

Feb. 27, 1968

J. J. JAMES
WOOD FASTENER

3,370,631

Filed May 17, 1965

2 Sheets-Sheet 1

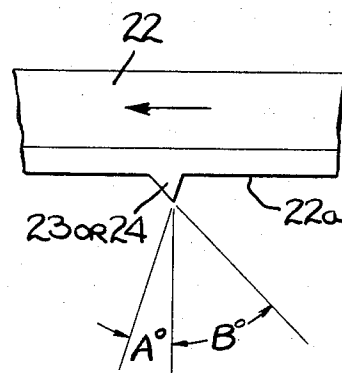
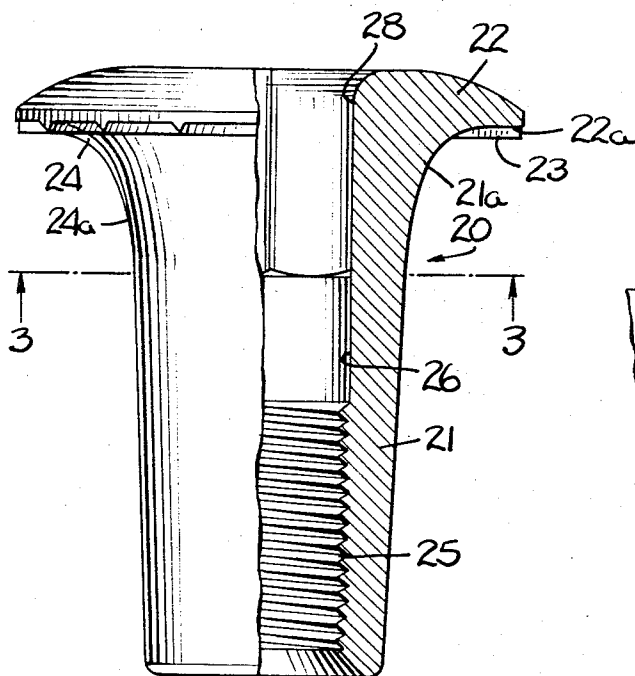
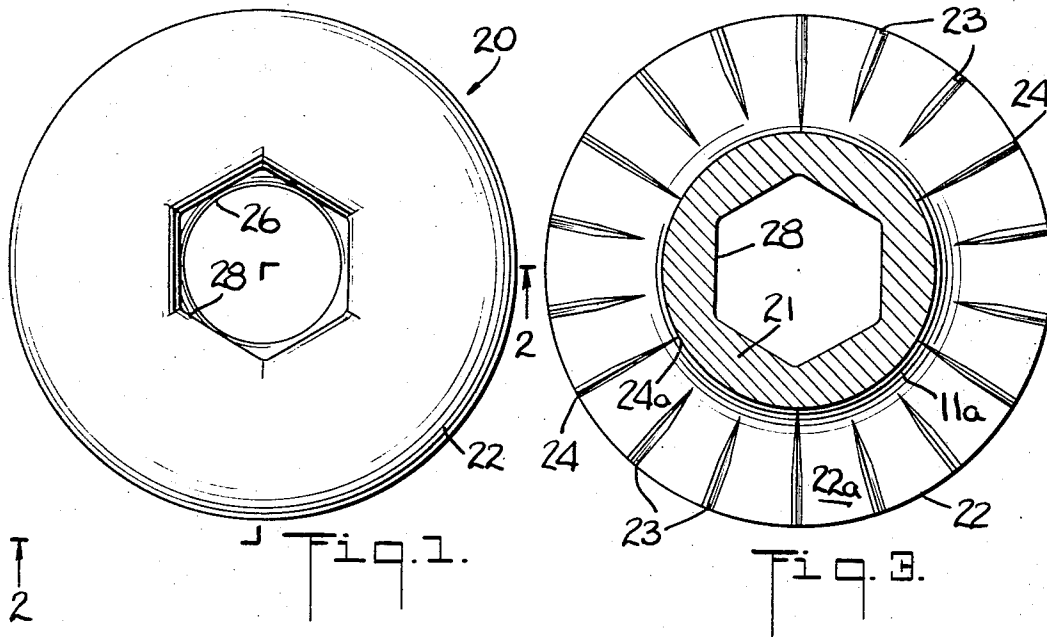


Fig. 2.

