

[54] **HAND TOOL CONNECTION AND TRIM COLLAR THEREFOR**

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[22] Filed: **Sept. 12, 1973**

[21] Appl. No.: **396,523**

[52] U.S. Cl. **145/29 R**, 145/29 B, 145/36

[51] Int. Cl. **B25d 1/00**

[58] Field of Search 145/29 R, 29 B, 30 R, 30 A,
145/30.5, 61 R, 61 A, 61 C, 61 D,
145/61 E, 61 F, 61 K, 61 M; 403/240,
403/263, 368, 243; 273/67 R

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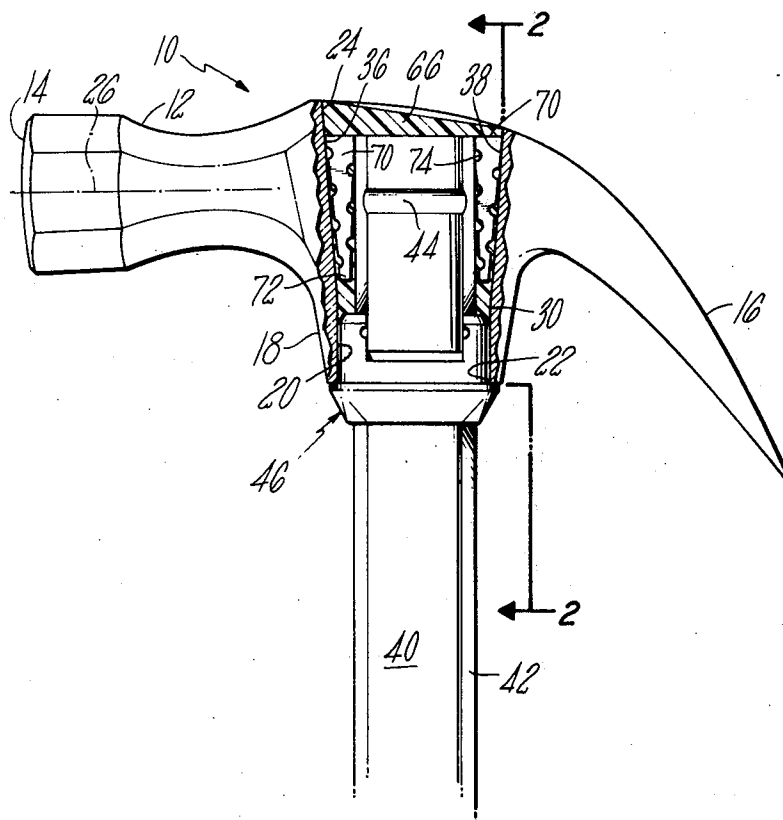
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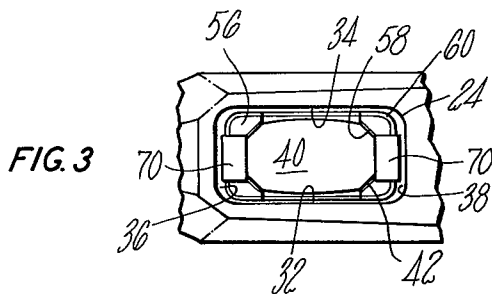
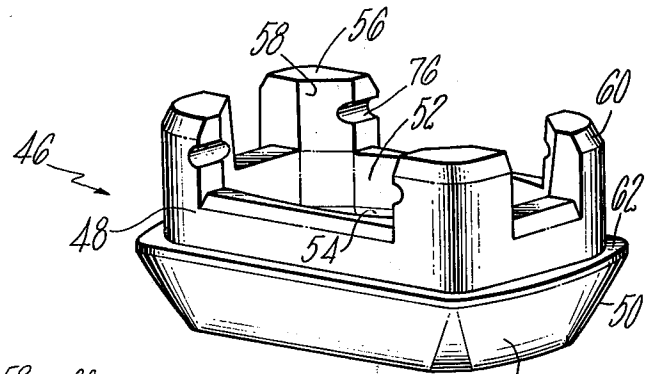
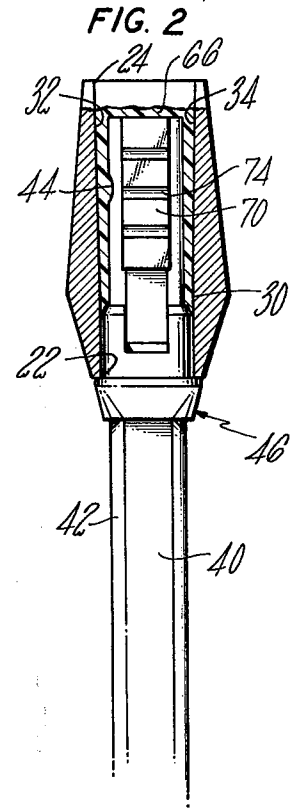
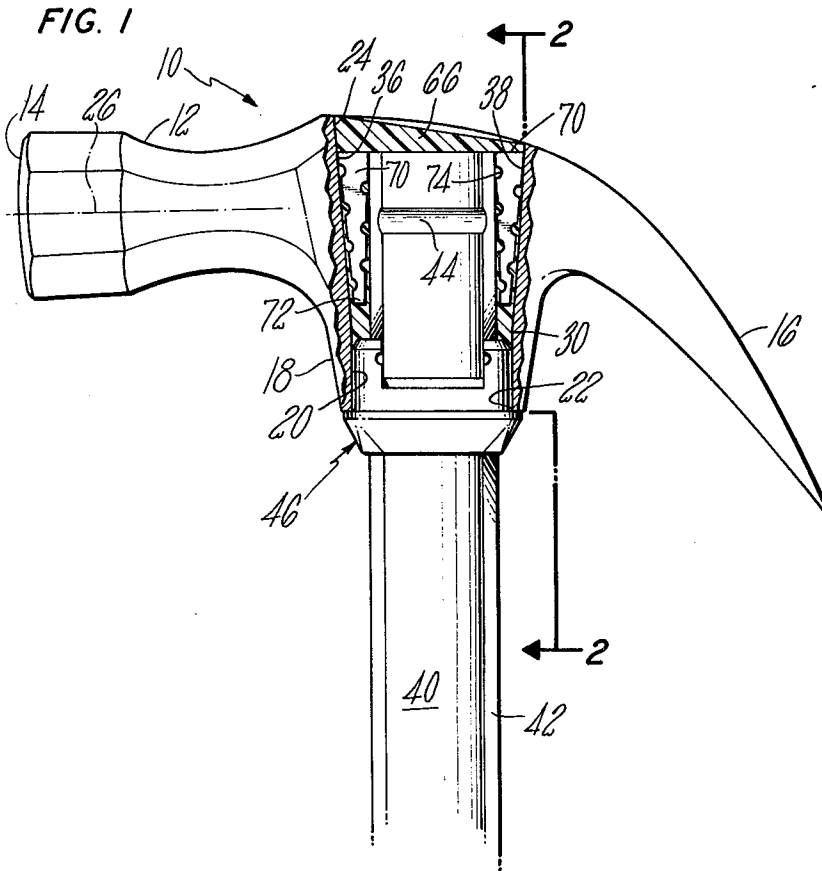
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[57] **ABSTRACT**

