

Feb. 18, 1969

M. HILTI

3,428,169

FASTENER AND PACKAGE THEREFOR

Filed Oct. 12, 1964

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Fig. 1

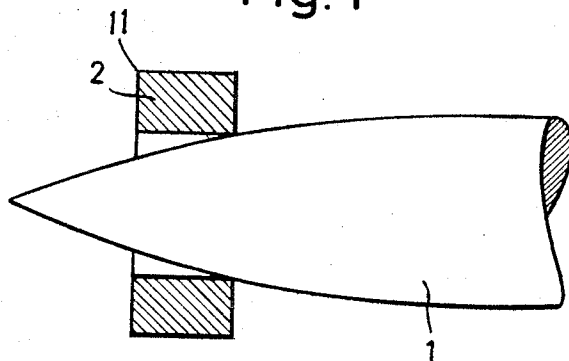


Fig. 2

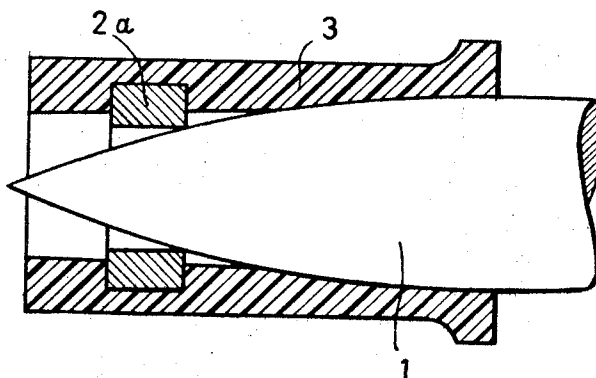
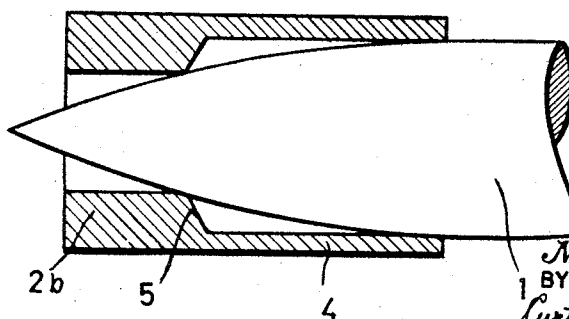


Fig. 3



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Fig. 4

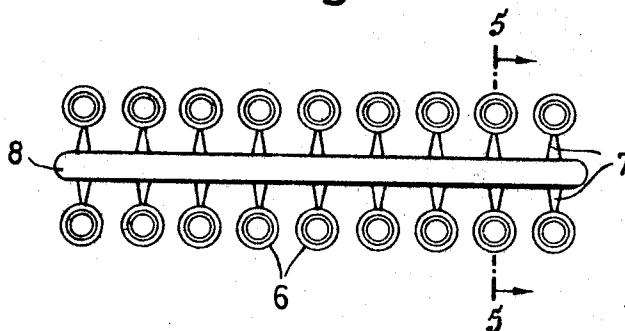


Fig. 5

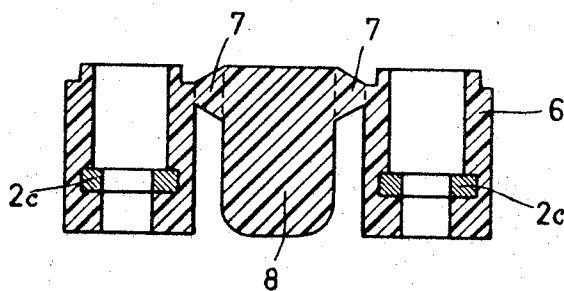
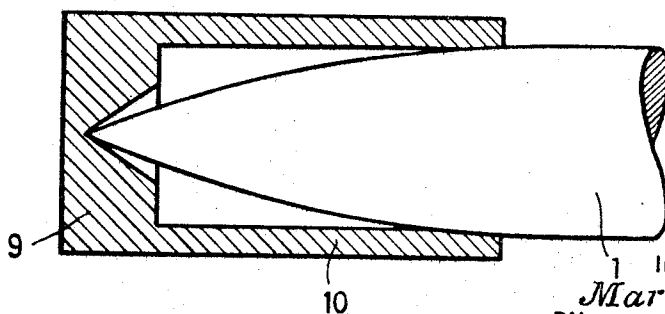


Fig. 6



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## FASTENER AND PACKAGE THEREFOR

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8 Claims

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### ABSTRACT OF THE DISCLOSURE

A fastening apparatus comprising a stud and a shearing ring for insertion into and through a fibrous material such as wood. The stud comprises an axially elongated shank portion and a pointed outwardly curved front end portion. The shearing ring is an annular-shaped member which fits onto the stud at its front end portion. When the stud is driven into a fibrous material, the shearing ring retains its position on its front end and shears through the fibrous material, however, when the stud strikes a hard material backing the fibrous material, it will be forced onto the shank portion of the stud and will burst.