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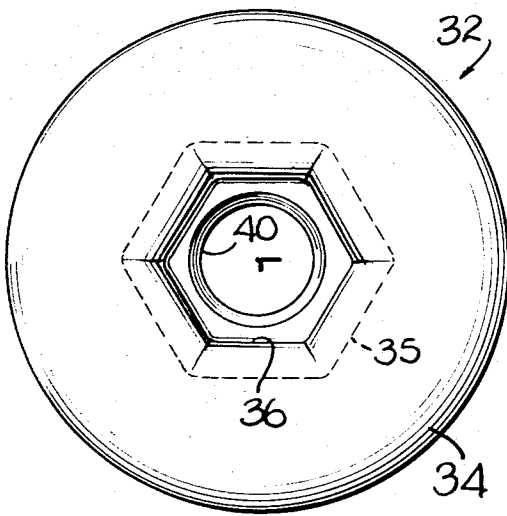
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Fig. 5.

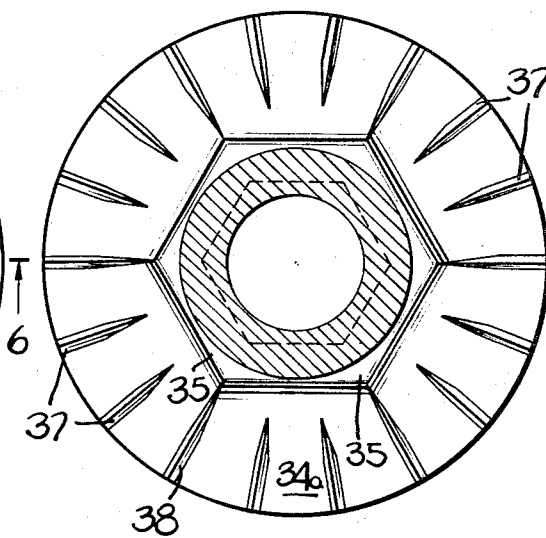
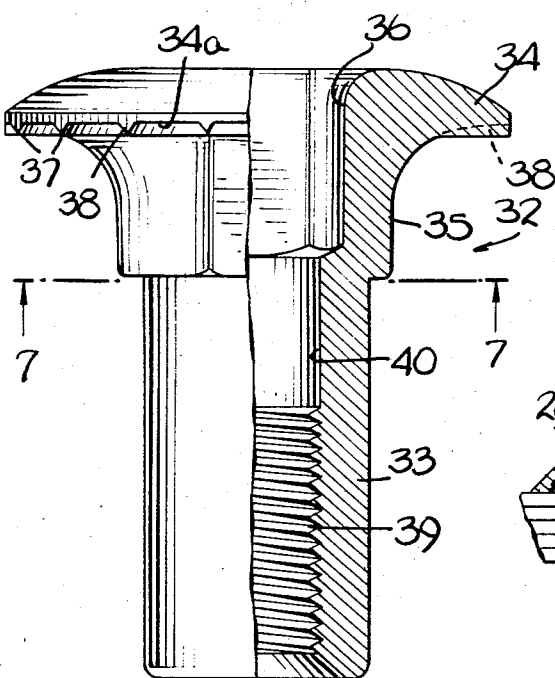


Fig. 7.



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Fig. 6.

