Nov. 7, 1950 R. WEBSTER 2,529,270

SELF-PIERCING AND SELF-HOLDING TEST PROD

Filed Feb. 26, 1949

Fig. 1.

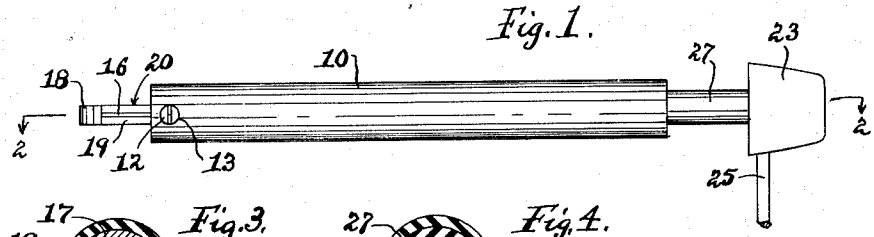


Fig. 3.

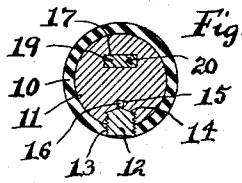


Fig. 4.

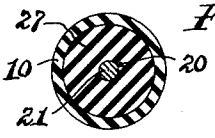


Fig. 2

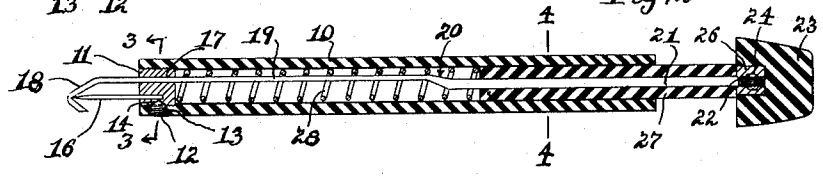


Fig. 5.

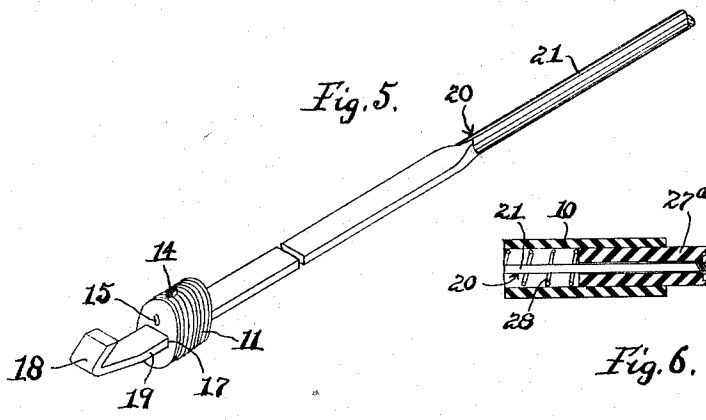


Fig. 6.

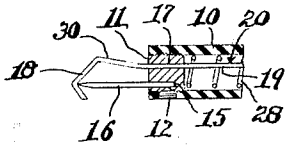


Fig. 7.

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SELF-PIERCING AND SELF-HOLDING TEST PROD

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4 Claims. (Cl. 173—273)

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My invention relates to a new and useful self-piercing and self-holding test prod primarily for use by repairmen in testing the circuits of radio and video apparatus in which high voltage currents are often employed and one of the objects of this invention is to so construct such an instrument that it will be practically completely insulated and thereby prevent the user from being subjected to the electrical current which might result in severe burns or other injuries.

In devices of this general character it is usually necessary to remove the insulation from an electrical conductor for the purpose of making contact therewith. This is not only a time consuming operation but often results in damage to the conductor, generally in the form of a wire, and requires the services of a highly skilled person to make a fairly good job of recovering the conductor with insulation tape which never has the finished appearance of the original insulated conductor. Therefore, another object of the present invention is to provide a tool which may be electrically connected to a conductor through the insulation thereof without removing, destroying or materially damaging said insulation.

