Oct. 5, 1954 C. B. LUNDSTROM 2,690,776

REINFORCED HAMMER HANDLE

Filed Feb. 28, 1951

Fig. 1

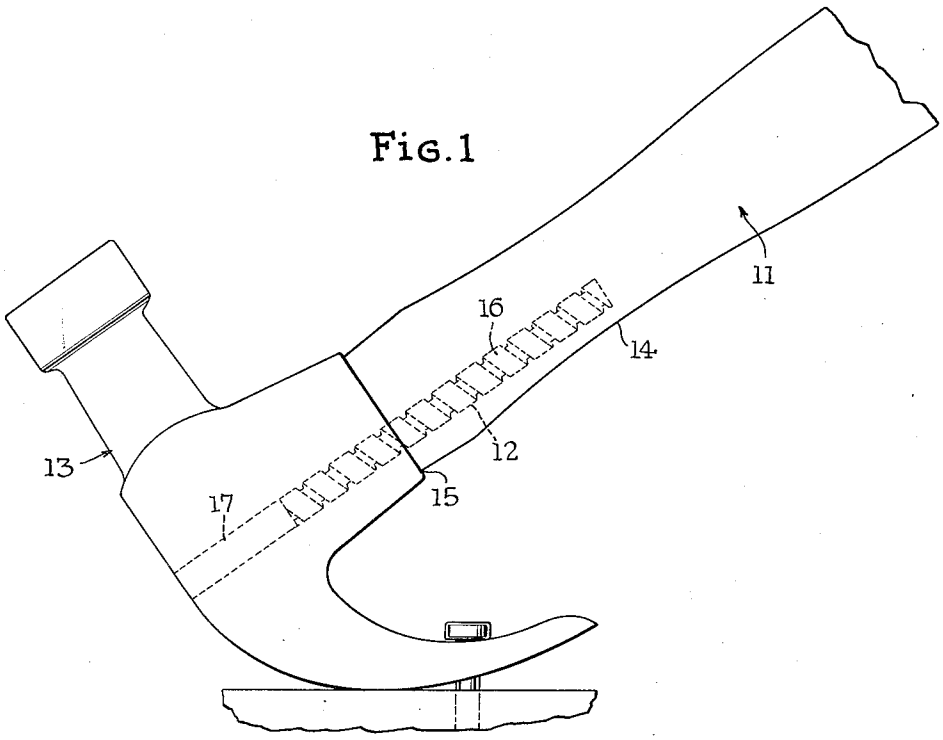


Fig. 2

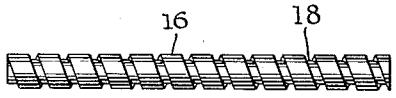


Fig. 3

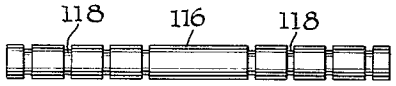


Fig. 4



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REINFORCED HAMMER HANDLE

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7 Claims. (Cl. 145—61)

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This invention relates to an improved wooden tool handle. Specifically it relates to a wooden handle having therein a longitudinal reinforcing member. The location of this member is so chosen that it serves to reinforce the handle in the zone where the tensile forces are at or near their maximum.

The principles of beam theory teach that the stresses set up in a beam which is subject to a static bending load change in character transversely of the beam from compression stresses to tensile stresses. Materials which are characterized by tensile and compression strengths which differ from one another may be reinforced to great advantage by reinforcing the material as used in the zone where the stresses are great and the natural strength is small. This principle is not ordinarily available where the beam is dynamically loaded. This invention applies the teaching of this principle to a wooden tool handle. The teaching of this principle is applicable because the maximum load although dynamic is uni-directional.

According to the invention a reinforcing member is secured in a longitudinal bore in a wooden tool handle. This bore is made in the region where the wood fibers are subjected to the maximum tensile stress during use of the tool. It has been found to be of prime importance that the reinforcing member be held securely against shifting and that the engagement is attained along as much of the surface of the member as possible. This engagement is achieved primarily through the use of surface irregularities on the cylindrical member which afford mechanical engagement between the parts.

The invention will be more clearly understood by reference to the accompanying drawings and to the written description relating thereto.

Fig. 1 is a side elevation of a carpenter's hammer embodying the invention.

Figs. 2, 3 and 4 show various forms of the reinforcing member which may be used in the practice of the invention.

Referring first to Fig. 1, a hammer is shown in the position in which it is used to pull nails. The handle is generally indicated by the numeral 11. The handle 11 is provided with a bore 12 which is parallel to the longitudinal axis of the oval handle, but is spaced therefrom along the major axis of the oval handle 11. This bore 12 extends from the outer end of the handle 11, which fits into the eye of the hammer head 13, through the shank portion 14. This bore could

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extend the entire length of the handle 11, but the usual points of failure are where the handle 11 enters the eye of the head 13 (indicated at 15) and in shank portion 14, therefore greater length of the bore is unnecessary.

