UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MINNESOTA

TSTEIGEN, INC. and HONGJIA WANG, Plaintiffs, v. VIKING DRILL & TOOL, INC., Defendant.	)	No. 21-cv-2759 (KMM/JFD) **JURY TRIAL DEMANDED**

DEFENDANT, VIKING DRILL AND TOOL, INC.'S INVALIDITY AND PRIOR ART STATEMENT AND CLAIM CHARTS

Pursuant to Paragraphs 1(a) and 1(b) (Discovery Relating to Validity and Prior art) of the Court's Pretrial Case Management Order (D.I. 21) ("Case Management Order"), Defendant, Viking Drill & Tool, Inc. ("Viking") hereby serves the following invalidity and prior art contentions and claim charts ("Invalidity Contentions") on Plaintiffs, Tsteigen, Inc. and Hongjia Wang (collectively "Plaintiffs") relating to U.S. Patent No. 11,007,583 ("the '583 patent") and 11,007,584 ("the '584 patent") (collectively, "Asserted Patents").

Viking contends that the prior art discussed herein render the Asserted Claims of the Asserted Patents invalid under 35 U.S.C. §§ 102 and 103. Exemplary prior-art citations and statements explaining the invalidity of the asserted claims are specified in the following disclosure and claim charts. Viking also provides exemplary combinations of prior art and the motivation to combine such references for purposes of Viking's

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Viking contends that the prior art discussed herein render the Asserted Claims of the Asserted Patents invalid under 35 U.S.C. §§ 102 and 103. Exemplary prior-art citations and statements explaining the invalidity of the asserted claims are specified in the following disclosure and claim charts. Viking also provides exemplary combinations of prior art and the motivation to combine such references for purposes of Viking's

obviousness defenses. Such combinations are exemplary, and Viking reserves the right to rely on any combination or combinations of the prior art references cited or discussed in these disclosures. Viking also contemporaneously produces with this submission the prior art references.

Viking further contends that the Asserted Claims of the Asserted Patents invalid under 35 U.S.C. § 112 as being indefinite, and/or for lack of written description and/or enablement.

To the extent these contentions contain any information that may be protected from discovery under the attorney-client privilege, the attorney work-product immunity or any other applicable privilege or immunity, such disclosure is inadvertent and does not, nor is it intended to, constitute a waiver of any such privilege or immunity.

I. GENERAL STATEMENTS

A. Claim Construction

These Invalidity Contentions should not be interpreted as a statement of Viking's position with regard to the proper claim construction of any claim term. Instead, Viking has made certain assumptions, to the extent necessary and appropriate, with respect to the meaning of claim terms for the purpose of these Invalidity Contentions, including any claim terms that are indefinite. By making these assumptions, Viking does not admit that any claim language satisfies 35 U.S.C. § 112. Likewise, the use of claim terms herein should not be understood to suggest or imply a common, usual, ordinary, customary, plain, or accepted meaning in the art for any such term. To the extent Plaintiffs have purported construction of claim limitations in the Supplemental Infringement Contentions

and their application of those apparent constructions, nothing in these contentions and claim charts should be construed as endorsing any position taken by Plaintiffs. To the extent Viking determines that a different meaning is appropriate for any claim term, or that any claim term does not constitute a claim limitation, Viking reserves the right to assert that meaning in connection with claim construction proceedings.

B. Ongoing Discovery and Disclosures

Discovery in this case is in its early stages, and Viking's investigation, including Viking's search for prior art, is ongoing. Viking bases these Invalidity Contentions on information in their possession as of the date of these Contentions, including Plaintiffs' Complaint, Plaintiffs' statements in the Joint Rule 26(f) Report, and Plaintiffs' Patent Infringement Contentions dated June 1, 2022 as supplemented on July 8, 2022. Notwithstanding that Plaintiffs have not sought leave to amend/supplement the Infringement Contentions dated June 1, 2022 in accordance with Paragraph 3 (Discovery Related to Claim Construction) of the Case Management Order, Viking has responded to the same. Viking therefore reserves the right, subject to the Case Management Order, to further supplement or alter the positions taken and information disclosed in these Invalidity Contentions including, without limitation, the prior art and grounds of invalidity set forth herein, to consider information or defenses that may come to light as a result of these continuing efforts.

Moreover, because expert discovery has not started, Viking reserves the right, subject to the Case Management Order, to amend these Invalidity Contentions as a result of new information disclosed through the parties' experts. Therefore, Viking reserves all

rights to further supplement or amend these Invalidity Contentions if and when further information becomes available. These Invalidity Contentions are provided without prejudice to the rights of Viking to introduce at trial any subsequently discovered evidence or expert opinions relating to currently known facts and to produce and introduce at trial all evidence, whenever discovered, relating to the proof of subsequently discovered facts. Moreover, facts, documents and things now known may be imperfectly understood and, accordingly, such facts, documents and things may not be included in the following Invalidity Contentions. Viking reserves the right to conduct discovery with reference to, or offer into evidence at the time of trial, any and all facts, expert opinion testimony, documents and things notwithstanding the written statements herein. Viking further reserves the right to refer to, conduct discovery with reference to, or offer into evidence at the time of trial, any and all facts, documents and things that are not currently recalled but might be recalled at some time in the future.

The information set forth below is provided without in any manner waiving: (1) the right to object to the use of any statement for any purpose, in this action or any other actions, on the grounds of privilege, relevance, materiality, or any other appropriate grounds; (2) the right to object to any request involving or relating to the subject matter of the statements herein; or (3) the right to revise, correct, supplement or clarify any of the statements provided below at any time.

Viking's invalidity positions in these contentions may be in the alternative and do not constitute any concession or admission by Viking for purposes of invalidity, enforceability, claim construction, and/or infringement. *See, e.g., Vanmoor v. Wal-Mart*

Stores, Inc., 201 F.3d 1363, 1366 (Fed. Cir. 2000). For example, Viking's Section 112 arguments may be in the alternative to Viking's obviousness arguments and should not be viewed, in any way, to be concessions about the prior art or knowledge of one of ordinary skill in the art.

C. Prior Art Identification and Citation

It should be recognized that a person of ordinary skill in the art ("POSA") would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a POSA would rely upon other information including other publications and general knowledge relevant to the subject matter of the Asserted Patents. Viking therefore reserves the right to rely upon other unidentified portions of the prior art references, other publications, other relevant knowledge and expert testimony to provide context and to aid understanding and interpretation of any identified portions. Viking also reserves the right to identify additional art that is not part of the combinations upon which it relies but demonstrates the state of the art. For example, Viking reserves the right to rely on additional references that show the common use and function of the excipients, and amounts thereof, to which the claims are directed. As an additional example, Viking reserves the right to rely on general references texts that describe the development of pharmaceutical formulations. Viking also reserves the right to rely upon other portions of the prior art references, other publications, and the testimony of experts to establish that the alleged

inventions were inherently disclosed in the prior art and/or would have been obvious to a POSA, including on the basis of modifying or combining certain cited references.

Viking hereby incorporates by reference any rejections made by the Patent and Trademark Office ("PTO") during the prosecution of the applications leading to the Asserted Patents. Subject to the Case Management Order, Viking reserves the right to assert any art cited in the prosecution history of the Asserted Patents or related applications as a basis for contending that the Asserted Claims are invalid. Viking further identifies as prior art upon which they may rely those references identified in Information Disclosure Statements during the prosecution of the Asserted Patents. Viking also reserves the right to rely upon any admissions relating to prior art in the Asserted Patents or their respective prosecution histories, including any post grant proceedings.

In addition, Viking reserves the right to rely on all prior art and all evidence of the relevant state of the art and prior sales that may be produced by Plaintiffs.

II. RESERVATION OF RIGHTS

Subject to the Case Management Order, Viking reserves all rights to modify, amend, or otherwise supplement these invalidity contentions, including with the addition of prior art references, should further discovery, the Court's claim construction, or other circumstances so require. Viking further reserves the right to supplement and/or amend these contentions if Plaintiffs assert claim constructions different from those relied upon by Viking; if Plaintiffs are permitted to assert additional or different infringement allegations at a later date; if Plaintiffs assert an interpretation of prior art different from

that used herein, including assertions that any limitations of the asserted claims are not disclosed in the prior art identified herein; and based upon information, documents, things, or electronically stored information produced in this or any other action or regulatory proceeding involving any of the patents at issue in this litigation (whether by Plaintiffs or a third party to this action). Viking further reserves the right to modify, amend, or otherwise supplement these invalidity contentions, including the addition of prior art references, in accordance with the Federal Rules of Civil Procedure, the Local Rules of the Court, the Case Management Order, any agreement of the parties, or any order of the Court.

Nothing in this statement of contentions should be construed as limiting Viking's statutory rights under 35 U.S.C. § 282 to provide notice of "the country, number, date, and name of the patentee of any patent, the title, date, and page numbers of any publication to be relied upon as anticipation of the patent in suit or, except in actions in the United States Court of Federal Claims, as showing the state of the art, and the name and address of any person who may be relied upon as the prior inventor or as having prior knowledge of or as having previously used or offered for sale the invention of the patent in suit" thirty days before trial. 35 U.S.C. § 282(c).

Plaintiffs have the burden to establish that the Asserted Claims of the Asserted Patents are entitled to the priority date of any earlier-filed application. *See Dynamic Drinkware, LLC v. National Graphics, Inc*. 800 F.3d 1375, 1380 (Fed. Cir. 2015). To establish an earlier priority date, each earlier application in the chain must fully disclose the claimed invention by meeting all requirements of 35 U.S.C. §112. *In re NTP, Inc*.,

654 F.3d 1268, 1277 (Fed. Cir. 2011). Viking reserves the right to (i) challenge the Asserted Patents' entitlement to priority to previous applications, (ii) challenge any alleged date of conception or reduction to practice; and (iii) identify additional prior art thereto.

III. INVALIDITY LEGAL STANDARDS

A. Anticipation

The law of anticipation denies patent protection for subject matter that is already known or disclosed to the public, and therefore not novel. A claim is invalid for anticipation if "a prior art reference discloses every limitation of the claimed invention, either explicitly or inherently." *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371, 1381 (Fed. Cir. 2007). The Federal Circuit relies on the maxim "that which would literally infringe if later anticipates if earlier." *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1378 (Fed. Cir. 2001). Further, the question of anticipation is considered from the perspective of one of ordinary skill in the art, where a reference is considered anticipatory if "it discloses the claimed invention 'such that a skilled artisan could take its teachings in combination with his own knowledge of the particular art and be in possession of the invention.'" *In re Graves*, 69 F.3d 1147, 1152 (Fed. Cir. 1995) (quoting *In re Legrice*, 301 F.2d 929, 936 (CCPA 1962)).

B. Obviousness

Patent claims are invalid if the "differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art."

35 U.S.C. § 103(a); *see Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161−62 (Fed. Cir. 2007); *TQ Delta, LLC v. DISH Network LLC*, 929 F.3d 1350, 1360 (Fed. Cir. 2019).

Invalidity under 35 U.S.C. § 103 is a legal conclusion based on the following factual inquiries: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art at the time when the invention was made; and (4) any other evidence of obviousness or nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17−18 (1966); *see also TQ Delta*, 929 F.3d at 1360 ("Obviousness is a question of law based on underlying findings of fact.") (internal citation and quotations removed).

To determine the level or ordinary skill in the art, the relevant field of art must be identified; courts accomplish this by looking to "the nature of the problem confronting the inventor." *Verizon Servs. Corp. v. Cox Fibernet Va., Inc.*, 602 F.3d 1325, 1338 (Fed. Cir. 2010) (quoting *Bancorp Servs., L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1375 (Fed. Cir. 2004)); *see also Ruiz v. A.B. Chance Co.*, 234 F.3d 654 (Fed. Cir. 2000) ("The determination of the level of ordinary skill in the art is an integral part of the *Graham* analysis."). A person of ordinary skill in the identified art is presumed to have knowledge of all pertinent prior art. *Custom Accessories*, 807 F.2d at 962. "A reference qualifies as prior art for an obviousness determination under § 103 only when it is analogous to the claimed invention." *In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011); *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986) (quoting *In re Wood*, 599 F.2d 1032, 1036 (C.C.P.A. 1979)); *see also In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992) ("A

reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem.").

The legal test for obviousness is a flexible inquiry focused on the objective reach of the claims. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415-16, 419 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."); *see also Indivior Inc. v. Dr. Reddy's Labs., S.A.*, 930 F.3d 1325, 1352 (Fed. Cir. 2019) ("obviousness demands a more expansive and flexible approach") (internal quotations and citation removed). Importantly, obviousness must be evaluated as of the time of invention so as not to improperly inject hindsight bias into the inquiry. *See Graham*, 383 U.S. at 36 (instructing courts to "resist the temptation to read into the prior art the teachings of the invention in issue" and "'guard against slipping into use of hindsight'") (quoting *Monroe Auto Equip. Co. v. Heckethorn Mfg. & Supply Co.*, 332 F.2d 406, 412 (6th Cir. 1964)); *Para-Ordnance Mfg., Inc. v. SGS Imps. Int'l, Inc.*, 73 F.3d 1085, 1087 (Fed. Cir. 1995) ("Obviousness may not be established using hindsight . . . ."). A patent may be proved obvious under the "teaching, suggestion, or motivation" ("TSM") test "if some motivation or suggestion to combine the prior art teachings can be found in the prior art, the nature of the problem, or the knowledge of a person having ordinary skill in the art." *KSR*, 550 U.S. at 407 (internal citation and quotation marks omitted). Conversely, "when the prior art teaches away from combining certain known elements, discovery of a

successful means of combining them is more likely to be nonobvious." *Id.* at 416 (citing *United States v. Adams*, 383 U.S. 39, 51−52 (1966)).

> An obviousness determination, however, does not require application of the TSM test. Rather, the inquiry must also "take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418−19. Moreover, a patent may be found obvious when the combination of elements was obvious to try. *Id.* at 420. When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103.

Id. at 421. Conversely, the obvious to try standard is not met when "the inventor would have had to try all possibilities in a field unreduced by direction of the prior art." *Bayer Schering Pharma AG v. Barr Labs., Inc.*, 575 F.3d 1341, 1347 (Fed. Cir. 2009); *In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988) (foreclosing an obvious to try analysis when the patentee simply "var[ies] all parameters or tr[ies] each of numerous possible choices until [arriving] at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful"); *see also Allergan, Inc.*, 754 F.3d at 972−73.

Generally, where the limitations of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Applied Materials, Inc.*, 692 F.3d 1289, 1295 (Fed. Cir. 2012). Formulators routinely optimize such variables during development of a new formulation. *Id.; see also Titanium*

Metals Corp. v. Banner, 778 F.2d 775, 783 (Fed. Cir. 1985). Discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art. *In re Boesch*, 617 F.2d 272, 276 (C.C.P.A. 1980).

Importantly, courts must consider all objective evidence of nonobviousness (also called secondary factors or considerations)—such as unexpected results, commercial success, long-felt need, licensing by competitors, and failure of others—before making an obviousness determination. *In re Cyclobenzaprine*, 676 F.3d at 1075−76. Still, the burden of production is shifted to require the patentee to produce evidence of nonobviousness, which may include objective evidence of nonobviousness, "after the challenger has successfully made his prima facie case demonstrating that the patent might be obvious." *Novo Nordisk*, 719 F.3d at 1353. In some cases evidence of secondary considerations "simply cannot overcome a strong prima facie case of obviousness." *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010).

C. Indefiniteness

"[A] patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2124 (2014). "[A] patent must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them." *Id.* at 2129 (quotations and citations omitted). The analysis to determine if a claim is invalid for indefiniteness examines the claims, specification, and prosecution history "to ascertain if they convey to one of skill in the art with reasonable

certainty the scope of the invention claimed." *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1341 (Fed. Cir. 2015); *see also Horizon Pharma Ireland Ltd. v. Actavis Labs., UT, Inc.*, No. 14-7992, 2016 WL 4408990, at *8 (D.N.J. Aug. 17, 2016) (applying definiteness requirement to "consisting essentially of").

D. Lack of Written Description

To satisfy the written description requirement, "the patent specification must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed." *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1479 (Fed. Cir. 1998) (internal quotations and citation omitted). This means that "the disclosure must. . . convey with reasonable clarity to those skilled in the art that. . . [the inventor] was in possession of the invention." *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000) (internal quotations and citation omitted) (affirming district court's finding that the patent claims were invalid); *see also Capon v. Eshhar*, 418 F.3d 1349, 1357 (Fed. Cir. 2005); *In re Curtis*, 354 F.3d 1347, 1350-52 (Fed. Cir. 2004) (affirming Board's finding that a prior application "did not provide an adequate written description of the later-claimed genus of friction enhancing coatings"); *Purdue Pharma L.P. v. F.H. Faulding & Co.*, 48 F.Supp.2d 420, 427 (D. Del. 1999); *Agilent Techs., Inc. v. Affymetrix, Inc.*, 567 F.3d 1366, 1383 (Fed. Cir. 2009) ("[T]he purpose of the written description requirement is to prevent an applicant from later asserting that he invented that which he did not . . ."); *Centocor Ortho Biotech, Inc. v. Abbott Labs.*, 636 F.3d 1341, 1348 (Fed. Cir. 2011) (written description requirement is satisfied only if the inventor "convey[s] with reasonable clarity to those skilled in the art that, as of the filing date sought, he or

she was in possession of the invention, and demonstrate[s] that by disclosure in the specification of the patent"). Under this requirement, the patent's specification must describe what is claimed with sufficient detail such that a person of ordinary skill in the art can conclude that "the inventor had possession of the claimed subject matter as of the filing date." *Ariad Pharm., Inc. v. Eli Lilly & Co.,* 598 F.3d 1336, 1351 (Fed Cir. 2010) (citation omitted); *see also Carnegie Mellon Univ. v. Hoffmann-La Roche Inc.,* 541 F.3d 1115, 1122 (Fed. Cir. 2008) ("[T]he applicant must 'convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention,' and demonstrate that by disclosure in the specification of the patent." (citation omitted)).

"[T]he hallmark of written description is disclosure. Thus, 'possession as shown in the disclosure' is a more complete formulation." *Ariad*, 598 F.3d at 1351. The test for written description involves an objective inquiry into whether the specification describes the invention sufficiently to allow a person of ordinary skill in the art to understand it and know that the inventor actually invented the claimed invention. *Id.* The operative time for this determination is the date of the patent's filing. *Id.* ("The law must be applied to each invention at the time it enters the patent process, for each patented advance has a novel relationship with the state of the art from which it emerges."). The Federal Circuit has stated that, when determining whether a patent specification complies with the written description requirement:

> [T[he level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology. For generic

> claims, we have set forth a number of factors for evaluating the adequacy of the disclosure, including "the existing knowledge in the particular field, the extent and content of the prior art, the maturity of the science or technology, [and] the predictability of the aspect at issue.

Id. (quoting *Capon*, 418 F.3d at 1359). Finally, "actual 'possession' or reduction to practice outside of the specification is not enough ... it is the specification itself that must demonstrate possession." *Id.* at 1352. Where the specification fails to disclose claimed features for which a POSA "would not have thought it would work," the claims fail to satisfy the written description requirement. *Nuvo Pharmaceuticals (Ireland) Designated Activity Co. v. Dr. Reddy's Labs. Inc.*, 923 F.3d 1368, 1377, 1381-84 (Fed. Cir. 2019) (finding "upon [the patentee's]' insistence as part of its obviousness analysis that ordinarily skilled artisans would not have" had a reasonable expectation of success based on the teachings of the prior art, and subsequently concluding the claims were invalid under §112 as not described "because the specification [similarly] provide[d] no experimental data or analytical reasoning showing the inventor possessed" the claimed method).

E. Lack of Enablement

An inventor is obligated to set forth in the specification "a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out of his invention."

"To be enabling, the specification of a patent must teach those skilled in the art

how to make and use the full scope of the claimed invention without 'undue experimentation.'" *ALZA Corp. v. Andrx Pharm., LLC,* 603 F.3d 935, 940 (Fed. Cir. 2010) (quoting *Genentech, Inc. v. Novo Nordisk, A/S,* 108 F. 3d 1361, 1365 (Fed. Cir. 1997)); *see also Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc.,* 166 F.3d 1190, 1195-96 (Fed. Cir. 1999); *In re Goodman,* 11 F.3d 1046, 1050 (Fed. Cir. 1993); 35 U.S.C. § 112, ¶ 1. "Whether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations," including the quantity of experimentation necessary and the amount of direction or guidance presented. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). Enablement of one mode of practicing the invention will not satisfy the enablement requirement if the invention is broadly claimed. *Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274, 1285 (Fed. Cir. 2007); *Liebel-Flarsheim Co. v. Medrad, Inc.,* 481 F.3d 1371, 1378-79 (Fed. Cir. 2007).

Where one of ordinary skill in the art "would have been required to engage in an iterative, trial-and-error process to practice the claimed invention even with the help of the . . . specification," the invention is not sufficiently enabled. *Wyeth & Cordis Corp. v. Abbott Labs*, 720 F.3d 1380, 1386 (Fed. Cir. 2013) (internal quotations omitted) (affirming summary judgment of invalidity for nonenablement where evaluating claimed candidate compounds would "take technicians weeks to complete" and the "specification offer[ed] no guidance or predictions about particular substitutions that might preserve" the effects of the claimed method of treatment); *see also In re '318 Patent Infringement Litig.*, 583 F.3d at 1327 ("Thus, at the end of the day, the specification, even read in the

light of the knowledge of those skilled in the art, does no more than state a hypothesis and propose testing to determine the accuracy of that hypothesis. That is not sufficient.").

Whether a patent complies with the enablement requirement is a question of law and is determined from the perspective of a person of ordinary skill in the art as of the filing date of the specification. *EnzoBiochem, Inc. v. Calgene, Inc.*, 188 F.3d 1362, 1371-72 (Fed. Cir. 1999). The Court must make an enablement determination "*retrospectively*, i.e., by looking back to the filing date of the patent application and determining whether undue experimentation *would have been* required to make and use the claimed invention at that time." *Id.* Although the enablement inquiry is viewed from the perspective of a person of ordinary skill in the art, that person's knowledge is not a "substitute for a basic enabling disclosure." *Genentech*, 108 F.3d at 1366 (recognizing that the specification, not knowledge of a person of ordinary skill in the art, must supply novel aspects of an invention to constitute adequate enablement).

IV. THE ASSERTED PATENTS

U.S. Patent No. 11,007,583 ("the '583 patent"), titled "Twist Drill," issued on May 18, 2021, from U.S. Application No. 16/699,089 ("the '089 application"), which was filed on November 28, 2019. U.S. Patent No. 11,007,584 ("the '584 patent"), titled "Twist Drill, was filed on November 10, 2020 and issued on May 18, 2021.

The '583 patent claims priority as a continuation-in-part of U.S. Application No. 15/847,900 ("the '900 application"), filed on December 19, 2017, which published as U.S. Publication No. 2018/0133808 A1, now abandoned, and a continuation-in-part of

international application no. PCT/CN2016/073767, which published as WO2017/136966 A1, filed on February 14, 2016.

The ’584 patent claims priority as a continuation of the ’583 patent, which is a continuation-in-part of U.S. Application No. 15/847,900, filed on December 19, 2017, and a continuation-in-part of international application no. PCT/CN2016/073767, filed on February 14, 2016.

A. Effective Filing Date

The Asserted Patents claim priority as a continuation-in-part of Application No. 15/847,900 (“the ‘’900 application”), filed December 19, 2017, which was a continuation[1] of PCT/CN2016/073767, filed February 14, 2016. Any claims in the Asserted Patents that are supported under 35 U.S.C. §112 by both PCT/CN2016/073767 and the ’900 application have an effective filing date of February 14, 2016. On the other hand, any claims in the Asserted Patents that are not supported under 35 U.S.C. §112 by PCT/CN2016/073767 and the ’900 application have an effective filing date of November 28, 2019, the filing date of the ’583 patent. These are the relevant dates for the purposes of establishing prior art.[2]

[1] While both the Asserted Patents make claim to the ’900 application being a continuation-in-part of PCT/CN2016/073767, it is noted that the ’900 application was filed as a continuation of PCT/CN2016/073767. *See* ’583 patent file history, Application Data Sheet under 37 CFR 1.76 dated November 27, 2019.

[2] Viking reserves the right to address and challenge any arguments by Plaintiffs as to the Asserted Patents’ entitlement to priority to previous applications, and also identify additional prior art.

B. Identification of Asserted Claims

On June 1, 2021, Plaintiffs provided their Patent Infringement Contentions and Claims Charts alleging that Viking infringes the following claims of the Asserted Patents:

Patent	Asserted Claims
’583 patent	1-3, 5-9, and 11-14
’584 patent	1-2, 4-7, and 9-11

1. The ’583 Patent

Claims 1 and 8 of the ’583 patent, which are the only independent claims, read as follows:

> 1. A twist drill, comprising:
> an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;
> a shank portion axially fixed to the cylinder portion opposite the cone portion;
> a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;
> a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:
> a conical first step surface;
> a cylindrical second step surface adjacent to the conical first step surface, a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;
> a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and
> a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and
> a top blade provided on the front end of the cone portion;
> wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and

each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and

wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and

the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.

8. A twist drill, comprising:

an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;

a shank portion axially fixed to the cylinder portion opposite the cone portion;

a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;

a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:

a conical first step surface;

a cylindrical second step surface adjacent to the conical first step surface, a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;

a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and

a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;

a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;

wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and

each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and

wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and

the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.

Claims 2, 3, and 5-7 depend from claim 1 and claims 9 and 11-14 depend from claim 8. Claim 2 adds a limitation regarding the minor cutting edge being configured to smooth the machined surface of the workpiece. Claims 3 and 9 add limitations relating to the height of each composite cutting blade group being uniform. Claim 5 adds a limitation regarding the top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges. Claims 6 and 11 add limitations regarding each of the plurality of composite cutting blade groups being coaxial with the cone portion. Claims 7 and 12 add limitations regarding the straight major cutting edge length of the top blade being greater than each of the major cutting edges of the composite cutting blade groups. Claim 13 adds a limitation regarding the straight minor cutting edge length being greater than each of the minor cutting edges of the plurality of composite cutting blade groups. Claim 14 adds a limitation regarding the operation portion being configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.

2. The ’584 Patent

Claims 1 and 6 of the ’584 patent, which are the only independent claims, read as follows:

1. A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:

providing a twist drill comprising:

a shank portion;

an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;

a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:

a conical first step surface;

a cylindrical second step surface adjacent to the conical first step surface,

a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;

a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and

a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and

a top blade provided on the front end of the cone portion;

wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and

wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;

positioning the twist drill atop the workpiece;

applying a torque and an axial drilling force to the twist drill;

cutting the workpiece with the top blade to create a drill hole in the workpiece;

continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;

continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,

wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and

continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.

6. A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:

providing a twist drill comprising:

a shank portion;

an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;

a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:

a conical first step surface;

a cylindrical second step surface adjacent to the conical first step surface, a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;

a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and

a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and

a top blade provided on the front end of the cone portion;

wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;

positioning the twist drill atop the workpiece;

applying a torque and an axial drilling force to the twist drill;

cutting the workpiece with the top blade to create a drill hole in the workpiece;

continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and

continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion, wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.

Claims 2, 4, and 5 depend from claim 1 and claims 7 and 9-11 depend from claim 6. Claims 2 and 7 add limitations regarding the minor cutting edge of being configured to smooth the machined surface of the workpiece. Claims 4 and 9 add limitations regarding the top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges. Claims 5 and 10 add limitations regarding the straight major cutting length of the top blade being longer than each of the major cutting edges of the plurality of composite cutting blade groups. Claim 11 adds a limitation regarding dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.

V. PERSON OF ORDINARY SKILL IN THE ART

A POSA is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *See* MPEP § 2141.03. A POSA has ordinary creativity, is not an automaton, and is capable of combining the teachings of the prior art. *See, e.g., KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 420–21 (2007). The relevant art is the development of machine tools, particularly drill bits.

A POSA with respect to the Asserted Patents would have been an individual educated in mechanical engineering with a bachelor's degree and one or two years of experience in the development of machine tools, or an associate's degree and at least five years of experience in the development of machine tools. A POSA would typically work in a team with machinists and would be aware of developments in the field of machine

tools, particularly drill bits, for example by attending trade shows, and by reading patents and trade journals.

V. SCOPE AND CONTENT OF THE RELEVANT PRIOR ART

Pursuant to Paragraph 1(a) of the Case Management Order, Viking identifies herein the prior art known at this time that it asserts invalidates, alone or in combination, each of the Asserted Claims of the Asserted Patents from the perspective of a POSA. To the extent that any of the elements of the Asserted Claims are deemed missing from the references, such elements would have been known or obvious to a POSA at the time of the invention. *See KSR, Int'l Co. v. Teleflex, Inc*., 550 U.S. 398 (2007). Viking also incorporates by reference its statements at the outset of these contentions concerning the supplementation or amendment of these contentions.

For any prior art patents and publications identified in these Invalidity Contentions, Viking reserves the right to rely on inherency, public use, offer for sale, and/or sale of the products described in those prior art patents or publications once Viking has had an opportunity to take discovery on these subjects.

Without limiting the contents of the prior art references on which Viking relies, Viking sets forth a summary of each prior art reference below. Where elements are disclosed at multiple locations within a single prior art reference, Viking has not necessarily identified every location in that reference. Likewise, where a reference is listed for one or more claim elements, Viking has not necessarily identified every element of that claim, or claim in that patent, to which that reference applies. Viking may rely on uncited portions of the identified prior art, references identified in the prior art disclosed

herein, other documents, and expert testimony. The citations to a particular Example, Table, or Figure from a reference include the caption and description and any text relating to the same. Similarly, citations to particular text referring to an Example, Table, or Figure also include the Example, Table, or Figure and caption.

Granted Patents

Name	Patent Number	Country	Date of Issue	Bates
Bannister	2,193,186	United States	March 12, 1940	VIKINGVP_00001722-1725
Wang II	D840,449	United States	February 12, 2019	VIKINGVP_00001453-1457
Nevills	5,452,971	United States	September 26, 1995	VIKINGVP_00001736-1761
Durfee I	10,058,929	United States	November 10, 2015	VIKINGVP_00001663-1678
Durfee II	9,687,915	United States	June 27, 2017	VIKINGVP_00001786-1794
Gentry	8,029,215	United States	October 4, 2011	VIKINGVP_00001762-1775
Allen	9,731,358	United States	August 15, 2017	VIKINGVP_00001795-1884
Korb	4,582,458	United States	April 15, 1986	VIKINGVP_00001730-1735
Rogalla	9,539,653	United States	January 10, 2017	VIKINGVP_00001776-1785
Mackey	3,592,555	United States	July 13, 1971	VIKINGVP_00001726-1729
Ruko	DE202011106232U1	Germany	November 9, 2011	VIKINGVP_00001459-1468

Patent Application Publications

Name	Publication Number	Country	Date of Publication	Bates
Wang I	2018/0133808	United States	May 17, 2018	VIKINGVP_00001705-1721
Wetzl	2005/0053438	United States	March 10, 2005	VIKINGVP_00001679-1690
Li	2011/0116884	United States	May 19, 2011	VIKINGVP_00001691-1704
Sheldon	2405820	United Kingdom	October 8, 2003	VIKINGVP_00001496-1502
Shiqing	CN102126039	China	July 20, 2011	VIKINGVP_00001425-1443
Tec-Spiral	WO2012/167448	PCT, China	December 13, 2012	VIKINGVP_00001872-1884
Zhang	WO2008/092386	PCT, China	August 7, 2008	VIKINGVP_00001858-1871
Zhou	CN103084629	China	May 8, 2013	VIKINGVP_00001444-1452

Non-Patent Literature

Name	Author	Year of Publication	Bates
Viking 2014 catalog	Viking Drill & Tool	2014	VIKINGVP_00000901-903
Viking 2015 catalog	Viking Drill & Tool	2015	VIKINGVP_00001512-1662
NAS 907	Aerospace Industries Association of America, Inc.	2001	VIKINGVP_00001469-1495
Matco Hyper-Step Flyer	Matco Tools	2018	VIKINGVP_00001458

Products

Name	Manufacturer/ Seller	Public Availability (at least as early as)	Production No.
Viking 00714 Drill	Viking Drill & Tool	2014	VIKINGVP_00001854-1857
Viking 00693 Drill	Viking Drill & Tool	2014	VIKINGVP_00001845-1849
Viking 00694 Drill	Viking Drill & Tool	2014	VIKINGVP_00001850-1853
Matco Hyper-Step Drills	Matco Tools	2018	VIKINGVP_00001503-1514

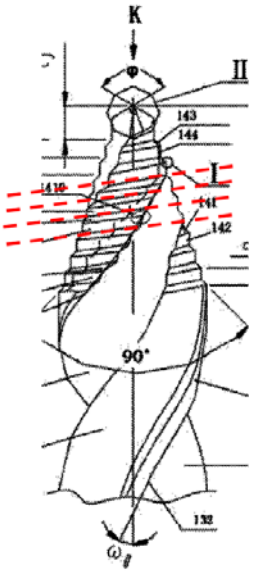
A. Granted Patents and Patent Application Publications

1. U.S. Patent Publication No. 2018/0133808 ("Wang I")

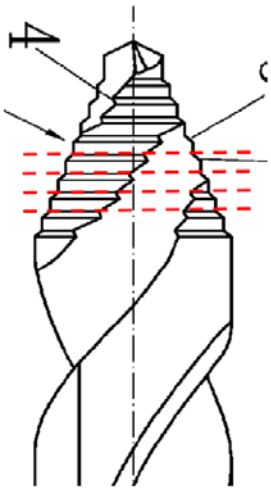
U.S. Patent Publication No. 2018/0133808 ("Wang I") was filed on December 19, 2017, as a continuation of PCT/CN2016/073767, which was filed on February14, 2016. Wang I published on May 17, 2018, which is more than one year before the filing date of the '583 patent. While the Asserted Patents claim priority to Wang I, any claim in the Asserted Patents that relies on the new material added in the CIP application for 35 U.S.C. §112 support, and for which there is no 35 U.S.C. §112 support in Wang I, is not entitled to priority under Wang I (or PCT/CN2016/073767). Wang I is, therefore, prior art to such claims under 35 U.S.C. §§ 102(a)(1).

Wang I provides no support under 35 U.S.C. § 112 for a number of claim limitations in the Asserted Patents. For example, Wang I provides no support for composite cutting blade groups being formed "spirally," which is a limitation present in all claims of the Asserted Patents. Wang I uses the term "spiral" only three times, each

time in the context of the formation of spiral flutes, not the composite cutting blade groups. Wang I fails to mention any aspect of forming the composite cutting blade groups spirally, and fails to show any such spirally formed composite cutting blade groups in the figures. As a continuation-in-part to Wang I, the ’583 patent added new figures, including Figure 3, which shows spirally formed cutting blade groups, and added a discussion directed to the spiral nature of the cutting blade groups: “[t]he cutting blade groups conically and spirally extend along the rake face 133 of the spiral flute IV towards the shank (shank portion 2)…” *See* ’583 patent at 6:10-12. Below is a side-by-side comparison of the ’583 patent’s FIG. 3 and Wang I’s FIG. 5, illustrating some of the new material introduced in the ’583 CIP application, compared to what was taught in Wang I. Any claim containing the “spirally formed” limitation cannot, therefore, claim priority before the filing date of the ’583 patent.



’ 583 Patent (FIG. 3)
Spirally formed composite cutting blade groups



Wang I (FIG. 5)
Composite cutting blade groups

Claims 1-14 of the ’583 patent each contain the limitation that each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips. Wang I provides no teaching for this limitation, and so fails to provide support for this limitation under 35 U.S.C. § 112. Thus, any claim containing this limitation cannot claim priority before the filing date of the ’583 patent.

Furthermore, claims 2 and 8 of the ’583 patent and claims 2 and 7 of the ’584 patent all include the limitation that the minor cutting edge is configured to smooth the machined surface of the workpiece. Wang I provides no teaching for this limitation, and so fails to provide support for this limitation under 35 U.S.C. § 112. Thus, any claim containing this limitation cannot claim priority before the filing date of the ’583 patent.

Wang I discloses, with reference to FIG. 5 which is reproduced below, a twist drill comprising drill body 2 having a shank portion and an operation portion axially fixed to the shank portion, the operating portion having a cone portion (along flank surface 3) axially fixed to the cylinder portion and a spiral flute 4 having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, with the shank portion axially fixed to the cylinder portion opposite the cone portion. *See, e.g.,* Wang I at FIG. 5, ¶ [0031] (annotated below), ¶¶ [[0031-39]] (generally).

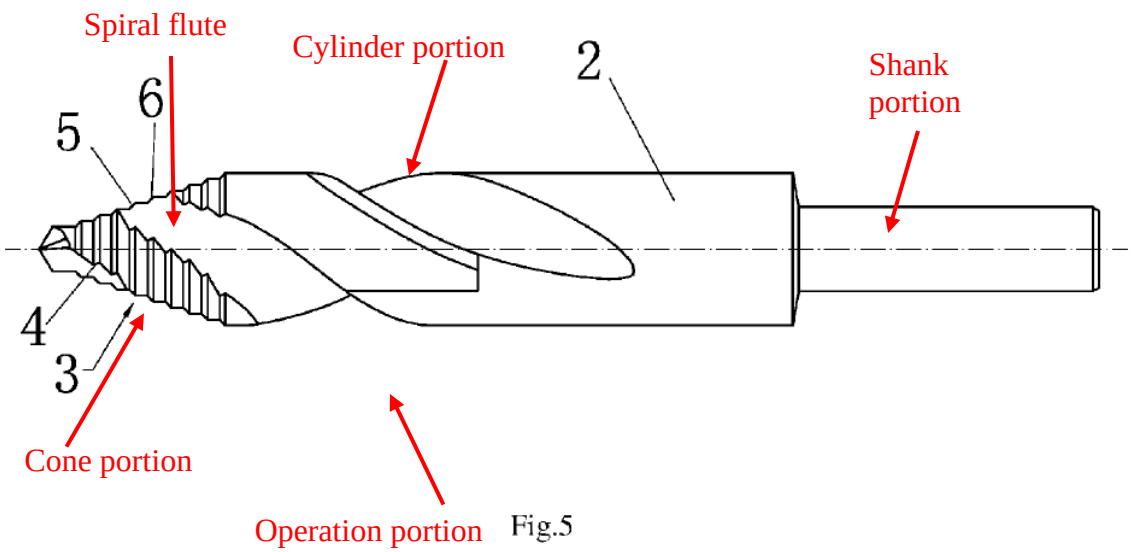
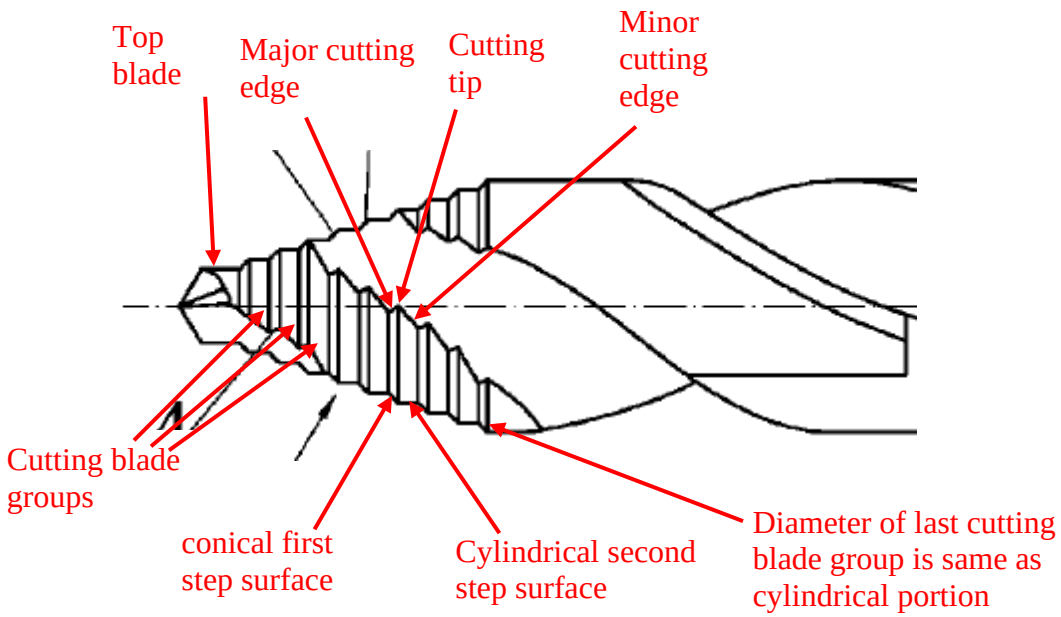


Fig.5

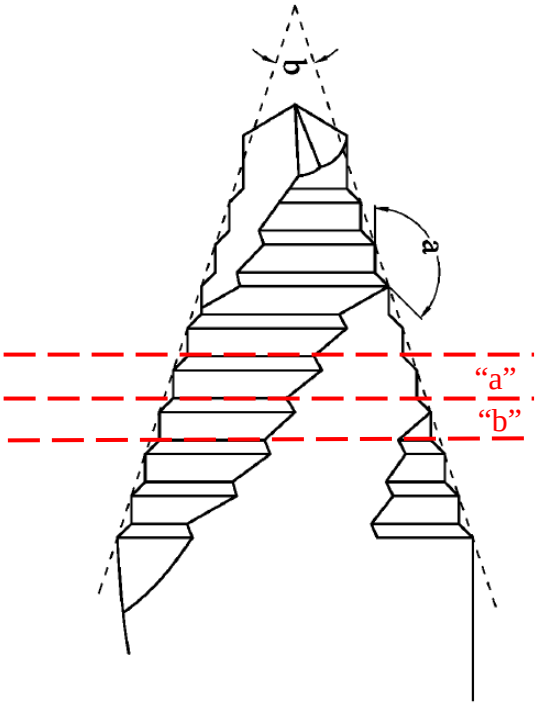
Wang I discloses a plurality of composite cutting blade groups (*e.g.*, 5 and 6) formed sequentially on the cone portion exterior from the front end of the cone portion to a rear end of the cone portion, with diameters of the composite cutting blade groups sequentially increasing from the front end to a rear end of the cone portion. Wang I at ¶¶ [[0031-32]].

Wang I discloses that each of the plurality of composite cutting blade groups comprises a conical first step surface and a cylindrical second step surface adjacent to the conical first step surface, a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute, a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute, a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute, and a top blade provided on the front end of the cone portion. *See* annotated reproduction of Fig. 5 below. The cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step

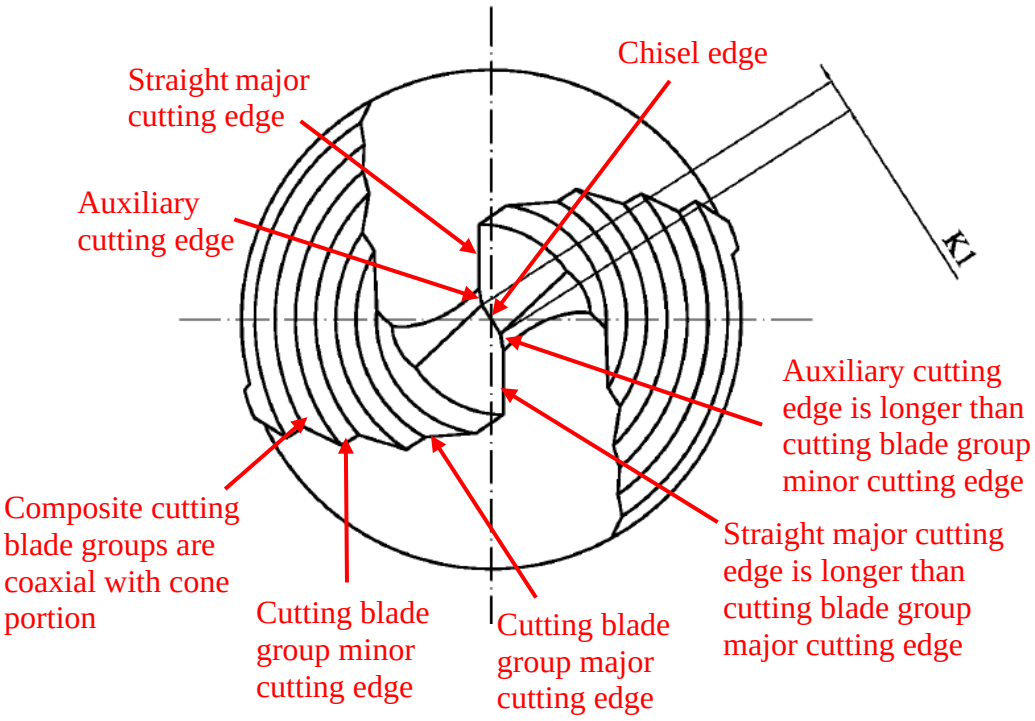
surface of a next composite cutting blade group. As Plaintiffs have construed the claim limitation, the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. To the extent that smoothing the machined surface by the minor cutting edge is inherent to the design of drill described in Wang I, this feature is taught by Wang I.



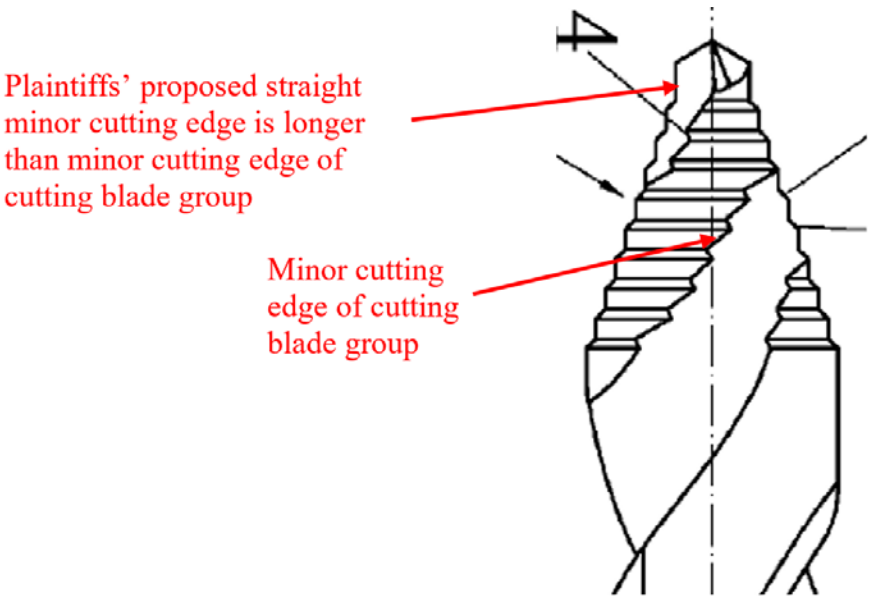
Wang I shows, for example, in FIG. 8, see annotated reproduction below, that the composite cutting blade groups are the same height as each other, and that the height of a composite cutting blade group is uniform around its perimeter. Wang I at FIG. 8.



Wang I shows, for example in FIG. 12, a top blade having a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edges being intersected by the chisel edge and a respective straight major cutting edge. An annotated reproduction of FIG. 12 is presented below, showing the chisel edge, auxiliary cutting edges and straight major cutting edges. The label "K1" shows the extent of the chisel edge. Furthermore, FIG. 12 shows that each composite cutting blade group is arranged coaxially with the cone portion of the drill, that the length of the straight major cutting length is greater than the major cutting edges of the composite cutting blade groups and that the length of the auxiliary cutting edge is longer than the minor cutting edges of the composite cutting blade groups.



Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Viking disagrees with this construction. If, however, this construction is correct, then Wang I shows a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* the annotated extract of FIG. 5 below.



Wang I describes the well-known approach to using drill bits, including positioning a twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill to form a hole in the workpiece by advancing at least a portion of the cylinder portion of the drill bit through the workpiece. Wang I at ¶ [0039]. Wang I generally describes such a previously-known approach involving cutting the workpiece with the top blade to create a drill hole in the workpiece, continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end, continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion, wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut, and continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece. As noted therein, such an approach (involving using a guide portion) improves centering accuracy of a twist drill when drilling a drill hole in a workpiece, and the various steps provide

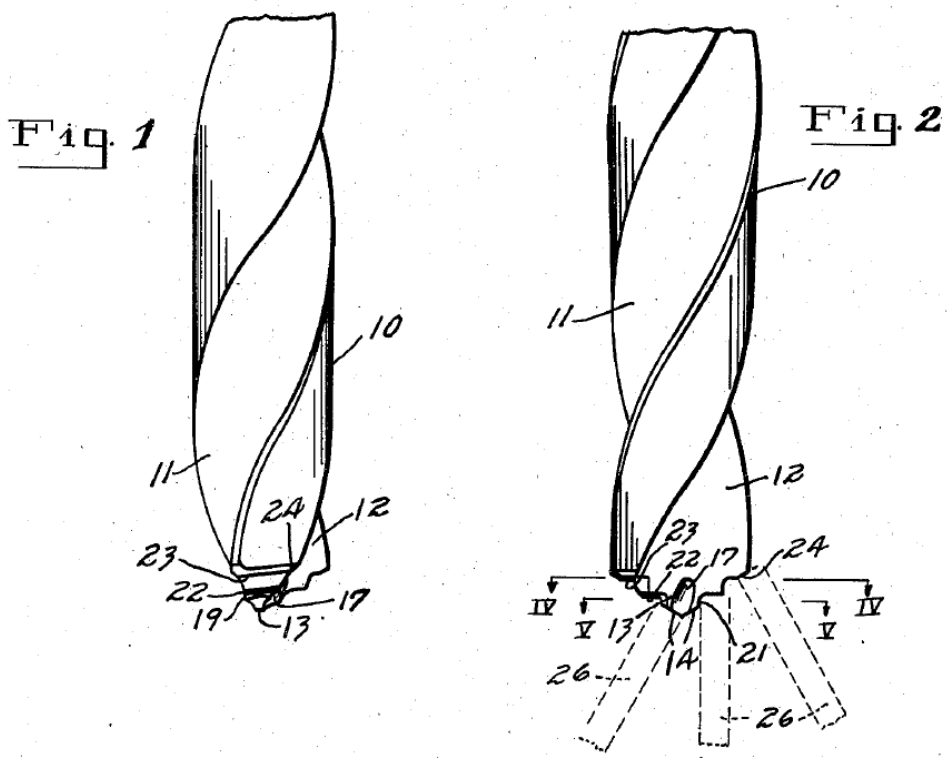
multistage centering using both a cone portion and (eventually) the cylinder portion. Wang I at ¶¶ [0034], [0039].

2. U.S. Patent No. 2,193,186 ("Bannister")

U.S. Patent No. 2,193,186 ("Bannister") was filed on June 6, 1938 and issued on March 12, 1940, which is more than 75 years prior to the any possible effective filing date of the Asserted Patents. Bannister is prior art to the Asserted Patents under 35 U.S.C. §§ 102(a)(1).

Bannister discloses a twist drill having a stepped, conical tip, with a spiral flute extending through the spiral tip and a shaft portion of the twist drill. Bannister describes the formation "of cutting edges 22 and 23 which are normal to the axis of the main drill 10, and the plane of the surface behind each edge is inclined to the axis of the drill, as shown in Fig. 1, in order to provide axial clearance for the drill so that it will feed at the desired rate of speed." Bannister at p. 2, 1:74-2:18 Bannister further describes beveling the normal cutting edges "to produce long spiral chips" and address problems relating to "short chips [that] are liable to jamb the drill in the hole and cause it to break off." *See* Bannister at p. 2, 1:10-14, 2:7-18. This decades-old feature is and has been utilized in a multitude of drill bits having a stepped head, for example as shown in further references below.

For reference, Figures 1 and 2 from Bannister are reproduced below, in which Figure 2 depicts the formation of normal cutting edges 22 and 23, with Figure 1 depicting the "spiral" nature of the cutting edges 22 and 23 after beveling.



Using this approach, Bannister teaches that grinding/beveling to produce such spiral/axial clearance allows operation in which "each succeeding grinding unit formed by the stepped cutting edges, forms a pilot for the succeeding larger drilling unit, so that holes drilled with my improved drill are perfectly round and straight, and of uniform section." Bannister at p. 2, 2:49-55.

Accordingly, Bannister teaches providing and using a twist drill having a shank, cylinder portion and cone portion, with a spiral flute extending from a front end of the cone portion and at least partway up the cylinder portion. Cutting units are formed sequentially on the cone portion and ground/beveled with a spiral cutting edge, with a first surface including a conical portion and a second step surface including a cylindrical portion, with major/minor cutting edges defined by the intersection of the respective step

surfaces, with the cutting units being arranged at a slight angle due to axial relief, and with a top blade, cutting unit positioning, and diameters as shown above. Bannister further characterizes use of the twist drill, using each succeeding grinding unit to form a pilot for the next to gradually cut a hole.

3. U.S. Patent Application Publication No. 2005-0053438 ("Wetzl")

U.S. Patent Application Publication No. 2005-0053438 ("Wetzl") is titled "Self-centering drill bit with pilot tip." Wetzl was published on March 10, 2005 and is prior art under 35 U.S.C. § 102(a)(1).

Wetzl describes a drill bit having a shank 28, a working end 24, and a fluted section 26 between the shank and the working end. Wetzl at Abstract. The working end has an outer cutting portion 34 with a pair of major cutting edges, 70 and 72, and a central pilot tip 36 which extends axially ahead of the outer cutting portion and is formed with at least one pair of minor cutting edges (40, 42; 44, 46). Wetzl at Abstract. In other words, Wetzl discloses a drill bit 20 having an operation portion (at working end 24 and fluted section 26) and a shank portion (shank 28 at shank end 22). Wetzl at Abstract, FIGS. 1-2, ¶¶ [0008], [0027]. The operation portion has a cylinder portion (fluted section 26). Wetzl at FIGS. 1, 8. The drill has flutes 30 having a sidewall formed on the exterior surface of the operating portion. Wetzl at FIGS. 1-4, 6, Abstract, ¶¶ [0008]; [0027]. The flutes extend from the tip end (i.e. working end 24) of the drill towards the shank portion 28. Wetzl at FIGS. 1-4, 6, Abstract, ¶¶ [0008]; [0027].

Wetzl discloses a pair of step-like cutting groups. The cutting groups comprise a cylindrical surface (i.e. helical lands 32) and a conical surface (i.e. trailing major relief

faces 74 and 76) and corresponding cutting edges (e.g. major cutting edges 70, 72, and the leading edge seen on the margin 90). Wetzl at FIGS. 1-6; ¶ [0032]. The twist drill 20 has cutting tips formed by the intersection of the cylindrical surfaces 32, conical surfaces 74 and 76, and the flutes 30. *See* Wetzl at FIGS. 2-6.

Wetzl also discloses a top blade (central pilot tip 36) at the front end of the drill 20. Wetzl at FIGS. 1-7, Abstract, ¶¶ [0008]-[0010], ¶¶ [0028]-[0029]. The top blade 36 has a chisel edge 38, a straight major cutting edge (i.e. outer minor cutting edges 44 and 46), and an auxiliary cutting edge intersected with the straight major cutting edge and the chisel edge (i.e. inner minor cutting edges 40 and 42). Wetzl at FIGS. 1-7, Abstract, ¶¶ [0008]-[0010], ¶¶ [0028]-[0029].

Wetzl also describes how the various cutting edges it provides can be provided with axial, diametrical, and radial relief to reduce interference and friction when using the step drill. Wetzl at FIGS. 2-7, ¶¶ [0030]-[0031], ¶ [0034], ¶ [0036]. For example, radial relief can be provided at the cutting tip such that the diameter of a cutting surface (i.e. outer surfaces 56 and 58) is curved radially inwardly and away from a workpiece when cutting. Wetzl at FIGS. 4, 7, ¶ [0030]. These surfaces can also have diametral relief such that the cutting surfaces taper in axially towards the shank portion 22. Wetzl at FIG. 5, ¶ [0031]. The cutting groups can also be provided with axial relief such that the cylindrical surfaces 76 and 74 such that the distance between the cylindrical surfaces and the tip of the drill increases as the drill is rotated in the cutting direction. Wetzl at FIGS. 2-6, ¶ [0034], ¶ [0036]. Radial relief is also provided on the cutting groups because the margin

90 protrudes radially slightly beyond the circumferential outer face of a cylindrical surface 26. Wetzl at FIGS. 2-4, ¶ [0035].

4. U.S. Patent Application Publication No. 2011-0116884 ("Li")

U.S. Patent Application Publication No. 2011-0116884 ("Li") is titled "Helical bit tool." Li was published on May 19, 2011 and is prior art under 35 U.S.C. § 102(a)(1).

Li describes a drill bit having a stepped tip, fluting, and a shank. Li at Abstract. More specifically, Li discloses a drill bit 1 having an operation portion (i.e. bit head 1) and a shank portion (not shown but necessarily present). Li at FIG. 1, Abstract, ¶¶ [0021]-[0024]. The operation portion has a cone portion (i.e. step area 7) increasing in diameter from the tip (at center 0) towards the shank, and a cylinder portion (formed by helical pieces 2) between and axially fixed to the cone portion and the shank. Li at FIG. 1, Abstract, ¶¶ [0021]-[0024]. The step drill has spiral flutes formed helically and having a sidewall formed on the exterior surface of the operating portion. Li at FIG. 1, Abstract, ¶¶ [0021]-[0024]. The flutes extend from the tip end of the drill towards the shank portion. Li at FIG. 1, Abstract, ¶¶ [0021]-[0024].

The drill bit has a plurality of cutting blade groups formed sequentially. Li at FIG. 1, Abstract, ¶¶ [0021]-[0024]. The cutting blade groups comprise a plurality of nearly cylindrical surfaces (i.e. vertical portions of the stepped area 7) and conical surfaces (i.e. top surface at bit head 6 at steps 71, 72, 7n). Li at FIG. 1, Abstract, ¶¶ [0021]-[0024]. The cutting blade groups further comprise cutting edges (main cutting edge 8 and vertical edges of cylindrical surfaces). Li at FIG. 1, Abstract, ¶¶ [0021]-[0024]. The twist drill has

cutting tips formed by the intersection of the cylindrical surfaces, the conical surfaces, and the flutes. Li at FIG. 1, Abstract, ¶¶ [0021]-[0024].

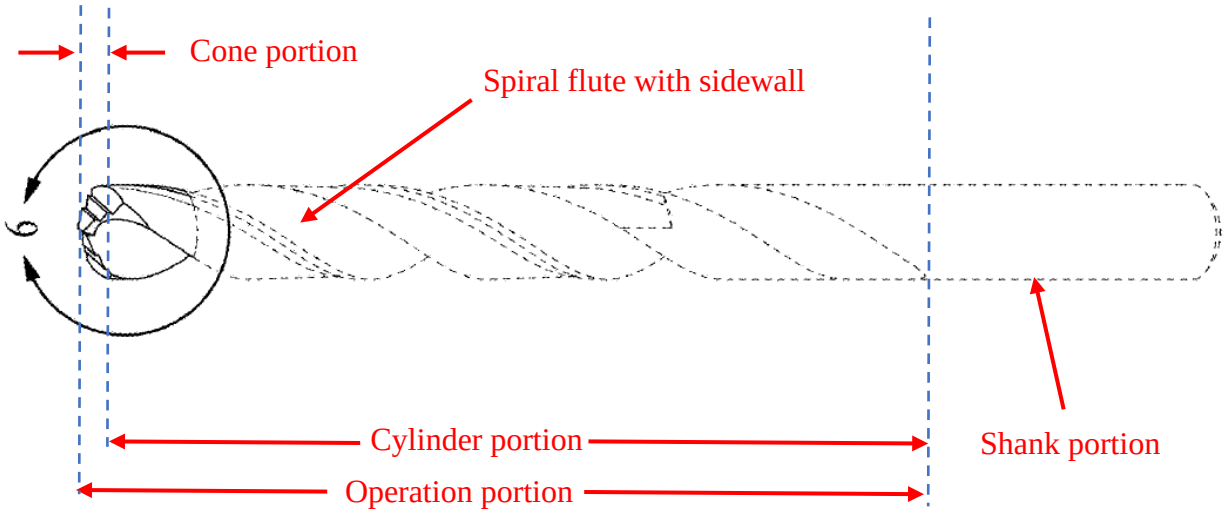
The drill bit also has a top blade at the front end of the cone portion. (i.e. blade at center 0 comprising chisel edge 11 and upright cutting face 15). Li at FIG. 1; Abstract, ¶¶ [0021]-[0024]. The tip has a chisel edge 11 and a straight major cutting edge (i.e. edge of upright cutting face 15).

A related embodiment of Li shows the twist drill depicted in FIG. 1 further including a margin or heat dissipation stage 12 around the cylindrical portion. Li at FIG. 2, ¶¶ [0025]-[0028]. A person having ordinary skill in the art would recognize that the heat dissipation stage 12 would act as a radial relief for any cutting edges on the cylindrical surface.

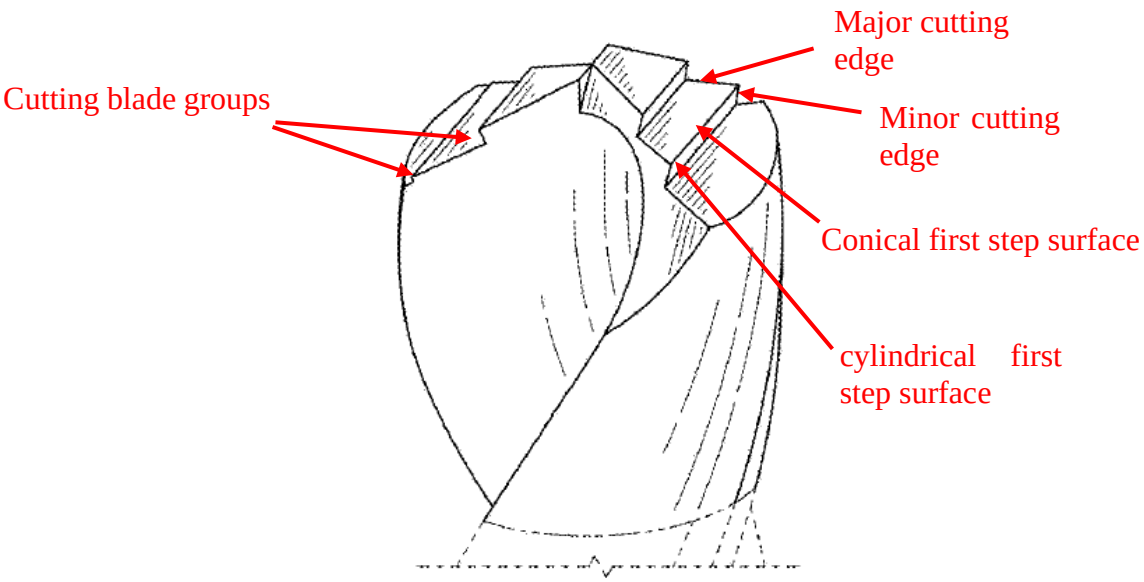
5. U.S. Design Patent No. D840,449 S ("Wang II")

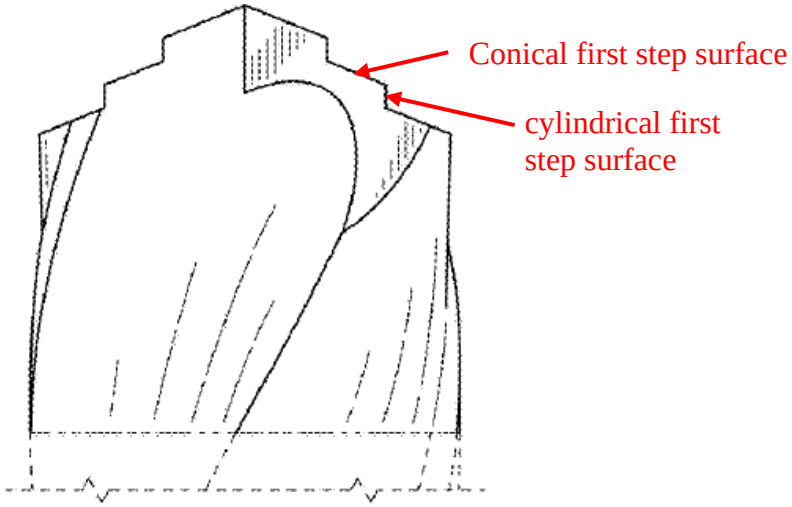
U.S. Design Patent No. D840,449 S ("Wang II") is titled "Twisted drill bit tip." Wang II was filed on June 28, 2017, and issued on February 12, 2019. Wang II is prior art under 35 U.S.C. § 102(a)(1) and (2).

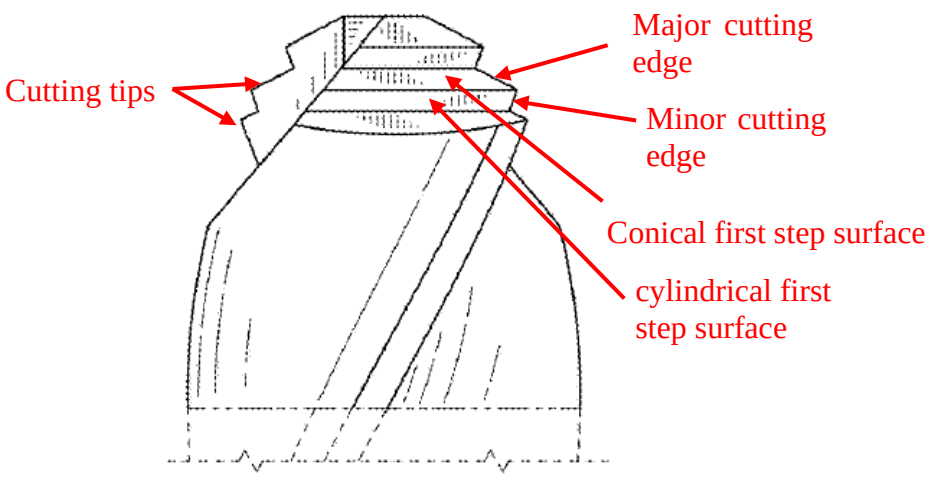
Wang II shows a twist drill having an operation portion that comprises a cone portion and a cylinder portion axially fixed to the cone portion. The drill has a shank portion axially fixed to the cylinder portion opposite the cone portion. A spiral flute is formed on an exterior surface of the operating portion and extends from a front end of the cone portion at least partway up the cylinder portion. The spiral flute has a sidewall. *See, e.g.*, Wang II at FIG. 1 (annotated, below); *see also* FIGs. 2-8.



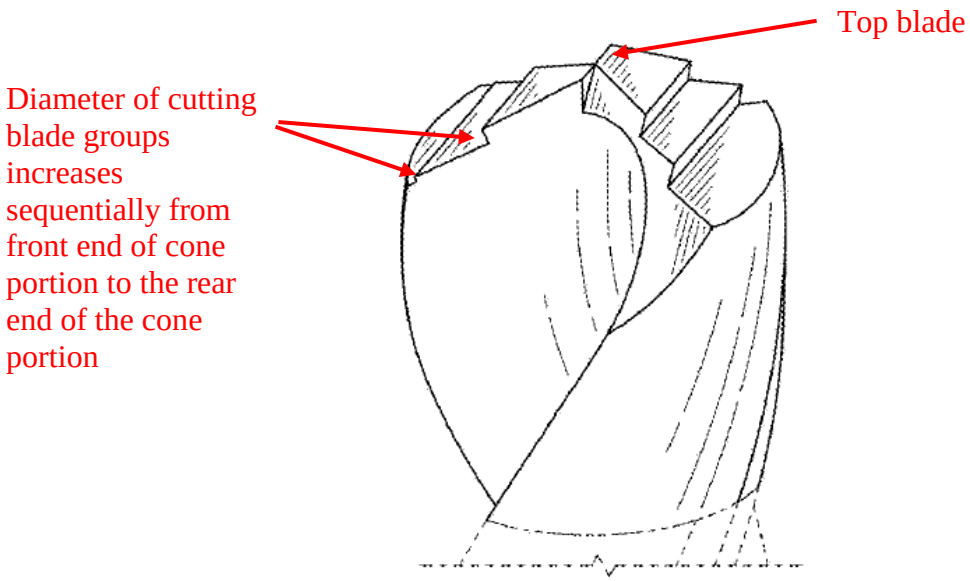
Wang II shows a plurality of composite cutting blade groups formed sequentially and at a slight angle on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. Each of the plurality of composite cutting blade groups comprises a first step surface; a second step surface adjacent to the first step surface, a major cutting edge defined by the intersection of the first step surface and the sidewall of the spiral flute; a minor cutting edge defined by the intersection of the second step and the and the sidewall of the spiral flute; and a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. Wang II at FIGs. 6-8 (annotated below); *see also* FIGs. 1-5.


Major cutting edge
Cutting blade groups
Minor cutting edge
Conical first step surface
cylindrical first step surface


Conical first step surface
cylindrical first step surface

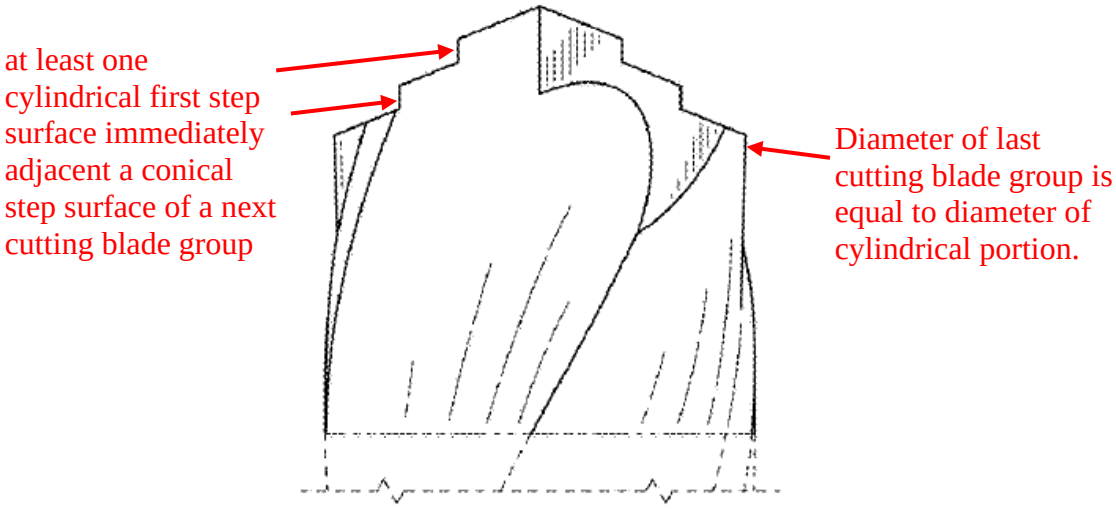


Wang II also shows a top blade provided on the front end of the cone portion and that a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. *See, e.g.*, Wang II at FIG. 6 (annotated below), FIGs. 1-5, 7 and 8.



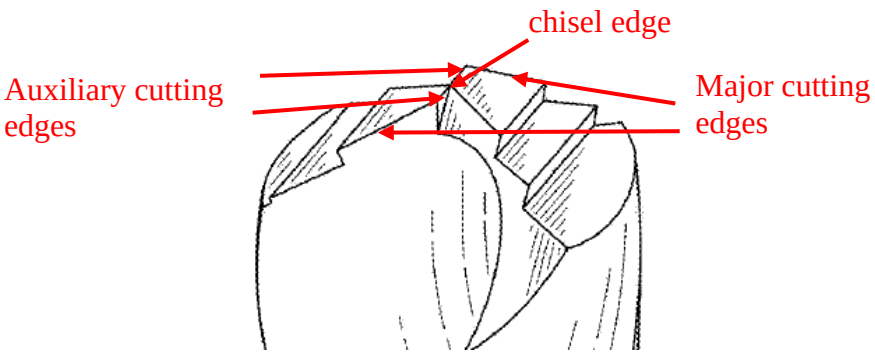
Wang II also shows wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade

group. To the extent that Plaintiffs' construction of "the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter" as set forth in the Supplemental Infringement Contentions is correct, Wang II also shows that the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See*, *e.g.*, Wang II at FIG. 7 (annotated below); *see also* FIGs. 1-6 and 8.



Wang II shows, e.g. in FIGs. 6, 7 and 8 that the heights of each cutting group, in other words the height of the "cylindrical step surfaces" in each cutting blade group, are the same. Wang II also shows that the height of each cylindrical step surface within a cutting blade group is circumferentially uniform.

Wang II shows a top blade having a chisel edge, two auxiliary cutting edges and two straight major cutting edges. *See* Wang II at FIG. 6 (annotated below); FIGs. 1-5, 7 and 8.



Wang II also shows that a straight major cutting edge of the top blade is longer than each of the major cutting edges of the plurality of composite cutting blade groups. *See* Wang II, annotated FIGs. 6-8 *supra*, FIGs. 1-5.

One of ordinary skill would, upon examination of Wang II, understand that Wang II shows a drill having an operation portion configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.

6. Great Britain Patent Application Publication No. 2405820 ("Sheldon")

Great Britain Patent Application Publication No. 2405820 ("Sheldon") is titled "Stepped drill bit with spiral fluting." Sheldon was published on October 8, 2003 and is prior art under 35 U.S.C. § 102(a)(1).

Sheldon describes a stepped spiral drill bit with having teeth at one end, fluting, a shank, and fluted steps. Sheldon at Abstract. More specifically, Sheldon discloses a step drill bit 1 having an operation portion (i.e. business end 5) and a shank portion (i.e. shaft 3). Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:22-30. The operation portion has a cone portion (i.e. steps 14, 18, and 22 increase in diameter and form an approximately

conical section) increasing in diameter from the tip (i.e. end of business end 5) towards the shank 3 and a cylinder portion between (at step 22 or alternatively shaft 3) and axially fixed to the cone portion and the shank. Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:22-30, p. 2:32- p. 3:24. The step drill has spiral flutes 17 formed helically and having a sidewall formed on the exterior surface of the operating portion. Sheldon at FIGS. 1-3, Abstract, p. 1:15-31; p. 2:22-30, p. 2:32- p. 3:24. The flutes extend from the tip end of the drill towards the shank portion. Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:22-30, p. 2:32- p. 3:24.

Each step comprises a cutting blade group formed sequentially. Sheldon at FIG. 1. The cutting blade groups comprise a plurality of cylindrical surfaces (i.e. "three sections of constant diameter stepped to increase away from the business end"), conical surfaces (i.e. countersinks 20), and corresponding cutting edges formed by the cylindrical surfaces, the conical surfaces, and the flutes. Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:22-30, p. 2:32- p. 3:24. The twist drill 1 has cutting tips formed by the intersection of the cylindrical surfaces, the conical surfaces, and the flutes. Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:22-30, p. 2:32- p. 3:24.

Sheldon also describes how the steps can have diametral relief. Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:32-p. 3:6. For example, Sheldon states that "the bore of the tool is not quite constant along its length but is slightly tapered (narrowing), by perhaps ¼ mm towards the business end from the shaft, so that the plug does not become jammed." Sheldon at FIGS. 1-3, Abstract, p. 1:15-31, p. 2:32-p. 3:6.

7. U.S. Patent No. 5,452,971 ("Nevills")

U.S. Patent No. 5,452,971 ("Nevills") is titled "Drill with discontinuous cutting lips." Nevils issued on September 26, 1995 and is prior art under 35 U.S.C. § 102(a)(1).

