Feb. 7, 1967 H. S. FORSBERG 3,302,673

COMPOSITE TOOL HANDLE

Filed Feb. 8, 1965

Fig. 1.

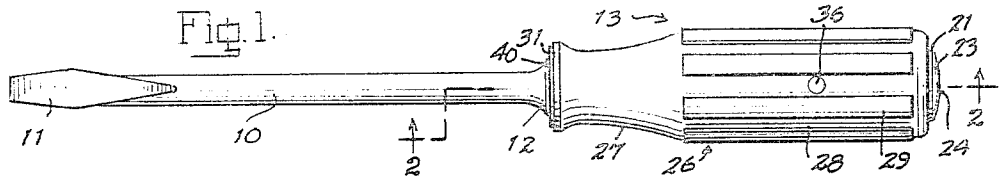


Fig. 2.

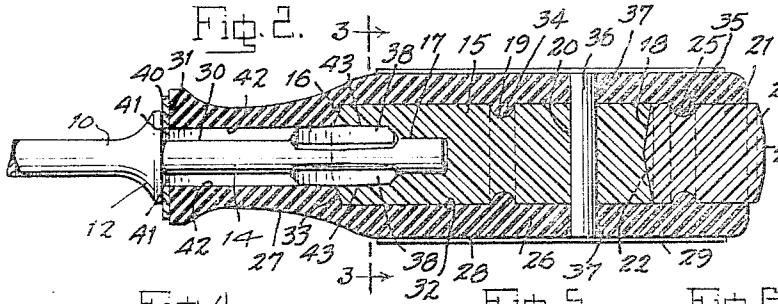


Fig. 3.

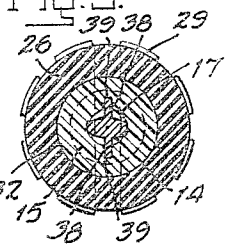


Fig. 4.

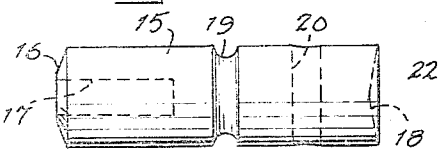


Fig. 5.

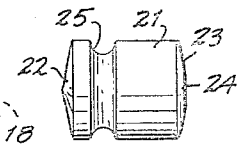


Fig. 6.

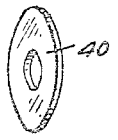


Fig. 7.

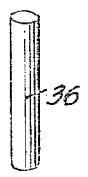


Fig. 8.

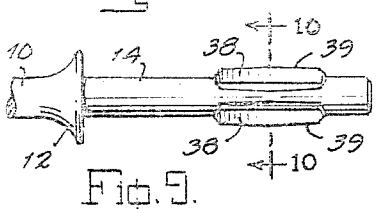


Fig. 11.

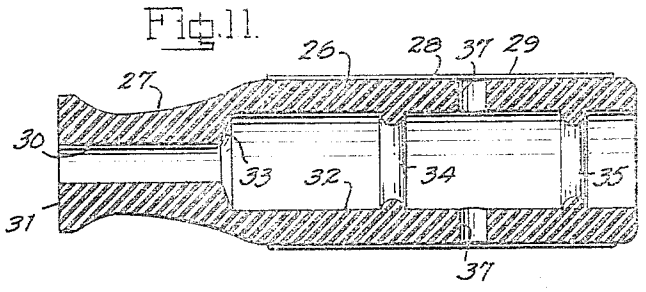


Fig. 9.

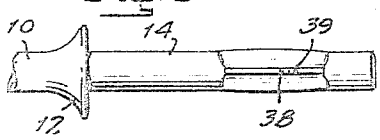


Fig. 12.