Another object of the invention is to provide a tool of the character mentioned which, when in use, has a strong gripping action, makes a positive contact, and will remain in place on a conductor until released by the operator thus leaving one or both hands free to make tests and/or repairs, changes and additions to electrical circuits.

Another object of this invention is to construct an electrical testing tool including a spring actuated presser jaw to force an insulated conductor engaged by said jaw towards a piercing element or needle in electrical communication with said jaw which is manually operated to retract it from the needle to permit the conductor to be engaged or release the pressure therefrom whereby said conductor and jaw may be disengaged from one another.

Another object of the invention is to provide a testing tool in which the piercing needle is removably and positively seated in a predetermined location whereby a blunted or dull one can be easily and quickly removed and replaced by a new sharp one and when assembled will be in proper relation to the presser jaw which acts as a centering medium.

Another object of the invention is to provide a testing tool which may be operated by one hand through holding the same between the index and second fingers and pressing a knob with the

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thumb thus making it easy to attach and permitting "fishing" through a mass of wires none of which, except the one gripped, will be shorted because of the thoroughly insulated construction of the tool.

Another object of the invention is to provide a tool of the character mentioned which is simple of operation, having but one moving part, that will grip, center and pierce any size bare, covered or shielded wire, within the limits of the jaw dimensions, and used for testing purposes or for bridging wires for current and voltage draw for temporary repairs.

Another object of the invention is to provide a tool including unique means for easily and quickly attaching and detaching a test lead to the knob bearing end thereof.

A further object of the invention is to provide a test tool in which the piercing operation is accomplished by spring pressure in one direction on a presser jaw and opened by manual pressure applied to said jaw.

A still further object of this invention is to provide an arrangement of parts of the tool whereby the tension of the spring may be selectively adjusted.

With the above and other objects in view invention consists of the details of construction and combination of elements hereinafter set forth and then designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same I will describe its construction in detail, referring to the accompanying drawing forming a part hereof, in which:

Fig. 1 is a side view of the prod or electrical testing tool constructed according to my invention.

Fig. 2 is a longitudinal sectional view on the line 2—2 of Fig. 1 with the presser jaw structure and piercing needle shown in elevation.

Fig. 3 is an enlarged cross section on the line 3—3 of Fig. 2.

Fig. 4 is a similar section on the line 4—4 of Fig. 2.

Fig. 5 is a slightly enlarged fragmentary perspective view of the presser jaw structure and the threaded plug.

Fig. 6 is a fragmentary sectional elevation of the device, illustrating a structure to permit easy adjustment of the tension of the spring.

Fig. 7 is a similar view showing a modified form of the presser jaw.

In carrying out my invention as herein embodied 10 represents a tubular body of desirable

length and consisting of some suitable electrical insulating material. In one end of said body, hereinafter referred to as the outer end, is mounted a round plug 11 of electrical conductive metal and, preferably, this plug is threaded so as to be screwed into said outer end of the body with the outer end or face of said plug adjacent the outer end of said body. In other words the outer end of the plug can be flush with or recessed within the outer end of the body but should not project beyond said outer end of said body. After the plug is properly positioned it may be held in place by a screw 12 threaded through a hole 13 in the body and into a radial threaded socket 14 in said plug. This screw should be countersunk relative to the body to prevent accidental contact of the person of an operator therewith, or be formed of some suitably hard non-conductive material for the same purpose and because it has another function, to be presently described.

In the outer end of the plug is a longitudinal needle socket 15 which is intersected by the radial socket 14 and terminates short of the inner end of said plug to act as a seat or stop for a needle or piercing element 16 inserted in said longitudinal socket 15 and said piercing element has a sharp pointed outer end. As the radial socket 14 intersects the longitudinal socket 15 so that they communicate with each other, the screw 12, when threaded home will engage the needle 16 to prevent accidental displacement thereof while permitting its ready removal when desired for changing needles.

The plug 11 is further provided with a through and through hole 17 non-circular in cross section and preferably oblong to prevent an item assembled therein from turning.