Nevills describes a twist drill bit having a stepped tip, fluting, and a shank. Nevills at Abstract. More specifically, Nevills discloses a drill bit 30 having an operation portion (i.e. cylindrically-long body 31) and a shank portion ("shank-end," not shown). Nevills at FIG. 8, 10:54-15:2. The operation portion has a cone portion (i.e. step area with steps at surfaces 37) increasing in diameter from the tip 35 towards the shank, and a cylinder portion (lower portion of cylindrically-long body 31) between and axially fixed to the cone portion and the shank. Nevills at FIG. 8, 10:54-15:2. The step drill has spiral flutes 32 formed helically and having a sidewall (32, 33, and 34) formed on the exterior surface of the operating portion. Nevills at FIG. 8, 10:54-15:2. The flutes extend from the tip end of the drill towards the shank portion. Nevills at FIG. 8, 10:54-15:2.

The drill bit has a plurality of cutting blade groups formed sequentially and spirally. Nevills at FIG. 8, 10:54-15:2. The cutting blade groups comprise a plurality of grooves 41 and conical surfaces (i.e. cutting-planes 37a, 37b, . . . 37x). Nevills at FIG. 8, 10:54-15:2. The cutting blade groups further comprise cutting edges (39a, 39b, . . . 39x and 40a, 40b, . . . 40x). (Id.). The twist drill has cutting tips formed by the intersection of the grooves, the conical surfaces, and the flutes. Nevills at FIG. 8, 10:54-15:2.

The drill bit also has a top blade at the front end of the cone portion. (i.e. chisel-point system 36). Nevills at FIG. 8, 10:54-15:2.The tip has a chisel edge at (i.e. 36a and 36b). Nevills also describes how the various cutting edges it provides can be provided

with relief to reduce interference and friction when using the drill. Nevills at FIG. 8, 10:54-15:2. For example, the conical surfaces 37a and 37b can have axial relief provided by a negative rake angle RA angle such that the surfaces are directed away from workpieces when the tool is used. Nevills at FIGS. 7-10; 11:26-12:25. The cylindrical portion and any cutting edges thereon can have radial relief provided by a leading peripheral-surface margin PM. Nevills at FIGS. 7-10; 11:5-25.

8. U.S. Patent No. 10,058,929 ("Durfee I")

U.S. Patent No. 10,058,929 ("Durfee I") is titled "Step drill bit with variable helical flute." Durfee I claims priority to a provisional application filed on November 10, 2015, was issued on August 28, 2018, and is prior art under 35 U.S.C. §§ 102(a)(1) and (a)(2).

Durfee I describes a step drill bit with a cutting head and steps having cutting edges formed by one or more flutes cut in the drill bit. Durfee I at Abstract. More specifically, Durfee I discloses a step drill bit having an operation portion (i.e. cutting portion or head 5) and a shank portion 2. Durfee I at FIGS. 1-6, 2:53-3:56. The operation portion has a cone portion (i.e. steps 8 increasing in diameter from the tip 22 towards the shank 2) and a cylinder portion between and axially fixed to the cone portion and the shank 2. Durfee I at FIGS. 1-6, 2:53-3:56. The step drill has spiral flutes 12 formed helically and having a sidewall formed on the exterior surface of the operating portion. Durfee I at FIGS. 1-6, 3:44-56. The flutes extend from the tip end of the drill towards the shank portion. Durfee I at FIGS. 1-6, 3:44-56.

Each step 8 comprises a cutting blade group formed sequentially and spirally. Durfee I at FIGS. 1-6. The cutting blade groups comprise a plurality of cylindrical surfaces (i.e. outer peripheral surfaces 21), conical surfaces (i.e. transition surfaces 23), and corresponding cutting edges (18 and 20) formed by the cylindrical surfaces 21, the conical surfaces 23, the flutes 12. Durfee I at FIGS. 1-6, 7:26-8:29. The twist drill 1 has cutting tips formed by the intersection of the cylindrical surfaces 21, the conical surfaces 23, the flutes 12. Durfee I at FIGS. 1-6.

Durfee I also describes how the steps can have axial and radial relief to reduce interference and friction when using the step drill. Durfee I at 1-6, 9:59-10:41, 11:12-12:8. For example, radial relief can be provided such that the diameter of a step surface continuously decreases from a cutting edge toward a trailing edge. Durfee I at 1-6, 9:59-10:41, 11:12-12:8. Similarly, axial relief can be provided such as through a helical pitch in which the distance between a step surface and the tip 22 continuously increases in the trailing direction (i.e. as the drill is rotated in the cutting direction). Durfee I at 1-6, 9:59-10:41, 11:12-12:8.

The twist drill 1 also has a top blade at the distal end 22. Durfee I at FIGS. 1-6.

9. U.S. Patent No. 9,687,915 ("Durfee II")

U.S. Patent No. 9,687,915 ("Durfee II") is titled "Step drill." Durfee II claims priority to a provisional application filed on June 14, 2013 and issued on June 27, 2017 and is prior art under 35 U.S.C. §§ 102(a)(1) and (2).

Durfee II describes a step drill bit with a cutting head and steps having cutting edges formed by one or more flutes cut in the drill bit. Durfee II at Abstract. More

specifically, Durfee II discloses a step drill bit having an operation portion (i.e. cutting portion or head 5) and a shank portion 2. Durfee II at FIGS. 1-4, 2:60-3:48. The operation portion has a cone portion (i.e. steps 8 increasing in diameter from the tip 22 towards the shank 2) and a cylinder portion between and axially fixed to the cone portion and the shank 2. Durfee II at FIGS. 1-4, 2:60-3:48. The step drill has spiral flutes 12 formed helically and having a sidewall formed on the exterior surface of the operating portion. Durfee II at FIGS. 1-4, 3:27-48. The flutes extend from the tip end of the drill towards the shank portion. Durfee II at FIGS. 1-4, 3:27-48.

Each step 8 comprises a cutting blade group formed sequentially and spirally. Durfee II at FIGS. 1-4. The cutting blade groups comprise a plurality of cylindrical surfaces (i.e. outer peripheral surfaces 21), conical surfaces (i.e. transition surfaces 23), and corresponding cutting edges (18 and 20) formed by the cylindrical surfaces 21, the conical surfaces 23, the flutes 12. Durfee II at FIGS. 1-4, 3:27-48, 4:14-64. The twist drill 1 has cutting tips formed by the intersection of the cylindrical surfaces 21, the conical surfaces 23, the flutes 12. Durfee II at FIGS. 1-4.

Durfee II also describes how the steps can have axial and radial relief to reduce interference and friction when using the step drill. Durfee II at FIGS. 1-4, 1:27-58, 1:66-2:13, 5:45-6:24, 6:58-7:51. For example, radial relief can be provided such that the diameter of a step surface continuously decreases from a cutting edge toward a trailing edge. Durfee II at FIGS. 1-4, 1:27-58, 1:66-2:13, 5:45-6:24, 6:58-7:51. Similarly, axial relief can be provided such as through a helical pitch in which the distance between a step surface and the tip 22 continuously increases in the trailing direction (i.e. as the drill is

rotated in the cutting direction). Durfee II at FIGS. 1-4, 1:27-58, 1:66-2:13, 5:45-6:24, 6:58-7:51.

The twist drill 1 also has a top blade at the distal end 22. Durfee II at FIGS. 1-4.

10. U.S. Patent No. 8,029,215 ("Gentry")

U.S. Patent No. 8,029,215 ("Gentry") is titled "Spiral drill bit and method of forming same." Gentry issued on October 4, 2011 and is prior art under 35 U.S.C. § 102(a)(1).

Gentry describes a prior art step drill 10 bit with a main body 18 and steps (cutting surfaces 22 and transition surfaces 24) having cutting edges (31) formed by one or more flutes cut in the drill bit. Gentry at FIGS. 1-3, 1:16-2:49. More specifically, Gentry discloses a step drill bit having an operation portion (i.e. main body 18) and a shank portion (towards the rear 14). Gentry at FIGS. 1-3, 1:16-2:49. The operation portion has a cone portion (i.e. steps increasing in diameter from the end 12 towards the rear 14) and a cylinder portion (adjacent to the rear wall 20) between and axially fixed to the cone portion and the shank. Gentry at FIGS. 1-3, 1:16-2:49. The step drill has flutes 26 having a sidewall formed on the exterior surface of the operating portion. Gentry at FIGS. 1-3, 1:16-2:49. The flutes extend from the tip end 12 of the drill towards the shank portion. Gentry at FIGS. 1-3, 1:16-2:49.

Each step comprises a cutting blade group formed sequentially. Gentry at FIGS. 1-3, 1:16-2:49. The cutting blade groups comprise a plurality of cylindrical surfaces 30, conical surfaces 28, and corresponding cutting edges (e.g. leading edge 31) formed by the cylindrical surfaces 30, conical surfaces 28, and the flutes 26. Gentry at FIGS. 1-3, 1:16-

2:49. The twist drill 1 has cutting tips formed by the intersection of the cylindrical surfaces 30, conical surfaces 28, and the flutes 26. *See* Gentry at FIGS. 1-3.

Gentry also describes the importance of providing axial, diametral, and radial relief to reduce interference and friction when using the step drill. Gentry at FIGS. 1-3, 1:16-2:49. "In order to properly cut a hole, reliefs are required between the drill bit…and the workpiece to be cut. More specifically, reliefs are required between the cutting surfaces…of the drill bit…and the workpiece. Gentry at 1:52-55. For example, radial relief C can be provided such that the diameter of a step surface continuously decreases from a cutting edge toward a trailing edge. Gentry at FIG. 3, 2:6-19. Similarly, axial relief A can be provided such as through a helical pitch in which the distance between a step surface and the end 12 continuously increases in the rear direction (i.e. as the drill is rotated in the cutting direction). Gentry at FIG. 1, 1:52-63. Diametral relief B (which can also be referred to as "back taper relief") can also be provided such that the cylindrical portion angles away from the workpiece (i.e. the diameter decreases from the front end 12 towards the rear 14). Gentry at FIG. 1, 1:63-2:6.

The twist drill 10 also has a top blade at front 12. Gentry at FIGS. 1-3, 1:16-2:49. Gentry also discloses step drills having generally the same elements disclosed in the prior art bits discussed above (i.e. at FIGS. 1-3 and 1:16-2:49), but where the steps are formed spirally and cutting groups are likewise formed spirally, such as that shown at FIG. 8. *See generally* Gentry.

11. U.S. Patent No. 9,731,358 ("Allen")

U.S. Patent No. 9,731,358 ("Allen") is titled "Step drill bit." Allen claims priority to a provisional application filed on June 6, 2013, was issued on August 15, 2017, and is prior art under 35 U.S.C. §§ 102(a)(1) and (2).

Allen describes step drill bits with having a shank, a transition portion, and a body portion defining a plurality of axially stacked, progressively sized steps, and cutting edges formed by one or more flutes. Allen at Abstract. More specifically, by way of example to the step drill bit shown with reference to FIGS. 1-7, Allen discloses a step drill bit 10 having an operation portion (i.e. body portion 18 and transition portion 16) and a shank portion (shank 12). Allen at FIGS. 1-2, 3:66-4:30. The operation portion has a cone portion (body portion 18) and a cylinder portion (transition portion 16) between and axially fixed to the cone portion and the shank. Allen at FIGS. 1-2, 3:66-4:30. The step drill has flutes 46 having a sidewall formed on the exterior surface of the operating portion. Allen at FIGS. 1-7, 5:42-6:13. The flutes extend from the tip end 21 of the drill towards the shank portion 12. Allen at FIGS. 1-7, 5:42-6:13.

Each step comprises a cutting blade group formed sequentially. Allen at FIGS. 1-7, 3:66-6:58. The cutting blade groups comprise a plurality of cylindrical surfaces (steps 20), conical surfaces (step chamfer 58), and corresponding cutting edges (e.g. lip 68) formed by the cylindrical surfaces 20, conical surfaces 58, and the flutes 46. Allen at FIGS. 1-3, 3:66-6:58. The twist drill 1 has cutting tips formed by the intersection of the cylindrical surfaces 20, conical surfaces 58, and the flutes 46. *See* Allen at FIGS. 1-2.

Allen also describes how the steps can have axial, diametrical, and radial relief to reduce interference and friction when using the step drill. Allen at FIGS. 3 and 7, 6:14-58. For example, radial relief 78 can be provided such that the diameter of a step surface continuously decreases from a cutting edge toward a trailing edge. Allen at FIG. 3, 6:14-58. Similarly, axial relief 74 can be provided such as through an upper edge 80 of the step such that the distance between a step surface and the tip 21 is less at the upper edge 80 than the remainder of the conical surface 58. Allen at FIG. 7, 6:14-58. Diametrical relief 76 can also be provided such that the cylindrical portion angles away from the workpiece (i.e. the diameter decreases from the front end 12 towards the rear 14). Allen at FIG. 7, 6:14-58. The Diametrical relief 76 can be zero degrees. Allen at FIG. 7, 6:14-58.

The twist drill 10 also has a top blade 21 at the front end of the cone portion. Allen at FIGS. 1-4, 6; 4:43-5:41. The tip 21 has a chisel edge 28, a straight major cutting edge (formed on the chisel surfaces 24), and an auxiliary cutting edge intersected with the straight major cutting edge and the chisel edge (also formed on the chisel surfaces 24). Allen at FIGS. 1-4, 6, 4:43-5:41.

12. U.S. Patent No. 4,582,458 ("Korb")

U.S. Patent No. 4,582,458 ("Korb") is titled "Stepped drill construction." Korb issued on April 15, 1986 and is prior art under 35 U.S.C. § 102(a)(1).

Korb describes a step drill bit with steps having cutting edges formed by one or more flutes cut in the drill bit. Korb at Abstract. More specifically, Korb discloses a step drill bit having an operation portion (i.e. stepped portion with reference numerals 1-9, together with cylindrical base 13) and a shank portion 12. Korb at FIGS. 1-7, Abstract,

2:13-51. The operation portion has a cone portion (i.e. stepped portion with reference numerals 1-9) and a cylinder portion 13 between and axially fixed to the cone portion and the shank 12. Korb at FIGS. 1,7, Abstract, 2:13-51. The step drill has flutes 18 having a sidewall formed on the exterior surface of the operating portion. Korb at FIGS. 1,7, Abstract, 2:13-51. The flutes extend from the tip end of the drill towards the shank portion. Korb at FIGS. 1-7, Abstract, 2:13-51.

Each step 8 comprises a cutting blade group formed sequentially. Korb at FIGS. 1-7, Abstract, 2:13-51. The cutting blade groups comprise a plurality of cylindrical surfaces 14, conical surfaces 16, and corresponding cutting edges (20 and 22) formed by the cylindrical surfaces 14, the conical surfaces 15, the flutes 18. Korb at FIGS. 1-7, Abstract, 2:13-51. The twist drill 1 has cutting tips formed by the intersection of the cylindrical surfaces 21, the conical surfaces 23, the flutes 12. Korb at FIGS. 1-7, Abstract, 2:13-51.

Korb also describes how the steps can have axial and radial relief to reduce interference and friction when using the step drill. Korb at FIGS. 1-7, Abstract, 2:13-51. For example, radial relief can be provided on the cylindrical surfaces such that on the cutting edges 20 and 22, each cylindrical surface 14 has a radially raised portion or lead b with a relief or back taper extending over a trailing portion of the cylindrical portions 14. Korb at 2:48-59. Similarly, axial relief can be provided on the conical surfaces 16 such that they have a raised portion or lead d on the cutting edge which is tapered or relieved extending over a trailing portion of the conical portion 16. Korb at 2:60-3:7.

13. U.S. Patent No. 9,539,653 ("Rogalla")

U.S. Patent No. 9,539,653 ("Rogalla") is titled "Twist drill." Rogalla claims priority to a German application filed December 20, 2012, was issued on January 10, 2017, and is prior art under 35 U.S.C. §§ 102(a)(1) and (2).

Rogalla describes a twist drill 1 having an operation portion (i.e. flute portion 3 having length L, FIG. 1) and a shank portion 2. The operation portion has a cone portion (Rogalla at 5:31-40) and a cylinder portion axially fixed to the cone portion and the shank portion (Rogalla at FIGS. 1-4, 6:23-28). The twist drill 1 of Rogalla has spiral flutes 5 having a sidewall formed on the exterior surface of the operating portion. Rogalla at FIGS 1-2, 5:31-40, 5:41-56, 6:5-15. The flutes extend from the tip end of the drill towards the shank portion. Rogalla at FIGS 1-2, 5:31-40, 5:41-56, 6:5-15.

The twist drill 1 has a plurality of cutting blade groups formed sequentially. Rogalla at FIGS. 1-2, 6:29-40. The cutting blade groups comprise a plurality of cylindrical surfaces (i.e. margins 11) and include cutting edges 12. Rogalla at FIGS. 1-2, 5:41-56, 5:57-6:4, 6:23-40. The twist drill 1 has cutting tips formed by the intersection of the flutes 5, the margins 11, and passages 14. Rogalla at FIGS. 1-2.

The twist drill 1 also has a top blade at the front end of the cone portion. (i.e. tip 4, main cutting edges 7, relief surfaces 8). Rogalla at FIGS. 1-3, 5:31-40, 5:41-56, 5:57-6:4. The tip 4 has a chisel edge (*see* FIG. 3), a straight major cutting edge (main cutting edges 7), and an auxiliary cutting edge intersected with the straight major cutting edge and the chisel edge (*see* FIG. 3).

14. U.S. Patent No. 3,592,555 ("Mackey")

U.S. Patent No. 3,592,555 ("Mackey") is titled "Drill with discontinuous cutting lips." Mackey issued on July 13, 1971 and is prior art under 35 U.S.C. § 102(a)(1).

Mackey describes a twist drill having a recess cut into the tip such that it forms a pilot tip and discontinuous cutting surfaces. Mackey at FIGS. 1-6; Abstract. More specifically, Mackey describes a drill bit 10 having an operation portion (i.e. portion shown in FIGS. 1 and 2) and a shank portion (not shown). Mackey at 2:14-18. The operation portion has a cylinder portion (i.e. fluted body 12) and a cone portion (see dashed lines on FIG. 1 showing conical geometry). Mackey at 2:14-18. The drill has flutes 16 having a sidewall formed on the exterior surface of the operating portion. Mackey at 2:14-18. The flutes extend from the tip end (towards point 20) of the drill 10 towards the shank portion (not shown). Mackey at 2:14-18.

Mackey discloses a pair of step-like cutting groups. The cutting groups comprise a cylindrical surface (i.e. helical lands on the fluted portion 12) and a conical surface (i.e. cutting lips 22 and 24 and relief surfaces 35 and 36) and corresponding cutting edges (i.e. cutting lips 22 and 24). Mackey at 2:45-64. The twist drill 20 has cutting tips formed by the intersection of the cylindrical surfaces, conical surfaces, and the flutes. *See* Mackey at FIGS. 1-3.

Mackey also discloses a top blade (portion towards cutting edge 26) at the front end of the drill 10. Mackey at FIGS. 1-6, Abstract, 2:14-3:63. The top blade 26 has a chisel edge and straight major cutting edges (i.e. cutting lips 23 and 25).

Mackey also describes how the various cutting edges it provides can be provided with relief to reduce interference and friction when using the step drill. Mackey at FIGS. 1-6, 2:49-64, 3:71-4:22. For example, the top blade 26 can also be provided with axial relief such that walls 29 and 30 taper towards the shank end. Mackey at FIGS. 1-6, 2:49-64, 3:71-4:22. The cutting groups can also be provided with axial relief such that the conical surfaces translate in a downward longitudinal direction toward the shank the drill is rotated in the cutting direction. Mackey at FIGS. 1-6, 2:49-64, 3:71-4:22.

15. German Utility Patent No. 202011106232U1 ("Ruko")

German Utility Patent No. 202011106232 ("Ruko") is titled "Multi-stage drills with different relief grinding of the cutting edges in the individual drilling stages." Ruko was published on December 9, 2011 and is prior art under 35 U.S.C. § 102(a)(1).

Ruko generally discloses a step drill 1 having spirally formed flutes SN1 and SN2. Ruko at FIGs. 1-2. Ruko shows that the steps of step drill 1 have radial relief. Ruko at FIG. 2. Ruko also shows that the steps of the step drill 1 have axial relief. Ruko at FIG. 1.

16. Chinese Patent Publication No. 102126039 ("Shiqing")

Chinese Patent Application No. 102126039 ("Shiqing") is titled "Spiral cutter for composite positioned cutting." Shiqing was published on July 20, 2011 and is prior art under 35 U.S.C. § 102(a)(1).

Shiqing describes a drill bit having a stepped tip, fluting, and a shank. Shiqing at FIGs. 1-2. More specifically, Li discloses a drill bit 1 having an operation portion and a shank portion (not shown but necessarily present). Shiqing at FIGs. 1-2. The operation portion has a cone portion increasing in diameter from the tip towards the shank, and a

cylinder portion (formed by helical pieces 2) between and axially fixed to the cone portion and the shank. Shiqing at FIGs. 1-2. The step drill has spiral flutes formed helically and having a sidewall formed on the exterior surface of the operating portion. Shiqing at FIGs. 1-2. The flutes extend from the tip end of the drill towards the shank portion. Shiqing at FIGs. 1-2.

The drill bit has a plurality of cutting blade groups formed sequentially. Shiqing at FIGs. 1-2. The cutting blade groups comprise a plurality of cylindrical surfaces and conical surfaces. Shiqing at FIGs. 1-2. The cutting blade groups further comprise cutting edges. Shiqing at FIGs. 1-2. The twist drill has cutting tips formed by the intersection of the cylindrical surfaces, the conical surfaces, and the flutes. Shiqing at FIGs. 1-2.

The drill bit also has a top blade at the front end of the cone portion. Shiqing at FIGs. 1-2. The tip has a chisel edge and a straight major cutting edge. Shiqing at FIGs. 1-2.

17. PCT Application Publication No. 2012/167448 ("Tec-Spiral")

PCT Application Publication No. 2012/167448 ("Tec-Spiral") is titled "Stepped drill bit with composite blade back and constant amount of feed." Tec-Spiral was published on December 13, 2012 and is prior art under 35 U.S.C. § 102(a)(1). Tec-Spiral generally discloses a step drill having spirally formed flutes. Tec-Spiral at FIGs. 1-2.

18. PCT Application Publication No. 2008/092386 ("Zhang")

PCT Application Publication No. 2008/092386 ("Zhang") is titled "Step drill with a spiral-form groove." Zhang was published on August 7, 2008 and is prior art under 35 U.S.C. § 102(a)(1).

Zhang generally discloses a step drill having spirally formed flutes. Zhang at FIGs. 1 and 3. Zhang shows that the steps comprise alternating generally cylindrical and generally conical surfaces. Zhang at FIG. 1.

19. Chinese Patent Application Publication No. 103084629 ("Zhou")

Chinese Patent Application Publication No. 103084629 ("Zhou") is titled "Twist drill with segmented main cutting blades and asymmetric blade opening height." Zhou was published on May 8, 2013 and is prior art under 35 U.S.C. § 102(a)(1).

Zhou describes a drill bit having a stepped tip, fluting, and a shank. Zhou at FIGs. 1-6. More specifically, Li discloses a drill bit 1 having an operation portion (i.e. portion shown at FIG. 1) and a shank portion (not shown but necessarily present). Zhou at FIGs. 1-6. The operation portion has a cone portion increasing in diameter from the tip towards the shank, and a cylinder portion between and axially fixed to the cone portion and the shank. Zhou at FIGs. 1-6. The step drill has spiral flutes formed helically and having a sidewall formed on the exterior surface of the operating portion. Zhou at FIGs. 1-6. The flutes extend from the tip end of the drill towards the shank portion. Zhou at FIGs. 1-6.

The drill bit has a plurality of cutting blade groups formed sequentially. Zhou at FIGs. 1-4. The cutting blade groups comprise a plurality of cylindrical surfaces and conical surfaces. Zhou at FIGs. 1-4.

B. Non-Patent Literature

1. Viking 2014 Catalog

The Viking 2014 Catalog was published in 2014 and is therefore, prior art to the Asserted Patents under 35 U.S.C. §102(a)(1). It demonstrates the availability of Viking's

prior art drills with split point tips and step drills having various forms of relief, such as radial and axial relief. It also lists that the advantages of using a split point tip include fast penetration into the workpiece, self centering and accurate starting. Specifically, the Viking 2014 Catalog demonstrates the availability of Viking's 00714 Drill.

2. Viking 2015 Catalog

The Viking 2015 Catalog is a catalog from 2015 for Viking's drills and is prior art under 35 U.S.C. § 102(a)(1). It demonstrates the availability of Viking's prior art drills with split point tips and step drills having various forms of relief, such as radial and axial relief. Specifically, the Viking 2015 Catalog demonstrates the availability of Viking's 00693 Drill, Viking's 00694 Drill, and Viking's 00714 Drill.

3. National Aerospace Standard 907 ("NAS 907")

The National Aerospace Standard 907 ("NAS 907") is a National Aerospace Standard ("NAS") for drills promulgated by the Aerospace Industries Association ("AIA"). AIA is a trade association representing manufacturers and suppliers of aircraft and related components. AIA develops the NAS, which are standards available to manufacturers that conform to the United States Military Standard for equipment manufacturing and provide standards for various components. On information and belief, NAS 907 was published in 2001 and is prior art under 35 U.S.C. § 102(a)(1).

NAS 907 sets forth standards for various features of drill bits. NAS 907 sets forth standard twist drill nomenclature, including "chisel edge," "cutting lip," "flutes," and

"shank." NAS 907 at 4-7. NAS 907 shows various split point geometries that can be used. *See*, *e.g.*, NAS 907 at 15-17.

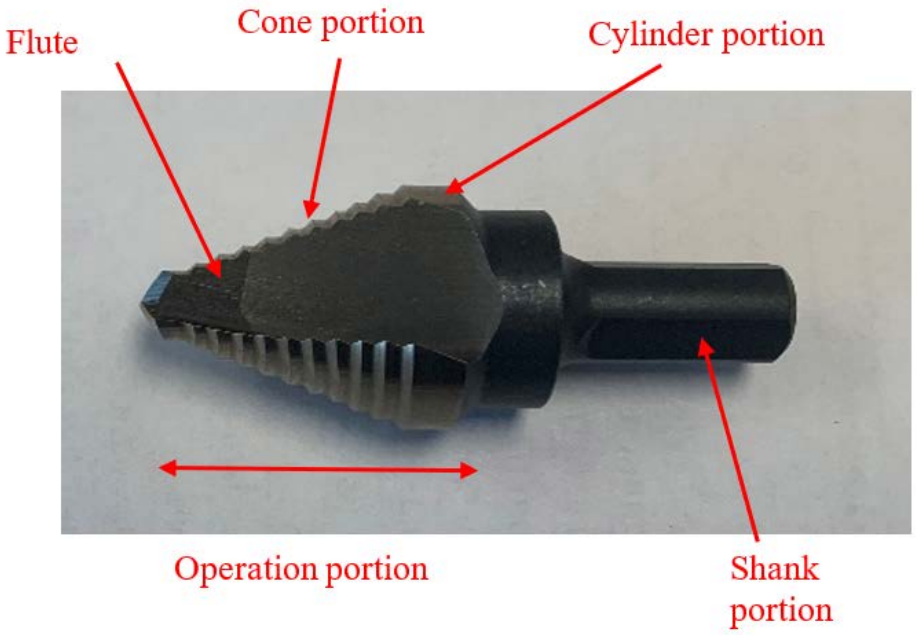
C. Prior Use, Sale or Otherwise Available to the Public

1. Viking 00714 Drill

Viking has marketed its 00714 drill in the United States since at least 2014[3, 4] and the 00714 drill is, therefore, prior art to the Asserted Patents under 35 U.S.C. §102(a)(1).

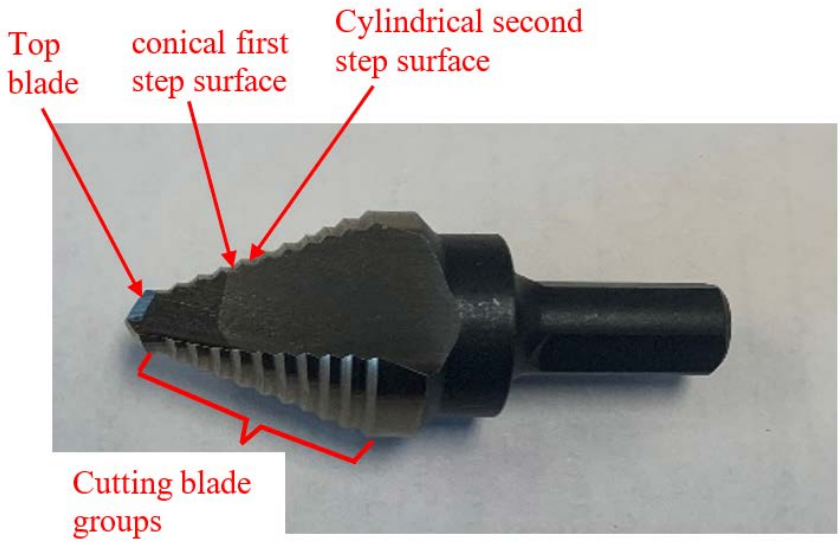
The 00714 drill, shown in the annotated photograph below, has a shank portion and an operation portion axially fixed to the shank portion, the operating portion having a cone portion axially fixed to the cylinder portion. A flute having a sidewall is formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, with the shank portion axially fixed to the cylinder portion opposite the cone portion.

[3] *See* Viking 2014 Catalog at VIKINGVP_00000903.
[4] *See* VIKINGVP_00001516-520.



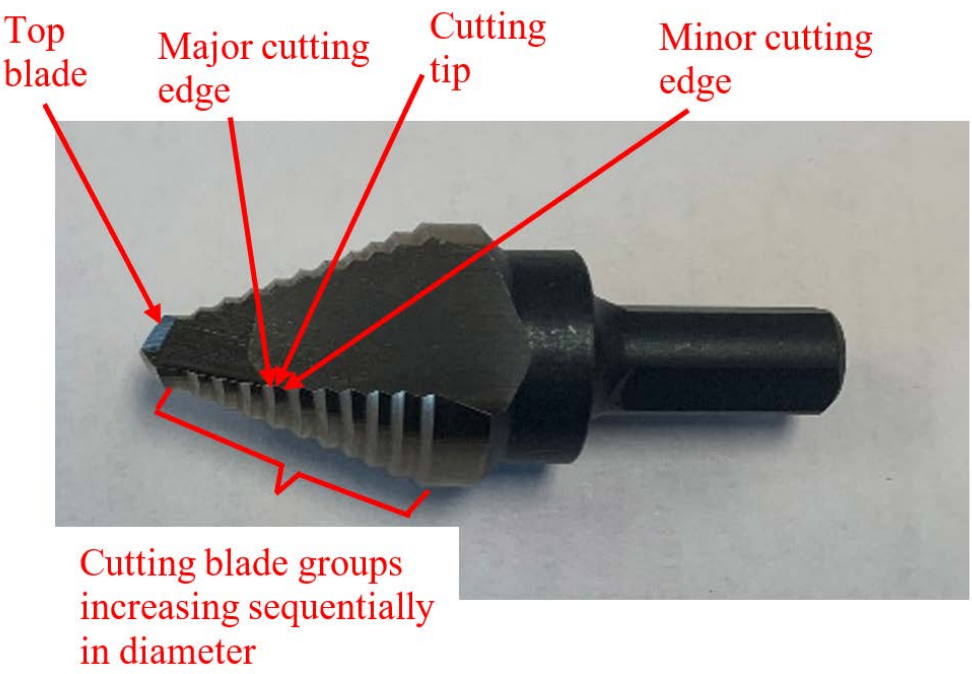
The 00714 drill has plurality of composite cutting blade groups formed sequentially on the cone portion exterior from the front end of the cone portion to a rear end of the cone portion. The composite cutting blade groups have axial relief, which Plaintiffs argue makes them "spirally" formed. The axial relief on the 00714 drill is greater than that of the Accused Products. Diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion. The composite cutting blade groups of the 00714 drill have a conical first step surface and a cylindrical second step surface adjacent to the conical first step surface, as shown in the annotated photograph of the 00714 drill below.[5]

[5] Like virtually all step drill cutting surfaces, the Viking 00714 drill has radial relief on the cylindrical step surfaces. Plaintiffs' infringement allegations appear to be based on the contention that the presence of such radial relief is irrelevant to whether such surfaces meet the "cylindrical first step surface" limitation (while at the same time arguing inconsistently that axial relief renders cutting groups "spirally-formed"). While Viking disagrees with

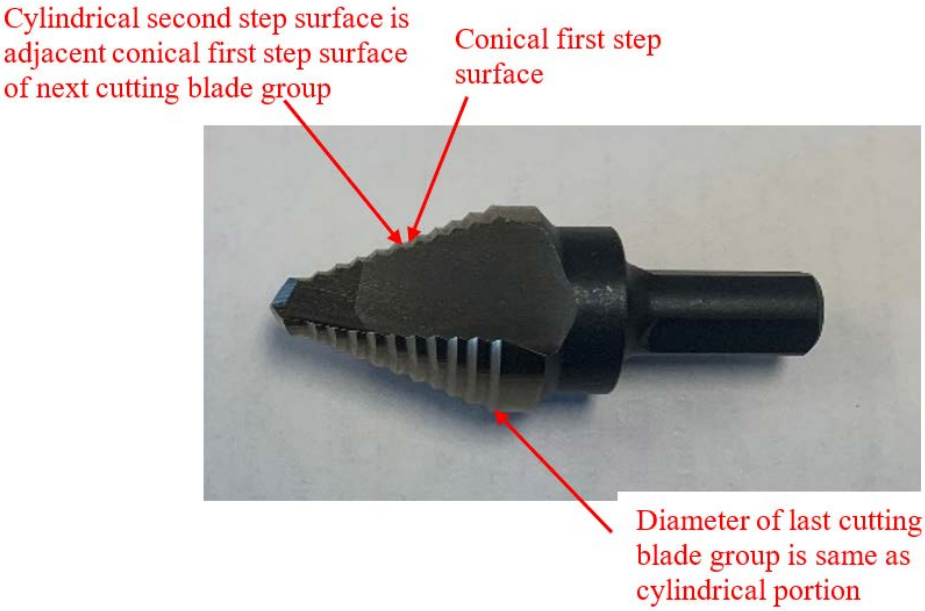


A major cutting edge is defined by the intersection of the conical first step surface and the sidewall of the spiral flute. A minor cutting edge is defined by the intersection of the cylindrical second step and the sidewall of the flute, a cutting tip is defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. The 00714 drill is provided with a top blade on the front end of the cone portion. Also, a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion, as shown in the annotated photograph of the 00714 drill below.

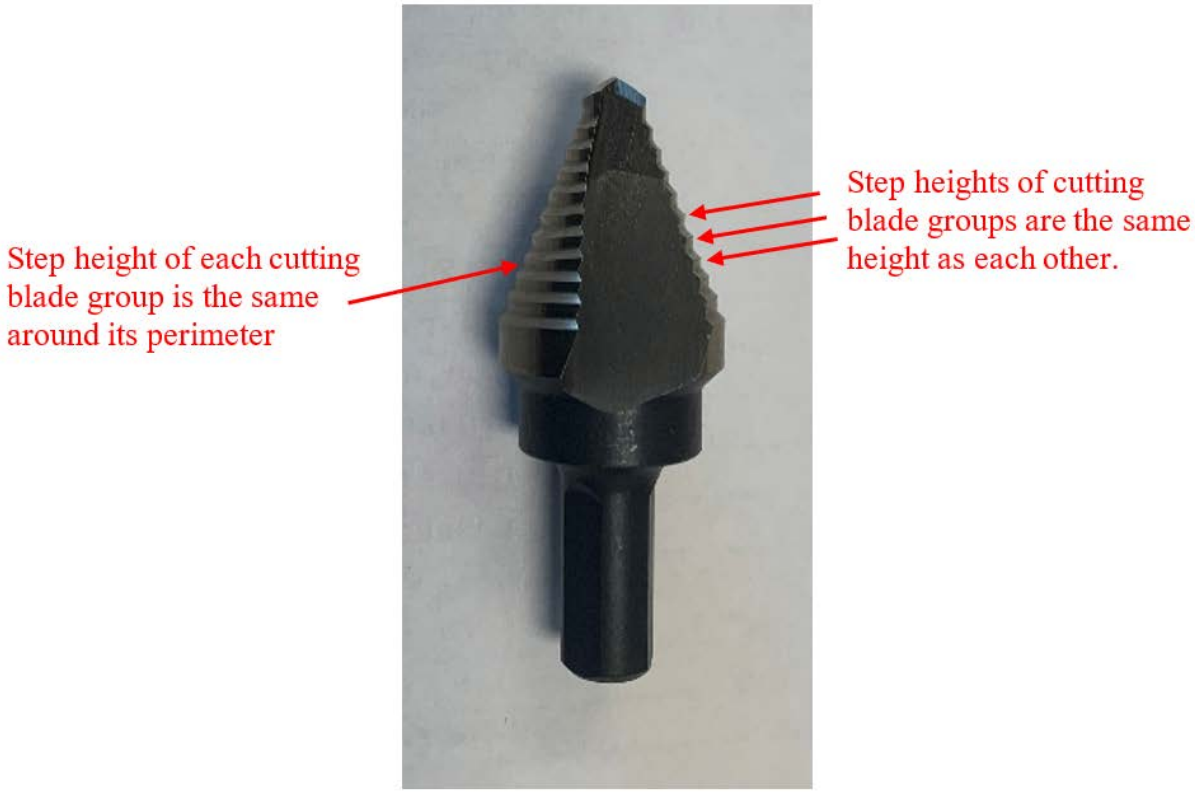
Plaintiffs' contention, based on that contention, the Viking 00714 drill has cylindrical second step surfaces.



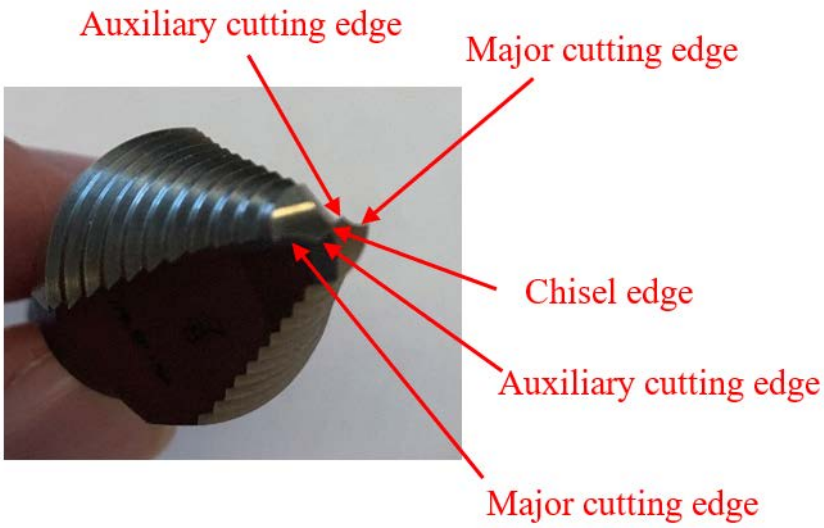
The cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. To the extent that Plaintiffs' construction of "the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter" as set forth in the Supplemental Infringement Contentions is correct, the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter, as shown in the annotated photograph of the 00714 drill below.



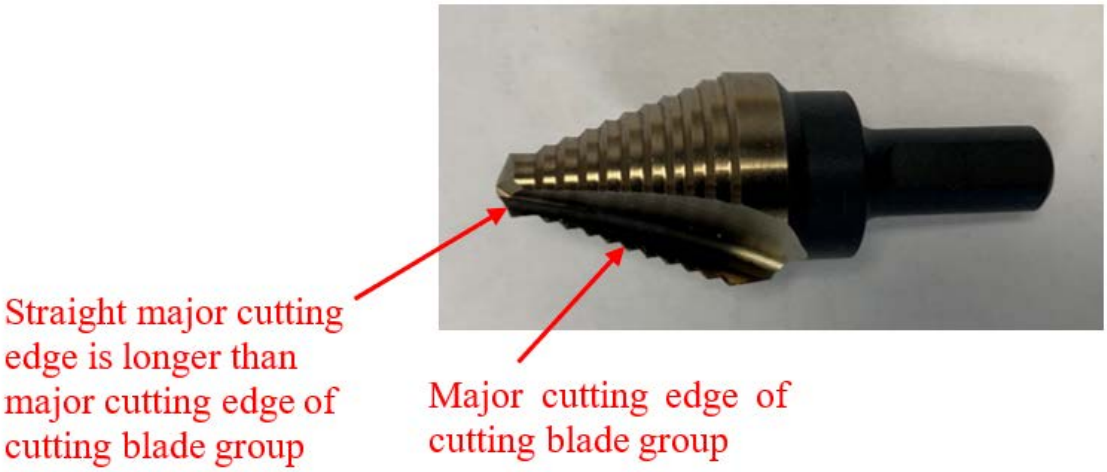
The composite cutting blade groups of the 00714 drill are the same height as each other, and that the height of a composite cutting blade group is uniform around its perimeter, as shown in the annotated photograph of the 00714 drill below.



The top blade of the 00714 drill is provided with a well-known split point tip, having a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edges are intersected by the chisel edge and a respective straight major cutting edge. An annotated photo of the 00714 drill, provided below, shows the chisel edge, auxiliary cutting edges and straight major cutting edges. To the extent that a cutting blade group with axial relief can be considered to have an axis, each composite cutting blade group is arranged coaxially with the cone portion of the drill.

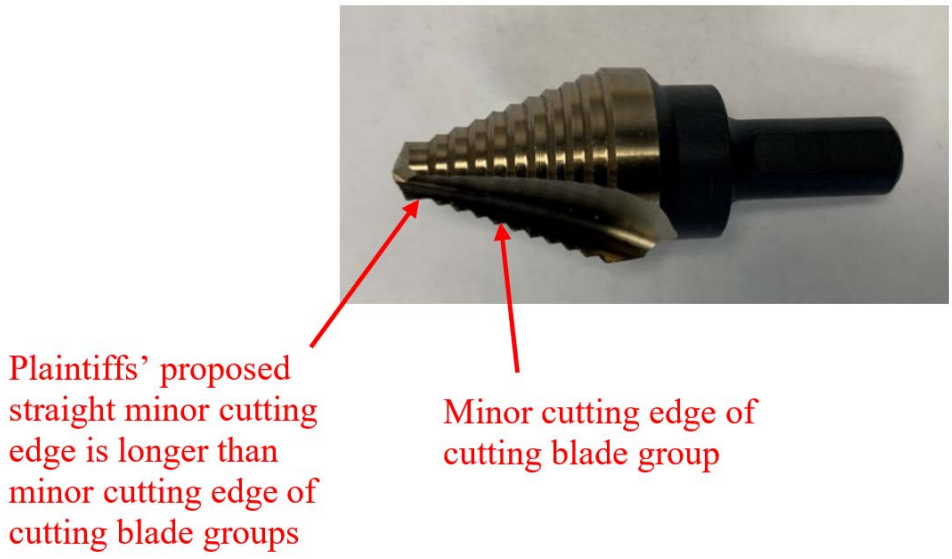


The length of the straight major cutting length of the 00714 drill is greater than the major cutting edges of the composite cutting blade groups, as shown in the annotated photo of the 00714 drill below.



Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Viking disagrees with this construction. If, however, this construction is correct, then Viking's

00714 drill has a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. See the annotated photo of the 00714 drill below.

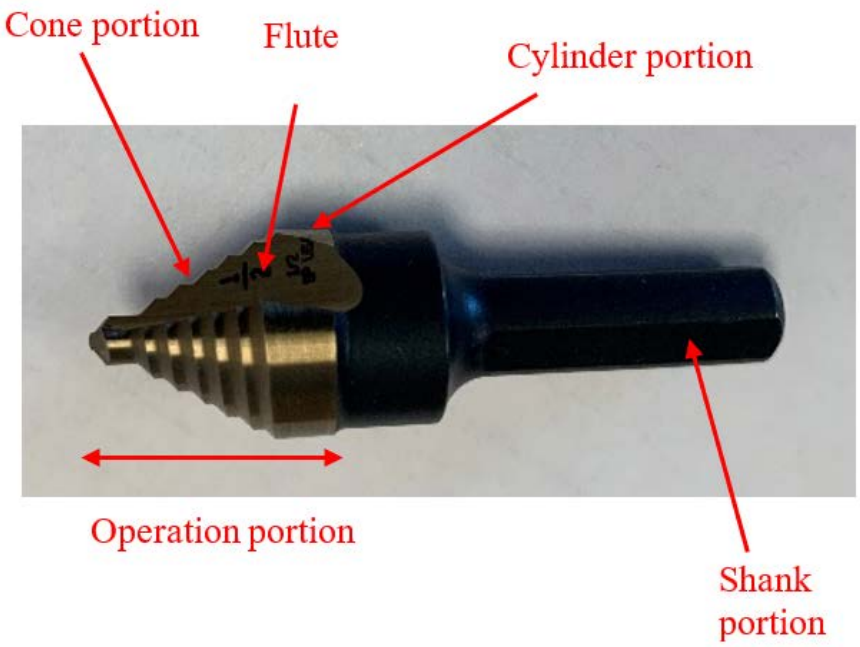


2. Viking's 00693 Drill

Viking has marketed its 00693 drill in the United States since at least 2015[6] and the 00693 drill is, therefore, prior art to the Asserted Patents under 35 U.S.C. §102(a)(1).

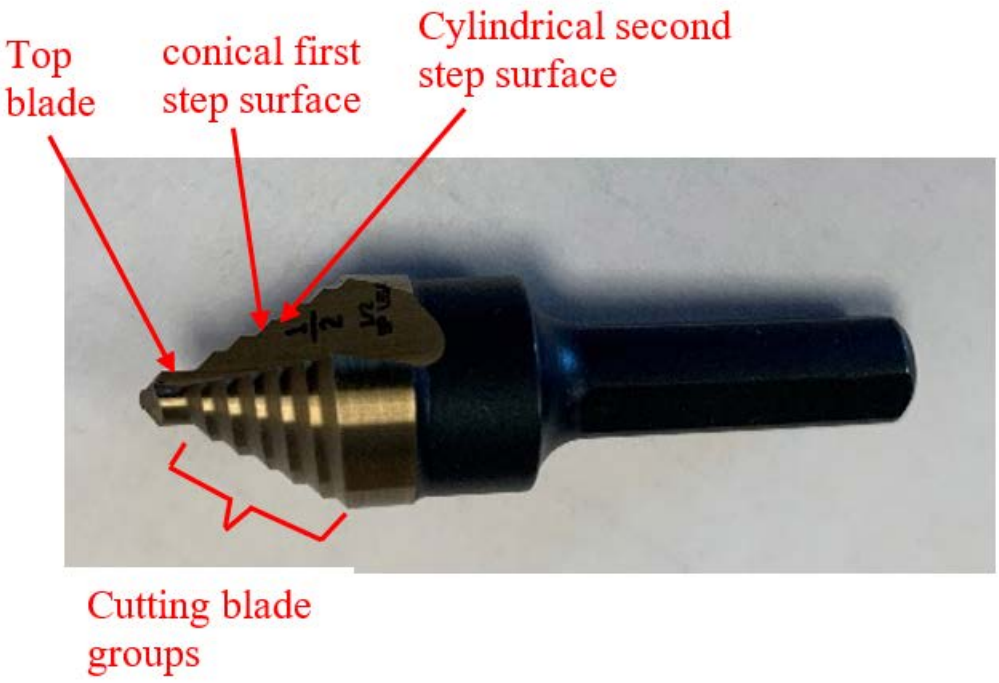
The 00693 drill, shown in the annotated photograph below, has a shank portion and an operation portion axially fixed to the shank portion, the operating portion having a cone portion axially fixed to the cylinder portion. A flute having a sidewall is formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, with the shank portion axially fixed to the cylinder portion opposite the cone portion.

[6] *See* Viking 2015 Catalog at VIKINGVP_00001616.



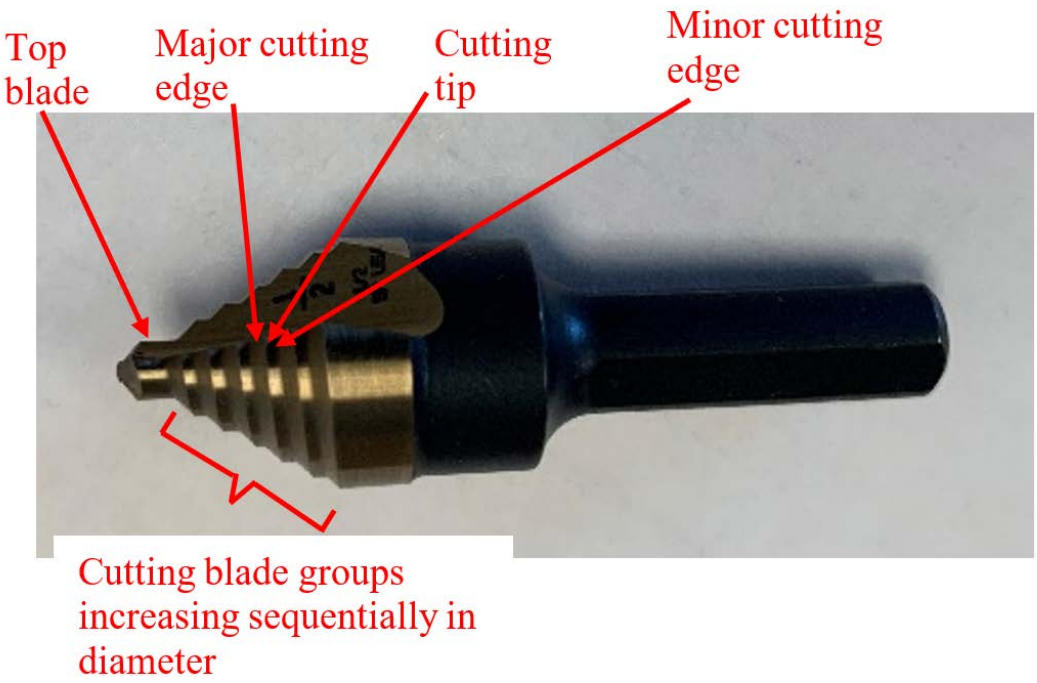
The 00693 drill has plurality of composite cutting blade groups formed sequentially on the cone portion exterior from the front end of the cone portion to a rear end of the cone portion. The composite cutting blade groups have axial relief, which Plaintiffs argue makes them "spirally" formed. The axial relief on the 00693 drill is greater than that of the Accused Products. Diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion. The composite cutting blade groups of the 00693 drill have a conical first step surface and a cylindrical second step surface adjacent to the conical first step surface, as shown in the annotated photograph of the 00693 drill below.[7]

[7] Like virtually all step drill cutting surfaces, the Viking 00693 drill has radial relief on the cylindrical step surfaces. Plaintiffs' infringement allegations appear to be based on the contention that the presence of such radial relief is irrelevant to whether such surfaces meet the "cylindrical first step surface" limitation (while at the same time arguing inconsistently that axial relief renders cutting groups "spirally-formed"). While Viking disagrees with

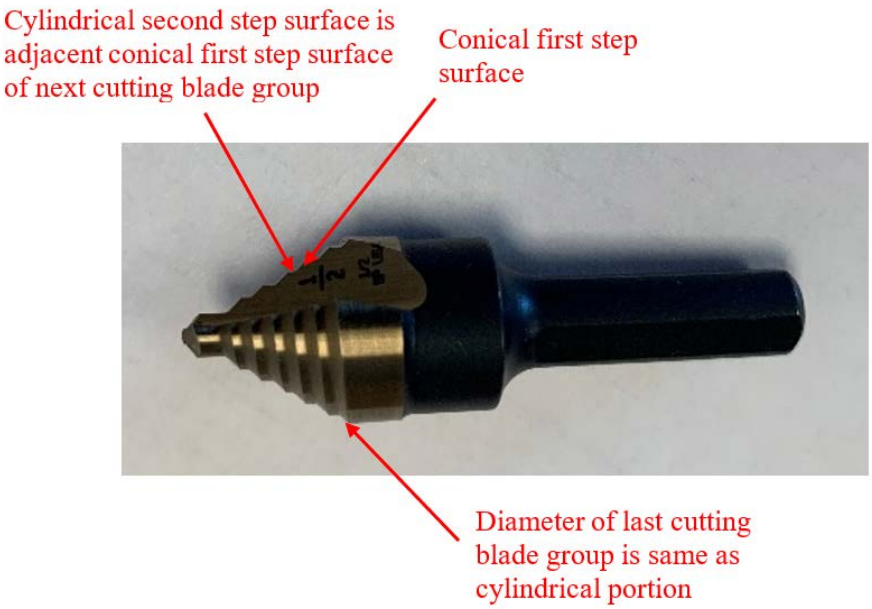


A major cutting edge is defined by the intersection of the conical first step surface and the sidewall of the spiral flute. A minor cutting edge is defined by the intersection of the cylindrical second step and the sidewall of the flute, a cutting tip is defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. The 00693 drill is provided with a top blade on the front end of the cone portion, as shown in the annotated photograph of the 00693 drill below.

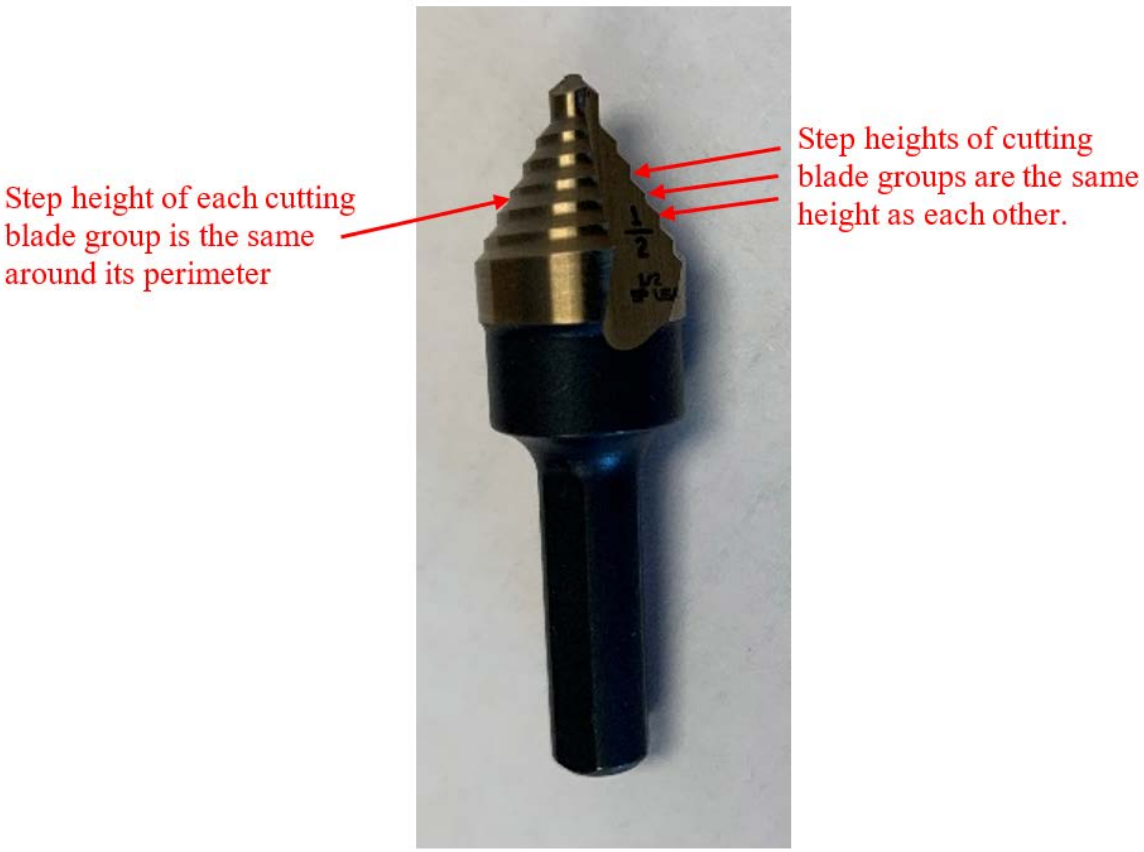
Plaintiffs' contention, based on that contention, the Viking 00693 drill has cylindrical second step surfaces.



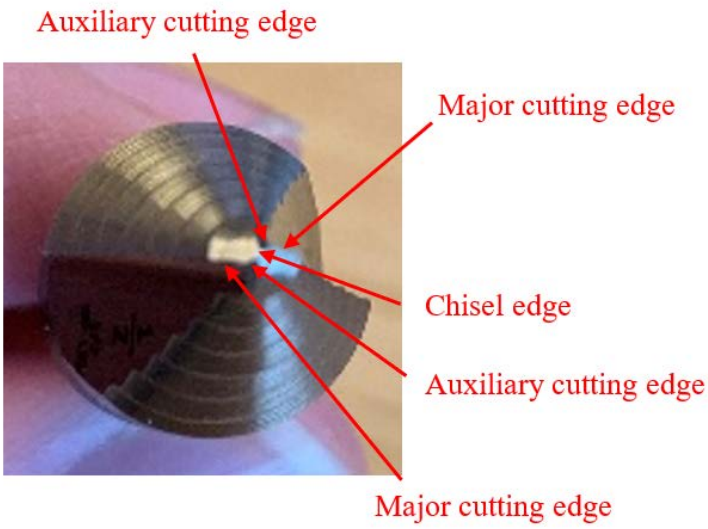
The cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. To the extent that Plaintiffs' construction of "the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter" as set forth in the Supplemental Infringement Contentions is correct, the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter, as shown in the annotated photograph of the 00693 drill below.



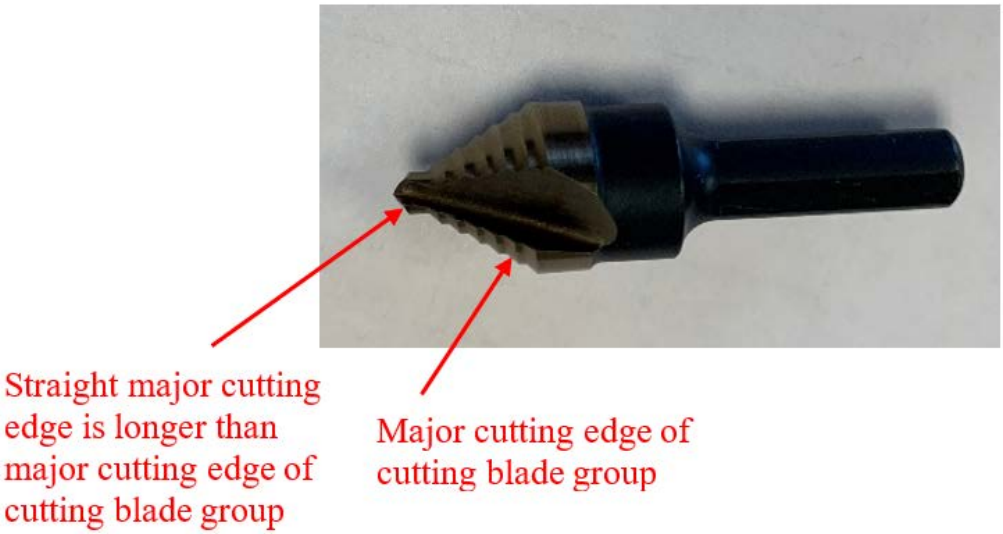
The composite cutting blade groups of the 00693 drill are the same height as each other, and the height of a composite cutting blade group is uniform around its perimeter, as shown in the annotated photograph of the 00693 drill below.



The top blade of the 00693 drill is provided with a well-known split point tip, having a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edges are intersected by the chisel edge and a respective straight major cutting edge. The annotated photo of the 00693 drill provided below shows the chisel edge, auxiliary cutting edges and straight major cutting edges. To the extent that a cutting blade group with axial relief can be considered to have an axis, each composite cutting blade group is arranged coaxially with the cone portion of the drill.

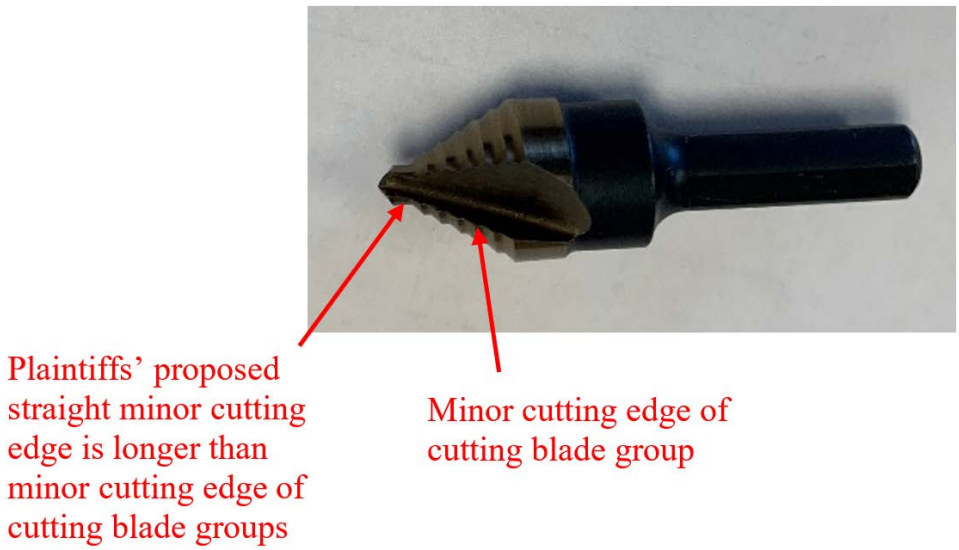


The length of the straight major cutting length of the 00693 drill is greater than the major cutting edges of the composite cutting blade groups, as shown in the annotated photo of the 00693 drill below.



Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Viking disagrees with this construction. If, however, this construction is correct, then Viking's

00693 drill has a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. See the annotated photo of the 00693 drill below.

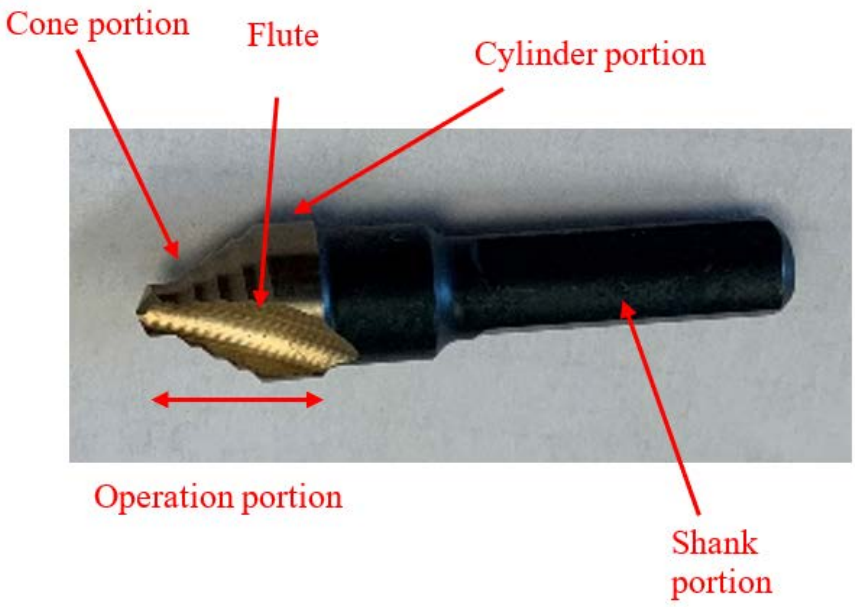


3. Viking's 00694 Step Drill

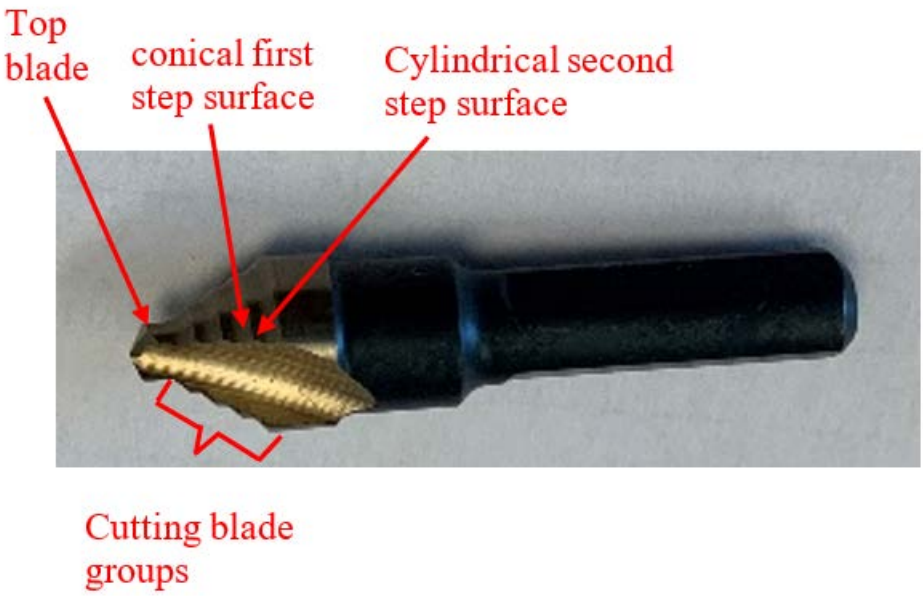
Viking has marketed its 00694 drill in the United States since at least 2015[8] and the 00694 drill is, therefore, prior art to the Asserted Patents under 35 U.S.C. §102(a)(1).

The 00694 drill, shown in the annotated photograph below, has a shank portion and an operation portion axially fixed to the shank portion, the operating portion having a cone portion axially fixed to the cylinder portion. A flute having a sidewall is formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, with the shank portion axially fixed to the cylinder portion opposite the cone portion.

[8] *See* Viking 2015 Catalog at VIKINGVP_00001616.

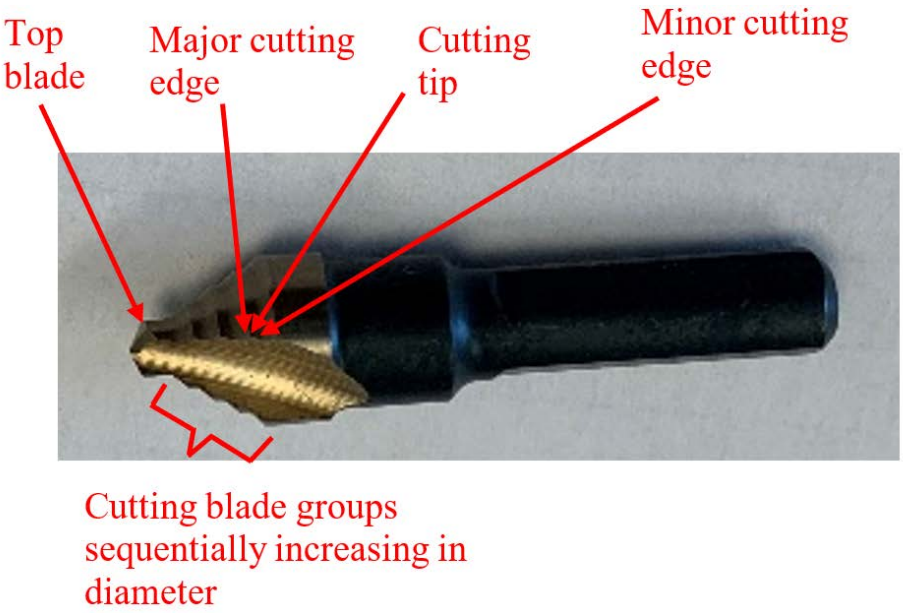


The 00694 drill has plurality of composite cutting blade groups formed sequentially on the cone portion exterior from the front end of the cone portion to a rear end of the cone portion. The composite cutting blade groups have axial relief, which Plaintiffs argue makes them "spirally" formed. The axial relief on the 00694 drill is greater than that of the Accused Products. Diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion. The composite cutting blade groups of the 00694 drill have a conical first step surface and a cylindrical second step surface adjacent to the conical first step surface, as shown in the annotated photograph of the 00694 drill below.

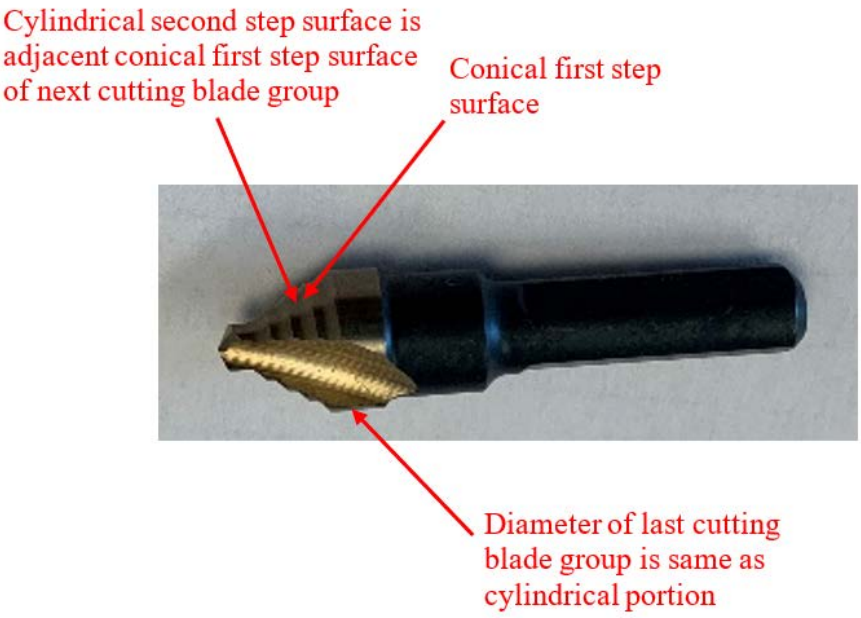


A major cutting edge is defined by the intersection of the conical first step surface and the sidewall of the spiral flute. A minor cutting edge is defined by the intersection of the cylindrical second step and the sidewall of the flute, a cutting tip is defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. The 00694 drill is provided with a top blade on the front end of the cone portion, as shown in the annotated photograph of the 00694 drill below.[9]

[9] Like virtually all step drill cutting surfaces, the Viking 00694 drill has radial relief on the cylindrical step surfaces. Plaintiffs' infringement allegations appear to be based on the contention that the presence of such radial relief is irrelevant to whether such surfaces meet the "cylindrical first step surface" limitation (while at the same time arguing inconsistently that axial relief renders cutting groups "spirally-formed"). While Viking disagrees with Plaintiffs' contention, based on that contention, the Viking 00694 drill has cylindrical second step surfaces.



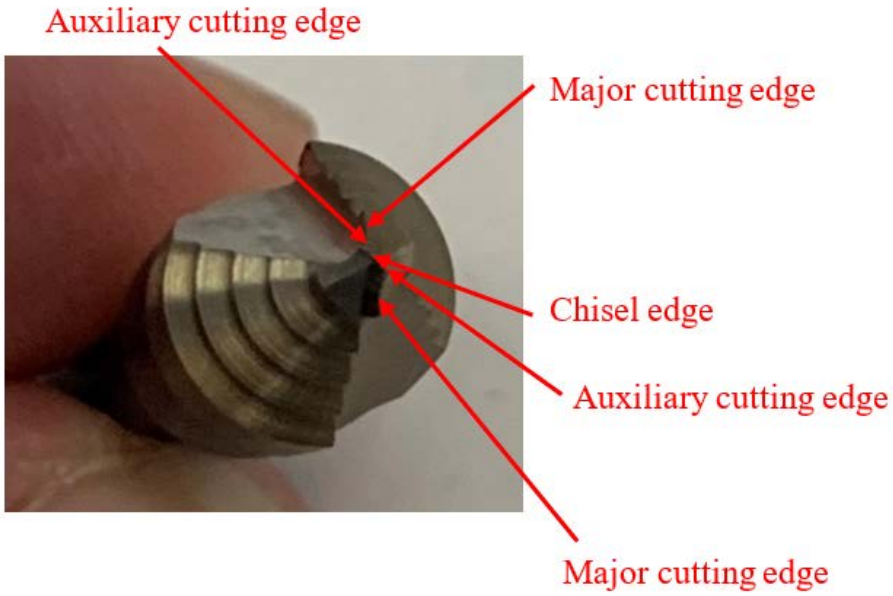
The cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. To the extent that Plaintiffs' construction of "the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter" as set forth in the Supplemental Infringement Contentions is correct, the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter, as shown in the annotated photograph of the 00694 drill below.



The composite cutting blade groups of the 00694 drill are the same height as each other, and that the height of a composite cutting blade group is uniform around its perimeter, as shown in the annotated photograph of the 00694 drill below.



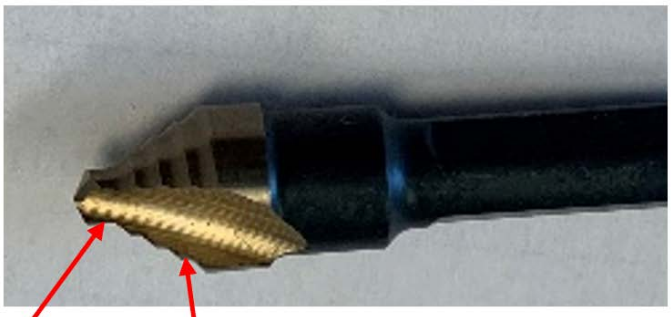
The top blade of the 00694 drill is provided with a well-known split point tip that has a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edges are intersected by the chisel edge and a respective straight major cutting edge. An annotated photo of the 00694 drill below shows the chisel edge, auxiliary cutting edges and straight major cutting edges. To the extent that a cutting blade group with axial relief can be considered to have an axis, each composite cutting blade group is arranged coaxially with the cone portion of the drill.



The length of the straight major cutting length of the 00694 drill is greater than the major cutting edges of the composite cutting blade groups, as shown in the annotated photo of the 00694 drill below.



Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Viking disagrees with this construction. If, however, this construction is correct, then Viking's 00694 drill has a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. See the annotated photo of the 00694 drill below.



4. Matco Hyper-Step Drills

On information and belief, Matco Tools has marketed its Hyper-Step Drills at least as early as August 2018.[10] On information and belief, the Matco Hyper-Step Drills were also otherwise available to the public at least as early as August 2018.[11] Since this date is more than one year prior to the filing date of the '593 patent, these drills are prior art to the Asserted Patents under 35 U.S.C. § 102(a)(1).

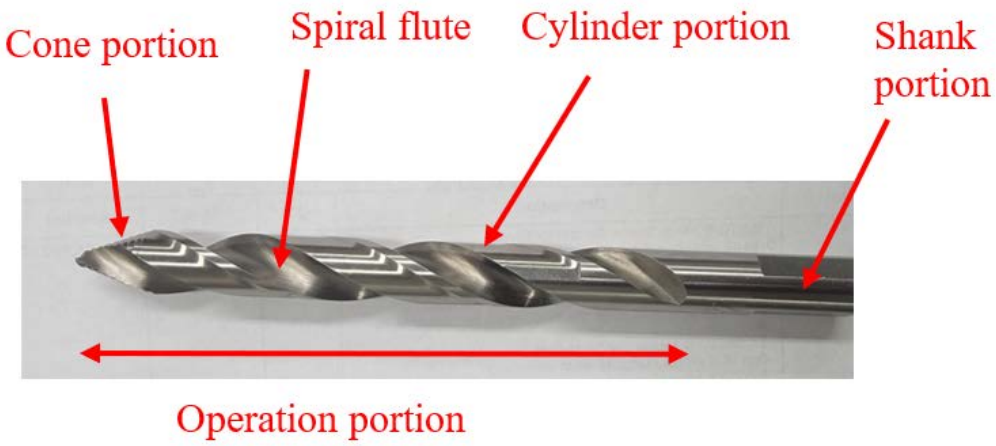
Shown below are photographs of the outside and inside of a drill box marked "MATCO TOOLS" and "DB29HS 29 PIECE HYPER-STEP DRILL BIT SET." The box contains a number of twist drill bits having stepped conical points. On information and belief, these drills are manufactured by or on behalf of Plaintiffs by Matco Tools. The drills in the "DB29HS 20 PIECE HYPER-STEP DRILL BIT SET" are referred to herein as the "Matco Hyper-Step Drills."