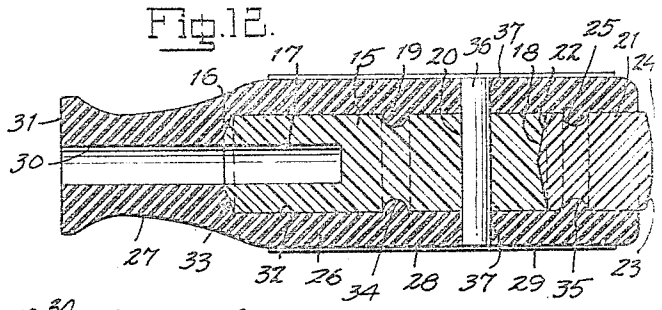


Fig. 10.

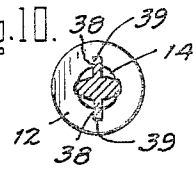
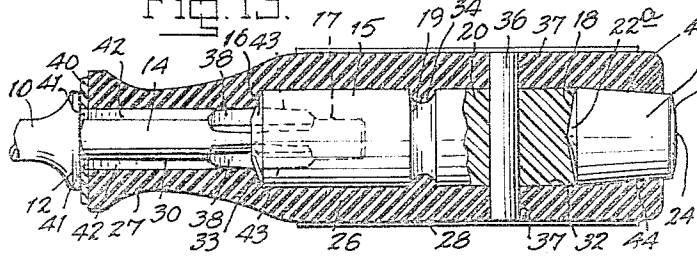


Fig. 13.



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United States Patent Office

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COMPOSITE TOOL HANDLE

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16 Claims. (Cl. 145—61)

This invention relates to hand tools, particularly of the screw driver or similar type comprising a hand grip handle part and a work-engaging part adapted to have both torque and axial force applied thereto by the hand of the user gripped about the handle part. In the manipulation of such tools the hand of the user is gripped about the tool handle with the thumb and index finger downwardly disposed so that torque is applied to the handle through the gripping relation of the hand therewith and axial force is applied through the combined gripping and downward pressure of the hand concentrated in the downwardly disposed thumb and index fingers. It is an object of the invention to provide a casing completely covering the handle including a contoured part to receive the thumb and index finger in substantially conforming relation, and formed of a relatively hard elastic material capable of slight yielding under gripping pressure and having a high degree of resistance to both rotational and axial slippage of the hand.

It is further proposed to provide an improved construction wherein the elastic casing is interlocked with a hard core rigidly connected to the tool shank, whereby there is a substantial increase in torque for a given effort, as distinguished from tools provided with rigid wood or hard composition handles, and wherein conforming engagement of the thumb and index finger with the contoured elastic casing effectually prevents axial slippage of the hand and enables an increased axial force to be applied with substantially less effort and greater comfort than has heretofore been possible with tool handles of the type wherein the thumb and index finger are engaged with a hard surfaced rigid part of the handle in exerting axial force on the tool.

A further object is to provide an improved assembly of a work-engaging part, a hard core, and an elastic casing, wherein in the assembled relation the casing is permanently interlocked with the work-engaging part and the core against relative turning and axial displacement.

Tools of the type contemplated are often used in the manner of a chisel by applying hammer blows to the end of the handle, and it is a further object of the invention to provide an impact plug member engaged with the core and projected from the end of the casing whereby hammer blows may be directed against the exposed end of the plug and directly transmitted through the core to the work-engaging part of the tool without damage to the elastic casing. A further object is to provide an impact plug member which may have relative rotational movement with respect to the core and casing while being interlocked with the core against relative lateral movement. With this arrangement repeated hammer blows directed against the plug, which in many cases will be in off-centered or angular relation to the longitudinal axis of the tool, will be effectually transmitted to the core while at the same time the relative rotational or creeping movement that may take place between the plug and the core as a result of such off-center blows will relieve the core, the casing and the user's hand gripped about the casing from the rotational strain that would otherwise be transmitted thereto by such blows.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings wherein a satisfactory embodiment of the invention is

shown. However, it will be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawings:

FIG. 1 is a side elevation of a screw driver embodying the invention;