The longitudinal needle socket 15 and the hole 17 are on diametrically opposite sides of the axial center of the plug in which they are formed.

A V-shaped presser jaw 18 is formed, bent or fashioned from the flat or non-circular shank 19 of the push rod 20 which also includes, preferably, a round neck 21 which, as covered in Figs. 1 to 5, inclusive, has a short threaded terminal end 22, Fig. 2. On this threaded terminal is screwed a knob 23 of insulation material with a radial hole 24 extending inwardly from the outside circumference to or intersecting the threaded socket in said knob which receives the threaded terminal of the push rod. The uncovered end of a test lead or wire 25, Fig. 1, can be inserted in the hole 24 and clamped in place between the terminal of the push rod 20 and the opposed walls of said hole 24 by screwing the knob onto the push rod or said push rod into said knob to effect the clamping action.

Preferably, the knob 23 has a metal insert 26 with the hole 24 running therethrough and the threaded socket for the terminal 22 formed therein. This insures a good electrical contact between the push rod 20 and the uncovered end of the lead or wire 25.

The push rod 20 is longer than the tubular body 10, in which it is enclosed, so that when the internal angle, nook or center of the V-shaped hook 18 is in engagement with the point of the needle 16 the opposite end or neck projects from the end of said body opposite the location of the plug 11 and the knob 23 on said push rod is spaced from the adjacent end of the body. About the part of the neck 21 of the push rod which projects outside of the body and any desired additional portion of the length of said neck is loosely fitted a tubular shield 27 of insulating material. The shield 27 is long enough to project from the knob into the open end of the body in which it is slidably or telescopically mounted. Said shield 27 is urged outwardly or rearwardly by a coil spring 28 located within the body 10 about a portion of the push rod 20 between the plug 11, and the stationary element, and the inner end of the shield 27, as the movable element. The action of the spring 28 keeps the shield 27 in contact with the knob 23 and urges said knob away from the adjacent end of the body 10 thereby retracting the push rod 20 to force the V-shaped jaw 18 towards the needle 16.

The above arrangement of parts not only imparts a spring pressed retraction action to the presser jaw but adequately encloses the major portions of the metallic parts especially in the region where the instrument will be grasped by the user.

When it is necessary or desirable to disassemble the instrument the screw 12 is backed out of the plug 11 and the latter removed from or screwed out of the tubular body 10. The knob 23 having been disconnected from the push rod 20, before or after the removal of the plug 11, said push rod can with the plug 11 thereon be withdrawn from the shield and body and the shield and spring allowed to drop from said body. By reversing the above manipulations the device can be readily assembled. After the parts are secured in place the push rod is held against axial rotation by the non-circular or flat shank portion 19 fitted in the non-circular or oblong hole 17.

If it is desirable to remove the needle 16, for replacement or other purposes, the screw 12 is merely withdrawn sufficiently to relieve the clamping pressure from the needle and projecting the jaw 18 forwardly the necessary distance to permit said needle to be pulled out of the socket 15. When the needle is in position for operation of the tool said needle is seated against the bottom of the socket and cannot be accidentally pushed inwardly to change the relation of the parts which would have a tendency to decrease the spring tension.

Where it is desirable to regulate the tension of the spring 28, the neck 21 is provided with threads 22*a*, Fig. 6, running a long distance inwardly from the terminal end of the push rod. The shield 27*a*, in this instance, while slidably mounted in the body 10 also has threaded connection with the threaded portion of the neck of the push rod. Preferably, the shield 27*a* has a metal insert 29 non-rotatably fixed therein and provided with a threaded hole for engagement with the threaded portion of the push rod neck. The balance of the parts are identical to those previously described. The push rod 20 is limited in its retractive movements by the jaw contacting the needle wherefore said push rod is in a stationary position, at least temporarily, and there is a temporary fixed relation between the plug and the extended threaded portion 22*a*. By screwing the shield 27*a* longitudinally along the push rod the position of said shield relative to the plug will be changed and the tension of the spring 28 will be increased or decreased in accordance with which direction said shield is moved along the push rod.