[10] *See* VIKINGVP_00001515.
[11] *See* VIKINGVP_00001458.



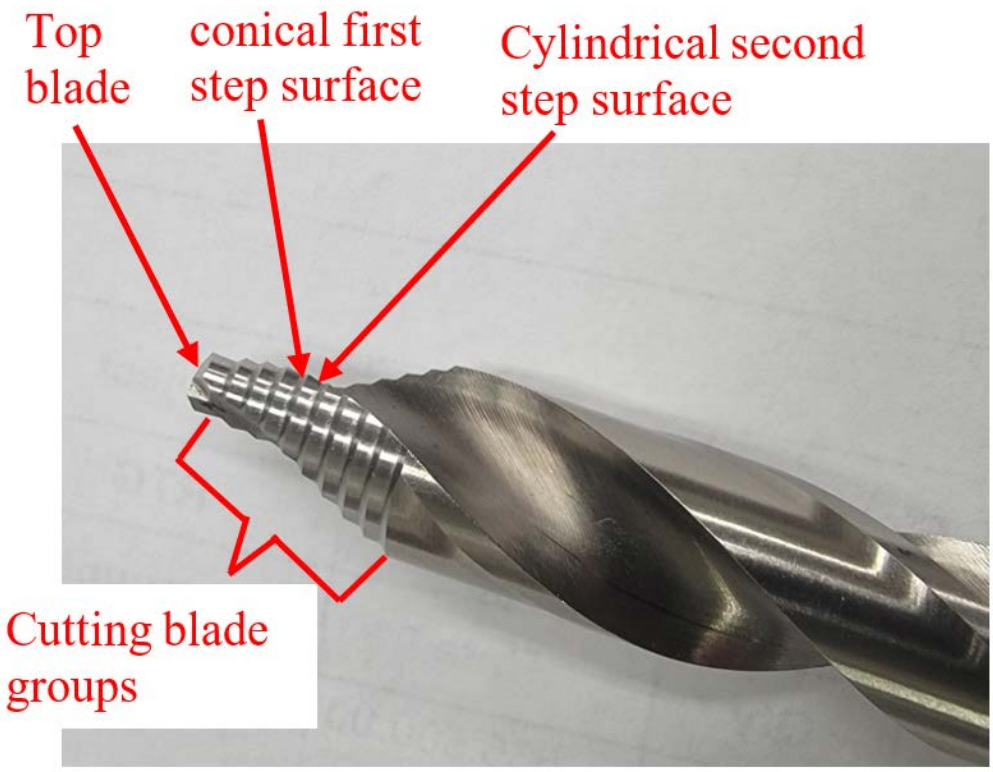


The Matco Hyper-Step Drills have a shank portion and an operation portion axially fixed to the shank portion, the operating portion having a cone portion axially fixed to the cylinder portion. A spiral flute having a sidewall is formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, with the shank portion axially fixed to the cylinder portion opposite the cone portion. These elements of the drills are shown for an exemplary Matco Hyper-Step Drill in the annotated photograph below.

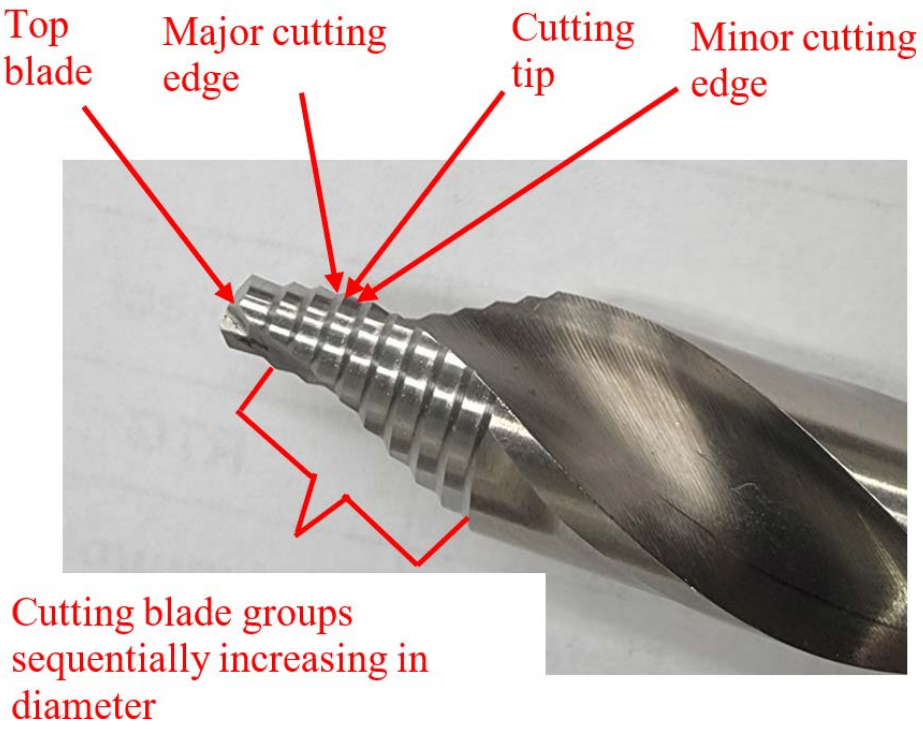


The Matco Hyper-Step Drills have a plurality of composite cutting blade groups formed sequentially on the cone portion exterior from the front end of the cone portion to a rear end of the cone portion. The composite cutting blade groups have axial relief, which Plaintiff argue make them "spirally" formed. Diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion. The composite cutting blade groups of the Matco Hyper-Step Drills have a conical first step surface and a cylindrical second step surface adjacent to the conical first step surface, as shown in the annotated photograph of an exemplary Matco Hyper-Step Drill below.[12]

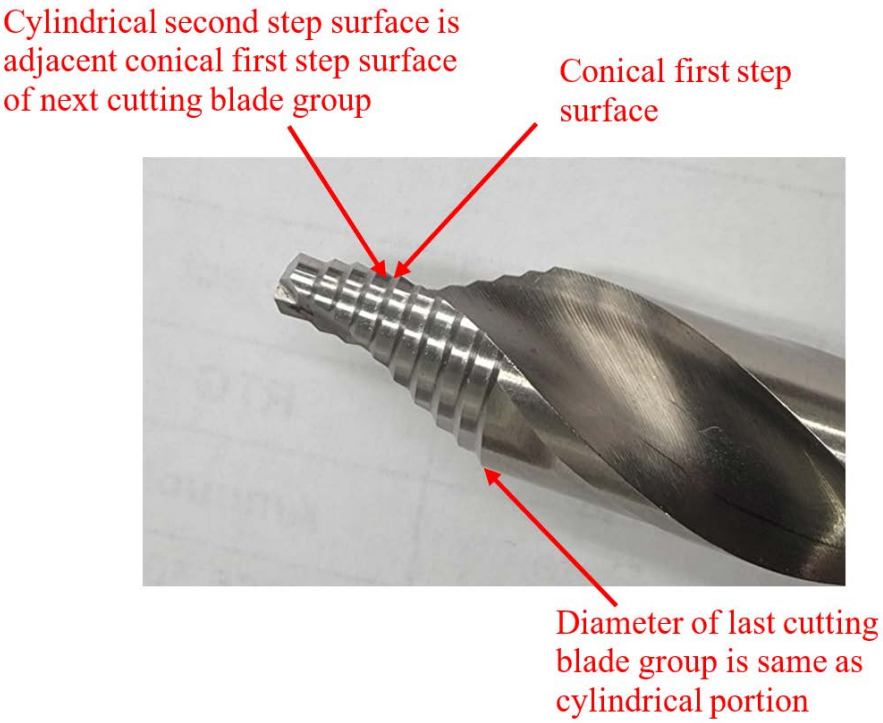
[12] Like virtually all step drill cutting surfaces, the Matco Hyper-Step Drills have radial relief on the cylindrical step surfaces. Plaintiffs' infringement allegations appear to be based on the contention that the presence of such radial relief is irrelevant to whether such surfaces meet the "cylindrical first step surface" limitation (while at the same time arguing inconsistently that axial relief renders cutting groups "spirally-formed"). While Viking disagrees with Plaintiffs' contention, based on that contention, the Matco Hyper-Step Drills have cylindrical second step surfaces.



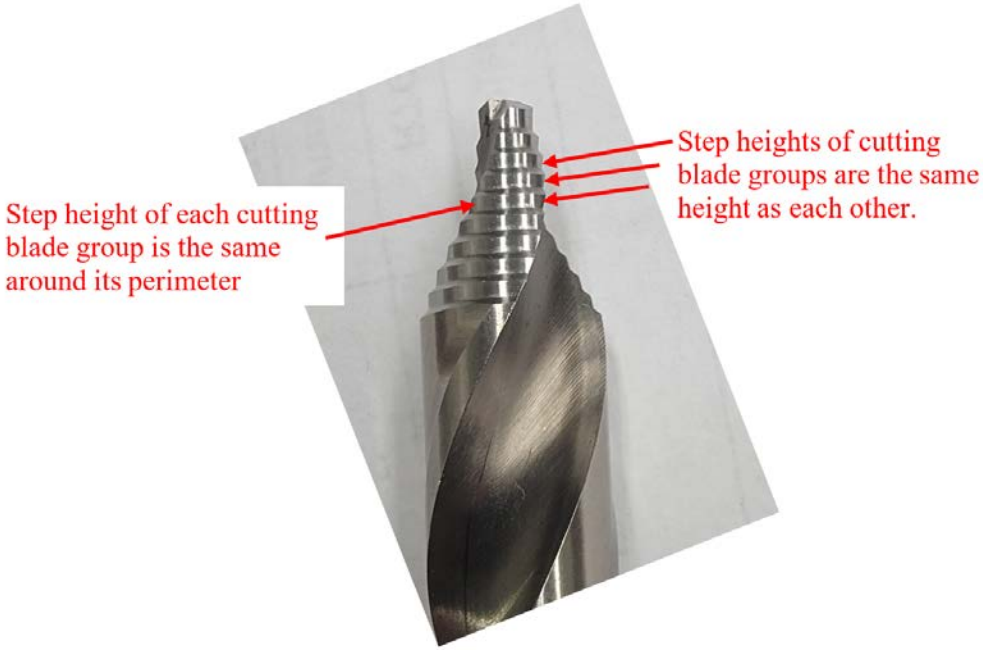
A major cutting edge is defined by the intersection of the conical first step surface and the sidewall of the spiral flute. A minor cutting edge is defined by the intersection of the cylindrical second step and the sidewall of the flute, a cutting tip is defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. The Matco Hyper-Step Drills are provided with a top blade on the front end of the cone portion, as shown in the annotated photograph of an exemplary Matco Hyper-Step Drill below.



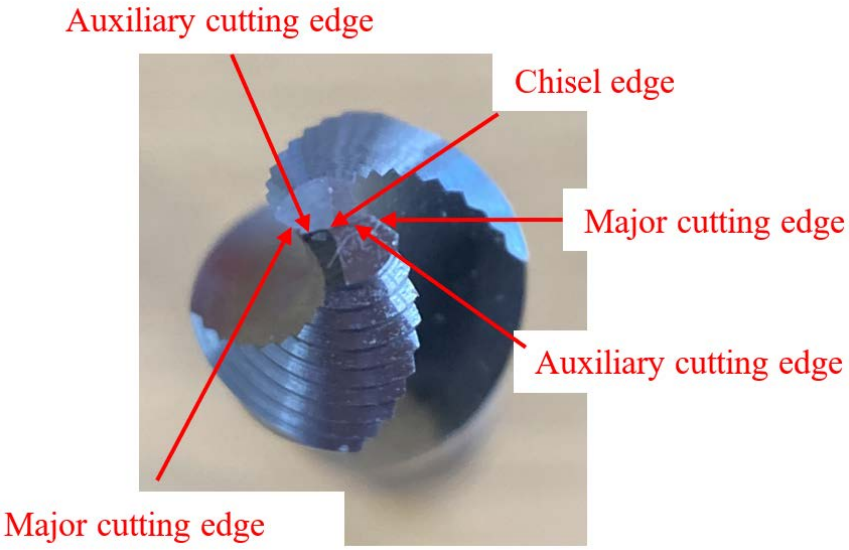
The cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. To the extent that Plaintiffs' construction of "the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter" as set forth in the Supplemental Infringement Contentions is correct, the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter, as shown in the annotated photograph of the exemplary Matco Hyper-Step Drill below.



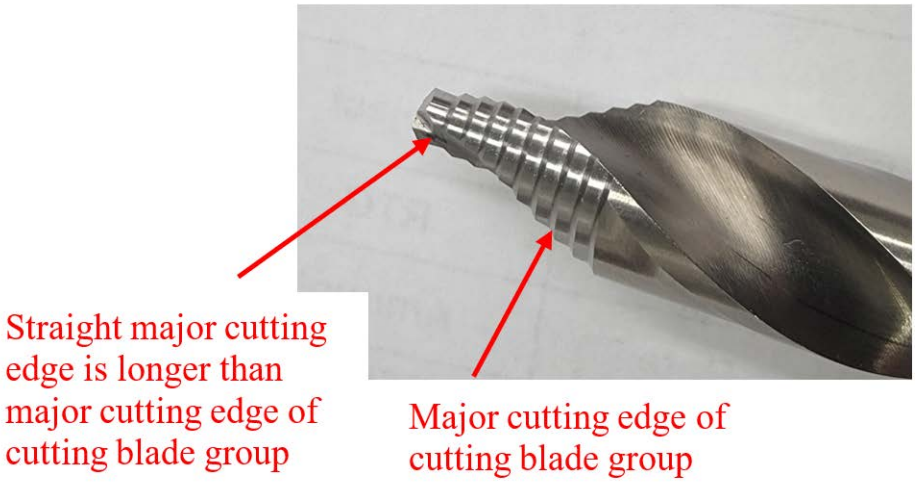
The composite cutting blade groups of the Matco Hyper-Step Drills are the same height as each other, and that the height of a composite cutting blade group is uniform around its perimeter, as shown in the annotated photograph of the exemplary Matco Hyper-Step Drill below.



The top blades of the Matco Hyper-Step Drills are provided with a well-known split point tip, that includes a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edges are intersected by the chisel edge and a respective straight major cutting edge. An annotated photo of the exemplary Matco Hyper-Step Drill below shows the chisel edge, auxiliary cutting edges and straight major cutting edges. To the extent that a cutting blade group with axial relief can be considered to have an axis, each composite cutting blade group is arranged coaxially with the cone portion of the drill.

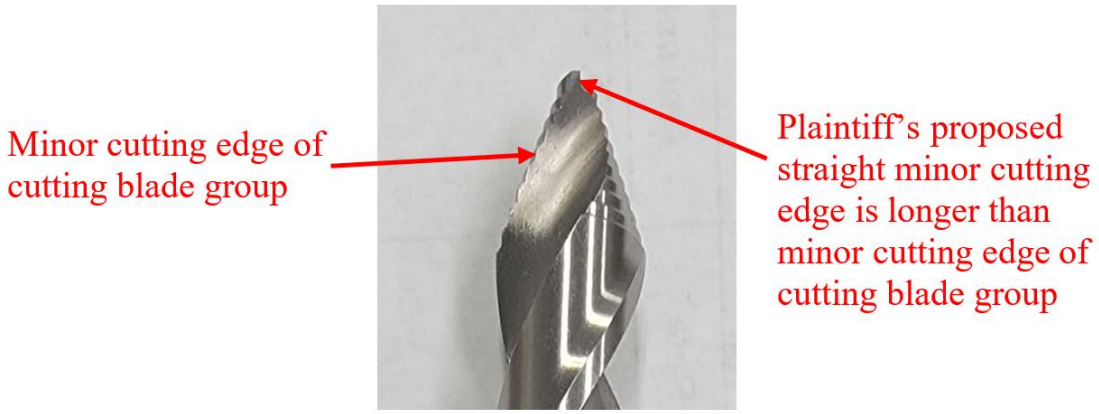


The length of the straight major cutting length of the Matco Hyper-Step Drills is greater than the major cutting edges of the composite cutting blade groups, as shown in the annotated photo of the exemplary Matco Hyper-Step Drill below.



Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Viking disagrees with this construction. If, however, this construction is correct, then the Matco

Hyper-Step Drills have a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. See the annotated photo of an exemplary Matco Hyper-Step Drill below.



VI. THE ASSERTED CLAIMS OF THE ASSERTED PATENTS ARE INVALID AS BEING ANTICIPATED AND/OR OBVIOUS OVER THE PRIOR ART

As set forth in **Exhibits A-I** and as discussed below and above, Asserted Claims of the Asserted Patents, as properly construed and/or if construed to cover Viking's products, are anticipated and/or obvious in light of the prior art references discussed herein alone and/or in combination, or in combination with the knowledge of a POSA, including the combinations of prior art references discussed below for each particular Asserted Claim. Viking identifies below exemplary combinations of references that render the Asserted Claims obvious. Invalidity need not be proven with resort to certain specific combinations of references, but instead must involve a holistic analysis of the prior art considered in view of the ordinary knowledge and creativity possessed by those of ordinary skill in the art, consistent with how a POSA would have proceeded when faced with a given problem. Indeed, these references all contribute to the scope and

content of the prior art, which is the appropriate analysis under *Graham* and *KSR*. Those cases do not require Viking to prove obviousness through an arbitrary characterization of references as "primary" and/or "secondary." Accordingly, although Viking identifies exemplary combinations of references that render the Asserted Claims obvious, the combinations of references discussed below are not intended to be exhaustive, but rather, to provide examples of combinations of the above references that render the Asserted Claims obvious.

A. Every Element of the Asserted Claims is Disclosed in the Prior Art

1. Twist drills having an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion ('583 Patent, claims 1 and 8, '584 Patent, claims 1 and 6).

Twist drills having a cone portion, a cylinder portion and a shank portion are well-known in the art, and have been used for many years. Bannister, which issued in 1940, shows a twist drill having a cylinder portion and a cone portion.[13] *See* Bannister at FIGs. 1, 2, p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Wang I discloses a twist drill having a cylinder portion and a cone portion, and a shank portion fixed axially to the cylinder portion. *See* Wang I at FIGs. 5-12; ¶¶ [31-39]. Li discloses a twist drill, referred to as a "helical bit tool," having a cylinder portion and a cone portion.[14] *See* Li at FIG. 1; Abstract; ¶¶ [3; 21-24]. Wang II discloses a twist drill having

[13] While Bannister does not explicitly show a shank portion, Bannister shows a break line where a shank portion would be located, and a POSA would understand Bannister's drill to include a shank portion so that it could be held in a drill press for operation.

[14] While Li does not explicitly show a shank portion, Li shows a break line where a shank portion would be located, and a POSA would understand Li's drill to include a shank portion so that it could be held in a drill press for operation.

a cylinder portion and a cone portion, with a shank portion fixed axially to the cylinder portion. *See* Wang II at FIGs. 1-8. Sheldon discloses a twist drill having a cylinder portion and a cone portion, with a shank portion fixed axially to the cylinder portion. *See* Sheldon at FIG. 1; p. 1:3 – p. 3:16. The prior art Matco drills a twist drill having a cylinder portion and a cone portion, and a shank portion fixed axially to the cylinder portion. *See* description of the Matco drills, *supra*. The prior art Viking 00693, 00694 and 00714 drills are all drills that include a cylinder portion and a cone portion, and have a shank portion fixed axially to the cylinder portion.[15] *See* descriptions of the Viking 00693, 00694 and 00714 drills. *supra.*

2. A spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion at least part way up the cylinder portion, the spiral flute having a sidewall. ('583 Patent, claims 1 and 8, '584 Patent, claims 1 and 6).

Wang I discloses a spiral flute on the exterior surface, extending from the front end of the nose portion to at least part way up the cylinder portion, the spiral flute having a sidewall. *See* Wang I at FIGs. 5-12, ¶¶ [[31, 32, 35]]. Bannister discloses a spiral flute on the exterior surface, extending from the front end of the nose portion to at least part way up the cylinder portion, the spiral flute having a sidewall. *See* Bannister at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Li discloses a spiral flute on the exterior surface, extending from the front end of the nose portion to at

[15] While the Viking drills may not normally be classed as twist drills, the term "twist drill" is only part of the preamble and carries no patentable weight. The Viking drills do, however, include the required limitations of cone portion, cylinder portion and shank portion.

least part way up the cylinder portion, the spiral flute having a sidewall. *See* Li at FIG. 1; Abstract; and ¶¶ [21 - 24]. Wang II discloses a spiral flute on the exterior surface, extending from the front end of the nose portion to at least part way up the cylinder portion, the spiral flute having a sidewall. *See* Wang II at FIGs. 1-3. Sheldon discloses a spiral flute on the exterior surface, extending from the front end of the nose portion to at least part way up the cylinder portion, the spiral flute having a sidewall. *See* Sheldon at FIG. 1; p. 1:3 – p. 3:16. The Matco drills have a spiral flute on the exterior surface, extending from the front end of the nose portion to at least part way up the cylinder portion, the spiral flute having a sidewall. *See* description of the Matco drills, *supra*.

The Viking 00693, 00694 and 00714 drills have straight flutes. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See, e.g.*, Durfee I at 1:32-39; 3:57-6:32; Durfee II at 4:58-60; Bannister at FIG. 2; Wetzl at FIGs. 1 and 2, ¶¶ [8, 27, 37, 38, 46-50]; Li at FIGs. 1-8; Wang II at FIGs. 1-4, and 608; Korb at FIGs. 1, 2 and 7, 1:33-35, 2:37-44. Korb suggests equivalency between a flute cut helically, and a straight flute cut at about zero degrees to the drill axis. Korb at 2:37-44. Step drills with helical flutes were also known from Sheldon and CN102126039 and CN103084629 (both cited during the reexamination of the ’583 patent), and from DE202011106232U1, WO2012/167448 and WO2008/092386 (these last three references all cited during prosecution of the Asserted Patents). Accordingly, it would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00693, 00694 and 00714 drills to a spiral flute, which is known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.

3. A plurality of composite cutting blade groups formed sequentially and spirally on a cone exterior from a front end of the cone portion to a rear end of the cone portion ('583 Patent, claims 1 and 8, '584 Patent, claims 1 and 6).

Wang I discloses a plurality of composite cutting blade groups formed sequentially on a cone exterior from a front end to a rear end of the cone portion. *See* Wang I at FIGs. 5-12, ¶¶ [31-39]. Bannister discloses a plurality of composite cutting blade groups formed sequentially on a cone exterior from a front end to a rear end of the cone portion. *See* Bannister at p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Li discloses a plurality of composite cutting blade groups formed sequentially on a cone exterior from a front end to a rear end of the cone portion. *See* Li at FIG. 1; Abstract; ¶¶ [21-24]. Wang II discloses a plurality of composite cutting blade groups formed sequentially on a cone exterior from a front end to a rear end of the cone portion. *See* Wang II at FIGs. 1-8. Sheldon discloses a plurality of composite cutting blade groups formed sequentially on a cone exterior from a front end to a rear end of the cone portion. *See* Sheldon at FIG. 1; p. 1:3- p.3:16.

Plaintiffs' infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then one of ordinary skill would have understood that the drills disclosed in the references also had spirally formed cutting blade groups. Gentry states that "in order to properly cut a hole, reliefs are required between the drill bit…and the workpiece to be cut. More

specifically, reliefs are required between the cutting surfaces…of the drill bit…and the workpiece. These reliefs include axial relief, diametral relief and radial relief." Gentry at 1:52-57 and provides definitions for these different types of relief. Gentry at 1:52-2:23. Examples of prior art references that describe drill bits having axial relief on similar cutting elements include Mackey at 2:55-59, 4:17-22; Durfee I at 11:27-54, 12:1-8; Durfee II at 1:50-55, 2:6-13, 7:5-51; and Wetzl at FIG. 6, ¶¶ [36-37]. It would, therefore, have been well known to a POSA that axial relief in such cutting elements improve the cutting efficiency of the drill bit and that, in the absence of axial relief, such drills will cut poorly and be subject to jamming. Thus, a POSA would have expected that axial relief to be included in the cutting blade groups of the drills taught in Wang I, Bannister, Wetzl, Li, and Wang II, even though such axial relief may have been omitted from the description.

Even if a POSA would not have understood the cutting blade groups taught in Wang I, Bannister, Li, Wang II and Sheldon to be provided with axial relief, it would still be obvious to form the cutting blade groups spirally. Gentry shows spiral grooves on a conical drill bit. For example, FIG. 8 shows spiral (helical) grooves 270, 272. "Once the conically-shaped main body 206 has been formed, the helical grooves 270, 272 are turned onto the spiral drill bit 50 using two form tools…The helical grooves 270, 272 begin at diametrically-opposed positions and are offset by a phase angle of 180 degrees." *See* Gentry at 7:4-8. A POSA would have been motivated to adopt this manufacturing approach because the manufacturing process for the drill bit reduces the amount of

grinding required, thus reducing the time and cost of forming the spiral drill bit. Gentry at 2:67-3:3.

The Viking 00693, 00694 and 00714 drills all include composite cutting blade groups formed sequentially around a cone exterior from a front end of the cone portion to a rear end of the cone portion. The cutting blade groups are formed with axial relief. To the extent that the claim language of being formed "spirally" covers drills having composite cutting blade groups with axial relief, then the cutting blade groups of the Viking 00693, 00694 and 00714 drills are also formed spirally. *See* description of Viking 00693, 00694 and 00714 drills, *supra.*

The Matco drills include composite cutting blade groups formed sequentially around a cone exterior from a front end of the cone portion to a rear end of the cone portion. The cutting blade groups are formed with axial relief. To the extent that the claim language of being formed "spirally" covers drills having composite cutting blade groups with axial relief, then the cutting blade groups of the Matco drills are also formed spirally. *See* description of Matco drills, *supra.*

4. The composite cutting blade groups comprising a conical first step surface, a cylindrical second step surface, a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute, a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the spiral flute, and a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge and the sidewall of the spiral flute. ('583 Patent, claims 1 and 8, '584 Patent, claims 1 and 6).

Wang I discloses composite cutting blade groups comprising the claimed conical first step surface, cylindrical second step surface, the major cutting edge, the minor

cutting edge and the cutting tip. *See* Wang I at FIGs. 5-12, ¶¶ [31-39]. Bannister discloses composite cutting blade groups comprising a first step surface, a cylindrical second step surface, a major cutting edge, the minor cutting edge formed by the intersection of the cylindrical second step surface and the spiral flute, and a cutting tip. *See* Bannister at p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Li discloses composite cutting blade groups comprising a first step surface, a cylindrical second step surface, a major cutting edge, the minor cutting edge formed by the intersection of the cylindrical second step surface and the spiral flute, and a cutting tip. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. Wang II discloses the composite cutting blade groups comprising the claimed conical first step surface, cylindrical second step surface, the major cutting edge, the minor cutting edge and the cutting tip. *See* Wang II at FIGs. 1-8. Sheldon discloses composite cutting blade groups comprising a first step surface, a cylindrical second step surface, a major cutting edge, the minor cutting edge formed by the intersection of the cylindrical second step surface and the spiral flute, and a cutting tip. *See* Sheldon at FIG. 1, p. 1:3-p. 3:16.

The Viking 00714, 00693, and 00694 drills all have composite cutting blade groups comprising the claimed conical first step surface, cylindrical second step surface,[16] the major cutting edge, the minor cutting edge and the cutting tip. *See* description of the Viking 00714, 00693, and 00694 drills, *supra*.

[16] Like virtually all step drill cutting surfaces, the Viking 00714, 00693, and 00694 drills have radial relief and, in some instances, back taper (diametral) relief on the cylindrical step surfaces. Plaintiffs' infringement allegations appear to be based on the contention that

The Matco drills all have composite cutting blade groups comprising the claimed conical first step surface, cylindrical second step surface,[17] the major cutting edge, the minor cutting edge and the cutting tip. *See* description of the Matco drills, *supra.*

To the extent that a reference does not teach a conical first step surface, it would have been obvious to a POSA that using a conical first step surface would lead to the advantages of improved drilling efficiency and control, drilling stability, precision, prolonged cutting tool life, reduced burring of the workpiece, as discussed in Wang I at ¶¶ [40]-[47]; Li at ¶¶ [23-24]; Sheldon at p. 3:1-3; Durfee I at 9:54-58 by providing a conical section like the drill types disclosed therein or a conical section drill like the Viking 00693, 00694 or 00714 drills or the Matco drills.

5. A top blade provided on the front end of the cone portion ('583 Patent, claims 1 and 8, '584 Patent, claims 1 and 6)

The drill disclosed in Wang I has a top blade at the drill's front end. *See* Wang I at FIGs. 5-12, ¶¶ [33, 34, and 39]. The drill disclosed in Bannister has a top blade at the drill's front end. *See* Bannister at FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left

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the presence of radial relief and/or back taper relief on a "cylindrical first step surface" is irrelevant to whether such surfaces meet the "cylindrical first step surface" limitation (while at the same time arguing inconsistently that axial relief renders cutting groups "spirally-formed"). While Viking disagrees with Plaintiffs' contention, based on that contention, the Viking 00714, 00693, and 00694 drills have cylindrical second step surfaces.

[17] Like virtually all step drill cutting surfaces, the Matco drills have radial relief on the cylindrical step surfaces. Plaintiffs' infringement allegations appear to be based on the contention that the presence of such radial relief is irrelevant to whether such surfaces meet the "cylindrical first step surface" limitation (while at the same time arguing inconsistently that axial relief renders cutting groups "spirally-formed"). While Viking disagrees with Plaintiffs' contention, based on that contention, the Matco drills have cylindrical second step surfaces.

col. l. 32 – p. 3 left col. l. 11. The drill disclosed in Li has a top blade. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. The drill disclosed in Wang II has a top blade. *See* Wang II at FIGs. 1-8. The drill disclosed in Sheldon has a top blade. *See* Sheldon at FIG. 1, p. 1:3-p. 3:16. The Viking 00714, 00693, and 00694 drills all have top blades. *See* description of the Viking 00714, 00693, and 00694 drills, *supra*. The Matco drills all have top blades. *See* description of the Matco drills, *supra.*

6. A diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. ('583 Patent, claims 1 and 8) and diameters of the composite cutting blade groups sequentially increase from the front end of the cone portion to the rear end of the cone portion. ('584 Patent, claims 1 and 6)

In the drill disclosed in Wang I, the diameters of the composite cutting blade groups sequentially increase from the front end of the cone portion to its rear end. *See* Wang I at FIGs. 5-12, ¶ [36]. In the drill disclosed in Bannister, the diameters of the composite cutting blade groups sequentially increase from the front end of the cone portion to its rear end. *See* Bannister at FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. In the drill disclosed by Li the diameters of the composite cutting blade groups sequentially increase from the front end of the cone portion to its rear end. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. The drill disclosed by Wang II has composite cutting blade groups that sequentially increase in diameter from the front end of the cone portion to its rear end. *See* Wang II at FIGs. 1-8. The drill disclosed by Sheldon has composite cutting blade groups that sequentially increase in diameter from the front end of the cone portion to its rear end. *See* Sheldon at FIG. 1 and

p. 1:3-p. 3:16. The Viking 00714, 00693, and 00694 drills all have composite cutting blade groups whose diameters increase sequentially from the front end of the cone portion to its rear end. *See* description of the Viking 00714, 00693, and 00694 drills, *supra*. Likewise, the Matco drills have composite cutting blade groups whose diameters increase sequentially from the front end of the cone portion to its rear end. *See* description of the Matco drills, *supra.*

To the extent that a reference does not teach this element, it would have been obvious to a POSA to modify the reference to incorporate the plurality of cutting blade groups of taught in Wang I and Durfee I, and that are present in the Viking 00693, 00694 and 00714 drills, and in Matco's drills in order to apply the advantages of the drill bit to larger bit sizes requiring more than one step.

7. Each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips ('583 Patent, claims 1 and 8)

It is not clear from the '583 patent how the composite cutting blade groups are configured to achieve the function of crushing cutting chips into finer chips and, consequently, Viking is unable to determine whether any of the prior art discussed herein teaches this claim limitation. However, it appears that Plaintiffs' allege that the crushing of cutting chips into finer chips inherently occurs due to the presence of multiple composite blade cutting groups. Although Viking does not agree with Plaintiffs' contention, if Plaintiffs' contention is correct, then the prior art also inherently teaches the limitation of crushing cutting chips into finer chips. All of Wang I, Bannister, Li,

Sheldon and Wang II, either alone or modified in the manner discussed above, include multiple composite cutting blade groups that, according to Plaintiffs' assertion, inherently crush cutting chips into finer chips. Also, the Viking 00693, 00694 and 00714 drills and the Matco drills have multiple composite cutting blade groups that, according to Plaintiffs' assertion, inherently crush cutting chips into finer chips.

The flutes of Wang I, Bannister, Li, Sheldon and Wang II, are configured to shunt chips, whether it be cutting chips or finer chips, as are the flutes of the Matco drills. The flutes of the Viking 00693, 00694 and 00714 drills, either alone or modified as discussed above, are configured to shunt chips.

8. At least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group. ('583 Patent, claims 1 and 8, '584 patent, claims 1 and 6)

Wang I discloses that at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* Wang I at FIGs. 5-12, ¶¶ [31, 36, 37]. Bannister, alone or modified as discussed above, shows a cylindrical second step surface immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* Bannister at 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11; Wang I at FIGs. 5-12, ¶¶ [31, 36, 37]; Durfee I at FIG. 3; Viking 00693, 00694, and 00714 drill descriptions *supra*; and Matco drill description *supra*. Li, alone or modified as discussed above, shows a cylindrical second step surface immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. Wang II shows a cylindrical

second step surface immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* Wang II at FIGs. 1-8. Sheldon shows a cylindrical second step surface immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* Sheldon at FIG. 1 and p. 1:3-3:16. The Viking 00693, 00694 and 00714 drills each include a cylindrical second step surface immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* description of Viking 00693, 00694 and 00714 drills, *supra*. The Matco drills have a cylindrical second step surface immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* description of Matco drills, *supra*.

9. The diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. ('583 Patent, claims 1 and 8, '584 patent, claims 1 and 6)

Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the prior art discloses this limitation. Specifically, Wang I discloses that the last composite cutting blade group immediately adjacent the cylinder portion has a diameter equal to that of the cylinder portion. *See* Wang I at FIGs. 5-12, ¶¶ [31-39]. Bannister, alone or modified as discussed above, shows that the last composite cutting blade group immediately adjacent the cylinder portion has a diameter equal to that of the cylinder portion. *See* Bannister at FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Li, alone or modified as discussed above, shows that the last

composite cutting blade group immediately adjacent the cylinder portion has a diameter equal to that of the cylinder portion. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. Wang II shows that the last composite cutting blade group immediately adjacent the cylinder portion has a diameter equal to that of the cylinder portion. *See* Wang II at FIGs. 1-8. Sheldon shows that the last composite cutting blade group immediately adjacent the cylinder portion has a diameter equal to that of the cylinder portion. *See* Sheldon at FIG. 1 and p. 1:3-3:16. In the Viking 00693, 00694 and 00714 drills, each has a last composite cutting blade group immediately adjacent the cylinder portion that has a diameter equal to that of the cylinder portion. *See* description of Viking 00693, 00694 and 00714 drills, *supra*. The Matco drills have has a last composite cutting blade group immediately adjacent the cylinder portion that has a diameter equal to that of the cylinder portion. *See* description of Matco drills, *supra*.

10. The minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality (’583 Patent, claims 2 and 8, ’584 patent, claims 2 and 7)

It is not clear from the ’583 patent specification how the minor cutting edge is configured to smooth the machined surface of the workpiece and, consequently, Viking is unable to determine whether any of the prior art discussed herein teaches this claim limitation. However, it appears from the Plaintiffs’ infringement allegations that the smoothing function is inherently carried out by the minor cutting edge. While Viking does not agree with Plaintiffs’ construction, if it is the case, then this smoothing function is inherent to the teachings of Wang I, Bannister, Li, Sheldon, and Wang II because they all include the claimed minor cutting edges. Likewise, the property of smoothing the

machined surface of the workpiece is inherent to the Viking 00693, 00694, and 00714 drills because they all include the claimed minor cutting edges. Also, the property of smoothing the machined surface of the workpiece is inherent to the Matco drills because they include the claimed minor cutting edges.

11. The height of each composite cutting blade group is uniform ('583 Patent, claims 3 and 9)

Claims with this limitation are invalid because it is indefinite. It is unclear whether this limitation means that each composite cutting blade group has the same height as the other composite cutting blade groups, or whether each composite cutting blade group itself has a uniform height around its respective perimeter. Regardless of which construction is correct, however, the prior art teaches this limitation.

Wang I shows that the heights of the composite cutting blade groups are all the same and also that the height of each composite cutting blade group is uniform around its respective perimeter. *See* Wang I at FIGs. 5-12. Li shows that the heights of the composite cutting blade groups are all the same and also that the height of each composite cutting blade group is uniform around its respective perimeter. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. Sheldon shows that the heights of the composite cutting blade groups are all the same and also that the height of each composite cutting blade group is uniform around its respective perimeter. *See* Sheldon at FIG. 1 and p. 1:3-3:16. In the Viking 00693, 00694 and 00714 drills, the heights of the composite cutting blade groups are the same and also the height of each composite cutting blade group is uniform around its respective perimeter. Also, In the respective Matco drills, the heights of the composite

cutting blade groups are all the same and also the height of each composite cutting blade group is uniform around its respective perimeter.

12. The top blade comprises a chisel edge, two auxiliary cutting edges and two major straight edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge ('583 Patent, claims 5 and 8, '594 Patent claims 4 and 9)

The claimed geometry for the top blade is well known in the art and is commonly referred to as a split tip point or a split point. *See* Korb at FIG. 8, 3:26-27; Wetzl at ¶¶ [6, 10, 28, and 39]; Viking 2014 catalog at VIKINGVP_00000903; Viking 2015 catalog at VIKINGVP_00001616; Matco Hyper-Step Flyer at VIKINGVP_00001458 (noting that "#3: Standard 135º Split Points"); NAS 907 at 15-17. It was known that this type of point provides fast penetration into the workpiece and accurate starting. *See* e.g. Viking 2014 catalog at VIKINGVP_00000903; Viking 2015 catalog at VIKINGVP_00001616.

Wang I teaches that the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* Wang I at FIGs. 5-12. Li teaches that the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* Li at FIG. 1, Abstract, ¶¶ [21-24]. Wang II teaches that the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* Wang II at FIGS. 1-8. The Viking 00693, 00694 and 00714 drills are each provided with a split tip

at the point of the drill, and these drills each have a top blade that comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* description of the Viking 00693, 00694 and 00714 drills *supra.* The Matco drills are provided with a top blade that comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* description of Matco drills *supra*.

To the extent a reference does not teach this limitation, this claim language is directed to a well-known type of drill tip, commonly referred to as a split point tip. *See* Korb at FIG. 8, 3:26-27; Wetzl at ¶¶ [6, 10, 28, and 39]; Viking 2014 catalog at VIKINGVP_00000903; Viking 2015 catalog at VIKINGVP_00001616; Matco Hyper-Step Flyer at VIKINGVP_00001458; NAS 907 at 15-17. It was known that this type of point provides fast penetration into the workpiece and accurate starting. *See* e.g. Viking 2014 catalog at VIKINGVP_00000903; Viking 2015 catalog at VIKINGVP_00001616.

Such designs were well known and were widely used, for example, in the Viking 00693, 00694, and 00714 drills. Split point tips were also described in at least Wang I, Wetzl, Li, and Wang II. It would have been obvious for a POSA to provide Sheldon's drill with the well-known split point tip for the advantages of accurate starting and fast penetration into the workpiece.

13. Each of the plurality of composite cutting blade groups is coaxial with the cone portion ('583 Patent, claims 6 and 11)

It appears from the Supplemental Infringement Contentions that Plaintiffs' position is that composite cutting blade groups can be coaxial with the cone portion regardless of whether the cutting blade groups are provided with radial relief. While Viking does not agree with this position, under Plaintiffs' construction, this claim element is disclosed by the prior art.

As has been discussed above, Wang I, Bannister, Li, Wang II and Sheldon show cutting blade groups. Wang I shows that the plurality of composite cutting blade groups are coaxial with the cone portion. *See* Wang I at FIGs. 7 and 12. Bannister shows that the plurality of composite cutting blade groups are coaxial with the cone portion. *See* Bannister, FIG. 3. Li shows that the plurality of composite cutting blade groups are coaxial with the cone portion. *See* Li at FIG. 1, Abstract, ¶¶ [0021-24]. Sheldon shows that the plurality of composite cutting blade groups are coaxial with the cone portion. *See* Sheldon at FIG. 1, p. 1:3-3:16.

Furthermore, as discussed above, a POSA would understand that any drill made according to the teachings of Wang I, Bannister, Li and Sheldon would include radial relief to the composite cutting blade groups, and so these references would also be understood to teach that composite cutting blade groups with radial relief were coaxial with the cone portion.

The Viking 00693, 00694 and 00714 drills are provided with radial relief on the composite cutting blade groups and are, under Plaintiffs' proposed construction, coaxial

with the cone portion. *See* Viking 00693, 00694 and 00714 drill descriptions *supra*. Likewise, the Matco drills are provided with radial relief on the composite cutting blade groups and are, under Plaintiffs' proposed construction, coaxial with the cone portion. *See* Matco drill description *supra*.

To the extent a reference does not teach this limitation, it would have been obvious to modify the cone portion of the drill with a stepped structure like that taught in Wang I or used in the Viking 00693, 00694 or 00714 drills with a structure resulting in cutting blade groups that are coaxial with the cone portion.

14. A straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups ('583 Patent, claims 7 and 12, '584 patent claims 5 and 10)

Wang I shows that a straight major cutting edge is longer than each of the major cutting edges of the plurality of composite cutting blade groups. *See* Wang I at FIGs. 7 and 12. Wang II shows that a straight major cutting edge is longer than each of the major cutting edges of the plurality of composite cutting blade groups. *See* Wang II at FIGs. 1-8. The Viking 00693, 00694 and 00714 drills are each provided with a split tip at the top blade of the drill, where the straight major cutting edge is longer than each of the major cutting edges of the plurality of composite cutting blade groups. *See* descriptions of Viking 00693, 00694 and 00714 drills *supra*. The Matco drills are provided with a split tip at the top blade of the drill, where the straight major cutting edge is longer than each of the major cutting edges of the plurality of composite cutting blade groups. *See* description of Matco drills *supra*.

To the extent that a reference does not teach this limitation, it would have been obvious for one of ordinary skill to modify the reference include more steps in the conical portion, for example as shown in Wang I, and as is present in the Viking 00693, 00694 and 00714 drills. One would have been motivated to do this, for example, to make the drilling force relatively small, uniform and reasonable, and to prolong the life of the tool by making the stepped cutting edge wear more uniformly. *See* Wang I at ¶¶ [40-47]. The thus modified drills would, like the drill in Wang I and the Viking 00693, 00694 and 00714 drills, include a top blade in which a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.

15. A straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups ('583 Patent, claim 13)

This claim limitation is indefinite. Vikingt is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Viking reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation.

Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. If this construction is correct, then Wang I discloses drills having a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* Wang I at FIGs. 5-12. If this construction is

correct, the Viking 00693, 00694 and 00714 drills each have a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* descriptions of Viking 00693, 00694 and 00714 drills *supra*. If this construction is correct, the Matco drills each have a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* descriptions of the Matco drills *supra*.

To the extent a reference does not teach this limitation, a reference modified in the manner discussed above to add a cone portion similar to that shown in Wang I or a cone portion as used by the Viking 00693, 00694 or 00714 drills, would satisfy this limitation.

16. The operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. ('583 Patent, claim 14)

In their Supplemental Infringement Contentions, Plaintiffs contend that under this limitation the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece in that the cylinder portion of the operating portion is long, with a flute that extends along much of the cylindrical portion, and thus the twist drill is configured to drill into relatively thick work pieces and that while drilling into a relatively thick workpiece, each of the plurality of composite cutting blade groups is doing its part of cutting into the workpiece. Viking

disagrees with this explanation of the claim limitation because it relies on the thickness of the workpiece, which is not part of the limitation. Moreover, the thickness of the workpiece in Plaintiffs' description is arbitrary and, apparently under Plaintiff's interpretation of the limitation, almost any thickness of workpiece can be selected so long as all cutting blade groups are engaged with the workpiece while at least a portion of the cylinder portion is also within the workpiece.

For all of Wang I, Bannister, Li, Sheldon and Wang II, and for the prior art Matco drills and the Viking 00693, 00694 and 00714 drills, there exists a workpiece thickness for which all the composite cutting blade groups are engaged with the workpiece while part of the cylinder portion is within the workpiece. Wang I teaches that the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. *See* Wang I at FIGs. 5-12, ¶¶ [31-39]. In other words, there is a workpiece thickness for which all cutting blade groups are engaged with the workpiece while part of the cylinder portion is in the workpiece. Bannister teaches that the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. *See* Bannister at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Li teaches that the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. *See* Li at FIG. 1, ¶¶

[21-24]. Wang II teaches that the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. *See* Wang II, FIGs. 1-8. Sheldon teaches that the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. *See* Sheldon at FIG. 1, p. 1:3-3:16, and also in consideration of a workpiece thicker than is shown in FIGs. 2A-3.

For each of the Viking 00693, 00694 and 00714 drills, there exists a workpiece depth such that all the composite cutting blade groups can be engaged with the workpiece while at least a portion of the cylinder portion is within the workpiece. Accordingly, this limitation is met by the Viking 00693, 00694 and 00714 drills. *See* descriptions of Viking 00693, 00694 and 00714 drills, *supra*. Likewise, for the Matco drills, there exists a workpiece depth such that all the composite cutting blade groups can be engaged with the workpiece while at least a portion of the cylinder portion is within the workpiece. Accordingly, this limitation is met by the Matco drills. *See* description of Matco drills, *supra*.

17. The step of providing a twist drill (’584 patent, claims 1 and 6)

This step is met simply by providing a prior art drill as discussed above in Section III.C.1.a above, including the drills disclosed in Wang I, Bannister, Li, Sheldon, Wang II, the Viking 00693, 00694, and 00714 drills and the Matco drills.

18. The steps of positioning the twist dill atop the workpiece and applying a torque and an axial drilling force to the twist drill. (’584 patent, claims 1 and 6)

These steps are simply met for all the prior art drills discussed above, including those disclosed by Wang I, Bannister, Li, Sheldon and Wang II, the Viking 00693, 00694 and 00714 drills and the Matco drills. These steps are simply the steps that a POSA would undergo preparatory to using any of the aforementioned drills. In particular, Wang I teaches these steps at paras. [33, 34, and 39], Bannister teaches these steps at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left col. l. 32 – p. 3 left col. l. 11, and Li teaches these steps at FIG. 1, and ¶¶ [3, 21-24, 27, 37 and 44]. Sheldon teaches these steps at FIGs. 1-3 and p. 1:3-3:6, and particularly at p. 3:18-23.

19. The step of cutting the workpiece with the top blade to create a drill hole in the workpiece. (’584 patent, claims 1 and 6)

This step is met for all the prior art drills discussed above, including those disclosed by Wang I, Bannister, Li, Sheldon, and Wang II, the Viking 00693, 00694 and 00714 drills and the Matco drills. This step is simply one of the steps a POSA would routinely use to drill a hole using any of the aforementioned drills, and simply describes the initial advancement of the drill into the workpiece. In particular, Wang I teaches these steps at paras. [33, 34, and 39], Bannister teaches these steps at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left col. l. 32 – p. 3 left col. l. 11, and Li teaches these steps at FIG. 1, and ¶¶ [3, 21-24, 27, 37 and 44]. Sheldon teaches these steps at FIGs. 1-3 and p. 1:3-3:6, and particularly at p. 3:18-23.

20. The step of continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end (’584 patent, claims 1 and 6)

This step is met for all the prior art drills discussed above, including those disclosed by Wang I, Bannister, Li, Sheldon, and Wang II, the Viking 00693, 00694 and 00714 drills and the Matco drills. This step is simply one of the steps a POSA would routinely use to drill a hole using any of the aforementioned drills, and simply describes the continuing advancement of the drill into the workpiece following the previous step. In particular, Wang I teaches these steps at paras. [33, 34, and 39], Bannister teaches these steps at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left col. l. 32 – p. 3 left col. l. 11, and Li teaches these steps at FIG. 1, ¶¶[3, 21-24, 27, 37 and 44]. Sheldon teaches these steps at FIGs. 1-3 and p. 1:3-3:6, and particularly at p. 3:18-23.

21. The step of continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion (’584 patent, claims 1 and 6)

This step is met for all the prior art drills discussed above, including those disclosed by Wang I, Bannister, Li, Sheldon, and Wang II, the Viking 00693, 00694 and 00714 drills and the Matco drills. This step is simply one of the steps a POSA would routinely use to drill a hole using any of the aforementioned drills, and simply describes the continuing advancement of the drill into the workpiece beyond the position described in the previous step. In particular, Wang I teaches these steps at paras. [33, 34, and 39], Bannister teaches these steps at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left col. l. 32 – p. 3 left col. l. 11, and Li teaches these steps at FIG. 1, and ¶¶ [3, 21-24, 27,

37 and 44]. Sheldon teaches these steps at FIGs. 1-3 and p. 1:3-3:6, and particularly at p. 3:18-23.

22. A cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut ('584 patent, claims 1 and 6)

This step is met for all the prior art drills discussed above, including those disclosed by Wang I, Bannister, Li, Sheldon and Wang II, the Viking 00693, 00694 and 00714 drills and the Matco drills. This step is simply one of the steps a POSA would routinely use to drill a hole using any of the aforementioned drills, and simply describes cutting the hole in the workpiece using the drill. In particular, Wang I teaches these steps at paras. [33, 34, and 39], Bannister teaches these steps at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left col. l. 32 – p. 3 left col. l. 11, and Li teaches these steps at FIG. 1, ¶¶[3, 21-24, 27, 37 and 44]. Sheldon teaches these steps at FIGs. 1-3 and p. 1:3-3:6, and particularly at p. 3:18-23.

23. Continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece. ('584 patent, claim 1)

This step is met for all the prior art drills discussed above, including those disclosed by Wang I, Bannister, Li, Sheldon and Wang II, the Viking 00693, 00694 and 00714 drills and the Matco drills. This step is simply one of the steps a POSA would routinely use to drill a hole using any of the aforementioned drills, and simply describes advancing the drill to a point where at least a portion of the drill's cylinder portion is within the workpiece. In particular, Wang I teaches these steps at paras. [33, 34, and 39], Bannister teaches these steps at FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left

col. l. 32 – p. 3 left col. l. 11, and Li teaches these steps at FIG. 1, and ¶¶ [3, 21-24, 27, 37 and 44]. Sheldon teaches these steps at FIGs. 1-3 and p. 1:3-3:6, and particularly at p. 3:18-23.

Thus, for at least these reasons, the Asserted Claims of the Asserted Patents are invalid as being anticipated and/or obvious in light of the teachings of the prior art and the knowledge of a POSA. As is explained in the accompanying claim charts, all claims of the Patents-in-suit are anticipated by the prior art Matco drills. As is explained in the accompany claim charts, claims 1, 2, 3 and 6 of the ’583 patent and claims 1, 2, 5, 6, 7, and 11 of the ’584 patent are anticipated by Sheldon. Below are exemplary references and combinations of references, as is explained in the accompanying claim charts, that invalidate the claims of the Patents-in-Suit as being obvious.

Matco Drills: all claims of the Patents-in-Suit are obvious over the Matco drills.

Sheldon: claims 1, 2, 3 and 6 of the ’583 patent and claims 1, 2, 5, 6, 7, and 11 of the ’584 patent are obvious over Sheldon. Claims 5, 7, 8, 9, 11, 12, 13, and 14 of the ’583 patent are obvious over Sheldon in combination with one or more of Korb, Wetzl, the Viking 2014 catalog, NAS 907, or the Viking 00693, 00694 or Viking 00714 drills. Claims 4, 9 and 10 of the ’584 patent are obvious over Sheldon in combination with one or more of Korb, Wetzl, the Viking 2014 catalog, NAS 907, or the Viking 00693, 00694 or Viking 00714 drills.

Wang I: all claims of the Patents-in-Suit are obvious over Wang I either alone or in combination either with Gentry or with one or more of Mackey, Durfee I, Durfee II, Wetzl or the Viking 00693, 00694 or 00714 drills.

Bannister: claims 1, 2, and 6, of the ’583 patent and claims 1, 2, 6, 7, and 11 of the ’584 patent are obvious over Bannister in combination with one or more of Wang I, Durfee I, Li, Sheldon or the Viking 00693, 00694 or 00714 drills, in combination either with Gentry or with one or more of Mackey, Durfee I, Durfee II, Wetzl, or the Viking 00693, 00694 or 00714 drills. Claims 3 and 9 of the ’583 patent are obvious over the combinations relating to claims 1 and 8 of the ‘583 patent respectively, or further combination with Wang I, Durfee I, Li, Sheldon or the Viking 00693, 00694 or 00714 drills. Claim 5 and claims 8, 11 and 14 ’583 patent of the are obvious over Bannister in combination with one or more of Wang I, Durfee I, Li, Sheldon or the Viking 00693, 00694 or 00714 drills, in combination either with Gentry or with one or more of Mackey, Durfee I, Durfee II, Wetzl, or the Viking 00693, 00694 or 00714 drills, and further combined with one or more of Korb, Wetzl, Viking 2014 catalog, NAS 907, or the Viking 00693, 00694 or 00714 drills. Claims 12 and 13 of the’583 patent are obvious over the same references as claim 8 of the ‘583 patent, or in further in combination with Wang I or the Viking 00693, 00694 or 00714 drills. Claim 5 of the ’584 patent is obvious over the same references as claim 1 of the ’584 patent, or further in combination with one or more of Wang I or the Viking 00693, 00694 or 00714 drills. Claim 9 of the ’584 patent is obvious over the same references as claim 6 of the ’584 patent, or further in combination with Korb, Wetzl, the Viking 2014 Catalog, NAS 907, or the Viking 00693, 00694 or 00714 drills. Claim 10 of the ’584 patent is obvious over the same references as claim 6 of the ’584 patent, or further in combination with one or more of Wang I or the Viking 00693, 00694 or 00714 drills.

Li: claims 1, 2, 5, 6, 8, 11, and 14 of the ’583 patent are obvious over Li in combination with one or more of Mackey, Durfee I, Durfee II, Wetzel, or the Viking 00693, 00694 or 00714 drills. Claims 3 and 7 of the ’583 patent are obvious over the same combination of prior art as claim 1 of the ’583 patent, or further in combination with Wang I, or the Viking 00693, 00694 or 00714 drills. Claims 9 and 13 of the ’583 patent, are obvious over the same combination of prior art as claim 8 of the ’583 patent, or further in combination with one or more of Wang I or the Viking 00693, 00694 or 00714 drills. claims 1, 2, 4, 6, 7, 9, and 11 of the ’584 patent are obvious over Li in combination with one or more of Mackey, Durfee I, Durfee II, Wetzel, or the Viking 00693, 00694 or 00714 drills and optionally over one or more of Wang I, Bannister and Wetzl. Claim 10 of the ’584 patent is obvious over the same combination of prior art as claim 6 of the ’584 patent, or further in combination with Wang I or the Viking 00693, 00694 or 00714 drills.

Wang II: Claims 1, 2, 3, 4, 5, 8, 9, 11 and 14 of the ’593 patent are invalid as obvious over Wang II alone or in combination either with Gentry or with one or more of Bannister, Durfee I, Durfee II, or the Viking 00693, 00694 or 00714 drills. Claim 7 of the ‘583 patent Claims 12 and 13 of the ’593 patent are obvious over the same combination of references as claim 8 of the ’583 patent, or further combined with one or more of Wang I or the Viking 00693, 00694 or 00714 drills. Claims 1, 2, 4, 6, 7, 9, and 11 of the ’584 patent are invalid as obvious over Wang II alone or in combination either with Gentry or with one or more of Bannister, Durfee I, Durfee II, or the Viking 00693, 00694 or 00714 drills, or further in combination with one or more of Wang I, Bannister Wetzl or Li. Claim 5 of the ’584 patent is obvious over the same combination of prior art as claim 1 of the

’584 patent, or further in combination with Wang I or the Viking 00693, 00694 or 00714 drills. Claim 10 of the ’584 patent is obvious over the same combination of prior art as claim 6 of the ’584 patent, or further in combination with Wang I or the Viking 00693, 00694 or 00714 drills.

Viking Drills: claims 1, 2, 5, 6, 7, 8, 9, 11, 12, 13, 14 of the ’583 patent and claims 1, 2, 4, 5, 6, 7, 9, 10, and 11 of the ’584 patent are invalid as being obvious over any of the Viking 00693, 00694 or 00714 drills, in combination with at least one of Bannister, Durfee I, Wetzl, Wang I, Wang II, Korb, CN1021260039, CN103084629, DE202011106232U1, WO2012/167448 and WO2008/092386.

B. There are No Secondary Considerations of Non-Obviousness

A patentee bears the burden of producing evidence of secondary considerations of non-obviousness and showing a legally and factually sufficient connection between this evidence and the claims of the patents, i.e., a nexus. *See Novo Nordisk A/S v. Caraco Pharms. Labs., Ltd.*, 719 F.3d 1346, 1352–54 (Fed. Cir. 2013); *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019). Plaintiffs have yet to assert any secondary considerations of nonobviousness. Plaintiffs have also not produced documents relating to any such secondary considerations, such as documents relating to allegations of commercial success, industry praise, or failure of others. To the extent Plaintiffs provide such information and more detail at a later stage in the case, such as in supplementary interrogatory responses and/or connection with expert reports, Viking reserves the right to respond.

Plaintiffs have alleged that their Hyper-Step™ twist drills has "several advantages over competing twist drill bits, including but not limited to, improved centering, decreased risk of skipping, greater stability, smoother and rounder bore surfaces, better distribution of the heat generated during the drilling process, and greater longevity of the twist drill bit." D.I. 1 at ¶ 12; D.I. 19 at 2. However, the Asserted Claims of the Asserted Patents are broader in scope than Plaintiffs' Hyper-Step™ twist drill. Plaintiffs have not offered any evidence that any alleged secondary considerations are due to the alleged inventions that are broadly claimed in the Asserted Claims of the Asserted Patents. Plaintiffs allege that Viking makes unauthorized copies of their Hyper-Step™ drills. D.I. 19 at 2. But the Accused Products do not meet all the limitations of the Asserted Claims of the Asserted Patents. Plaintiffs have not explained why any of their secondary considerations were reasonably commensurate in scope with the Asserted Claims of the Asserted Patents.

There are No Unexpected Results. Plaintiffs allege that their Hyper-Step™ twist drills has "several advantages over competing twist drill bits, including but not limited to, improved centering, decreased risk of skipping, greater stability, smoother and rounder bore surfaces, better distribution of the heat generated during the drilling process, and greater longevity of the twist drill bit." D.I. 1 at ¶ 12; D.I. 19 at 2. However, these advantages are not unexpected. "[W]hen unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with the closest prior art." *Kao Corp. v. Unilever Us., Inc.*, 441 F.3d 963, 970 (Fed. Cir. 2006). "Unexpected results that are probative of nonobviousness are those that are 'different in

kind and not merely in degree from the results of the prior art.'" *Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 739 (Fed. Cir. 2013). Moreover, any allegation of advantages over competing twist drill bits as compared to the closest prior art would merely amount to a difference in degree and not in kind. "And 'differences in degree' of a known and expected property are not as persuasive in rebutting obviousness as differences in 'kind' – i.e., a new property dissimilar to the known property." *Bristol-Myers Squibb Co. v. Teva Pharms. USA, Inc.*, 752 F.3d 967, 977 (Fed. Cir. 2014); *In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991). "[T]here is no requirement that the closest prior art be commercialized." *Trs. of Columbia Univ. v. Illumina, Inc.*, 620 Fed. App'x 916, 932 (Fed. Cir. 2015). Plaintiffs also did not allege any unexpected superiority of the inventions allegedly covered by the Asserted Claims during prosecution of the of the Asserted Patents and during Reexamination Proceeding No. 90/014,941. Viking reserves the right to address and respond to any contention and evidence of unexpected results to the extent Plaintiffs subsequently raise the same and produce or identify such evidence.

There was No Long Felt Need or Failure of Others. There was no long felt need that was met by the claimed alleged invention and Plaintiffs have not contended that long felt need that was met by the claimed alleged invention. There was also no failure of others to solve the problems addressed by the Asserted Patents, and Plaintiffs have not alleged there was failure of others. Viking reserves the right to address and respond to any contention and evidence of long felt, unmet need or failure of others to the extent Plaintiffs subsequently raise the same and produce or identify such evidence.

There is No Commercial Success. Plaintiffs allege that "Tsteigen is a licensee of the Wang patents and a major supplier of the patented products within the United States." D.I. 1 at ¶ 2; D.I. 19 at 1. Plaintiffs have however, provided no evidence to show sales of any product that may be covered by the Asserted Claims of the Asserted Patents, including but not limited to the Hyper-Step™ drills, are a result of the features of the claimed invention, and not based on other factors. Plaintiffs have also not provided any information regarding the amount of sales of any of Plaintiffs' any product that may be covered by the Asserted Claims of the Asserted Patents, including but not limited to the Hyper-Step™ drills, as compared to other twist drills that are currently being marketed. Moreover, contrary to Plaintiffs' assertion that their Hyper-Step™ drills are a commercial embodiment of the Asserted Patent, they in fact are not and there is no nexus between the Asserted Claims of the Asserted Patents. Viking reserves the right to address and respond to any contention and evidence of commercial success to the extent Plaintiffs subsequently raise the same and produce or identify such evidence.

There is No Industry Praise or Industry/Public Acceptance. Plaintiffs allege praise that Plaintiff, Hongjia Wang, developed an innovative twist drill bit configuration. D.I. 1 at ¶ 11; D.I. 19 at 2. Plaintiffs, however, have provided no evidence of praise in the industry and the industry/public's acceptance of the Hyper-Step™ drills. Viking reserves the right to address and respond to any evidence of praise in the industry and the industry/public's acceptance of any product, including the Hyper-Step™ drills, that are manufactured and sold by the Plaintiffs, to the extent Plaintiffs subsequently produce or identify such evidence. Viking reserves the right to address and respond to any

contention and evidence of industry praise or industry/public acceptance to the extent Plaintiffs subsequently raise the same and produce or identify such evidence.

There is no Copying. Plaintiffs allege that Viking makes unauthorized copies of their Hyper-Step™ drills. D.I. 19 at 2; *see also* D.I. 1 at ¶ 13. Even if that were true, copying is weak evidence of non-obviousness. *Ecolochem, Inc. v. S. California Edison Co*., 227 F.3d 1361, 1380 (Fed. Cir. 2000) ("A showing of copying is only equivocal evidence of nonobviousness in the absence of more compelling objective indicia of other secondary considerations."). The Accused Products that are the subject of this litigation do not infringe the Asserted Claims of the Asserted Patents, so there has been no copying by Viking. Therefore, copying is not probative of nonobviousness in this Action. Viking reserves the right to address and respond to any evidence of copying to the extent Plaintiffs subsequently produce or identify such evidence.

There is No Commercial Acquiescence. Plaintiffs have not disclosed any licenses covering the Asserted Patents, other than the license between Plaintiff, Tsteigen Inc. and Plaintiff, Hongjia Wang. D.I. 1 at ¶ 2. However, Mr. Wang is the one of two Directors of Tsteigen Inc. and serves as its Chief Executive Officer. *Id.* There is no nexus between this license and the merits of the claimed invention, and so it is not probative of the non-obviousness of the Asserted Patents. Further, Plaintiffs have not identified any other license covering the Asserted Patents, and Viking reserves the right to address and respond to any contention and evidence to the extent Plaintiffs subsequently raise the same and produce or identify such evidence.

VII. THE ASSERTED CLAIMS OF THE ASSERTED PATENTS ARE UNDER 35 U.S.C. § 112

A. The Asserted Claims of the Asserted Patents are Invalid Under 35 U.S.C. §112(a) for Non-Enablement and Lack of Written Description

Various Asserted Claims are invalid for failure to comply with the enablement and written description requirements set forth in 35 U.S.C. § 112(a): "[t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same."

Claims fail to satisfy the enablement requirement when, at the effective filing date of the patent, a POSITA could not practice their full scope without undue experimentation. *See Wyeth & Cordis Corp. v. Abbott Labs*., 720 F.3d 1380, 1384 (Fed. Cir. 2013). In addition, the scope of enablement must be commensurate with the full scope of the claim. *Id*. at 1384–85; *see also AK Steel Corp. v. Sollac and Ugine*, 344 F.3d 1234, 1244 (Fed. Cir. 2003). The Federal Circuit has provided several factors that may be utilized in determining whether a disclosure would require undue experimentation: (1) the quantity of experimentation necessary; (2) the amount of direction or guidance disclosed in the patent; (3) the presence or absence of working examples in the patent; (4) the nature of the alleged invention; (5) the state of the prior art; (6) the relative skill of those in the art; (7) the predictability of the art; and (8) the breadth of the claims. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

To satisfy the written description requirement, the description must "clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). In other words, the test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the investor had possession of the claimed subject matter as of the filing date. *Id*. The test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art. "Whether the written description requirement is satisfied is a fact-based inquiry that will depend on the nature of the claimed invention and the knowledge of one skilled in the art at the time an invention is made and a patent application is filed." *Carnegie Mellon Univ. v. Hoffman La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008).

Actual "possession" or reduction to practice outside of the specification is not enough. Rather, as stated above, it is the specification itself that must demonstrate possession. Moreover, while the description requirement does not demand any particular form of disclosure, *id.*, or that the specification recite the claimed invention in *haec verba*, a description that merely renders the invention obvious does not satisfy the requirement. *Lockwood v. Am. Airlines*, 107 F.3d 1565, 1571–72 (Fed. Cir. 1997). Further, a claim fails to satisfy the written description requirement if "the entirety of the specification clearly indicates that the invention is of much narrower scope." *Cooper Cameron Corp. v. Kvaerner Oilfield Prods., Inc.*, 291 F.3d 1317, 1323 (Fed. Cir. 2002) (citing *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1479–80 (Fed. Cir. 1998)).

All the claims of the ’583 patent include the limitation that “each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips.” The plain language of this limitation requires that chips that are initially cut from the workpiece, “cutting chips,” and are then crushed by the cutting blade groups into finer chips. It is unclear how the composite cutting blade groups are configured to achieve the function of crushing “cutting chips into finer chips.” This is not taught in the specification, which only states “the composite cutting blade groups are able to crush chips into multiple sections, that is, to crush the removed metal chips into finer chips which are easy to be removed.” *See* ’583 patent at 9:19-22. There is nothing in the patent teaching one of ordinary skill how to configure the cutting blade groups to crush the cutting chips, for example what sizes, angles and the like are needed to achieve the crushing function, and a POSA would have to undergo undue experimentation to determine how to configure the composite cutting blade groups to achieve the function of crushing the cutting chips into finer chips. Moreover, the specification as filed gives no indication that the inventors contemplated an invention that involves configuring the cutting blade groups such that they crush cutting chips into finer cutting chips. Therefore, this limitation renders the claims invalid for lack of enablement and written description.

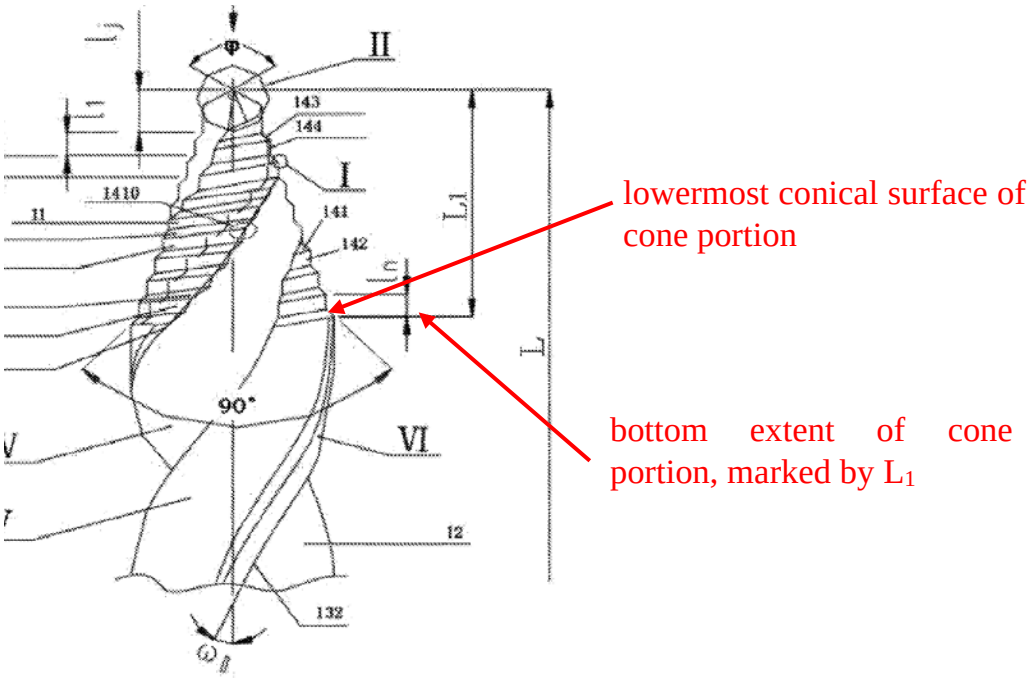
Furthermore, claim 13 of the ’583 patent contains a limitation which has no support in the specification. If this claim is not found to be indefinite, see *infra*, then the claim is not enabled. The claim limitation reads “wherein a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of

composite cutting blade groups." Thus, according to the language of the claim, the "straight minor cutting edge" is to be found on the top blade. Claim 13 depends from claim 8 which defines the top blade as having a chisel edge, two auxiliary cutting edges and two straight major cutting edges. The specification does not describe the top blade having any other features than the chisel edge, two auxiliary cutting edges and two straight major cutting edges. *See* '583 patent at 7:36-46. In particular, the specification contains no mention of a "straight minor cutting edge." The "straight minor cutting edge" cannot be a reference to an "auxiliary cutting edge" as it would be indefinite to refer to the same part of the twist drill using two different terms. Since there is no support in the specification for anything that might be considered to be a "straight minor cutting edge," the claim is not enabled. For the same reason, the specification as filed does not indicate that the inventors contemplated an invention where the top blade has a straight minor cutting edge in addition to auxiliary edges. Therefore, this limitation renders the claims invalid for lack of enablement and written description.

Every independent claim of the '583 patent and the'584 patent contains the limitation "wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter." This limitation was introduced to the claims of the '583 and '584 patents during prosecution[18] to overcome a prior art rejection. There is no written description or disclosure of this limitation, and so it is invalid under 35 U.S.C. § 112(a).

[18] Both in amendments dated March 15, 2021. *See* file histories of the '583 and '584 patents.

In describing the drill represented in FIG. 3 (shown below), the length of the cone portion, L_1, is clearly shown to be from the tip of the drill to the bottom edge of the sloped surface that contacts the upper edge of the cylinder portion ("the lowermost conical surface of the cone portion"). This is confirmed in the specification: "The total length of the cone portion 11of the twist drill 100 is L_1…" '583 patent at 7:31-32. Thus, the cylinder portion extends up to the lower edge of the lowermost conical surface of the cone portion.



According to how they are defined in the claims, each composite cutting blade group is formed of a pair of surfaces, a conical first step surface, which is closer to the drill tip, and a cylindrical second step surface, which is adjacent to the conical first step surface and lies further from the tip than the first conical step surface. The claims state that the composite cutting blade groups are formed "on the cone portion." FIG. 3, however, shows that the lowermost surface of the cone portion, whose lower edge is at a distance L_1 from the tip, is a conical surface, not a cylindrical surface. Since the lowermost conical surface

is not paired up with a cylindrical surface within the cone portion to form a "composite cutting blade group," the lowermost cylindrical surface is not part of a "composite cutting blade group" and it separates the lowest "composite cutting blade group" of the cone portion from the cylinder portion.

The claim language requires the "last composite cutting blade group" to be "immediately adjacent to the cylinder portion." But this is simply not shown in the figures nor described in the specification. Instead, the "last composite cutting blade group" of the cone portion is separated from the cylinder portion by the lowermost conical surface of the cone portion. Furthermore, the "last composite cutting blade group" of the cone portion that is separated from the cylinder portion does not have a diameter that is the same as the cylinder portion. Instead, its diameter is less than that of the cylinder portion. is Accordingly, this claim limitation is invalid because it fails to meet the requirements of 35 U.S.C. § 112(a).

Plaintiffs have attempted to avoid this problem in the infringement contentions by pointing to the part of the cylinder portion that is closest to the lowermost conical surface of the cone portion and declaring that to be a cylindrical surface that forms a "composite cutting blade group" with the lowermost conical surface of the cone portion. This does not remedy the issue, however. The claims limit the "composite cutting blade groups" to being formed "on a cone portion exterior." There is simply no support in specification or the

figures for the composite cutting blade groups extending beyond a distance L_1 from the drill tip, to the cylinder portion.[19]

B. All Asserted Claims of the Asserted Patents are Invalid Under 35 U.S.C. §112(b) for Indefiniteness

According to 35 U.S.C. §§ 112(b), the specification "shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention." To meet this requirement, the asserted claim "must set forth what the applicant regards as his invention and second, it must do so with sufficient particularity and distinctness, i.e., the claim must be sufficiently definite." *Allen Eng'g Corp. v. Bartell Indust*., Inc., 299 F.3d 1336, 1348 (Fed. Cir. 2002) (internal quotes removed) (quoting *Solomon v. Kimberly-Clark Corp*., 216 F.3d 1372, 1377 (Fed. Cir. 2000)); see also *Justacomm-Texas Software, LLC, v. Axway, Inc*., Case No. 6:10-cv- 00011-LED, Dkt. No. 1079 at 6 (E.D. Tex. July 5, 2012). "A determination of whether a claim recites the subject matter which the applicant regards as his invention and is sufficiently definite, so as to satisfy the requirements of 35 U.S.C. § 112, ¶ 2, is a legal conclusion . . . ." *Allen Eng'g*, 299 F.3d at 1343. A court must hold a claim invalid "[w]here it would be apparent to one of skill in the art, based on the specification, that the invention set forth in [the] claim is not what the patentee regarded as his invention." Id. at 1349.

[19] Even if there was 112(a) support for this incorrect interpretation, it would run into a vagueness problem, as addressed in the 112(b) indefiniteness section below.