FIG. 2 is a longitudinal sectional view on an enlarged scale taken along the line 2—2 of FIG. 1, certain parts being shown in side elevation;

FIG. 3 is a transverse sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a side elevation of the separated core member;

FIG. 5 is a side elevation of the separated impact plug;

FIG. 6 is a perspective view of the separated cushion washer member;

FIG. 7 is a perspective view of the separated locking pin member;

FIG. 8 is a side elevation of the stud end portion of the separated screw driver shank;

FIG. 9 is a side elevation of the stud end portion of the screw driver shank turned 90° from the position as seen in FIG. 8;

FIG. 10 is a cross-sectional view taken along the line 10—10 of FIG. 8;

FIG. 11 is a longitudinal sectional view of the separated casing member;

FIG. 12 is a longitudinal sectional view showing the casing member, the core member, the locking pin member, and the impact plug member in assembled relation; and

FIG. 13 is a longitudinal sectional view similar to FIG. 2 showing a modified form of impact plug member embodied therein, certain parts being shown in side elevation.

Referring to the drawing the invention is illustrated by way of example as being embodied in a screw driver, which includes a conventional screw driver shank 10, preferably of hardened steel, provided at one end with a flattened blade portion 11 and at its other end with a flared-out bolster portion 12 against which the handle, indicated generally as 13, is adapted to abut, and a cylindrical stud 14 extending axially from the shank for rigid attachment to the handle core, as will presently more fully appear.

The handle comprises a core member 15 preferably in the form of an extrusion of high-impact plastic material, for example cellulose acetate, having a beveled shoulder 16 at its forward end and a cylindrical pocket 17 extending axially inwardly from the forward end, and provided at its rearward end with a relatively shallow conical recess 18 for seating engagement by the impact plug member, as will hereinafter more fully appear. Substantially centrally between the ends of the core member there is provided an annular groove 19 of semicircular cross-section, and intermediate the groove and the rearward end there is provided a diametrically extending cylindrical passage 20 for receiving the locking pin, as will hereinafter more fully appear.

The impact plug member 21 is also preferably formed from a cylindrical extrusion of high-impact plastic material, for example cellulose actetate, and is of corresponding diameter to the core member 15, its inner end 22 being of relatively shallow conical shape for seating in the correspondingly recessed end 18 of the core member. The outer end is suitably shaped for impact by hammar blows, being preferably convexly curved as at 23 in surrounding relation to a central planar circular area 24. Intermediate the ends of the plug member there is provided an annular groove 25 of semicircular cross-section for interlocking

with the casing member, as will presently more fully appear.

The elastic casing member **26** is preferably molded from suitable material having the desired degree of hardness and elasticity, for example, hard rubber having a hardness test on the Shore D Durometer of approximately 35 units. Externally the casing comprises a forward contoured part **27** and a rearward cylindrical part **28**, the forward part converging forwardly from the cylindrical part and being flared outwardly at its forward end to provide a contour into which the thumb and index finger of the hand of the user gripped about the handle will comfortably fit as torque and axial force is applied thereto. The cylindrical part is preferably provided with a series of spaced longitudinal ribs **29** to resist rotational slippage of the user's hand gripped about the handle.

Interiorly the casing is provided at its forward portion with a cylindrical passage **30** extending axially inwardly from the forward planar end wall **31** substantially along the length of the convergent and flared thumb and finger conforming portion **27** and opening at its inner end to a cylindrical pocket **32** for receiving the core member **15** and the impact plug member **21**, the pocket being of substantially corresponding diameter to the core and plug members and opening to the rearward end of the casing. A beveled shoulder **33** is provided at the forward end of the pocket for abutting engagement by the beveled shoulder end **16** of the core member, and annular ribs **34** and **35** of semicircular cross-section are provided at spaced points along its length for respective interlocking engagement in the annular grooves **19** and **25** of the core and plug members.