This invention relates to fastening objects together by means of anchoring studs and the like. More in particular, this invention relates to improvements in making fastenings involving materials having a fibrous structure, e.g., wood.

It is known that when studs, nails or similar elements having a pointed end are driven into materials having a fibrous structure, there is a tendency for the material to be split or torn. This undesired result is due in part to the fact that fibrous structures have different mechanical or physical properties in different directions, and there is a tendency for the material to split along a direction having reduced strength.

In order to minimize the energy required to drive in studs, they generally are provided with bluntly-curved front ends having a somewhat oval shape, e.g., of the type sometimes referred to as an ogival point. However, experience has shown that the use of such points substantially increases the chance of cracking or splitting of materials having a fibrous structure. Thus there has existed for some time a serious problem in fastening to fibrous materials, and particularly in fastening fibrous materials to hard bases such as concrete or steel.

This problem has been solved in accordance with the present invention in a surprisingly simple and effective manner. In several illustrative embodiments of the invention to be described hereinbelow, there is provided on the ogival front-end region of the stud a sleeve-shaped metallic ring, the front annular end surface of which concentrically surrounds and is spaced from the tip region of the stud. It has been found that such a stud arrangement can be driven into materials of fibrous structure without the troublesome tearing and splitting ordinarily encountered. Moreover, such a stud arrangement is particularly advantageous when used to fasten fibrous material to a base of hard material such as concrete or steel. In the latter case, the sleeve ring bursts upon the initial penetration of the stud into the hard receiving material, and thus this ring does not interfere with the continued penetration of the stud into the hard material.

Accordingly, it is an object of this invention to provide improved means for fastening. A more specific object of this invention is to provide means for fastening to materials having a fibrous structure in such a way as to result in a lessened tendency to cause splitting or cracking of the fibrous material. Other objects, aspects and advantages of the present invention will in part be apparent from, and in part pointed out in, the following specifica-

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tion considered together with the accompanying drawings, in which:

FIGURE 1 shows an anchoring stud and shearing ring assembly in accordance with the present invention;

FIGURE 2 shows a shearing ring arrangement similar to that of FIGURE 1 but including a surrounding sleeve;

FIGURE 3 shows a modified stud and ring assembly;

FIGURE 4 shows a plurality of encased shearing rings carried on a plastic rod;

FIGURE 5 is a cross-sectional view taken along line 5—5 of FIGURE 4; and

FIGURE 6 shows an arrangement wherein the shearing ring is in the form of a closed cap mounted on the forward end of the stud.

Referring now to FIGURE 1, there is shown the front-end portion of a conventional steel anchoring stud 1. This front-end portion has an ogival contour, coming to a sharp point at the tip and smoothly joining the shank portion of the stud at the other end. This shank portion is conventionally cylindrical, but for certain applications may be slightly tapered, e.g., with a taper angle of one to two degrees, in accordance with the disclosure of copending application Ser. No. 271,520, filed on Apr. 8, 1963, now abandoned, by the present inventor.

Seated on the front-end portion of the stud 1 is a metal shearing ring 2 in the form of a rigid sleeve or hollow cylinder. The inner diameter of the ring is substantially smaller than the diameter of the stud shank, and the ring is held in place by the pressure of a force-fit against the ogival surface. The outer diameter of the shearing ring desirably is approximately the same as the diameter of the stud shank. Preferably, as shown, the shearing ring outer diameter is somewhat larger than the diameter of the stud shank. The outer edges of the shearing ring are developed in the form of a sharp corner, particularly the forward outer edge 11.

In its simplest form, the shearing ring for fastening with wood is a hollow cylinder the axial length of which is of the same order of magnitude as its outer diameter. Preferably, as shown in FIGURE 1, a shearing ring will be used in which the axial length of the cylinder corresponds approximately to its wall thickness, i.e., the distance between the inner and outer cylindrical surfaces.

The shearing ring is formed of a tough material, preferably hardened metal. The strength of the ring is sufficient that when it is driven into wood, it remains intact and fixed in position on the ogival front region of the anchoring stud. In effect, the shearing ring acts somewhat as a stamping device so that the fibrous material is not split by the ogival tip of the stud but is instead sheared off or punched out.

