

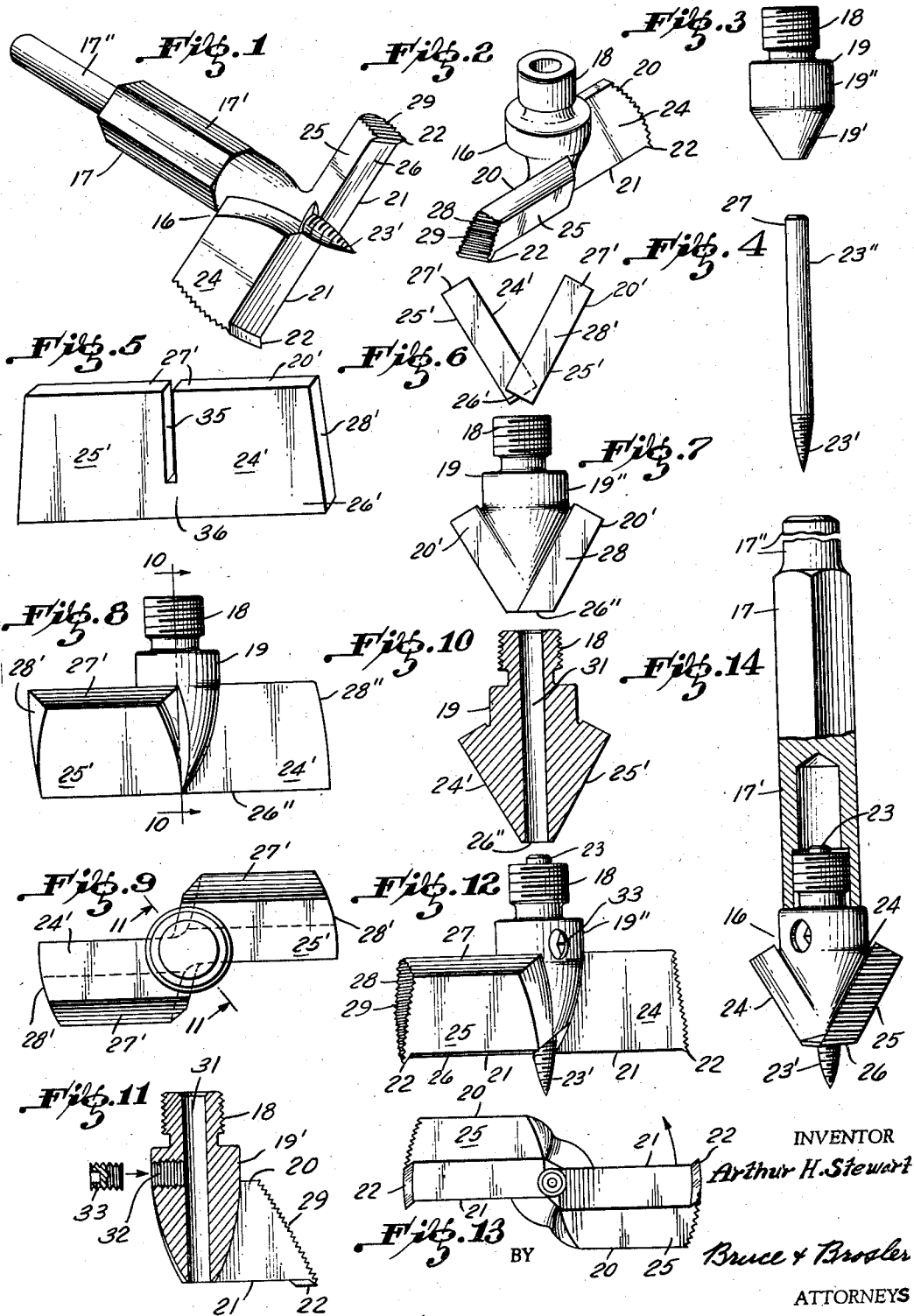
April 28, 1959

A. H. STEWART

2,883,888

BORING TOOL AND METHOD FOR MAKING SAME

Original Filed Aug. 17, 1951



1

2,883,888

BORING TOOL AND METHOD FOR MAKING SAME

Arthur H. Stewart, Hayward, Calif.