A claim is sufficiently definite only if, viewed in light of the specification and prosecution history, it informs those skilled in the art about the scope of the invention with reasonable certainty. *Nautilus, Inc. v. Biosig Instruments, Inc*., 572 U.S. 898 (2014). Various Asserted Claims identified below do not comply with the requirements for particularly pointing out and distinctly claiming "the subject matter which the applicant regards as his invention" for the following reasons. For example, as demonstrated either individually or collectively by the claim elements addressed below, various Asserted Claims fail to inform those skilled in the art about the scope of the invention with reasonable certainty, rendering those claims (and any claims depending therefrom) invalid as indefinite. The following chart identifies the claims in which the identified terms and phrases explicitly appear, although those identified terms and phrases may also be incorporated into additional dependent Asserted Claims. Viking's contentions as to indefiniteness also include those dependent claims. Additionally, to the extent any Asserted Claim containing the identified limitations or phrases or substantially identical limitations or phrases is not specifically identified, Viking's analysis is preliminary, and Viking reserve the right to assert claim constructions other than "indefinite" for each of the terms identified below. In the table below, Viking still identifies such a claim based on its inclusion of such term or phrase.

The following claim terms/phrases are or may be indefinite for failing to inform one of skill in the art with reasonable certainty about the scope of the invention.

Claim Terms/Phrases	Asserted Claims
formed sequentially and spirally on a cone portion exterior	’583 patent: 1, 8 ’584 patent: 1, 6
a cylindrical second step surface	’583 patent: 1, 8 ’584 patent: 1, 6
the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter	’583 patent: 1, 8 ’584 patent: 1, 6
a height of each composite cutting blade group is uniform	’583 patent: 3, 9
coaxial with the cone portion	’583 patent: 6, 11
a straight minor cutting edge	’583 patent: 13

Regarding the phrase “formed sequentially and spirally on a cone portion exterior,” Plaintiffs have asserted that the cutting blade groups in the Accused Products meet this limitation because they are “more slanted than any conventional step drill.” While Viking disagrees with this claim interpretation, if it were adopted, it would render the claimed invention indefinite. There is no such thing as a “conventional” step drill. Step drills have been made over the years with widely varying degrees of axial relief (which Plaintiffs apparently equate to “slant”). Therefore, a competitor could not reasonably determine when a product had axial relief (or other “slant”) in excess of a “conventional” step drill.

Regarding the phrase “a cylindrical second step surface,” Plaintiffs have asserted that the Accused Products infringe, even though they employ radial relief that renders the identified surface in the accused products non-cylindrical. Particularly given Plaintiffs’ contention that the axial relief in the Accused Products makes the cutting blade groups “spirally formed,” if the “cylindrical second step surface” can be interpreted to cover a

surface that is not cylindrical, then it is indefinite since a person of skill in the art has no ability to ascertain how much deviation from cylindrical is permitted while still being "cylindrical."

Regarding the phrase "the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter," it is unclear from the claims, as read in view of the specification and drawings, where on the claimed drill "the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion" ends and "the cylinder portion diameter" begins.

Regarding the phrase "a height of each composite cutting blade group is uniform," it is unclear whether this requires that the height within a single cutting blade group is uniform along the circumferential dimension of the single cutting blade group, or whether the height of each cutting blade group is the same as the heights of the other cutting blade groups.

Regarding the phrase "coaxial with the cone portion," it is unclear how the axis of the "cone portion" is defined. Even if the axis of the cone portion is found not to be indefinite, if this phrase can be interpreted to cover a cutting blade group that is not coaxial with the cone portion, then it is indefinite.

It is unclear what the phrase "a straight minor cutting edge" refers to. The claim limitation reads "wherein a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. Thus the "straight minor cutting edge" is to be found on the top blade. Claim 13 depends

from claim 8 which already defines the top blade as having a chisel edge, two auxiliary cutting edges and two straight major cutting edges. Thus, it is unclear what other feature of the top blade the term "straight minor cutting edge" refers to. Furthermore, the specification does not describe the top blade having any other features than the chisel edge, two auxiliary cutting edges and two straight major cutting edges. *See* '583 patent, col. 7, ll. 36 – 46. The specification does not aid a POSA in understanding what this phrase means, since the phrase does not appear anywhere in the specification. If the "straight minor cutting edge" is intended to be a reference to an "auxiliary cutting edge" then the claim is indefinite, as it is confusing and vague to refer to the same part of the twist drill using two different terms. If the "straight minor cutting edge" is not a reference to an "auxiliary cutting edge" then the claim is indefinite, because a POSA would not understand, based on a reading of the specification and drawings, what part of the drill the phrase refers to. Accordingly, the phrase "straight minor cutting edge" is indefinite.

VIII. CONCLUSION

Based upon the information presently available to Viking, and based upon Viking's initial understanding of the scope and construction of the Asserted Claims of the Asserted Patents, these Asserted Claims are invalid at least on the grounds set forth above and in the claim charts attached as **Exhibits A-I**.

Date: July 13, 2022

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CERTIFICATE OF SERVICE

I hereby certify that on July 13, 2022, I caused Defendant, Viking Drill & Tool, Inc.'s Invalidity and Prior Art Statement, and accompanying Claim Charts to be served via electronic mail on all counsel or parties of record:

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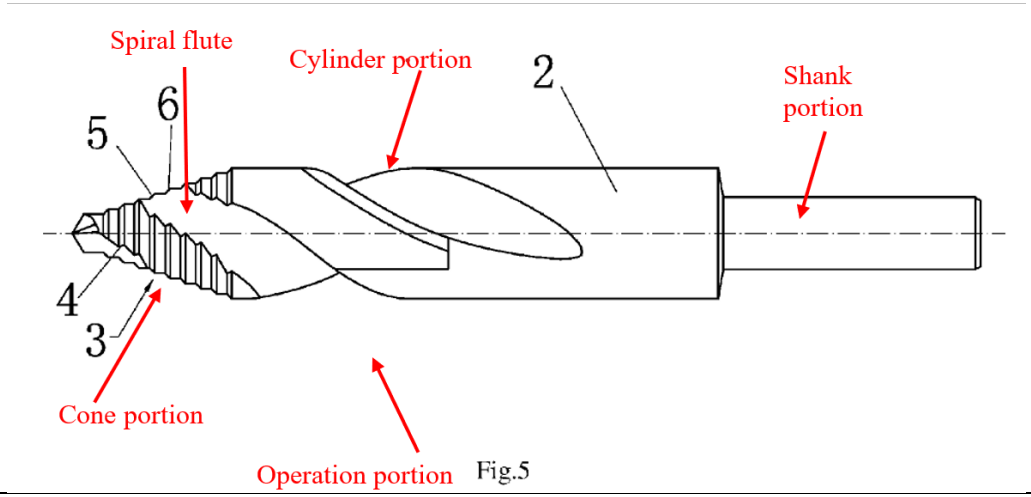
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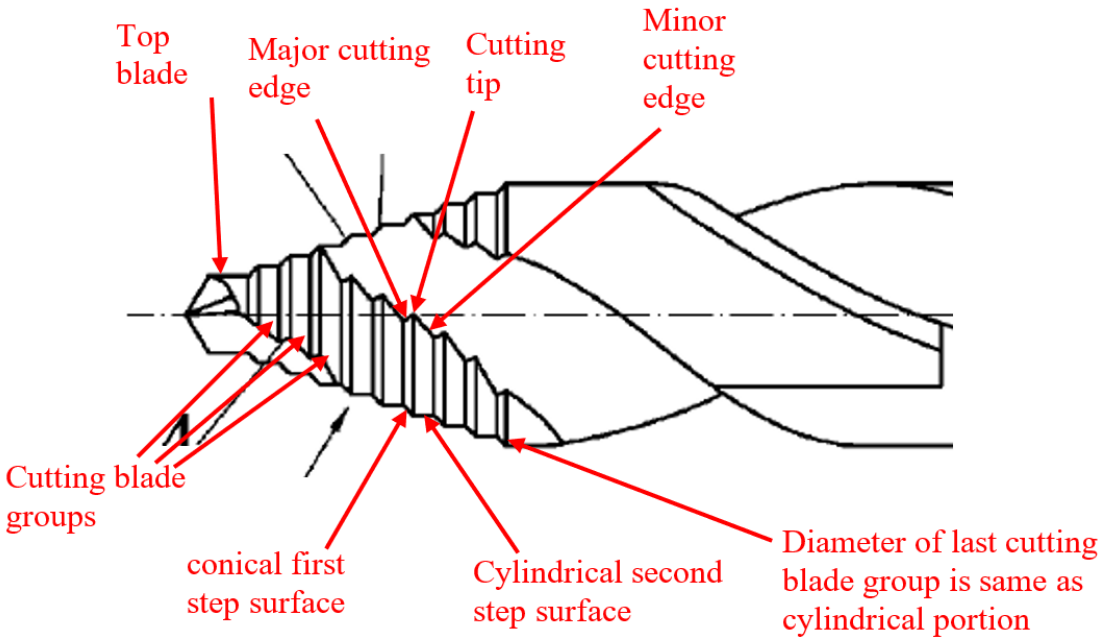
Attorneys for Plaintiffs Tsteigen, Inc. and Hongjia Wang

Dated: July 13, 2022

s/J. Derek Vandenburgh
J. Derek Vandenburgh

Exhibit A

’583 Patent	
Claim 1	**U.S. Patent App. Pub. No. 2018/0133808 (“Wang I”)**
[’583: 1.pre] A twist drill, comprising:	Wang I discloses a twist drill. *See, e.g.*, Abstract.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	Wang I, FIGs. 5-12, ¶¶ [31-39] For example, in FIG. 5 (annotated below), Wang I shows an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion.  Fig.5
[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	Wang I, FIGs. 5, 9, 11, ¶ [31] For example, in FIG. 5, Wang I shows a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated FIG. 5 in [’583: 1.pre]
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	Wang I, FIGs. 5-12, ¶¶ [31, 32, 35] Wang I shows spiral flutes 4, *e.g.* in FIG. 5, formed on an exterior surface of the operating portion, extending from a front end of the cone portion and at least partway up the cylinder portion. The flutes have sidewalls. *See* annotated FIG. 5 in [’583: 1.pre]

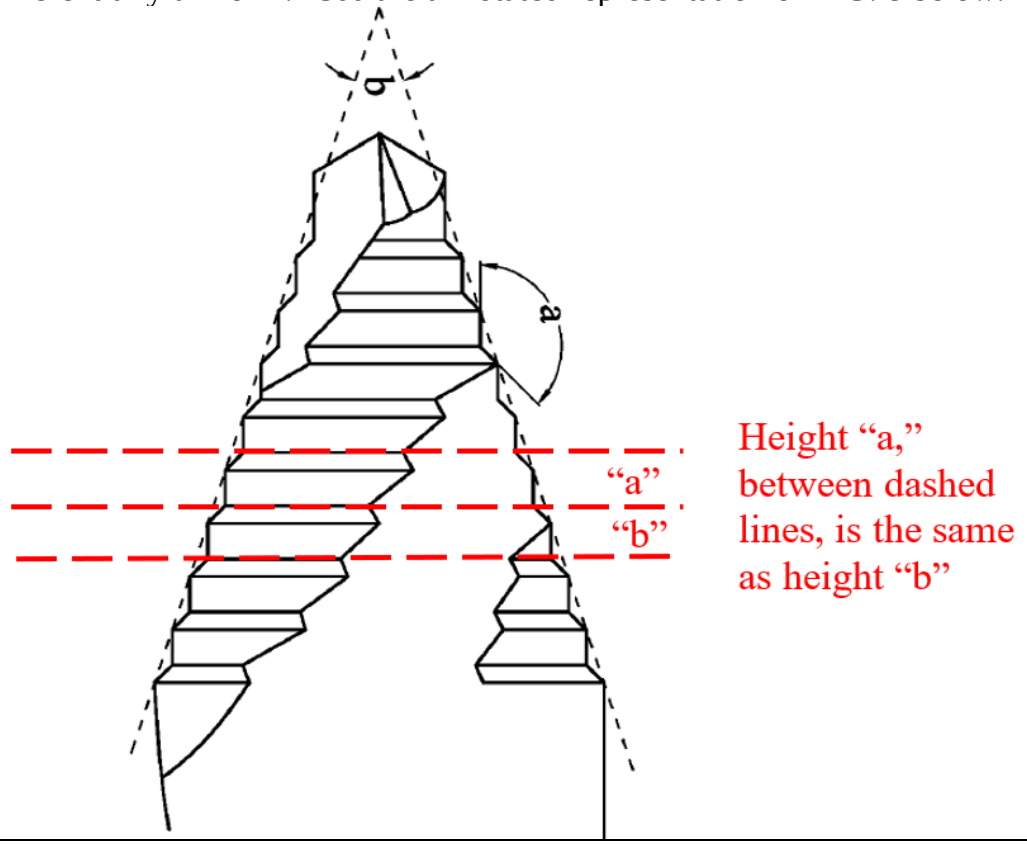
['583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	Wang I. FIGs. 5-12, ¶¶ [31-39] Wang I shows composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. *See* annotated representation of FIG. 5 below.  Wang I does not show or teach that the composite cutting blade groups are formed spirally. U.S. Patent No. 8,029,215 ("Gentry") shows spiral grooves on a conical drill bit. For example, FIG. 8 shows spiral (helical) grooves 270, 272. "Once the conically-shaped main body 206 has been formed, the helical grooves 270, 272 are turned onto the spiral drill bit 50 using two form tools…The helical grooves begin at diametrically-opposed positions and are offset by a phase angle of 180 degrees." *See* Gentry, col. 7, ll. 4-8. A person of ordinary skill would have been motivated to

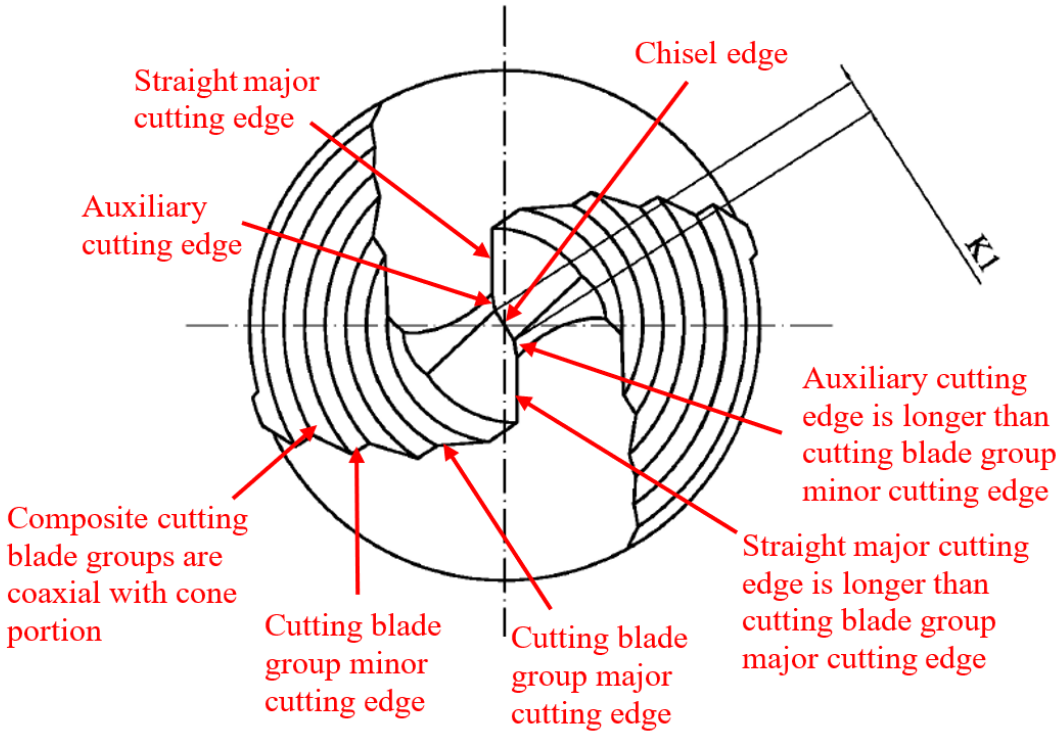
	adopt this manufacturing approach because the manufacturing process for the drill bit reduces the amount of grinding required, thus reducing the time and cost of forming the spiral drill bit. *See* Gentry, 2:67 – 3:3. Plaintiff's infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Defendant disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it would have been obvious to add such axial relief to the cutting blade groups shown in Wang I. Examples of prior art drill bits having axial relief on similar cutting elements include the Viking 00693, 00694 and 00714 drills, the MATCO drills, Mackey, U.S. Patent No. 10,328,499 ("Durfee I"), US Patent No. 9,687,915 ("Durfee II"), and U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl"). It is well known that axial relief in such cutting elements improve the cutting efficiency of the drill bit and that, in the absence of axial relief, such drills will cut poorly. Thus, it would have been obvious to add the same axial relief to Wang I that is present in the accused products.
['583: 1.e] a conical first step surface;	Wang I FIGs. 5-12, ¶¶ [31-39]. Wang I shows a conical first step surface. *See* annotated representation of FIG. 5 in ['583: 1.d]
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Wang I, FIGs. 5-12, ¶¶ [31-39] *See* annotated representation of FIG. 5 in ['583: 1.d] Wang I shows a cylindrical second step surface adjacent to the conical first surface.
['583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Wang I, FIGs. 5-12, ¶¶ [31, 32] Wang I shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. Specifically, Wang I states "the flutes 4 divide main cutting blades into a plurality of first cutting blades 5 and second cutting blades 6; and connecting lines of the first cutting blades 5 and the second cutting blades 6 form a step-like structure (which can also be called a ladder-like structure), i.e., the main cutting blades of the present disclosure are step-like structures." ¶ [31]

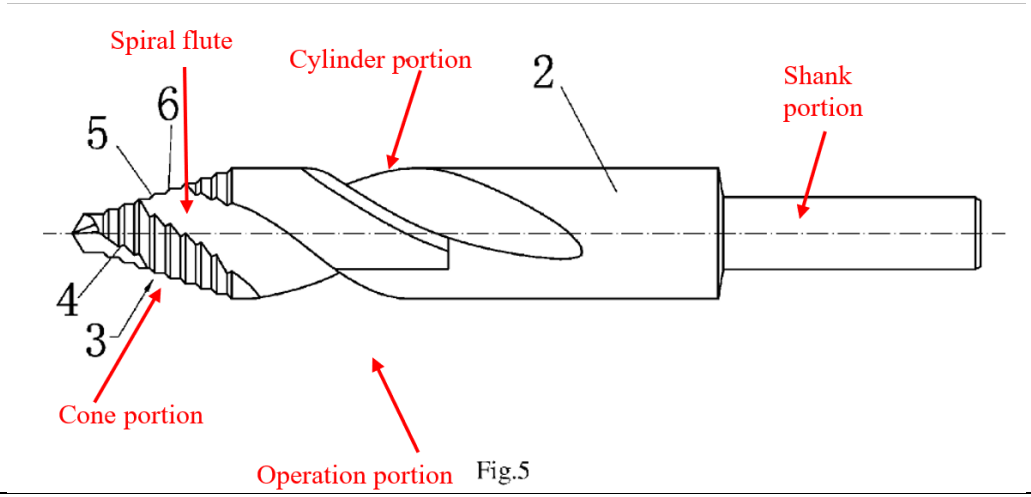
	See annotated representation of FIG. 5 in [’583: 1.d]
[’583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute; and	Wang I, FIGs. 5-12, ¶¶ [31, 32] Wang I shows a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. Specifically, Wang I states “the flutes 4 divide main cutting blades into a plurality of first cutting blades 5 and second cutting blades 6; and connecting lines of the first cutting blades 5 and the second cutting blades 6 form a step-like structure (which can also be called a ladder-like structure), i.e., the main cutting blades of the present disclosure are step-like structures.” ¶ [31] *See* annotated representation of FIG. 5 in [’583: 1.d]
[’583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Wang I, FIGs. 5-12 ¶¶ [[31-39]] Wang I shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge and the sidewall of the spiral flute, *see e.g.* FIG. 5. *See* annotated representation of FIG. 5 in [’583: 1.d]
[’583: 1.j] a top blade provided on the front end of the cone portion;	Wang I, FIGs. 5-12, ¶¶ [33, 34, 39] *See* annotated representation of FIG. 5 in [’583: 1.d] Wang I shows a top blade provided on the front end of the cone portion. Specifically, Wang I refers to a “guide portion, stating “In order to drill stably, a guide portion (i.e. for the first cutting blade and the second cutting blade at the foremost end of the drill bit body, the first cutting blade is in contact with the workpiece at first) is formed at the foremost end of the drill bit body 2. An apex angle of the guide portion is an angle of 90-140 degrees, and preferably, 118 degrees is set as an optimal angle. Certainly, the angle of the guide portion can be changed properly according to different processing materials, as shown in FIG. 6.” ¶ [33] “When the drill bit starts to come into contact with the surface of the workpiece, a guide hole is first drilled by a very small drill point (i.e. the guide portion) of the first section. The small drill point is easy to be positioned and drill the small hole due to a small diameter.” Wang I, ¶ [39]

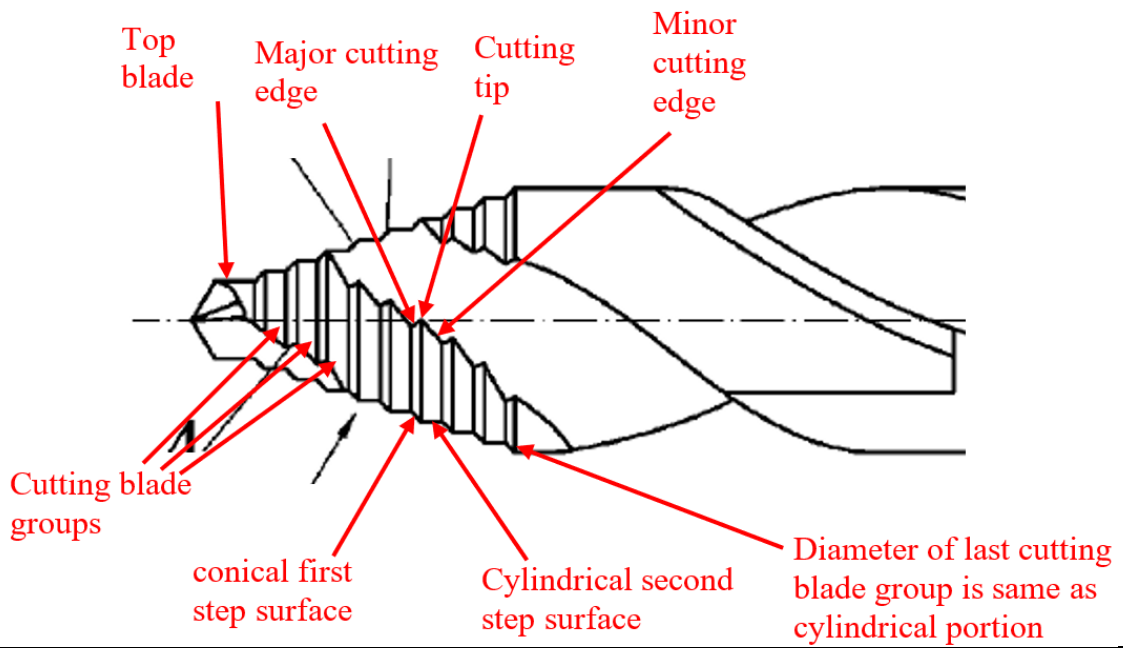
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	Wang I, FIGs. 5-12, ¶ [36] *See* annotated representation of FIG. 5 in ['583: 1.d] Wang I shows that the diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion of the rear end of the cone portion. "As shown in FIG. 11, the flank surface between the flutes forms a step-like circular arc; and a diameter d of the circular arc between the two opposite second cutting blades is gradually increased to form a step-like structure. For example, from a diameter d1 between the foremost second cutting blades to a diameter dn between the last second cutting blades, the diameters show a gradually increasing trend; and the increased size can be constant or variable." Wang I, ¶ [36]
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Wang I, FIGs. 5-12. Plaintiff's infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Defendant disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Wang I. A person of ordinary skill will understand that the spiral flutes 4 flute shown in FIGs. 5-12 will shunt chips from the cutting surface out of the drilled hole.
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	Wang I, FIGs. 5-12, ¶¶ [31, 36, 37] "connecting lines of the first cutting blades 5 and the second cutting blades 6 form a step-like structure (which can also be called a ladder-like structure), i.e., the main cutting blades of the present disclosure are step-like structures. Meanwhile, a cross section of the entire flank surface 3 is also a step-like structure." Wang I, ¶ [31] "the flank surface between the flutes forms a step-like circular arc." Wang I, ¶ [36] "In view of the above characteristics, the step-like cutting blades should be provided as many as possible," Wang I, ¶ [37].
['583: 1.n] the diameter of the last composite cutting blade group located at the	Wang I FIGs. 5-12, ¶¶ [31-39]

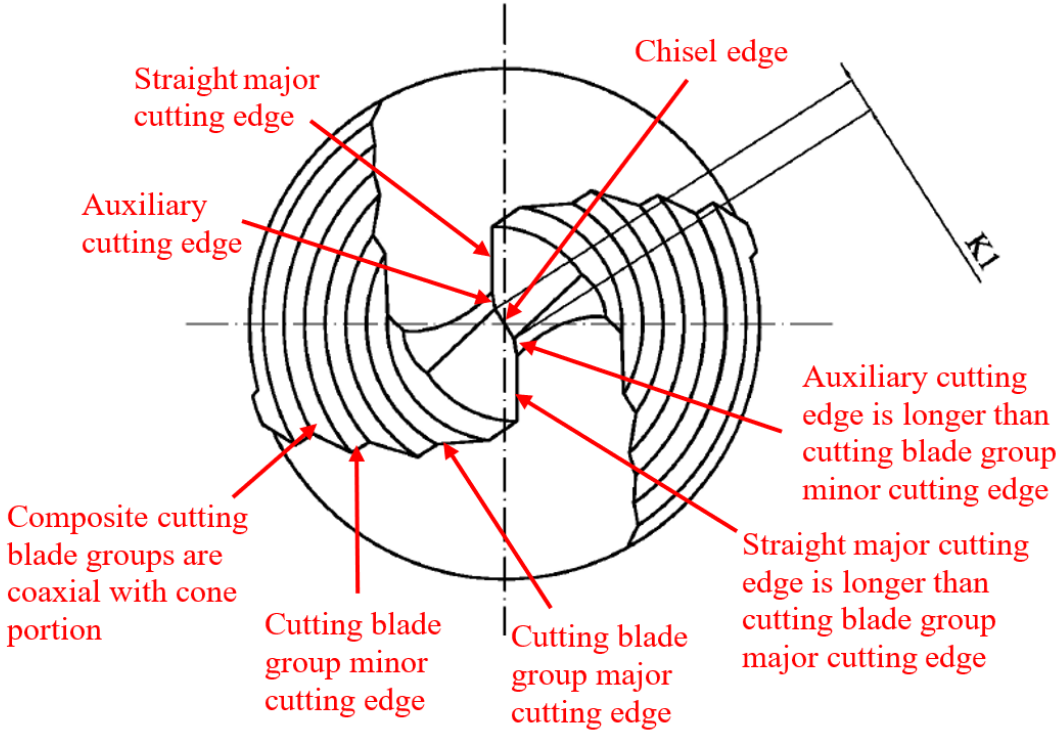
rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in the Wang I's drill, immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter.
Claim 2	**Wang I**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Wang I, FIGs. 5-12. Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Defendant disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Wang I.

Claim 3	**Wang I**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	Wang I, FIGs. 5-12. For example, the heights of the composite cutting blade groups shown in FIG 8 are all the same. Furthermore, the height of each composite cutting blade group is circumferentially uniform. *See* the annotated representation of FIG. 8 below. 
Claim 5	**Wang I**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting	Wang I, FIGs. 5-12 Wang I shows, for example in FIGs. 7 and 12, that the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges. The figures also show that the auxiliary cutting edge is respectively intersected with the straight

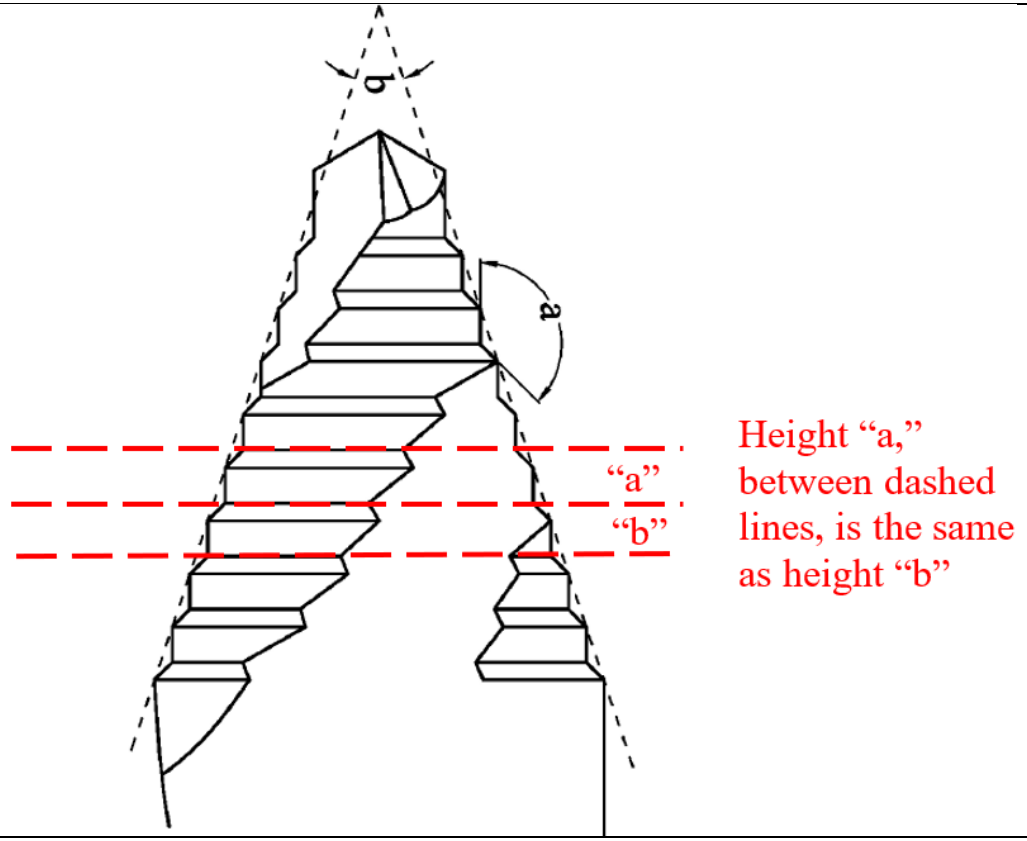
edge is respectively intersected with the straight major cutting edge and the chisel edge.	major cutting edge and the chisel edge. *See* the annotated representation of FIG. 12 shown below. 
Claim 6	**Wang I**
[’583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Wang I, FIGs. 5-12 Wang I shows, for example in FIGs. 7 and 12, that the plurality of composite cutting blade groups are each coaxial with the cone portion. *See* the annotated representation of FIG. 12 shown in [’583: 5].
Claim 7	**Wang I**
[’583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major	Wang I, FIGs. 5-12, Wang I shows, for example in FIGs. 7 and 12, that a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the

cutting edges of the plurality of composite cutting blade groups.	plurality of composite cutting blade groups. *See* the annotated representation of FIG. 12 shown in [’583: 5].
Claim 8	**Wang I**
[’583: 8.pre] A twist drill, comprising:	Wang I discloses a twist drill. *See*, *e.g.*, Abstract.
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* [’583: 1.a]  Fig.5
[’583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* [’583: 1.b] and [’583: 8.a]
[’583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* [’583: 1.c] and [’583: 8.a]
[’583: 8.d] a plurality of composite cutting blade groups formed sequentially and	*See* [’583: 1.d] For example, Wang I shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 5 shown below.

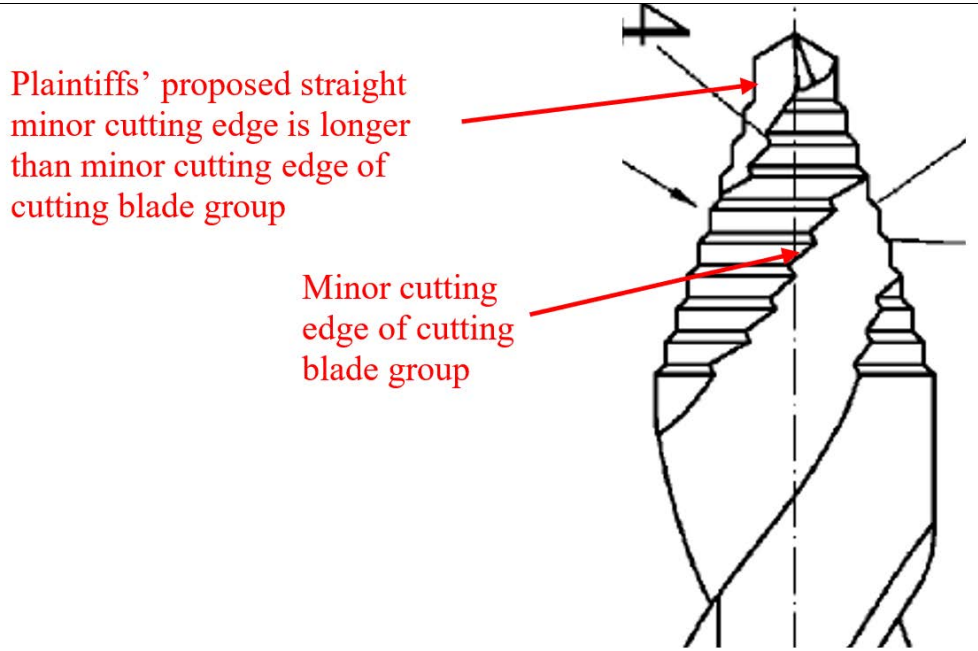
spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	
['583: 8.e] a conical first step surface;	*See* ['583: 1.e] and ['583: 8.d]
['583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and ['583: 8.d]
['583: 8.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583: 1.g] and ['583: 8.d]
['583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* ['583: 1.h], ['583: 2], and ['583: 8.d]

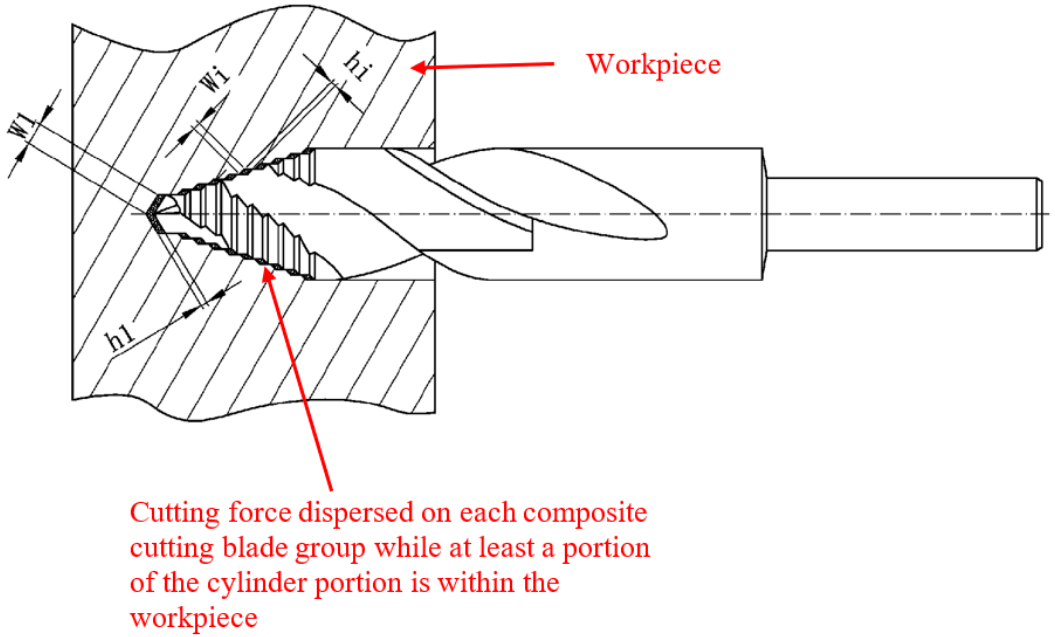
[’583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	*See* [’583: 1.i] and [’583: 8.d]
[’583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	*See* [’583: 1.j] and [’583: 5] *See* the annotated representation of Wang I’s FIG. 12 shown below. 
[’583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* [’583: 1.k] and the annotated representation of Wang I’s FIG. 12 shown in [’583: 8.j]

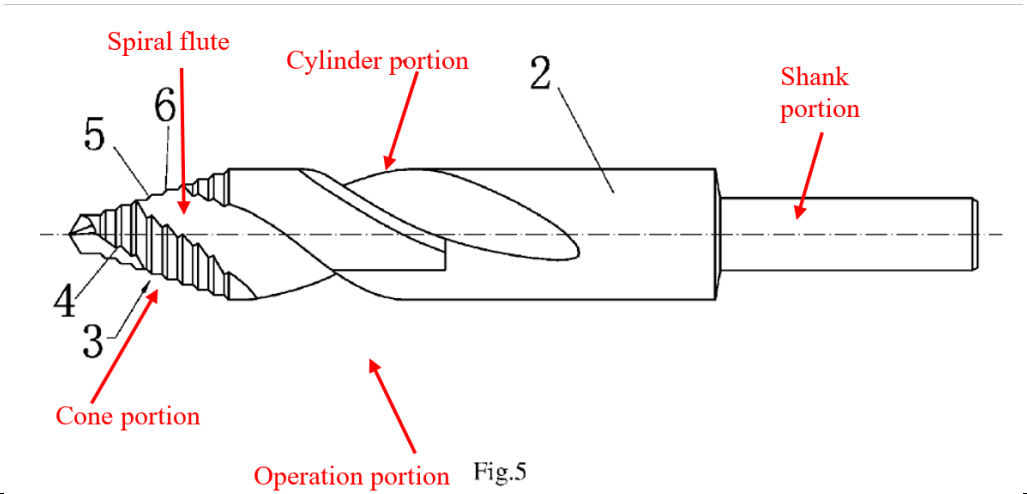
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l]
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m]
[’583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	*See* [’583: 1.n] and the annotated representation of FIG. 5 shown in [’583: 8.d]
Claim 9	**Wang I**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* [’583: 3] and the annotated representation of FIG. 8 below.

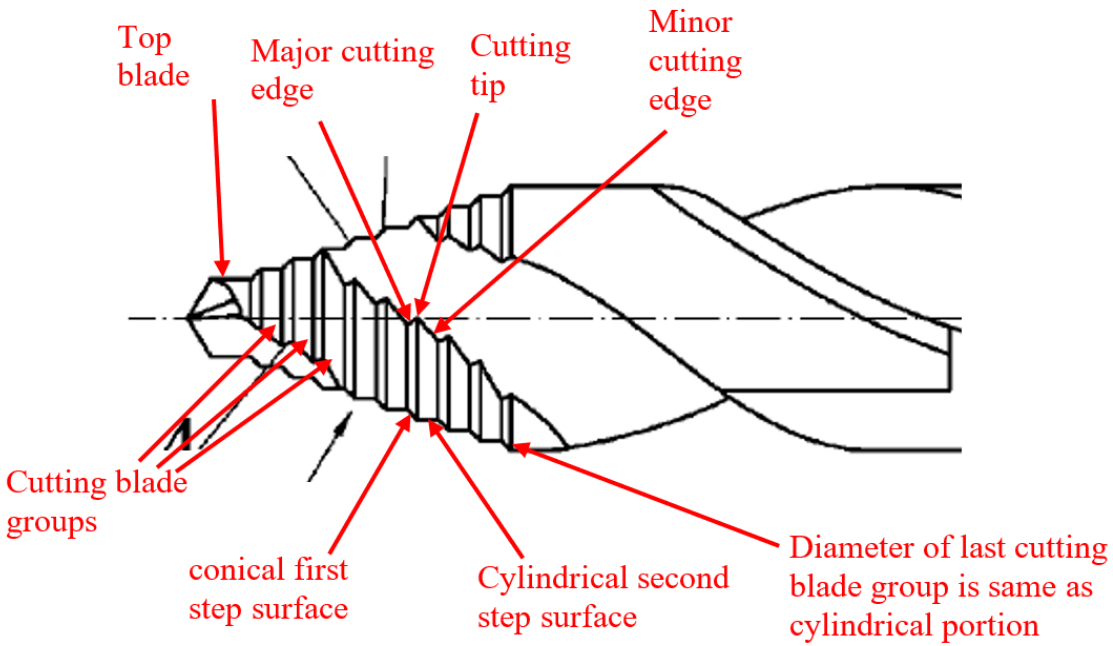
	
Claim 11	**Wang I**
['583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* ['583: 6] and the annotated representation of FIG. 12 shown in ['583: 8.j].
Claim 12	**Wang I**
['583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each	*See* ['583: 7] and the annotated representation of FIG. 12 shown in ['583: 8.j].

of the major cutting edges of the plurality of composite cutting blade groups.	
Claim 13	**Wang I**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	Wang I, FIGs. 5-12. This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. If this construction is correct, then Wang I discloses drills having a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* the annotated representation of FIG. 5 below.

	
Claim 14	**Wang I**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	Wang I, FIGs. 5-12 and ¶¶ [31-39] Wang I teaches that the operation portion of the drill disperses a cutting force on each of the plurality of cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. In particular, Wang I states "the number of steps and the lengths of the first cutting blades and the second cutting blades can be flexibly selected according to the size of drilled holes and the area of the flank surface. In general, on the flank suffices with the equal area, the more the number of the divided first cutting blades and second cutting blades is, the better. In this case, the smaller the contact area between the first cutting blades and the workpiece is, the smaller the resistance borne by the cutting tool during drilling is, and the easier the drilling is. In view of the above characteristics, the step-like cutting blades should be provided as many as possible, the diameter between the foremost second cutting blades should be set as

	small as possible, but the diameter between the foremost second cutting blades will be limited by a standard drill core thickness of the drill bit." Para [37]. Also, "When the drill bit starts to come into contact with the surface of the workpiece, a guide hole is first drilled by a very small drill point (i.e. the guide portion) of the first section. The small drill point is easy to be positioned and drill the small hole due to a small diameter. Then, the small hole is gradually expanded by a subsequent gradually-widened ladder blade until a final size of the twist drill is reached. In the gradual drilling and hole expanding processes, compared with the one-process continuous cutting of the linear cutting blade of a conventional twist drill, the cutting resistance is reduced and the feeding is easy and fast." Wang I, ¶ [39]. *See also* annotated reproduction of FIG. 9 below. 
'584 Patent	
Claim 1	**Wang I**

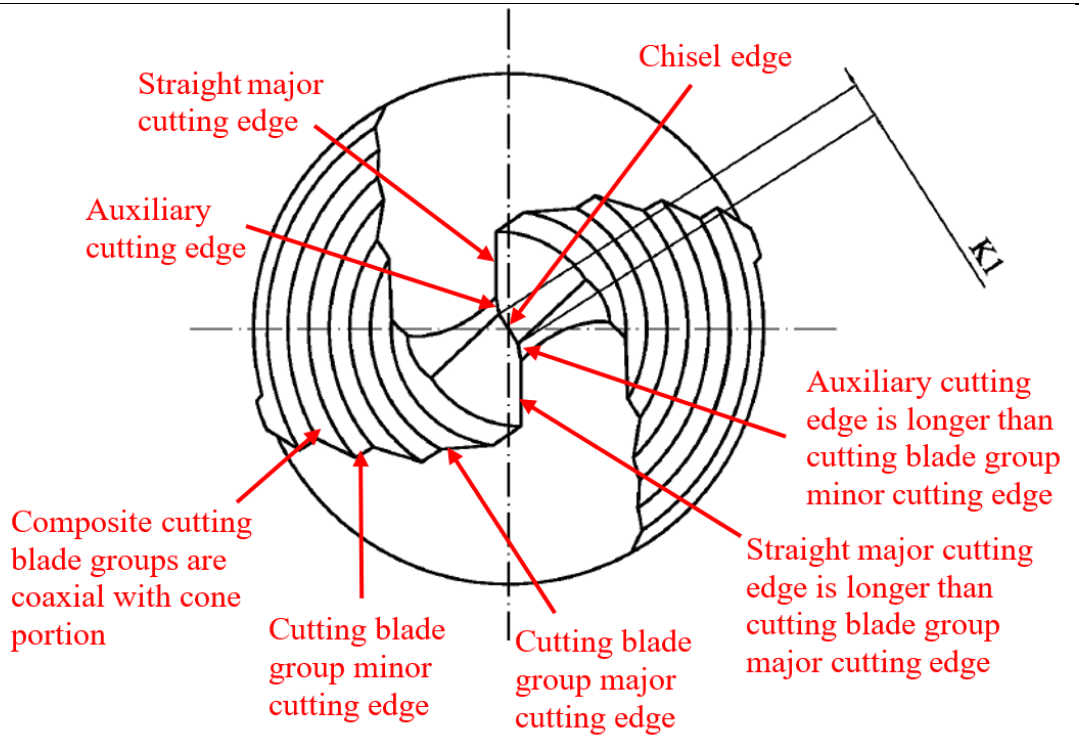
['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	Wang teaches a method in which the positioning (centering) of the drill is improved. ¶¶ [13,39]. As shown below in ['584: 1.a,], Wang I's method involves using a twist drill with a cone portion and cylinder portion.
['584: 1.a] providing a twist drill comprising: a shank portion;	Wang I provides a twist drill having a shank portion. *See* ['583: 1.b]. and the annotated representation of Wang I's FIG. 5 reproduced below.  Fig.5
['584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the	Wang I describes a twist drill having an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated representation of Wang I's FIG. 5 reproduced in ['584: 1.a]

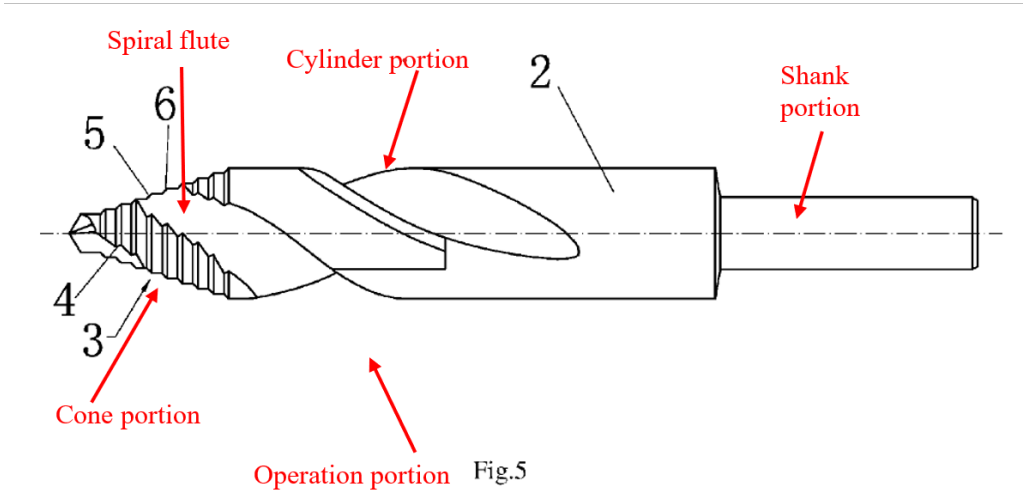
cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	
['584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d] For example, Wang I shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 5 shown below. 
['584: 1.d] a conical first step surface;	Wang I shows a composite cutting blade group having a conical first step surface. *See* ['583: 1.e] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c]
['584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	Wang I shows a composite cutting blade group having a cylindrical second step surface adjacent to the conical first step surface. *See* ['583: 1.f] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c]

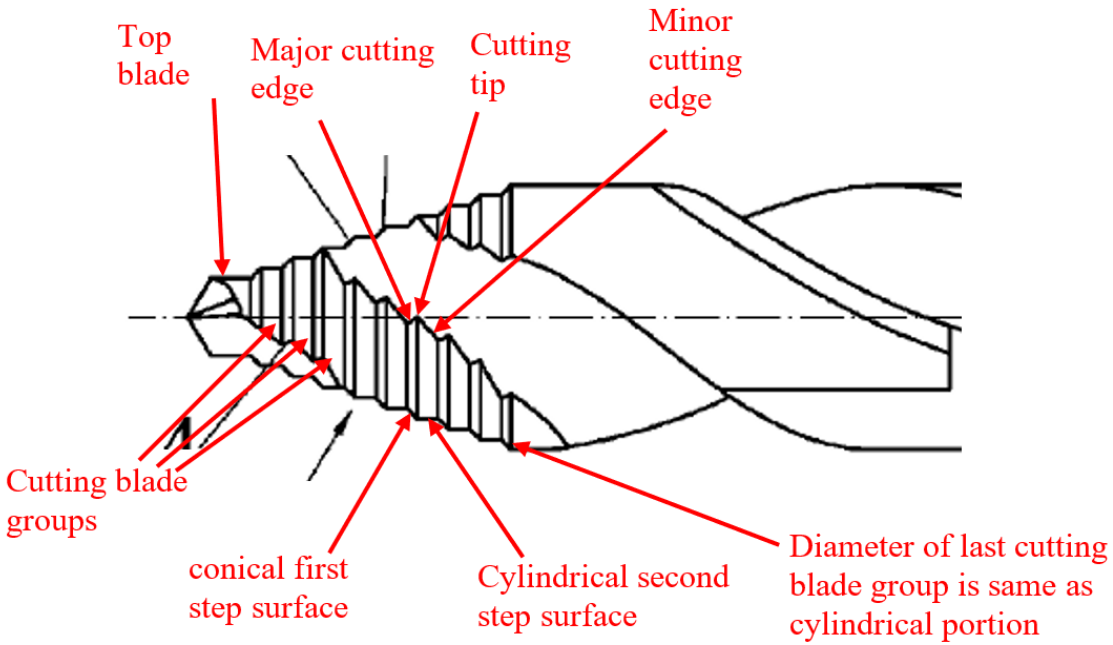
['584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Wang I shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* ['583: 1.g] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c].
['584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Wang I shows minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* ['583: 1h] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c].
['584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Wang I shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* ['583: 1.i] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c].
['584: 1.i] a top blade provided on the front end of the cone portion;	Wang I shows a top blade provided on the front end of the cone portion. *See* ['583: 1.j] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c].
['584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	Wang I shows the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. *See* ['583: 1.m] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c].
['584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then Wang I shows the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion being equal to the cylinder portion diameter. *See* ['583: 1.n] and the annotated representation of Wang I's FIG. 5 shown in ['584: 1.c].
['584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	Wang I teaches positioning the twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill. ¶¶ [31-39]. In particular, Wang I states the following. "In order to drill stably, a guide portion (i.e. for the first cutting blade and the second cutting blade at the foremost end of the drill bit body, the first cutting blade is in contact with the workpiece at first) is formed at the foremost end of the drill bit body 2. An apex angle of the guide portion is an angle of 90-140 degrees, and preferably, 118 degrees is set as an optimal angle. Certainly, the angle of the guide

	portion can be changed properly according to different processing materials, as shown in FIG. 6." Wang I, ¶ [33] "The cutting blades of the guide portion are relatively short, so the drilling will be relatively stable. Moreover, since the main cutting blades are divided into the first cutting blades with relatively small areas, the cutting torque and the power are dispersed by the first cutting blades so as to save efforts during drilling with force. It should be noted that the foremost first cutting blade in contact with the workpiece at first in the present disclosure may be unparallel to the subsequent first cutting blade." Wang I, ¶ [34] "When the drill bit starts to come into contact with the surface of the workpiece, a guide hole is first drilled by a very small drill point (i.e. the guide portion) of the first section. The small drill point is easy to be positioned and drill the small hole due to a small diameter. Then, the small hole is gradually expanded by a subsequent gradually-widened ladder blade until a final size of the twist drill is reached. In the gradual drilling and hole expanding processes, compared with the one-process continuous cutting of the linear cutting blade of a conventional twist drill, the cutting resistance is reduced and the feeding is easy and fast." Wang I, ¶ [39].
['584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	Wang I teaches cutting the workpiece with the top blade to create a drill hole in the workpiece. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 1.l].
['584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	Wang I teaches continuing cutting the workpiece using one or more of the plurality of cutting blade groups situated closest to the front end. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 1.l].
['584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	Wang I teaches continuing cutting the workpiece using one of more of the plurality of composite cutting blade groups situated closer to the cylinder portion. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 1.l], and FIGs. 9 and 10.

[’584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	Wang I teaches a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in [’584: 1.l], and FIGs. 9 and 10.
[’584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	Wang I teaches cutting the workpiece while at least a portion of the cylinder portion is within the workpiece. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in [’584: 1.l], and FIGs. 9 and 10.
Claim 2	**Wang I**
[’584: 2] The method of claim 1 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Wang I, FIGs. 5-12. Plaintiffs’ infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in Wang I.
Claim 4	**Wang I**
[’584: 4]The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	Wang I teaches the top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge being respectively intersected with the straight major cutting edge and the chisel edge. *See* [’583: 5] and the annotated representation of FIG. 12 shown below.

	
Claim 5	**Wang I**
[’584: 5] The method of claim 1 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	Wang I teaches a straight major cutting edge length of the top blade being greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* [’583: 7] and the annotated representation of Wang I’s FIG. 12 shown under [’584: 4].
Claim 6	**Wang I**
[’584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone	Wang teaches a method in which the positioning (centering) of the drill is improved. ¶¶ [13, 39]. As shown below in [’584: 1.a,], Wang I’s method involves using a twist drill with a cone portion and cylinder portion.

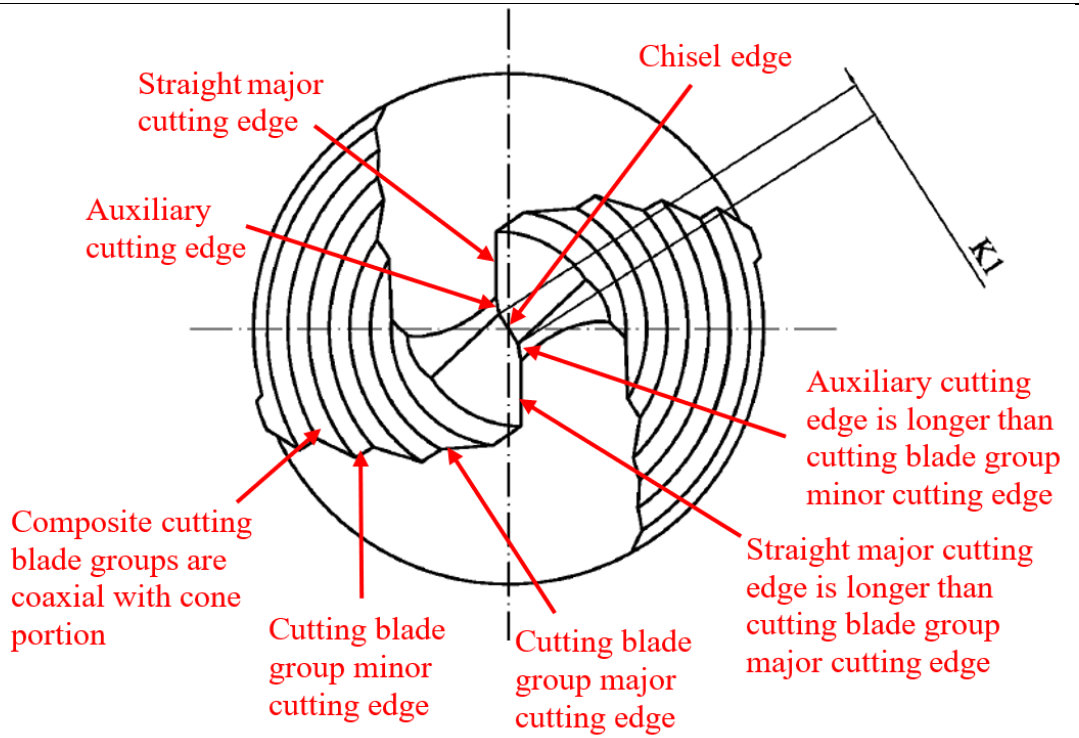
portion and a cylinder portion, the method comprising:	
['584: 6.a] providing a twist drill comprising: a shank portion;	Wang I provides a twist drill having a shank portion. *See* ['583: 1.b] and the annotated representation of Wang I's FIG. 5 reproduced below. 
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	Wang I describes a twist drill having an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated representation of Wang I's FIG. 5 reproduced in ['584: 6.a].

[’584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	Wang I shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 5 below. *See* ['583: 1.d]. 
[’584: 6.d] a conical first step surface;	Wang I shows a composite cutting blade group having a conical first step surface. *See* [’583:1.e] and the annotated representation of FIG. 5 shown in [’584: 6.c].
[’584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	Wang I shows a composite cutting blade group having a cylindrical second step surface adjacent to the conical first step surface. *See* [’583:1.f] and the annotated representation of FIG. 5 shown in [’584: 6.c].
[’584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Wang I shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* [’583:1.g] and the annotated representation of FIG. 5 shown in [’584: 6.c].

['584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Wang I shows minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* ['583.1h] and the annotated representation of FIG. 5 shown in ['584: 6.c].
['584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Wang I shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* ['583: 1.i] and the annotated representation of FIG. 5 shown in ['584: 6.c].
['584: 6.i] a top blade provided on the front end of the cone portion;	Wang I shows a top blade provided on the front end of the cone portion. *See* ['583: 1.j] and the annotated representation of FIG. 5 shown in ['584: 6.c].
['584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	Wang I shows the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. *See* ['583: 1.m].
['584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then Wang I shows the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion being equal to the cylinder portion diameter. *See* ['583: 1.n] and the annotated representation of FIG. 5 shown in ['584: 6.c].
['584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	Wang I teaches positioning the twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill. ¶¶ [31-39]. In particular, Wang I states the following: "In order to drill stably, a guide portion (i.e. for the first cutting blade and the second cutting blade at the foremost end of the drill bit body, the first cutting blade is in contact with the workpiece at first) is formed at the foremost end of the drill bit body 2. An apex angle of the guide portion is an angle of 90-140 degrees, and preferably, 118 degrees is set as an optimal angle. Certainly, the angle of the guide portion can be changed properly according to different processing materials, as shown in FIG. 6." Wang I, ¶ [33].

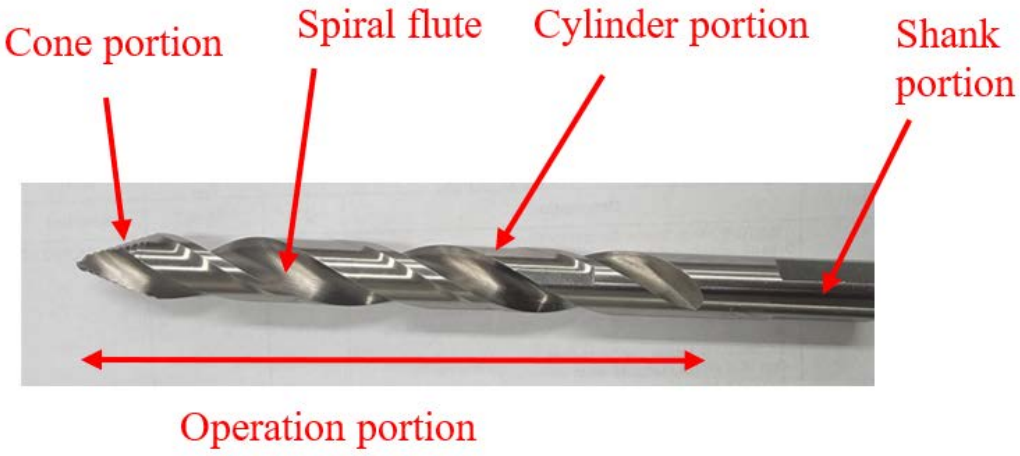
	"The cutting blades of the guide portion are relatively short, so the drilling will be relatively stable. Moreover, since the main cutting blades are divided into the first cutting blades with relatively small areas, the cutting torque and the power are dispersed by the first cutting blades so as to save efforts during drilling with force. It should be noted that the foremost first cutting blade in contact with the workpiece at first in the present disclosure may be unparallel to the subsequent first cutting blade." Wang I, ¶ [34]. "When the drill bit starts to come into contact with the surface of the workpiece, a guide hole is first drilled by a very small drill point (i.e. the guide portion) of the first section. The small drill point is easy to be positioned and drill the small hole due to a small diameter. Then, the small hole is gradually expanded by a subsequent gradually-widened ladder blade until a final size of the twist drill is reached. In the gradual drilling and hole expanding processes, compared with the one-process continuous cutting of the linear cutting blade of a conventional twist drill, the cutting resistance is reduced and the feeding is easy and fast." Wang I, ¶ [39].
['584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	Wang I teaches cutting the workpiece with the top blade to create a drill hole in the workpiece. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 6.l].
['584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	Wang I teaches continuing cutting the workpiece using one or more of the plurality of cutting blade groups situated closest to the front end. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 6.l].
['584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	Wang I teaches continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 6.l].
['584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	Wang I teaches cutting the workpiece while at least a portion of the cylinder portion is within the workpiece. ¶¶ [31-39], particularly paragraphs 33, 34 and 39 recited in full in ['584: 6.l], and FIGs. 9 and 10.

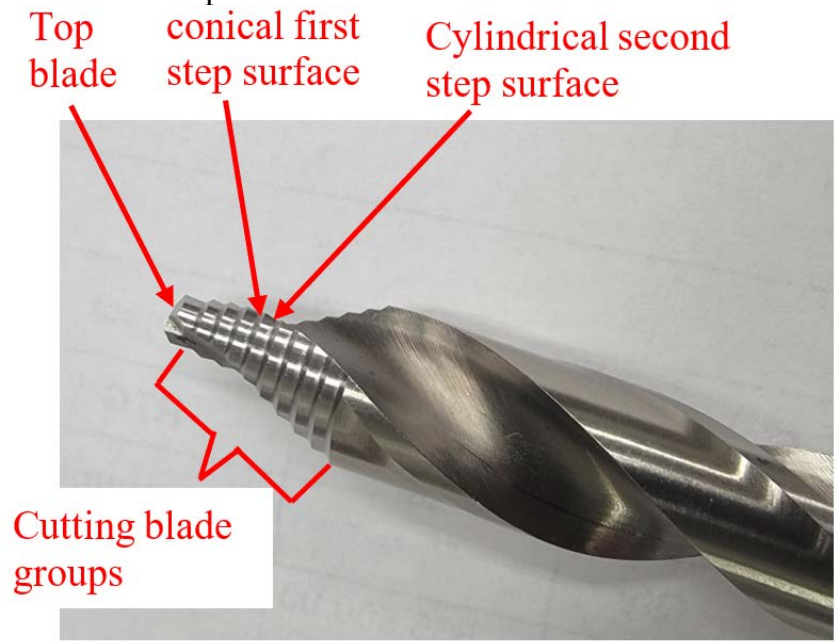
Claim 7	**Wang I**
['584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Wang I, FIGs. 5-12. Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Defendant disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Wang I. *See* ['584: 2].
Claim 9	**Wang I**
['584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	Wang I teaches the top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge being respectively intersected with the straight major cutting edge and the chisel edge. *See* ['583: 5]
Claim 10	**Wang I**
['584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	Wang I teaches a straight major cutting edge length of the top blade being greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* ['583: 7] and the annotated representation of FIG. 12 shown below.

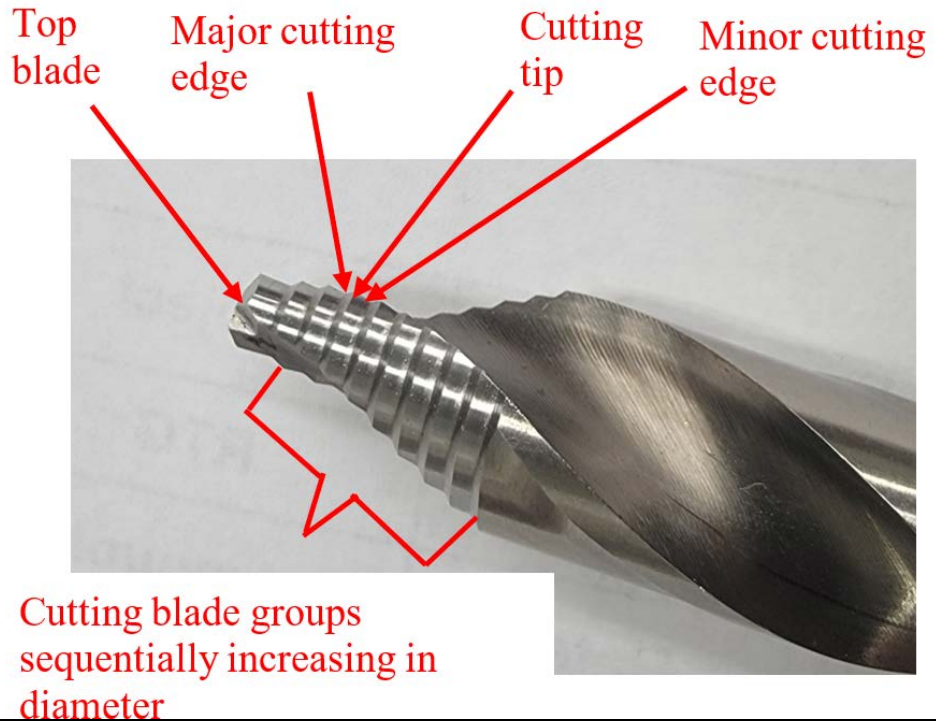
	
Claim 11	**Wang I**
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	Wang I teaches dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece. In particular, Wang I states “the number of steps and the lengths of the first cutting blades and the second cutting blades can be flexibly selected according to the size of drilled holes and the area of the flank surface. In general, on the flank suffices with the equal area, the more the number of the divided first cutting blades and second cutting blades is, the better. In this case, the smaller the contact area between the first cutting blades and the workpiece is, the smaller the resistance borne by the cutting tool during drilling is, and the easier the drilling is. In view of the above characteristics, the step-like cutting blades should be provided as many as possible, the diameter between the foremost second

	cutting blades should be set as small as possible, but the diameter between the foremost second cutting blades will be limited by a standard drill core thickness of the drill bit." Wang I, ¶ [37]. Also, "When the drill bit starts to come into contact with the surface of the workpiece, a guide hole is first drilled by a very small drill point (i.e. the guide portion) of the first section. The small drill point is easy to be positioned and drill the small hole due to a small diameter. Then, the small hole is gradually expanded by a subsequent gradually-widened ladder blade until a final size of the twist drill is reached. In the gradual drilling and hole expanding processes, compared with the one-process continuous cutting of the linear cutting blade of a conventional twist drill, the cutting resistance is reduced and the feeding is easy and fast." Wang I, ¶ [39]. *See also* ['583:14]

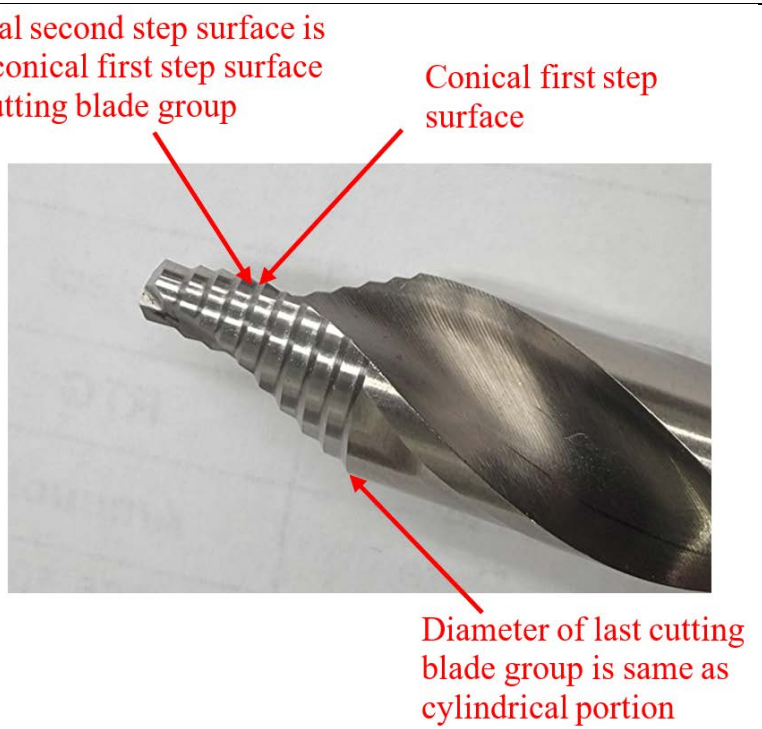
Exhibit B

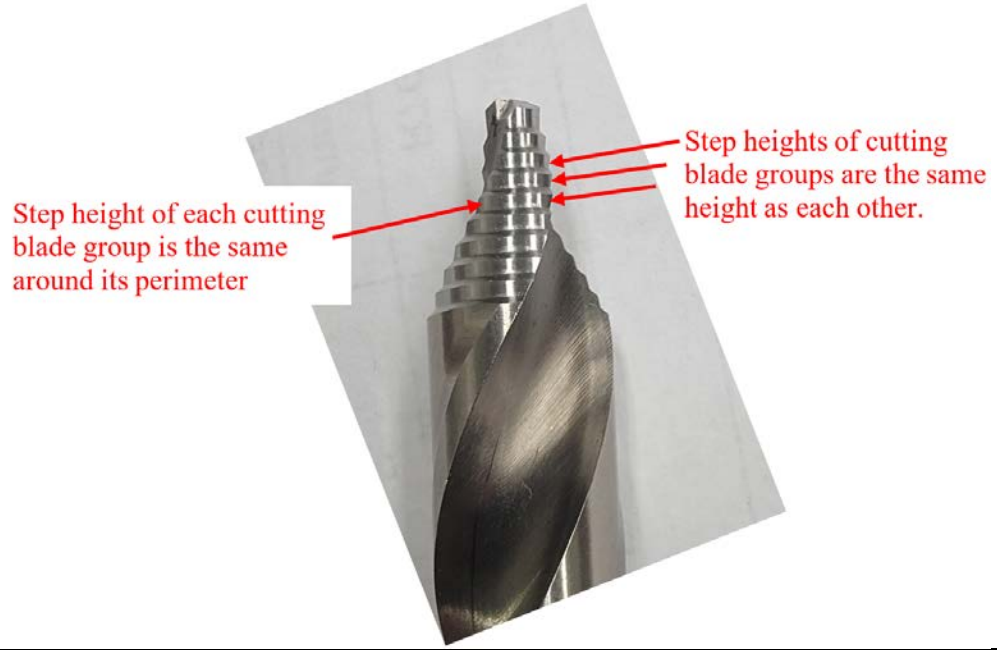
’583 Patent	
Claim 1	**Matco Drills**
[’583: 1.pre] A twist drill, comprising:	The Matco drills are twist drills. 
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	The Matco drills include an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion. 

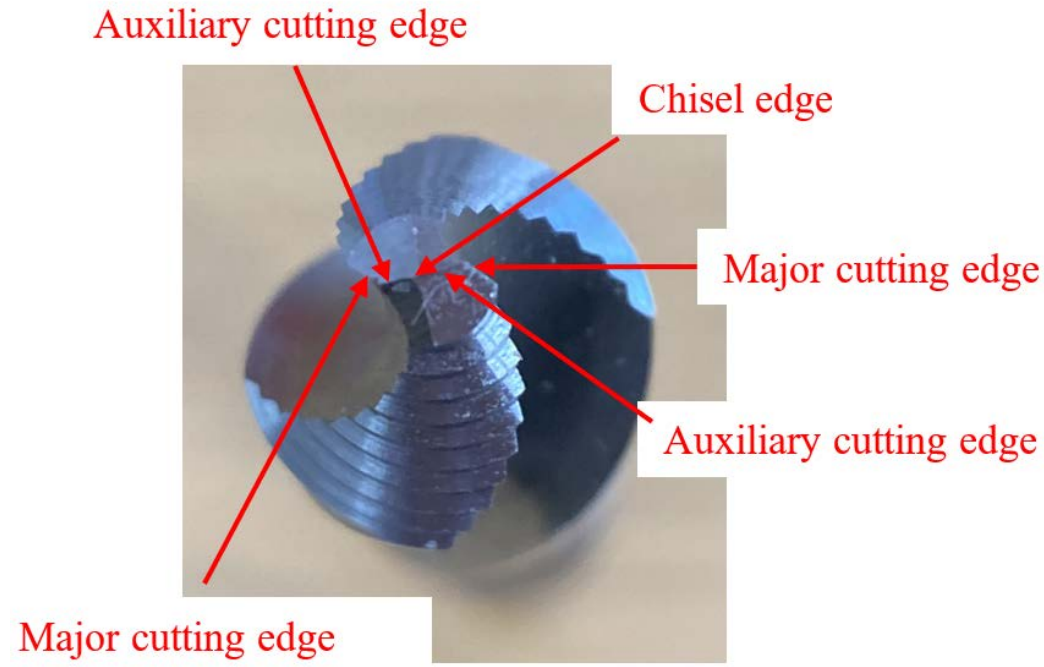
['583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	The Matco drills have a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated photo of an exemplary Matco drill in ['583: 1.a].
['583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	The Matco drills have a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall. *See* annotated photo of an exemplary Matco drill in ['583: 1.a].
['583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	The Matco drills have a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion.  Plaintiffs' infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades

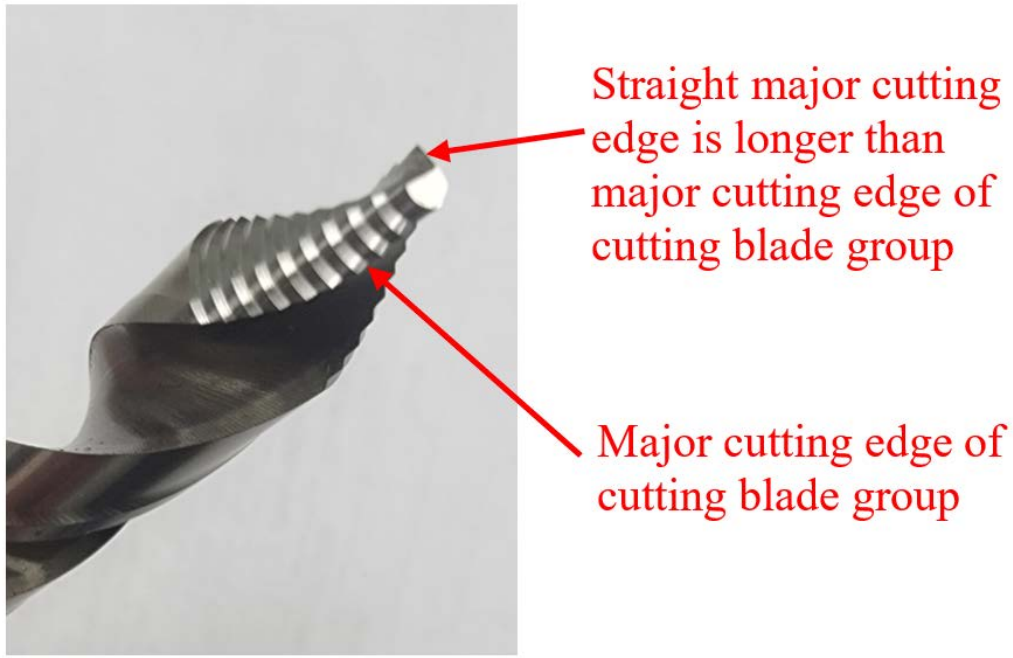
	groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it is also present in the Matco drills.
['583: 1.e] a conical first step surface;	The Matco drills have a conical first step surface. *See* annotated photo of Matco drill in ['583: 1.d].
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent the second step surfaces from being considered "cylindrical." While Viking disagrees with this contention, based on Plaintiffs' assertion, the Matco drills have a cylindrical second step surface adjacent to the conical first step surface. *See* annotated photo of Matco drill in ['583: 1.d].
['583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	The Matco drills have a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. 