While the material, for example hard rubber, of which the casing is formed is relatively hard, its elasticity and recovery factor are sufficient to permit assembly of the core member and the impact plug member therewith by inserting these members through the rearward open end of the pocket **32**, the elasticity being sufficient to permit the restricted passages through the rib portions **34** and **35** to expand as the cylindrical surface of the core and plug members are forced therethrough and thereupon contract into interlocking relation in the grooves **19** and **25**. In the assembled relation as seen in FIG. 12 the beveled end **16** of the core member abuts the beveled shoulder **33** of the pocket **32**, the passage **30** of the casing is axially aligned with the pocket **17** of the core member, the conical end **22** of the plug member seats in the conical recess **18** of the core member, and the axial dimension of the plug member is such that its outer end is projected in exposed relation from the end of the casing.

The core member and the casing are interlocked against relative rotational movement by a cylindrical locking pin **36** engaged with a tight frictional fit in diametrically opposed passages **37—37** in the casing and the diametric passage **20** of the core member, and in this relation the pin interlocks the casing and core members against relative turning movement, and in cooperation with the beveled shoulder **33** and the rib **34** interlocks these members against relative axial movement. The impact plug is interlocked against relative axial movement by the rib **35** but is free to have relative rotational movement with respect to the core and the casing while being restricted against lateral displacement through the seating interengagement of the conical surfaces **18** and **22** of the core and plug members.

The cylindrical stud end **14** of the screw driver shank **10** is of substantially corresponding diameter to the passage **30** of the casing member and the socket **17** of the core member and its length substantially corresponds to the combined lengths of this passage and socket. At an intermediate portion of the stud end, spaced from the bolster shoulder **12** a distance substantially less than the length of the passage **30** and spaced from the outer extremity of the stud a distance substantially less than the depth of the socket **17**, there are provided a pair of diametrically projecting wing formations **38—38** formed by swaging the material of the stud, these wing formations being relatively thin and long and having parallel side surfaces and sharply ground projecting edges **39**, preferably ground at a slight inward angle at each side of the center point. The grinding of the edges of the wing portions produces sharp cutting edges at the intersections of the parallel side surfaces and the ground surfaces, and by virtue of the slight inclinations of these edges and the fact that the stud is of hardened steel the projected wings are adapted to cut deeply into interlocking engagement with the core member.

In assembling the screw driver shank with the handle parts the latter are first assembled as seen in FIG. 12 and the cushion washer **40**, preferably formed of a relatively hard high-impact plastic material, is placed against the forward end wall **31** of the casing with its central aperture in register with the passage **30**. Thereupon the stud end of the screw driver shank is engaged through the aperture of the washer with the passage **30** of the casing with the cylindrical outer end of the stud acting as a pilot. The stud is then forced axially into the handle causing the wing portions **38** to cut notches **41** through the washer and longitudinal furrows **42** along the passage **30**, and finally being forced into the socket **17** of the core member where the forward portions of the wings cut furrows **43** therein while the rearward portions of the wings remain in engagement with the furrows **42** in the casing.

As a result of the tendency of the plastic material of the core member to recover its original shape through elastic memory the furrowed material surrounding the wings tends to bind against the surfaces of the wings, with the result that the connection of the stud with the core member is for all practical purposes a substantially permanent one wherein the core member is rigidly interlocked with the stud against relative turning and axial movement. In this assembled relation the disposition of the portions of the wings in the furrows **42** of the casing tends to restrict relative torsional or twisting movement between the casing member and the stud, particularly when the convergent end of the casing member surrounding the stud is compressed by the thumb and index finger of the user's hand gripped about the handle to apply torque and axial force to the screw driver. Also, in the assembled relation the convergent end of the casing is permanently interlocked against axial displacement between the beveled end **16** of the core member and the cushion washer **40** interposed between the end of the handle and the bolster portion **12** of the shank **10**.