A connection between a hammer head and a handle resting in the eye of the head but free of direct contact therewith to provide an annular space extending fully around the handle includes a pre-formed annular trim collar at the entrance end of the eye, a pair of non-crushable metal fillers traversing the axis of percussion of the tool head and an impact resistant resin bonding the assembly together. The collar is comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimensions as the annular space. The plug portion is disposed within the annular space by a force fit connection to effectively seal the entrance end of the eye and a tapered exterior trim surface extending from the shoulder toward the handle.

9 Claims, 4 Drawing Figures





HAND TOOL CONNECTION AND TRIM COLLAR THEREFOR

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to hand tools of the percussive or impact type such as hammers and the like. More particularly, the present invention is concerned with the connection between the head and the handle of such tools and finds particular application in hand tools using handles made from synthetic materials such as fiber reinforced plastics and the like.

With the advent of low cost synthetic materials considerable interest has been generated in the use of fiber-glass reinforced handles for hand tools and the like. However the traditional means of interconnecting the handle with the tool head such as a hammer head has involved the use of the usual wedges and these wedges have proven unsatisfactory for synthetic materials due to the tendency of such materials to split and delaminate. Accordingly, efforts have been directed toward the use of suitable bonding adhesives of the impact-resistant type. However, in order to provide an effective and long lasting connection it has been necessary to assure positive bonding of the handle along a major axial extent of the eye within the tool head. This, in turn, has necessitated provisions for a gap or space between the head and the handle along a substantial portion of the eye to accommodate the resin and has required the use of aligning devices to accurately hold the two spaced components in an aligned condition during the application and curing of the bonding resin. In order to provide proper positioning of the head relative to the handle, the fixturing of these components necessarily introduces additional manufacturing operations and costs that detract from the advantages of using such materials. Additionally, an unsightly gap is visible between the eye of the tool head and the handle at the end of the eye from which the handle protrudes. Although this gap can be covered with a trim collar to provide a finished appearance, the collar is merely a decorative band serving only an aesthetic function.

Accordingly, it is an object of the present invention to provide a new and improved connection between the handle and the head of an impact tool that includes a trim collar construction extending into the eye of the tool head for a short distance for providing proper alignment between the tool head and the handle positioned within the eye of the tool head while sealing the gap therebetween during the application of a suitable bonding resin capable of forming a firm interconnection therebetween.

Another object of the present invention is to provide a new and improved handle connection of the type described which utilizes a trim collar capable of providing the necessary alignment between the handle and the tool head without fixturing while at the same time imparting improved appearance to the assembly and facilitating the formation of a tight, effective connection having a prolonged and useful life. Included in this object is the provision for a trim collar of non-impact transmitting character that extends into the eye of the tool head to provide a force fit connection and seal between the eye and the tool handle.

Still another object of the present invention is to provide a new and improved connection of the type described that incorporates the use of crush resistant fill-

ers capable of assisting the bonding material in improving the compression load-carrying characteristics of the tool particularly during nail pulling or similar applications that subject the handle connection to substantial compression forces.

A further object of the present invention is to provide a tool handle connection including a trim collar capable of preventing leakage of the bonding resin during assembly while at the same time substantially reducing the need for fixturing in order to provide proper tool alignment and balance between the striking face of the tool and the handle. Included in this object is the provision for a new and improved interconnection between a tool head and a fiberglass handle of a character which provides no direct contact between the tool head and the handle yet provides the aforementioned sealing and aligning capabilities while providing an attractive tool of high quality.

Other objects will be in part obvious and in part pointed out in more detail hereinafter.

These and related objects are accomplished in accordance with the present invention by providing a hand tool comprised of a tool head having an eye extending entirely therethrough and having an entrance end and an outer end, a reinforced fiber handle having a portion positioned within the eye and being free of direct contact with the tool head to provide an annular space extending fully around the handle and axially along the entire length of the eye, a pre-formed annular trim collar sealably interconnecting the handle and the tool head at the entrance end of the eye and a bonding resin providing a tight and durable interconnection therebetween. The tool head is provided with a striking surface and an axis of percussion extending through said head from said striking surface and intersecting the eye at substantially a right angle to the axis thereof. The reinforced fiber handle portion extends within the eye a sufficient distance to intersect the axis of percussion but the trim collar is positioned so as to be essentially non-impact transmitting. The annular trim collar is comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimensions as the annular space around the handle and is disposed within the space to effectively seal the space at the entrance end of the eye. The plug portion is held in position by a force fit interconnection with the tool head and handle. The trim portion includes an outwardly projecting shoulder for engaging the tool head adjacent the entrance end of the eye and a tapered exterior trim surface extending from the shoulder toward the handle. The bonding resin is disposed within the annular space sealed by the trim collar and extends toward the outer end of the eye through the axis of percussion for bondably joining the head, handle and trim collar in a tight effective connection.

A better understanding of the objects, advantages, features, properties and relations of the invention will be obtained from the following detailed description and accompanying drawing which set forth certain illustrative embodiments and are indicative of the various ways in which the principle of the invention is employed.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a side view of a portion of a hammer, partially broken away and partially in section, showing one em-

bodiment of the handle connection of the present invention;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary end view of the hammer of FIG. 1 with the bonding resin removed for greater clarity of illustration, and

