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A. L. STOWELL

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COMBINATION HAND TOOL AND SPARK TESTER

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Fig. 1

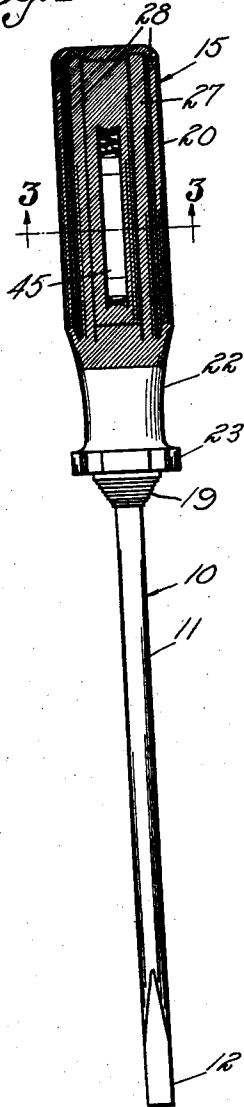


Fig. 2

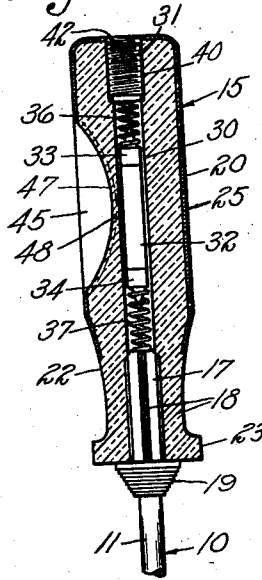
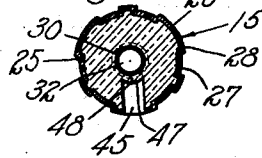


Fig. 3



Inventor  
Austin L. Stowell

By *H. Gray Lindsey*

Attorney

# UNITED STATES PATENT OFFICE

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## COMBINATION HAND TOOL AND SPARK TESTER

Austin L. Stowell, New Britain, Conn., assignor  
to The Stanley Works, New Britain, Conn., a  
corporation of Connecticut

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7 Claims. (Cl. 175-183)

This invention relates to improvements in a combined hand tool and spark testing device, and has for its principal object the provision in a screw driver or similar hand tool of means for testing the efficiency of electrical apparatus such as ignition systems.

A further object lies in the provision of means for rendering the indication of the spark testing device clearly visible even in bright sunlight.

Other objects and advantages will appear as the description proceeds.

In the accompanying drawing, I have shown a preferred mechanical embodiment of the idea of the invention, but it is to be understood that the drawing is for the purpose of illustration only and is not to be considered as limiting the invention, the scope of which is to be measured entirely by the scope of the subjoined claims.

In the drawing:

Fig. 1 is an elevational view of a hand tool such as a screw driver including a spark testing device constructed according to the idea of this invention;

Fig. 2 is a vertical cross sectional view of the upper portion of the screw driver illustrated in Fig. 1; and

Fig. 3 is a transverse sectional view taken on the line 3-3 of Fig. 1.

Referring to the drawing in detail, Fig. 1 illustrates a screw driver provided with a metallic shank member generally indicated at 10 formed at one end with a flattened portion or blade 12 the tip of which is adapted to fit in the transverse slots of conventional screw heads. Upon the end of the shank 10 opposite the flattened portion 12, I have provided a handle generally indicated at 15. Preferably, this handle is composed of insulating material such as a synthetic material the basis of which may be a cellulose nitrate composition. This material is ordinarily transparent, or practically so, but may be dyed to produce any desired color effect.

Referring now particularly to Fig. 2, it will be observed that the upper portion of the shank 10 is provided with a cylindrical portion or stem 17 around the exterior of which are a plurality of substantially equally spaced axially extending fins or ridges 18 separated from the shank portion 11 by a bolster 19, the larger end of which abuts the lower end of the handle. This bolster may be made integral with the shank 10 or may be a separate member rigidly secured on the shank. The handle may be provided with an upper cylindrical portion 20, an annular reduced portion 22 below the cylindrical portion, and a reinforcing

flange 23 at the lower end of the handle having substantially the same diameter as the cylindrical portion 20. The outer layer of the cylindrical portion of the handle may also be dye colored, as indicated at 25, and may further be provided with axially extending grooves 27 and lands 28 to provide a roughened exterior whereby the handle may be more firmly grasped and turned by the hand of the user. These lands and grooves may be of varying widths and spaced around the circumference of the handle in such a manner as to provide an attractive or artistic effect.

