

Dec. 11, 1945.

L. A. SMITH

2,390,744

DRILLING AND COUNTERSINKING TOOL

Filed Dec. 23, 1942

Fig. 1.

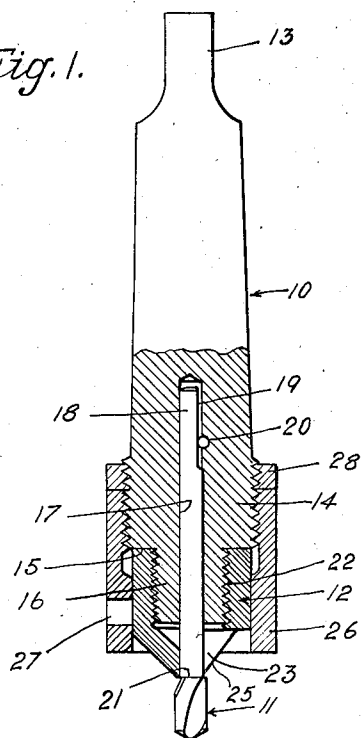


Fig. 3.

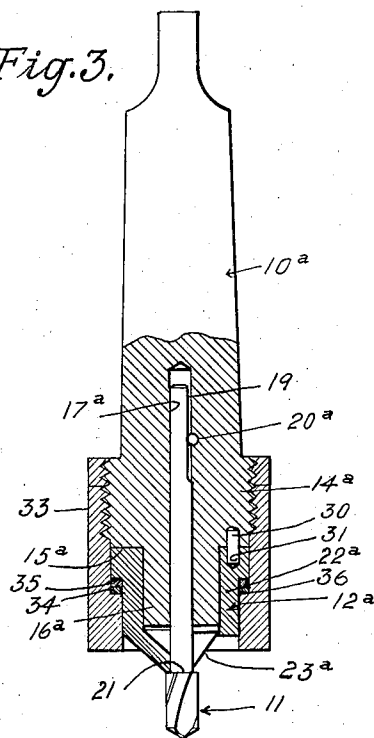
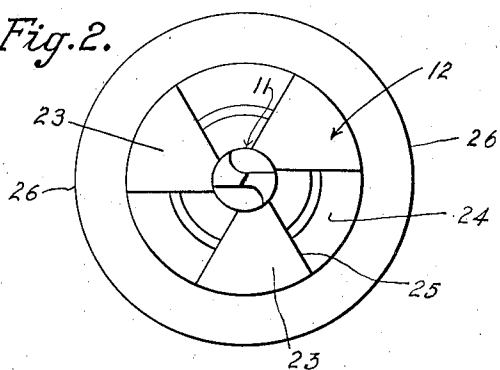


Fig. 2.



Inventor
Lawson A. Smith
by *V. H. Hapwell*
Attorney

UNITED STATES PATENT OFFICE

2,390,744

DRILLING AND COUNTERSINKING TOOL

Lawson A. Smith, Los Angeles, Calif., assignor
to Robert H. Clark, Los Angeles, Calif.

Application December 23, 1942, Serial No. 469,860

7 Claims. (Cl. 77—66)

This invention relates to tools and relates more particularly to a combination drilling and countersinking tool. A general object of this invention is to provide a simple, practical and particularly effective tool operable to drill an opening or bore and form a counterbore or countersink in the same operation.

In many structures and devices it is necessary to provide openings for the reception of screws, bolts, etc. and to form depressions or countersinks at the mouths of such openings to receive the heads of the screws or bolts. In providing such openings it has been the general practice to drill the opening in one operation and then form the countersink or depression in a separate operation and with a separate tool. This has necessitated the provision and maintenance of separate drilling and countersinking tools and the carrying on of two distinct series of operations.

Another object of this invention is to provide a single tool that serves to dependably support a drill of the selected type and size for drilling an opening or bore and that also carries or is provided with means for countersinking at the mouth of the bore upon the completion of the bore and in the self-same operation. In employing the tool of the present invention an opening or bore and a countersink may be formed in rapid succession in one operation.

Another object of this invention is to provide a tool of the character mentioned in which the countersink means is readily removable so that it may be sharpened or replaced by a countersink means designed to form a counterbore or countersink of different diameter or configuration.

Another object of this invention is to provide a tool of the character referred to in which the countersink means is in the form of a simple unit that is readily installed, replaced and sharpened.

Another and important object of this invention is to provide a tool of the character referred to whose body is in the nature of an adapter, socket or holder adapted to be inserted in the spindle of a drilling machine or the like, and capable of removably supporting a drill for operation thereby, which body also serves to carry a simple effective means for countersinking. Considered in one light the device of the present invention is in the nature of a socket or drill holder embodying a countersink.