FIG. 4 is an enlarged perspective view of the trim collar used in the connection shown in FIG. 1.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing in greater detail wherein like reference numerals indicate like parts throughout the several figures, the invention is shown as embodied in a hammer having a forged steel hammer head 10 of the claw type provided on one end with the usual poll and bell 12 including a striking surface 14, at the other end with bifurcated claws 16 and with an intermediate, transversely projecting shank or neck portion 18. A handle-receiving eye 20 extends centrally through the entire head 10 passing axially through the shank 18 and is provided with an entrance end 22 at the free end of the shank 18 and an enlarged outer end 24. The axis of percussion 26 of the tool head 10 extends from the striking surface 14 rearwardly toward the claws 16 and intersects the eye 20 at substantially a right angle to the axis thereof. The eye is of a conventional size and shape such that the cross-sectional area within the eye is substantially uniform and unchanged from the entrance end 22 inwardly to a point approximately one-third along the axial length of the eye. In the specific embodiment illustrated the aforementioned uniform eye size is provided along substantially the full length of the neck or shank portion 18 up to a break point indicated generally by the numeral 30.

As best seen in FIG. 2, the side walls 32, 34 of the eye 20 taper outwardly with a very minor or slight flair or divergence from the break point 30 toward the outer end 24. However, as will be apparent, the principles of the present invention will apply equally well if the side walls are substantially parallel throughout their full extent or even taper inwardly in slightly converging fashion toward the outer end of the eye. The front and rear walls, 36, 38, respectively, of the eye exhibit a substantially greater divergence than the side walls so that the cross-sectional area in the eye increases gradually from the break point 30 to the outer end 24 of the eye. While the amount of taper or slope of the front surface 36 or rear surface 38 may vary, it will be appreciated that the contour or shape of the eye, as illustrated in FIGS. 1 and 2 is substantially the same as that exhibited by conventional tools of this type. Consequently it is clear the present invention may utilize existing equipment and manufacturing techniques for the tool head construction thereby effecting considerable economies in the manufacturing operations.

For purposes of illustration and in accordance with the preferred embodiment, a tool handle 40 formed of fiber-reinforced material such as resin impregnated fiberglass is shown as an elongated, straight, rod-like member of substantially uniform cross-section throughout its entire length. The rod-like handle 40 is of generally rectangular cross-section and is provided with axially extending chamfer surfaces 42 at each of its longitudinally extending four corners. The preferred handle material for use in the assembly of the present invention is molded glass fiber reinforced polyester. Such

material is substantially less susceptible to dimensional variation under differing ambient humidity conditions and exhibits higher tensile strength and greater resistance to compressive forces than the conventionally employed wooden handles. Extruded fiberglass filaments free of kinks extend continuously along the handle in a substantially straight manner and constitute at least sixty percent by weight and preferably seventy to seventy-five percent by weight of the handle. These continuous filaments or strands are embedded within and encompassed by the resin to provide a smooth, aesthetically pleasing exterior appearance for the handle. As shown in FIGS. 1 and 2, the handle 40 may be provided with a side notch 44 at one end to enable the bonding resin of the connection to freely flow therein and form a mechanical interlock with the handle.

Since the handle 40 exhibits cross-sectional dimensions that are substantially smaller than the cross-sectional dimensions of the eye 20 at its entrance end 22, there is no direct contact between the handle 40 and the walls of the eye when the handle is centrally located within the eye. As mentioned, the tool head connection of the present invention is directed to those tools having no direct contact between the handle and the tool head, i.e., the parts are sized to provide an annular space or clearance gap between the walls of the eye and the handle portion positioned within the eye. In such an assembly it is of utmost importance to maintain proper alignment between the striking face of the tool and the longitudinal axis of the handle in order to provide for proper operation of the tool as well as the appropriate balance, feel or heft thereof.

As mentioned, it is an advantageous feature of the present invention that a new and improved trim collar 46 is utilized in the connection and can be used for the alignment operation. Referring particularly to FIG. 4, the trim collar 46 is a pre-formed annular ring-like member of generally rectangular configuration and constructed of suitable plastic material. For example, good results have been obtained using a vinyl plastic such as polyvinyl chloride plastic sold by B. F. Goodrich Chemical Co. under the trademark "Geon 8814GP" and having a durometer value of 80A-85A. The collar 46 is comprised of a concealed plug portion 48 and an exposed trim portion 50 that not only assures a neat external appearance at the entrance end of the eye but also firmly abuts the neck 18 of the tool head at the entrance periphery of the eye to assure a positive seal for retaining the bonding resin within the eye and prevent leakage thereof as the resin hardens. The concealed plug portion 48 of the collar exhibits substantially the same cross-sectional dimension as the annular space defined by the walls of the eye at the entrance end 22 and the surfaces of the handle 40 mounted therein. In fact, in practice the dimensions of the concealed plug portion are slightly large than the annular space within which it must fit in order to provide the desired force fit or interference fit connection between the trim collar and both the handle and the tool head.

