

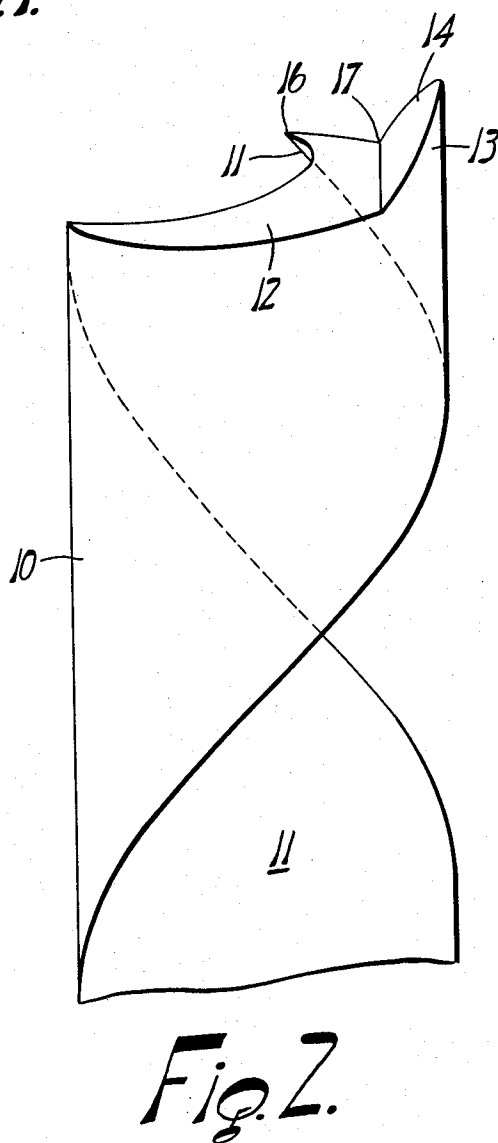
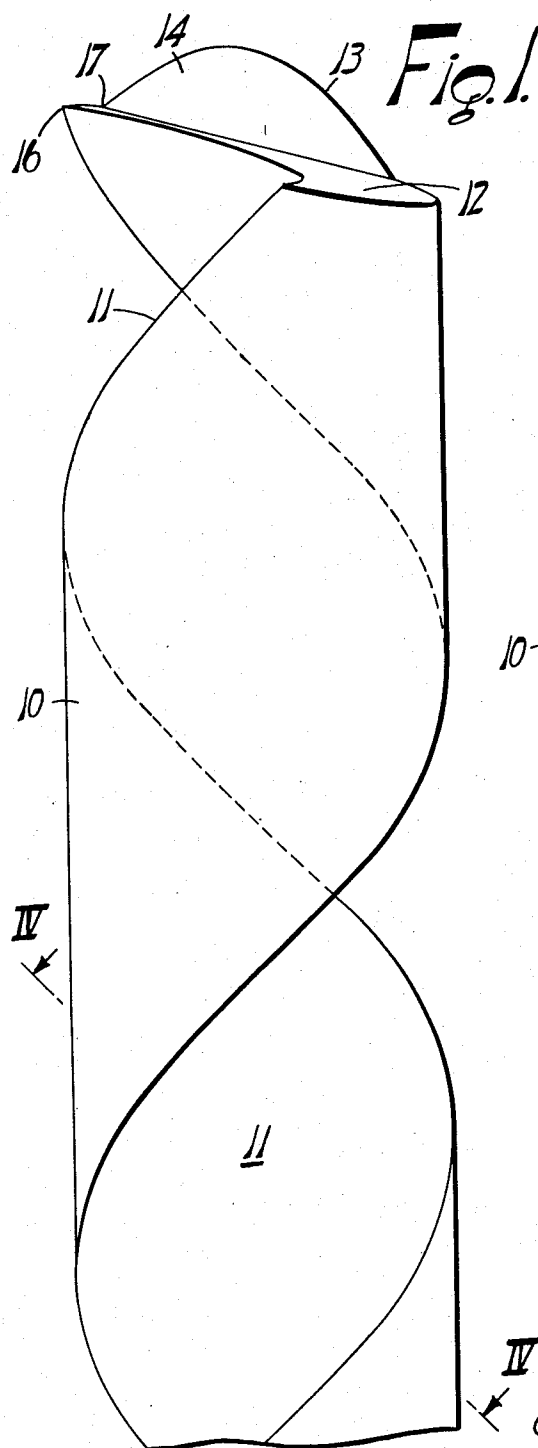
April 20, 1954

J. A. EINHIPLE
DRILL

2,675,841

Filed July 28, 1951

2 Sheets-Sheet 1



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Fig. 3.