The handle is further provided with an axial bore 30 extending therethrough, the lower end of which is adapted to receive the cylindrical stem 17 of the shank 10, and the upper end of which extends to the exterior of the handle at the end opposite the shank 10 and is screw threaded to receive a closure plug 31. It will be observed that when the handle 15 is forced upon the stem 17 so that the stem portion 17 of the shank occupies the lower end portion of the bore 30, the ribs 18 on the stem portion 17 will sink into the wall of the bore to effectively restrain the handle from rotation relative to the stem or shank. Within this bore 30, I have provided a spark testing device in the form of an elongated capsule 32 having a transparent intermediate portion and metallic end portions 33 and 34. The capsule may be filled with neon gas under reduced pressure, it being a well known phenomenon that neon gas when held in a tube under such reduced pressure will emit a light when a high electrical potential is impressed thereon. The capsule 32 is supported in the bore 30 by means of resilient coil springs 36 and 37 disposed one at each end thereof. As particularly illustrated in Fig. 2, the coil spring 37 extends from the metallic end member 34 to the upper surface of the stem 17 of the metallic shank 10, thereby resiliently supporting the capsule 32 in the bore 30 and at the same time providing an electrical connection between the metallic shank 10 and the metallic portion 34 of the capsule 32. The upper portion of the bore 30 above the capsule 32 is, as indicated at 40, provided with interior screw threads as indicated at 42. A closure plug 31, preferably formed of insulating material, is screwed into the enlarged portion 40 of the bore 30 and maintained in adjusted position therein by the engagement of screw threads upon the exterior of the plug cooperating with the screw threads 42. The spring member 36 is interposed and slightly compressed between the upper portion of the upper metallic member 33 and the

lower transverse surface of the plug 31, and by its tension and the force exerted thereby upon the similar spring 37 maintains the capsule 32 in a centrally located position within the handle 15 and maintains the electrical connection between the shank 10 and the metallic end portion 34 of the capsule 32.

In one side of the handle, I have provided an aperture comprising a groove 45 through which the indicating capsule 32 may be viewed from the exterior of the handle. As clearly illustrated in Fig. 2, this groove is of substantially rectangular cross section and is in the form of a section of a circle and may be produced by cutting into the handle along a radius thereof by a circular milling cutter for a portion of the radius of the cutter. The groove is so located that the line bisecting its arc passes substantially through the center of the capsule 32 which, in turn, is located at approximately the center of the cylindrical portion 20 of the handle 15, and is so positioned that the chord of the circular section is approximately parallel to the axes of the bore and the spark indicating element. As indicated in Figures 1 and 3, the width of the groove 45, as measured along the circumference of the handle, is approximately the same as the diameter of the capsule 32, and its maximum length at the exterior of the handle is approximately the same as the length of the capsule 32.

As illustrated particularly in Fig. 3, the bottom surface 47 of the groove 45 is longitudinally concave and transversely convex the arc of the transverse convexity having a radius which by preference is somewhat smaller than the radius of the bore 30 in order to provide a lens effect for that portion of the aperture which lies closest to the bore. It will be observed from an inspection of Fig. 2 that the groove does not enter into the bore 30 but is separated therefrom by a thickness of the material of the handle indicated at 48, and by means of the curvature described immediately above, this thickness of material is prevented from acting as a dispersing lens and may be formed into a condensing lens, as illustrated in Fig. 3 to magnify the indicating element. There is a very definite utility for such a curved surface as that described. It is apparent that if the bottom surface of the groove were transversely straight, that portion of the material of the handle between the groove and bore 30 would form a concave or dispersing lens which would tend to disperse the light rays emitted by the element 32 and render the spark indications of this element less visible. For this reason, I have provided a curved surface to the bottom of the groove to correct such a tendency or, if desired, by making the central part of the material between the groove and the bore thicker than the edge parts thereof, to provide a condensing lens adapted to correct the direction of the light rays emitted from the element 32 and cause both the rays emitted directly from the element and a portion of those rays reflected by the wall of the bore 30 to be concentrated into the aperture or groove 45.

The bore 30 has been provided extending entirely through the handle 15 in order to render the capsule 32 renewable in case the original capsule should be defective or be broken, and also to provide for ease and facility in cleaning the handle after it has been milled. The milling operation so distorts and roughens the surface portion of the material that a cloudy or milky effect is given to the handle which effectively prevents the transmission and reflection of light. In

order to clarify this cloudy or milky effect, the handle member is cleaned, preferably by dipping it into a solution which is a solvent for the material of which the handle is formed. It is apparent that if the bore did not extend entirely through the handle one or two conditions would occur—either the cleaning material would not enter into the bore or else a portion of the cleaning material would be trapped in the bore and would eat into the handle, thus distorting the shape of the bore and weakening the structure of the handle. With the present construction in which the bore extends entirely through the handle, the cleaning material readily drains out of the bore and has no other effect than to perform its cleaning or clarifying function.