Another object of this invention is to provide a tool of the character mentioned in which the

countersink means presents cutting edges which extend inwardly to the drill, leaving no gap or space in which cuttings can collect and preventing the formation of a burr around the drilled bore.

A further object of this invention is to provide a drilling and countersinking tool of the character referred to that may be set or adjusted to form a counterbore or countersink of any selected depth.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a longitudinal detailed sectional view of one form of tool of the invention showing the upper portion of the body in side elevation. Fig. 2 is an enlarged end view of the tool illustrated in Fig. 1 and Fig. 3 is a view similar to Fig. 1 illustrating another form of the invention.

The embodiment of the invention illustrated in Figs. 1 and 2 of the drawing may be said to comprise, generally, a body 10 formed to carry a drill 11 and countersink means 12 on the body.

The body 10 is an elongate member adapted to be carried and operated by a machine tool or drilling machine useful in performing drilling and countersinking operations. The body 10 may be shaped and proportioned to be received or rotated by mechanisms and tools of different kinds. In the drawing the body 10 has a more or less conventional shape, being round in transverse cross-section and being longitudinally tapered toward its inner end. A flat tang is provided on the inner end of the body 10 to facilitate the transmission of rotation to the body. The forward or outer portion of the body 10 is shaped to carry the drill 11 and the countersink means 12. A forward end portion 14 of the body 10 is cylindrical and terminates at an annular radial shoulder 15. A stem 16 of reduced diameter extends forwardly from the shoulder 15. A central longitudinal opening 17 extends through the stem 16 and enters the body proper. The opening 17 is provided to receive the shank 18 of the drill 11 and as illustrated may be a simple bore of uniform diameter. It is to be observed that the body 10 may be a simple, inexpensively produced one-piece member.

The invention contemplates the employment of drills of different types, diameters, and lengths and the drill 11 disclosed in the drawing is to be considered as merely illustrative or typical.

The drill 11 shown is short, and of the kind useful in center boring and in drilling through thin stock or sheet stock, it being obvious that the drill may be of any length. The shank 18 of the drill 11 is received or engaged in the body opening 17 and it is preferred to provide means for positively transmitting rotation from the body 10 to the drill. The means for transmitting rotation from the body to the drill may take various forms. In the simple case illustrated the inner portion of the shank 18 has an elongate flat surface 19 and a pin 20 is engaged in a transverse opening in the body 10 to cooperate with the surface 19. The opening which carries the pin 20 partially intersects the opening 17 so that the pin 20 protrudes into the opening 17 to engage with the flat shank surface 20.

I prefer to provide the drill 11 with an annular inwardly facing shoulder 21 at the outer terminus of its shank. The shoulder 21 allows the countersinking means 12 to extend inwardly to or beyond the effective diameter of the drill 11 as will be more fully described. The shoulder 21 need not be extensive and it is exaggerated in width in the drawing for the purpose of illustration. The shoulder 21 is spaced some distance from the forward end of the body stem 16.

The countersink means 12 is a feature of the invention. The means 12 is operable to form a counterbore or countersink at the mouth of the opening bored by the drill 11 immediately following the drilling of said bore, and in the same operation of the tool, it being merely necessary to continue the feed or advancement of the tool to form the counterbore. In the embodiment of the invention being described the countersink means 12 is a simple unit, comprising a member 22 removably screw-threaded on the stem 16 and provided with axially projecting cutting parts 23. The inner end of the threaded member 22 is plain and flat and is adapted to bear on the body shoulder 15. It is to be observed that the engagement of the member 22 with the shoulder 15 definitely positions or locates the cutting parts 23. The periphery of the member 22 may be substantially flush with the exterior of the body portion 14 and may be knurled or provided with flat faces to facilitate the threading of the member. The tubular member 22 is preferably of sufficient length to extend to or beyond the end of the stem 16.

The cutting parts 23 of the countersink means 12 extend from the outer end of the member 22 and converge inwardly to or toward the drill 11. The nature, shape, and number of the cutting parts 23 may be varied, depending upon the nature of the intended operations and the shape of the counterbore or countersink to be formed. The cutting parts 23 may be formed to produce a counterbore or countersink depression of any selected diameter and depth with walls at the selected pitch or angle. In the case illustrated the cutting parts 23 are formed to produce a frusto-conical or tapered countersink depression around the mouth of the bore formed by the drill 11 and the cutting parts 23 are shaped so that the walls of the countersink will have a substantial pitch. I have shown three circumferentially spaced cutting parts 23 separated by substantial chip-clearing spaces or notches 24. The cutting parts 23 may be dressed or ground, as required. As illustrated the cutting parts 23 have cutting edges 25 which are substantially radial with respect to the drill 11 and which converge downwardly and inwardly toward the drill. The cutting edges 25 may extend to the inner lower ex-

termities or cutting parts 23. It is preferred to have the cutting edges 25 extend to or behind the shoulder 21 to act on the work from immediately at the periphery of the drill 11 and outwardly therefrom, so that there is no space or gap around the drill in which cuttings may collect or in which a bead or burr may be formed. The above described shoulder 21 permits the cutting edges 25 to extend inwardly to the shank 18 of the drill or at least to a point behind the shoulder, leaving absolutely no gap between the effective diameter of the drill and the active inner diameter of the countersink cutting parts 23.

