the collar 4 with a flange 9 at the lower end of the plunger.

The plunger 3′ is preferably made of non-magnetic material, and has attached to its upper end an iron core 10, which may be laminated or radially slotted as shown. This core extends upward through a solenoid 11 fixed within the casing 1, and which has electrical connections by which it is energized, and which are later more particularly described. The upper end of the core 10 is enlarged, as shown at 12, this enlargement being guided by the interior walls 13 of the chamber 2. In order to prevent the reciprocating part from having an angular movement within the casing, the chamber 2 is vertically slotted, as shown at 14, where it guides the core 10, and the enlargement 12 of the core is formed to fit the slots 14.

15 indicates a spring coiled within the casing and bearing upwardly against the enlargement 12 of the core 10, so that the core and its connected parts are normally impelled into the extreme limit of their upward movement. When, however, the solenoid 11 is energized, the core 10 is drawn downward, thereby impelling the plunger 3′ and the tool 6 toward the work.

The circuit by which the solenoid 11 is energized includes two separate devices by which it is opened to permit the tool to make its return stroke. The first I shall term the

main switch, and the second the supplemental switch. The main switch, designated broadly at 16, may be made in any desired way so as to open a connection between two points in the circuit whenever the current in such circuit ceases. I have shown a practical arrangement embodying two spring blades 17 and 18, each attached to metallic rings 19 and 20, insulated from one another and from the casing, but supported thereby. The ring 20 is in metallic connection with the leading-in wire 21, while the ring 19 is connected to the winding 22 of a small magnet 23.

24 indicates an armature for the magnet 23 which is held thereby in contact with the two springs 17 and 18 when the magnet is energized. When the magnet is de-energized, the armature drops away from the springs 17 and 18 so that the electric connection between them is interrupted.

The circuit from the winding 22 is completed to the solenoid and from thence to the outgoing terminal 25, but in this connection I employ special means which constitutes an important feature of the invention.

26 and 27 indicate strips which are vertically inset in the slots 14, but insulated from the metal of the casing. The strip 26 is connected to the winding 22, and the strip 27 is connected to the solenoid 11. The reciprocating part carries means of suitable character and including the supplemental switch for completing the circuit between the two strips.

In the drawing a pair of blade springs 28, 29, are attached to the upper end of the core 10, so as to bear against the strips 26 and 27 respectively. These blade springs 28, 29, are insulated from one another and from the core, but are capable of being bridged or connected by a spring plate 30. This plate is fastened to a stem 31, which extends downward through the core 10, and through the plunger 3', and is fastened to the tool 6. The spring plate 30 is capable of vertical yielding movement by its elasticity and is arranged to be vertically adjustable on the stem 31 by means of the sleeve 32 which may be threaded to the stem and which directly supports the plate 30.

33 indicate lock nuts for fixing the adjustment.

The operation is as follows: Considering the parts in the positions shown, the electric circuit is interrupted between the springs 17 and 18, so that the spiral spring 15 is effective to impel the core 10 upward. When the core arrives at the limit of its upward movement, it impinges against the armature 24, and moves said armature upward, so as to establish a connection between the blades 17 and 18. Current is now free to flow through wire 21, ring 20, blade 18, armature 24, blade 17, ring 19, winding 22, strip 26, blade spring 28, plate 30, blade spring 29, strip 27, and finally through the windings of the solenoid 11 and the outgoing terminal 25. The solenoid is thereby energized to attract the core 10 which is at this time in a position to be drawn downward. The downward stroke proceeds until the plunger arrives at the bottom of its stroke or until the tool 6 strikes against the work which is being operated upon. In the latter case the tool is arrested by the impact and the spring 7 compressed by the downward movement of plunger 3', which continues by its momentum and the power of the solenoid. The relative movement of the tool and the plunger is transmitted to the stem 31, so that the spring plate 30 is moved upward off of the two metallic contacts 28, 29. Inasmuch as the current for the energization of the solenoid traverses this path, it is evident that the solenoid will be de-energized. Not only is the solenoid de-energized to allow the spring 15 to commence its return movement, but the magnet 23, also lying in the main circuit, is also de-energized so that the armature 24 falls to break contact between the springs 17 and 18. Therefore, the solenoid 11 will not again be energized until the reciprocating part is moved upward to the extreme limit of its movement and impinges against the armature. When the plunger strikes the armature the circuit between the blades 17 and 18 is again completed. In the meantime the spring 7 has moved the tool and plunger into their normal relation, so that contact is established by the plate 30. The solenoid is, therefore, energized and draws down its core to repeat the above operation.

