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F. A. EICH ET AL

2,328,629

DRILL

Original Filed July 29, 1940

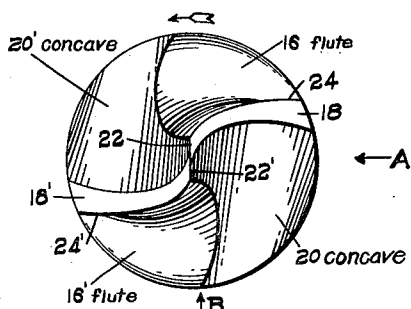


Fig. 1.

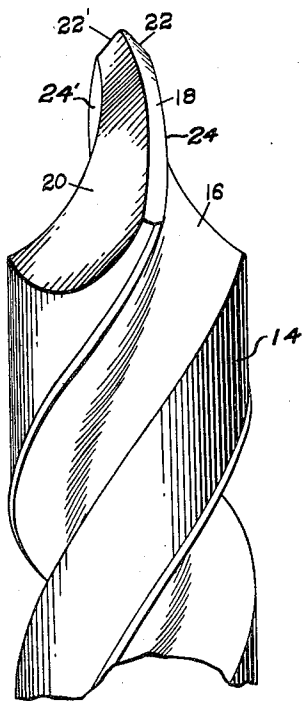


Fig. 2.

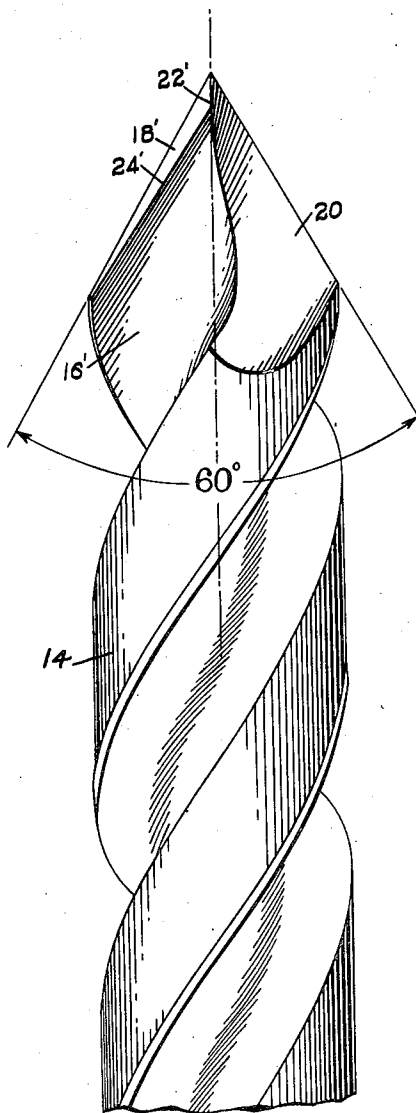


Fig. 3.

INVENTORS.
Frank A. Eich
Frank E. Higgins
By their Attorney
Victor E. Cobb

UNITED STATES PATENT OFFICE

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DRILL

Frank A. Eich, Melrose, Mass., and Frank E. Higgins, Plaistow, N. H., assignors to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Original application July 29, 1940, Serial No. 348,090. Divided and this application January 4, 1941, Serial No. 373,156

5 Claims. (Cl. 145—117)

Heretofore, it has been difficult rapidly and easily to drill hard wood, such as maple, with a twist drill of the usual type because the drill would not readily penetrate the work but would become overheated, which would draw its temper, and burn the wood. Accordingly, it has been necessary to use for this work a drill which has a sharp pyramidal center point and small circumferential lips which cut and define the outer wall of the bottom of the drilled hole before the chips are shaved off and removed from that part of the hole by the body of the drill. While such drills are suitable for this work, they must be kept sharp by frequent and difficult hand grinding in order to maintain them in proper working condition.

It is an object of the present invention to provide a multi-fluted, and preferably a double-fluted, twist drill with a point somewhat similar to the usual form of twist drill point but which is especially shaped to penetrate hard wood without excessive heating. Such a drill may be sharpened conveniently and accurately on a grinding machine which has been specially developed for the purpose by the present inventors, which machine is described and claimed in an application for Letters Patent of the United States, Serial No. 348,090, filed July 29, 1940, of which application the present application is a division.

The various features of the drill consist of end surfaces of novel shape arranged to meet in a novel manner to form cutting edges and clearances suitable for the intended class of work.

One of these features eliminates the usual chisel edge that is regularly formed across the web of a drill at 90° to its axis. This is especially important as such an edge impedes the penetration of the drill and scrapes or tears the fibres of the wood in the center of the hole being drilled. For such an edge, there is substituted one which is in two portions, each of which makes an angle of less than 90° to the axis of the drill, and together provide an edged web which is inclined to the surface being drilled and easily penetrates the work.

The end of the drill is diametrically symmetrical and consists of four irregularly shaped, discontinuous faces meeting in a common point at substantially the geometric center of the drill.