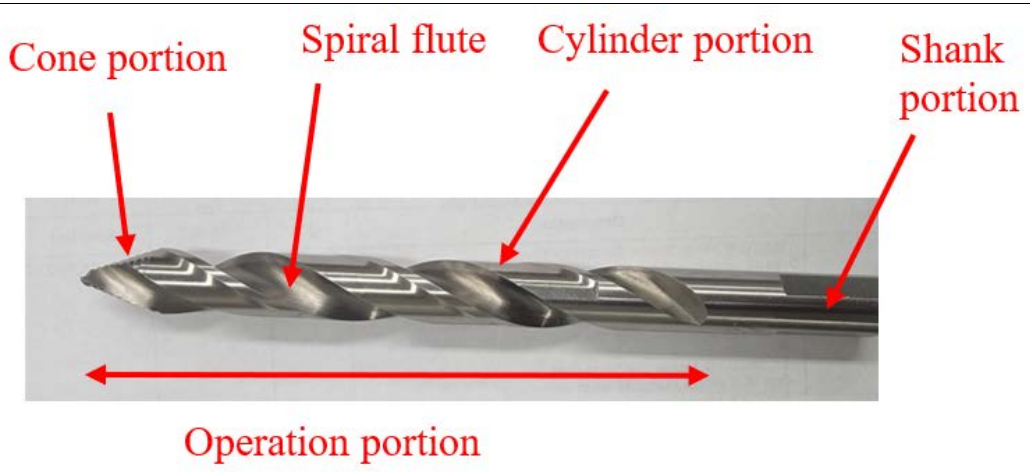
[’583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute; and	The Matco drills have a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. *See* annotated photo of Matco drill in [’583: 1.g].
[’583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	The Matco drills have a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* annotated photo of Matco drill in [’583: 1.g].
[’583: 1.j] a top blade provided on the front end of the cone portion;	The Matco drills have a top blade provided on the front end of the cone portion. *See* annotated photo of Matco drill in [’583: 1.g]
[’583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	In the Matco drills, a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. *See* annotated photo of Matco drill in [’583: 1.g]
[’583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Plaintiffs’ infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in the Matco drills. A person of ordinary skill will understand that the spiral flutes of the Matco drills inherently shunt chips from the cutting surface out of the drilled hole.
[’583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	In the Matco drills, at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group, as shown in the annotated photo of an exemplary Matco drill below.

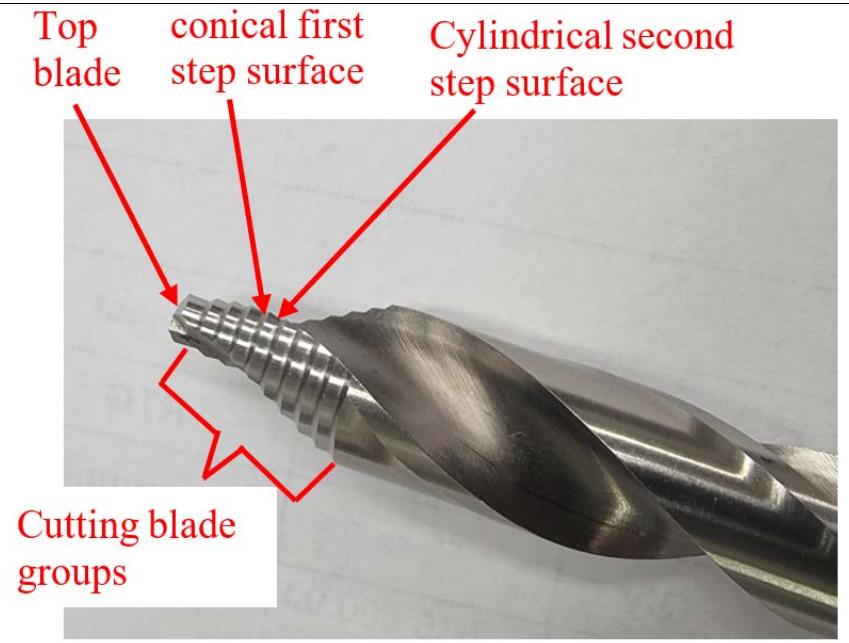
	
['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in the Matco drills immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See* annotated photo of Matco drill in ['583: 1.m].
Claim 2	**Matco Drills**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention,

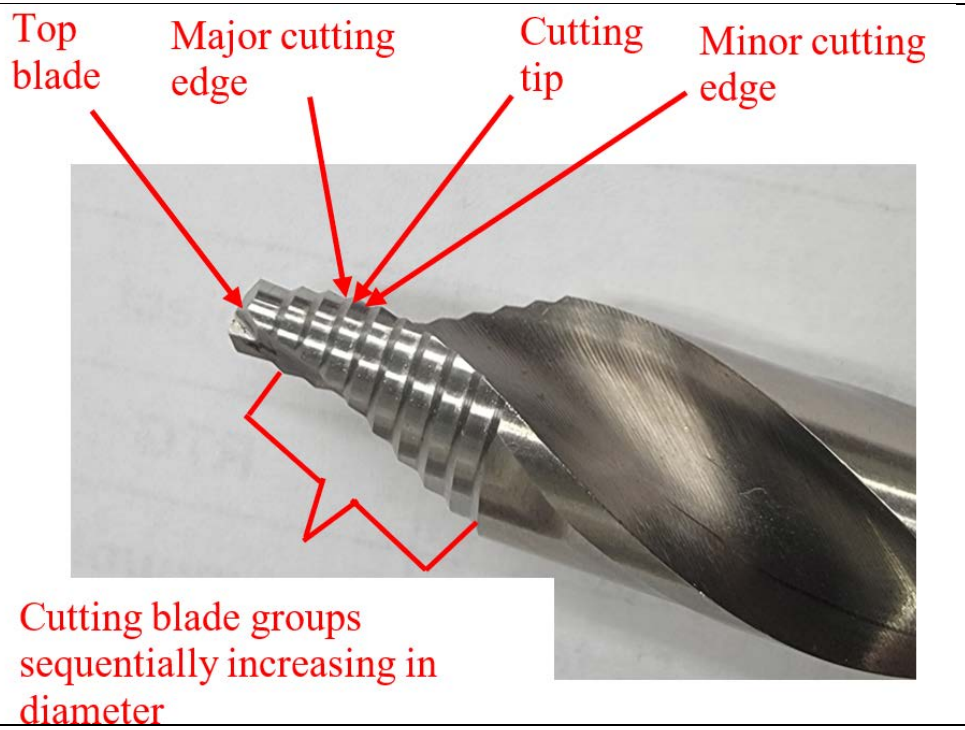
	based on Plaintiffs' assertion, this limitation is also inherent in the Matco drills because they have minor cutting edges.
Claim 3	**Matco Drills**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	In the Matco drills, the height of each composite cutting blade group is the same around its perimeter and the step heights are the same as each other. Thus, if claim 3 is found to not be indefinite, it is met by the Matco drills. 
Claim 5	**Matco Drills**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	In the Matco drills, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. See the annotated photo of an exemplary Matco drill shown below. This well-known configuration of drill tip is commonly referred to as a split point tip. *See, e.g.*, U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl") ¶¶ [6-7].

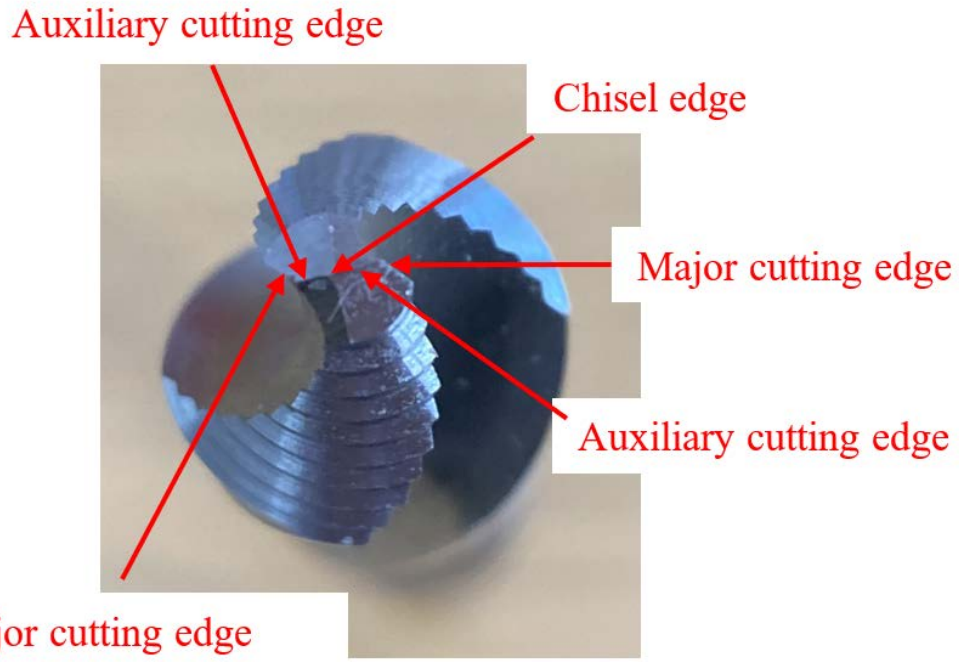
	
Claim 6	**Matco Drills**
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Defendant disagrees with this contention, based on Plaintiffs' assertion, this limitation is also present in the Matco drills.
Claim 7	**Matco Drills**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	In the Matco drills, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. See the annotated photo of an exemplary Matco drill below.

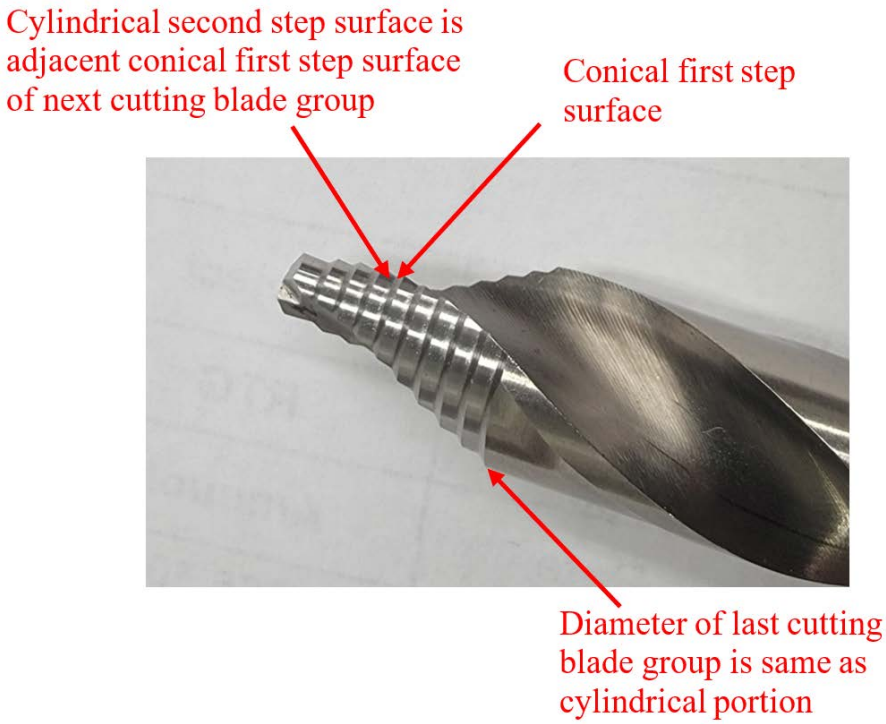
	
Claim 8	**Matco Drills**
[’583: 8.pre] A twist drill, comprising:	The Matco drills are twist drills. *See* [‘583: 1.pre].
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* [‘583: 1.a].

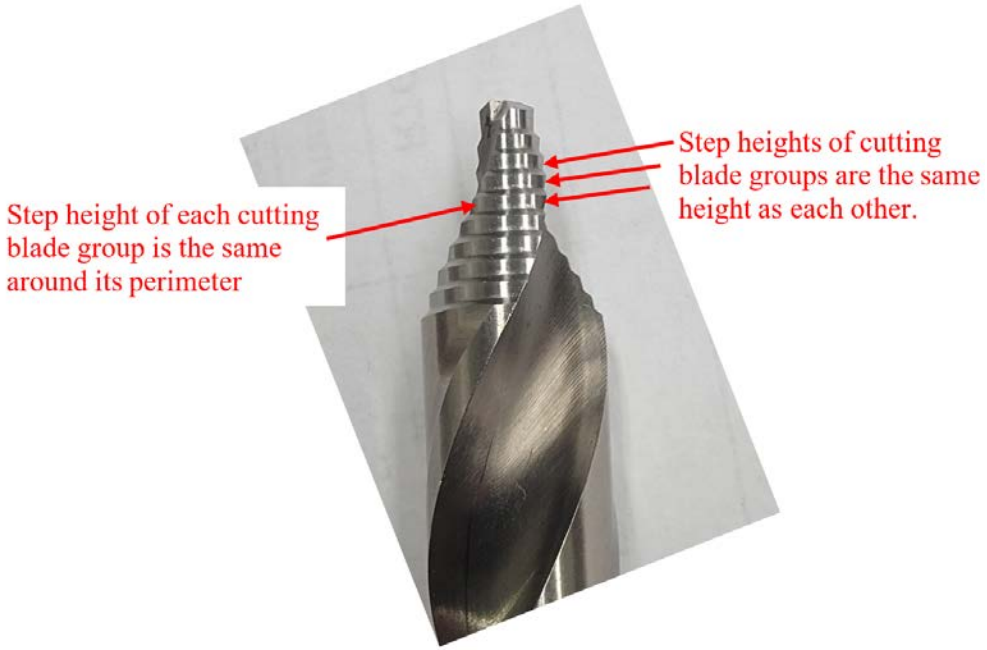
	
[’583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* [’583: 1.b] and [’583: 8.a].
[’583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* [’583: 1.c] and [’583: 8.a].
[’583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d].

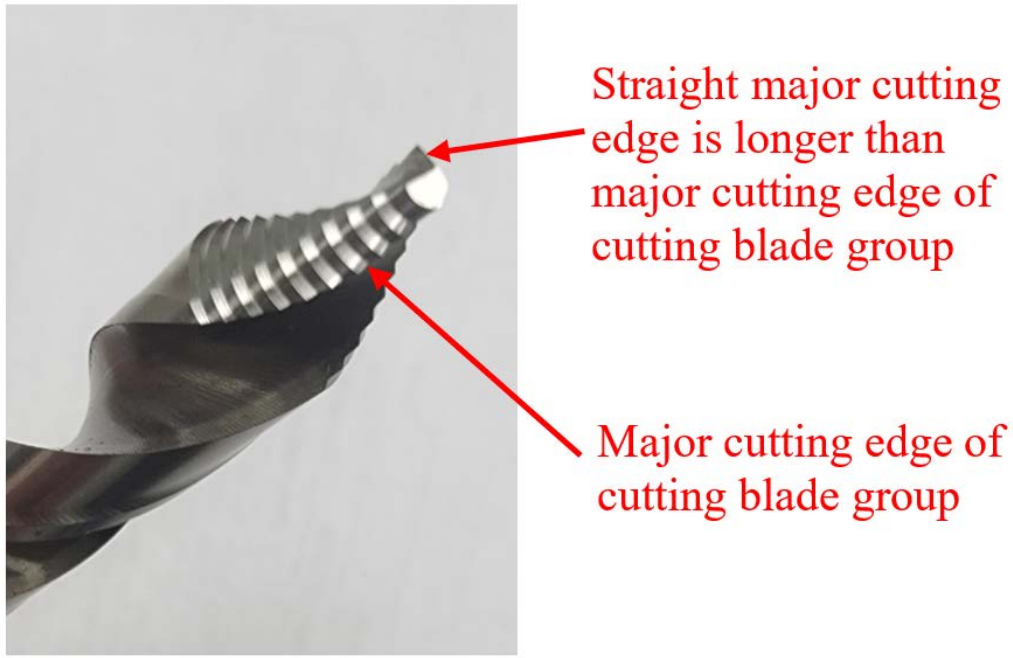
	
['583: 8.e] a conical first step surface;	*See* ['583: 1.e] and ['583: 8.d].
['583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and ['583: 8.d].
['583: 8.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583: 1.g] and ['583: 8.d].

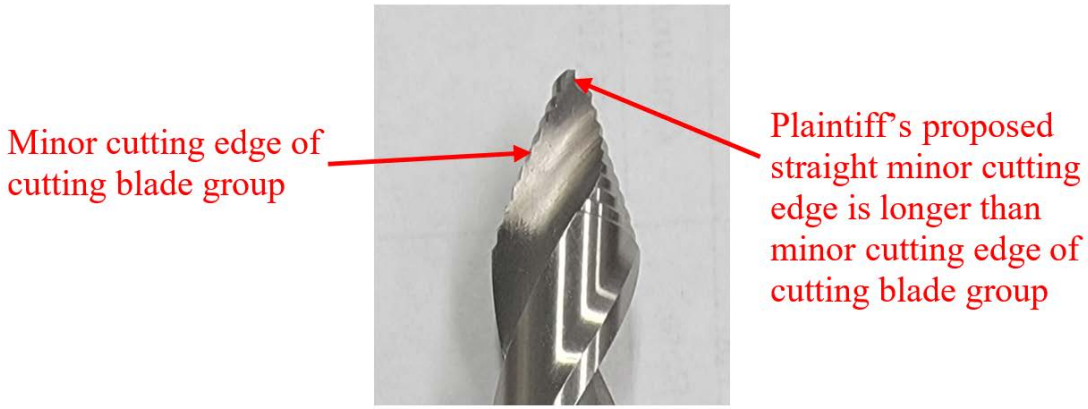
	
['583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* ['583: 1.h], ['583: 2], and the annotated photo of an exemplary Matco drill in ['583: 8.g].
['583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	*See* ['583: 1.i] and the annotated photo of an exemplary Matco drill in ['583: 8.g].
['583: 8.j] a top blade provided on the front end of the cone portion, the top blade	*See* ['583: 1.j], the annotated photo of an exemplary Matco drill in ['583: 8.g] and ['583: 5].

comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	
[’583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* [’583: 1.k] and [’583: 8.g].
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent	*See* [’583: 1.m].

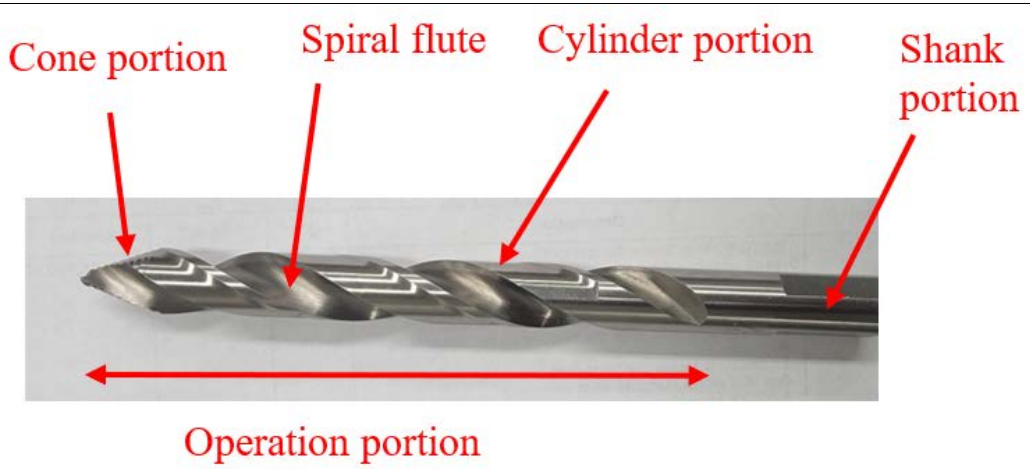
to a conical first step surface of a next composite cutting blade group; and	
[’583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	*See* [’583: 1.n] 
Claim 9	**Matco Drills**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* [’583: 3].

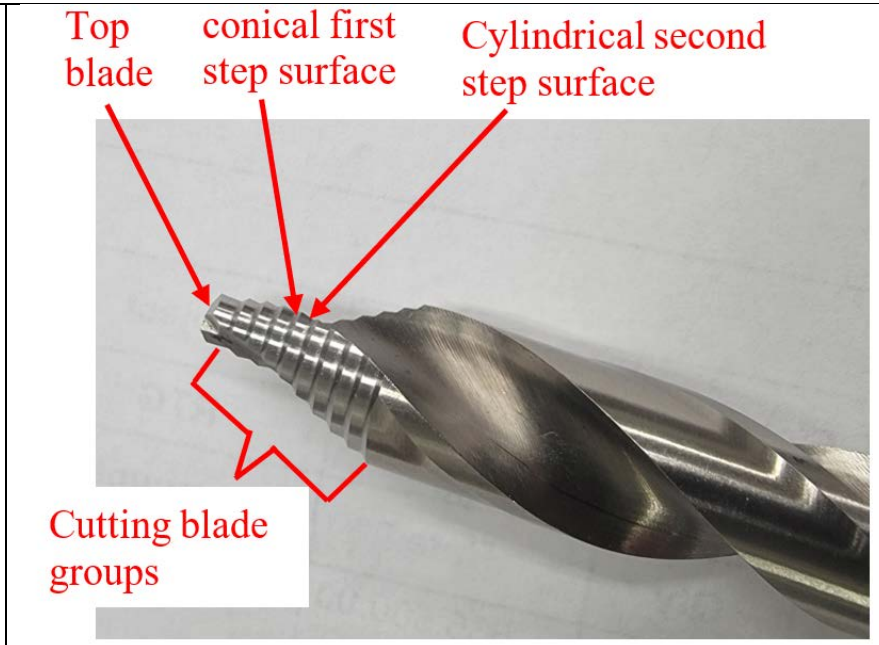
	
Claim 11	**Matco Drills**
[’583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* [’583: 6].
Claim 12	**Matco Drills**
[’583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [’583: 7].

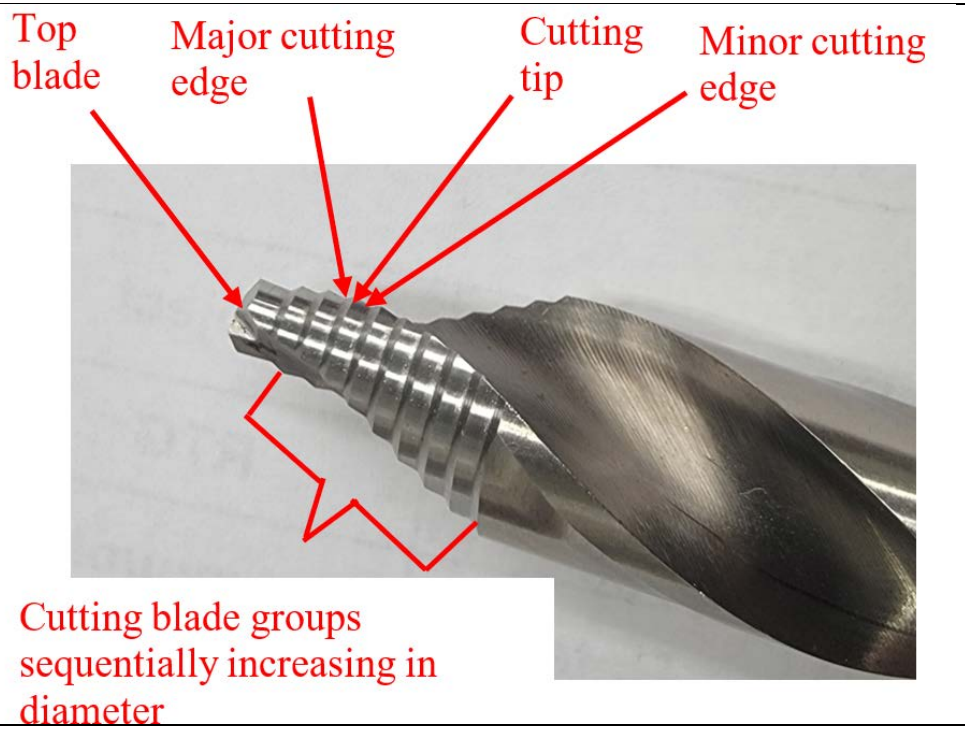
	
Claim 13	**Matco Drills**
[’583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	This claim is invalid because it is indefinite. Defendant is unable to determine what a “straight minor cutting edge” is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of “straight minor cutting edge” is clarified during the course of this litigation. Plaintiffs have proposed that “a straight minor cutting edge” is a cutting edge parallel to the drill axis and descending from the outermost point of the “straight major cutting edge” of the top blade in a direction away from the tip of the drill. If this construction is correct, then the Matco drills have a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the

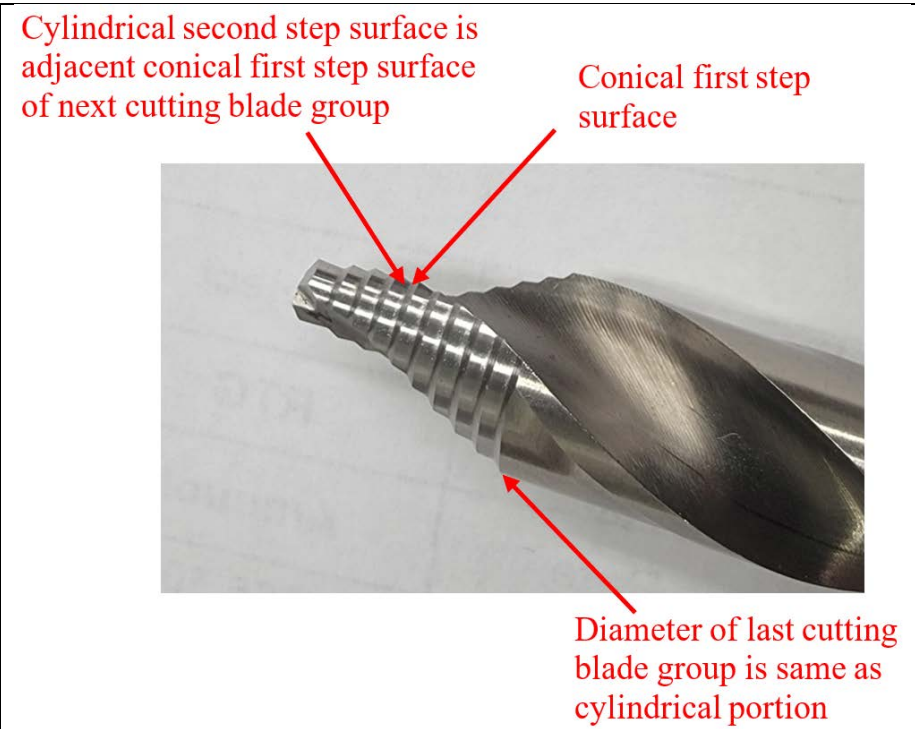
	plurality of composite cutting blade groups. *See* the annotated photo of an exemplary Matco drill below. 
Claim 14	**Matco Drills**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	The operation portion of the Matco drills is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.
'584 Patent	
Claim 1	**Matco Drills**
['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	It was well known to one of ordinary skill that the provision of a conical cutting tip to a cylindrical twist drill, such as is present in the Matco drills, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* U.S. Patent App. Pub. No. 2018/0133808 ("Wang I") at ¶¶ [13, 39-47]; U.S. Patent No. 2,193,186 ("Bannister") at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; U.S. Patent App. Pub. No. 2011/0116884 ("Li") at ¶¶ [3, 24, 37, 44].

	The Matco drills are twist drills:  It was well known to one of ordinary skill that the provision of a conical cutting tip to a cylindrical twist drill, such as is present in the Matco drills, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶paras [13, 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; Li at paras [¶¶ 3, 24, 37, 44].
[’584: 1.a] providing a twist drill comprising: a shank portion;	The Matco drills have a shank portion. *See* [’583: 1.b].

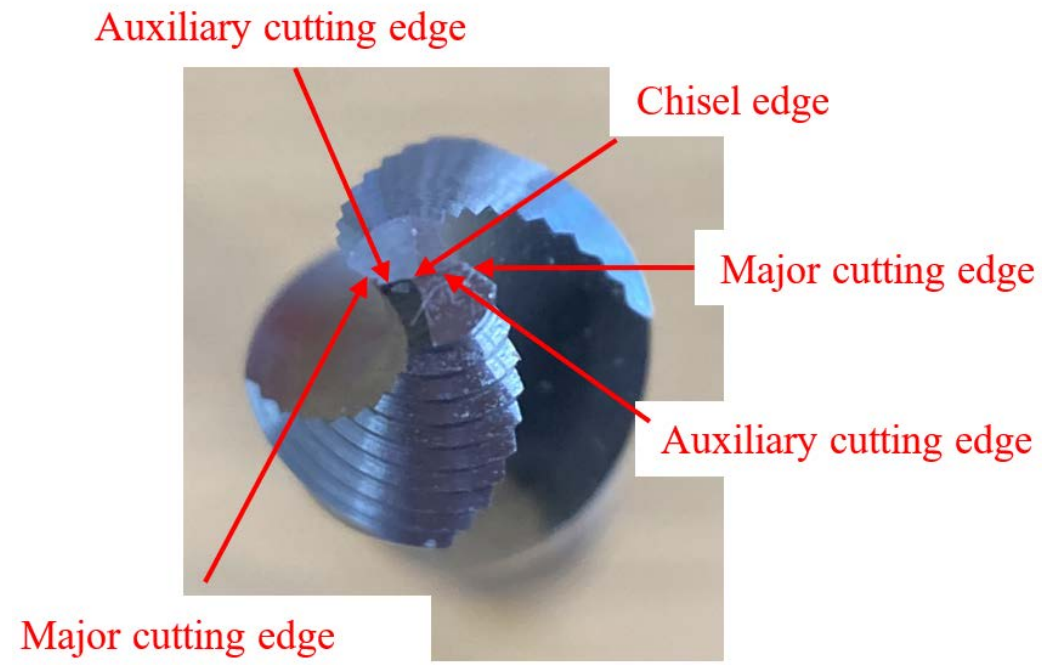
	
[’584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	The Matco drills have an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* [’583: 1.a], [’583: 1.c], and the annotated photo of an exemplary Matco drill reproduced in [’584: 1.a].
[’584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of	*See* [’583: 1.d] and [’583: 1.k].

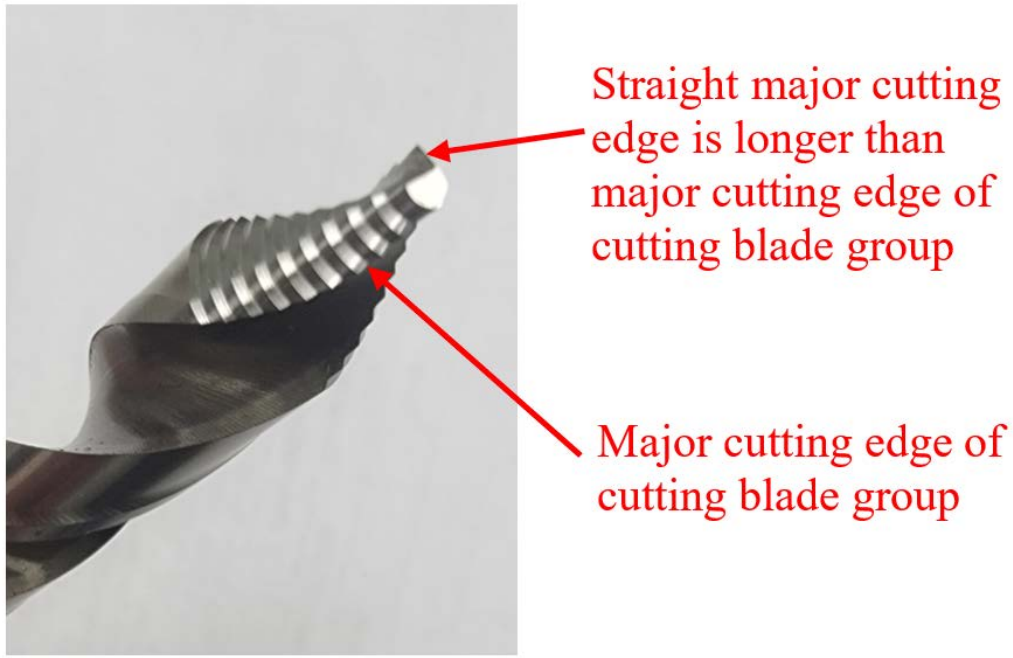
the cone portion, each of the plurality of composite cutting blade groups comprising:	
['584: 1.d] a conical first step surface;	*See* ['583:1.e] and the annotated photograph of a representative Matco drill shown in ['584: 1.c].
['584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583:1.f] and the annotated photograph of a representative Matco drill shown in ['584: 1.c].
['584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583:1.g] and the annotated photo of an exemplary Matco drill below.

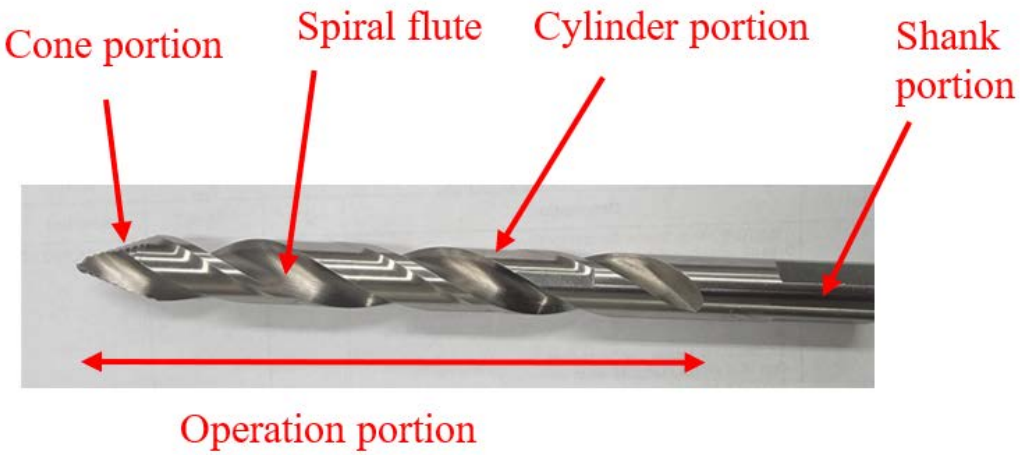
	
['584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* ['583.1h] and the annotated photo of an exemplary Matco drill in ['584: 1.f].
['584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* ['583.1i] and the annotated photo of an exemplary Matco drill in ['584: 1.f].
['584: 1.i] a top blade provided on the front end of the cone portion;	*See* ['583.1j] and the annotated photo of an exemplary Matco drill in ['584: 1.f].
['584: 1.j] wherein the cylindrical second step surface of at least one composite	*See* ['583: 1.m] and the annotated photo of an exemplary Matco drill below.

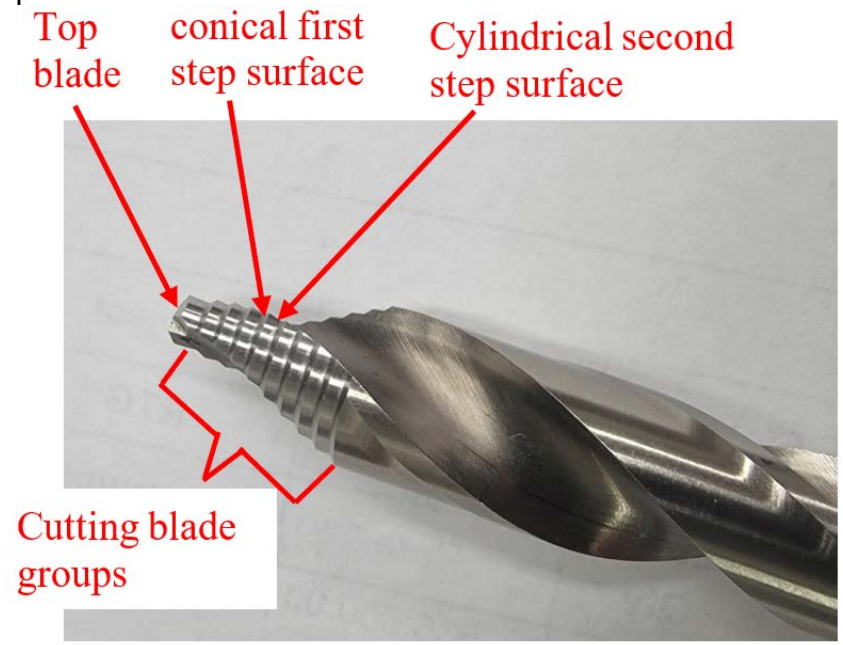
cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	
['584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Matco drills also have a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* ['583: 1.n] and the annotated photo of an exemplary Matco drill in ['584: 1.j].
['584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim limitation is simply one step of the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using one of the Matco drills. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at paras [¶¶ 5, 6, 13, 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶[6-8]; Li at ¶¶ [3, 24, 37, 44].

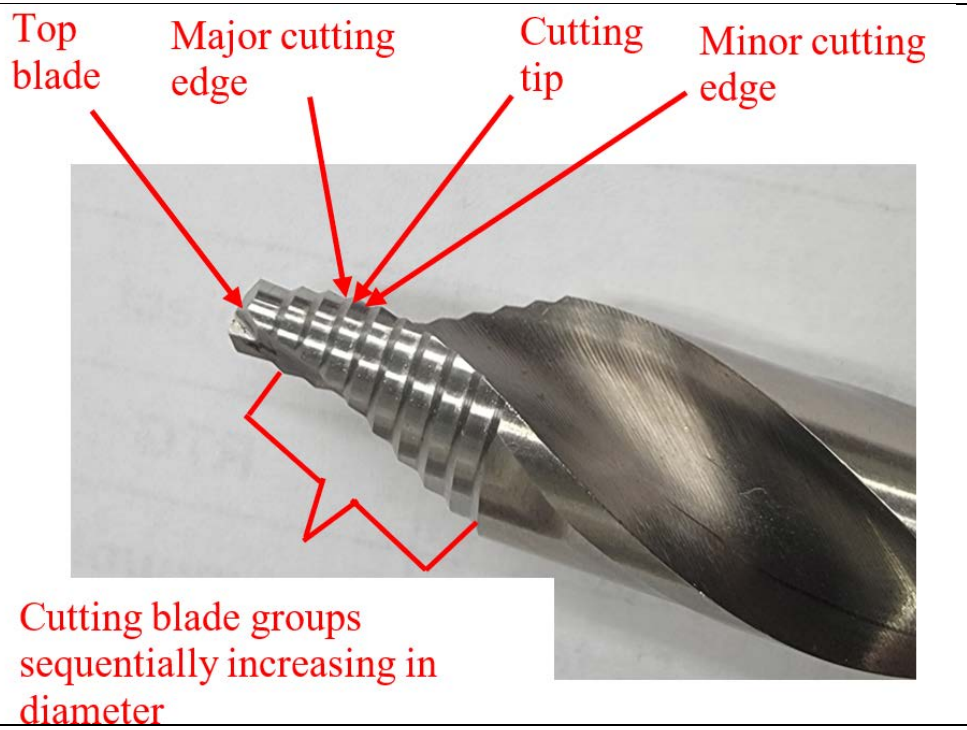
['584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* ['584: 1.l].
['584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	*See* ['584: 1.l].
['584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* ['584: 1.l].
['584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	This is a natural outcome of using a Matco drill and is, therefore, inherent to the use of the drill.
['584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	*See* ['584: 1.l].
Claim 2	**Matco Drills**
['584: 2] The method of claim 1 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Matco drills because they have minor cutting edges.
Claim 4	**Matco Drills**
['584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting	The Matco drills have a top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge being respectively intersected with the straight major cutting edge and the chisel edge.

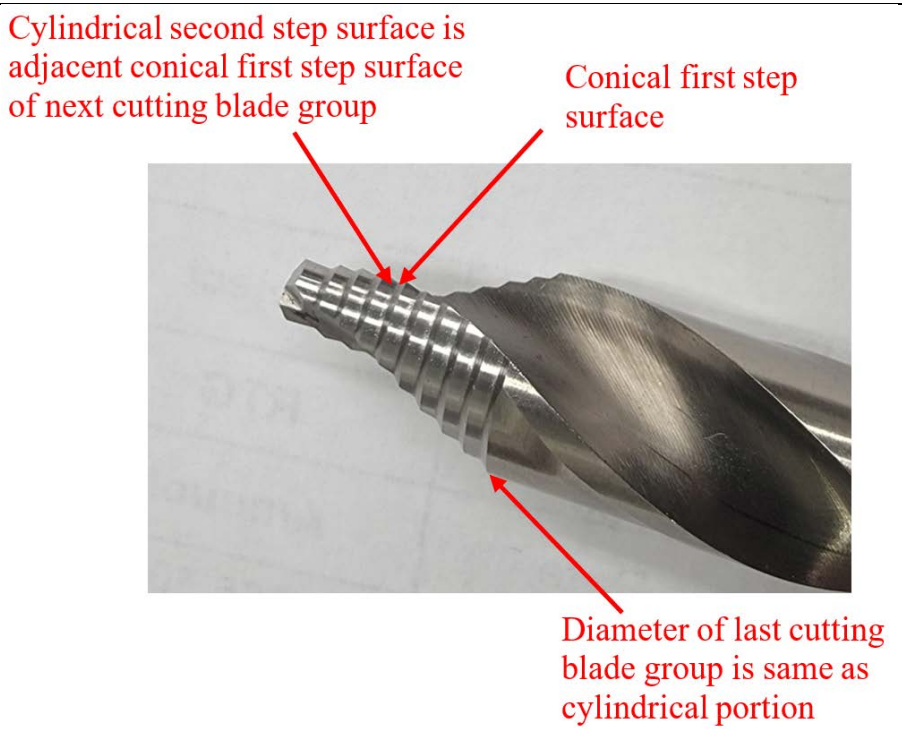
edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	*See* ['583: 5] and the annotated photograph of a representative Matco drill shown below. 
Claim 5	**Matco Drills**
['584: 5] The method of claim 1 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	The Matco drills have a straight major cutting edge length of the top blade that is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* ['583: 7] and the annotated photo of a representative Matco drill below.

	
Claim 6	**Matco Drills**
[’584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	The Matco drills are twist drills: 

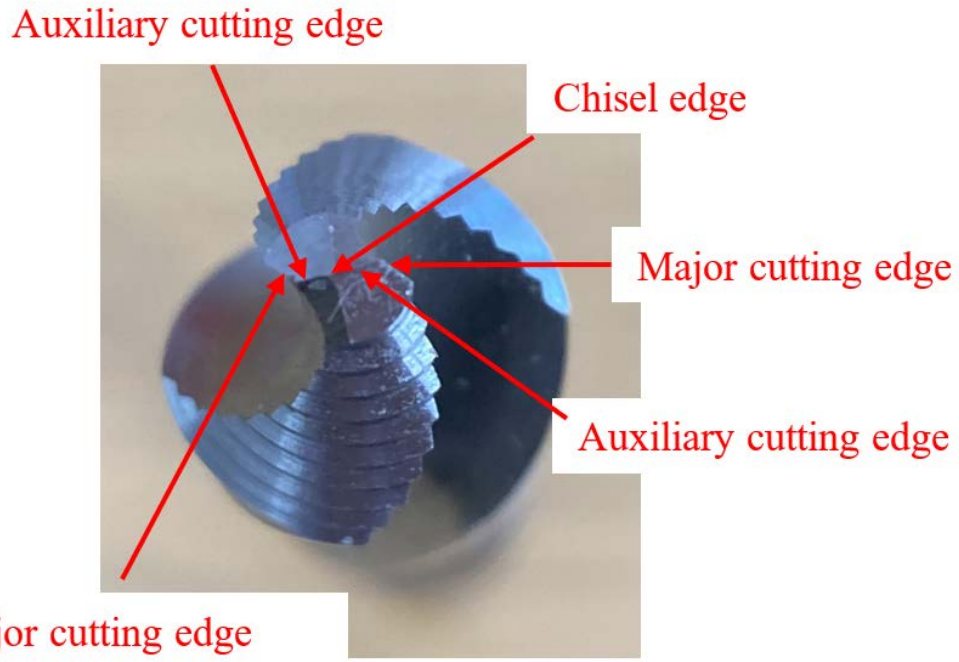
	It was well known to one of ordinary skill that the provision of a conical cutting tip to a cylindrical twist drill, such as is present in the Matco drills, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; Li at ¶¶ [3, 24, 37, 44].
['584: 6.a] providing a twist drill comprising: a shank portion;	*See* ['583: 1.b]. Also, see the annotated photograph of a representative Matco drill below. 
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially	The Matco drills have an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photograph of a representative Matco drill in ['584: 6.a].

fixed to the cylinder portion opposite the cone portion;	
[’584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d], [’583: 1.k], and [’584: 1.c]. The Matco drills have a plurality of composite cutting blade groups, as seen in the annotated photograph of a representative Matco drill shown below. 
[’584: 6.d] a conical first step surface;	*See* [’583:1.e] and the annotated photograph of a representative Matco drill shown in [’584: 6.c].
[’584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* [’583:1.f] and the annotated photograph of a representative Matco drill shown in [’584: 6.c].
[’584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* [’583:1.g] and the annotated photo of an exemplary Matco drill below.

	
['584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* ['583.1h] and the annotated photo of an exemplary Matco drill in ['584: 6.f].
['584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* ['583: 1.i] and the annotated photo of an exemplary Matco drill in ['584: 6.f].
['584: 6.i] a top blade provided on the front end of the cone portion;	*See* ['583: 1.j] and the annotated photo of an exemplary Matco drill in ['584: 6.f].
['584: 6.j] wherein the cylindrical second step surface of at least one composite	*See* ['583: 1.m] and the annotated photo of an exemplary Matco drill below.

cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	
[’584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Matco drills also have a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated photo of a representative Matco drill in [’584: 6.j].
[’584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step in the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using one of the Matco drills. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; Li at ¶¶ [3, 24, 37, 44].

[’584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 6.l]
[’584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	*See* [’584: 6.l]
[’584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 6.l]
[’584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	This is a natural outcome of using a Matco drill and is, therefore, inherent to the use of the drill.
Claim 7	**Matco Drills**
[’584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	*See* [’584: 2]
Claim 9	**Matco Drills**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	*See* [’583: 5] and the annotated photograph of a representative Matco drill shown below.

	
Claim 10	**Matco Drills**
['584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7] and the annotated photo of a representative Matco drill below.

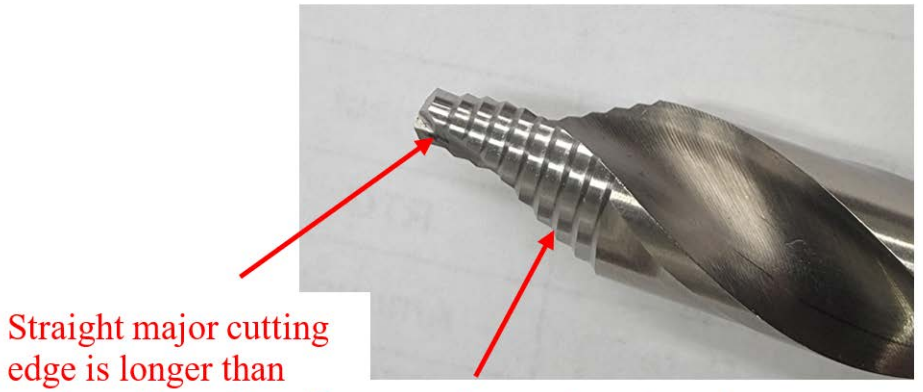
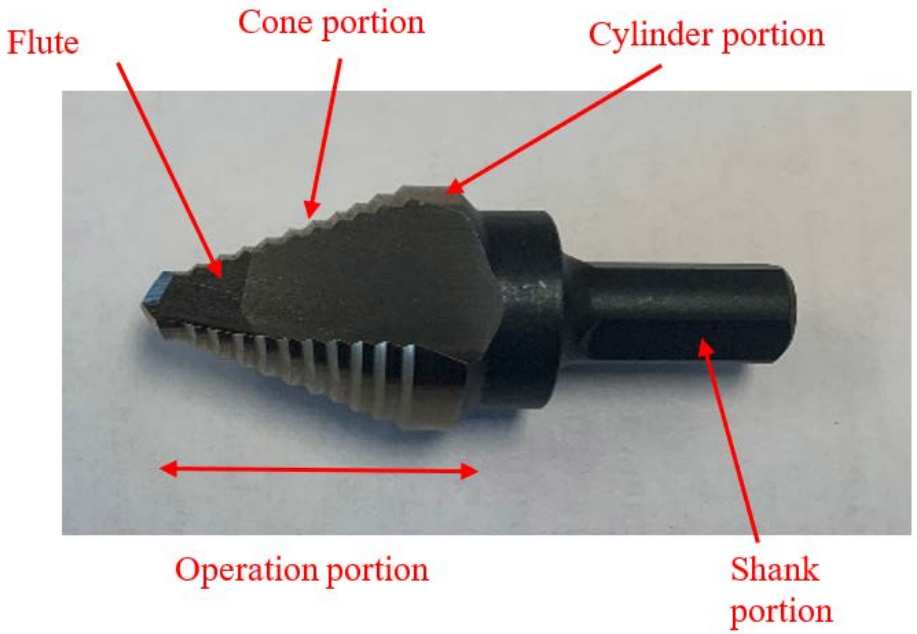
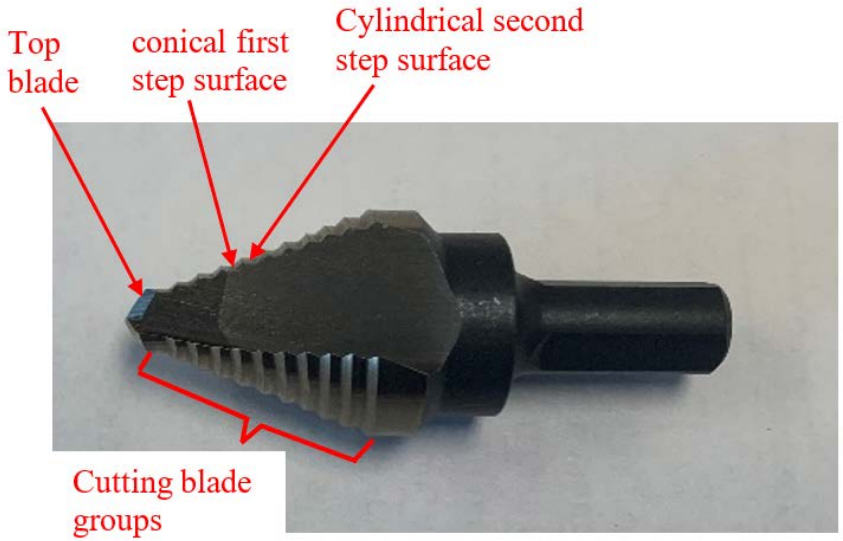
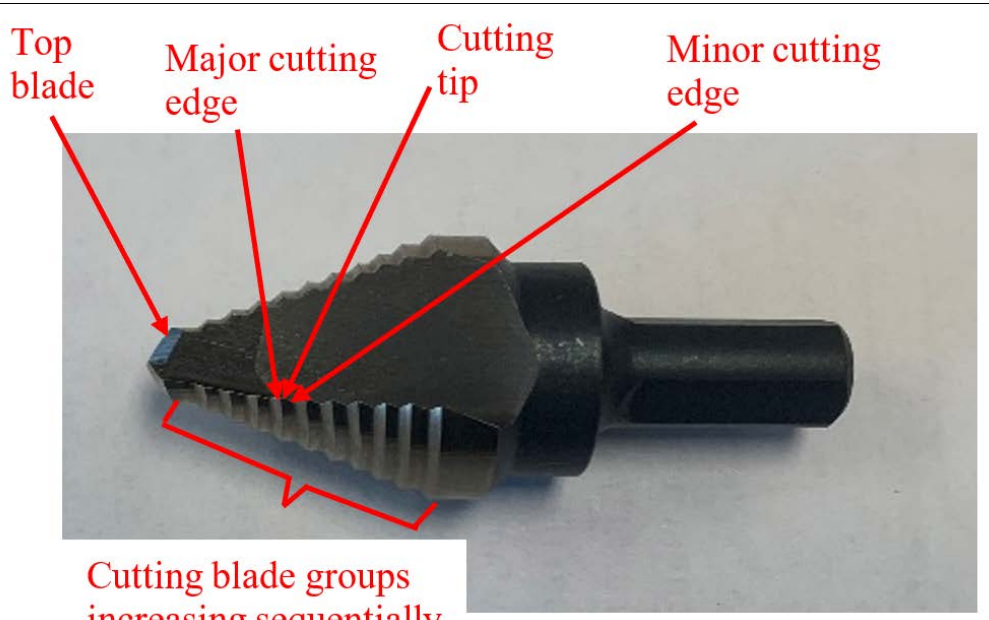
	
Claim 11	**Matco Drills**
['584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	This is a natural outcome of using a Matco drill and is, therefore, inherent to the use of the drill.

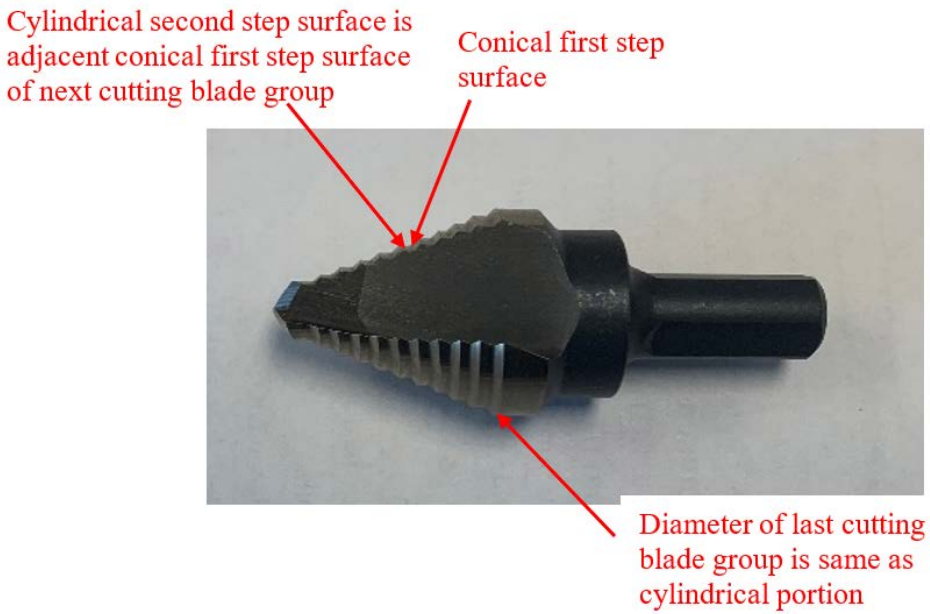
Exhibit C

’583 Patent	
Claim 1	**Viking 00714 Drill**
[’583: 1.pre] A twist drill, comprising:	The preamble carries no patentable weight. The Viking 00714 drill has a flute that extends from a cone portion to a cylinder portion.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	The Viking 00714 drill includes an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion. 
[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	The Viking 00714 drill has a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated photo of an exemplary Viking 00714 drill in [’583: 1.a].
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from	The Viking 00714 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00714 drill in [’583: 1.a].

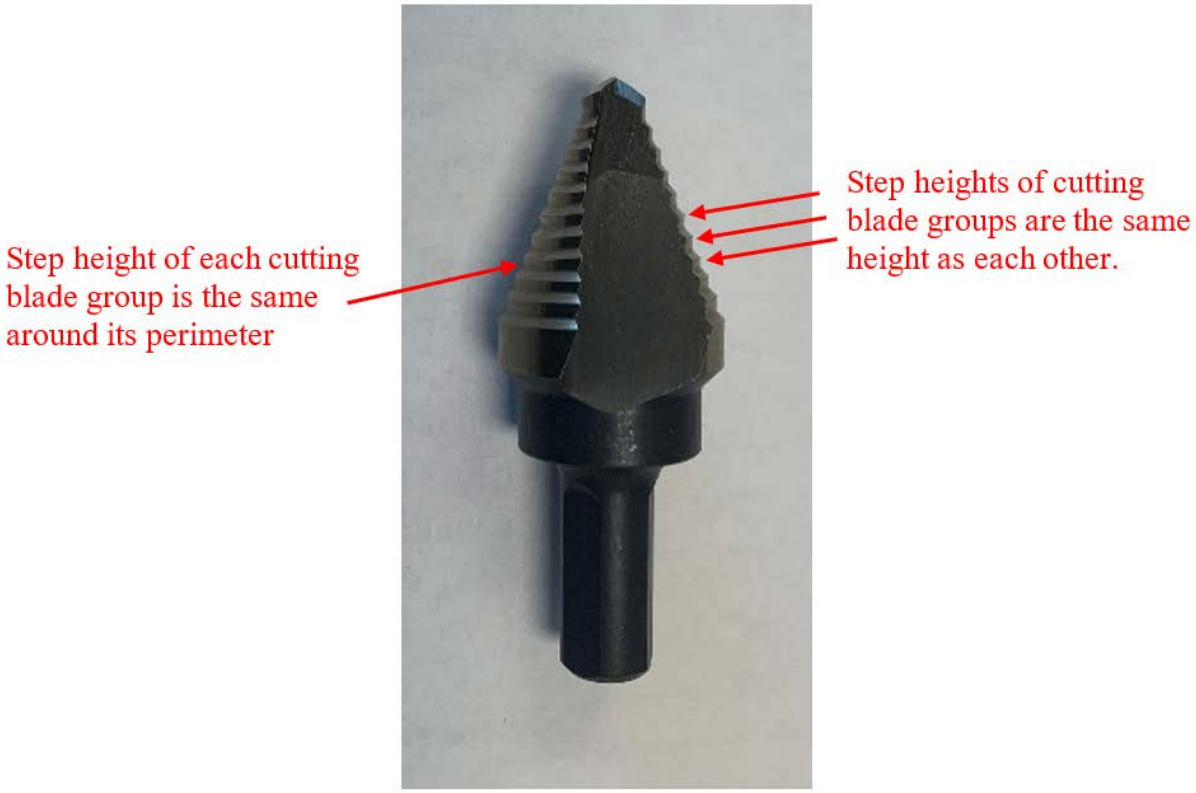
a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	The Viking 00714 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* U.S. Patent No. 10,328,499 ("Durfee I"), 1:33-39 and 3:57 – 6:32; U.S. Patent No. 2,193,186 ("Bannister"), *see* FIG. 2; U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl"), *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], U.S. Patent App. Pub. No. 2011/0116884 ("Li"), FIGs. 1-8; U.S. Patent App. Pub. No. 2018/0133808 ("Wang I"), FIGs. 5-12 and ¶¶ [31, 32, 35, 36]; U.S. Patent No. D840,449 ("Wang II"), FIGs. 1-4, and 6-8; U.S. Patent No. 4,582,458 ("Korb"), FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of Vikings 00714 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	The Viking 00714 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. 

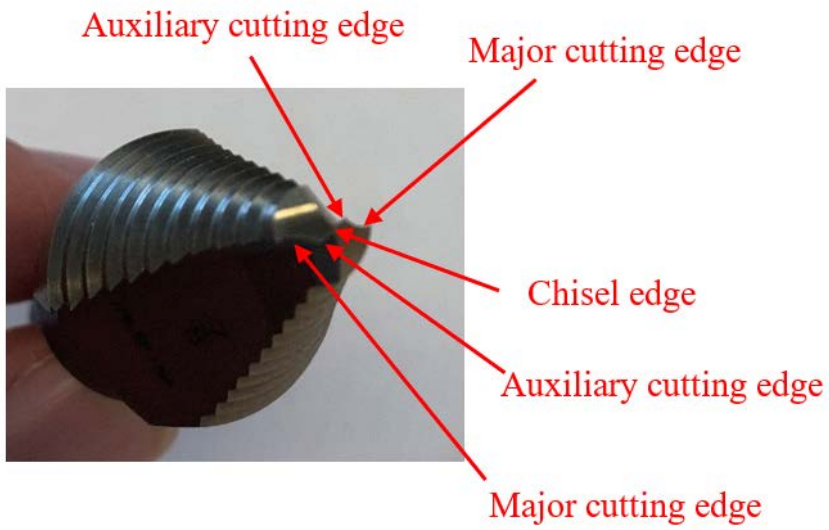
	Plaintiff's infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it is also present in the Viking 00714 drill. The Viking 00714 drill has greater axial relief than the Accused Products.
['583: 1.e] a conical first step surface;	The Viking 00714 has a conical first step surface. *See* annotated photo of an exemplary Viking 00714 drill in ['583: 1.d].
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial, radial and back taper relief does not prevent the second step surfaces from being considered "cylindrical." While Viking disagrees with this contention, based on Plaintiffs' assertion, the Viking 00714 drill has a cylindrical second step surface adjacent to the conical first step surface. *See* annotated photo of an exemplary Viking 00714 drill in ['583: 1.d].
['583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	The Viking 00714 drill has a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute.

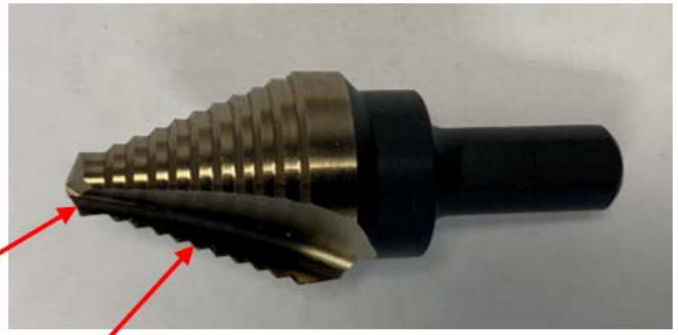
	
[’583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	The Viking 00714 drill has a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* annotated photo of exemplary Viking 00714 drill in [’583: 1.g].
[’583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	The Viking 00714 drill has a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* annotated photo of exemplary Viking 00714 drill in [’583: 1.g].
[’583: 1.j] a top blade provided on the front end of the cone portion;	The Viking 00714 drill has a top blade provided on the front end of the cone portion. *See* annotated photo of exemplary Viking 00714 drill in [’583: 1.g].

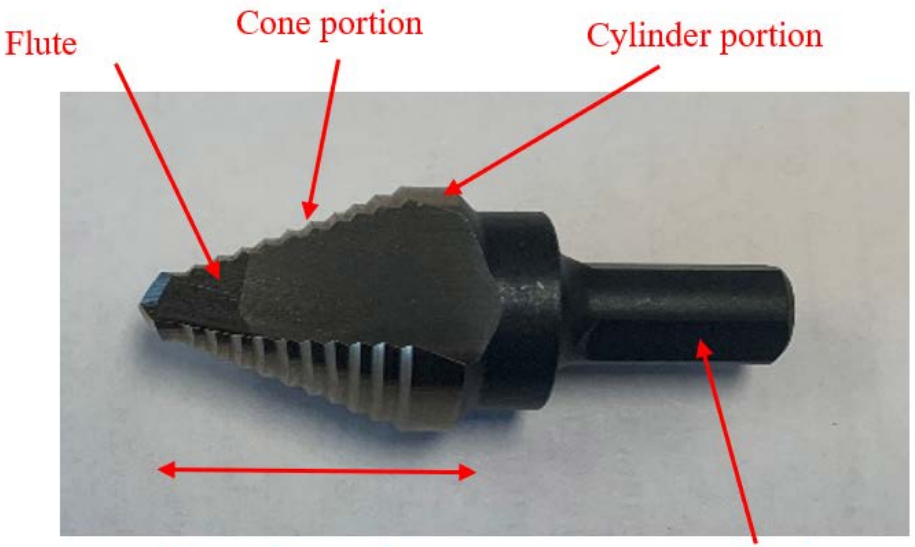
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	With the Viking 00714 drill, a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. *See* annotated photo of a Viking 00714 drill in ['583: 1.g].
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Plaintiff's infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Viking 00714 drill. A person of ordinary skill will understand that the flute of the Viking 00714 drill, either alone or modified with spiral flutes, will shunt chips from the cutting surface out of the drilled hole.
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	In the Viking 00714 drill, at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group. 

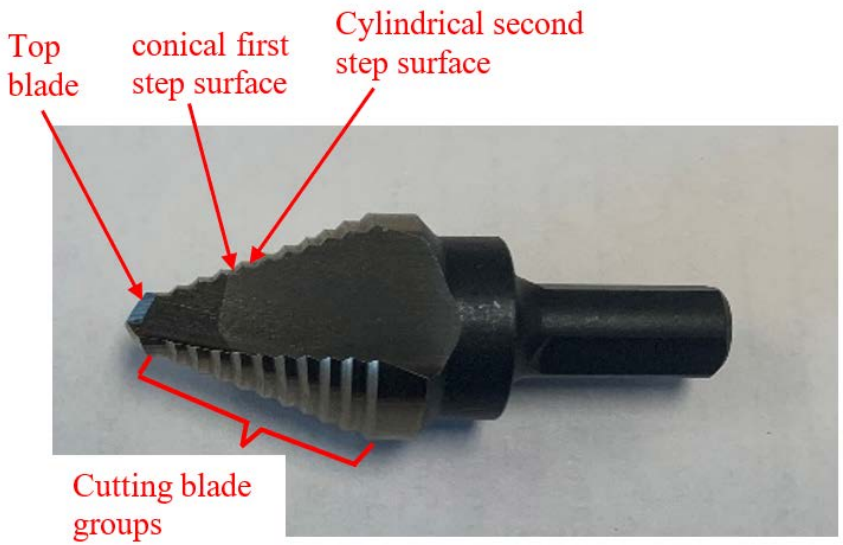
['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in the Viking 00714 drill immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See* annotated photo of exemplary Viking 00714 drill in ['583: 1.m].
Claim 2	**Viking 00714 Drill**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that the claimed smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Viking 00714 drill because it has minor cutting edges.

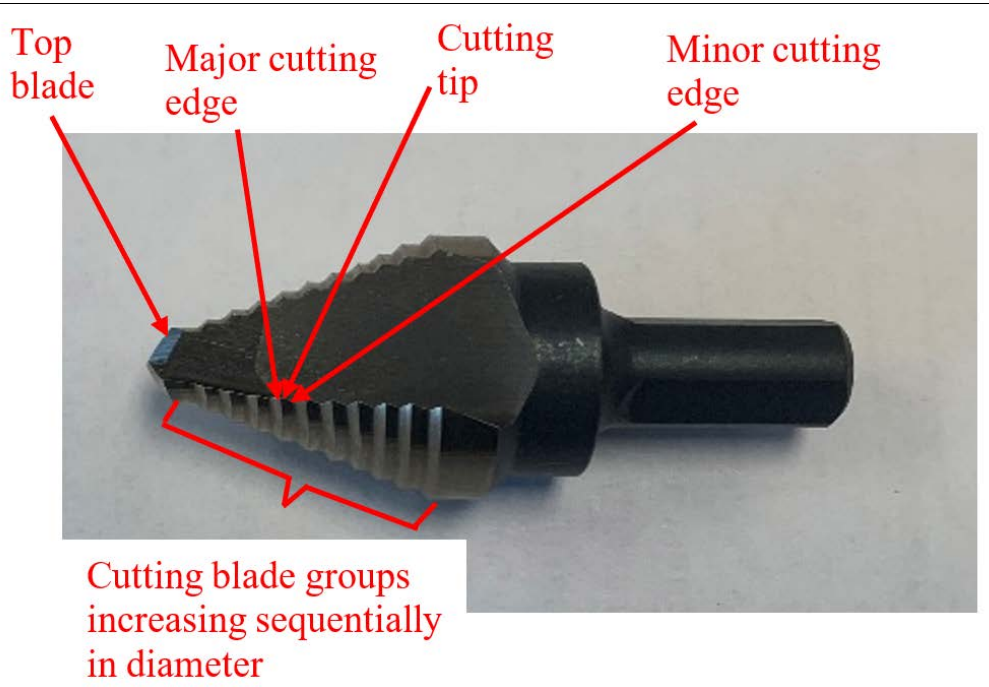
Claim 3	Viking 00714 Drill
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	In the Viking 00714 drill, the height of each composite cutting blade group is the same around its perimeter and the step heights are the same as each other. Thus, if claim 3 is found to not be indefinite, it is met by the Viking 00714 drill. 
Claim 5	**Viking 00714 Drill**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the	The Viking 00714 drill has a split point tip, having a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.

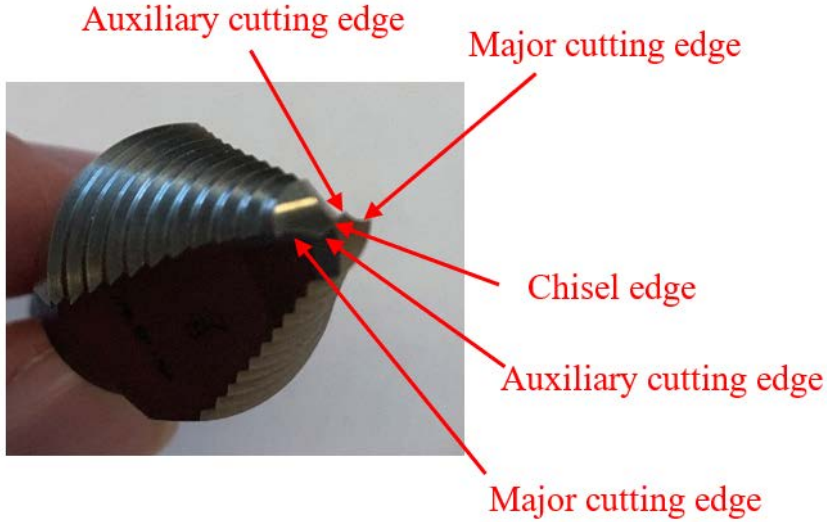
auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 6	**Viking 00714 Drill**
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Defendant disagrees with this contention, based on Plaintiffs' assertion, then this limitation is also present in the Viking 00714 drill.
Claim 7	**Viking 00714 Drill**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	In the Viking 00714, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* the annotated photo of a Viking 00714 drill below.

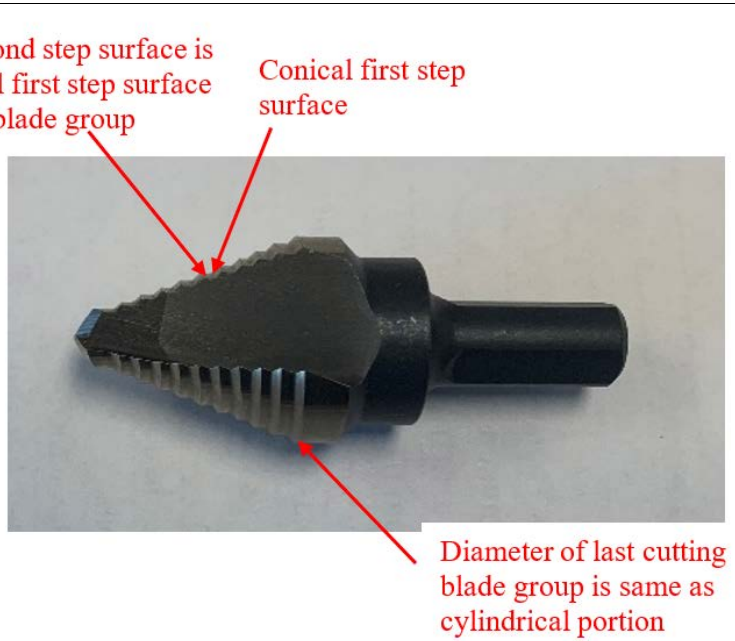
	 Straight major cutting edge is longer than major cutting edge of cutting blade group Major cutting edge of cutting blade group
Claim 8	**Viking 00714 Drill**
[’583: 8.pre] A twist drill, comprising:	The preamble carries no patentable weight. The Viking 00714 drill is a drill having a flute that extends from a cone portion to a cylinder portion.
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* [’583: 1.a].

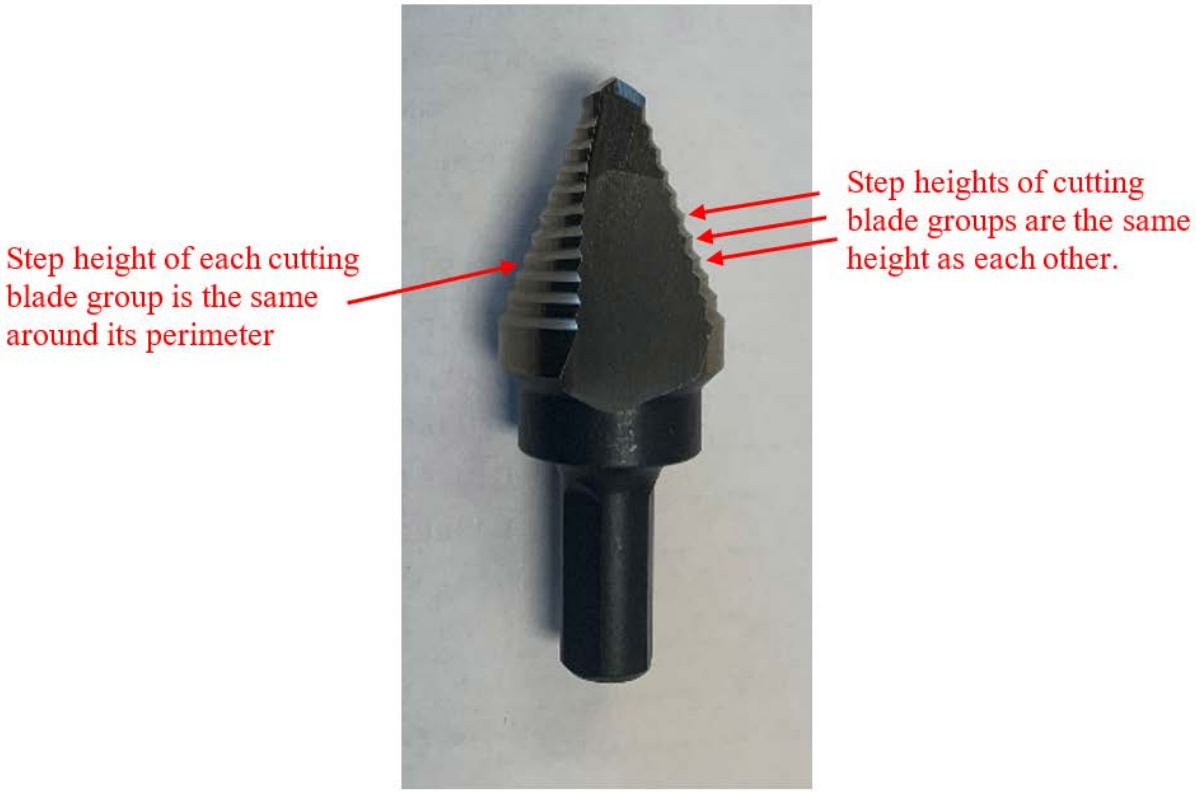
	
['583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* ['583: 1.b] and ['583: 8.a].
['583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* ['583: 1.c] and ['583: 8.a]. The Viking 00714 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00714 drill in ['583: 8.a]. The Viking 00714 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; US Patent No. 9,687,915 ("Durfee II"), 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills

	with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of Vikings 00714 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d]. 
['583: 8.e] a conical first step surface;	*See* ['583: 1.e] and ['583: 8.d].
['583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and ['583: 8.d].
['583: 8.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583: 1.g] and ['583: 8.d].