Original application August 17, 1951, Serial No. 242,289.
Divided and this application October 24, 1955, Serial No. 542,318

9 Claims. (Cl. 76—102)

The invention relates to the structure and production of a boring bit for wood or the like.

Among the objects of the present invention are:

(1) To provide a novel and improved method of fabricating a wood boring bit or the like;

(2) To provide a novel and improved method of fabricating a wood boring bit or the like, which may be accomplished economically and result in a bit capable of withstanding excessive strains and stresses;

(3) To provide a novel and improved method of fabricating a wood boring bit or the like, which lends itself to the selection of materials for component parts, which materials are best calculated to fulfill the purposes and functions of such components in the final structure;

(4) To provide a novel and improved boring bit;

(5) To provide a novel and improved boring bit in which integrally formed component portions are metallurgically different to better support the functions of such component portions in the operation of the bit.

(6) To provide a novel and improved boring bit or the like in which the lead screw is conveniently adjustable or replaceable.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth or be apparent in the following description of a typical embodiment thereof and in the accompanying drawings, in which,

Figure 1 is a perspective view of a bit embodying the features of the invention.

Figure 2 is a perspective view of the unitary working head of the bit.

Figure 3 is an enlargement of a preformed hub element of the working head.

Figure 4 is an elevation of a lead screw used in the head assembly.

Figure 5 is a side view of a flat blank for providing the cutting blades of the bit head.

Figure 6 is a side view of the blank of Figure 5 shaped for its unitary attachment to the hub element of Figure 3.

Figure 7 shows the elements of Figures 3 and 6 in mutually united relation, with the element of Figure 6 viewed as in that figure.

Figure 8 is an elevation of the assembly of Figure 7 taken at right angles to the latter view.

Figure 9 is a top view of the assembly of Figures 7 and 8.

Figure 10 is a section taken at the line 10—10 in Figure 8 after the hub of the head has been provided with a bore for receiving the pilot screw of Figure 4.

Figure 11 is a section taken at the line 11—11 in Figure 9 and disclosing the provision of a set screw for releasably securing the lead screw in its operative position.

Figure 12 is an elevation of the completed bit head as viewed in Figure 8.

Figure 13 is an underneath view of the bit head.

Figure 14 is a partly sectional side view of the bit as-

2

sembly of Figure 1, and shows the attachment of the bit head to a carrying shank therefor.

This application is a division of my application for Boring Tool, Serial No. 242,289, filed August 17, 1951, now abandoned.

Referring generally to the structural combination of the present boring bit, the same is shown as comprising a cutter head assembly 16 coaxially and removably mounted on a shank member 17 arranged for engagement by a suitable bit-turning device. One portion 17' of the shank 17 provides an axial socket extending from its free end and threadedly receiving a rearward axial stem extension 18 of a hub portion 19 for unitarily and releasably connecting the shank and head; the shank portion 17' preferably has an exterior cross-section of regular polygonal form for holding engagement by a wrench while the other shank portion 17'' is of circular section for its gripped engagement by a chuck or the like.

Like radial arms 20 of the cutter head comprising portions of a bit element 20', extend oppositely from the hub 19, and provide aligned chisel-type cutting blades with the lines of their working edges 21 straight and preferably slightly ahead of radial lines from the hub axis. Terminal grooving spurs 22 of the blades 20 extend in advance of the zone of operation of the cutting edges 21 for providing an advance groove in a workpiece to define the boundary for the area of cutting in a workpiece. A lead screw 23 is replaceably mounted in the hub portion 19 of the head assembly 16 axially thereof and has its tapered advance end portion 23' extending forwardly of the plane of action of the grooving spurs 22 and from the outer ends of the cutting edges 21. The paring action of the working edges 21 of the blades 20 is appreciably facilitated by reason of the provision of said edges ahead of radial lines from the common hub and lead screw axis, since the cutting action is then slightly oblique to the edge lines. As is brought out in Figure 13, the cutting edges 21 preferably extend in lines which are tangential to the cylinder of the lead screw base thereat, whereby to provide for a continuous line of cutting by the head.