In a relatively small tool of this character the space between the side of the needle and the adjacent portion of the shank 19 is rather limited, if parallelism between the needle and the entire length of the shank is retained, which restricts the use of the device to wires of smaller gauges.

This difficulty is overcome by providing the shank 19 with an angular portion 30, Fig. 7, just back of the jaw and adjacent the needle. The angular portion 30 projects outwardly relative to the needle, from the main part of the shank towards the jaw and outside of the plug 11. In other words, the angular portion diverges from the needle in a direction towards the jaw which is formed at the outer end of said angular portion. This permits the tool to be used in connection with wires of larger as well as those of smaller gauges.

In actual practice, when the tool is used, the body 10 can be grasped between the index and second fingers of one hand at a convenient location adjacent the knob 23. The thumb of the same hand can then be used to press said knob inward which will project the push rod and shield forwardly against the action of the spring 28 and move the jaw 18 away from the point of the needle 16. The jaw is hooked over the wire to be tested and the knob released permitting the spring 28 to retract said jaw and force the wire insulating or shielding material over the pointed end of the needle until the wire conductor solidly contacts said needle to form a good electrical connection. The current can now flow through the needle 16, plug 11, push rod 20 and the lead 25 to a test set, directly to the other side of the line or any other connections provided.

It is to be particularly noted that the action of the spring operated jaw causes the needle to pierce the wire insulation material and the tool is spring clamped to the wire so that the test connection can be maintained even during the time necessary to make prolonged observations or repairs, and the electric conductive parts of the instrument are so well insulated, covered or shielded that there is very little chance of an operator obtaining a shock during use thereof.

Of course I do not wish to be limited to the exact details of construction herein shown and described as these may be varied within the scope of the appended claims without departing from the spirit of my invention.

Having described my invention what I claim as new and useful is:

1. A self-piercing and self-holding test prod comprising a tubular body of insulating material, a metallic plug fixed in one end of said body, a tubular shield of insulating material telescopically mounted in the opposite end of said body, a slidably mounted push rod projecting through the plug, body and shield so that the ends extend outside of said plug and shield, the end adjacent the plug carrying a V-shaped jaw, the inside angle of said jaw constituting a nook facing the outer end of the plug, means on the opposite end of said push rod to function as a stop for the shield, a spring within the body engaging the plug and shield to urge the latter outward and thereby retract the jaw, and a piercing element

fitted in the plug parallel to the axis of the body for cooperation with said jaw and in line with the nook of said jaw, said piercing element being in electrical communication with the push rod through the metallic plug.

2. In a device of the kind described, a tubular body of insulating material, a metallic plug screw threaded into one end of said body, a longitudinal needle socket in the outer end of said plug to one side of the center and having a bottom, a screw having threaded connection with the body and plug and projected into said socket, a needle removably mounted in the socket and seated on the bottom of said socket and temporarily held in place by the screw which also retains the plug against rotation, a tubular shield of insulating material telescopically mounted in the opposite end of said body, a push rod having a non-circular shank with a V-shaped jaw on the outer end with the nook in alignment with the needle point and a threaded circular neck with a threaded end, said push rod mounted in the body with the neck in the axial center and projecting through and in threaded engagement with the shield and the shank being offset and slidably mounted in a non-circular hole through the plug to the side of its center opposite the needle socket, an insulated knob on the threaded terminal end of the push rod neck, and a spring in the body engaging the plug and shield to urge the latter outward against the knob for retracting the jaw through the medium of said knob and the push rod of which said jaw is a part.

3. The structure according to claim 2 wherein the non-circular shank portion of the push rod is oblong in cross section and the non-circular hole through the plug is of the same shape.

4. The structure according to claim 2, in combination with a metal insert in the knob having a threaded socket to receive the threaded end of the push rod neck and provided with a radial hole intersecting said socket and aligned with a radial hole through the knob material to the perimeter thereof.

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