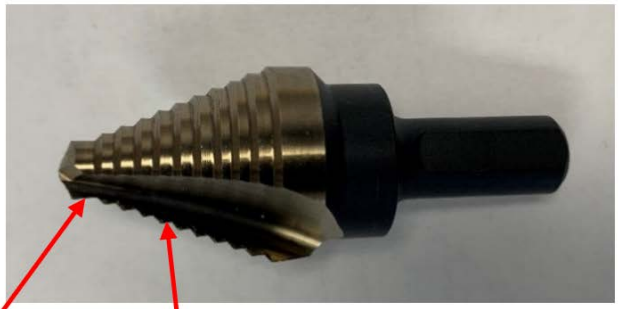
	
['583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* ['583: 1.h], ['583: 2], and the annotated photo of an exemplary Viking 00714 drill in ['583: 8.g].
['583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting	*See* ['583: 1.i] and the annotated photo of an exemplary Viking 00714 drill in ['583: 8.g].

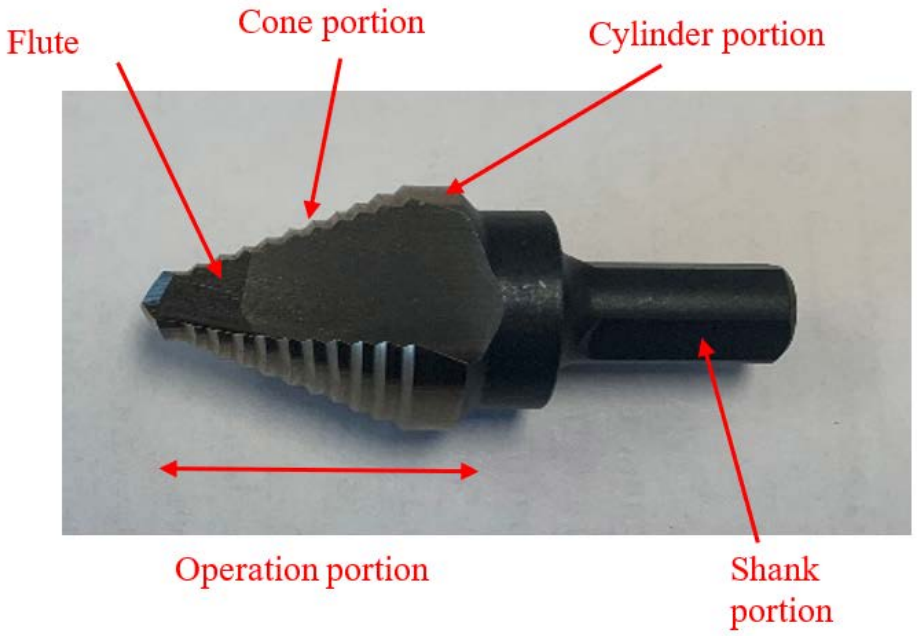
edge, and the sidewall of the spiral flute;	
['583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	*See* ['583: 1.j], ['583: 5], the annotated photo of an exemplary Viking 00714 drill in ['583: 8.g] and the annotated photo of an exemplary Viking 00714 drill below. 
['583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* ['583: 1.k], ['583: 8.g], and the annotated photo of an exemplary Viking 00714 drill below.

	
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00714 drill in [’583: 8.k].
[’583: 8.n] the diameter of the last composite cutting blade group	*See* [’583: 1.n], [’583: 8.g], and the annotated photo of an exemplary Viking 00714 drill in [’583: 8.k].

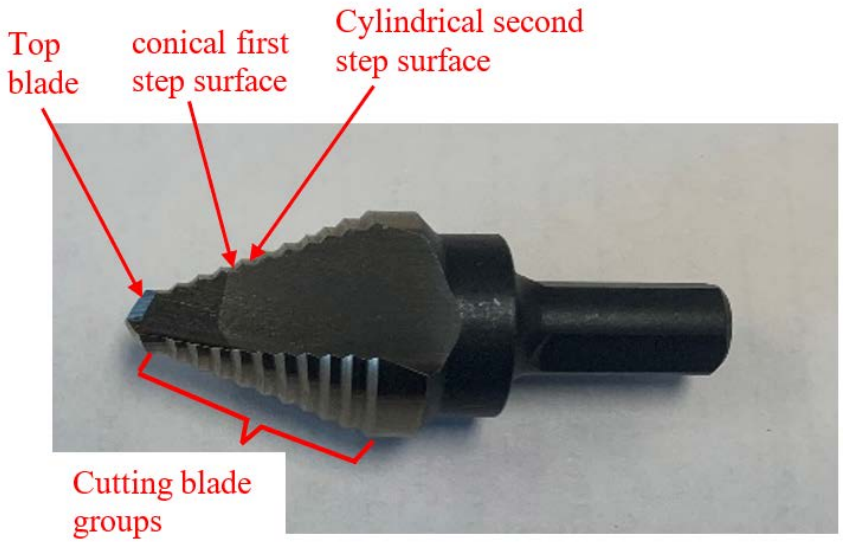
located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	
Claim 9	**Viking 00714 Drill**
['583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* ['583: 3]. 
Claim 11	**Viking 00714 Drill**
['583: 11] The twist drill of claim 8 wherein, each of the plurality of	*See* ['583: 6].

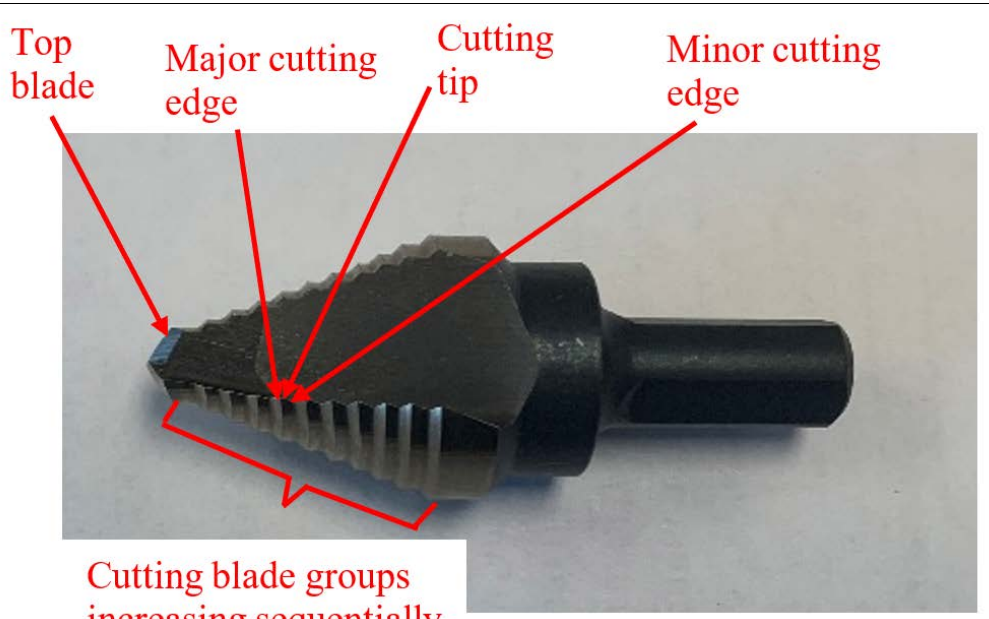
composite cutting blade groups is coaxial with the cone portion.	
Claim 12	**Viking 00714 Drill**
['583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7]. 
Claim 13	**Viking 00714 Drill**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Defendant disagrees with this construction. If, however, this construction is correct, then Viking's 00714 drill has a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* the annotated photo of the 00714 drill below.

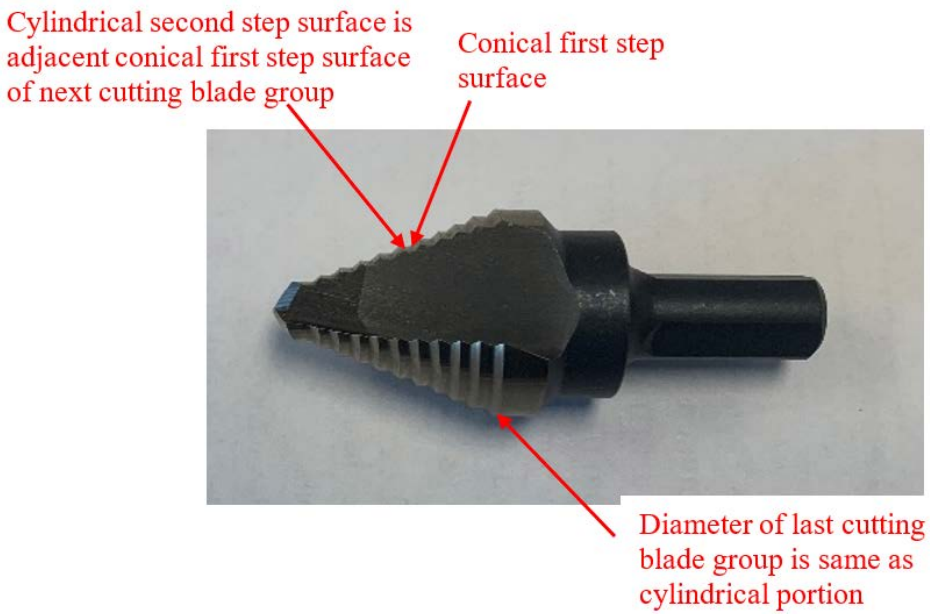
	 Plaintiffs' proposed straight minor cutting edge is longer than minor cutting edge of cutting blade groups Minor cutting edge of cutting blade group
Claim 14	**Viking 00714 Drill**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	The operation portion of the Viking 00714 drill is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.
'584 Patent	
Claim 1	**Viking 00714 Drill**
['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill	Viking's 00714 drill is a drill having a flute that extends from a cone portion to a cylinder portion.

hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	It was well known to one of ordinary skill that the provision of a conical cutting tip to a drill, such as is present in the Viking 00714 drill, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, and 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
['584: 1.a] providing a twist drill comprising: a shank portion;	The Viking 00714 has a shank portion. *See* ['583: 1.b] and ['584: 1.pre]. 
['584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of	The Viking 00714 drill has an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photo of an exemplary Viking 00714 drill reproduced in ['584: 1.a].

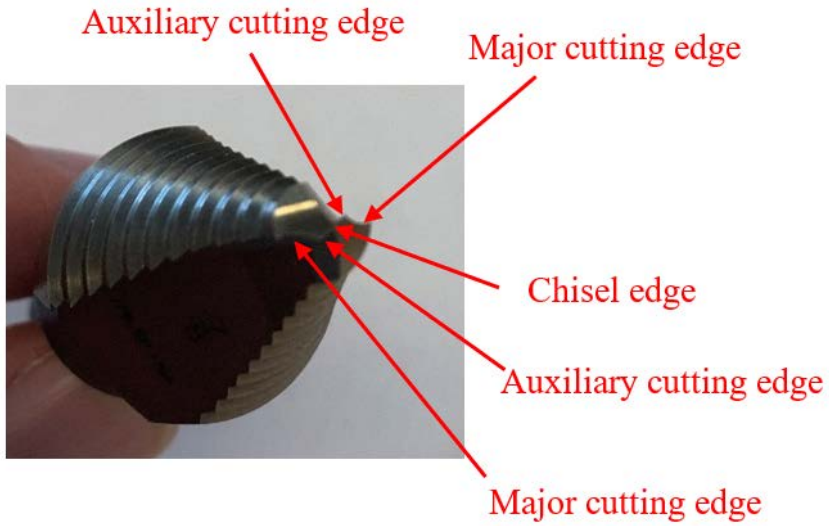
the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	The Viking 00714 has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00714 drill in [’584: 1.a]. The Viking 00714 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; Durfee II, 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of Vikings 00714 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
[’584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	The Viking 00714 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups. *See* [’583: 1.d], [’583: 1.k], and the annotated photograph of a Viking 00714 shown below.

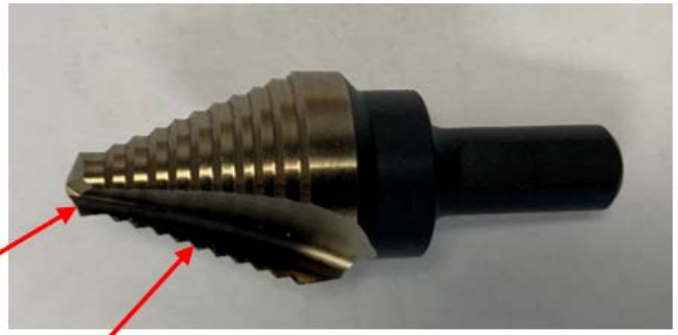
	 Under Plaintiffs' construction, the composite cutting blade groups of the Viking 00714 drills are formed "spirally." *See* ['583: 1.d].
['584: 1.d] a conical first step surface;	*See* ['583: 1.e] and the annotated photograph of a Viking 00714 drill shown in ['584: 1.c].
['584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and the annotated photograph of a Viking 00714 drill shown in ['584: 1.c].
['584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583: 1.g] and the annotated photo of an exemplary Viking 00714 drill below.

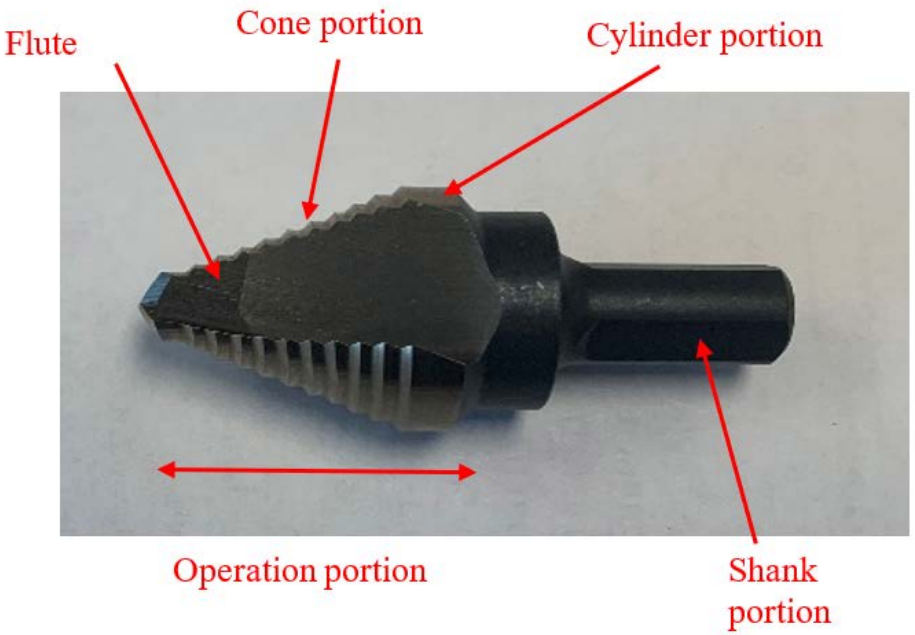
	
['584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* ['583: 1h] and the annotated photo of an exemplary Viking 00714 drill in ['584: 1.f].
['584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* ['583: 1i] and the annotated photo of an exemplary Viking 00714 drill in ['584: 1.f].
['584: 1.i] a top blade provided on the front end of the cone portion;	*See* ['583: 1j] and the annotated photo of an exemplary Viking 00714 drill in ['584: 1.f].

['584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* ['583: 1.m] and the annotated photo of an exemplary Viking 00714 drill below. 
['584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Viking 00714 drill also has a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* ['583: 1.n] and the annotated photo of an exemplary Viking 00714 drill in ['584: 1.j].
['584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step of the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using a Viking 00714 drill. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].

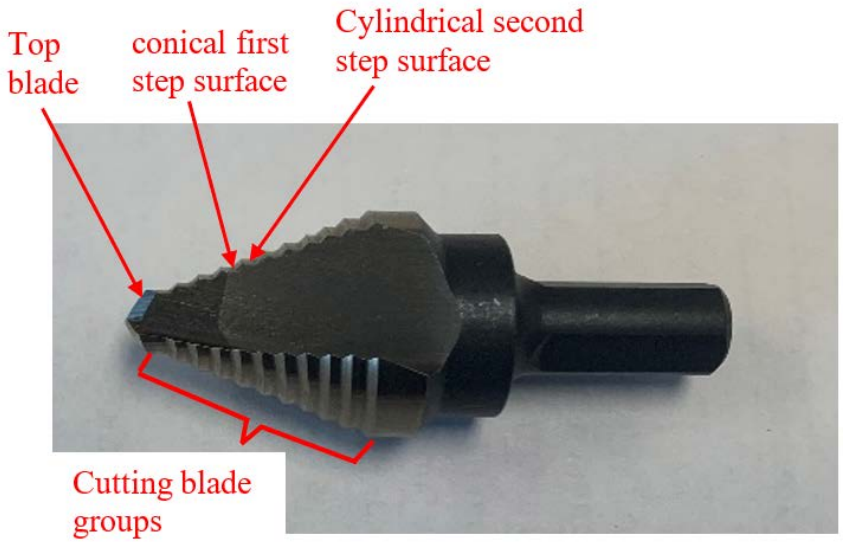
[’584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 1.l].
[’584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	*See* [’584: 1.l].
[’584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 1.l].
[’584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	This is a natural outcome of the geometry of the cone portion of the Viking 00714 drill.
[’584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	*See* [’584: 1.l].
Claim 2	**Viking 00714 Drill**
[’584: 2] The method of claim **1** wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs’ infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in the Viking 00714 drill because it has minor cutting edges.
Claim 4	**Viking 00714 Drill**

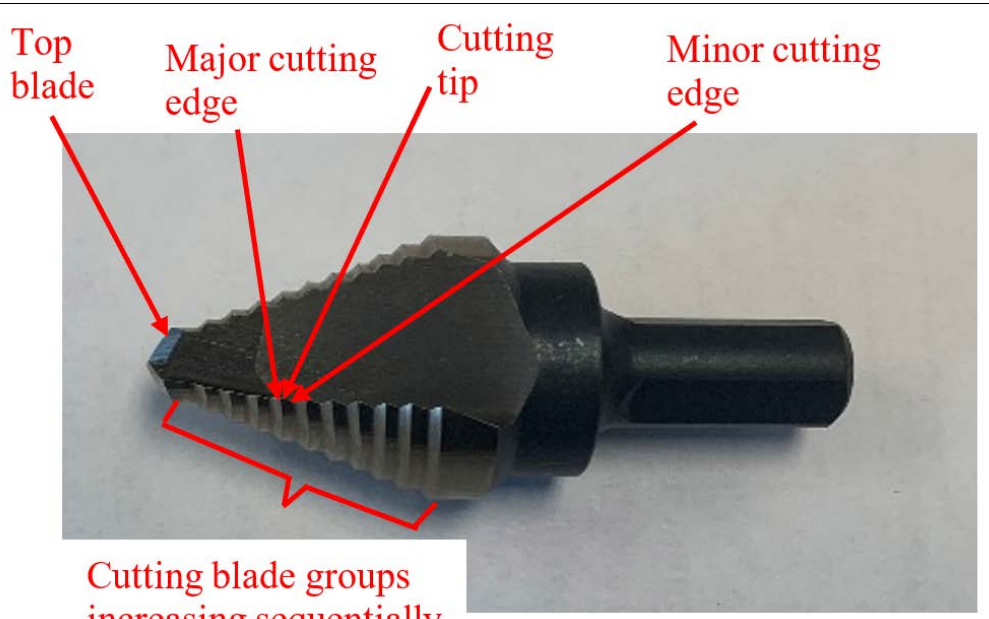
['584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	The Viking 00714 drill has a top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* ['583: 5] and the annotated photograph of a Viking 00714 drill shown below. 
Claim 5	**Viking 00714 Drill**
['584: 5] The method of claim **1** wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	The Viking 00714 has a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* ['583: 7] and the annotated photo of a Viking 00714 drill below.

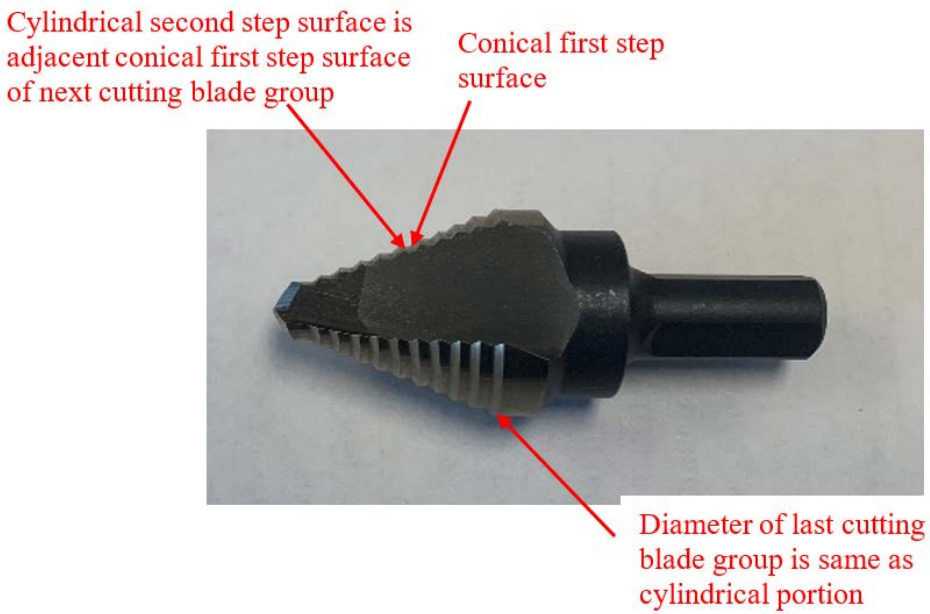
	 Straight major cutting edge is longer than major cutting edge of cutting blade group Major cutting edge of cutting blade group
Claim 6	**Viking 00714 Drill**
[’584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	Viking’s 00714 drill has a flute that extends from a cone portion to a cylinder portion. It was well known to one of ordinary skill that the provision of a conical cutting tip to a drill, such as is present in the Viking 00714 drill, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, and 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
[‘584: 6.a] providing a twist drill comprising: a shank portion;	The Viking 00714 drill has a shank portion. *See* [’583: 1.b] and [’584: 6.pre].

	
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the	The Viking 00714 drill has an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photo of an exemplary Viking 00714 drill reproduced in ['584: 6.a]. The Viking 00714 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00714 drill in ['584: 6.a].

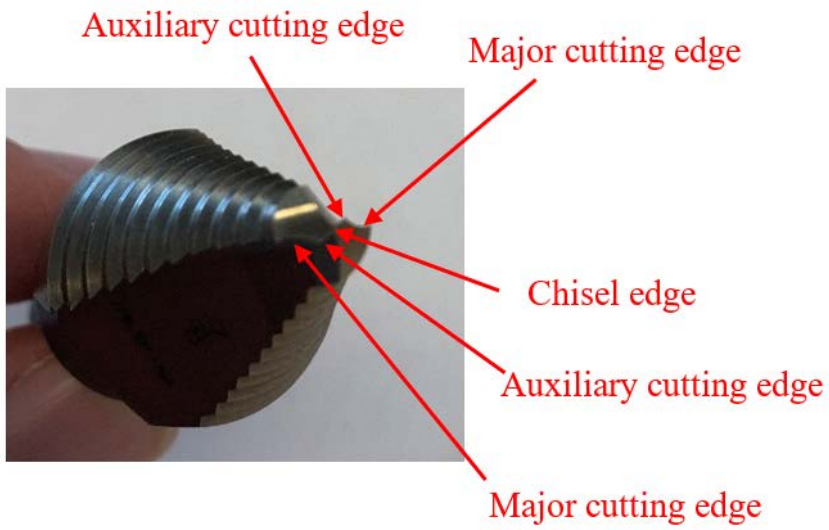
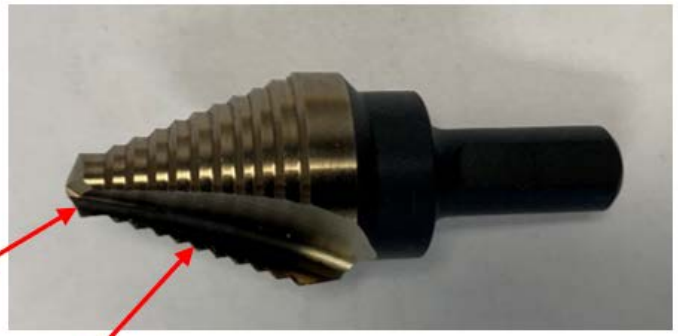
cylinder portion opposite the cone portion;	The Viking 00714 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; Durfee II, 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of Vikings 00714 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d], ['583: 1.k], and ['584: 1.c]. The Viking 00714 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups. *See* the annotated photo of an exemplary Viking 00714 drill reproduced below.

	 Under Plaintiffs' construction, the composite cutting blade groups of the Viking 00714 drills are formed "spirally." *See* ['583: 1.d].
['584: 6.d] a conical first step surface;	*See* ['583: 1.e] and the annotated photograph of a Viking 00714 drill shown in ['584: 6.c].
['584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and the annotated photograph of a Viking 00714 drill shown in ['584: 6.c].
['584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583: 1.g] and the annotated photo of an exemplary Viking 00714 drill below.

	
['584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* ['583: 1h] and the annotated photo of an exemplary Viking 00714 drill in ['584: 6.f].
['584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* ['583: 1i] and the annotated photo of an exemplary Viking 00714 drill in ['584: 6.f].
['584: 6.i] a top blade provided on the front end of the cone portion;	*See* ['583: 1j] and the annotated photo of an exemplary Viking 00714 drill in ['584: 6.f].

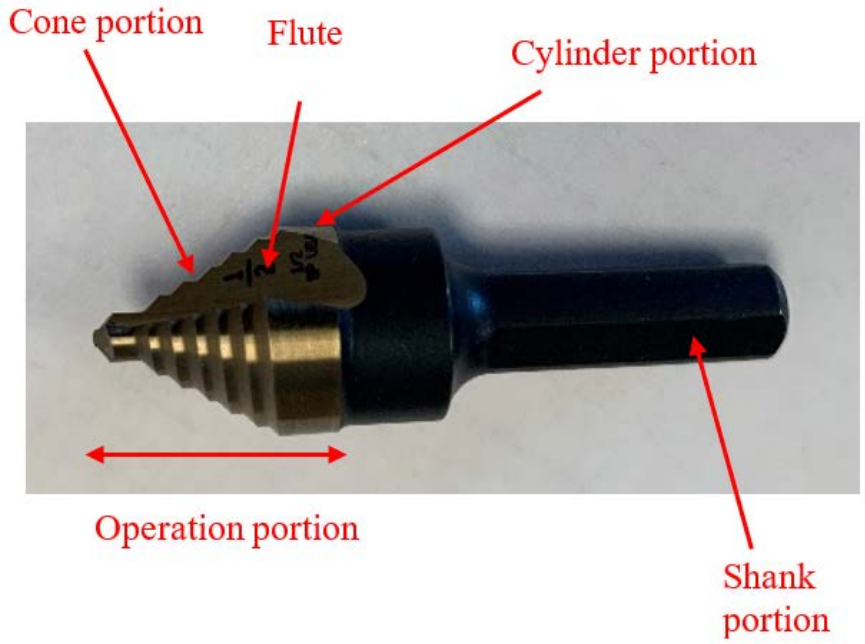
['584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* ['583: 1.m] and the annotated photo of an exemplary Viking 00714 drill below. 
['584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Viking 00714 drill also has a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* ['583: 1.n] and the annotated photo of a Viking 00714 drill in ['584: 6.j].
['584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step of the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using a Viking 00714 drill. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].

[’584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 6.l].
[’584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	*See* [’584: 6.l].
[’584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 6.l].
[’584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	This is a natural outcome of using a Viking 00714 drill and is, therefore, inherent to the use of the drill.
Claim 7	**Viking 00714 Drill**
[’584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	*See* [’584: 2].
Claim 9	**Viking 00714 Drill**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two	*See* [’583: 5] and the annotated photograph of a Viking 00714 drill shown below.

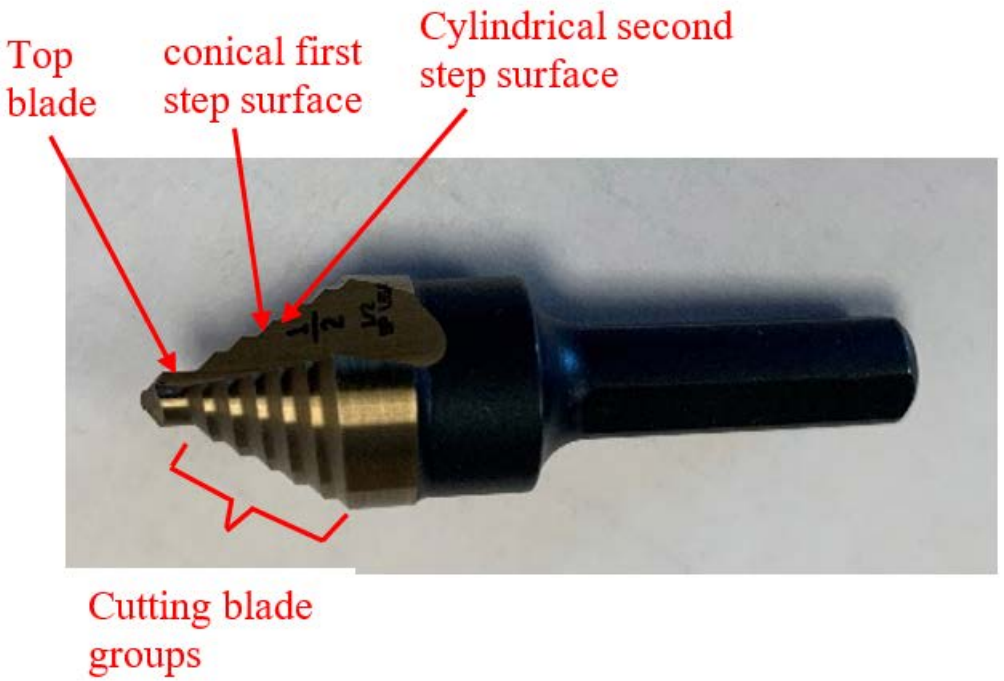
auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 10	**Viking 00714 Drill**
[’584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [‘583: 7] and the annotated photo of a Viking 00714 drill below. 
Claim 11	**Viking 00714 Drill**

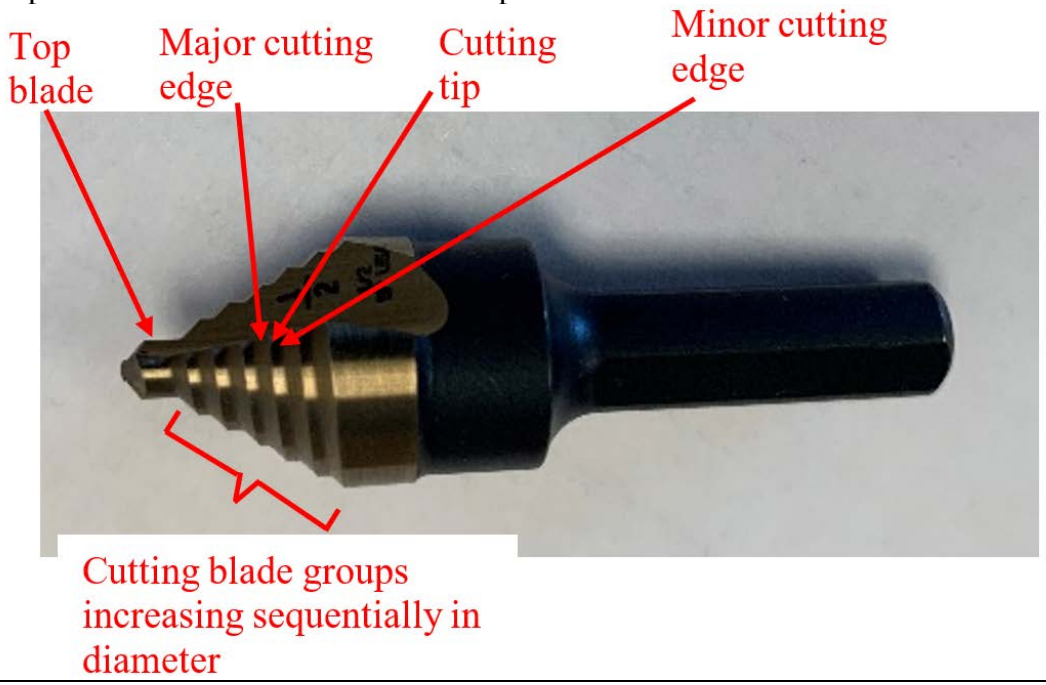
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	This is a natural outcome of using a Viking 00714 drill and is, therefore, inherent to the use of the drill.

Exhibit D

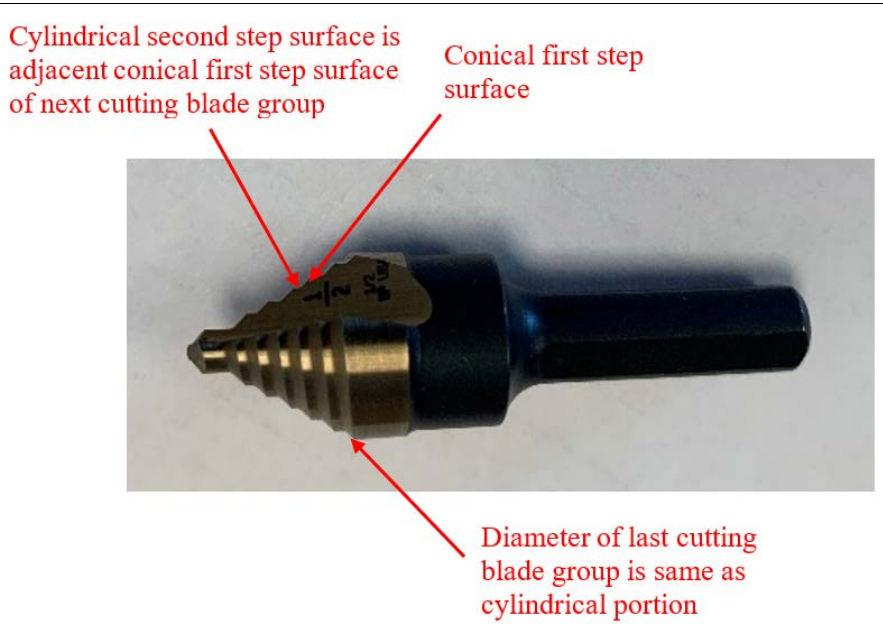
’583 Patent	
Claim 1	**Viking 00693 Drill**
[’583: 1.pre] A twist drill, comprising:	The preamble carries no patentable weight. The Viking 00693 drill is a drill having a flute that extends from a cone portion to a cylinder portion.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	The Viking 00693 drill includes an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion. 
[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	The Viking 00693 drill has a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated photo of an exemplary Viking 00693 drill in [’583: 1.a].
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the	The Viking 00693 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00693 drill in [’583: 1.a]. The Viking 00693 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.*

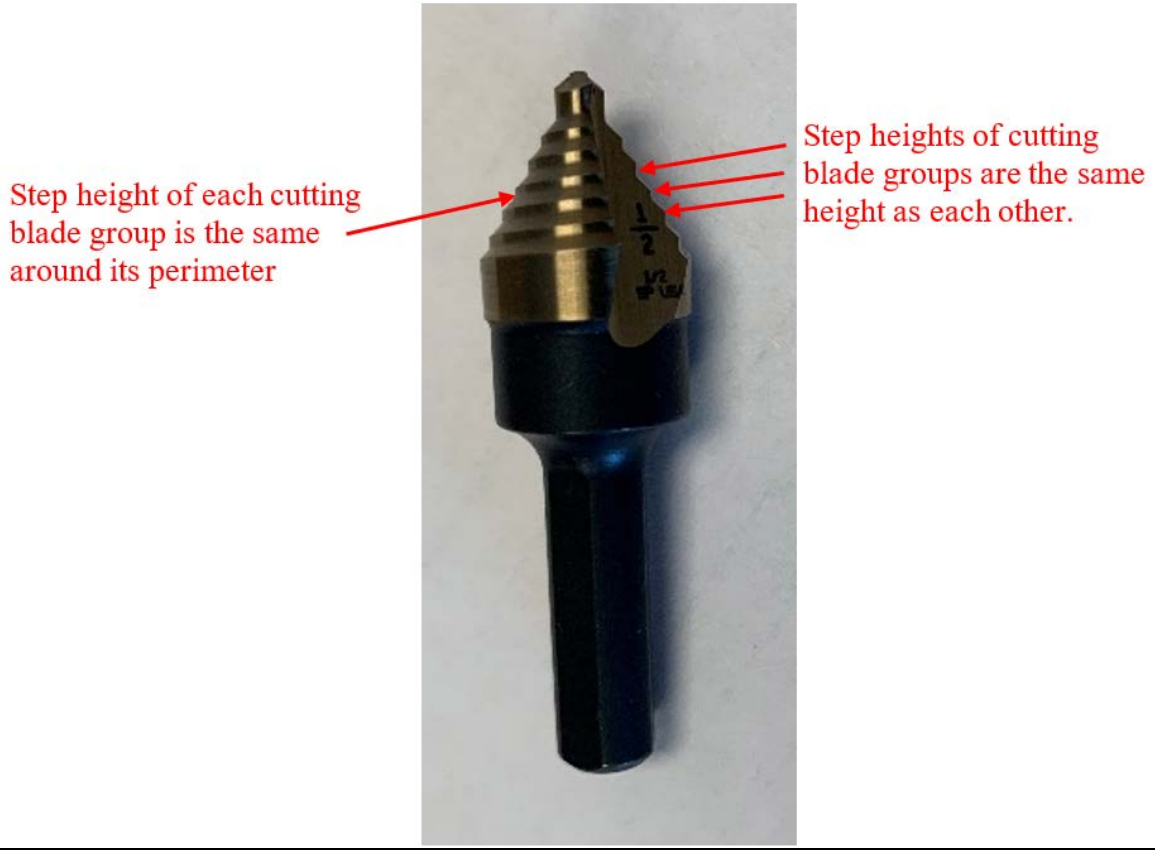
cylinder portion, the spiral flute having a sidewall;	U.S. Patent No. 10,328,499 ("Durfee I"), 1:33-39 and 3:57 – 6:32; U.S. Patent No. 2,193,186 ("Bannister"), *see* FIG. 2; U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl"), *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], U.S. Patent App. Pub. No. 2011/0116884 ("Li"), FIGs. 1-8; U.S. Patent App. Pub. No. 2018/0133808 ("Wang I"), FIGs. 5-12 and ¶¶ [31, 32, 35, 36]; U.S. Patent No. D840,449 ("Wang II"), FIGs. 1-4, and 6-8; U.S. Patent No. 4,582,458 ("Korb"), FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00693 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	The Viking 00693 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion.

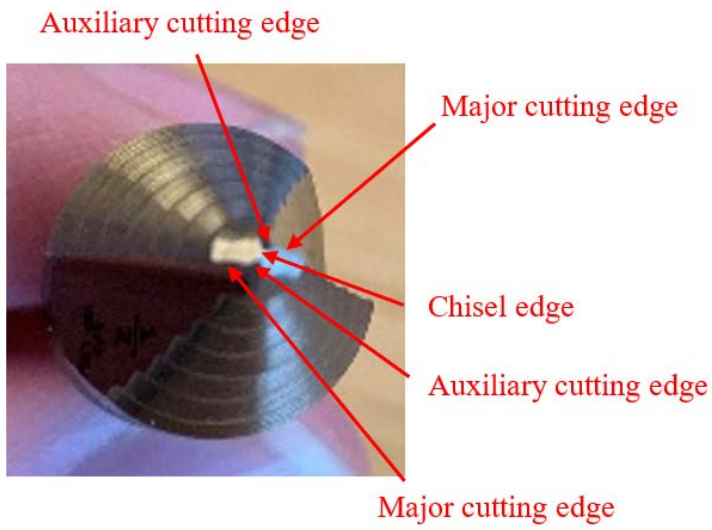
	 Plaintiff's infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it is also present in the Viking 00693 drill. The Viking 00693 drill has greater axial relief than the Accused Products.
['583: 1.e] a conical first step surface;	The Viking 00693 drill has a conical first step surface. *See* annotated photo of an exemplary Viking 00693 drill in ['583: 1.d].
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial, radial, and back taper relief does not prevent the second step surfaces from being considered "cylindrical." While Viking disagrees with this contention, based on Plaintiffs' assertion, the Viking 00693 drill has a cylindrical second step surface adjacent to the conical first step surface. *See* annotated photo of an exemplary Viking 00693 drill in ['583: 1.d].

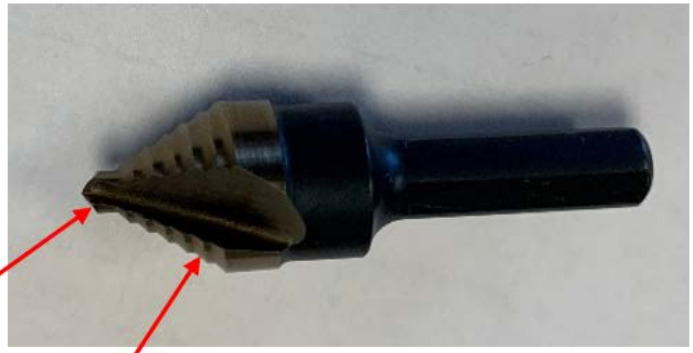
['583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	The Viking 00693 drill has a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. 
['583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	The Viking 00693 drill has a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* annotated photo of exemplary Viking 00693 drill in ['583: 1.g].
['583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	The Viking 00693 drill has a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* annotated photo of exemplary Viking 00693 drill in ['583: 1.g].

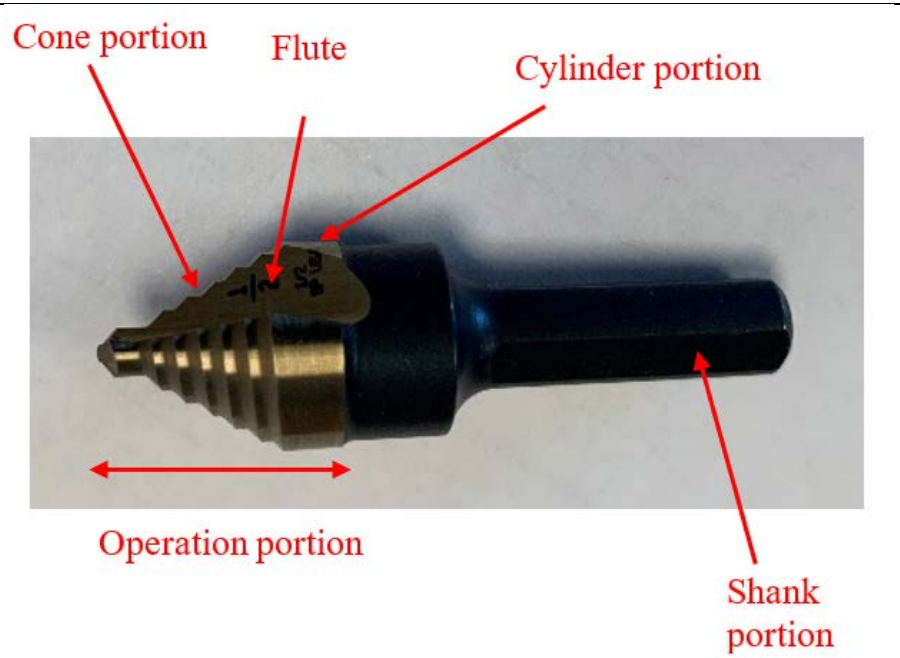
['583: 1.j] a top blade provided on the front end of the cone portion;	The Viking 00693 drill has a top blade provided on the front end of the cone portion. *See* annotated photo of exemplary Viking 00693 drill in ['583: 1.g].
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	With the Viking 00693 drill, a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. *See* annotated photo of exemplary Viking 00693 drill in ['583: 1.g].
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Plaintiff's infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Viking 00693 drill. A person of ordinary skill will understand that the Viking 00693 drill modified with spiral flutes will shunt chips from the cutting surface out of the drilled hole.
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	In the Viking 00693 drill, at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group.

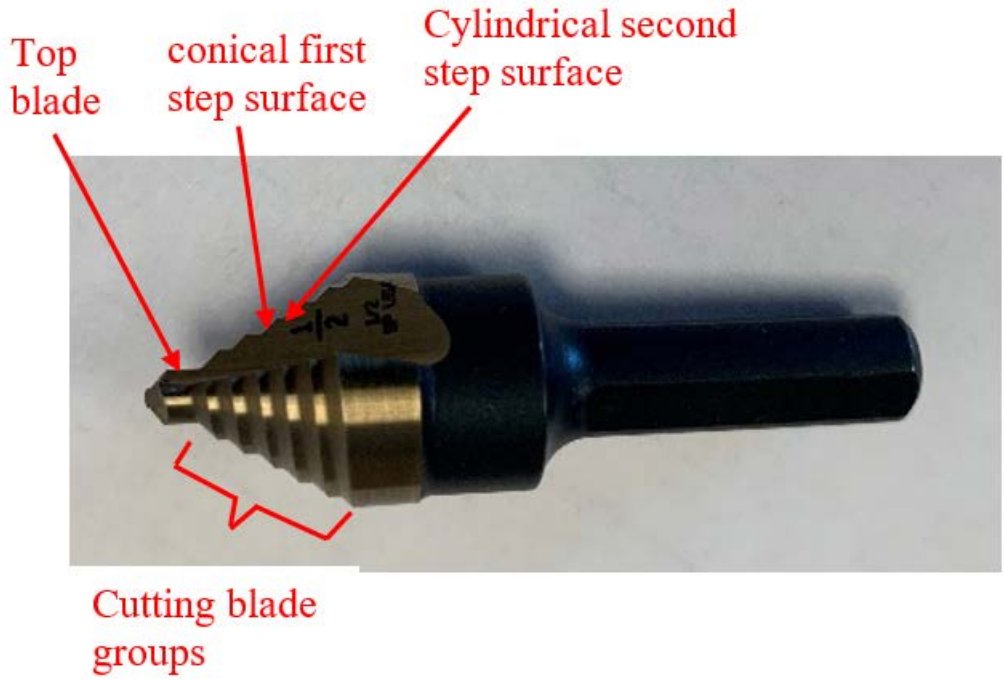
	
['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in the Viking 00693 drill immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See* annotated photo of exemplary Viking 00693 drill in ['583: 1.m].
Claim 2	**Viking 00693 Drill**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Viking 00693 drill because it has minor cutting edges.

Claim 3	**Viking 00693 Drill**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	In the Viking 00693 drill, the height of each composite cutting blade group the same around its perimeter and the step heights are the same as each other. Thus, if claim 3 is found to not be indefinite, it is met by the Viking 00693 drill. 
Claim 5	**Viking 00693 Drill**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two	Viking 00693 drill has a split point tip, having a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.

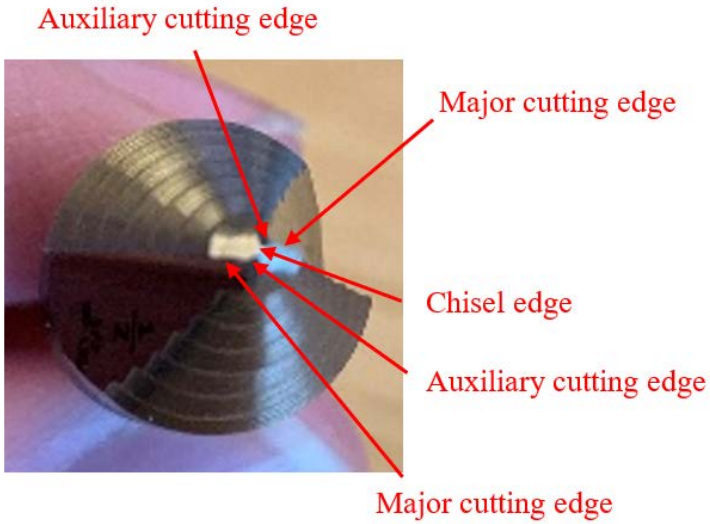
auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 6	**Viking 00693 Drill**
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Defendant disagrees with this contention, based on Plaintiffs' assertion, then this limitation is also present in the Viking 00693 drill.
Claim 7	**Viking 00693 Drill**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	In the Viking 00693 drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* the annotated photo of a Viking 00693 drill below.

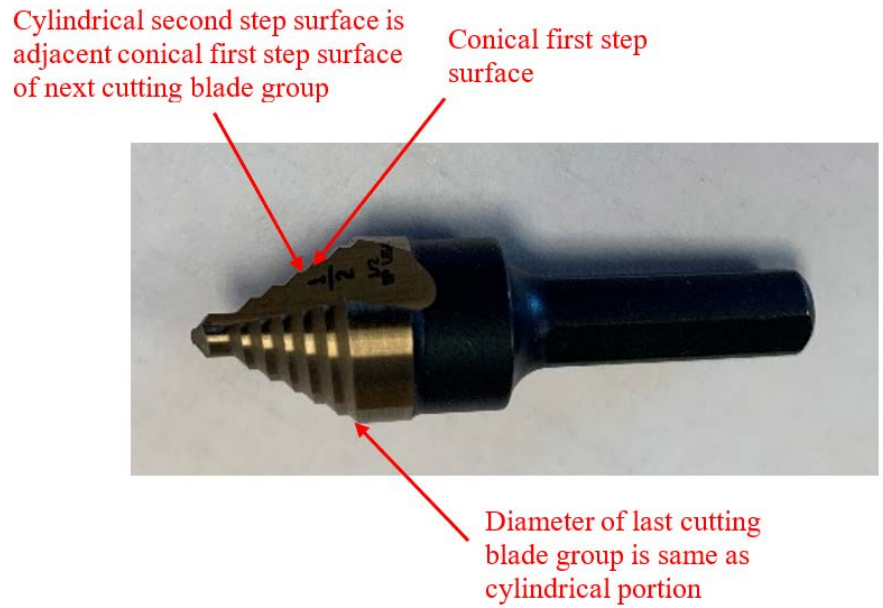
	 Straight major cutting edge is longer than major cutting edge of cutting blade group Major cutting edge of cutting blade group
Claim 8	**Viking 00693 Drill**
[’583: 8.pre] A twist drill, comprising:	The Viking 00693 drill is a drill having a flute that extends from a cone portion to a cylinder portion. *See* [’583: 1.pre].
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* [’583: 1.a].

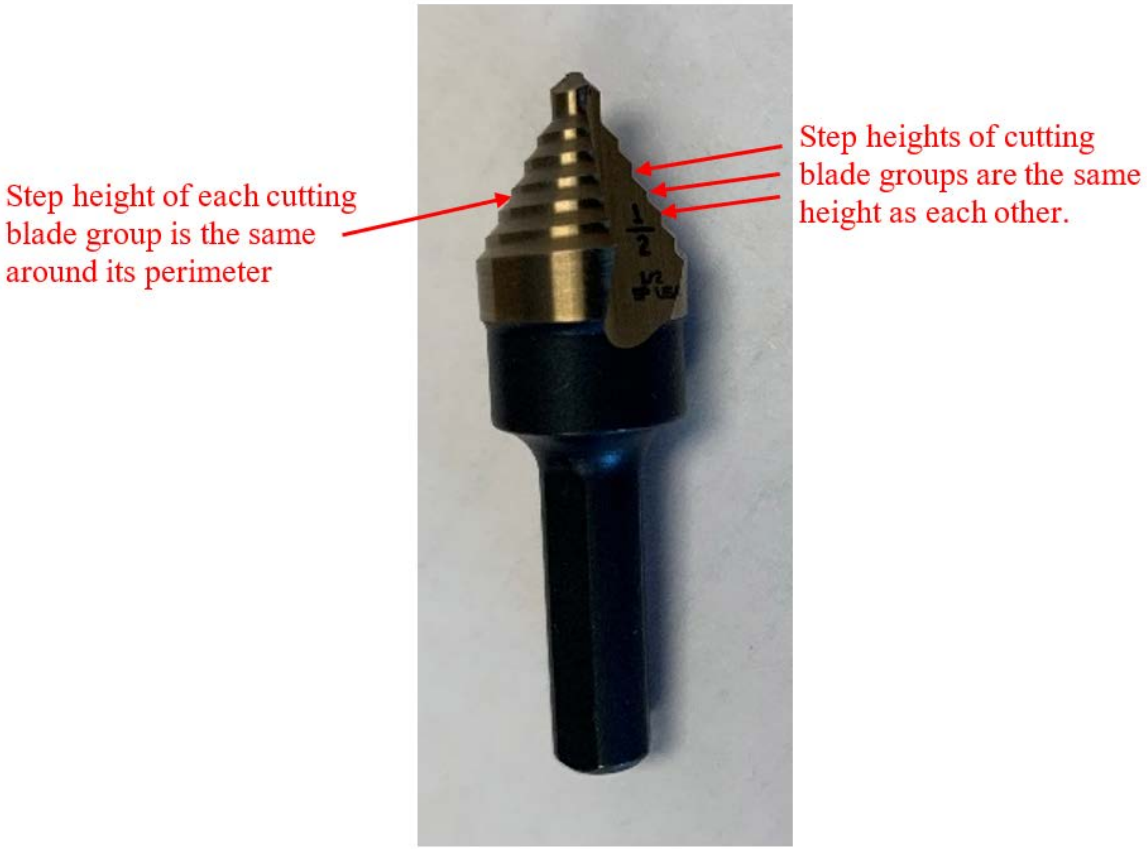
	
['583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* ['583: 1.b] and ['583: 8.a].
['583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* ['583: 1.c] and ['583: 8.a]. The Viking 00693 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00693 drill in ['583: 8.a]. The Viking 00693 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; US Patent No. 9,687,915 ("Durfee II"), 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills

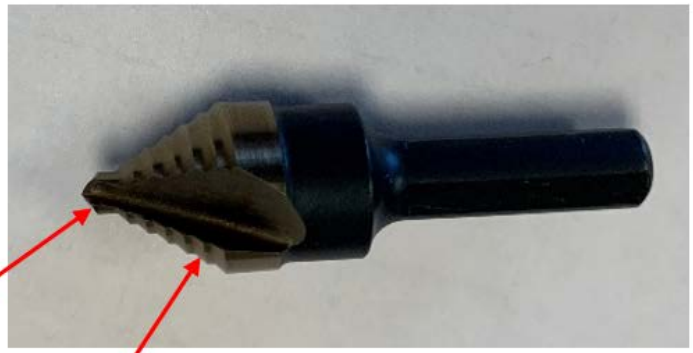
	with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00693 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
[’583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d]. 
[’583: 8.e] a conical first step surface;	*See* [’583: 1.e] and [’583: 8.d].
[’583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* [’583: 1.f] and [’583: 8.d].

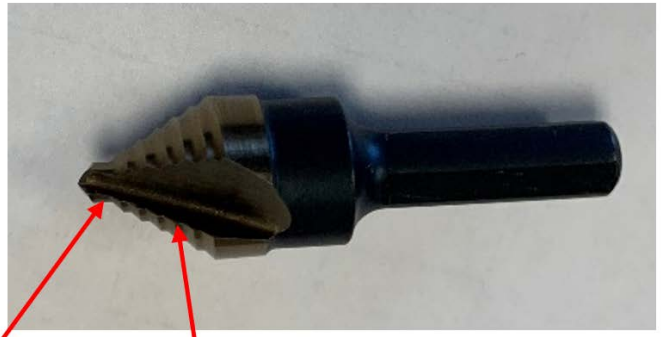
['583: 8.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583: 1.g] and ['583: 8.d]. 
['583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* ['583: 1.h], ['583: 2], and the annotated photo of an exemplary Viking 00693 drill in ['583: 8.g].
['583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting	*See* ['583: 1.i] and the annotated photo of an exemplary Viking 00693 drill in ['583: 8.g].

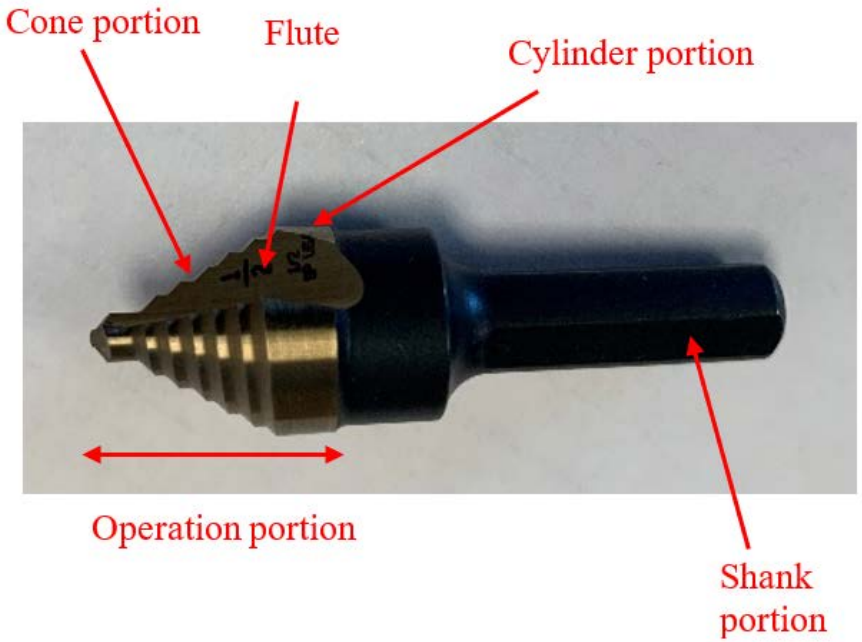
edge, and the sidewall of the spiral flute;	
[’583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	*See* [’583: 1.j], [’583: 5], the annotated photo of an exemplary Viking 00693 drill in [’583: 8.g] and the annotated photo of an exemplary Viking 00693 drill below. 
[’583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* [’583: 1.k], [’583: 8.g], and the annotated photo of an exemplary Viking 00693 below.

	
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00693 drill in [’583: 8.k].
[’583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone	*See* [’583: 1.n], [’583: 8.g], and the annotated photo of an exemplary Viking 00693 drill in [’583: 8.k].

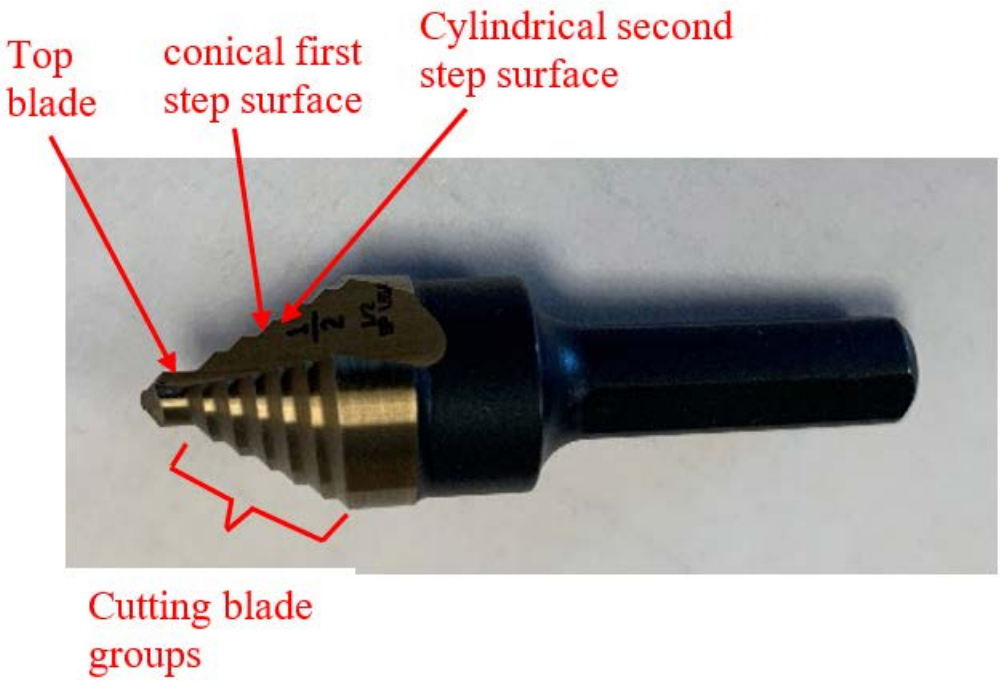
portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	
Claim 9	**Viking 00693 Drill**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* [’583: 3]. 
Claim 11	**Viking 00693 Drill**

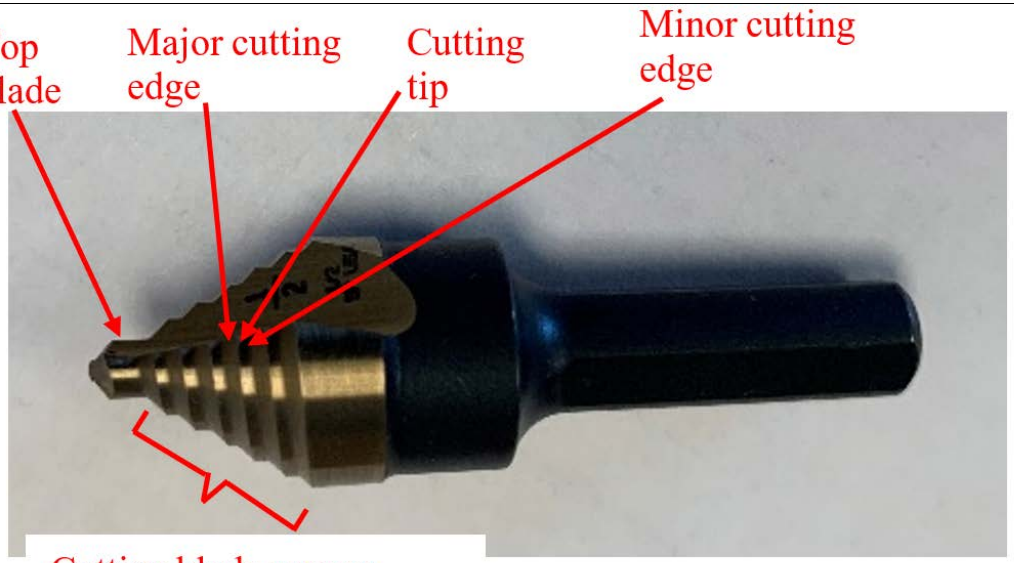
['583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* ['583: 6].
Claim 12	**Viking 00693 Drill**
['583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7]. 
Claim 13	**Viking 00693 Drill**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Defendant disagrees with this construction. If, however, this construction is correct, then the Viking 00693 drill has a straight minor cutting

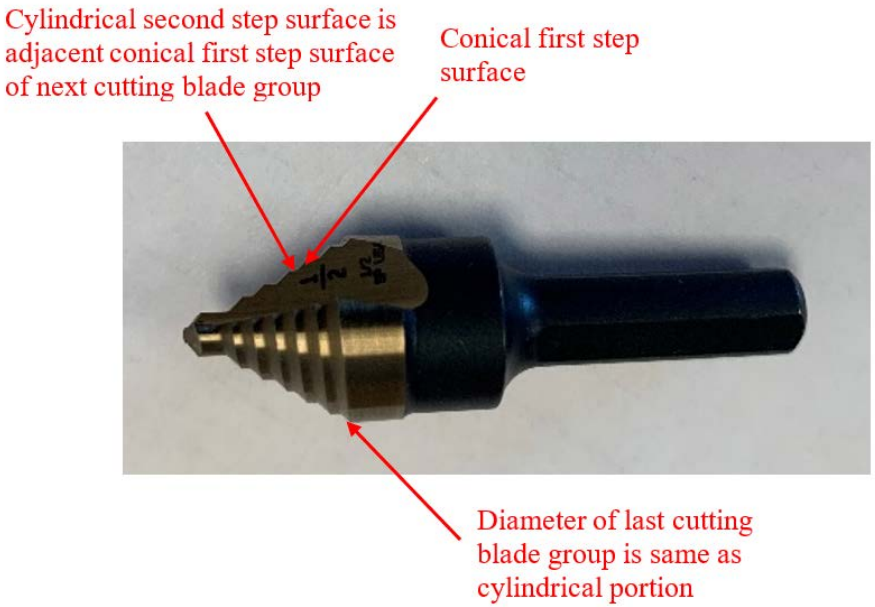
	edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* the annotated photo of the Viking 00693 drill below. 
Claim 14	**Viking 00693 Drill**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	The operation portion of the Viking 00693 drill is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.
'584 Patent	
Claim 1	**Viking 00693 Drill**

['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	The Viking 00693 drill is a drill having a flute that extends from a cone portion to a cylinder portion. However, it was well known to one of ordinary skill that the provision of a conical cutting tip to a drill, such as is present in the Viking 00693 drill, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, and 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
['584: 1.a] providing a twist drill comprising: a shank portion;	The Viking 00693 drill has a shank portion. *See* ['583: 1.b] and ['584: 1.pre]. 
['584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising	The Viking 00693 drill has an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a flute having a sidewall and being formed into an exterior surface of the operating portion extending

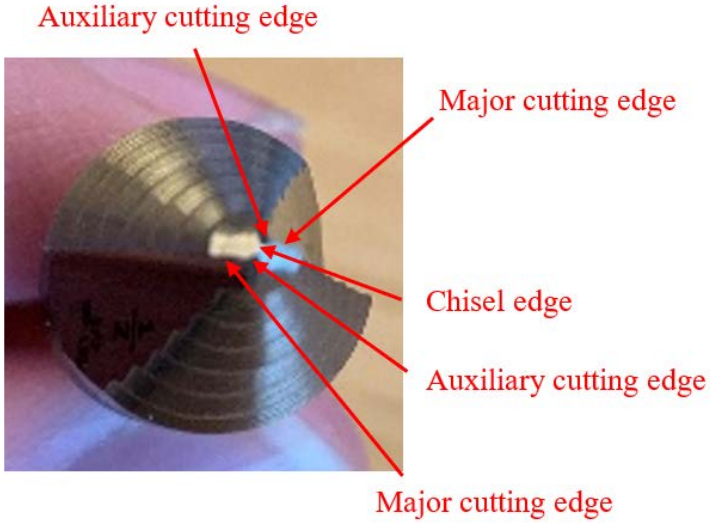
the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photo of an exemplary Viking 00693 drill reproduced in ['584: 1.a]. The Viking 00693 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00693 drill in ['584: 1.a]. The Viking 00693 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; Durfee II, 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 608; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of Viking 00693 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each	The Viking 00693 has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups. *See* ['583: 1.d], ['583: 1.k], and the annotated photograph of a Viking 00693 drill shown below.

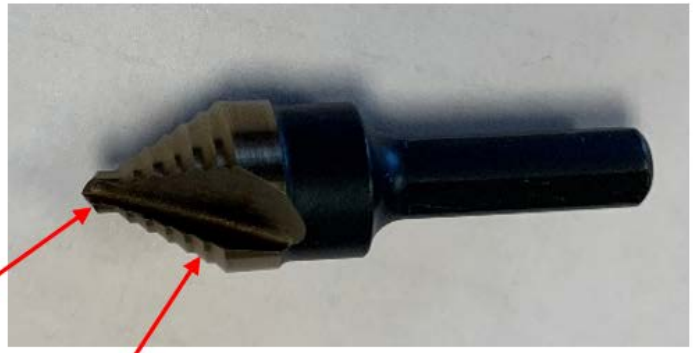
of the plurality of composite cutting blade groups comprising:	 Under Plaintiffs' construction, the composite cutting blade groups of the Viking 00693 drills are formed "spirally." *See* ['583: 1.d].
['584: 1.d] a conical first step surface;	*See* ['583:1.e] and the annotated photograph of a Viking 00693 drill shown in ['584: 1.c].
['584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583:1.f] and the annotated photograph of a Viking 00693 drill shown in ['584: 1.c].
['584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583:1.g] and the annotated photograph of an exemplary Viking 00693 drill below.

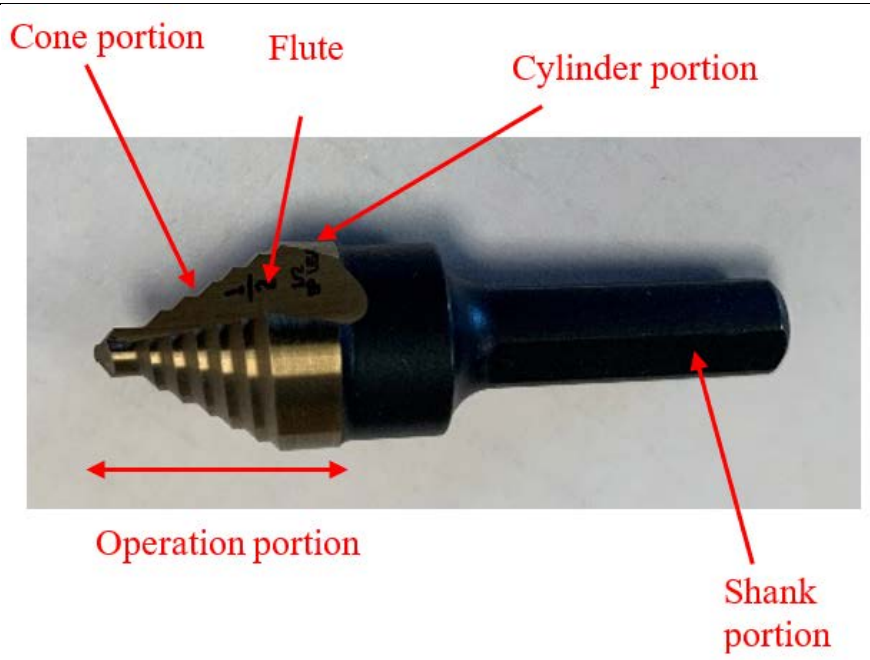
	
[’584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* [’583.1h] and the annotated photo of an exemplary Viking 00693 drill in [’584: 1.f].
[’584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* [’583.1i] and the annotated photo of an exemplary Viking 00693 drill in [’584: 1.f].
[’584: 1.i] a top blade provided on the front end of the cone portion;	*See* [’583.1j] and the annotated photo of an exemplary Viking 00693 drill in [’584: 1.f].

[’584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00693 drill below. 
[’584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Viking 00693 drill also has a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated photo of an exemplary Viking 00693 drill in [’584: 1.j].
[’584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step of the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using a Viking 00693 drill. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].

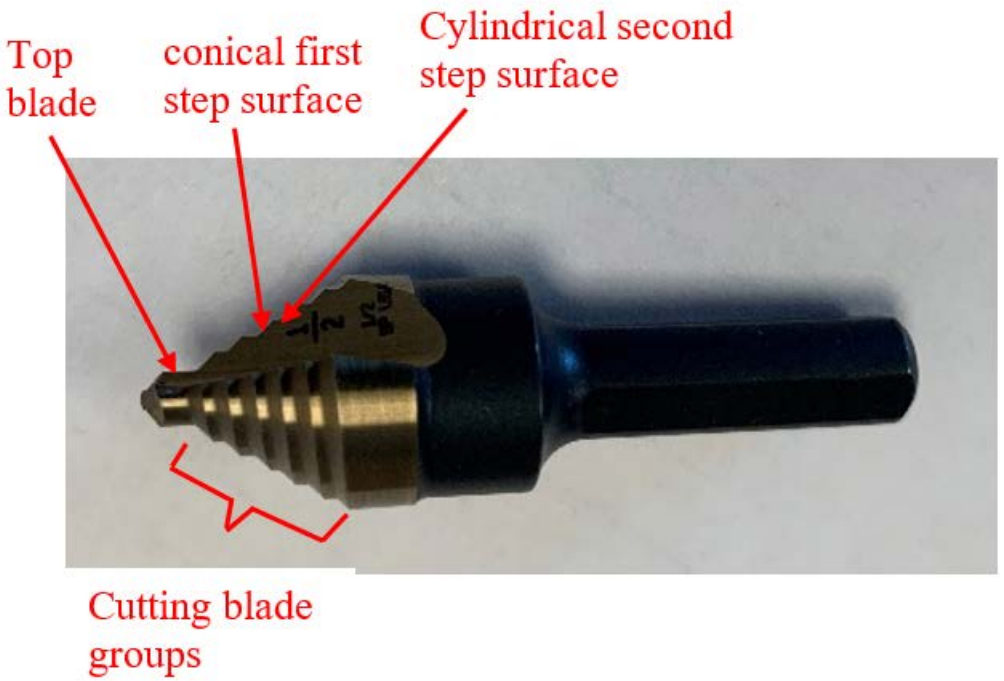
[’584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 1.l].
[’584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	*See* [’584: 1.l].
[’584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 1.l].
[’584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	This is a natural outcome of the geometry of the cone portion of the Viking 00693 drill.
[’584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	*See* [’584: 1.l].
Claim 2	**Viking 00693 Drill**
[’584: 2] The method of claim **1** wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs’ infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in the Viking 00693 drill because it has minor cutting edges.
Claim 4	**Viking 00693 Drill**

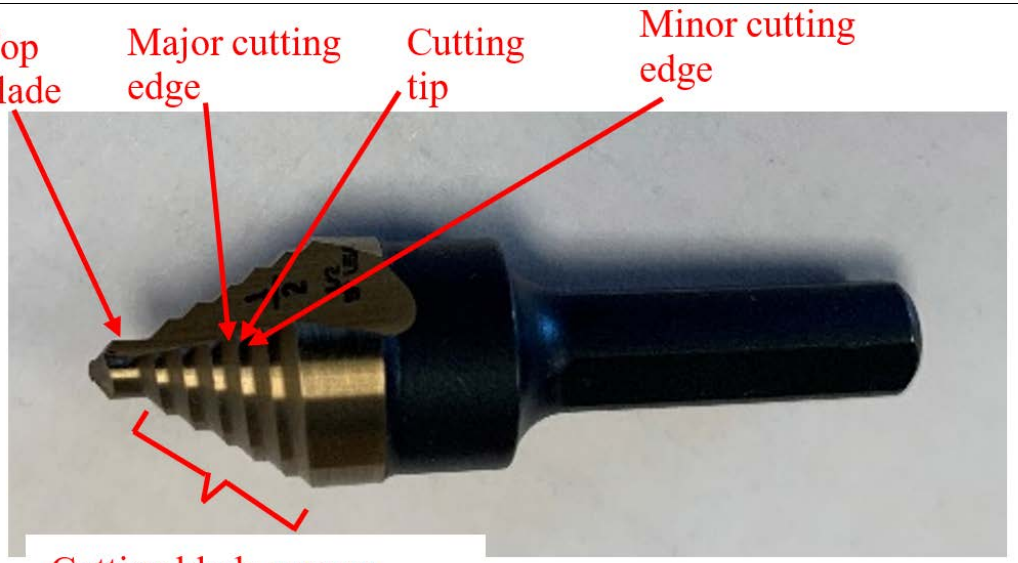
['584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	The Viking 00693 drill has a top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* ['583: 5] and the annotated photograph of a Viking 00693 drill shown below. 
Claim 5	**Viking 00693 Drill**
['584: 5] The method of claim **1** wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	The Viking 00693 has a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* ['583: 7] and the annotated photo of a Viking 00693 below.