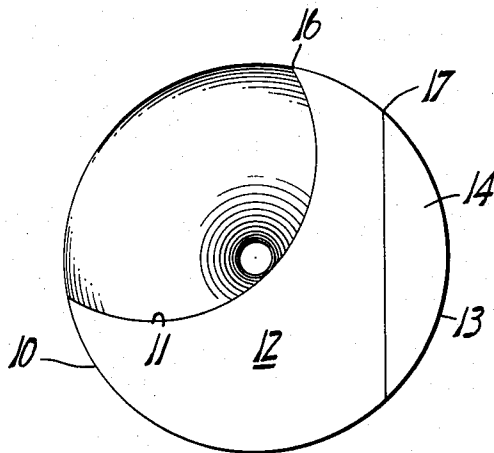
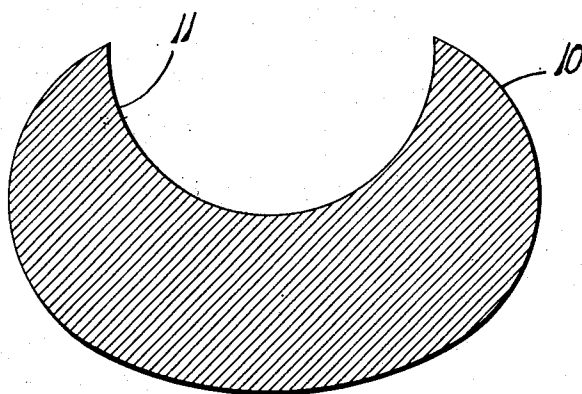


Fig. 4.



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UNITED STATES PATENT OFFICE

2,675,841

DRILL

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Application July 28, 1951, Serial No. 239,116

7 Claims. (Cl. 145—117)

1

This invention relates to drill bits and more particularly to a special and unique drill bit which is especially useful in drilling relatively soft and yieldable materials, although the novel drill bit disclosed herein may be used in drilling any material where it may be found useful and advantageous.

Reference will be had herein to one special field of application of the drill bit of the present invention wherein the results obtained are superior to any heretofore attainable with devices of the prior art. It is to be understood that reference to such special field is by way of example only and that the inventor of the present drill bit is entitled to all uses to which the drill bit of the present invention may gainfully be put.

A very common wall or ceiling treatment or surfacing comprises panels or slabs of low density wood fibreboard and for acoustical sound absorbing and deadening purposes the surfaces of such panels or slabs are commonly provided with a multiplicity of drilled holes. Acoustical tiles or boards of this type are widely manufactured and the accepted current mode of producing the multiplicity of surface perforations is by the use of gangs of conventional twist drills.

In earlier practices these perforations were produced by merely driving piercing punches into the boards or tiles, usually in a series of successive punching or piercing operations beginning with a punch of relatively small diameter and gradually increasing until perforations of approximately the desired diameter are formed.

This punching or piercing method was found to be inferior to and less satisfactory than drilling although drilling by the means available up to the advent of the present invention has itself been attended by marked disadvantages and results which fall far short of perfection. For one thing, the yieldable nature of the wood fibre or pulp material from which these panels or tiles are conventionally made, the same being of relatively low density compared to wood, for instance, or so-called hard board, results in holes which are materially less in diameter than the diameter of the conventional twist drills employed in drilling the same.

This results from the fact that, by present means and methods, only part of the material displaced by the twist drill is removed by true drilling action and another part is merely compressed radially outwardly, so that it springs back when the drill bit is removed from the opening. This results in a perforation which is

2

rough in appearance and is materially less in diameter than the drill, and this condition is aggravated if the panel is subsequently painted or enamelled, especially where conventional spraying is employed. The rather rough fibre surface which forms the peripheral wall of each perforation absorbs the coating material and swells and further reduces and constricts the opening, thereby not only reducing the efficiency of sound absorption but further adding to the rough and unsightly appearance of the finished panel. The aqueous emulsion paints frequently employed for coating acoustical tiles or panels after they have been perforated and which is otherwise highly desirable as a coating material further aggravates the constriction of the perforations by absorption.