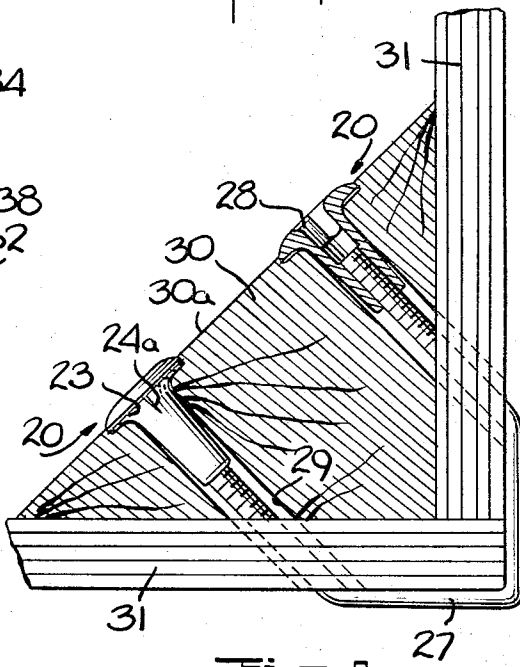


Fig. 8.

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3,370,631

WOOD FASTENER

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Filed May 17, 1965, Ser. No. 456,197

3 Claims. (Cl. 151—37)

This invention relates to a threaded wood fastener and more particularly to a threaded wood fastener which can imbed itself in the surface of the wooden member in which it is mounted.

In securing together wooden structures such as crates and shipping containers, it has been common practice to employ wood fasteners having a comparatively wide flat head portion for engaging one surface of the wooden structure and a comparatively narrow shank body portion adapted to be threadedly engaged with another fastening device. For example, such wood fasteners have been provided with internally threaded bodies adapted to engage the threads of bolts, screws, U-bolts, etc.

Experience has shown that the wide flat head having a substantially square peripheral edge in section distributes the compressive load applied to the surface of the wood and protects it from excessive crushing. However, the wide flat head can rotate with respect to the wood surface during installation of the bolt. To prevent this, certain wood fasteners have been provided which utilize stamped raised portions on the surface of the head which engages the wood surface to increase the frictional engagement of the fastener with the wood structure.

Whether the fastener with a wide flat head includes the raised portions or not, the head remains substantially above the surface during installation. As a result the flat head with its square edges as viewed in section provides a substantial projection extending from the surface of the wood. Where such a fastener is disposed upon the inner surface of a crate or a container, the projecting head can cause damage to the contents.

When wood fasteners of the type under discussion are installed, it is often necessary to drive the fastener by rotating it, rather than driving the member which is to engage the fastener. An example of this is the engagement of fasteners with the threaded legs of a U-bolt. Prior fasteners have included drive of wrench socket openings extending from the wide flat head into the body with the geometrical form of the opening extending to the outer surface of the body adjacent to the head. Where the fastener is to be installed in a drilled hole or be driven while inserted in a drilled hole, the socket form at the external surface of the body can interfere with insertion and the driving of the fastener.

It is therefore an object of the invention to provide a wood fastener having a head which merely projects to a limited extent beyond the adjacent surface of the wood.

It is another object of the invention to provide a wood fastener having a head which is formed to reduce interference with objects adjacent to it.

It is still another object of the invention to provide a wood fastener having a head conditioned to facilitate imbedded engagement thereof with the surface of the wood.

It is an additional object of the invention to provide a wood fastener having a head conditioned to enter the surface of the wood as the fastener is driven.

It is a further object of the invention to provide a wood fastener having a body with an external form to facilitate insertion and rotation in a hole extending into the wooden surface.

In the embodiment of the invention, the fastener includes a body portion having a substantially circular transverse cross-section. The head portion of the fastener

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extends radially outwardly from the body portion adjacent one end thereof. The radially extending surface of the head portion facing toward the body portion has radially extending teeth projecting therefrom for engaging the surface adjacent to an opening in which the fastener is inserted.

In another embodiment of the invention the body portion is substantially tulip-shaped with a flared end and a narrow end. The head portion overlies the flared end.

In still another embodiment of the invention the head portion is rounded in order to eliminate any interference or injury to objects adjacent to it.

In an additional embodiment of the invention, the teeth are adapted to secure the fastener after installation and also to counter-sink the surface of the member into which the fastener is installed.

Other features and advantages of this invention will become more apparent in the description which follows below when taken in connection with the drawings, which are as follows:

FIG. 1 is a plane view of the preferred embodiment of the invention;

FIG. 2 is a fragmentary vertical section view taken along line 2—2 in FIG. 1 and showing the substantially smooth cylindrical form of the body portion of the fastener.