Referring to the drawing,

Fig. 1 is an enlarged end view of the drill of the present invention;

Fig. 2 is an enlarged elevation of the drill looking in the direction of the arrow A in Fig. 1; and

Fig. 3 is an enlarged view of the drill, looking in the direction of the arrow B in Fig. 1.

As illustrated, the preferred form of drill of the present invention is a right-hand, double-fluted twist drill 14 so that, when operating to drill a hole, it rotates in the direction of the arrow in Fig. 1. It is provided with a novel end which makes it possible to drill hard wood at high speed without drawing the temper of the drill or burning the wood. In Fig. 1 the flutes are shown at 16 and 16'. The end of the drill is formed by four irregularly shaped, discontinuous surfaces which meet at the geometric center of the drill in substantially a common point. These surfaces are the narrow lands 18 and 18', which support the cutting edge and which lie (except for slight clearance) in the surface of a cone of approximately 60° included angle (see Fig. 3) and the wider concave clearance surfaces 20 and 20'. The surfaces 20 and 20' are located behind their respective lands and extend to substantially the geometric center of the drill, cutting into the web of the drill. Each land and the concave clearance surface in front of it meet to form a cutting edge on the web at one side of the center of the drill (i. e., 18' meeting with 20 and 18 with 20'), as indicated at 22 and 22' on what will be termed the forward edge of each land. The two parts of the cutting edge thus formed appear, in end view, to extend across the web of the drill in substantially a straight line.

The remaining portion of each cutting edge, as indicated at 24 and 24', continues in a curve at a considerable angle to the just-described portions 22 and 22', until it ends at the circumference of the drill. This part of each edge is formed by the meeting of the remaining portion of the forward edge of each land and the flute immediately in front of the same (i. e., 18 with 16 and 18' with 16'). The straight and curved portions of each edge together recede (i. e., extend clockwise in Fig. 1) from the center of the drill substantially 90° before reaching its circumference. In other words, the direction of the edge, when seen in end view, varies through substantially 90° from the center to the periphery of the drill.

Each concave clearance surface provides a path for guiding the chips to the adjacent flute, through which they pass from the work.

It should be noted that each concave clearance surface extends substantially to the center of the drill, each such surface cutting away a portion of the web but so related that sufficient metal remains on the web to support each cutting edge. The short or central portions 22

and 22' of the cutting edge, i. e., those on the web, lie in a substantially continuous axial plane. (However, the edge cannot lie exactly in such a plane as it is practically impossible to have the edges meet in exact alinement at an exact point at the geometric center of the drill, although in fact, each edge is offset from the center by only a few thousandths of an inch at the most. This offset may be considered in effect as a slight web of this dimension. Accordingly, although the drill of the present invention possesses a web having the strength of the usual drill, it possesses only a slight web at the penetrating point, whose thickness is practically nil.)

When viewed at right angles to this axial plane, these edge portions slant away from the center of the drill to leave a point. The remaining portions 24 and 24' of the two cutting edges are formed on the forward edge of each land and, therefore, this portion of each cutting edge is much steeper than the portion lying on the web because it lies in the 60° cone of Fig. 3. It is therefore evident that all parts of each cutting edge slant or taper from the periphery to the axis of the drill to form a point; and because of this construction the drill will easily penetrate hard or other wood. In other words, the drill does not have the usual chisel edge that lies at right angles to the axis of the drill and which, as before stated, scrapes and tears the fibres of the wood in the center of the hole.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A multi-lipped twist drill, each lip having two irregularly-shaped discontinuous surfaces, one of which is a land lying substantially in the surface of a cone, and the other of which is a

concave clearance surface behind the land and within said cone, all of said surfaces of all of the lips meeting at substantially the geometric center of the drill.

5 2. A double-lipped twist drill, each lip having two irregularly-shaped discontinuous surfaces, one of which is a narrow land, and the other of which is a wider concave clearance surface behind the land, all of said surfaces meeting at substantially the geometric center of the drill.

10 3. A double-lipped twist drill, each lip having two irregularly-shaped discontinuous surfaces, one of which is a land, and the other of which is a concave clearance surface behind the land, both of said surfaces meeting at substantially the geometric center of the drill and the land lying in the surface of a cone having an included angle of substantially 60°.

15 4. A twist drill having a plurality of similar lips spaced equally around the axis of the drill, the lips having cutting edges which taper from the periphery of the drill to the axis to form a point, a major portion of each edge being curved in end view and a minor portion being straight, and said straight portions meeting at said point.

20 5. A twist drill having a plurality of similar lips spaced equally around the axis of the drill, the lips having cutting edges which taper from the periphery of the drill to the axis to form a point, a major portion of each edge being curved in end view and a minor portion being straight, said straight portions meeting at said point, and the direction of each edge, when seen in end view, varying through substantially 90° from the center to the periphery of the drill.

FRANK A. EICH.
FRANK E. HIGGINS.