In the modification illustrated in FIG. 13, the impact plug member **21*a*** is of tapered form converging outwardly from its inner conical end **22*a***, and is retained against axial displacement by a correspondingly tapered outer end wall portion **44** of the pocket **32**. Like the plug member **21** the outer projected end is provided with a convexly curved surface **23*a*** surrounding a central planar circular area **24*a***.

What is claimed is:

1. In a hand tool:

(a) a tool part comprising

(1) a shank including a bolster portion, and

(2) a stud extending from said bolster portion in axial alignment with said shank; and

(b) a handle part comprising

(1) a relatively rigid core member having forward and rearward ends and a stud-receiving axial pocket, extending rearwardly from said forward end, and

(2) an elastic casing having forward and rearward ends, an axial core-receiving pocket opening at one end to said rearward end of said casing and having an annular shoulder at its opposite end rearwardly spaced from said forward end of said casing, and an axial stud-receiving passage extending from the forward end of said casing to said shoulder;

(c) said core member being secured within said core-receiving pocket with its forward end butted against said shoulder and its stud-receiving pocket axially aligned with said stud-receiving passage; and

(d) said stud being forcibly received in said axially aligned passage and pocket with said bolster portion of said tool shank opposed to the forward end of said casing.

2. The invention as defined in claim 1, wherein the external surface of said casing is substantially cylindrical in substantially surrounding relation to said core-receiving pocket and converges forwardly from said substantially cylindrical portion to a forward outwardly flared portion in substantially surrounding relation to said stud-receiving passage.

3. The invention as defined in claim 1, wherein said stud has outwardly projecting wing portions disposed within said stud-receiving pocket, said wing portions adapted through forcing of said stud into said passage and pocket to cut into the walls of said pocket to fix said stud against rotation relatively to said core.

4. The invention as defined in claim 3, wherein said wing portions have substantially parallel sides and ground outer edges.

5. The invention as defined in claim 1, wherein said stud has outwardly projecting wing portions partially disposed within said stud-receiving passage and partially disposed within said stud-receiving pocket, said wing portions adapted through forcing of said stud into said passage and pocket to cut into the walls of said passage and pocket to fix said stud against rotation relatively to said core and casing.

6. The invention as defined in claim 1, further characterized by a washer of relatively rigid material interposed between said bolster portion and the forward end of said casing.

7. The invention as defined in claim 1, further characterized by interengaging means cooperatively arranged between said core member and said casing to restrain relative axial movement between them.

8. The invention as defined in claim 1, further characterized by interengaging annular rib and groove means cooperatively arranged between said core member and said casing to restrain relative axial movement between them.

9. The invention as defined in claim 1, further characterized by means cooperatively arranged between said core member and said casing to restrain relative axial movement between them.

10. The invention as defined in claim 1, further characterized by diametric locking pin means cooperatively arranged between said core member and said casing to restrain relative axial movement between them.

11. The invention as defined in claim 1, wherein said core member has its rearward end inwardly spaced from the rearward end of said casing, and further characterized by an impact plug member disposed within said core-receiving pocket having one end engaged with the rearward end of said core member and its other end projected outwardly from said rearward end of said casing.

12. The invention as defined in claim 11, wherein said plug member is rotatable in said casing relatively to said core member, and further characterized by means cooperatively arranged between said plug member and casing to restrain axial displacement of said plug member.

13. The invention as defined in claim 11, further characterized by interengaging means cooperatively arranged between said plug and core members to restrain relative lateral movement of said plug member.

14. The invention as defined in claim 11, further characterized by interengaging cone means cooperatively arranged between said plug and core members to restrain relative lateral movement of said plug member.

15. The invention as defined in claim 11, wherein said plug member is rotatable in said casing relatively to said core member, and further characterized by annular rib and groove means cooperatively arranged between said plug and casing members to restrain axial displacement of said plug member.

16. The invention as defined in claim 11, wherein said plug member is rotatable in said casing relatively to said core member, and further characterized by interengaging inwardly divergent annular walls on said casing and plug member to restrain axial displacement of said plug member.

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