

Sept. 15, 1953

J. V. EMMONS

2,652,083

WOOD BIT

Filed Aug. 2, 1951

2 Sheets-Sheet 1

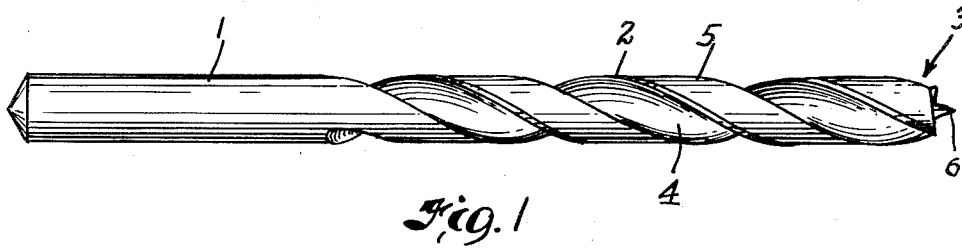


Fig. 1

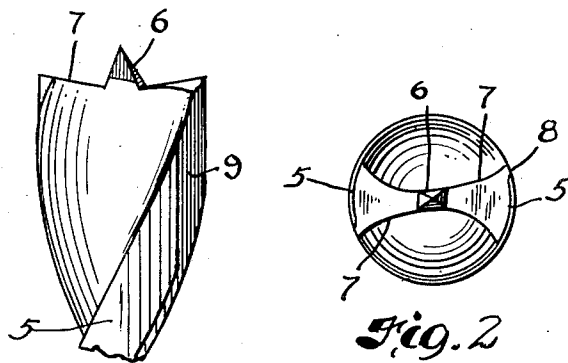


Fig. 2

Fig. 3a

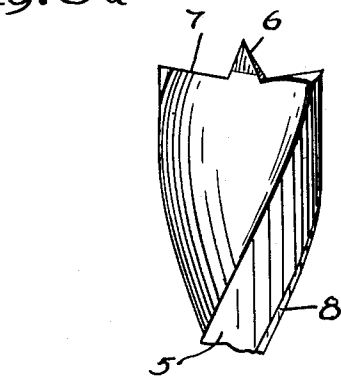


Fig. 3

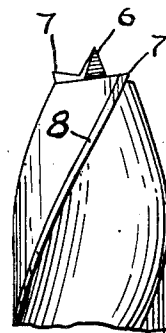


Fig. 4

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Fig. 5

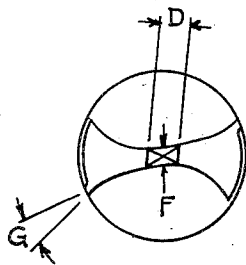


Fig. 6

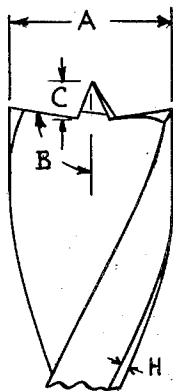


Fig. 7

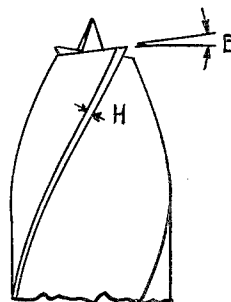


Fig. 8

- A Diameter at Point
B Angle of Cutting Lips to Axis
C Height of Brad
D Width of Brad
E Angle of Lip Clearance
F Web Thickness at Point
G Rake Angle of Cutting Lip at Outside corner
H Margin Width
J Helix Angle
Surface Finish

Range	Example
92° to 100°	96°
20% to 40%	25%
15% to 25%	20%
5° to 10°	7°
8% to 16%	12%
5° to 20°	12°
4% to 8%	6%
22° to 35°	28°
Electropolished	

Notes:

The short dimension of the base of the brad is the web thickness F.

All % dimensions are in terms of A-Diameter at Point.