FIG. 3 is a horizontal section view taken along the line 3—3 in FIG. 2 and showing the teeth of the head portion of the fastener;

FIG. 4 is a fragmentary side elevation view of one of the wedge-shaped teeth of the head portion;

FIG. 5 is a plane view of another embodiment of the fastener;

FIG. 6 is a fragmentary vertical section view taken along the line 6—6 in FIG. 5;

FIG. 7 is a horizontal section view taken along the line 7—7 in FIG. 6; and

FIG. 8 is a horizontal section view of the fastener of the invention engaged with a U-bolt extending through the corner portion of a structure being secured thereby.

The present invention comprises fastener 20 (FIGS. 1-3) having body portion or body 21 and a head portion or head 22 extending radially outwardly from the longitudinal axis of the body adjacent one end thereof. As shown in FIGS. 2 and 3, the body has a circular transverse cross-section which is progressively flared outwardly from the longitudinal axis of the body to form tulip-shaped portion 21a which connects the body to the head.

Surface 22a of head 22 (FIGS. 2 and 3) is provided with a plurality of pairs of teeth 23 which extend radially with respect to the head. Teeth 23 are blended into a terminal at the end of the tulip-shaped portion where it joins surface 22a of the head. In addition between the pairs of teeth 23, the head is also provided with teeth 24 which extend across surface 22a and then across tulip-shaped portion 21a. Inner ends 24a of teeth 24 are blended into the tulip-shaped portion.

As shown in FIGS. 2 and 3, fastener 20 is provided with threads 25 which extend along the surface of cavity 26. The threads are adapted during installation to engage a threaded member such as the threaded end portion of U-bolt 27.

When the fastener is used with a threaded member, such as U-bolt 27, it can be necessary to rotate or drive fastener 20 with respect to the threaded ends of the U-bolt. In order to accomplish this, socket 28 is provided within head 22. The transverse cross-section of the socket is of a form suitable to engage a conventional wrench key or driver. As shown in FIG. 2, the provision of tulip-shaped portion 21a results in the wall thickness of body 21 gradually increasing toward the head so that the body has its greatest thickness in the vicinity of socket 28. Thus

the fastener is capable of withstanding the torque applied to sockets 28 by the driving tool.

As shown in FIG. 8, the circular cross-section of fastener 20, in conjunction with its progressively flared body, that is the tulip-shaped portion, facilitates the insertion of the fastener into hole 29 into a member, such as wooden corner brace 30 of a crate or shipping container 31. Thus even where hole 29 closely fits body 21 of the fastener, it can be easily inserted into the hole and engaged with the threaded end portion of U-bolt 27.

With the driving tool inserted into socket 28, fastener 20 can be rotated within hole 29 and threaded onto the end portion of the U-bolt. The flared construction of the body facilitates the gradual entrance of the fastener into the hole. As surface 22a of head 22 approaches surface 30a of the corner brace, teeth 24 advance into hole 29 and are adapted to mill or abrade away the wall of the hole. Subsequently the portions of teeth 23 and 24 which extend along surface 22a of the head come in contact with surface 30a of the corner brace. Again the teeth are adapted to mill or abrade the surface so that the fastener, as it is rotated, can operate in the manner of a countersinking tool. As a result, head 22 can come to rest after installation with surface 22a or at least teeth 23 and 24 imbedded in surface 30a of the brace.

During this phase of installation, the flared form of the body by providing increased thickness in the tulip-shaped portion 21a enables the fastener, especially in the body portion, to withstand the driving torque applied to cavity 28 and subsequently to withstand the tensile loads applied to the body in the region between the threads engaged to the U-bolt and head 22. Thus the flared section prevents stress concentrations in the transition of tensile forces from the body to the head.