A further disadvantage which has long been considered unavoidable and which results from drilling these perforations by conventional means will now be described. The initial entry of the centrally located point of a conventional twist drill apparently compresses the material to such an extent that after drilling a visible bevel formation, similar in appearance to a shallow counter-sink, surrounds the drilled perforation.

While reference is had herein to low density wood fibreboard, by way of example, similar phenomena present themselves in drilling other materials which are softer than wood in its natural state.

The present invention provides a twist drill which substantially entirely eliminates the foregoing objections and defects and which otherwise performs in a far more satisfactory manner than twist drills heretofore employed for the purposes indicated. By cleanly cutting and substantially entirely removing the cut material from the drilled hole, the resultant hole is of full diameter and has a clean, smooth peripheral wall. It is further found that, due probably to the smoothness of the drilled wall, substantially no swelling takes place upon spraying so that the openings retain their clean appearance and substantially full diameter.

The twist drill of the present invention has a novel flute formation and a novel cutting end formation and one form thereof is shown in the accompanying drawings and is described in detail in the following specification. While drill sizes may vary, the drawing shows the principles and construction of the exemplary form on a much enlarged scale with reference to drills normally employed in preparing acoustical panels, such drills being of the general order of three

sixteenths of an inch in diameter. With this basis of reference, the drawings would represent an enlargement of sixteen times the diameter of a drill generally suitable for drilling acoustical panel perforations.

While one form of the twist drill of the present invention is illustrated and described in detail, it is to be understood that various modifications may be made without departing from the principles of the present invention, the scope thereof being limited only as defined in the appended claims.

In the drawings:

Fig. 1 is a general elevational view of the bit and of one form of the twist drill of the present invention;

Fig. 2 is a similar elevational view but taken at right angles to Fig. 1;

Fig. 3 is an end elevational view of the twist drill of Figs. 1 and 2; and

Fig. 4 is a cross-sectional view on the line IV—IV of Fig. 1.

In the several figures of the drawings, like characters of reference denote like parts and the numeral 10 designates a generally cylindrical drill body having a helical flute 11 extending therealong from its drilling end. Flute 11 is, generally speaking, of greater cross-sectional area, compared to the cross-sectional area of the drill body than is the flute of a conventional twist drill.

The oblique cross-sectional view, Fig. 4, is taken directly transversely of the direction of flute 11 and shows the cross section of the flute in the exemplary form disclosed herein, the same being arcuate and having its depth extending into the drill body 10 substantially beyond the axis of the latter.

The major portion of the end of the drill bit comprises a flat surface designated 12 having at one side thereof a wedge-like projecting knife formation 13. The outer surface of this knife formation is continuous with the outer peripheral surface of the drill body and the inner surface comprises an inclined plane designated 14, the apex angle of knife formation 13 being approximately 30° in the form shown by way of example in the drawings.

As viewed in Fig. 1, the straight line formed by the juncture of the flat surfaces 12 and 14 extends at an angle of about 15° to the horizontal. In addition to the slant thus imparted to surface 12, the latter also preferably slants downwardly away from the juncture line from right to left as viewed in Fig. 2 or toward the observer as viewed in Fig. 1 at an angle of approximately 5°, again merely by way of example.

The helical flute 11 is arranged along the drill body 10 in such a way that it intersects surface 12 approximately as illustrated in Figs. 2 and 3 to establish the desired definite relationship between the knife formation 13 and the material removing cutting edge formed by the juncture of flute 11 and surface 12. In this regard the critical consideration is the distance along the arcuate circumferential edge of surface 12 from the point designated 16, where the flute intersects surface 12 at one side of the flute, to the point designated 17 at one end of the juncture line between surfaces 12 and 14.