It will now be noted that the cutter arms 20 comprise relatively thick blades which are correspondingly oblique to the bit axis and have flat forward faces 24 which comprise the lift faces of the paring edges 21. The rear faces 25 of the arms 20 are parallel to the forward arm faces 24 and are connected thereto by faces 26 which comprise the advance sides of the cutting edges, it being noted that the blade faces 26 are appropriately sloped away from the common plane of action of the blade edges 21 to provide the necessary cutting relief for the blades thereat; the relation is brought out in Figure 14. The edge faces 27 at the blade edges opposite the faces 26 are not operatively utilized and may remain perpendicular to the mutually parallel blade faces 24 and 25 as in the blank. It will be understood that as the cutting edges 21 of the rotating bit are drawn against a workpiece by the action of the threaded engagement of the lead screw 23 in the workpiece, the grooving spurs 22 are operative to define the boundary of a workpiece portion which is progressively shaved or chiseled from the workpiece by the co-operative cutting action of the blade edges 21.

Recalling that the primary function of a lead screw of a boring bit for boring holes in wood or other relatively soft material is to progressively draw the cutting blades of the bit into the work at a rate determined by the pitch of the lead screw, and that the threads provided in a workpiece by a lead screw frequently become stripped under working conditions, means are provided for insuring a continued operative feeding of the bit against the work independently of the lead screw after a bore has been started, said means utilizing the completed bore

portion and comprising the threading engagement of the end blade faces 28 in the opposed bore face as a tap to provide and maintain the feeding control for the bit supplementary to or independently of the lead screw.

Preferably, and as shown, the end blade faces 28 are radially relieved to a slight degree from their boundaries at the forward blade faces 24 to facilitate the threading engagement of their thread section 29 in the bore of a workpiece and to minimize the frictional resistance against the turning of the advancing bit in the bore being provided behind the plane of action of the grooving points 22. The thread sections 29 comprise parts of a common helical thread having a pitch which preferably corresponds to that of the lead screw 23 for the bit for automatically insuring the working advancement of the bit independently of the lead screw, and the provision and functioning of the threads 29 is understood to become particularly valuable as the thickness of the material yet to be removed in boring a through hole decreases to the break-through position for the bit.

Because of the different duties and physical qualities required of the hub and blade and lead screw element of a present cutter head 16, the latter is preferably provided by a unitary association of the hub 19 and the arms 20 and the lead screw 23, whereby each of these elements may be initially formed of a material having the preferred composition and qualities required of it in the assembly; in practice, the various elements may be formed of ferrous alloys. As particularly illustrated, the hub member 19 has a frusto-conical portion 19' which extends directly and integrally from a cylindrical intermediate portion 19'' from which the threaded stem 18 oppositely and integrally extends, this member being adapted for production as a unit by an automatic machine, and being preferably formed of a low-carbon steel for strength. The lead screw 23 may be made of a medium alloy steel by an automatic machine, and comprises a tapered threaded portion 23' at an end of a uniform shank portion 23'' which is arranged for its releasably set mounting in a complementary axial bore 31 which is provided through the head structure during its fabrication; as is brought out in Figures 10 to 12, a radial hole 32 is provided in the hub portion 19'' to threadedly receive a set screw 33 for releasably fixing the lead screw in longitudinally adjusted position in the bore 31.

The bit head portion which provides the blade arms 20 is shaped from a blank 20' of tool steel which is initially provided as a relatively thick flat element of uniform thickness and symmetrical outline having its end faces 28' arranged to provide the threaded blade-end faces 28 of the completed head. The edge faces 26' and 27' of the blank 20' respectively provide the faces 26 and 27 of the arms, are mutually parallel, and are perpendicular to the flat side faces which connect them, it being noted by reference to Figure 5 that the blank 20' is originally of isosceles trapezoid outline with its shorter length at the face 27' which is in perpendicular relation to said side faces 24' and 25'. The blank is provided with a kerf 35 midway thereof from the face 27', which leaves a blank portion 36 connecting the thus separated parts of the blank.