If the stud is being used to anchor the fibrous material to a hard receiving material, such as concrete, penetration of the stud into the hard material will force the ring back along the ogival front end of the stud, and this movement will cause the ring to burst. Thus, the stud can continue on unimpeded in its penetration into the hard material. Although such studs can be driven in by many known techniques, it is particularly advantageous to drive the stud in by thrust-piston tools in which the driving force is supplied by the propellant gas of an explosive charge.

FIGURE 2 shows a shearing ring 2a over which a plastic sleeve 3 has been sprayed. As before, the shearing ring is positioned on the ogival front-end region of the anchoring stud. It can be seen that the sprayed plastic grips the rear half of the ogival region. The plastic used should have sufficient elasticity at the temperatures of intended use. Thermoplastic materials have been found desirable.

FIGURE 3 shows a shearing ring arrangement wherein a relatively long metal sleeve 2b is placed on the front

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end of the anchoring stud, to act in much the same manner as the shorter rings of FIGURES 1 and 2. The interior of this sleeve ring 2b is stepped so as to form an annular shoulder 5 the inwardly facing edge of which engages the stud. The rearward extension 4 of the sleeve also engages the stud in the region near the shank, thereby holding the ring in two axially separated positions.

As shown in FIGURES 4 and 5, a group of shearing rings 2c can be supplied to the customer mounted on a plastic rod 8 for the purpose of facilitating handling. Wrapped or sprayed around each individual ring is a coaxial plastic sleeve 6 which is connected by a narrow and easily-broken arm 7 to the plastic rod 8. In use, the tip of the anchoring stud is pressed into the larger opening of the sleeve until the front end portion is engaged with the ring 2c. Then the completed stud assembly is removed from the rod 8 by breaking the arm 7, and the anchoring stud driven into the fibrous material with the shearing ring fixed in position.

FIGURE 6 shows a shearing ring arrangement in the form of a metal cap 9 which is twisted onto the front-end portion of the anchoring stud 1. The cylindrical part 10 of the cap clamps onto the ogival region of the stud, very near to the stud shank. Relatively soft materials, such as wood, are readily punched through by the shearing cap which remains intact and in position on the front end of the stud. Upon striking against a base of hard material, however, the tip of the stud passes through the front wall of the cap and penetrates into the hard material. The cap thus shifts back towards the shank of the stud, and generally bursts.

Although several preferred embodiments of the invention have been set forth in detail, it is desired to emphasize that these are not intended to be exhaustive or necessarily limitative; on the contrary, the showing herein is for the purpose of illustrating the invention and thus enable others skilled in the art to adapt the invention in such ways as meet the requirements of particular applications, it being understood that various modifications may be made without departing from the scope of the invention as limited by the prior art.

I claim:

1. An anchoring stud assembly comprising a stud and a shearing ring member, said stud having an axially extending shank portion and a pointed curved front-end portion extending axially from one end of said shank, said shearing ring member positioned on the front-end portion of said stud and having a leading surface directed away from said shank portion and a trailing surface directed toward said shank portion, said ring having an inner diameter substantially less than the diameter of said shank whereby said ring contacts the front-end portion of said stud at the inner edge of said trailing surface, said ring member having an outer diameter approximately the same as the diameter of the shank, said ring formed of a relatively tough material sufficient

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to cut through a fibrous material without being deformed and having a sharp corner at the outer edge of the leading surface whereby when said stud is driven into fibrous material said ring maintains its position on the stud and shears through the fibrous material.

2. A stud assembly in accordance with claim 1, wherein said ring member is formed of metal.

3. A stud assembly in accordance with claim 1, wherein the inner surface of the ring is stepped to provide engagement between said ring and said front-end portion in two axially-separated positions.

4. A stud assembly in accordance with claim 1, wherein said ring member is surrounded by a plastic sleeve.

5. A stud assembly in accordance with claim 1, wherein the leading surface of said ring member includes a front wall extending over the tip of the stud to form a cap enclosure.

6. A stud assembly in accordance with claim 1, wherein the leading surface of said ring member concentrically surrounds and is spaced at its inner edge from the immediately adjacent region of said front-end portion.

7. In a stud assembly as set forth in claim 1, a packaging means for said shearing rings comprising, in combination, an elongated member, a plurality of easily-broken arms secured at spaced positions along said elongated member, and a plurality of sleeves fastened to the outer ends of said arms, each of said sleeves carrying within it one of said shearing rings.

8. In a stud assembly as set forth in claim 7, wherein said elongated member, said arms and said sleeves are all formed of plastic, each shearing ring being coaxially mounted within its sleeve.

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CHARLIE T. MOON, *Primary Examiner*.

U.S. Cl. X.R.

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