In the form illustrated in Fig. 1, use is made of the reinforcing member 16 which is shown in Fig. 2. The diameter of the bore 12 corresponds to overall diameter of the member 16. The member 16 is driven into place, and the outer end of the bore 12 is closed by means of dowel 17. It will be noted that the member 16 is provided with a helically disposed groove 18.

After the member 16 and the dowel 17 have been driven into place, the handle 11 is compressed, at least in the region of the bore 12. This compression is preceded by a suitable plasticizing treatment, e. g. steaming, and causes a distortion of the wood fibers so that they fill the groove 18. It will be apparent that the member and the handle are thus mechanically engaged. It is essential that this mechanical engagement be effectively produced because the member 16 and handle 11 should be incapable of moving relatively to each other. This fixed relation of these parts assures that the tensile stresses will be in part carried by the member 16. It will be apparent that compression of the handle 11 causes the wood fibers adjacent the unrecessed portions of the reinforcing member 16 to be compacted so that they are present in a number per unit of area that is greater than the number per unit of area which is characteristic of the wood in its natural state. Wood having its fibers thus compacted is commonly referred to as densified and that term will be used in the appended claims.

It will also be apparent that the modified reinforcing members shown in Figs. 3 and 4 can be secured in place in the bore 12 in the same manner as the member 16. The member 116 shown in Fig. 3 is not as effective as the member 16 because the encircling grooves 118 and the localized distortion of the wood fibers result in a point of weakness. The modification shown in Fig. 4 is inferior to the member 16 because the flats 218 which afford the desired mechanical engagement, cause a greater distortion of the wood fibers than the modifications shown in Figs. 2 and 3. Nonetheless, satisfactory strength characteristics are achieved through the use of any of the modifications discussed above.

An even greater strength may be realized if an adhesive is used to bond the wood fibers to

the reinforcing member. The reinforcing members are commonly made of steel, although other metals, plastics and fabric cords may be used. Applicant has found that the steel members may advantageously be bonded by use of a liquid casein latex dispersion. Adhesives of this type are commercial articles and no claim is made to their composition. This type of adhesive is particularly desirable because it can be used cold or in hot presses. The use of an adhesive is optional and the invention is not limited to its use.

An example of a suitable method of compression is described and claimed in applicant's co-pending application Ser. No. 189,737 filed October 12, 1950, now abandoned, but the invention is not limited to use in conjunction with this particular method.

The reinforcing member, regardless of the particular modification selected, is encased within the handle. The purpose of this is to use all of the available surface to produce the desired mechanical engagement between the handle and the reinforcing member. It is important that the member be held securely and not be permitted to shift axially relatively to the handle. Any shifting of the relative positions of these parts is indicative of the fact that the reinforcing member is not carrying the stresses which it is intended to carry.

One of the important aspects of the invention is that its embodiment in a conventional tool handle does not materially change the weight or balance of the tool. While the illustrated embodiment shows the use of the invention in conjunction with a carpenter's hammer, it will be apparent that it may advantageously be used to reinforce the handles of other tools which are subject to severe bending stresses during use. It will be obvious also that other forms of the reinforcing member than those illustrated, might be used which would embody the underlying inventive concept herein set forth. No limitation to the precise forms illustrated is intended or implied, except as indicated by the appended claims.

I claim:

1. A reinforced wooden tool handle of oval cross-section subject to loading as a beam whereby flexure of said handle occurs substantially in a plane passing through the major axis of said cross-section, comprising in combination a wooden handle having a longitudinal bore therein, said bore being displaced from the neutral axis of said handle toward that side of the handle which is stressed in tension by said loading and a reinforcing member of greater tensile strength than the wood in said bore, said member having a recessed surface, the wood fibers of the handle adjacent the surface of said bore being densified adjacent the unrecessed portion of the member's surface and being displaced radially inward of said member into the recesses in said surface thus affording mechanical engagement between the member and the handle.

2. The combination defined in claim 1, the recessed portion of the surface being in the form of a spiral groove.

3. The combination defined in claim 1, the recessed portion of the surface being in the form of a spiral groove, and an adhesive to bond the surface of the member to the surface of the bore.

4. The combination defined in claim 1, the recessed portion of the surface being in the form of a plurality of annular grooves.

5. The combination defined in claim 1, the recessed portion of the surface being in the form of a plurality of annular grooves, and an adhesive to bond the surface of the member to the surface of the bore.

6. The combination defined in claim 1, the recessed portion of the surface being in the form of a plurality of indentations.

7. The combination defined in claim 1, the recessed portion of the surface being in the form of a plurality of indentations, and an adhesive to bond the surface of the member to the surface of the bore.

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