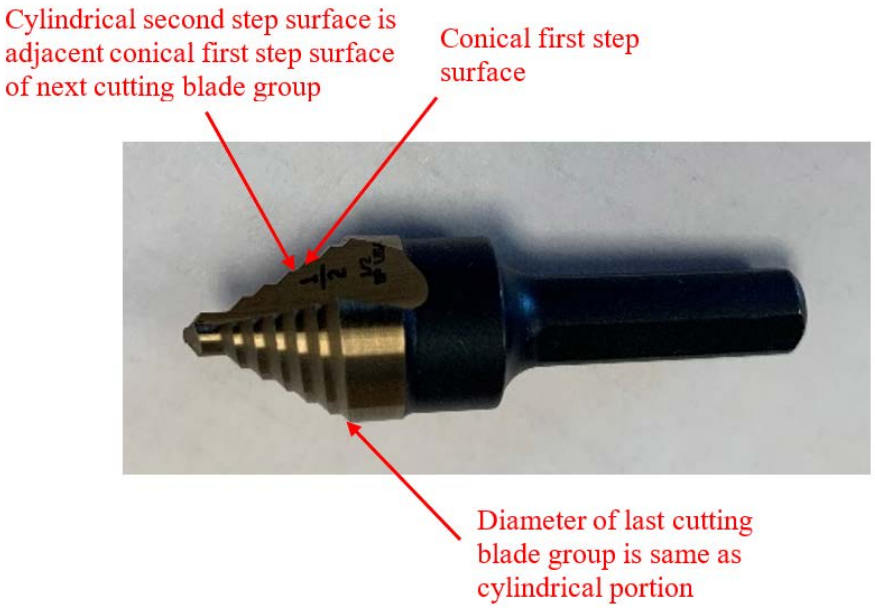
	 Straight major cutting edge is longer than major cutting edge of cutting blade group Major cutting edge of cutting blade group
Claim 6	**Viking 00693 Drill**
['584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	The Viking 00693 drill is a drill having a flute that extends from a cone portion to a cylinder portion. It was well known to one of ordinary skill that the provision of a conical cutting tip to a drill, such as is present in the Viking 00693, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, and 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
['584: 6.a] providing a twist drill comprising: a shank portion;	The Viking 00693 drill has a shank portion. *See* ['583: 1.b] and ['584: 6.pre].

	
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the	The Viking 00693 drill has an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photo of an exemplary Viking 00693 drill reproduced in ['584: 1.a]. The Viking 00693 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00693 drill in ['584: 6.a].

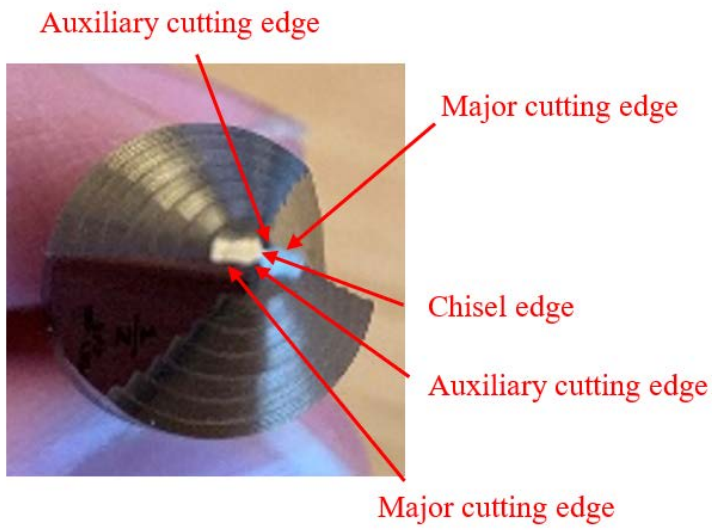
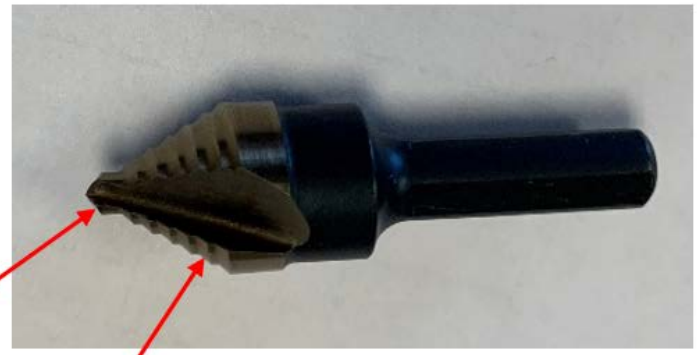
cylinder portion opposite the cone portion;	The Viking 00693 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; Durfee II, 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 608; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00693 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d], ['583: 1.k], and ['584: 1.c]. The Viking 00693 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups. *See* the annotated photo of an exemplary Viking 00693 drill reproduced below.

	 Under Plaintiffs' construction, the composite cutting blade groups of the Viking 00693 drills are formed "spirally." *See* ['583: 1.d].
['584: 6.d] a conical first step surface;	*See* ['583:1.e] and the annotated photograph of a Viking 00693 drill shown in ['584: 6.c].
['584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583:1.f] and the annotated photograph of a Viking 00693 drill shown in ['584: 6.c].
['584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583:1.g] and the annotated photo of an exemplary Viking 00693 drill below.

	
[’584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* [’583.1h] and the annotated photo of an exemplary Viking 00693 drill in [’584: 6.f].
[’584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* [’583.1i] and the annotated photo of an exemplary Viking 00693 drill in [’584: 6.f].
[’584: 6.i] a top blade provided on the front end of the cone portion;	*See* [’583.1j] and the annotated photo of an exemplary Viking 00693 drill in [’584: 6.f].

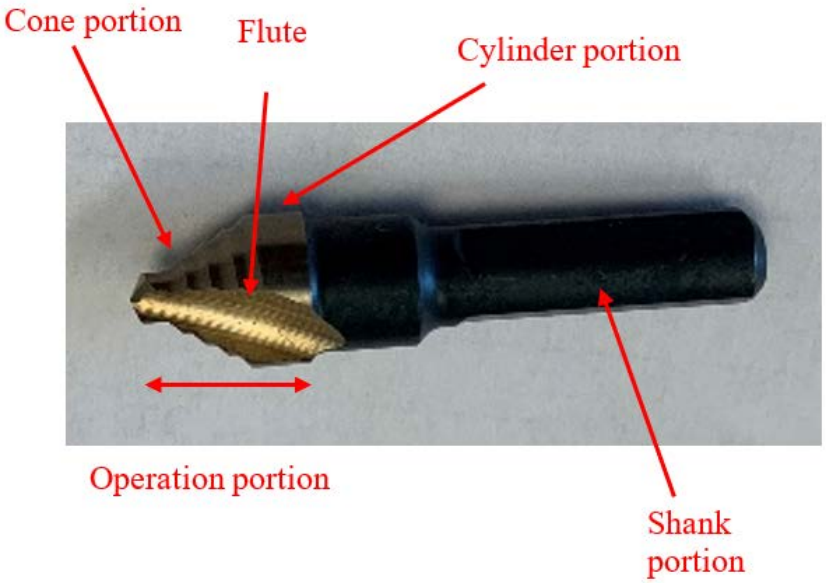
[’584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00693 drill below. 
[’584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Viking 00693 drill also has a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated photo of a Viking 00693 drill in [’584: 6.j].
[’584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step of the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using a Viking 00693 drill. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].

[’584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 6.l].
[’584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	*See* [’584: 6.l].
[’584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 6.l].
[’584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	This is a natural outcome of using a Viking 00693 drill and is, therefore, inherent to the use of the drill.
Claim 7	**Viking 00693 Drill**
[’584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	*See* [’584: 2].
Claim 9	**Viking 00693 Drill**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two	*See* [’583: 5] and the annotated photograph of a Viking 00693 drill shown below.

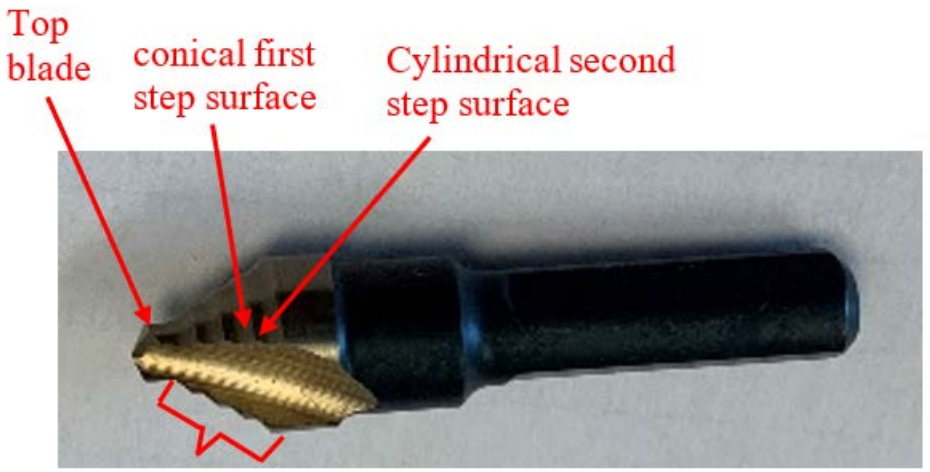
auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 10	**Viking 00693 Drill**
['584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7] and the annotated photo of a Viking 00693 drill below. 
Claim 11	**Viking 00693 Drill**

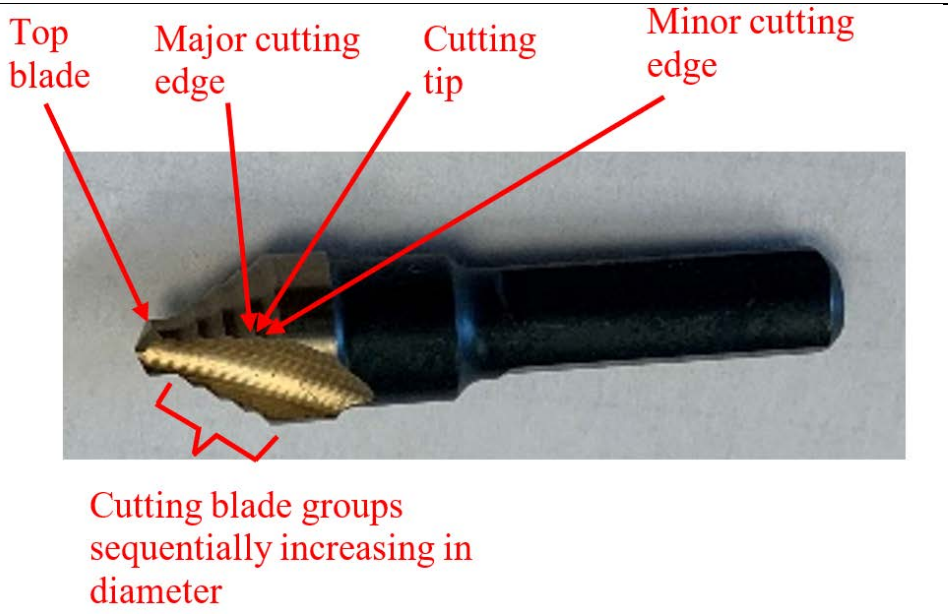
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	This is a natural outcome of using a Viking 00693 drill and is, therefore, inherent to the use of the drill.

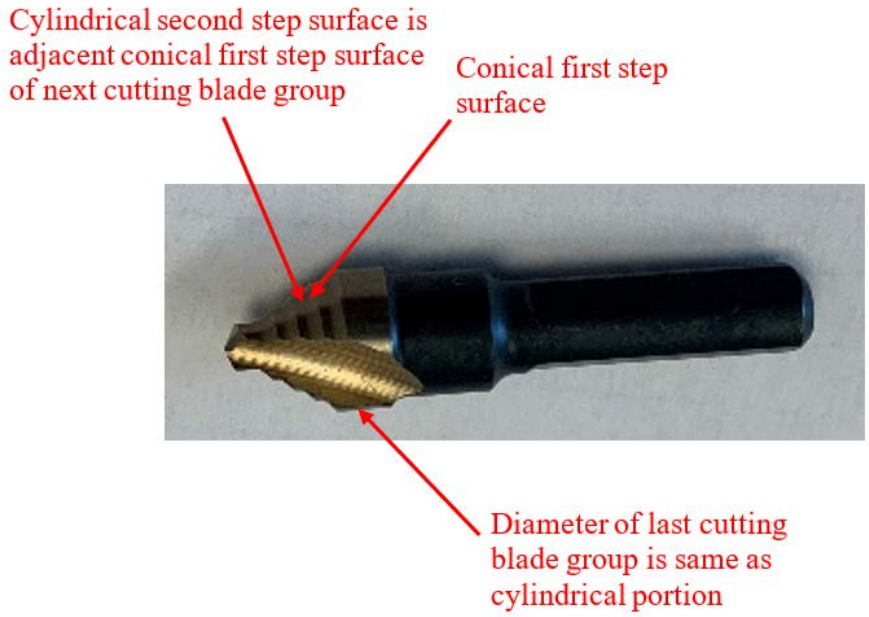
Exhibit E

’583 Patent	
Claim 1	**Viking 00694 Drill**
[’583: 1.pre] A twist drill, comprising:	The preamble carries no patentable weight. The Viking 00694 drill is a drill having a flute that extends from a cone portion to a cylinder portion.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	The Viking 00694 drill includes an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion. 
[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	The Viking 00694 drill has a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated photo of an exemplary Viking 00694 drill in [’583: 1.a].
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion	The Viking 00694 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00694 drill in [’583: 1.a].

and at least partway up the cylinder portion, the spiral flute having a sidewall;	The Viking 00694 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* U.S. Patent No. 10,328,499 ("Durfee I"), 1:33-39 and 3:57 – 6:32; U.S. Patent No. 2,193,186 ("Bannister"), *see* FIG. 2; U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl"), *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], U.S. Patent App. Pub. No. 2011/0116884 ("Li"), FIGs. 1-8; U.S. Patent App. Pub. No. 2018/0133808 ("Wang I"), FIGs. 5-12 and ¶¶ [31, 32, 35, 36]; U.S. Patent No. D840,449 ("Wang II"), FIGs. 1-4, and 6-8; U.S. Patent No. 4,582,458 ("Korb"), FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00694 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
['583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	The Viking 00694 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion.

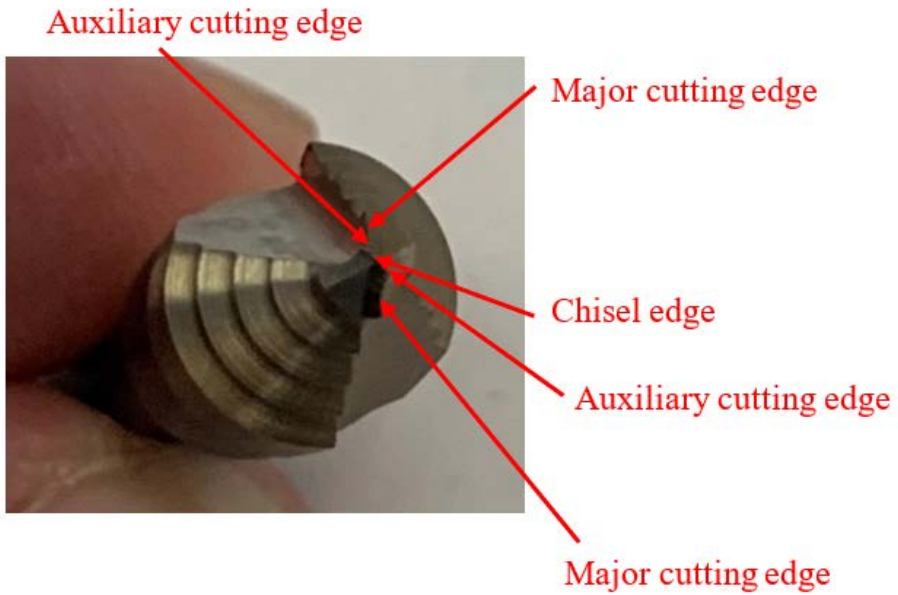
	 Plaintiff's infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it is also present in the Viking 00694 drill. The Viking 00694 drill has greater axial relief than the Accused Products.
['583: 1.e] a conical first step surface;	The Viking 00694 drill has a conical first step surface. *See* annotated photo of an exemplary Viking 00694 drill in ['583: 1.d].
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial, radial, and back taper relief does not prevent the second step surfaces from being considered "cylindrical." While Viking disagrees with this contention, based on Plaintiffs' assertion, the Viking 00694 drill has a cylindrical second step surface adjacent to the conical first step surface. *See* annotated photo of an exemplary Viking 00694 drill in ['583: 1.d].
['583: 1.g] a major cutting edge defined by the intersection of the	The Viking 00694 drill has a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute.

conical first step surface and the sidewall of the spiral flute;	
[’583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	The Viking 00694 drill has a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* annotated photo of exemplary Viking 00694 drill in [’583: 1.g].
[’583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	The Viking 00694 drill has a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* annotated photo of exemplary Viking 00694 drill in [’583: 1.g].
[’583: 1.j] a top blade provided on the front end of the cone portion;	The Viking 00694 drill has a top blade provided on the front end of the cone portion. *See* annotated photo of exemplary Viking 00694 drill in [’583: 1.g].

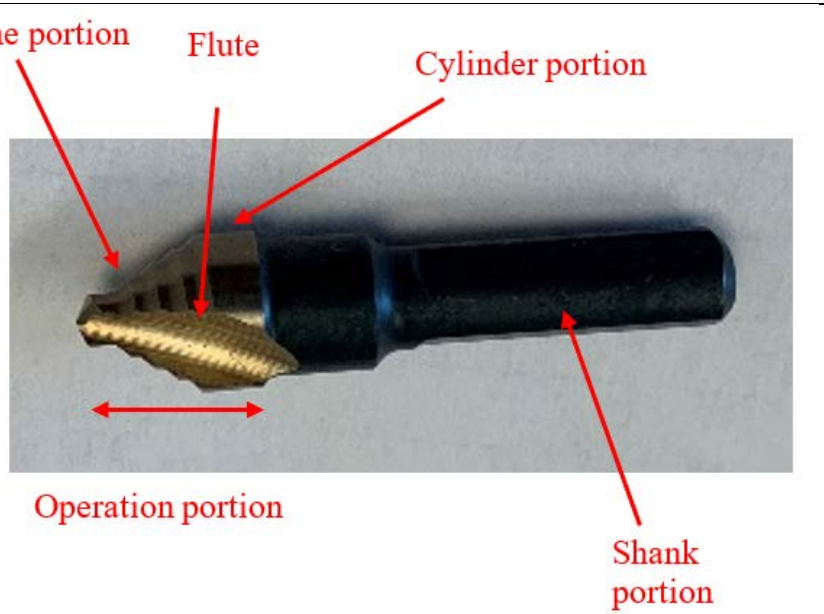
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	With the Viking 00694 drill, a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. *See* annotated photo of exemplary Viking 00694 drill in ['583: 1.g].
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Plaintiff's infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Viking 00694 drill. A person of ordinary skill will understand that the Viking 00694 drill modified with spiral flutes will shunt chips from the cutting surface out of the drilled hole.
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	In the Viking 00694 drill, at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group. 

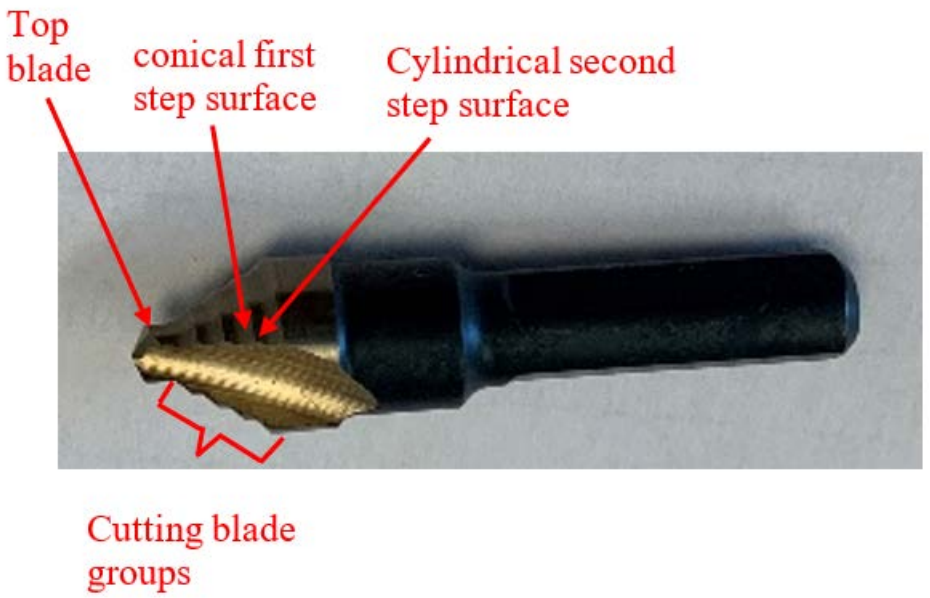
['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in the Viking 00694 drill immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See* annotated photo of exemplary Viking 00694 drill in ['583: 1.m].
Claim 2	**Viking 00694 Drill**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in the Viking 00694 drill because it has minor cutting edges.

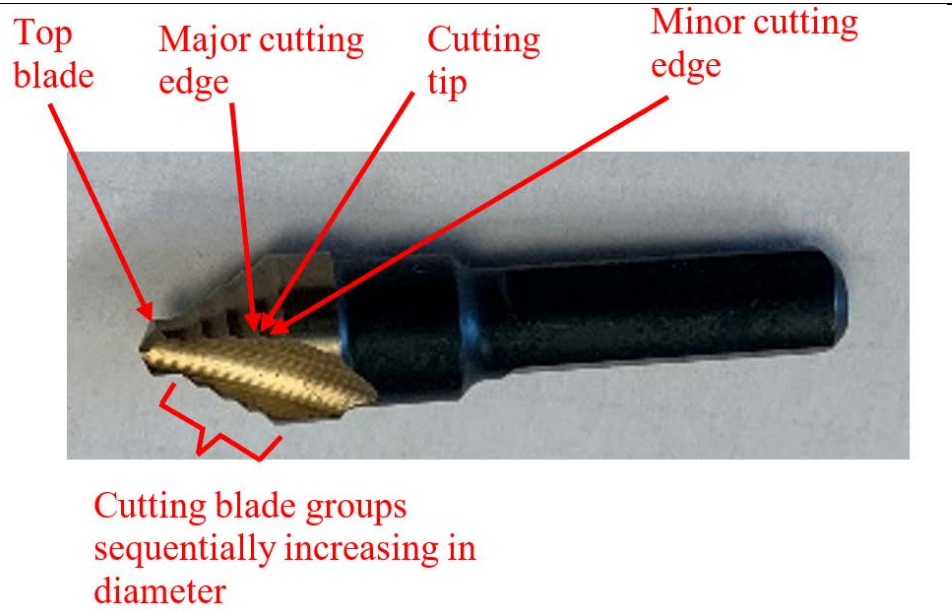
Claim 3	**Viking 00694 Drill**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	In the Viking 00694 drill, the height of each composite cutting blade group is the same around its perimeter and the step heights are the same as each other. Thus, if claim 3 is found to not be indefinite, it is met by the Viking 00694 drill. 
Claim 5	**Viking 00694 Drill**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the	Viking 00694 drill has a split point tip, having a chisel edge, two auxiliary cutting edges and two straight major cutting edges, where the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.

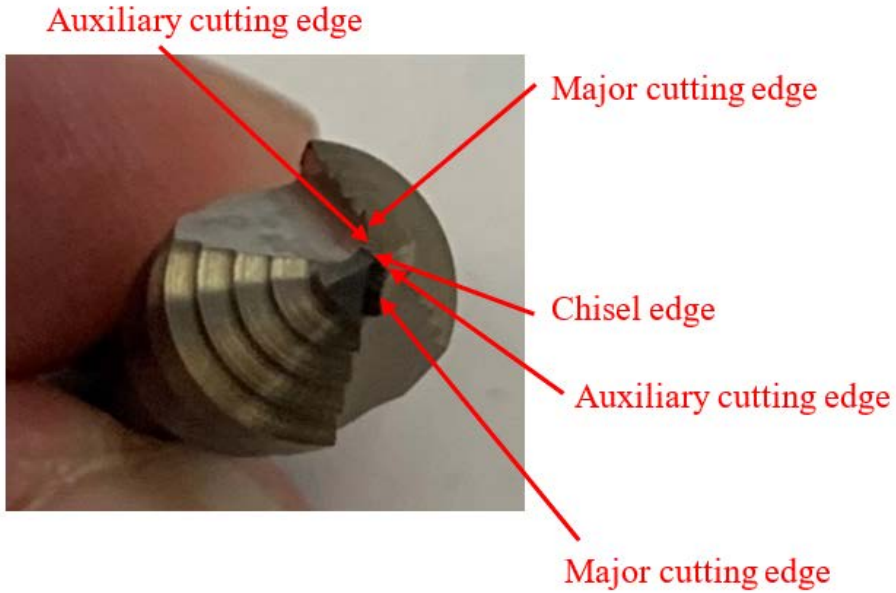
straight major cutting edge and the chisel edge.	
Claim 6	**Viking 00694 Drill**
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Defendant disagrees with this contention, based on Plaintiffs' assertion, then this limitation is also present in the Viking 00694 drill.
Claim 7	**Viking 00694 Drill**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	In the Viking 00694 drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* the annotated photo of a Viking 00694 drill below.

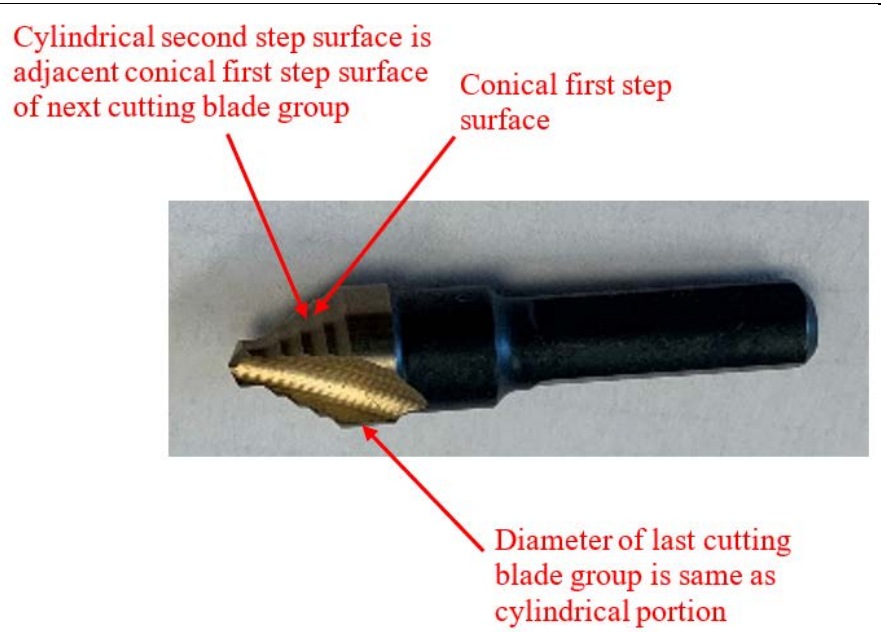
	
Claim 8	**Viking 00694 Drill**
[’583: 8.pre] A twist drill, comprising:	The preamble carries no patentable weight. The Viking 00694 drill has a flute that extends from a cone portion to a cylinder portion. *See* [’583: 1.pre].
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* [’583: 1.a].

	
['583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* ['583: 1.b] and ['583: 8.a].
['583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* ['583: 1.c] and ['583: 8.a]. The Viking 00694 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00694 drill in ['583: 8.a]. The Viking 00694 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; US Patent No. 9,687,915 ("Durfee II"), 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills

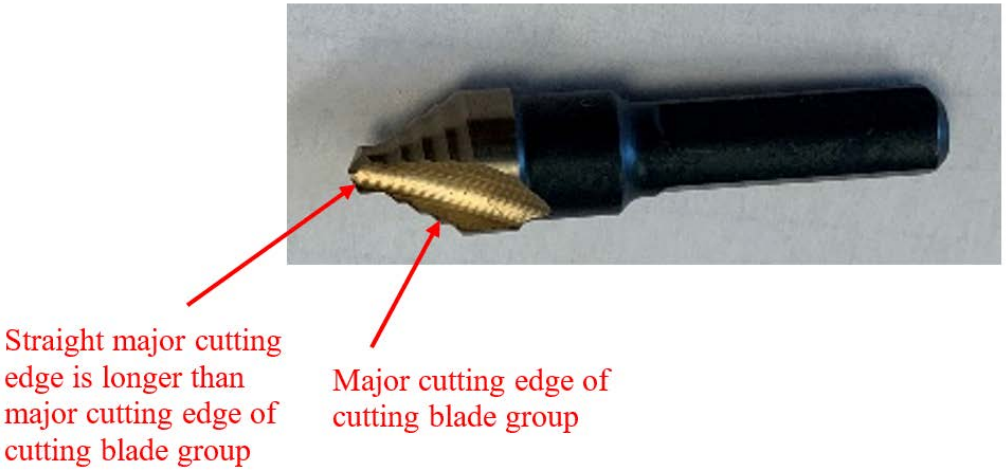
	with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00694 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
[’583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d]. 
[’583: 8.e] a conical first step surface;	*See* [’583: 1.e] and [’583: 8.d].
[’583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* [’583: 1.f] and [’583: 8.d].
[’583: 8.g] a major cutting edge defined by the intersection of the	*See* [’583: 1.g] and [’583: 8.d].

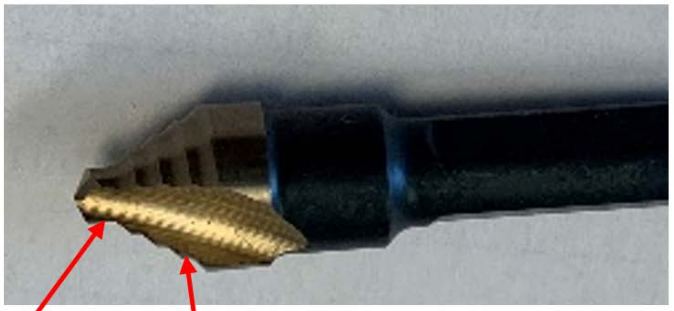
conical first step surface and the sidewall of the spiral flute;	
[’583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* [’583: 1.h], [’583: 2], and the annotated photo of an exemplary Viking 00694 drill in [’583: 8.g].
[’583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	*See* [’583: 1.i] and the annotated photo of an exemplary Viking 00694 drill in [’583: 8.g].

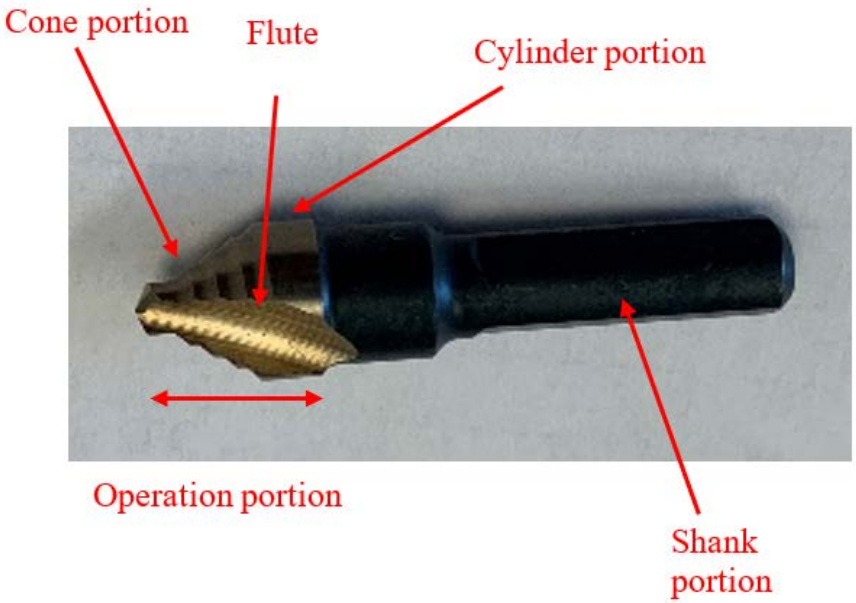
['583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	*See* ['583: 1.j], ['583: 5] the annotated photo of an exemplary Viking 00694 drill in ['583: 8.g] and the annotated photo of an exemplary Viking 00694 drill below. 
['583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* ['583: 1.k], ['583: 8.g] and the annotated photo of an exemplary Viking 00694 drill below.

	
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00694 drill in [’583: 8.k].
[’583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone	*See* [’583: 1.n], [’583: 8.g], and the annotated photo of an exemplary Viking 00694 drill in [’583: 8.k].

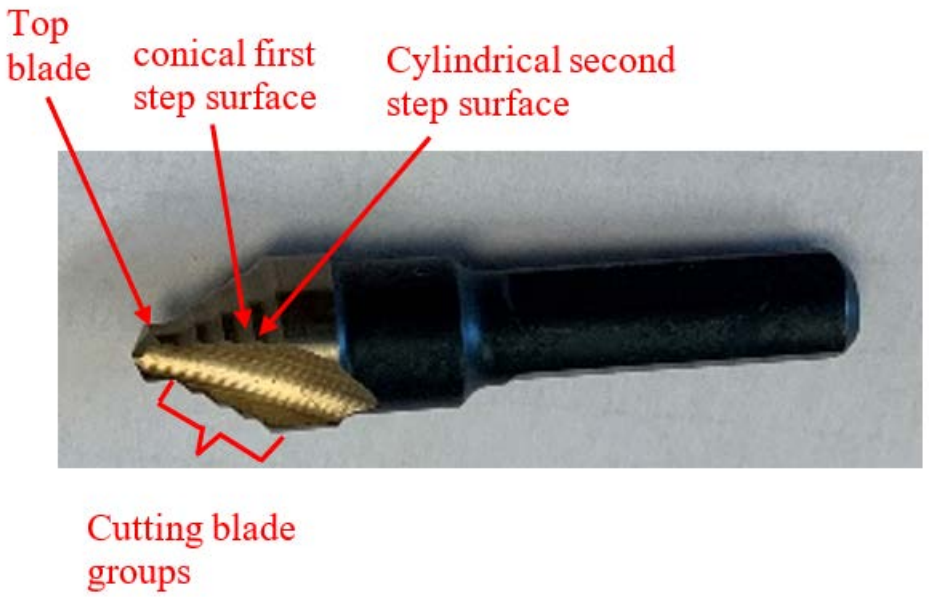
portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	
Claim 9	**Viking 00694 Drill**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* [’583: 3]. 
Claim 11	**Viking 00694 Drill**
[’583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* [’583: 6].
Claim 12	**Viking 00694 Drill**

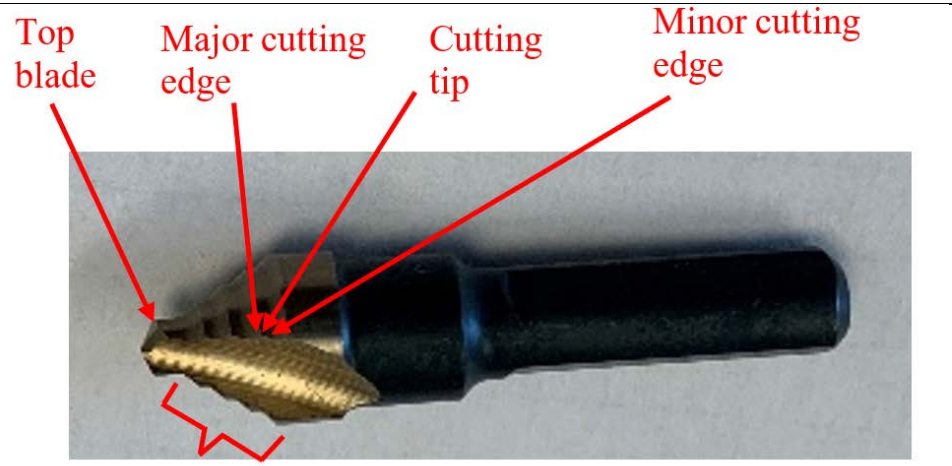
['583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7]. 
Claim 13	**Viking 00694 Drill**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. Defendant disagrees with this construction. If, however, this construction is correct, then the Viking 00694 drill has a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See* the annotated photo of the 00694 drill below.

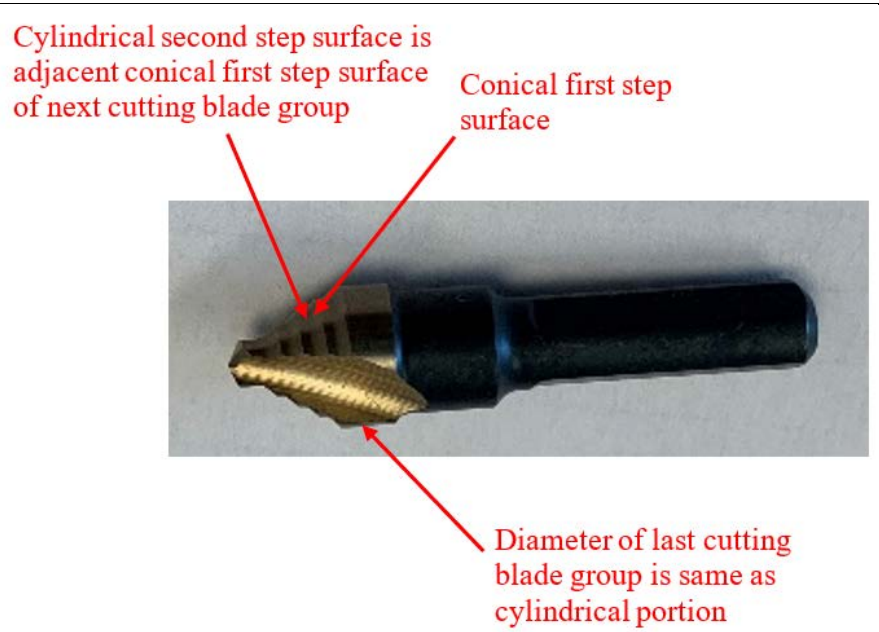
	
Claim 14	**Viking 00694 Drill**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	The operation portion of the Viking 00694 drill is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.
'584 Patent	
Claim 1	**Viking 00694 Drill**
['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill	The Viking 00694 drill is a drill having a flute that extends from a cone portion to a cylinder portion.

hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	However, it was well known to one of ordinary skill that the provision of a conical cutting tip to a drill, such as is present in the Viking 00694 drill, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, and 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right :32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
['584: 1.a] providing a twist drill comprising: a shank portion;	The Viking 00694 drill has a shank portion. *See* ['583: 1.b] and ['584: 1.pre]. 
['584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being	The Viking 00694 drill has an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photo of an exemplary Viking 00694 drill reproduced in ['584: 1.a].

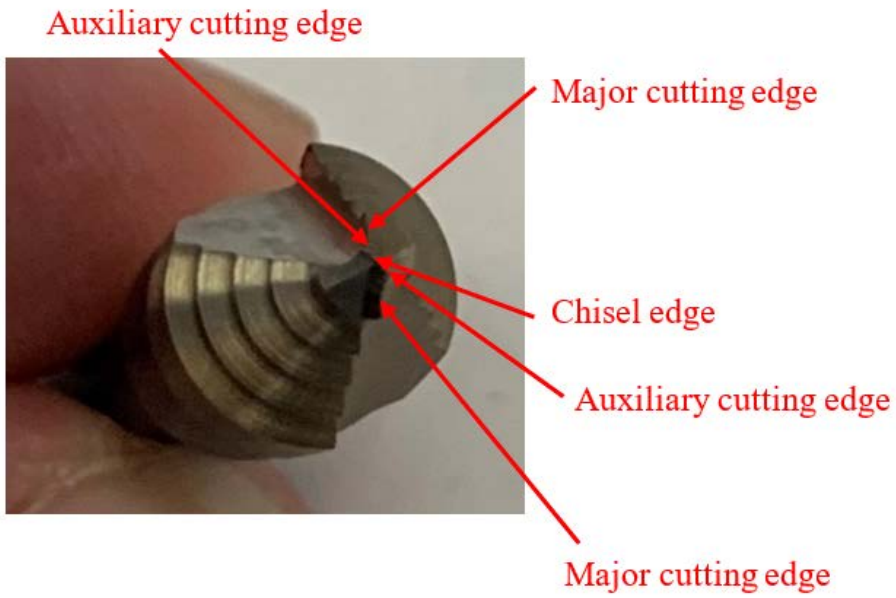
formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	The Viking 00694 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00694 drill in [’584: 1.a]. The Viking 00694 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; Durfee II, 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00694 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
[’584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	The Viking 00694 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups. *See* [’583: 1.d], [’583: 1.k], and the annotated photograph of a Viking 00694 drill shown below.

	 Under Plaintiffs' construction, the composite cutting blade groups of the Viking 00694 drills are formed "spirally." *See* ['583: 1.d].
['584: 1.d] a conical first step surface;	*See* ['583:1.e] and the annotated photograph of a Viking 00694 drill shown in ['584: 1.c].
['584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583:1.f] and the annotated photograph of a Viking 00694 drill shown in ['584: 1.c].
['584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583:1.g] and the annotated photo of an exemplary Viking 00694 drill below.

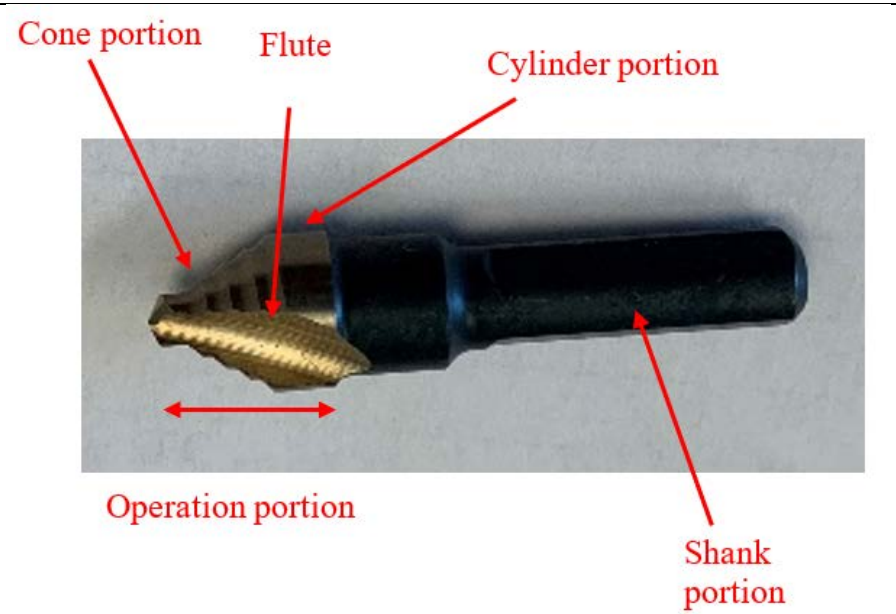
	
[’584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* [’583.1h] and the annotated photo of an exemplary Viking 00694 drill in [’584: 1.f].
[’584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* [’583.1i] and the annotated photo of an exemplary Viking 00694 drill in [’584: 1.f].
[’584: 1.i] a top blade provided on the front end of the cone portion;	*See* [’583.1j] and the annotated photo of an exemplary Viking 00694 drill in [’584: 1.f].
[’584: 1.j] wherein the cylindrical second step surface of at least one	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00694 drill below.

composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	
[’584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Viking 00694 drill also has a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated photo of an exemplary Viking 00694 drill in [’584: 1.j].
[’584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using a Viking 00694 drill. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left :1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
[’584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 1.l].

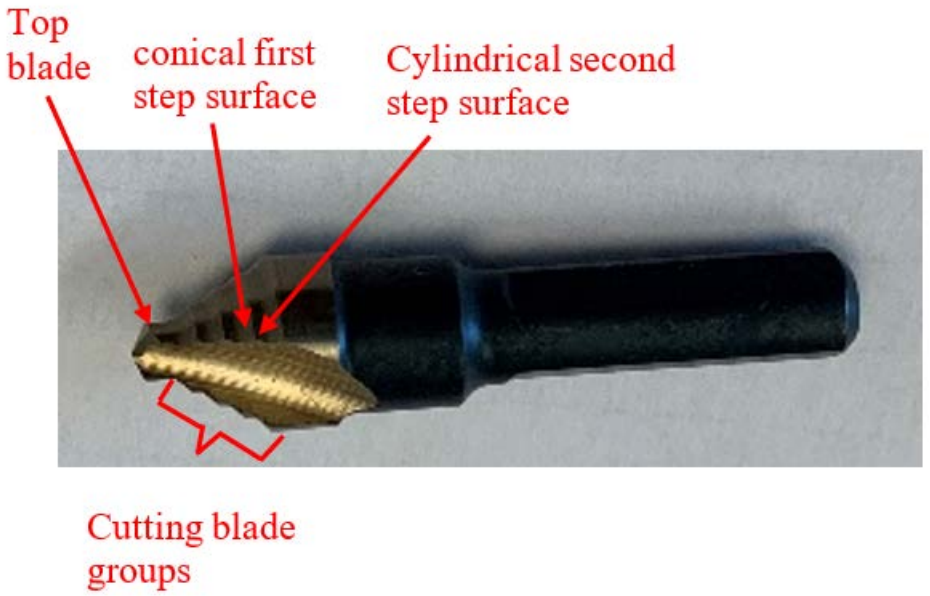
[’584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	*See* [’584: 1.l].
[’584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 1.l].
[’584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	This is a natural outcome of the geometry of the cone portion of the Viking 00694 drill.
[’584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	*See* [’584: 1.l].
Claim 2	**Viking 00694 Drill**
[’584: 2] The method of claim 1 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs’ infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in the Viking 00694 drill because it has minor cutting edges.
Claim 4	**Viking 00694 Drill**
[’584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade	The Viking 00694 drill has a top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with

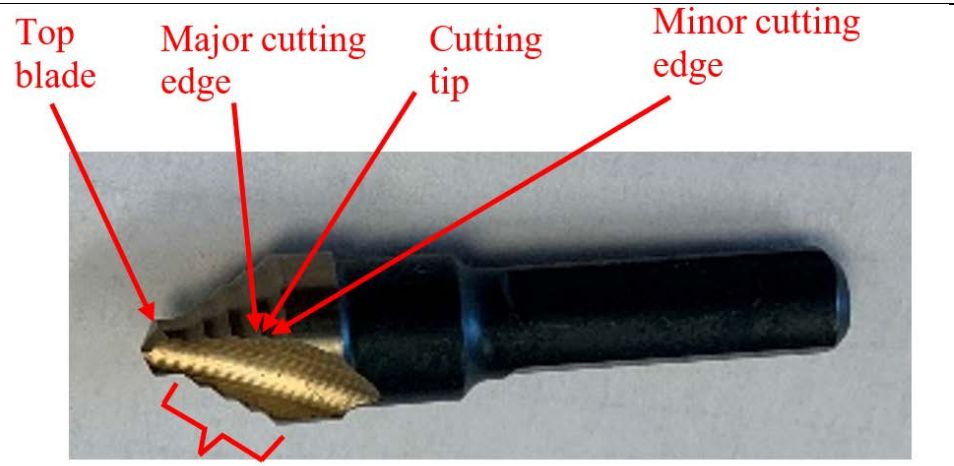
comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	the straight major cutting edge and the chisel edge. *See* ['583: 5] and the annotated photograph of a Viking 00694 drill shown below. 
Claim 5	**Viking 00694 Drill**
['584: 5] The method of claim **1** wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	The Viking 00694 drill has a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* ['583: 7] and the annotated photo of a Viking 00694 drill below.

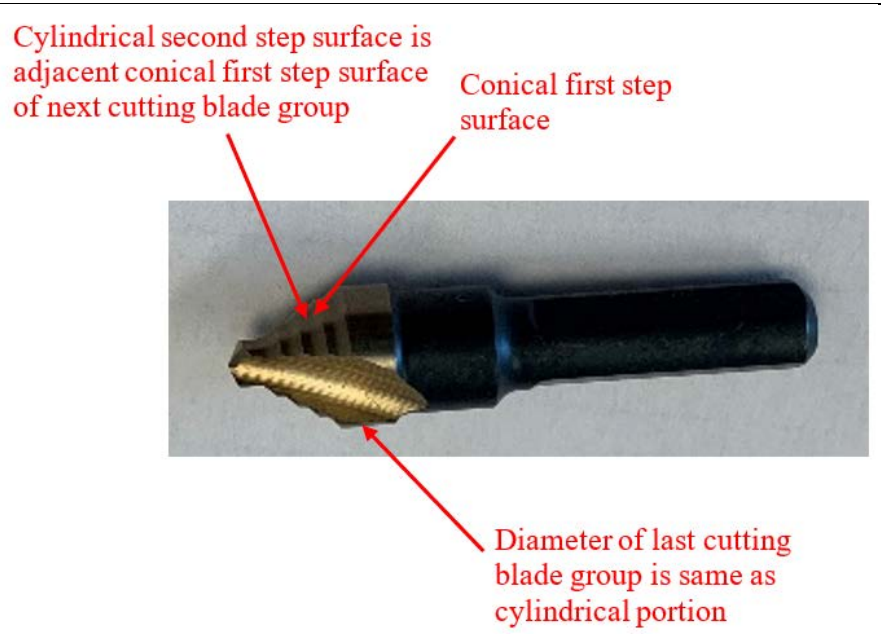
	
Claim 6	**Viking 00694 Drill**
['584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	The Viking 00694 drill is a drill having a flute that extends from a cone portion to a cylinder portion. It was well known to one of ordinary skill that the provision of a conical cutting tip to a drill, such as is present in the Viking 00694 drill, would improve centering accuracy when drilling a workpiece using multistage centering and using both a cone portion and a cylinder portion. *See* Wang I at ¶¶ [13, and 39-47]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
['584: 6.a] providing a twist drill comprising: a shank portion;	The Viking 00694 drill has a shank portion. *See* ['583: 1.b] and ['584: 6.pre].

	
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the	The Viking 00694 drill has an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated photo of an exemplary Viking 00694 drill reproduced in ['584: 1.a]. The Viking 00694 drill has a flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion. The flute has a sidewall. *See* annotated photo of an exemplary Viking 00694 drill in ['584: 6.a].

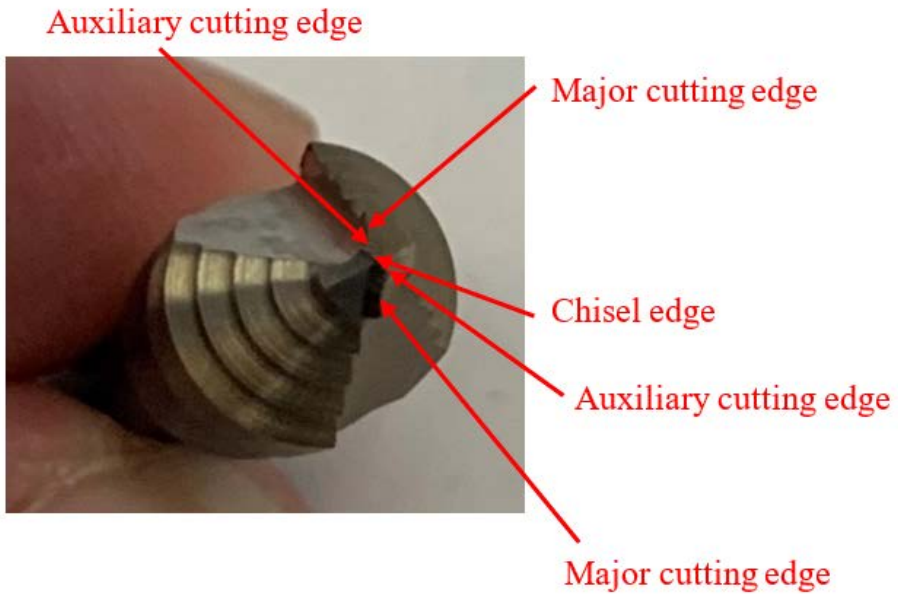
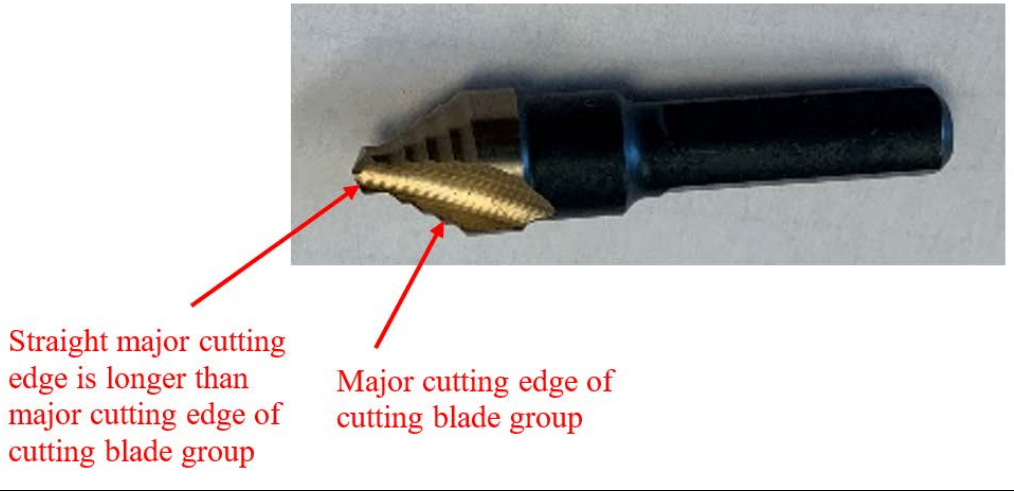
cylinder portion opposite the cone portion;	The Viking 00694 drill does not have a spiral flute, rather it has a straight flute. It was known that drills having stepped front portions could have a straight flute or a spiral flute. *See e.g.* Durfee I, 1:33-39 and 3:57 – 6:32; Durfee II, 4:58-60; Bannister, *see* FIG. 2; Wetzl, *see* FIGs. 1 and 2, and ¶¶ [8, 27, 37, 38, 46-50], Li, FIGs. 1-8. Wang II, FIGs. 1-4, and 6-8; Korb, FIGs. 1, 2 and 7, 1:33-35, and 2:37-44. Korb suggests equivalency between a flute cut helically, and a flute cut at about zero degrees to the drill axis. Step drills with helical flutes were also known in CN1021260039, CN103084629, DE202011106232U1, WO2012/167448, and WO2008/092386. It would have been obvious to one of ordinary skill to modify the straight flute of the Viking 00694 drill because they are known to be easier, quicker and less expensive to manufacture in a drill than a straight flute.
[’584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d], [’583: 1.k], and [’584: 1.c]. The Viking 00694 drill has a plurality of composite cutting blade groups formed sequentially on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups. *See* the annotated photo of an exemplary Viking 00694 drill reproduced below.

	 Under Plaintiffs' construction, the composite cutting blade groups of the Viking 00694 drills are formed "spirally." *See* ['583: 1.d].
['584: 6.d] a conical first step surface;	*See* ['583:1.e] and the annotated photograph of a Viking 00694 drill shown in ['584: 6.c].
['584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583:1.f] and the annotated photograph of a Viking 00694 drill shown in ['584: 6.c].
['584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* ['583:1.g] and the annotated photograph of an exemplary Viking 00694 drill below.

	
[’584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* [’583.1h] and the annotated photo of an exemplary Viking 00694 drill in [’584: 6.f].
[’584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* [’583.1i] and the annotated photo of an exemplary Viking 00694 drill in [’584: 6.f].
[’584: 6.i] a top blade provided on the front end of the cone portion;	*See* [’583.1j] and the annotated photo of an exemplary Viking 00694 drill in [’584: 6.f].
[’584: 6.j] wherein the cylindrical second step surface of at least one	*See* [’583: 1.m] and the annotated photo of an exemplary Viking 00694 drill below.

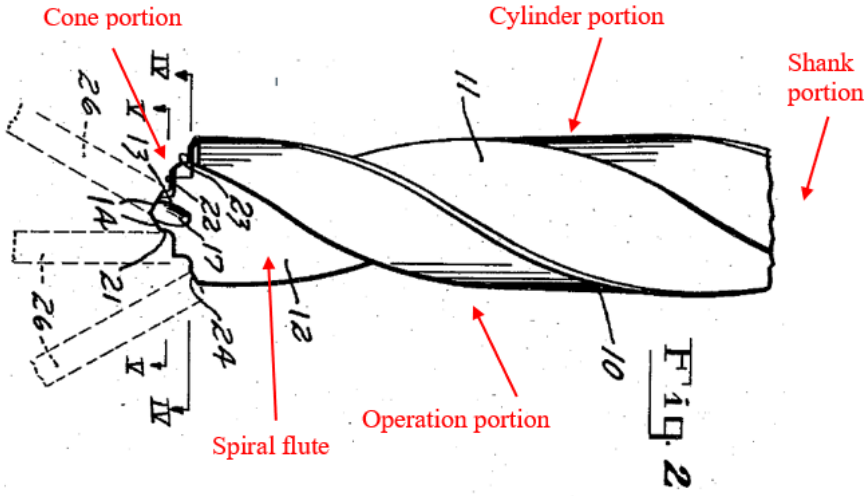
composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	
[’584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then the Viking 00694 drill also has a last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion whose diameter is equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated photo of a Viking 00694 drill in [’584: 6.j].
[’584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	This claim is simply one step of the drilling process that a person of ordinary skill would have known could be used to drill a hole in a workpiece using the Viking 00694 drill. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; and Li at ¶¶ [3, 24, 37, 44].
[’584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 6.l].

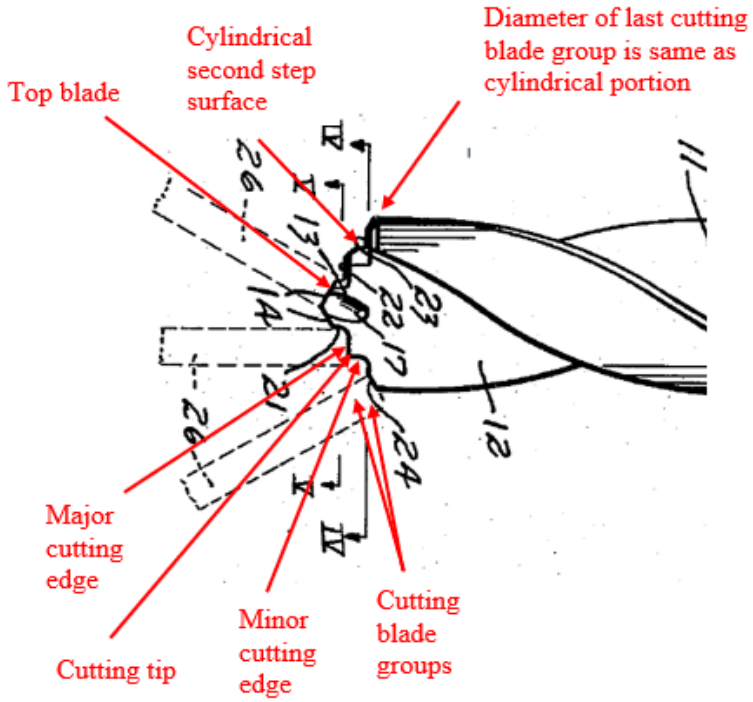
[’584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	*See* [’584: 6.l].
[’584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* [’584: 6.l].
[’584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	This is a natural outcome of using a Viking 00694 drill and is, therefore, inherent to the use of the drill.
Claim 7	**Viking 00694 Drill**
[’584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	*See* [’584: 2].
Claim 9	**Viking 00694 Drill**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is	*See* [’583: 5] and the annotated photograph of a Viking 00694 drill shown below.

respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 10	**Viking 00694 Drill**
[’584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [’583: 7] and the annotated photo of a Viking 00694 drill below. 
Claim 11	**Viking 00694 Drill**

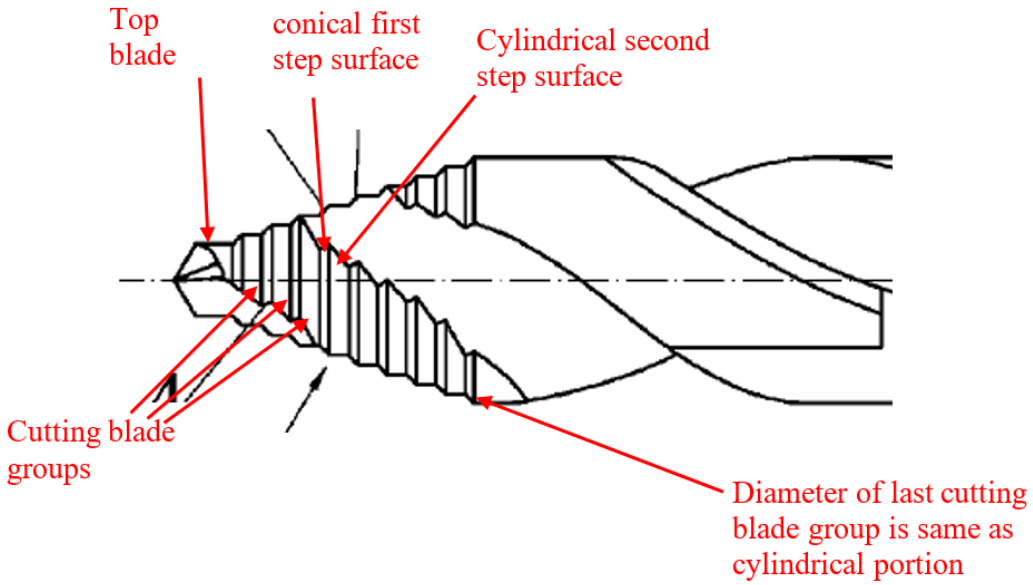
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	This is a natural outcome of using a Viking 00694 drill and is, therefore, inherent to the use of the drill.

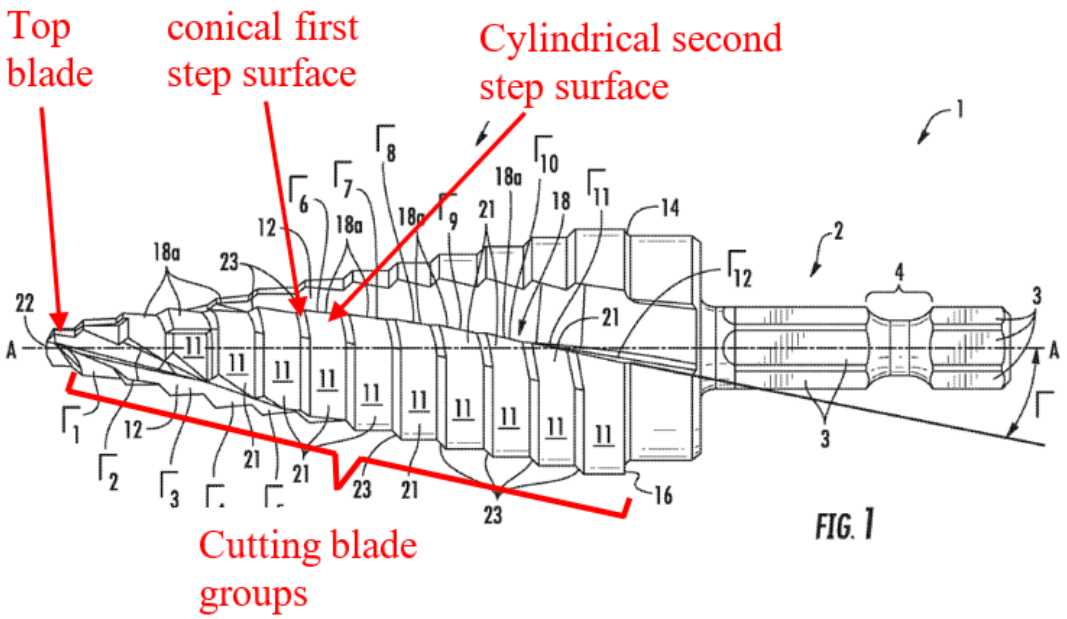
Exhibit F

’583 Patent	
Claim 1	**Bannister (U.S. Patent No. 2,193,186)**
[’583: 1.pre] A twist drill, comprising:	The preamble carries no patentable weight. Bannister discloses a twist drill. See, e.g., Abstract.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. For example, in FIG. 2 (annotated below), Bannister shows an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion. 
[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. For example, in FIGs. 1 and 2, Bannister shows a break line where a shank portion would be axially fixed to the cylinder portion opposite the cone portion. See annotated FIG. 2 in [’583: 1.a].
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister shows spiral flutes 11 and 12, e.g., in FIG. 2, formed on an exterior surface of the operating portion, extending from a front end of the cone portion and at least partway up the cylinder portion. The flutes have sidewalls.

front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	See annotated FIG. 2 in ['583: 1.a].
['583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister shows composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. See annotated representation of FIG. 2 below. 

	Under the proper interpretation of "spirally," under which the Accused Products do not infringe, Bannister does not show or teach that the composite cutting blade groups are formed spirally. However, Gentry shows spiral grooves on a conical drill bit. For example, FIG. 8 shows spiral (helical) grooves 270, 272. "Once the conically-shaped main body 206 has been formed, the helical grooves 270, 272 are turned onto the spiral drill bit 50 using two form tools…The helical grooves 270, 272 begin at diametrically-opposed positions and are off set by a phase angle of 180 degrees." *See* Gentry, col. 7, ll. 4-8. A person of ordinary skill would have been motivated to adopt this manufacturing approach because the manufacturing process for the drill bit reduces the amount of grinding required, thus reducing the time and cost of forming the spiral drill bit. *Id.*, col. 2, l. 67 – col. 3, l. 3. Plaintiff's infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then Bannister meets this limitation because Bannister teaches that the composite cutting blade groups have axial relief. See Bannister Fig. 1 and p. 2 left col. l. 75 – p. 2 right col. l. 4 ("the plane of the surface behind each edge is inclined to the axis of the drill, as shown in Fig. 1, in order to provide axial clearance for the drill so that it will feed at the desired rate of speed."). Moreover, even in the event Bannister is found not to show axial relief, it would have been obvious to add such axial relief to the cutting blade groups shown in Bannister. Examples of prior art drill bits having axial relief on similar cutting elements include the Viking 00693, 00694 and 00714 drills, Mackey, Durfee I, Durfee II, and Wetzel. It is well known that axial relief in such cutting elements improves the cutting efficiency of the drill bit and that, in the absence of axial relief, such drills will cut poorly. Thus, it would have been obvious to add the same axial relief to Bannister that is present in the Accused Products.
['583: 1.e] a conical first step surface;	Bannister does not teach a conical section having a conical first step surface, instead showing a surface perpendicular to the drill axis. However, it would have been obvious to a person of ordinary skill that using a conical first step surface would lead to the advantages of improved drilling efficiency and control, drilling stability, precision, prolonged cutting tool life, reduced burring of the workpiece, as discussed in Wang I (Wang I at paras. [40]-[47], Durfee I (Durfee I at col. 8, ll. 22-29), Li (Li at [0023]-[0024]),

	Sheldon (Sheldon at 3:1-3) by providing a conical section like the drill types disclosed therein or a conical section drill like Viking's 00693, 00694 or 00714 drills. Wang I shows a conical first step surface, e.g. in FIG. 5. 

	Durfee I shows a conical first step surface, e.g. in FIG. 1.  Li shows a conical first step surface, e.g., in Fig. 1:

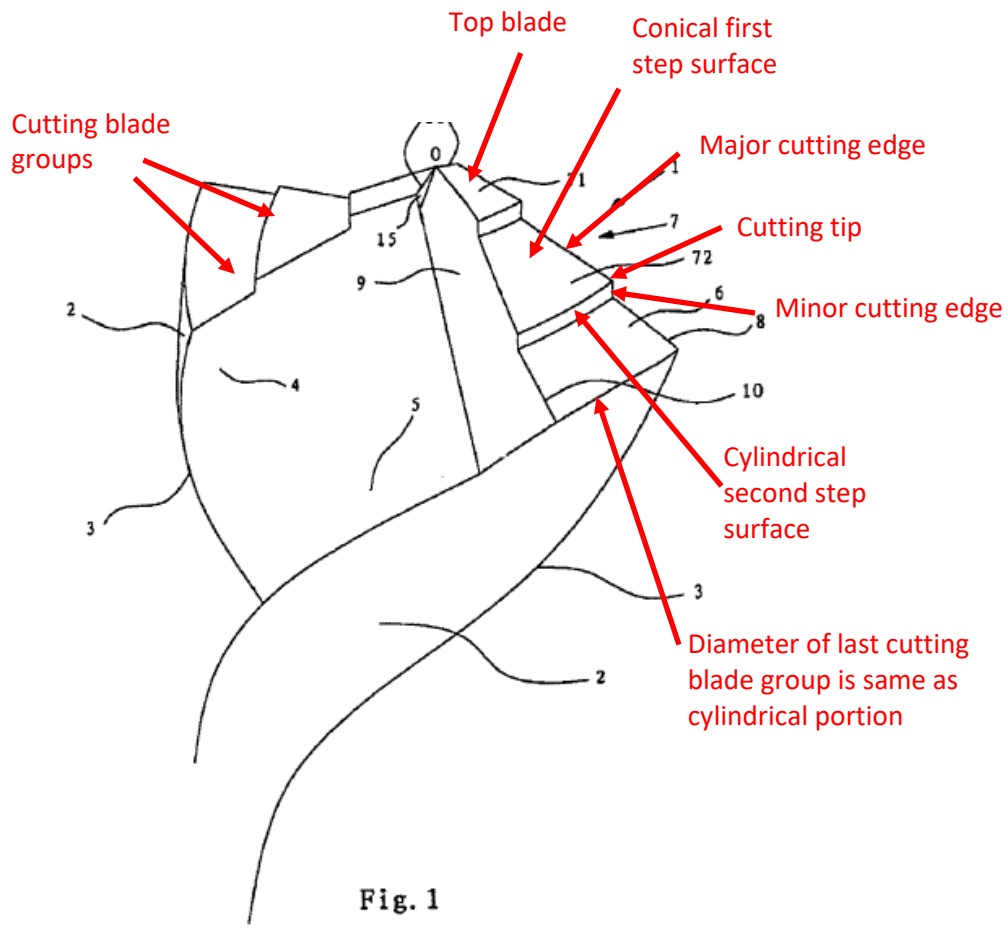
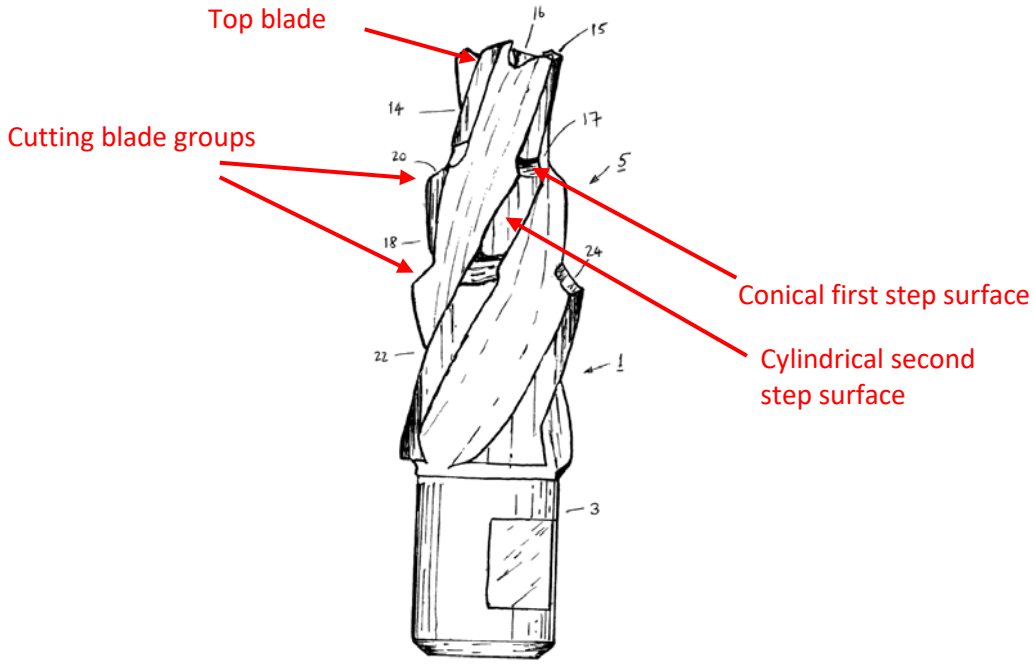
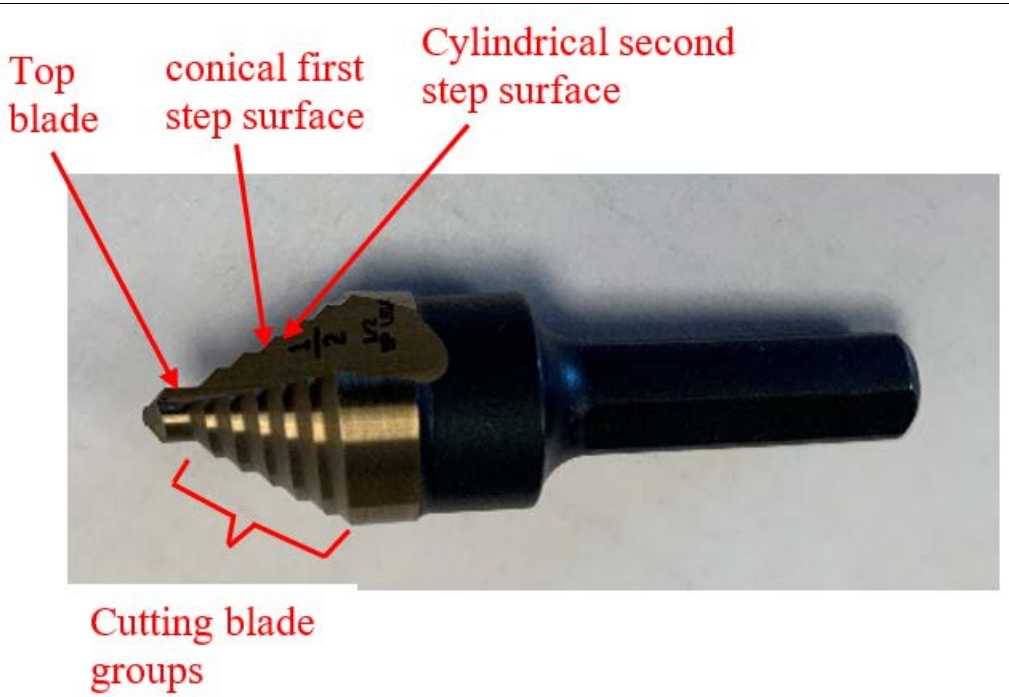
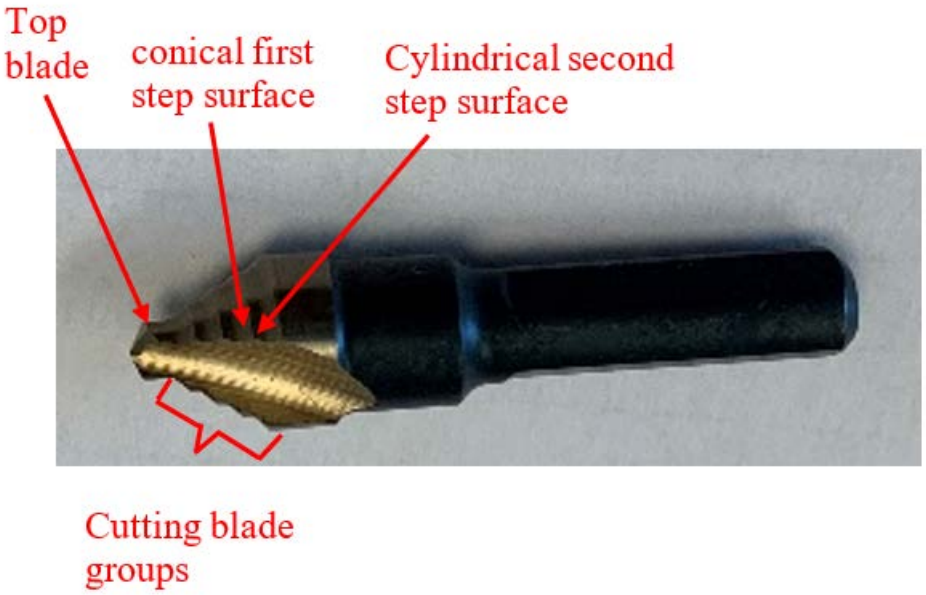
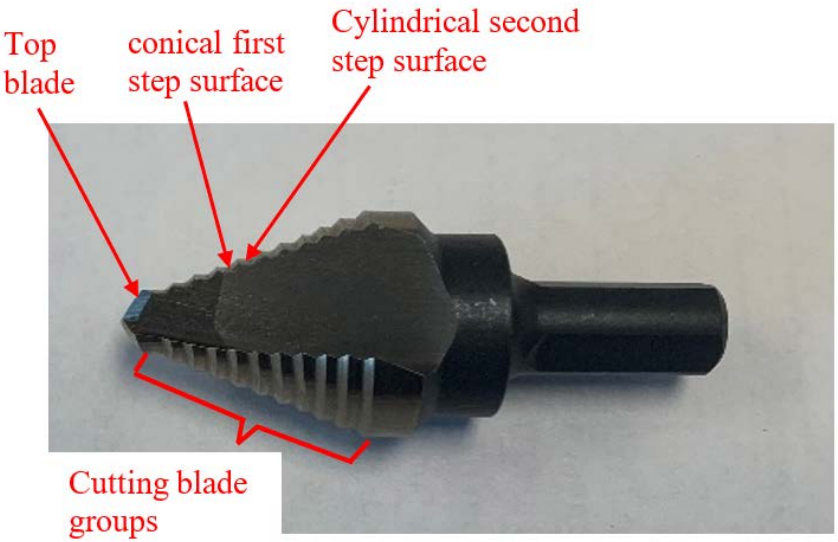

Top blade
Conical first step surface
Cutting blade groups
Major cutting edge
Cutting tip
Minor cutting edge
Cylindrical second step surface
Diameter of last cutting blade group is same as cylindrical portion
0
1
1
7
72
6
8
15
9
2
4
5
10
3
3
2

Fig. 1

	Sheldon shows a conical first step surface in Fig. 1:  Viking's 00693 drill includes a conical first step surface.