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2,652,083

WOOD BIT

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Application August 2, 1951, Serial No. 239,940

1 Claim. (Cl. 145—117)

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The increased availability of portable drilling machines powered by either electricity or compressed air has shown the need for use in them of more efficient bits for drilling wood. The requirements for bits to be used in such power driven machines, which are held in the hands while operating, are different from those of bits driven by rigid stationary machines.

This invention resides in the discovery of certain relationships between details of design, some of which are old, that cooperate in providing an improved bit of greatly increased utility for the intended use.

Portable drilling machines held by either one or two hands are most frequently used by such workers as plumbers, electricians, farmers, etc., who desire to drill a hole to pass a pipe, a bolt or a conduit through wood as quickly and easily as possible. Some of the requirements for a bit for such service are as follows: low feed pressure with partial self-feeding, low torque, minimum of binding in the hole, fast cutting, good chip clearance, easy locating of the hole and dependable centering of the hole.

It is a principal object of my invention to provide a tool by which the above enumerated objectives may be obtained.

Other and more particular objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claim, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Fig. 1 is a side elevational view of one form of tool constructed in accordance with the principles of my invention;

Fig. 2 is an end view of the point of the tool shown in Fig. 1;

Fig. 3 is a side elevation drawn to an enlarged scale of the operating end of the tool shown in the previous figures;

Fig. 4 is a view similar to Fig. 3 but taken on a plane substantial at right angles to the plane on which Fig. 3 is taken;

Fig. 3a is a view generally similar to Fig. 3 but showing a modified form of construction; and

Figs. 5 to 8 inclusive are like Figs. 1 to 4 respectively excepting that they carry dimension reference letters, the data for which are given at the bottom of sheet 2 of the drawings.

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Referring now more specifically to the drawings and more especially to Figs. 1 to 4, the tool here illustrated comprises a shank portion generally indicated at 1, a body portion generally indicated at 2 and a point portion generally indicated at 3. The novel features of the invention reside in the body and point. Any type of shank may be used to suit any particular type of machine. The straight shank shown has been used for purposes of illustration only.

The component parts of the tool which include the novel features of the invention comprise the flutes 4 and lands 5 of the body portion 2 and the brad 6 and cutting edges 7 of point 3. The term "point" as used in the specification and claim is meant to designate the operating end of the tool, the principal parts of which are the brad 6 and the cutting edges 7. These parts of the tool will now be described in greater detail in the order just enumerated.

The flutes

A tool constructed in accordance with my invention has two helical flutes 4 and two intermediate lands 5. The flutes 4 should have a helix angle of from 22 to 35°, preferably about 28°. The depth of the flutes is such as to leave a web thickness at the point of the tool which should be from 8% to 16%, preferably 12% of the diameter of the tool at its point. These flutes should be formed so that the web thickness increases as the web approaches the shank end of the tool. This increase in web thickness may be up to .012 inch per inch of length, an increase of .006 inch per inch of length being preferred. The flutes should have a shape such that the cutting lips formed at the point on the forward end of the lands will be hooked and show a rake angle at their outside corner of from about 5° to 20°, preferably about 12°.

The flutes should be highly polished to reduce friction between the tool and the escaping chips. Available electrolytic polishing methods will be found highly useful for this purpose. The electro-polished flute surface will be found to have a very low coefficient of friction thus facilitating easy removal of the chips from deep holes.

The lands

The lands, of course, determine the outside dimensions of the tool. The outside diameter of the body of the tool should have a back taper of from .001 inch to .005 inch per inch of length, preferably about .0025 inch per inch of length with the smaller end of the body at the shank end.

The width of the lands measured along the line which is substantially normal to the outer edges of the lands should be from 40% to 50%, preferably about 45% of the diameter of the bit at its point.

The lands should be cleared for at least the rearward portion of their length, leaving a margin 8 about 4% to 8% of the diameter in width, preferably about 6%. If desired, a small portion of the land near the point may be left uncleared, as shown at 9 in Fig. 3a, to steady the bit at the start and help produce a round hole. This uncleared portion can be about one half diameter long, measured on the heel side of the land.