Teeth 23 and 24 are wedge-shaped as shown in FIG. 4. Engagement of the teeth with the surface adjacent to the hole in which the fastener is being inserted, during rotation or driving of the fastener, enables the teeth to mill or countersink the surface so that the head of the fastener is at least partially imbedded into the surface. This causes the degree of projection of the head above the surface to be reduced and thereby reduces interference between head 22 with objects which are to be packed in the crate or container. In order to further prevent the possibility of injury to the objects placed adjacent to head 22, the head as shown in FIG. 2 is rounded from its outer periphery toward socket 28. As a result, the top portion of head 22 is substantially in the form of a portion of a toroid. Consequently when the fastener is installed and partially recessed into the surface adjacent to it, the rounded head is presented to the interior of the crate or container.

As shown in FIG. 4, the wedge-shaped section of teeth 23 and 24 is inclined with respect to surface 22a in a direction opposite to that of the rotation of the fastener during installation. The direction of rotation in relation to the inclination of the teeth is represented by an arrow in FIG. 4. Where threads 25 are right-hand threads requiring right-hand or clockwise rotation of the fastener during installation, the teeth are inclined in a leftward or a counterclockwise direction which is opposite to the direction of rotation of the fastener during the driving operation. An advantage of this inclined relationship is that once the fastener is installed, the surface of the tooth defined by angle A in FIG. 4 can serve as an abutment member which prevents rotation of the fastener in a direction opposite to that of its original driving. Therefore the surface defined by angle B encounters the surface adjacent to the hole in which the fastener is inserted during the driving of the fastener, and subsequently the surface defined by angle A jams the fastener from accidentally unthreading or loosening.

Fastener 20 can be conveniently manufactured by die-casting the fastener from zinc alloy. The flared form of the body, the rounded form of the head, and the substan-

tial elimination of corners except in socket 28 and adjacent to teeth 23 and 24, simplifies the die casting operation. In addition to enabling the fastener to be manufactured in the mass production and economical technique of die-casting, the use of a zinc alloy results in the fastener being substantially corrosion resistant.

In the embodiment of FIG. 7, the fastener 32 includes body portion or body 33 and head portion or head 34. In fastener 32, body 33 is connected to head 34 by collar 35 which forms socket 36, which is adapted to receive the wrench or driving tool. In order to maintain a sufficient wall thickness about socket 36, the outer surface of collar 35 substantially corresponds to the form of socket 36, such as a hexagon, as shown in FIGS. 5 and 6. As shown in FIG. 7, wedge-shaped teeth 37 are disposed in pairs which extend partway from the periphery of the head to collar 35. Between the pairs of teeth 37 there is provided teeth 38 which extend to the corner portions of the polygonal figure of collar 35. Similarly as with respect to the fastener 20, fastener 32 is provided with threads 39 which extend into cavity 40 adjacent to collar 35. Upon the installation of fastener 32, the countersinking and the locking action is confined to that of teeth 37 and 38 which extend across surface 34a of the head.

What is claimed is:

1. A threaded fastener comprising a hollow body portion being threaded at one end portion thereof and having a circular transverse cross-section with a substantially smooth external surface through the length thereof, a head portion extended radially outwardly from the longitudinal axis of said body portion adjacent the opposite end thereof, said head portion having an annular surface facing toward said body portion and disposed substantially in a plane extending at right angles to said longitudinal axis, said annular surface extending from the periphery of said head portion to adjacent said body portion, the other surface of said head portion opposite said annular surface and said body portion adjacent thereto having a wrench opening centrally disposed therein and being rounded from the periphery of said head portion toward said opening, said body portion adjacent the other end portion thereof being progressively flared outwardly from said longitudinal axis thereof to blend into said annular surface of said head portion, said annular surface having elongated teeth projecting therefrom, the length of said teeth extending radially across said annular surface, at least some of said teeth extending beyond said annular surface to said flared body portion adjacent thereto, said teeth being adapted to countersink and subsequently engage the surface adjacent to an opening in which the fastener is inserted.

2. A threaded fastener as set forth in claim 1 wherein said body portion is tulip-shaped.

3. A threaded fastener as set forth in claim 1 wherein said teeth are directed in a direction opposite to the direction of the threading in said hollow body portion.

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