The ring-like trim collar 46 defines a central, axially extending aperture 52 having substantially the identical shape as the periphery of the tool handle 40. The aperture 52 is substantially uniform in size throughout the plug portion 48 but is provided with a slight diverging taper 54 as it extends from the plug portion through the trim portion to the lower end thereof. In the preferred embodiment, the tapered portion 54 of the aperture 52

is sufficiently divergent so that the size of the aperture at the bottom of the trim collar 46 is slightly larger than the periphery of the tool handle and permits smooth initial insertion of the handle 40 into the aperture during the assembly operation.

The exterior of the concealed plug portion 48 is of rectangular configuration and is substantially identical in size and shape to the entrance end 22 of the eye. However, the external periphery of the concealed plug portion 48 is slightly larger than the peripheral opening of the eye 20 at its entrance end 22 so that upon insertion of the trim collar 46 into the eye, a firm interference or force fit is affected between the collar and the walls of the eye.

As mentioned the trim collar 46 is adapted to engage the handle 40 by an interference fit and will provide a limited degree of handle alignment as the handle is mounted in the eye of the tool head. To assist in this aligning operation, the trim collar 46 is provided with a plurality of handle-aligning legs 56 integrally projecting above the plug portion 48 and located at the four corners of that generally rectangular member. The interior and exterior surfaces of the legs are coextensive with the corresponding surfaces of the plug portion 48 and, as best shown in FIG. 4, the inwardly facing surface 58 of each leg 56 is adapted to engage the chamfer 42 on the corners of the tool handle 40. The surfaces 58 have a slightly diverging taper which facilitates limited movement of the handle while simultaneously providing proper alignment and retention thereof relative to the tool head upon mounting the handle 40 within the eye 20. The outermost edge of each leg is provided with a suitable chamfer 60 to permit ready insertion of the collar 46 into the entrance end 22 of the eye. As shown the collar is a low profile member and the total axial extent of the plug portion 48 and upstanding legs 56 is no longer than shank portion 18. Thus the collar 46 will provide the desired aligning function without extending into the percussion area of the tool head. In fact the collar does not extend beyond the break point 30 and stops far short of the axis of percussion 26 to provide no impact transmitting function.

The exposed trim portion 50 of the collar 46 is provided with a shoulder 62 extending outwardly from the concealed plug portion 48 at substantially a right angle thereto. When the collar is mounted on the tool head, the shoulder 62 rests against the end of shank 18 and positively seals and conceals the periphery or entrance end 22 of the eye. A tapered exterior trim surface 64 extends downwardly from the shoulder 62 toward the bottom of the collar to provide a neat finished appearance to the connection between the tool head and the handle.

As will be appreciated, the trim collar provides a secure fluid-tight seal at the entrance end of the eye to prevent leakage of the bonding resin 66 during the assembly of the tool. The resin held within the clearance gap rapidly hardens or cures to a solid impact resistant condition and forms a firm connection between the handle and the tool head. However, in accordance with the present invention it has been additionally found that the handle connection exhibits improved durability when subjected to substantial nail pulling loads if non-crushable metal fillers 70 are inserted within the clearance gap defined by the tool handle 40 and the front and rear walls, 36,38 of the eye. Although the fill-

ers 70, as best shown in FIG. 1, are of wedge-shaped configuration, they do not provide a wedging function but merely loosely rest within the clearance gap and assist in absorbing a portion of the compressive forces to which the connection is subjected during the nail pulling operation. This loose filler function is achieved by providing the fillers 70 with a greater taper than is exhibited by the clearance gap, thus permitting the innermost end 72 of the metal filler to rest freely within the clearance gap and permit the formation of thin resinous layers between the filler and the confronting walls and surfaces of the respective tool head and handle. As shown, the filler 70 is also provided with transversely extending notches 74 that permit the flow of resin therethrough to provide a mechanical interlock between the filler 70 and the impact resistant epoxy resin 66. Similarly, the upstanding legs 56 of the trim collar 46 are also provided with transversely extending grooves or notches 76 for receiving the bonding resin 66 and completing the interlocked relationship between the handle 40, the tool head 10 and the trim collar 46.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teaching of the present invention.