Having the blank 20' initially provided in the original form shown for it in Figure 5, the blank is heated at its portion 36, and is then twisted at said portion about an axis parallel to the blank edge face 26' until, when viewed endwise as in Figure 6, the different blank portions define between them an angle which is the same as the cone angle of the hub portion 19', the blade then having the appropriate form for its unitary association with the hub 19 by fitting and welding these elements together to provide a primary integral assembly. It will be noted that, by reason of the twisting of the blank 20' in the described manner, the opposite blank faces are each divided at the kerf 35 to provide portions 24' and 25' which respec-

tively correspond to the faces 24 and 25 of the formed blades 20.

Having the formed element 20' unitarily welded to the hub 19, the assembly is mounted in a lathe chuck or the like by use of the hub stem 18, has the extremities of its arms trued to a cylinder coaxial with said stem, and has the advance edge of the element 20' fully faced off to provide a temporary flat advance face 26'' replacing the blank face 26' and perpendicular to the head axis, whereby to provide the arrangement of Figures 7 and 8. The supported hub and blade assembly is then provided with the coaxial bore 31 illustrated in Figure 10 for receiving the stem portion 23'' of a lead screw 23. Following the provision of the axial bore 31, the advance face 26'' is milled away to provide the relieved blade faces extending from the cutting edges 21 to the rear blade faces 27 while simultaneously providing the cutting spurs 22 at the outer face ends. After the reversely oblique cutting edge faces 26 have been provided along the advance edges of the arms 20, adjacent portions thereof are obliquely notched out across the advance end of the bore 31 to provide for the fitted engagement of the threaded portion 23' of the lead screw 23 between them with the cutting edges 21 tangent thereto at opposite sides thereof. The threaded hole 32 for receiving the set screw 33 in the hub portion 19'' may also be provided at this stage of production of the head 16.

Figures 11 to 14 inclusive disclose the essential structural combination of the hub and blade assembly as completed by providing the blade end faces 28 with thread portions 29 comprising parts of a helical thread which is coaxial with the bit axis and has the same effective pitch as the threads of the lead screw 23 used with the bit, whereby to supplement or replace the action of the lead screw in the previously described manner. The completion of the present cutter head assembly 16 includes certain operations such as finally grinding the blade faces 24 and 26, a circumferentially eccentric grinding of the threaded blade ends 28 to provide a desirable relief for the trailing thread parts, the removal of any burrs from the structure edges, other appropriate finishing operations, and the installation of the lead screw 23 in the bore 31. It will be understood that annealing and retempering operations would be performed at appropriate times and parts to facilitate the various shaping and turning and grinding operations upon the head parts during the fabrication of the head.

From the foregoing description taken in connection with the accompanying drawings, the advantage of the present boring tool, and the method of its production, will be readily understood by those skilled in the art to which the invention appertains. While I have described the principle of the production and use of a form of my invention which I now consider to comprise a preferred embodiment thereof, I desire to have it understood that the showing is primarily illustrative, and that such changes and developments may be made, when desired, as fall within the scope of the following claims.

I claim:

1. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank having an upper edge and a lower edge, cutting through the upper edge at substantially its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge, leaving an uncut portion adjacent said lower edge to produce two blank sections connected by said uncut portion, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and fixing said hub portion to said blank sections.

2. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank having

5

an upper edge and a lower edge, cutting through the upper edge at substantially its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge, leaving an uncut portion adjacent said lower edge to produce two blank sections connected by said uncut portion, heating said uncut portion and while hot, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank, to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and welding said hub portion to said blank sections.

3. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank of having an upper edge and a lower edge, cutting through the upper edge at substantially its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge, leaving an uncut portion adjacent said lower edge to produce two blank sections connected by said uncut portion, heating said uncut portion and while hot, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and fixing said hub portion to said blank sections, relieving the lower edge of each blank section to form a cutting edge, and securing a lead screw to said hub portion.

4. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank of substantially isosceles trapezoidal shape and of appreciable thickness, with the upper and lower edge faces substantially normal to the flat side faces connecting them, cutting through the shorter edge face at its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge face, leaving an uncut portion adjacent said lower edge face to produce two blank sections connected by said uncut portion, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and welding said hub portion to said blank sections, relieving the lower edge of each blank section to a point adjacent the outer end thereof to form a cutting edge and a spur at the extremity thereof, and securing a lead screw to said hub portion.

5. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank of substantially isosceles trapezoidal shape and of appreciable thickness, with the upper and lower edge faces substantially normal to the flat side faces connecting them, cutting through the shorter edge face at its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge face, leaving an uncut portion adjacent said lower edge face to produce two blank sections connected by said uncut portion, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and welding said hub portion to said blank sections, relieving the lower edge of each blank section to a point adjacent the outer end thereof to form a cutting edge and a spur at the extremity thereof, and securing a lead screw and a shank to said hub portion.

6. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank of substantially isosceles trapezoidal shape and of appreciable thickness, with the upper and lower edge faces substan-

6

tially normal to the flat side faces connecting them, cutting through the shorter edge face at its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge face, leaving an uncut portion adjacent said lower edge face to produce two blank sections connected by said uncut portion, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and welding said hub portion to said blank sections, forming an axial passage through said hub portion and the uncut portion of said blank, removably fixing a lead screw in said axial passage, and attaching a shank to said hub portion.

7. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank of substantially isosceles trapezoidal shape and of appreciable thickness, with the upper and lower edge faces substantially normal to the flat side faces connecting them, cutting through the shorter edge face at its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge face, leaving an uncut portion adjacent said lower edge face to produce two blank sections connected by said uncut portion, heating said uncut portion and while hot, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and welding said hub portion to said blank sections, forming an axial passage through said hub portion and the uncut portion of said blank, relieving the lower edge of each blank section from said axial passage to a point adjacent the outer end thereof to form a cutting edge along each blank section and a spur at the extremity thereby, removably fixing a lead screw in said axial passage, and attaching a shank to said hub portion.

8. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank having an upper edge and a lower edge, cutting through the upper edge at substantially its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge, leaving an uncut portion adjacent said lower edge to produce two blank sections connected by said uncut portion, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and fixing said hub portion to said blank sections and threading the outer edges of said angularly rotated blank sections.

9. The steps in the method of fabricating a wood boring bit or the like comprising forming a blank having an upper edge and a lower edge, cutting through the upper edge at substantially its midpoint and for the greater portion of the width of said blank along a line substantially normal to the lower edge, leaving an uncut portion adjacent said lower edge to produce two blank sections connected by said uncut portion, heating said uncut portion and while hot, angularly rotating said blank sections in opposite directions about an axis substantially parallel with the lower edge of said blank, to form an angle between said blank sections when viewed endwise, disposing within said angle in symmetrical relationship to said blank sections, a hub portion and welding said hub portion to said blank sections and threading the outer edges of said angularly rotated blank sections.

References Cited in the file of this patent

UNITED STATES PATENTS

12,551	Hoagland	Mar. 20, 1855	961,770
21,179	Banes	Aug. 17, 1858	1,409,258
41,517	Law	Feb. 9, 1864	1,557,900
208,862	Swan	Oct. 8, 1878	2,372,612
222,970	Wenchel	Dec. 23, 1879	2,626,533
288,676	Stearns	Nov. 20, 1883	2,794,468
			15,581

Grandperin	June 21, 1910
Stenger	Mar. 14, 1922
Thompson	Oct. 20, 1925
Stogsdill	Mar. 27, 1945
Huckshold	Jan. 27, 1953
Huxtable	June 4, 1957

FOREIGN PATENTS

Great Britain	Nov. 14, 1891
---------------	---------------