The cleared lands assist in reducing the friction between the tools and the wall of the hole. The substantial back taper on the body of the tool assists in preventing binding in deep holes. The relatively narrow width of the lands and the relative thinness of the web makes possible unusually large flute areas thus providing ample room to facilitate the easy clearance of the chips.

The cutting edges

The principal cutting lips 7 are formed at an angle of from 92° to 100° to the axis of the bit, preferably about 96°. The angle of lip clearance is from 5° to 10°, preferably about 7°. The rake angle at the outside corner of the cutting lips is from 5° to 20°, preferably about 12°.

The brad

The brad 6 is roughly in the form of a parallelogram based pyramid, with its point on the axis of the bit. Two opposite edges of the pyramid are higher than the other two edges so that they form cutting edges with clearance behind them. The brad width at the base is from 15% to 25% of the diameter, preferably about 20%. The brad height is about 20% to 40% of the diameter, preferably 25%.

A tool constructed in accordance with the principles of my invention as explained above accomplishes the stated objectives given earlier in the description by a number of cooperating factors, some of which may be enumerated as follows:

The low feed pressure with partial self-feeding is secured by the shape of the brad, the thinness of the web and the hooked and fishtailed cutting lip. The advantages of partial self-feeding to the operator are that the rate of penetration is under his control. By using light pressure he can drill slowly to secure a smoother hole, to ease the breakthrough, or to drill out a knot. By using heavy pressure he can secure a hole in a minimum of time. Such control is not possible with auger bits where the rate of feed is fixed by the lead of the screw.

The low torque is attained by the efficient cutting action of the point construction, the reduction of friction by the back taper and by the easy clearing of chips without clogging the flutes.

The minimum of binding in the hole is accomplished by the back taper, the clearance behind the margins and the easy clearing of chips without clogging the flutes.

The fast cutting is accomplished by the thinness of the web, the cutting action of the two edges of the brad and the drawing cut of the

cutting lip starting from a point at the outside corner which makes the point partly self-feeding. It is assisted and regulated by the specified helix angle of the flutes and by the specified angle of lip clearance.

The good chip clearance is secured by the proper helix angle, the ample chip room in the flutes and the electro-polished flute surfaces with low coefficient of friction with wood.

The easy location of the spot where the hole is to be drilled is made possible by the sharp pointed brad with the point on the axis of the bit. Whenever the brad touches the wood it immediately penetrates and establishes the center of the hole.

The dependable centering of the hole is secured by the shape and substantial dimensions of the brad which hold the bit on center until the outside corners of the cutting lips start to cut and establish the wall of the hole.

The foregoing is believed fully descriptive of the physical structure of the tool. The tool may be formed of any suitable metal from which wood bits are commonly formed. Carbon steels having a carbon content from about 0.60% to about 1.20% will be found eminently suited for this purpose. Alloy steels characterized by the presence therein of useful amounts of alloying elements such as chromium, manganese, tungsten, molybdenum and vanadium may also be used to advantage.

In the formation of a tool of this kind, manufacturing procedures may be employed which are conventional in the production of tools of this kind.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in the following claim or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

A wood bit comprising a main body portion having alternate helical flutes and lands, the ends of said lands terminating in divergent plane surfaces which are alternately oppositely inclined with respect to a plane normal to the axis of the bit to provide two principal cutting edges formed on the ends of said lands extending inwardly from the outside corner of the land in a continuous arc to the base of a pyramidal brad, the angle of the plane in which the arc is located being from 92° to 100° to the longitudinal axis of the bit, the tangent to the outside end of the arc forming a rake angle of the cutting lip of from 5° to 20°, the inner ends of the principal cutting edges terminating in the base of a pyramidal brad which has the form of a rhomboidal parallelogram, the long sides of which are on the surfaces of the helical flutes, two opposite edges of the pyramid being higher than the other two edges thus providing secondary cutting edges with clearance behind them.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
235,234	Hardisty	Dec. 7, 1880
2,332,295	Bouchal	Oct. 19, 1943
2,600,286	Weiland	June 10, 1952