The arrangement as thus described and illustrated in the drawings is such that the first phase of drilling comprises a circular scoring by the knife formation 13 in such a way that the material which is displaced by the knife forma-

tion is forced inwardly toward the axis of the drill by compression of the material whereby there is substantially no tendency to compress material outwardly against the peripheral wall of the hole being drilled. Following such initial circular scoring, the point 16 first attacks the material within the scored circle at the outer diameter of the hole being formed and shears such material progressively inwardly toward and across the center of the hole.

While the large capacity of the flute 11 for feeding cut material out of the wall is important in the device of the present invention, very critical importance resides in the particular end formation of the drill bit whereby the outline of the opening is first scored without outward compression of the material and with no hindrance at any point within the scored circle to prevent free inward radial compression, followed by the clean inwardly progressive shearing of the thus scored core of material from its outer periphery inwardly cutting edge formed by the juncture of flute 11 with end surface 12.

What is claimed is:

1. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute leading therefrom, a cutting knife formation at said cutting end face spaced from said helical flute and having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, said end face slanting recedingly away from said inclined plane intersection and also slanting along said intersection, the axially outermost end of said intersection being disposed adjacent to one side of the juncture of said flute with said flat face.

2. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute leading therefrom, a cutting knife formation at said cutting end face spaced from said helical flute and having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, the bottom wall of said flute being generally arcuate and extending into the cylindrical body beyond the axis thereof and intersecting the wall of said cylindrical body to form a helical cutting edge having an effective apex angle of approximately forty-five degrees, said end face slanting recedingly away from said inclined plane intersection and also slanting along said intersection, the axially outermost end of said intersection being disposed adjacent to one side of the juncture of said flute with said flat face.

3. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute leading therefrom, a cutting knife formation at said cutting end face spaced from said helical flute and having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, the bottom wall of said flute being generally arcuate and extending into the cylindrical body beyond the axis there-

5

of, said end face slanting recedingly away from said inclined plane intersection and also slanting along said intersection, the axially outermost end of said intersection being disposed adjacent to one side of the juncture of said flute with said flat face.

4. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute leading therefrom, a cutting knife formation at said cutting end face having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, the helical edges of said flute intersecting the wall of said cylindrical body to form a helical cutting edge having an effective apex angle of approximately forty-five degrees, said end face slanting recedingly away from said inclined plane intersection and also slanting along said intersection, the axially outermost end of said intersection being disposed adjacent to one side of the juncture of said flute with said flat face and the juncture of said flute with said flat face being spaced from said cutting knife formation.

5. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute intersecting said end face to form a curved cutting edge, said curved cutting edge terminating at both ends at the periphery of said cylindrical body, a cutting knife formation at said cutting end face spaced from said curved cutting edge and having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, said end face being so slanted that the end of said flute intersection cutting edge adjacent to said scoring knife portion projects beyond the remainder thereof whereby said flute intersection cutting edge shears material progressively from the outer edge inwardly.

6. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute intersecting said end face to form a curved cutting edge, said curved cutting edge terminating at both ends at the periphery of said cylindrical body, said flute extending in-

6

wardly of said cylindrical body beyond the axis thereof, a cutting knife formation at said cutting end face spaced from said curved cutting edge and having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, said end face being so slanted that the end of said flute intersection cutting edge adjacent to said scoring knife portion projects beyond the remainder thereof whereby said flute intersection cutting edge shears material progressively from the outer edge inwardly to and beyond the axis of the drill.

7. In a twist drill, a cylindrical drill body having a generally flat cutting end face occupying the major portion of the end area of said cylindrical body, and a helical flute intersecting said end face to form a curved cutting edge, said curved cutting edge terminating at both ends at the periphery of said cylindrical body, the intersection of said curved cutting edge and the periphery of the cylindrical drill body forming at said end face an angle of approximately forty-five degrees, a cutting knife formation at said cutting end face spaced from said curved cutting edge and having one wall forming an axial continuation of the peripheral surface of the drill body and its other wall lying in an inclined plane intersecting said flat end face, said walls forming an axially projecting peripheral scoring knife portion, said end face being so slanted that the end of said flute intersection cutting edge adjacent to said scoring knife portion projects beyond the remainder thereof whereby said flute intersection cutting edge shears material progressively from the outer edge inwardly.

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