We claim:

1. A hand tool for percussive use comprising a tool head having a striking surface, an axis of percussion extending through said head from said striking surface and a handle-receiving eye spaced from said striking surface and extending entirely through said head along an axis normal to the axis of percussion, said eye having an entrance end and an outer end; a reinforced fiber handle having a portion positioned within the eye a sufficient distance to intersect said axis of percussion and extending outwardly from the entrance end of the eye, said handle portion being free of direct contact with the tool head to provide an annular space extending fully around the handle and axially along the handle between the handle portion and the tool head; a preformed annular trim collar sealably interconnecting the handle and the tool head at the entrance end of the eye comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimension as the annular space and being disposed within the space to effectively seal the space at the entrance end of the eye, said plug portion being of sufficient length to facilitate initial handle alignment and retention in said alignment upon mounting in said eye yet of an insufficient length to extend through the axis of percussion and being held in position by a force fit interconnection with the tool head within the eye, said trim portion including an outwardly projecting shoulder for engaging the tool head adjacent the periphery of the eye at the entrance end thereof and a tapered exterior trim surface extending from the shoulder toward the handle; and an impact resistant resin disposed within said annular space at said axis or percussion for bondably joining said head, said handle and said trim collar.

2. The hand tool of claim 1 wherein the trim collar includes a plurality of integral handle-aligning legs extending inwardly of the entrance end of the eye from the plug portion, said legs being spaced around the handle for secure aligning engagement therewith.

3. The hand tool of claim 1 wherein the handle-receiving eye is of generally rectangular cross-section and is defined by opposed walls extending axially from the entrance end of the eye in substantial parallelism for a distance insufficient to reach the axis of percussion of the tool head and diverging toward the outer end as they intersect the axis of percussion, said handle portion being of generally rectangular cross-section and said plug portion including a plurality of integral aligning legs extending inwardly of the entrance end of the eye and engaging the handle and the walls of the eye at diagonally spaced corners thereof.

4. The hand tool of claim 1 wherein the handle is a reinforced glass fiber rod of uniform generally rectangular cross-section throughout its length and the trim collar is provided with integral upstanding alignment legs engaging the corners of the handle.

5. A hand tool for percussive use comprising a tool head having a striking surface, an axis of percussion extending through said head from said striking surface and a handle-receiving eye spaced from said striking surface and extending through said head along an axis normal to the axis of percussion; a handle having a portion positioned within the eye a sufficient distance to intersect said axis of percussion, said handle portion being free of direct contact with the tool head to provide an annular space extending fully around the handle between the handle portion and the tool head; a preformed annular trim collar sealably interconnecting the handle and the tool head comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimension as the annular space and being disposed within the space, said plug portion being of sufficient length to facilitate initial handle alignment and retention in said alignment upon mounting in said eye yet of an insufficient length to extend through the axis of percussion and being held in position by a force fit interconnection with the handle portion and tool head within the eye, said trim portion engaging the tool head adjacent the periphery of the eye at the end thereof; and an impact resistant resin disposed within said annular space at said axis of percussion for bondably joining said head and said handle.

6. A hand tool for percussive use comprising a tool head having a striking surface, an axis of percussion extending through said head from said striking surface and a handle-receiving eye spaced from said striking surface and extending entirely through said head along an axis normal to the axis of percussion, said eye having an entrance end and an outer end; a reinforced fiber handle having a portion positioned within the eye a sufficient distance to intersect said axis of percussion and extending outwardly from the entrance end of the eye, said handle portion being free of direct contact with the tool head to provide an annular space extending fully around the handle and axially along the handle between the handle portion and the tool head; a preformed annular trim collar sealably interconnecting the handle and the tool head at the entrance end of the eye comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimension as the annular space and being disposed within the space to effectively seal the space at the entrance end of the eye, said plug portion being of an insufficient length to extend through the axis of percussion and being held in position by a force fit interconnection with the tool head within the eye, said trim

portion including an outwardly projecting shoulder for engaging the tool head adjacent the periphery of the eye at the entrance end thereof and a tapered exterior trim surface extending from the shoulder toward the handle; and an impact resistant resin disposed within said annular space at said axis of percussion for bondably joining said head, said handle and said trim collar of said tool including noncrushable filler means disposed within the annular space and intersecting the axis of percussion, said filler means being bondably retained by the impact resistant resin and enhancing the durability of the tool under compression load conditions.

