Feb. 3, 1953 G. E. JENNEY, JR., ET AL 2,627,192

PROCESS OF MAKING DRIVER BITS

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Fig. 1.

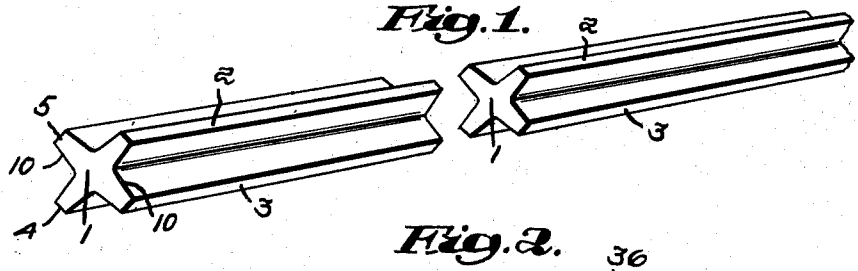


Fig. 2.

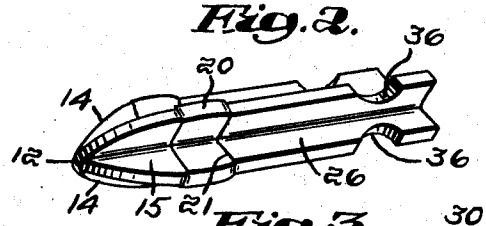


Fig. 3.

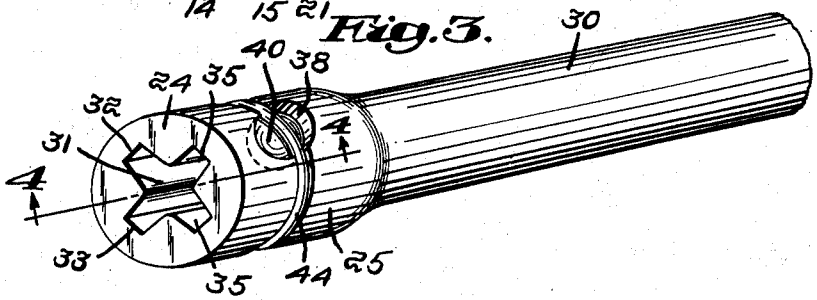


Fig. 4.

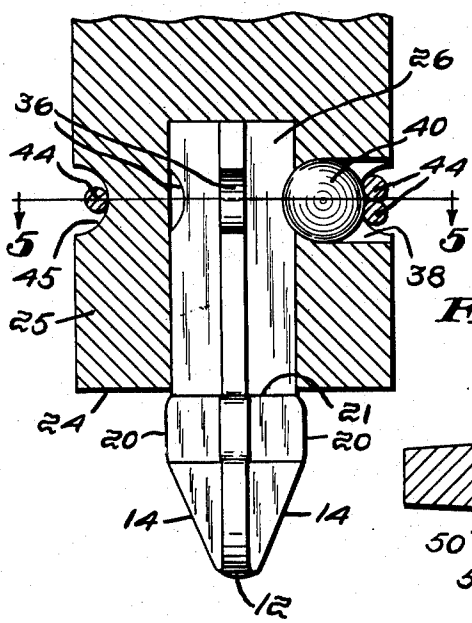


Fig. 5.

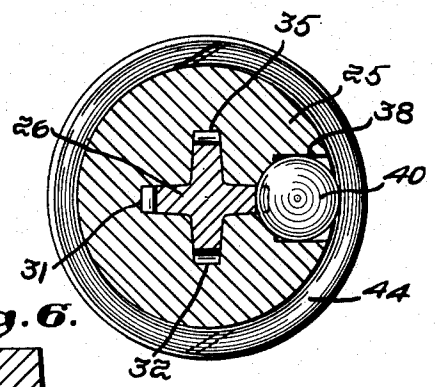
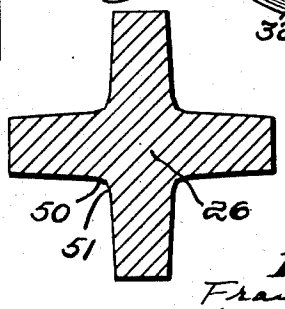


Fig. 6.



Inventors:
Frank K. Brown
Harvey F. Phippard Jr.
George E. Jenney Jr.
James R. Hoddevik

by

Attorney

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PROCESS OF MAKING DRIVER BITS

George E. Jenney, Jr., North Dartmouth, and Harvey F. Phipard, Jr., and Frank K. Brown, South Dartmouth, Mass., assignors to Research Engineering & Manufacturing, Inc., New Bedford, Mass.

Application September 25, 1950, Serial No. 186,642

1 Claim. (Cl. 76—101)

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Our present invention is directed to improve driver bits, or the like, for use in connection with recessed head screws, and is a continuation-in-part of our prior application Ser. No. 37,848 filed July 9, 1948, allowed September 22, 1949, now abandoned and re-filed as Ser. No. 143,424, filed February 10, 1950, now Patent No. 2,550,635, dated April 24, 1951.