It will be observed that the force of the spring 7, and the spring plate 30, controls the power of the stroke. This happens since if these springs 7 are very stiff a much greater resistance in the path of the tool is necessary to compress the spring. I have provided means by which the tension of the springs are adjusted so that the force of the stroke can be controlled. This is accomplished by the threaded sleeve 32 which may be screwed downward so as to impel the spring plate 30 against its contacts with greater or less pressure. When the device is used it is merely necessary for the operator to initially complete the circuit by any means, as for example, by a push button 34 and move the tool into proximity to the work, after which the action is automatic, the tool continuing to reciprocate and strike the work with a predetermined impact regardless of whether or not the position of the frame corresponds to its normal length of stroke. Thereafter it is only necessary for the operator to keep the casing in approximately the right position with respect to the work, somewhere between

the limits of the stroke of the reciprocating parts.

It will be observed that the only place where an arc can be drawn is at the plate 30. Since this plate engages two contacts and furthermore separates from them with very great suddenness, the formation of a destructive arc is prevented. Any slight blistering or burning of the contacts is not harmful, because the force of their engagement with the plate 30 is great enough to keep the surfaces in good condition. Finally it will be obvious that the plate 30 and the contacts are easily removable and replaceable whenever desired or necessary.

A feature of the invention lies in having the apparatus adapted to exert a steady pressure against the work if desired. It will be seen that when the tool is resting steadily against the work there is no impact to compress spring 7 and open the circuit at the plate 30. The steady force of the solenoid is not sufficient to accomplish this.

What I claim, is:—

1. In an appliance of the class described, a tool, electric means for impelling said tool against the work, and a switch for breaking the circuit of said means simultaneously with the blow or impact of the tool against the work.

2. In an appliance of the class described, a tool, electric means for impelling said tool, a switch for breaking the circuit of said means simultaneously with the blow or impact of the tool against the work, and an additional switch for immediately afterward breaking such circuit at another point.

3. In an appliance of the class described, a tool, electric means for impelling said tool to make a working stroke, a main switch, a supplemental switch, and means actuated by the impact of the tool with the work for breaking the circuit of said electric means first at the supplemental switch and then at the main switch.

4. In an appliance of the class described, a tool, electric means for impelling said tool to make a working stroke, a switch for interrupting the circuit of said means actuated by the impact of the tool against the work with a predetermined force, and means for adjusting the amount of said force.

5. In an appliance of the class described, a tool, electric means for impelling said tool against the work, a magnet operated switch for maintaining a closed circuit in said electric means, and a supplemental switch actuated by the impact of the tool with the work, for interrupting the circuit at said magnet operated switch.

6. In an appliance of the class described, a tool, electric means for impelling said tool against the work, and a switch movable with the tool and arranged to break the circuit of said means simultaneously with the impact of the tool against the work.

7. In an appliance of the class described, a tool, electric means for impelling said tool against the work, a switch carried by said tool for interrupting the circuit of said means, and means carried by the tool for opening said switch when the tool strikes the work with a predetermined blow or impact.

8. In an appliance of the class described, a solenoid, a tool reciprocated thereby, and means actuated by the impact of the tool against the work for breaking the circuit of said solenoid.

9. In an appliance of the class described, a solenoid, a tool adapted to be moved thereby, and means for breaking the circuit of the solenoid simultaneously with the impact of the tool against the work.

10. In an appliance of the class described, a solenoid, a tool adapted to be moved thereby, a main switch, a supplemental switch, and means for breaking the circuit of said solenoid at such supplemental switch simultaneously with the impact of the tool against the work, and immediately afterward breaking said circuit at said main switch.

11. In an appliance of the class described, a reciprocating part, a solenoid for moving said part, a switch for controlling said solenoid, and means carried by said part but having a relative movement with respect thereto for opening said switch.

12. In an appliance of the class described, a reciprocating part, a solenoid, means carried by said part for momentarily breaking the circuit of said solenoid, and additional means for breaking the circuit of the solenoid during the entire period of the return stroke of said reciprocating part.

13. In an appliance of the class described, a frame or casing, a solenoid fixed thereto, a reciprocating part having a tool, a plunger, and a core within said solenoid, a stem secured to the tool and passing through said plunger and core and having a movement relative to said core, a supplemental switch carried by said core and opened by the movement of the stem with respect thereto, means for completing the circuit of said solenoid through said switch, a main switch adapted to be closed by the upward movement of said core, and magnetic means for maintaining said main switch closed during the downward movement of the core and while the circuit is closed at said supplemental switch, all as and for the purpose set forth.

14. In an appliance of the class described, a frame or casing having a central longitudinal chamber, a solenoid fixed within said chamber, a reciprocating part having a tool, a plunger and a core within said solenoid and an enlargement on said core, a pair of spring blades carried by said enlargement, a switch

for normally making an electric connection between said blades, strips longitudinally supported within said chamber and insulated therefrom and in the path of said spring blades, a main switch at the upper end of the casing, magnetic means for maintaining said main switch closed, and a circuit including said main switch, said strips, said supplemental switch and said solenoid for energizing the latter.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

OTIS ALLEN KENYON.

Witnesses:
EDWARD D. C. SPERRY,
WALDO M. CHAPIN.