It should be observed that the countersink means 12 is embodied in a simple one-piece unit. The countersink means 12 may be easily removed for replacement by a countersink unit having cutting parts 23 of different formation, of different diameter, etc. and the countersink unit may be easily removed for redressing and then readily replaced. The countersink means 12 may be embodied in a member 22 which is integral as initially formed, in which case it is constructed of steel or material capable of being hardened or tempered to retain effective cutting edges 25. In other cases it may be preferred to braze or otherwise join cutting parts of special cutting material, such as high speed steel or the like, to the tubular member 22 or to legs on the member 22, in which case the member 22 need not be constructed entirely of cutting material.

The tool of the invention may include an adjustable stop 26 for limiting the depth of the counterbore or countersink and operable to render the countersink means 12 ineffectual when it is desired to perform drilling operations without countersinking. The stop 26 may be a simple sleeve threaded on the cylindrical body portion 14 to be readily adjustable along the body. The stop 26 extends outwardly around the member 22 and may be proportioned so that it may be adjusted to a position to prevent the cutting parts 23 from engaging the work. In Fig. 1 the stop 26 is shown in an intermediate position where it limits the depth of the counterbore or countersink that may be formed by the cutting parts 23. The stop 26 may be fully retracted so that the cutting parts 23 are effective throughout their extents. The outer end of the stop 26 is flat to evenly ride on the work. One or more openings 27 may be provided in the wall of the stop 26 adjacent its outer end to discharge the cuttings or chips. A lock nut or jamb nut 28 may be threaded on the body portion 14 to set or retain the stop 26 in the selected position.

In the use or operation of the tool illustrated in Figs. 1 and 2 of the drawing a countersink member 12 having cutting parts 23 of the selected type and configuration is threaded on the body stem 16 and a drill 11 of the selected kind and diameter is secured to the body 10 by entering its shank 18 in the opening 17 so that its flat surface 19 cooperates with the pin 20. It is to be understood that a set of members 22 may be provided with the tool so that the tool is capable of forming a wide range or selection of counterbores and countersinks of different sizes and configurations and a set of drills of different sizes and kinds may likewise be provided. With the member 22 and the drill 11 conditioned for use the stop 26 is adjusted to the selected position and is locked in place by the jamb nut 28. With the body 10 engaged in the spindle of the drill, drilling machine, or the like, the actual drilling operations are carried on in the usual manner.

When the drill 11 is advanced or fed into the work the advancement may be continued so that the cutting parts 23 engage the work to form the counterbore or countersink at the mouth of the opening. Thus the countersinking operation is merely a continuation of the drilling operation and the drilled bore and the countersink are both formed in one continuous operation. The drill 11 forms a pilot or centering means for the cutting parts 23 of the countersinking means and the cutting parts 23 engaged with the drill or the drill shank stabilize and brace the drill. Both the drill 11 and the countersinking means 12 may be easily removed from the body 10 for sharpening or for replacement by drills and countersinking means of different diameters, etc.

The form of the invention illustrated in Fig. 3 may be said to comprise, generally, a body 10^a for carrying a drill 11 and a countersinking means 12^a on the body.

The body 10^a may be substantially the same as the body 10 being an elongate tapered member formed for engagement in the spindle of a drill or drilling machine and provided with a forward cylindrical portion 14^a. A shoulder 15^a occurs at the outer end of the portion 14^a and a reduced stem 16^a continues forwardly from the shoulder 15^a. A central longitudinal opening 17^a extends through the stem 16^a and enters the body 10^a.

The drill 11 may be the same as described above, or may be any other selected or required kind of drill. I have shown the plain shank 18 of the drill 11 arranged in the opening 17^a of the body 10^a to have its flat surface 19 cooperate with the driving pin 20^a. The drill 11 is positioned so that its shoulder 21 is spaced forwardly from the end of the stem 16^a.

The countersink means 12^a includes a member 22^a in the form of a collar or sleeve engaged on the stem 16^a of the body. The member 22^a is adapted to be slid onto the stem 16^a so that its inner end bears against the shoulder 15^a. Means is provided for positively transmitting rotation from the body 10^a to the member 22^a. In the simple form of the invention illustrated this means comprises a pin 30 fixed to the body 10^a to project axially from the shoulder 15^a. A socket 31 is provided in the inner end of the member 22^a to receive the pin 30 for the transmission of the turning forces from the body to the member.