The present development and general use of screws, bolts, or the like having a recessed or rocketed head within the periphery of the area of the head requires a special type of driver or bit to fit the recess in the head of the screw and effect the turning and driving. Such recessed head fasteners are usually made with four wings or flutes opening into the central area and are made with various forms of inner contour in the recesses to wedgingly cooperate with the correspondingly formed driver. Where there are four side wings, the driver, accordingly, must have four ribs, both thus being in cruciform contour, and the central part is pointed or appropriately formed to also fit and center the driver and recess into interlocking engagement.

However, great difficulty has heretofore been found in making such drivers to accurately fit the recessed heads of the fastener and to also stand up under the torque and strain involved—especially in machine-driven bits, particularly as the driving strain is exerted on the tip portion of the driver.

Also as these wings and ribs, as well as a portion of the entering point, are usually on a bevel or slant—in order to effect the wedging of the driver and recessed head together—the subsequent driving torque tends to make the driver "jump out" of the recessed head and to burr or damage both the head of the screw and the contour of the driving bit.

Therefore, it has proven to be of vital importance to have a driver and recess in accurate, close, and tight-fitting relation. Also, different-sized bits must be provided for different-sized recessed heads, and the difficulties involved in making such driving bits by ordinary methods have presented a serious problem.

Ordinarily, it has heretofore been customary to mill out or grind a driver into an appropriate cruciform contour to fit the recessed head fastener with which it is intended to be used. But such grinding or milling has resulted in two very serious difficulties. First, the contour of the wings and pointed portion of the driver was non-symmetrical and hence prevented an accurate fitting in the recessed head of the fastener. Secondly, the

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grinding and milling operations necessarily weakened the stock from which the driver was made and presented a relatively rough and weakened surface, which would not fit accurately and would wear quickly into a non-fitting contour to such an extent that the bit had to be quickly discarded. It will be appreciated that any grinding or milling action on metal tends to weaken the fibers of the metal during such action, and under microscopic examination presents a most unsatisfactory contacting surface, as well as weakening the strength of the metal itself.

It has also been proposed to make such driver bits by starting with a normally cruciform contour of stock, cutting the same off in sections and grinding the point and sides or ribs. But such a process has also been unsatisfactory, and bits so made were not only relatively expensive to manufacture but were quickly worn, disfigured, and discarded. As soon as such a bit is worn, it fails to fit snugly and accurately the recessed head fastener with which it is employed and, hence, becomes unsatisfactory in that it fails in the wedging action as well as tending to "jump out," burr the rims of the recessed head, and its own ribs and point.

Our present invention is directed to obviate the difficulties briefly outlined and by a new and novel process to form driver bits for recessed head fasteners with perfect accuracy, uniform dimensions in the series of ribs and point desired, while automatically increasing the surface strength of the metal of the bit which is to be in contact with the recessed head and thru which the driving torque is transmitted.

Thus, we are enabled to produce a more satisfactory and long-wearing bit and by a simple and inexpensive operation.

In carrying out our invention, we start with a round or square stock—preferably round—having an outer diameter equal to or slightly greater than that of the ribs intended to be formed therefrom.

Thereupon, we subject such stock to a series of cold-drawing operations which will result in lengthening the stock to the extent of three or four times its original length as it is drawn thru the successive dies into the final cruciform contour desired, and simultaneously compacting, solidifying, smoothing, and strengthening the surface fibers in the metal stock during this cold-forging action of drawing the stock thru successive dies. This cold-forging operation necessarily greatly strengthens the wear-resistance to the rib elements of the bit as well as giving a smooth, fin-

ished, and streamlining surface to the fibers of the metal.

With the stock thus prepared by this cold-forging action, we then complete the final contour and pointing of the bit by a coining operation in the press, thereby still further compacting, solidifying, and cold-forging the point itself. Such a coining operation is preferably performed by the same kind of die that is used to make the punch or header tool to form the recess in the head of the fasteners. This is necessary because the dimensions of the driver and the recess are different and, therefore, the male master tool used for forming the die for the production of the punch which makes the recess is different in dimension from the male punch and the female die made from it used in forming the screwdriver point.

Thus great numbers of bits can be made to identical dimensions by coining because relatively a very small amount of stock is moved or re-formed. Large numbers of identical pieces are not possible in milling or grinding because of tool wear, the tool being a milling cutter or a grinding tool. In addition, if extreme care is used to get perfect indexing of the wings of the driver in the coining die, all coined drivers will be perfectly symmetrical and perfectly indexed. However, this degree of care cannot economically be exercised in milling or grinding any quantity of pieces so that milled or ground bits are not accurately indexed and symmetrically formed.

Thus our improved driver bit so made has a long life because of accurate fitting, and prevents the danger of wearing, burring, "jumping out," and damaging both its ribs and the wings or top of the recessed fastener to which it is applied.

