

**Patent Owner's Copy of Paragraphs added to Corrected and Supplemental
Declaration of Dr. William Endres filed on November 7, 2023**

108. In my opinion,¹ a POSA would not be motivated to modify Bannister's beveled cutting edge with the angled segmented edges of Zhou or with the angled steps of Welty. In particular, the advantages petitioner asserts are provided to Bannister's drill by the structures of Zhou or Welty are redundant to the advantages already described in Bannister and/or advantages not needed by Bannister. Petitioner describes a long list of advantages that are supposedly bestowed by the Zhou or Welty. However, these advantages are already described in the text of Bannister, and there is no reason to think that the structures of Zhou and/or Welty would be an improvement, given the operational purpose of Bannister.

109. The supposed advantages of "reduced drilling axial resistance and torque" and "increased drilling efficiency" is redundant to and not needed in Bannister. Bannister already teaches "a drill which shall be operable with much less power." (**Ex. 1006** at 1, col. 1:1-5). Because the first or smallest drill unit is of substantially the same diameter for all diameter drills" ... "power requirement for drilling large holes is thus reduced to the amount required for driving the cutting edges through the metal and the amount heretofore required for crushing the large

¹ Paragraph numbers 52–107 intentionally omitted.

central cores is eliminated. (*Id.* at 2, col. 2:20-30). “In grinding my improved drill, ... the last cutting edge 24 [is] formed within an angle of approximately 59° to the axis of the drill, or an included angle of 118° , which is considered the most efficient angle in grinding twist drills.” (*Id.* at 2, col. 2:56-62). “As seen in Figs. 3 and 5, the provision of the auxiliary flutes reduces the central core area at the point to where it is negligible, so that the amount of metal to be crushed in drilling is reduced to a minimum and the feeding pressure for the drill is greatly reduced. I have found, in actual tests with a one inch drill, that the feeding pressure required, as compared with a standard conical point drill, was reduced more than 42%.” (*Id.* at 2, col. 2:27-36).

110. A drill bit that has reduced power requirements will, as a result, be more efficient and likely be accompanied by reduced drilling axial resistance and certainly torque (proportional to power, power being the product of torque and rotational speed). In my opinion, these advantages are already provided by existing structure in the Bannister device, such as the small first drilling unit and the single beveled cutting edge. Petitioner has failed to describe how the proposed modifications would provide an advantage over and above the advantages already inherent to Bannister’s drill bit, and how they are not redundant thereto. Since Bannister and either Zhou or Welty disclose drill bits that serve the same function and because each already operates effectively, a POSA would have no reason to

combine these devices into a single device. Petitioner does not explain why modifying Bannister in this manner would be an improvement on what Bannister already provides.

111. The supposed advantage of “improved separation and expulsion of swarf” is redundant to and not needed in Bannister. Bannister already discloses a metal working twist drill “which shall be effective to clear the hole being drilled of chips as they are formed.” (Ex. 1006 at 1, col. 1:3-12). “The chips from the small drill unit are carried up the auxiliary flutes into the main flutes and thence off with the chips from the other drill units.” (*Id.* at 1, col. 2:54 - 2, col 1:2). “These long spiral chips thus formed take with them the short chips formed by the cutting edges which are substantially normal to the axis of the drill and thus rid the hole of the short chips which might otherwise clog it.” (*Id.* at 2, col. 1:15-19). “As is well known, bevelled cutting edges, in drilling soft metal, such as copper or soft steel, produce long chips, whereas cutting edges normal to the axis of the drill produce short chips, and the short chips are liable to jamb the drill in the hole and cause it to break off. By providing the bevelled cutting edges 14 on the central drilling unit 13, and the bevelled cutting edges 24 on the outer drill unit, I am enabled to produce long chips along with the short ones, which long chips entangle with the short ones and carry them out of the hole being drilled.” (*Id.* at 2, col. 2:7-18).

112. Thus, Bannister already provides separating and removing chips/swarf through its teachings of a singled beveled cutting edge and by the auxiliary flutes. Bannister does not require modification by Zhou or Welty for this advantage. In my opinion, the doubling up of advantages proposed by Petitioner—without justification on how it would be an improvement on the system already taught by Bannister—is purely the product of hindsight.

113. The supposed advantage of “reduced binding” is redundant to and not needed in Bannister. Bannister teaches that “The sides 19 and 21 of the drilling unit 13 are made vertical, and are ground without radial clearance, whereby they have a snug bearing with the walls of the hole at all times, which holds the drill steady and insures a round hole. The central unit is so short that the absence of radial clearance does not cause the unit to bind and heat is not generated due to the absence of radial clearance.” (Ex. 1006 at 2, col. 1:62-71). The advantage of reduced binding is already provided in Bannister by keeping the vertical wall height short. Petitioner provides no evidence that making each step a conical step as taught by Zhou or Welty would further reduce binding; and there is no indication that binding is a problem with Bannister’s already operationally effective drill bit.