Cutting parts 23^a project from the outer end of the member 22^a and are shaped or dressed to form a counterbore or countersink depression of the required diameter and configuration. I have shown the cutting parts 23^a similar to the cutting parts 23 described above, it being understood that they may be of other formations if required. The cutting parts 23^a extend axially and converge forwardly and inwardly so that their ends may engage behind the shoulder 21 of the drill 11. This leaves no gap between the drill and the cutting parts 23^a.

The countersinking means 12^a further includes a collar or sleeve 33 for retaining the member 22^a on the body 10^a. The collar 33 is screw threaded on the cylindrical body portion 14^a and extends forwardly to surround the member 22^a. An internal inwardly facing shoulder 34 is provided on the collar 33 and opposes an outwardly facing external annular shoulder 35 on the member 22^a. If desired the shoulder 34 may directly cooperate with the shoulder 35 to clamp the member 22^a against the shoulder 15^a and thus hold the member in its operative position. In

the construction illustrated shims 36 are engaged between the shoulders 34 and 35. The shims 36 stop or locate the collar 33 so that its lower end may cooperate with the work to serve as a stop for determining the depth of the counterbore or countersink. By changing the thickness or number of shims 36 the collar 33 may be adjusted so that the tool will form counterbores or countersink depressions of different depths.

The operation of the tool illustrated in Fig. 3 of the drawing is substantially the same as the operation described above. In this form of the invention a drill 11 of the selected diameter, length and type is engaged in the opening 17 and the member 22^a carrying cutting parts 23^a for forming a countersink of the required size and shape is engaged on the stem 16^a so that its socket 31 receives the pin 30. The collar 33 is then threaded on the body to retain the member 22^a in position. The collar 33 may be adjusted by means of the shims 36 to serve as a stop, if this is desired. The drilling and countersinking operation is performed in the manner above described.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A drilling and countersinking tool including a body having an opening entering its forward end to receive and directly support a drill so that the drill may extend from said end of the body, a tubular member removably supported on the forward end portion of the body, means positively stopping the member against longitudinal movement on the body, and countersink cutting parts on said member projecting from said end of the body around the drill, the drill having a shoulder spaced from and opposing said end of the body, said cutting parts extending inwardly toward the drill to engage behind the shoulder.

2. A drilling and countersinking tool including an elongate body having a reduced stem projecting from its forward end and an opening extending longitudinally through the stem and adapted to receive a drill so that the drill projects from the end of the stem, a member surrounding the stem to be removably supported thereon, countersink cutting parts projecting axially from said member and adapted to engage about the drill, and a collar threaded directly on the exterior of the body and engaging the member to clamp it against said end of the body.

3. A drilling and countersinking tool including an elongate body having a reduced stem at its forward end and an opening extending longitudinally through the stem and adapted to receive a drill so that the drill projects from the outer end of the stem, an annular member removably engaged over and supported on the stem, countersink cutting parts projecting axially from said member and adapted to engage about the drill, a collar threaded on the body for clamping the member against said end of the body, the collar being adapted to engage the work to limit the depth of the cut made by said parts, and one or more shims between the member and collar for locating the collar.

4. A drilling and countersinking tool includ-

ing a shank, an externally threaded head on the forward end of the shank, a stem projecting from the forward end of the head and having an opening to support a drill so it projects forward from the stem, an annular member supported on the stem in engagement with the forward end of the body, countersink cutters projecting forward from said member, and a stop sleeve threaded on the head to extend over said member and beyond the end of the stem.

5. A drilling and countersinking tool including a body, an annular member supported on the forward end of the body, countersink cutters projecting forward from said member, a drill carried by the body to project beyond the cutters, and a single sleeve threaded to the body engaging said member to hold it on the body and projecting forward from the body to act as a stop.

6. A drilling and countersinking tool including a shank, an externally threaded head on the forward end of the shank, a stem projecting from the forward end of the head and having an open-

ing to support a drill so it projects forward from the stem, an annular member supported on the stem, countersink cutters projecting forward from said member, and a stop sleeve threaded on the head to extend over said member and beyond the end of the stem and engaging said member to hold it on the stem.

7. A drilling and countersinking tool including a shank, an externally threaded head on the forward end of the shank, a stem projecting from the forward end of the head and having an opening to support a drill so it projects forward from the stem, an annular member on the stem to bear against the forward end of the body and having an outwardly facing shoulder, countersink cutters projecting forward from said member, and a stop sleeve threaded on the head to extend over said member and beyond the end of the stem and having an inwardly facing shoulder bearing against the outwardly facing shoulder of the annular member.

LAWSON A. SMITH