A microscopic examination of the cold-forged surface and the further compacting and solidifying of the point by the heading and swaging operation shows the fibers in smooth, firm, streamlined relation and is most important in accomplishing the desirable result obtained by our process and, in effect, produces a novel wear-resisting construction of driver.

Referring to the drawings:

Fig. 1 is a perspective view of the blank stock after being subjected to the drawing action to produce the cruciform contour;

Fig. 2 is a perspective view after the coining operation and when a prepared length of the cruciform stock has been cut off to form the driving bit;

Fig. 3 is a perspective view of a holder substantially like that illustrated in our said Patent No. 2,550,635;

Fig. 4 is an enlarged cross-sectional view on the line 4—4 of Fig. 3, and

Fig. 5 is a cross-sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a cross-sectional view showing flat surfaces in the base of each flute, which are desirable for driving contact with certain types of recessed head fasteners.

The bit made by our present process may be provided with any suitable length of shank either to be removably attached to a brace or machine-driven spindle, as illustrated in Fig. 3, or to a hand screwdriver, as shown in our co-pending design application Ser. No. D. 11,744, filed August 12, 1950, and may be molded or soldered to solid shanks.

As above explained, we preferably employ round stock with an outer diameter substantially equal to or slightly greater than that of the extreme diameter of the cruciform ribs when it has gone thru the successive drawing dies, the drawing action lengthening the stock to the extent of three or even four times the original length, viz. 300% to 400%, and meanwhile compacting, smoothing, streamlining cold-forging the surface of the ribs as well as strengthening the center. This drawing action also forms the desired bevel or wedging surface on each side of the ribs, or wings, as indicated at 10—10.

Thereupon, the blanks are cut off, grooved and chamfered at the back end as shown at 1, with the ribs 2, 3, 4, and 5 ready to be fitted in a heading press or machine for the pointing by a coining action. We may then treat, coat, or plate the point portion with a suitable lubricant such as lead, copper, cadmium, silver, tin, or the like. After the coining operation, the bits are heat-treated, case-hardened, and tempered.

We may also desire to form the base of each flute with straight flat portions lengthwise of the point or of the entire bit, as shown in Fig. 6, at 50 and 51. This is important, as in many types of recessed head screws it is such bottom or flat surfaces which first contact with the point portion of the driver and, therefore, constitutes the actual driving and wedging elements.

Also, the coining action may extend the ribs slightly, as shown at 20—20, in order to give a shoulder 21 which is spaced from the face 24 of a holder 25, and the end thrust is exerted on the end of the bit.

Any suitable holder may be utilized, such as herein shown for illustrative purposes, comprising the shank 30 with the head 25 recessed, as shown at 31, said recess also having a cruciform contour corresponding in number and area to that of the ribs 2, 3, 4, and 5, as indicated at 32, 33, 34, and 35. Such recess, however, is preferably of a slightly greater depth than the height of the ribs so that the same may be readily fitted in and removed therefrom, the cruciform contour of both the ribs in the bit and the corresponding side openings in the recesses, affording a driving interlocking action.

To unite the bit and holder together, any suitable means may be employed as a pin, rivet, stud, or the like, but preferably we utilize a spring-locking arrangement as shown. For this purpose, a series of notches or grooves are formed in the shank portion 26, as indicated at 36—36, and at one side of the holder 25 is an opening 38 to receive a locking ball 40 of appropriate diameter to register with said notches 36, said ball being held yieldingly in locking engagement in the shank by an encircling spring 44 fitted in the peripheral groove 45 substantially as shown in Figs. 4 and 5.

Thus the bit is removably held in assembled position in the holder, the locking ball 40 being yieldingly forced into any of the notches 36 which may register therewith when the bit is fitted in the recess 31 in the holder, and permits the holder to be readily removed, the withdrawal of the bit forcing the locking ball out of the notches against the tension of the encircling spring 44, as will be readily understood. The end of the bit takes the driving thrust and the interlocking ribs and recesses transmit the driving torque from the driver to the fastener, while the cold-forged metal of the driver affords a wear-resisting compact surface between the driver and fastener, insuring a perfect fit and a long life to the bit.

We claim:

The herein described process of making driver bits of pointed cruciform contour for wedging driving connection with recessed head fasteners

having a cooperating recess of substantially similar contour, which consists in preparing round stock of slightly greater diameter than the extreme diameter of the cruciform rib construction of the driver, subjecting said round stock to a cold-forging operation which consists in successive drawing actions until said stock is drawn to an increased length of approximately 300% of the original length, said successive drawing dies simultaneously conforming the faces of the ribs into predetermined final finished bevelled contour during the compacting, smoothing, streamlining and cold-forging action of said drawing operations on the stock, and thereupon coating the pointed portion with a lubricant and completing the pointing formation of one end of the cruciform stock so formed by a heading press constituting a coining action, and subsequently subjecting the bits to a heat-treating, case-hardening, and tempering operation, the completed

bit being so formed independently of milling, trimming, cutting, or grinding operations.

GEORGE E. JENNEY, JR.
HARVEY F. PHIPARD, JR.
FRANK K. BROWN.

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