114. The supposed advantage of “more accurate and round drilling holes” is redundant to and not needed in Bannister. Bannister already discloses a metal

working twist drill is disclosed “which shall be effective to drill a round hole” (**Ex. 1006** at 1, col. 1:1-6). “The first drill unit, and each succeeding drill unit, acts as a guide for the following drill unit so that the drill runs true and drills a straight round hole.” (*Id.* at 1, col. 2:46-49). “The sides 19 and 21 of the drilling unit 13 are made vertical, and are ground without radial clearance, whereby they have a snug bearing with the walls of the hole at all times, which holds the drill steady and insures a round hole.” (*Id.* at 2, col. 1:62-67). “I grind the drill so that the point presents a series of drilling units. The first unit corresponds to a drill of relatively small diameter, say 3/8 inch, having a central core of minimum area which may readily be entered into the ordinary center punch mark of the metal to be drilled, and which therefore maintains its proper starting position. The hole is thus centered to start and there is no necessity of raising the drill and employing a hand tool to center it.” (*Id.* at 1, col. 2:34-43).

115. The supposed advantages of “drill bit durability” and “cutting edge wears more slowly” is redundant to and not needed in Bannister: “There being less crushing of the material, there is less heat generated, and a drill made in accordance with my Invention will do much more work without regrinding.” (**Ex. 1006** at 2, col. 2:45-47).

116. In my opinion, Viking’s proposed modification to replace Bannister’s perpendicular steps with the angled steps of Zhou or Welty defeats Bannister’s

principle of operation. Petitioner argues a POSA would have been motivated to modify Bannister with the angled step as taught by Zhou or Welty to create a plurality of composite cutting blade groups, with each group having a conical first step surface. Instead, Petitioner made conclusory statements that “conical first step surfaces were well known in similar prior art drills with stepped tips, such as those shown in Zhou and Welty”. There is no description of how or why a POSA would have converted Bannister’s beveled cutting edge from a bevel (or chamfer) design (*i.e.*, to cut away a square edge) to the claimed conical first step surface (*i.e.*, slating the entire distance between two cylindrical second step surfaces), in each of a plurality of composite cutting blade groups. That is, instead of one bevel as described in Bannister, Petitioner suggests extensive modification to expand the bevel and eliminate all the perpendicular steps. The perpendicular steps affect the direction of chip flow from the edge into the flute, to thus be different than the direction of the chip forming at the beveled edge. Making such a change is contradictory to the net cutting mechanics captured in the Bannister design.

117. Bannister describes a metal working twist drill “which shall be effective to clear the hole being drilled of chips as they are formed.” (**Ex. 1006** at 1, col. 1:3-12). “The chips from the small drill unit are carried up the auxiliary flutes into the main flutes and thence off with the chips from the other drill units.” (*Id.* at 1, col. 2:54 - 2, col. 1:2). “These long spiral chips thus formed take with

them the short chips formed by the cutting edges which are substantially normal to the axis of the drill and thus rid the hole of the short chips which might otherwise clog it.” (*Id.* at 2, col. 1:15-19). “As is well known, bevelled cutting edges, in drilling soft metal, such as copper or soft steel, produce long chips, whereas cutting edges normal to the axis of the drill produce short chips, and the short chips are liable to jamb the drill in the hole and cause it to break off. By providing the bevelled cutting edges 14 on the central drilling unit 13, and the bevelled cutting edges 24 on the outer drill unit, I am enabled to produce long chips along with the short ones, which long chips entangle with the short ones and carry them out of the hole being drilled.” (*Id.* at 2, col. 2:7-18). “The drill is next ground ... with a series, or plurality of steps, of cutting edges 22 and 23 which are normal to the axis of the main drill ...” (*Id.* at 2, col. 1:72-75).

118. Bannister’s basic design principle is that small chips are created by the central drilling unit 13 and the square cutting edges 22 and 23 of successively larger drill units. The beveled cutting edges have an importance and central task in Bannister’s design, namely to carry off smaller chips created by the perpendicular steps of cutting edges 22 and 23. Further, the beveled cutting edges have an important position – at the very back, nearest the body of the twist drill, so that the small chips transported by the auxiliary and main flute are carried further back and out of the hole by the long spiral chips created by the beveled cutting edges. To

change this design as proposed would completely change the operation of Bannister's drill.

119. Likewise, neither Zhou nor Welty, discussed in detail above, provide any motivation for a POSA to combine a conical cutting edge from Zhou or Welty with the drill bit taught in Bannister. In my opinion, Viking's proposed combination of Bannister with Zhou or Welty is purely the combination of hindsight. Welty describes a gundrill, and given the vastly different operation, a twist drill innovator would not be motivated to apply the teachings of a gundrill to a twist drill, such as Bannister.