7. A hand tool for percussive use comprising a tool head having a striking surface, an axis of percussion extending through said head from said striking surface and a handle-receiving eye spaced from said striking surface and extending entirely through said head along an axis normal to the axis of percussion, said eye having an entrance end and an outer end; a reinforced fiber handle having a portion positioned within the eye a sufficient distance to intersect said axis of percussion and extending outwardly from the entrance end of the eye, said handle portion being free of direct contact with the tool head to provide an annular space extending fully around the handle and axially along the handle between the handle portion and the tool head; a preformed annular trim collar sealably interconnecting the handle and the tool head at the entrance end of the eye comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimension as the annular space and being disposed within the space to effectively seal the space at the entrance end of the eye, said plug portion being of an insufficient length to extend through the axis of percussion and being held in position by a force fit interconnection with the tool head within the eye, said trim portion including an outwardly projecting shoulder for engaging the tool head adjacent the periphery of the eye at the entrance end thereof and a tapered exterior trim surface extending from the shoulder toward the handle; and an impact resistant resin disposed within said annular space at said axis of percussion for bondably joining said head, said handle and said trim collar said trim collar being a plastic material and the said plug portion being provided with laterally extending recesses, said resin being received within said recesses for interlocking the trim collar thereto.

8. A hand tool for percussive use comprising a tool head having a striking surface, an axis of percussion extending through said head from said striking surface and a handle-receiving eye spaced from said striking surface and extending entirely through said head along an axis normal to the axis of percussion, said eye having an entrance end and an outer end; a reinforced fiber handle having a portion positioned within the eye a sufficient distance to intersect said axis of percussion and extending outwardly from the entrance end of the eye, said handle portion being free of direct contact with the tool head to provide an annular space extending fully around the handle and axially along the handle between the handle portion and the tool head; a preformed annular trim collar sealably interconnecting the handle and the tool head at the entrance end of the eye comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimension as the annular space and being disposed within the space to effectively seal the space at the

entrance end of the eye, said plug portion being of an insufficient length to extend through the axis of percussion and being held in position by a force fit interconnection with the tool head within the eye, said trim portion including an outwardly projecting shoulder for engaging the tool head adjacent the periphery of the eye at the entrance end thereof and a tapered exterior trim surface extending from the shoulder toward the handle; and an impact resistant resin disposed within said annular space at said axis of percussion for bondably joining said head, said handle and said trim collar said tool including wedge-shaped metal fillers, the eye in the tool head diverging toward the outer end thereof, the fillers having a greater taper than the gap defined by the handle portion and the eye whereby the innermost end of the fillers are spaced from the handle portion and the tool head and the resin is disposed therein.

9. A hand tool for percussive use comprising a tool head having a striking surface, an axis of percussion extending through said head from said striking surface and a handle-receiving eye spaced from said striking surface and extending entirely through said head along an axis normal to the axis of percussion, said eye having an entrance end and an outer end; a reinforced fiber handle having a portion positioned within the eye a sufficient distance to intersect said axis of percussion and extending outwardly from the entrance end of the eye,

said handle portion being free of direct contact with the tool head to provide an annular space extending fully around the handle and axially along the handle between the handle portion and the tool head; a pre-formed annular trim collar sealably interconnecting the handle and the tool head at the entrance end of the eye comprised of an exposed trim portion and a concealed plug portion having substantially the same cross-sectional dimension as the annular space and being disposed within the space to effective seal the space at the entrance end of the eye, said plug portion being of an insufficient length to extend through the axis of percussion and being held in position by a force fit interconnection with the tool head within the eye, said trim portion including an outwardly projecting shoulder for engaging the tool head adjacent the periphery of the eye at the entrance end thereof and a tapered exterior trim surface extending from the shoulder toward the handle; and an impact resistant resin disposed within said annular space at said axis of percussion for bondably joining said head, said handle and said trim collar said trim collar being a plastic material and being provided with laterally extending recesses adapted to assist in mechanically interlocking the trim collar within the eye of the tool head.

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