When the device is assembled, however, and the closure plug 31 inserted in place, it will be observed that the spark indicating element 32 is then hermetically sealed in the bore 30 by reason of the fact that the groove 45 does not project into the bore and the spark indicating element is thus protected from dirt and from injury due to any object coming in contact therewith. It has also been found preferable to construct the plug 31 of insulating material so that there will be no danger of an electrical shock being transmitted from the metallic shank 10 to the hand of the user of the screw driver.

A further novel advantage of the construction herein illustrated and described lies in the fact that the bottom surface of the groove is inwardly recessed from the surface of the handle so that the lens will not be marred by the striking of the handle against objects or by any other effect which would tend to roughen the exterior surface of the handle and would also protect it from the accumulation of dirt and foreign material by reason of the fact that the lens portion is recessed a sufficient distance to insure that it will not come in contact with the hand of the user of the tool. A further advantage of applicant's construction is that the groove 45 may be cleaned or washed out with a cleaning fluid without danger of the cleaning fluid entering the bore where it or the vapors thereof would be in danger of being ignited by the electrical action set up around the spark indicating element.

From the above description, it will be apparent that I have provided a structure which readily and completely fulfills the objects of the invention, as the narrow, deep groove 45 extending into the handle to a point adjacent the bore in which the indicating capsule 32 is located provides a means for observing the capsule through the handle and also provides a means for rendering the indications of the capsule clearly visible even in sunlight by effectively shielding all exterior light from the capsule.

While I have illustrated and described a preferred mechanical embodiment of the idea of my invention, it is to be understood that the invention is not limited to the construction so described and illustrated but that the scope thereof is to be measured entirely by the scope of the appended claims.

Having now described my invention so that others skilled in the art may clearly understand the same, what I desire to secure by Letters Patent is as follows:

1. A handle of a transparent material having an axial bore closed at its outer end, a metallic shank extending into and closing the forward end of said bore, and a spark testing device of the neon capsule type located within said bore

rearwardly of said shank, said handle having a longitudinally extending groove registering with said spark testing device, the bottom of said groove being convexly curved in a transverse direction.

2. A handle of transparent material having an axial bore closed at its outer end, a metallic shank extending into and closing the forward end of said bore, and a spark testing device of the neon capsule type located within said bore rearwardly of said shank, said handle being colored to render the same substantially opaque adjacent the surface of the handle, and said handle having a longitudinally extending groove registering with said testing device and deeper than the coloring material but shallower than the wall of the handle whereby to leave at the bottom of the groove a transparent partition through which the spark testing device may be observed.

3. A combined hand tool and spark testing device comprising a metallic shank, and a handle of insulating material having an opaque surface and an axial bore extending therethrough, a spark testing element in the intermediate portion of said bore, a portion of said shank being rigidly secured in one end of said bore and a closure plug in the opposite end of said bore to hermetically seal said spark indicating element in said bore, said handle having a groove extending through said opaque surface portion to provide a transparent window through which said spark testing element may be observed.

4. A combined hand tool and spark indicating device comprising a metallic shank member, a handle of insulating material provided with an axial bore extending entirely therethrough and mounted on said shank, a spark indicating element in said bore, means for maintaining said spark indicating element centrally located in said bore and to provide an electrical connection between said shank and said element, said handle including an aperture for viewing said element shaped as a relatively narrow, elongated groove in the form of a section of a circle having the chord thereof parallel to the major axis of said element.

5. A combined hand tool and spark indicating

device comprising a metallic shank member and a handle of insulating material, a spark indicating element in said handle electrically connected with said shank, said handle being provided with a radially directed groove extending from the exterior of said handle to a position adjacent to said element, the bottom face of said groove being transversely curved and forming a lens of a transparent concavo-convex portion of the material of said handle between the bottom of said groove and said element.

6. A combined hand tool and spark indicating device comprising a metallic shank member and a handle of transparent insulating material, a bore in said handle, a spark indicating element in said bore electrically connected with said shank, said handle including a radially directed groove in the form of a section of a circle having its chord parallel to the axis of said handle extending from the exterior of said handle to a position adjacent to said bore, the bottom face of said groove having a transverse curvature forming a transparent concavo-convex portion of the material of said handle between said groove and said element, the radius of transverse curvature of the bottom face of said groove adjacent to said indicating element being less than the radius of curvature of the bore of said handle adjacent to said element.

7. A combined hand tool and spark indicating device comprising a metallic shank and a handle of insulating material having an opaque or translucent outer portion and a transparent inner portion and an axial bore extending therethrough, a light emitting spark indicating element in said bore, said handle having a relatively narrow elongated groove in the form of a section of a circle having the chord thereof parallel to the major axis of said element extending from the outer surface of said body to a position adjacent to said bore, the transparent handle material between the bottom of said groove and the spark indicating element forming a lens adapted to concentrate emissions of light from the spark indicating element.

AUSTIN L. STOWELL.