Top blade
conical first step surface
Cylindrical second step surface
Cutting blade groups

	Viking's 0694 drill includes a conical first step surface.  Viking's 00714 drill includes a conical first step surface.

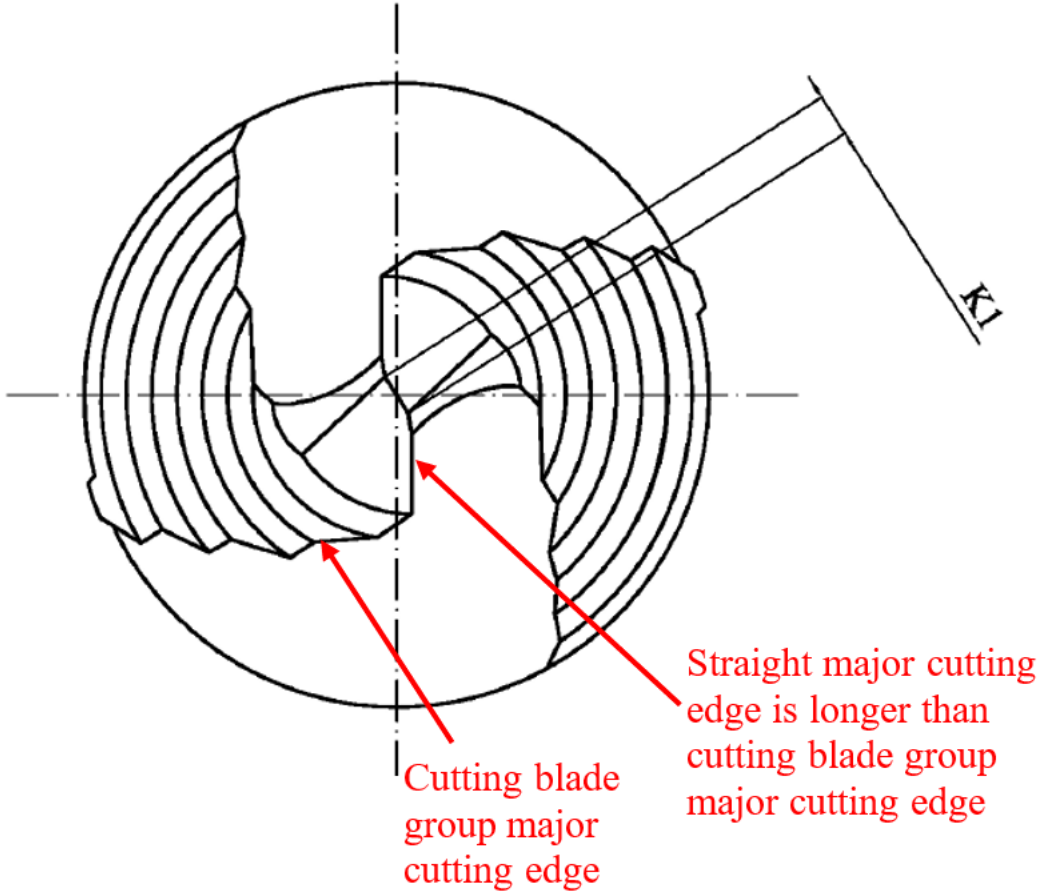
	
[’583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. See annotated representation of FIG. 2 in [’583: 1.d]. Bannister shows a cylindrical second step surface. Thus, as modified to make the first step surface conical (see [‘583: 1.e]), Bannister meets this limitation. Additionally, Wang I, Durfee I, Li and Sheldon all disclose cylindrical second step surfaces adjacent to the conical first step surface, and cylindrical second step surfaces adjacent to conical first step surfaces are present in Viking’s 00693, 00694 and 00714 drills, as shown in the annotated photographs provided in [’583: 1.e].
[’583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister shows a major cutting edge 24 defined by the intersection of a step surface and the sidewall of the spiral flute. Specifically, Bannister states “The central grinding unit 13 and each succeeding grinding unit formed by the stepped cutting edges, forms a pilot for the succeeding larger drilling unit . . . .” Bannister, p. 2 right col. ll. 49-52.

	See annotated representation of FIG. 2 in ['583: 1.d]. Thus, as modified to make the first step surface conical (see ['583: 1.e]), Bannister meets this limitation. Additionally, Wang I, Durfee I, Li and Sheldon each show a major cutting edge, and major cutting edges are to be found in Viking's 00693, 00694 and 00714 drills. See the Figures in ['583: 1.e].
['583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute; and	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister shows a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. Specifically, Bannister states "The central grinding unit 13 and each succeeding grinding unit formed by the stepped cutting edges, forms a pilot for the succeeding larger drilling unit . . . ." Bannister, p. 2 right col. ll. 49-52. Thus, Bannister discloses this limitation. See annotated representation of FIG. 2 in ['583: 1.d]. Wang I, Durfee I, Li and Sheldon each disclose a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. See the Figures in ['583. 1.e]. Likewise, Viking's 00693, 00694 and 00714 drills have a minor cutting edge defined by the cylindrical second step and the sidewall of the flute. See ['583. 1.e].
['583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister shows a cutting tip defined by the intersection of the minor cutting edge, a major cutting edge, and the sidewall of the spiral flute. Thus, as modified to make the first step surface conical (see ['583: 1.e]), Bannister meets this limitation. Wang I, Durfee I, Li and Sheldon each disclose a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge and the side wall of the spiral flute. See the Figures in ['583. 1.e]. Likewise, Viking's 00693, 00694 and 00714 drills each have a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge and the sidewall of the flute. See the Figures in ['583. 1.g].
['583: 1.j] a top blade provided on the front end of the cone portion;	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. See annotated representation of FIG. 2 in ['583: 1.d]. Bannister shows a top blade provided on the front end of the cone portion. Specifically, Bannister refers to "a central drilling unit 13 having bevelled cutting edges 14, and provided with auxiliary flutes

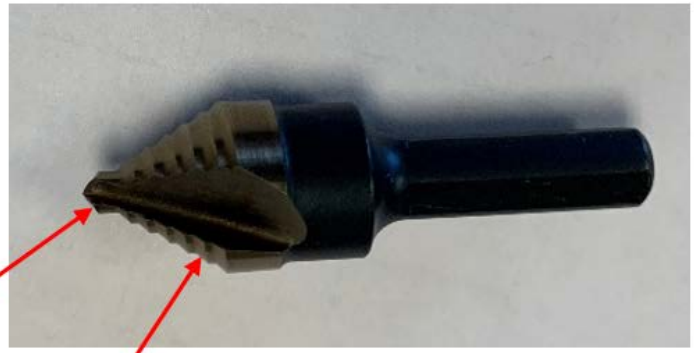
	17 and 18 which merge into the main flutes 11 and 12." Bannister, p. 2 left col. ll. 49-53. Thus, Bannister discloses this limitation. In addition, Wang I, Durfee I, Li and Sheldon each disclose a top blade. See the Figures in ['583. 1.e]. Likewise, Viking's 00693, 00694 and 00714 drills, each have a top blade. See the Figures in ['583. 1.e].
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. See annotated representation of FIG. 2 in ['583: 1.d]. Bannister shows that the diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. Thus, Bannister discloses this limitation. Wang I, Durfee I, Li and Sheldon each disclose that the diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion of the rear end of the cone portion. See the Figures in ['583. 1.e]. Likewise, in Viking's 00693, 00694 and 00714 drills the diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion. See the Figures in ['583. 1.e].
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Plaintiff's infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite cutting blade groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Bannister. Bannister teaches that the spiral flutes 11 and 12 shown in FIGs. 1-2 will shunt chips from the cutting surface out of the drilled hole. Bannister specifically describes that "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." Bannister, p. 1 right col. l. 54 – p. 2 left col. l. 2.

	Likewise, the drill bits of Wang I, Durfee I, Li, Sheldon as well as Viking's 00693, 00694 and 00714 drills teach these elements either expressly or inherently.
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister shows that the horizontal step surface forming the cutting edge 24 is immediately adjacent to a cylindrical second step surface. See annotated representation of FIG. 2 in ['583: 1.d]. As indicated above, a person of ordinary skill would be motivated to modify Bannister to include conical first step surfaces in a manner as shown in Wang I and Durfee I, and as is used in the Viking 00693, 00694 and 00714 drills. See ['583: 1.e]. In each of these cases, at least one cylindrical second step surface is immediately adjacent a conical first step surface of a next composite blade group. Thus, as modified to make the first step surface conical (see ['583: 1.e], Bannister meets this limitation.
['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in Bannister, immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter. Bannister shows in FIGs. 1-2 that the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.
Claim 2	**Bannister (U.S. Patent No. 2,193,186)**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Bannister, FIGs. 1-2. Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Bannister.

Claim 3	**Bannister (U.S. Patent No. 2,193,186)**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	Defendant believes this claim to be indefinite, because it can be construed to mean that the height of each composite cutting blade group is the same as the height of the other composite blade groups, or can be construed to mean that the height of each composite cutting blade group is uniform around its perimeter. If found to be definite, however, Bannister discloses this limitation under either interpretation of claim 3. See Fig. 2. Under either interpretation of claim 3, this claim is also taught by any of Wang I, Durfee I, Li, Sheldon, or the Viking 00693, 00694 or 00714 drills. See the Figures shown in ['583: 1.e].
Claim 5	**Bannister (U.S. Patent No. 2,193,186)**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	This claim language is directed to a well-known type of drill tip, commonly referred to as a split point tip. See Korb FIG. 8 and col. 3, ll. 26-27; and Wetzl, paras. [6, 10, 28, and 39], and Norseman 2014 catalog at pp. 6 - 15, 26, 26, 28, 29. It was known that this type of point provides fast penetration into the workpiece and accurate starting. See e.g. Norseman 2014 catalog at p. 8 Such designs were well known and were widely used, for example, in the Viking 00693, 00694, and 00714 drills. Split point tips were also shown in at least Wang I, Wetzl, Li, and Wang II. It would have been obvious for a person of ordinary skill to provide Bannister's drill with the well-known split point tip for the advantages of accurate starting and fast penetration.
Claim 6	**Bannister (U.S. Patent No. 2,193,186)**
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Bannister, FIGs. 1-3; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Defendant disagrees with this contention, based on Plaintiffs' assertion, then Bannister shows cutting blade groups that are coaxial with the axis of the cone portion, e.g. in FIG. 3.

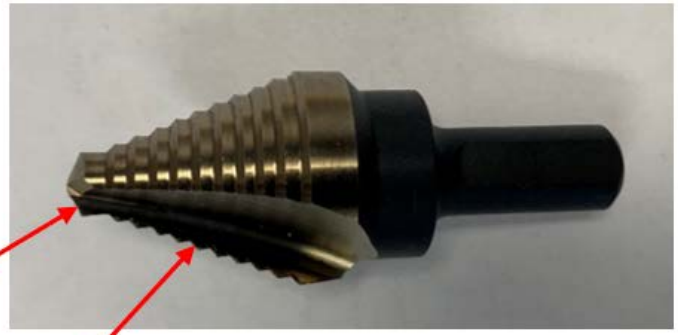
Claim 7	Bannister (U.S. Patent No. 2,193,186)
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	See Bannister, p. 2 right col. l. 70 – p. 3 left col. l. 2. To the extent that Bannister does not disclose this limitation, it would have been obvious for one of ordinary skill to modify Bannister to include more steps in the conical portion while keeping a larger straight major cutting surface on the top blade as shown, for example in Wang I, and as is present in the Viking 00693, 00694 and 00714 drills. Wang I shows, for example in FIG. 12, that a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. 

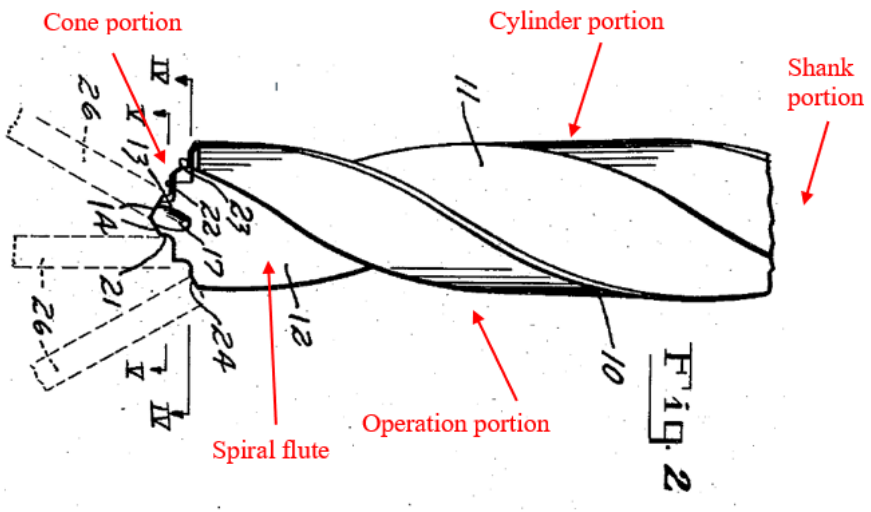
This limitation is also present in the Viking 00693, 00694 and 00714 drills.
Viking 00693 drill:

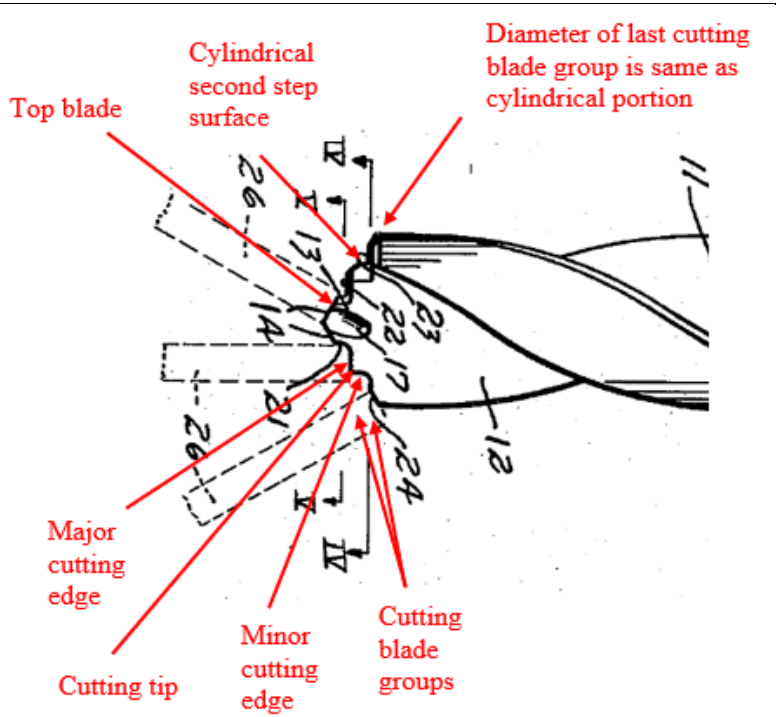


Viking 00694 drill:



	Viking 00714 drill:  One would have been motivated to do this, for example, to make the drilling force relatively small, uniform and reasonable, and to prolong the life of the tool by making the stepped cutting edge wear more uniformly.
Claim 8	**Bannister (U.S. Patent No. 2,193,186)**
[’583: 8.pre] A twist drill, comprising:	The preamble carries no patentable weight. Bannister discloses a twist drill. See, e.g., Abstract.
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	See [‘583: 1.a].

	
[’583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	See [‘583: 1.b].
[’583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	See [‘583: 1.c].
[’583: 8.d] a plurality of composite cutting blade groups formed	See [‘583: 1.d]. For example, Bannister shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 2 shown below.

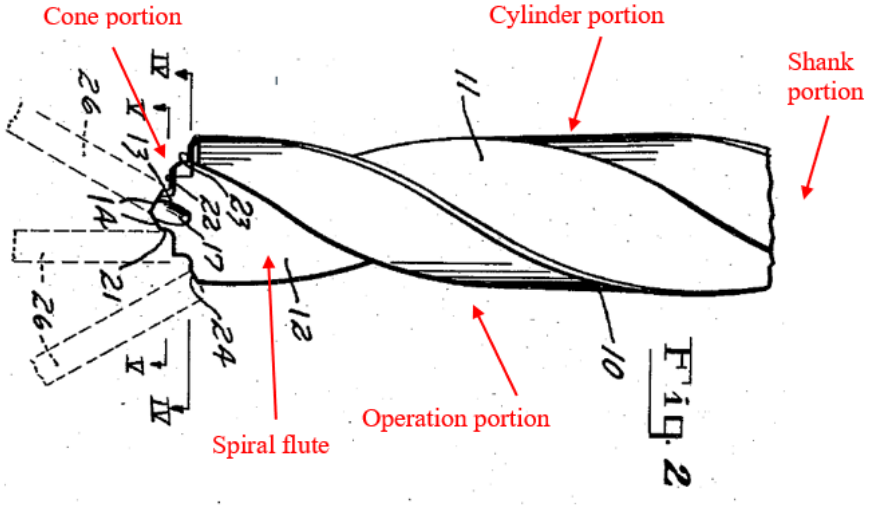
sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	
[’583: 8.e] a conical first step surface;	See [‘583: 1.e] and [’583: 8.d].
[’583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	See [‘583: 1.f] and [’583: 8.d].
[’583: 8.g] a major cutting edge defined by the intersection of the conical first step surface	See [‘583: 1.g] and [’583: 8.d].

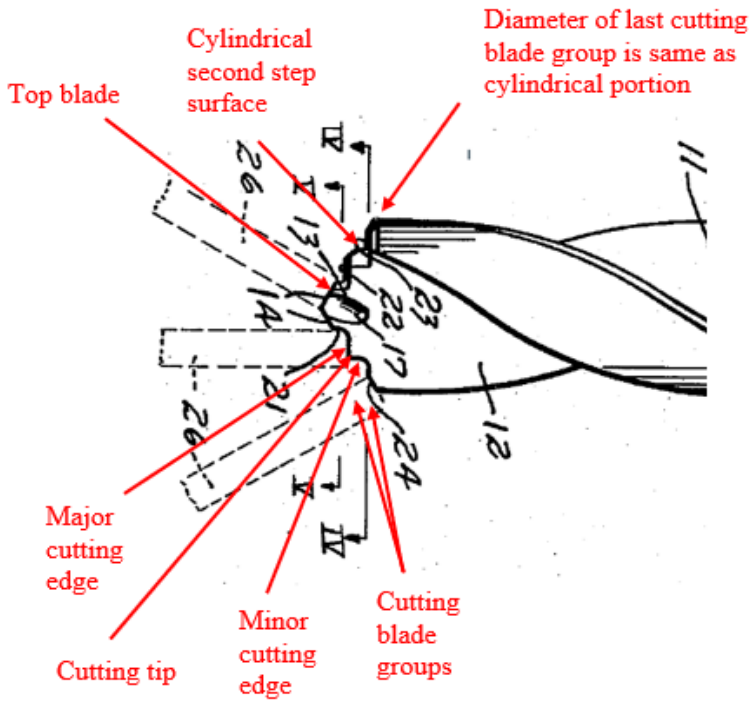
and the sidewall of the spiral flute;	
[’583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	See [‘583: 1.h], [‘583: 2], and [’583: 8.d].
[’583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	See [‘583: 1.i] and [’584: 8.d].
[’583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with	See [‘583: 1.j] and [‘583: 5].

the straight major cutting edge and the chisel edge;	
[’583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	See [‘583: 1.k] and see the annotated representation of Bannister’s FIG. 2 shown in [‘583: 8.d].
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	See [‘583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	See [‘583: 1.m] and the annotated representation of FIG. 2 in [’583: 8.d].
[’583: 8.n] the diameter of the last composite cutting blade group	See [‘583: 1.n] and the annotated representation of FIG. 2 shown in [’583: 8.d].

located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	
Claim 9	**Bannister (U.S. Patent No. 2,193,186)**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	See [’583: 3].
Claim 11	**Bannister (U.S. Patent No. 2,193,186)**
[’583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	See [’583: 6].
Claim 12	**Bannister (U.S. Patent No. 2,193,186)**
[’583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	See [’583: 7].
Claim 13	**Bannister (U.S. Patent No. 2,193,186)**

['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. If this construction is correct, then this feature is shown in at least Wang I and the Viking 00693, 00694 and 00714 drills, and it would have been obvious to modify Bannister to meet this limitation for the same reason set forth above relative to claim 7. See ['583: 7].
Claim 14	**Bannister (U.S. Patent No. 2,193,186)**
['583: 12] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31; p. 2 left col. l. 32 – p. 3 left col. l. 11. A person of ordinary skill will understand that the operation portion of the drill disperses a cutting force on each of the plurality of cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece. Bannister also describes that "[t]he power requirement for drilling large holes is thus reduced to the amount required for the cutting edges through the metal and the amount heretofore required . . . ." Bannister, p. 2 left col. ll. 27-30. Thus, Bannister meets and discloses this limitation.
'584 Patent	
Claim 1	**Bannister (U.S. Patent No. 2,193,186)**
['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole	Bannister, FIGs. 1-2; p. 1 left col. l. 1 – p. 2 left col. l. 31, p. 2 left col. l. 32 – p. 3 left col. l. 11. Bannister teaches a method of improving centering accuracy of a twist drill. Bannister specifically describes that "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." Bannister at p. 1 right col. ll. 46-49.

in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	As shown below in [‘584: 1.a,], Bannister’s method involves using a twist drill with a cone portion and cylinder portion.
[’584: 1.a] providing a twist drill comprising: a shank portion;	Bannister provides a twist drill having a shank portion. See [’583: 1.b]. Also, see the annotated representation of Bannister’s FIG. 2 reproduced below. 
[’584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior	Bannister describes a twist drill having an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. See [‘583: 1.a], [‘583: 1.c], and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 1.a].

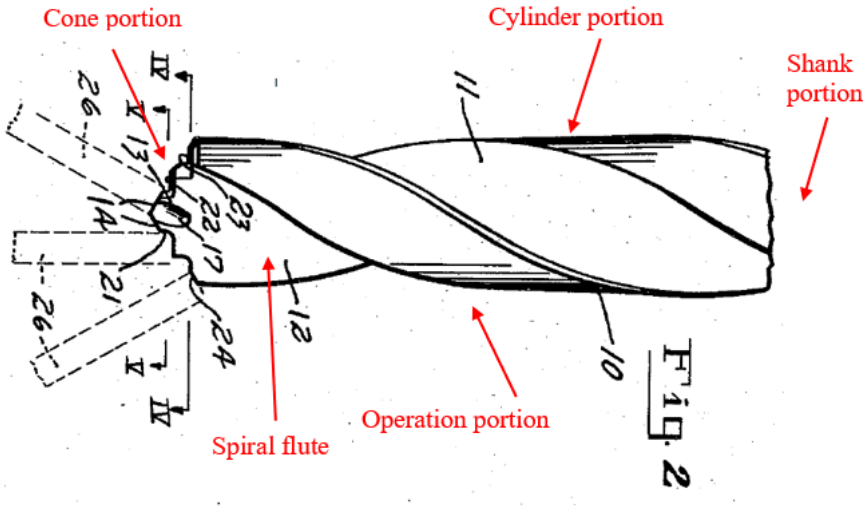
surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	
['584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	See ['583: 1.d]. For example, Bannister shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 2 shown below. 

['584: 1.d] a conical first step surface;	See ['583: 1.e] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 1.c].
['584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	See ['583: 1.f] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 1.c].
['584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	See ['583: 1.g] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 1.c].
['584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	See ['583: 1.h] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 1.c].
['584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	See ['583: 1.i] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 1.c].
['584: 1.i] a top blade provided on the front end of the cone portion;	See ['583: 1.j] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 1.c].

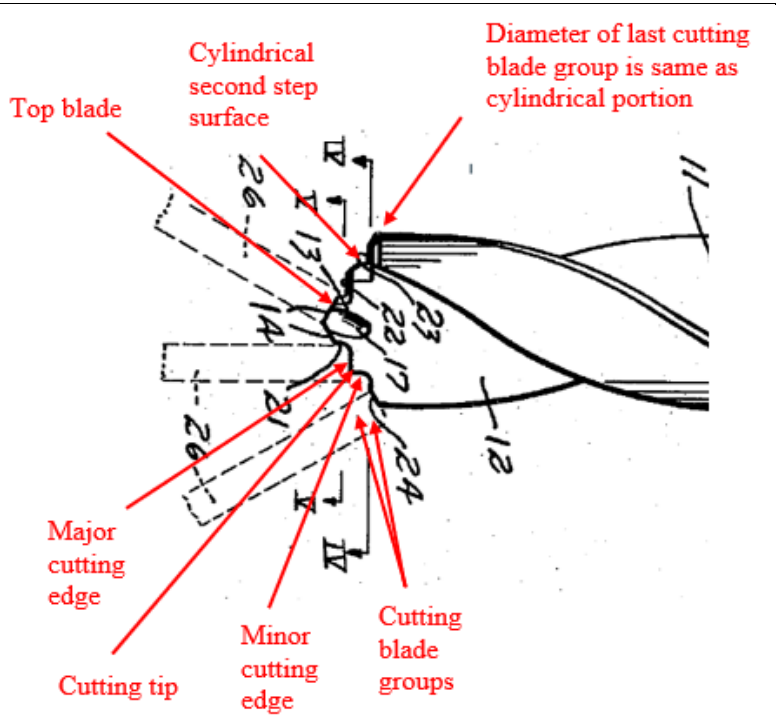
[’584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	See [‘583: 1.m] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 1.c].
[’584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	See [‘583: 1.n] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 1.c].
[’584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	Bannister describes the conventional drilling methods and explains how the inventive drill bit overcomes deficiencies in the prior art drilling process. A person having ordinary skill in the art would understand that use of Bannister’s inventive drill bit inherently includes positioning the twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill.
[’584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	Bannister teaches this limitation, stating “The central grinding unit 13 and each succeeding grinding unit formed by the stepped cutting edges, forms a pilot for the succeeding larger drilling unit . . . .” Bannister, p. 2 right col. ll. 49-52; see also p. 1, left col., ll. 1-11, ll. 25-34, right col., ll. 32-49.
[’584: 1.n] continuing cutting the workpiece using one or more of the	See [’584: 1.m]. Bannister specifically describes that “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.” Bannister at p. 1 right col. ll. 46-49.

plurality of composite cutting blade groups situated closest to the front end;	
[’584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	See [’584: 1.m] and [‘584: 1.n].
[’584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	This is a natural outcome of using the Bannister drill and is, therefore, inherent to the use of the drill. See also [’584: 1.m] and [‘584: 1.n].
[’584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	See [’584: 1.m] and [‘584: 1.n].
Claim 2	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 2] The method of claim 1 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece	See [‘583: 2] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 1.c].

to improve surface quality.	
Claim 4	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	See [‘583: 5].
Claim 5	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 5] The method of claim **1** wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	See [‘583: 7].
Claim 6	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 6.pre] A method for improving centering accuracy of a twist drill	See [’584: 1.pre].

when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	
['584: 6.a] providing a twist drill comprising: a shank portion;	Bannister provides a twist drill having a shank portion. See ['583: 1.b]. Also, see the annotated representation of Bannister's FIG. 2 reproduced below. 
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a	See ['583: 1.a], ['583: 1.c] and the annotated representation of Bannister's FIG. 2 reproduced in ['584: 6.a].

sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	
[’584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	See [‘583: 1.d]. For example, Bannister shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 2 below.

	
[’584: 6.d] a conical first step surface;	See [’583: 1.e] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 6.c].
[’584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	See [’583: 1.f] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 6.c].
[’584: 6.f] a major cutting edge defined by the intersection of the conical first step surface	See [’583: 1.g] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 6.c].

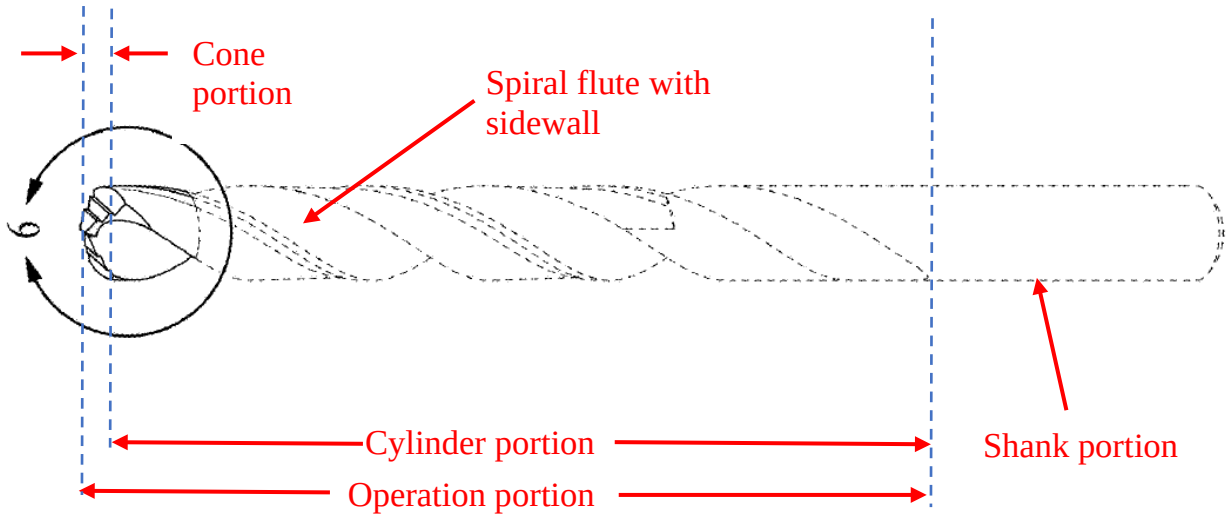
and the sidewall of the spiral flute;	
[’584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	[’583: 1.h] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 6.c].
[’584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	See [’583: 1.i] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 6.c].
[’584: 6.i] a top blade provided on the front end of the cone portion;	Bannister shows a top blade provided on the front end of the cone portion. See [’583: 1.j] and the annotated representation of FIG. 2 shown in [’584: 6.c].
[’584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	See [’583: 1.m] and the annotated representation of Bannister’s FIG. 2 reproduced in [’584: 6.c].
[’584: 6.k] the diameter of the last composite cutting blade group	See [’583: 1.n] and the annotated representation of FIG. 2 shown in [’584: 6.c].

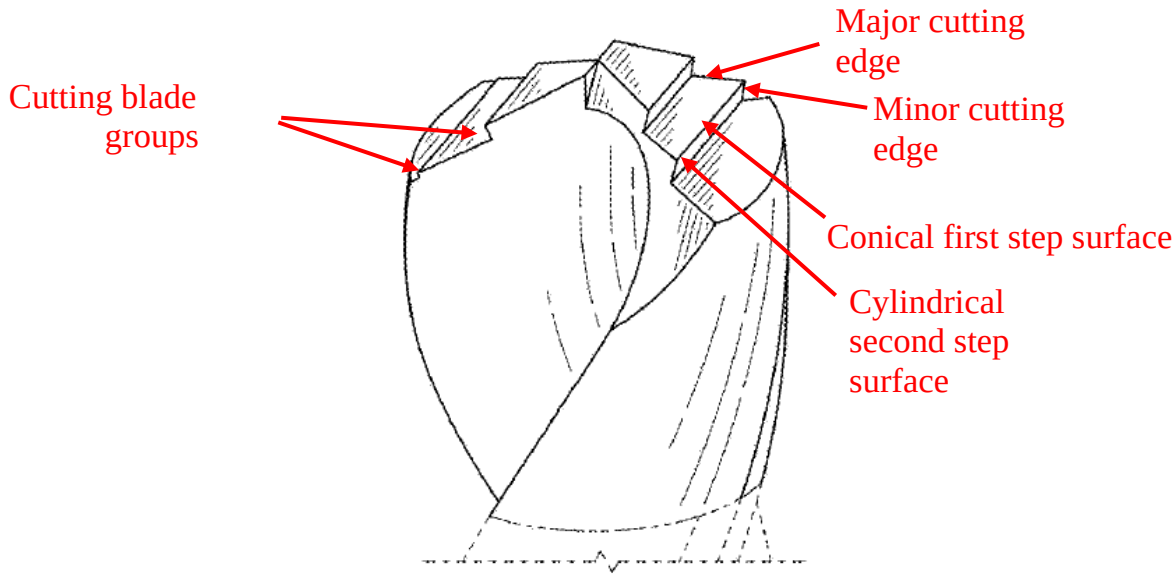
located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	
[’584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	See [‘584: 1.l].
[’584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	See [‘584: 1.m].
[’584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	See [‘584: 1.n].
[’584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	See [‘584: 1.o].

[’584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	See [‘584: 1.p].
Claim 7	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	See [‘583: 2] and the annotated representation of FIG. 2 shown in [’584: 6.c].
Claim 9	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	See [‘583: 5].

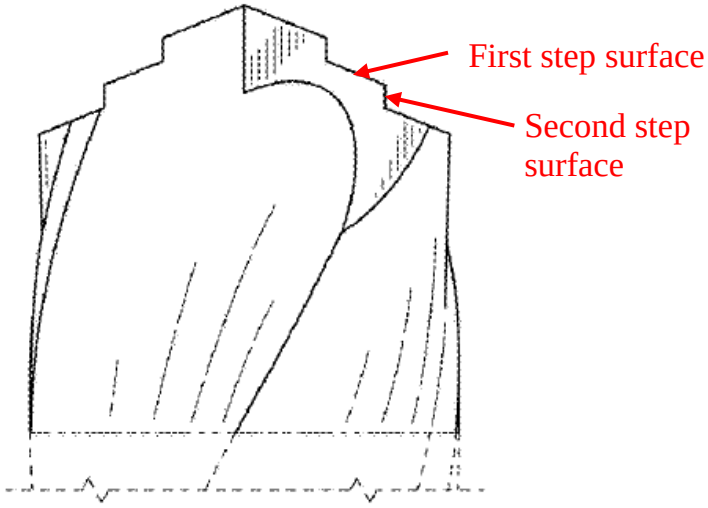
Claim 10	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	See [‘583: 7].
Claim 11	**Bannister (U.S. Patent No. 2,193,186)**
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	See [‘583: 14].

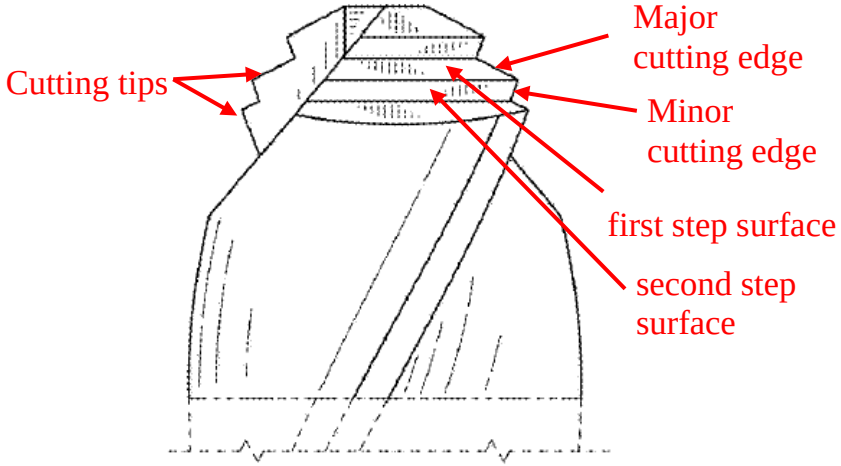
Exhibit G

’583 Patent	
Claim 1	**Prior Art – Wang II (U.S. Design Pat. No. D840,449)**
[’583: 1.pre] A twist drill, comprising:	U.S. Patent No. D840,449 (“Wang II”) discloses a twisted drill tip. *See, e.g.*, Claim, FIG. 1.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	Wang II, FIGs. 1-8. For example, in FIG. 1 (annotated below) Wang II shows discloses a twist drill having a cylinder portion and a cone portion, with a shank portion fixed axially to the cylinder portion. 
[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	Wang II, FIGs. 1-3. For example, in FIG. 1, Wang II shows a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated FIG. 1 in [’583: 1.a].
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion	Wang II, FIGs. 1-3. Wang II shows spirals flutes, e.g., in FIG. 1, formed on an exterior surface of the operating portion, extending from a front end of the cone portion and at least partway up the cylinder portion. The spiral flutes have sidewalls.

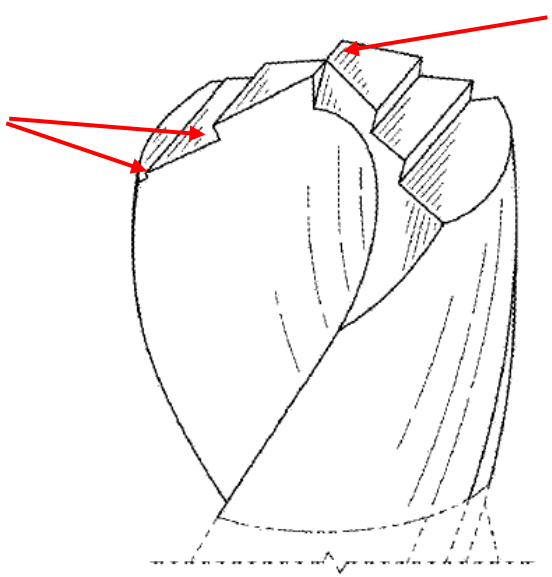
and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* annotated FIG. 1 in [’583: 1.a].
[’583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	Wang II, FIGs. 1-8. Wang II shows composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. *See* annotated FIG. 6 below.  Wang II does not show or teach that the composite cutting blade groups are formed spirally. U.S. Patent No. 8,029,215 (“Gentry”) shows spiral grooves on a conical drill bit. For example, FIG. 8 shows spiral (helical) grooves 270, 272. “Once the conically-shaped main body 206 has been formed, the helical grooves 270, 272 are turned onto the spiral drill bit 50 using two form tools…The helical grooves begin at diametrically-opposed positions and are offset by a phase

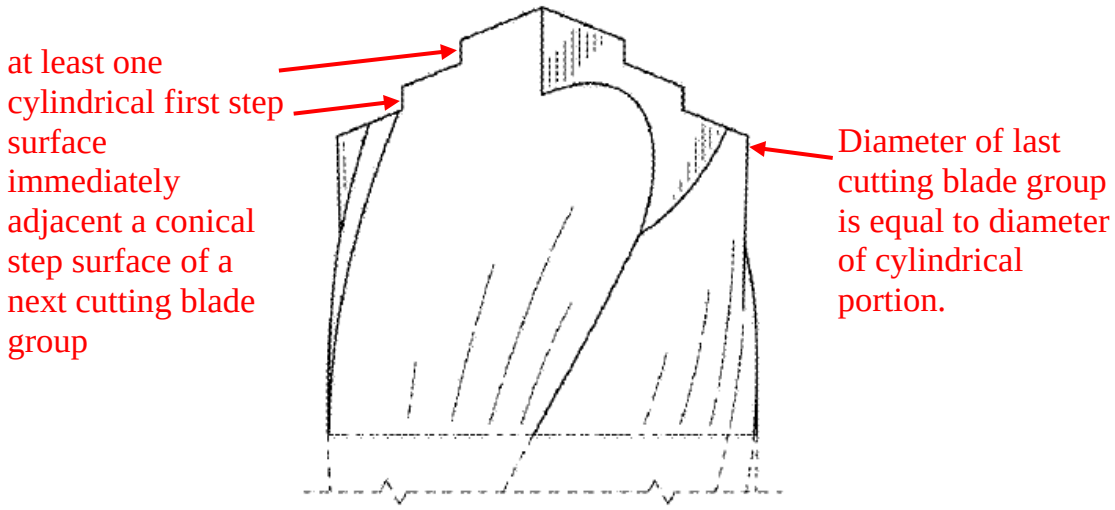
	angle of 180 degrees." *See* Gentry, 7:4-8. A person of ordinary skill would have been motivated to adopt this manufacturing approach because the manufacturing process for the drill bit reduces the amount of grinding required, thus reducing the time and cost of forming the spiral drill bit. *Id.*, 2:67–3:3. Plaintiffs' infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it would have been obvious to add such axial relief to the cutting blade groups shown in Wang II. Examples of prior art drill bits having axial relief on similar cutting include the Viking 00693, 00694 and 00714 drills, U.S. Patent No. 2,193,186 ("Bannister"), U.S. Patent No. 3,592,555 ("Mackey"), U.S. Patent No. 10,058,929 ("Durfee I"), U.S. Patent No. 9,687,915 ("Durfee II"), and U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl"). It is well known that axial relief in such cutting elements improve the cutting efficiency of the drill bit and that, in the absence of axial relief, such drills will cut poorly. Thus, it would have been obvious to add the same axial relief to Wang II that is present in the accused products.
['583: 1.e] a conical first step surface;	Wang II, FIGs. 1-8. Wang II shows composite cutting blade groups comprising a first step surface. *See* annotated FIG. 6 in ['583: 1.d]. *See* also annotated FIGs. 7 and 8 below:

	 Wang II, FIG. 7.

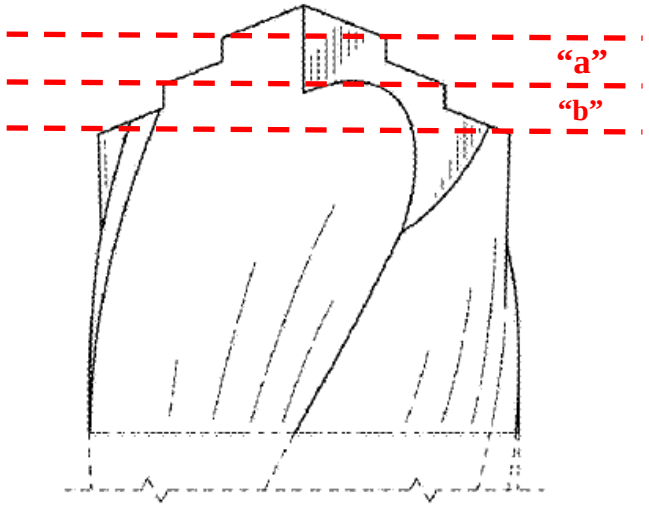
	 Wang II, FIG. 8. To the extent that Wang II does not show that the first step surface is conical it would have been obvious to a person of ordinary skill to modify this surface to be conical based on the curved step surfaces of the Viking 00693, 00694 and 00714 drills, and the curved step surfaces shown in Bannister, Mackey, Durfee I, Durfee II, and Wetzl.
[’583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Wang II, FIGs. 1-8. To the extent that Wang II does not show that the second step surface is cylindrical, it would have been obvious to a person of ordinary skill to modify this surface to be cylindrical based on the curved step surfaces of the Viking 00693, 00694 and 00714 drills, and the curved step surfaces shown in Bannister, Mackey, Durfee I, Durfee II, and Wetzl. Plaintiffs’ infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent the second step surfaces from being considered “cylindrical.” While Viking disagrees with this contention, based on Plaintiffs’ assertion, Wang II, as modified to include conical and cylindrical surfaces, discloses composite cutting blade groups comprising a cylindrical second step surface adjacent to the conical first surface.

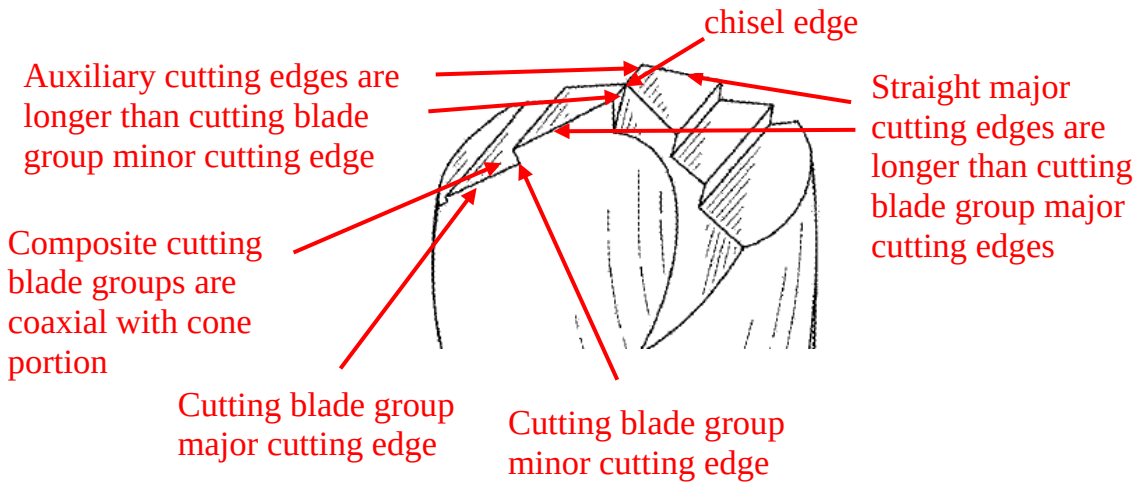
	See annotated FIG. 6 in [’583: 1.d] and annotated FIGs. 7, 8 in [’583: 1.e].
[’583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Wang II, FIGs. 1-8. Wang II shows composite cutting blade groups comprising a major cutting edge defined by the intersection of the first step surface, as modified under [’583: 1.e] to be conical and the sidewall of the spiral flute. *See* annotated FIG. 6 in [’583: l.d] and annotated FIG 8 in [’583: 1.e].
[’583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Wang II, FIGs. 1-8 Wang II shows composite cutting blade groups comprising a minor cutting edge defined by the intersection of the second step surface, as modified under [’583: 1.f] to be cylindrical, and the sidewall of the spiral flute. *See* annotated FIG. 6 in [’583: l.d] and annotated FIG 8 in [’583: 1.e].
[’583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Wang II, FIGs. 1-8 Wang II shows composite cutting blade groups comprising a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* annotated FIG 8 in [’583: 1.e].
[’583: 1.j] a top blade provided on the front end of the cone portion;	Wang II, FIGs. 1-8. Wang II shows a top blade provided on the front end of the cone portion. *See* annotated FIG. 6 below:

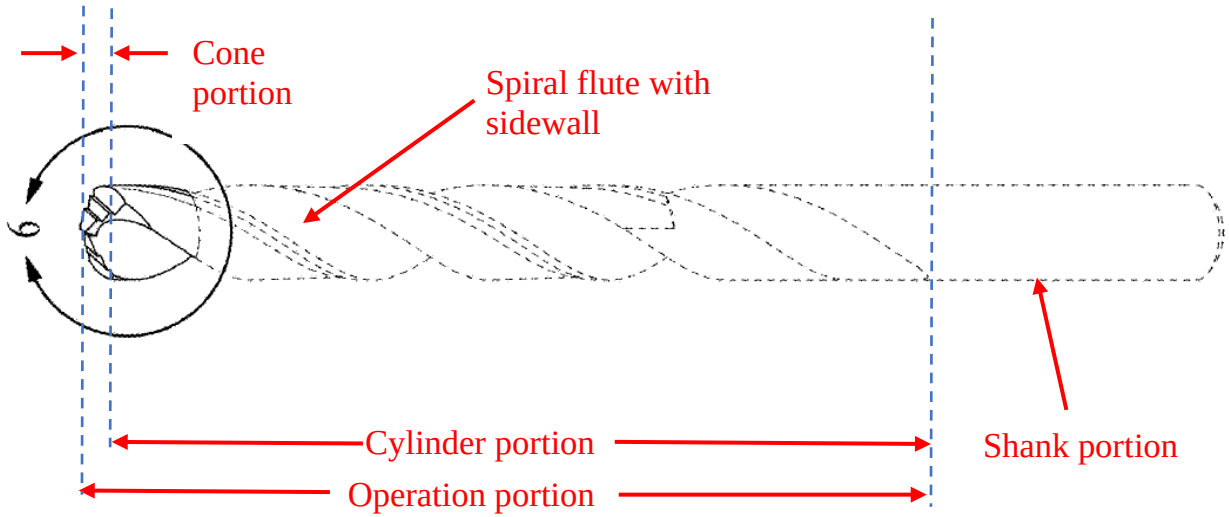
	
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	Wang II, FIGs. 1-8. Wang II shows that the diameter of each of the plurality of composite cutting blade groups, as modified under ['583: 1.e] and ['583: 1.f] increases sequentially from the front end of the cone portion to the rear end of the cone portion. *See* annotated FIG. 6 in ['583: 1.j].
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Wang II, FIGs. 1-8. Plaintiffs' infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Wang II, because Wang II teaches a drill with a plurality of composite cutting blade groups. A person of ordinary skill will understand that the spiral flutes shown in FIGs. 1-4 and 6-8 will shunt chips from the cutting surface out of the drilled hole.

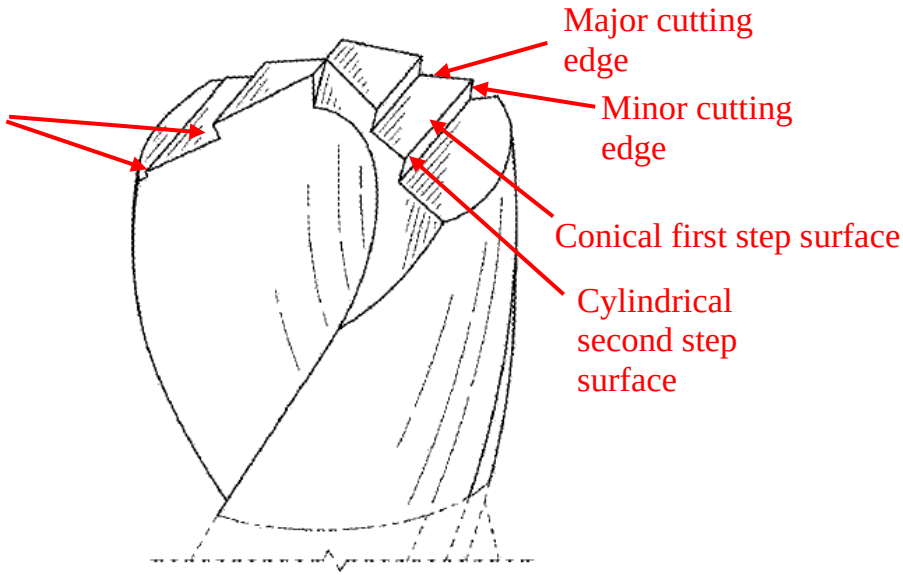
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	Wang II, FIGs. 1-8. Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent the second step surfaces from being considered "cylindrical." While Viking disagrees with this contention, based on Plaintiffs' assertion, Wang II shows that at least one cylindrical second step surface, as modified under ['583: 1.f] is immediately adjacent to a conical first step surface, as modified under ['583: 1.e] of a next composite cutting blade group. *See* annotated FIG. 7 below.  To the extent this limitation is not taught in Wang II, a person of ordinary skill would be motivated to modify Wang II to include conical first step surfaces in a manner as shown in Wang I and Durfee I, and as is used in the Viking 00693, 00694 and 00714 drills. *See* ['583: 1.e], ['583: 1.f]. In each of these cases, at least one cylindrical second step surface is immediately adjacent a conical first step surface of a next composite blade group. Thus, as modified, Wang II meets this limitation.
['583: 1.n] the diameter of the last composite cutting blade group	Wang II, FIGs. 1-8.

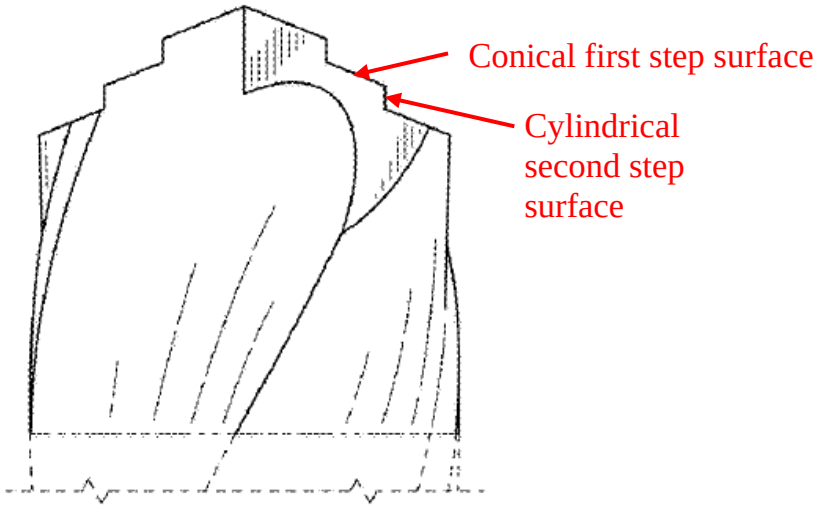
located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion,, Wang II shows in FIGs. 1-4, 6-8 shows that the diameter of the last composite cutting blade group, as modified under ['583: 1.e] and ['583: 1.f], located at the rear end of the cone portion immediately adjacent to the cylinder portions is equal to the cylinder portion diameter. *See* annotated FIG. 7 in ['583: 1.m].
Claim 2	**Wang II**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is inherent in Wang II, because Wang II teaches a minor cutting edge.

Claim 3	**Wang II**
[’583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	Defendant believes this claim to be indefinite, because it can be construed to mean that the height of each composite cutting blade group is the same as the height of the other composite blade groups, or can be construed to mean that the height of each composite cutting blade group is uniform around its perimeter. If found to be definite, however, Bannister discloses this limitation under either interpretation of claim 3. *See* Fig. 2. Nevertheless, Wang II shows, e.g., in FIGs. 6, 7, and 8 that the heights of each cutting group, in other words the height of the “cylindrical step surfaces” in each cutting blade group, are the same. *See* annotated FIG. 7 below:  Height “a” between dashed lines is the same as height “b” To the extent this limitation is not taught in Wang II, this limitation would be taught by Wang II as modified by in the manner set forth under [’583: 1.e] and [’583: 1.e] above.
Claim 5	**Wang II**

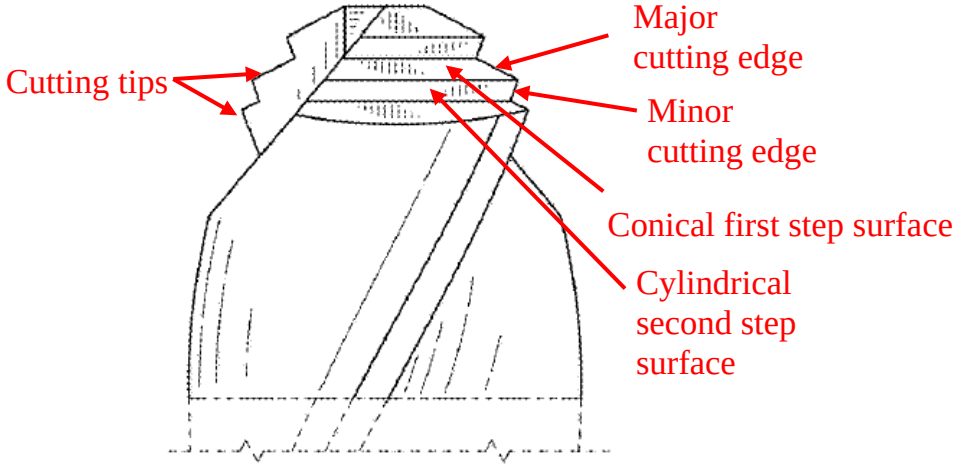
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	Wang II, FIGs. 1-8. Wang II shows, for example in FIGs. 1, 3,4, 6, and 8, that the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* annotated FIG. 6 below. 
Claim 6	**Wang II**
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Wang II, FIGs. 1-8. Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also present in the drill disclosed by Wang II, as modified in the manner discussed above under ['583: 1.e] and ['583: 1.f]. Wang II, as modified, has a plurality of composite cutting blade groups coaxial with the cone portion.
Claim 7	**Wang II**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top	Wang II, FIGs. 1-8.

blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	Wang II shows that a straight major cutting edge of the top blade is longer than each of the major cutting edges of the plurality of composite cutting blade groups. *See* annotated FIG. 6 in [’583: 1.d] and annotated FIGs. 7 and 8 in [’583: 1.e]. To the extent that Wang II does not disclose this limitation, it would have been obvious for one of ordinary skill to modify Wang II to include more steps in the conical portion while keeping a larger straight major cutting surface on the top blade as shown, for example as discussed under [’583: 1.e] and [’583: 1.f] based on Wang I, and the Viking 00693, 00694 and 00714 drills.
Claim 8	**Wang II**
[’583: 8.pre] A twist drill, comprising:	Wang II discloses a twist drill. *See, e.g.*, Claim, FIG. 1.
[’583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	See [‘583: 1.a] 
[’583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* [‘583: 1.b] and [’583: 8.a]

[’583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* [‘583: 1.c] and [’583: 8.a]
[’583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d]. For example, Wang II shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIGs. 6, 7, and 8 shown below.  Wang II, FIG. 6.

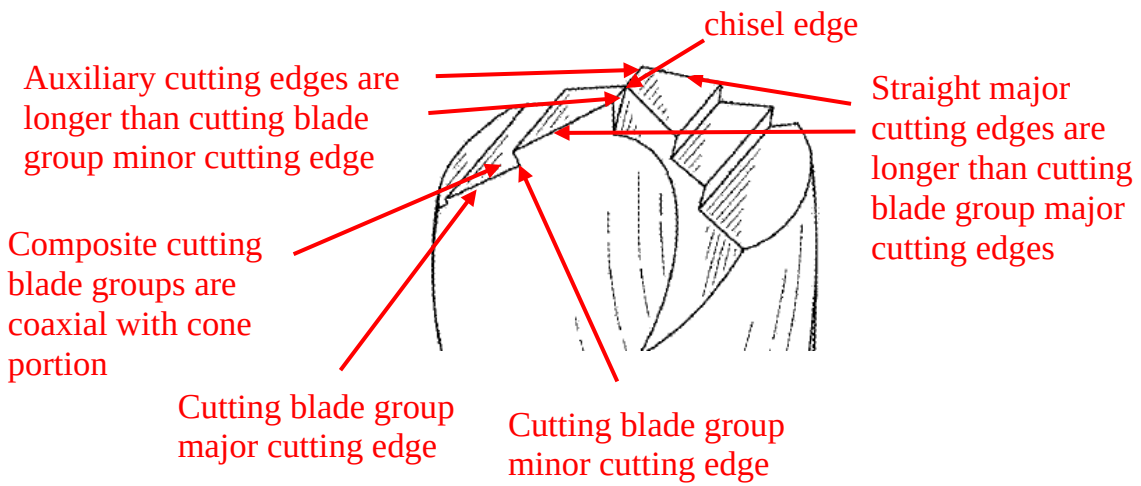
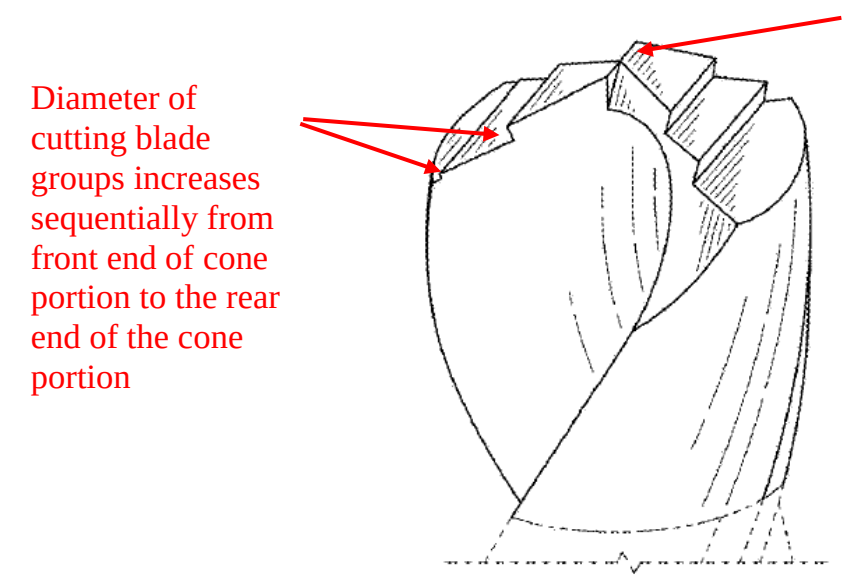


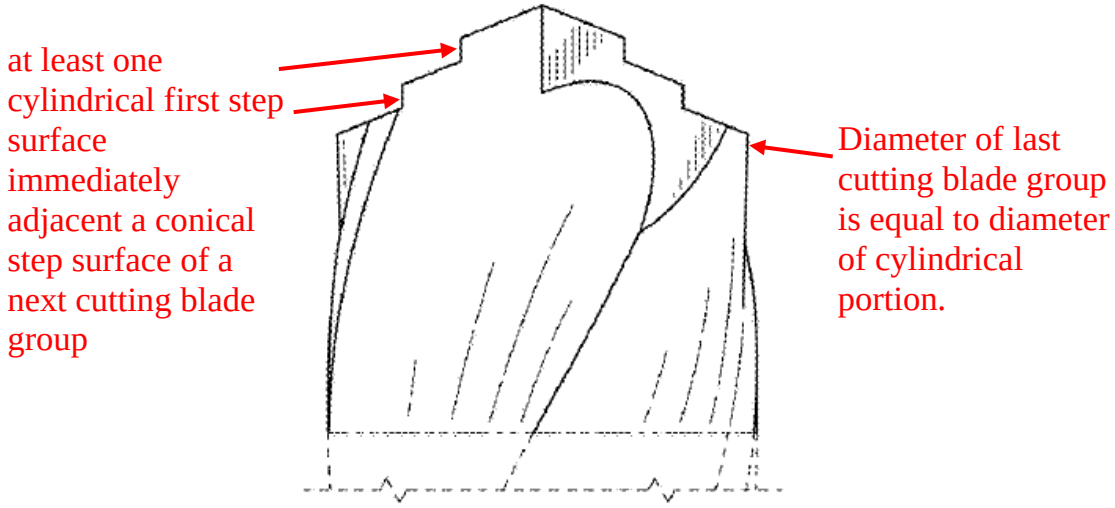
Wang II, FIG. 7.

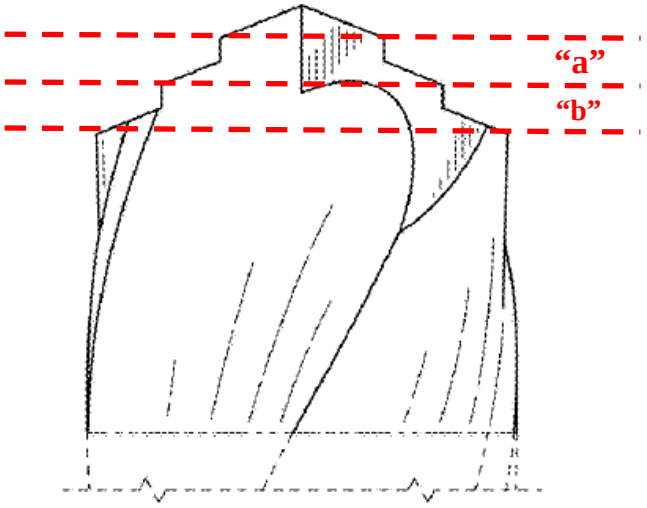


Wang II, FIG. 8.

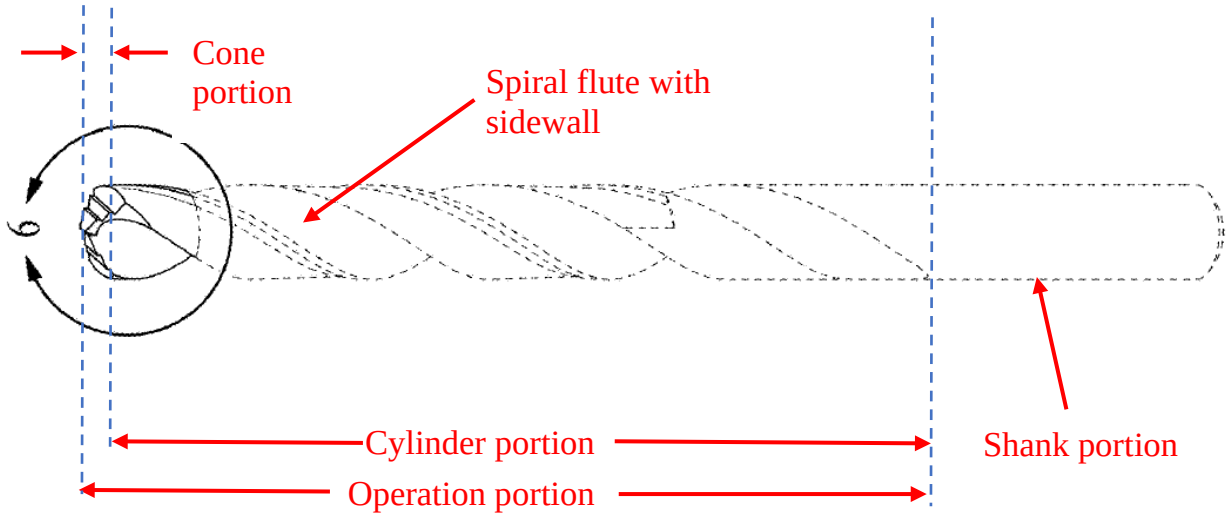
[’583: 8.e] a conical first step surface;	*See* [’583: 1.e] and [’583: 8.d].
[’583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* [’583: 1.f] and [’583: 8.d].
[’583: 8.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* [’583: 1.g] and [’583: 8.d].
[’583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* [’583: 1.h], [’583: 2], and [’583: 8.d].
[’583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	*See* [’583: 1:i] and [’583: 8.d].
[’583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with	*See* [‘583: 1.j] and [‘583: 5]. *See* the annotated representation of Wang II’s FIG. 12 shown below.

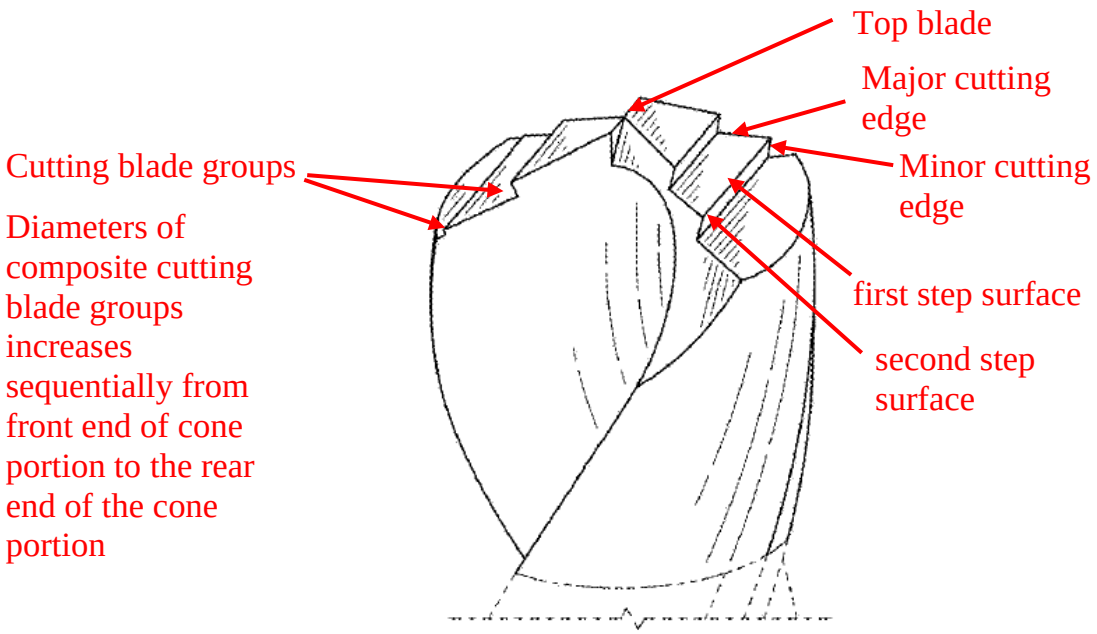
the straight major cutting edge and the chisel edge;	
['583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* ['583: 1.k] and the annotated representation of Wang II's FIG. 6 shown below. 

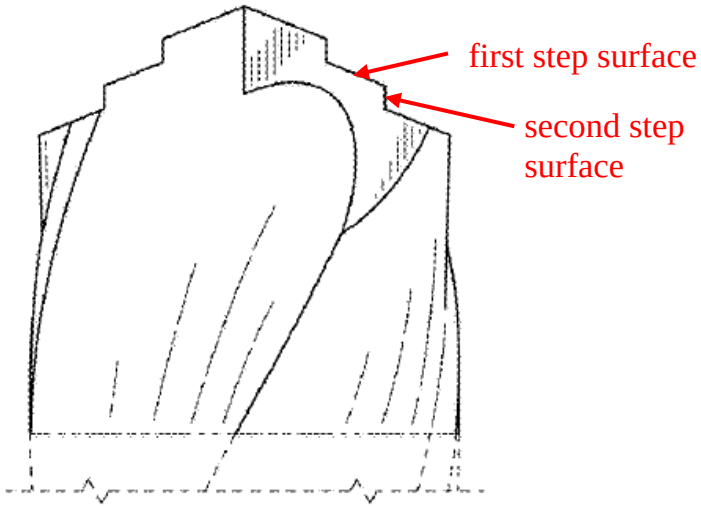
['583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* ['583: 1.l].
['583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	*See* ['583: 1.m] and the annotated representation of FIG. 7 below. 
['583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	*See* ['583: 1.n] and the annotated representation of FIG. 7 in ['583: 8.m].
Claim 9	**Wang II**

['583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* ['583: 3] *See* the annotated representation of FIG. 8 below.  Height "a" between dashed lines is the same as height "b"
Claim 11	**Wang II**
['583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* ['583: 6].
Claim 12	**Wang II**
['583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7]. *See also* the annotated representation of FIGs. 6-8 shown in ['583: 8.d].

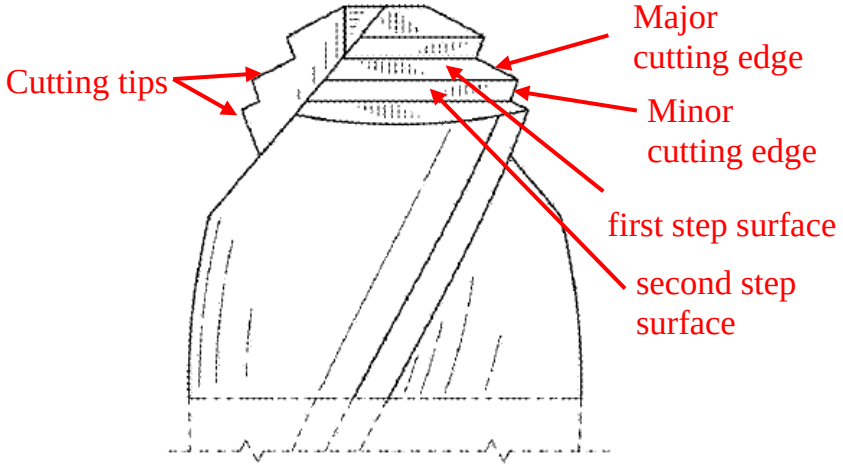
Claim 13	**Wang II**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	Wang II, FIGs. 1-8. This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. If this construction is correct, then Wang II, as modified to have a plurality of composited cutting blade groups as taught by Wang I or as seen in the Viking 00693, 00694 and 00714 drills would have straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.
Claim 14	**Wang II**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	Wang II, FIGs. 1-8. One of ordinary skill would, upon examination of Wang II, understand that Wang II shows a drill having an operation portion configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.
'584 Patent	
Claim 1	**Wang II**
['584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using	Upon examination of Wang II, one of ordinary skill would understand that use of Wang II's design to improve centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion.

multistage centering and using both a cone portion and a cylinder portion, the method comprising:	
[’584: 1.a] providing a twist drill comprising: a shank portion;	Wang II shows a design for a twisted drill bit tip having a shank portion. *See* [’583: 1.b]. *See also* the annotated representation of Wang II’s FIG. 1 reproduced below. 
[’584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank	Wang II shows a twist drill having an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* [‘583: 1.a], [‘583: 1.c], and the annotated representation of Wang II’s FIG. 1 reproduced in [’584: 1.a].

portion axially fixed to the cylinder portion opposite the cone portion;	
[’584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* [’583: 1.d] and [’583: 1.n]. For example, Wang II shows a plurality of composite cutting blade groups, as seen in annotated representations of FIGs. 6-8 reproduced below.  Wang II, FIG. 6.

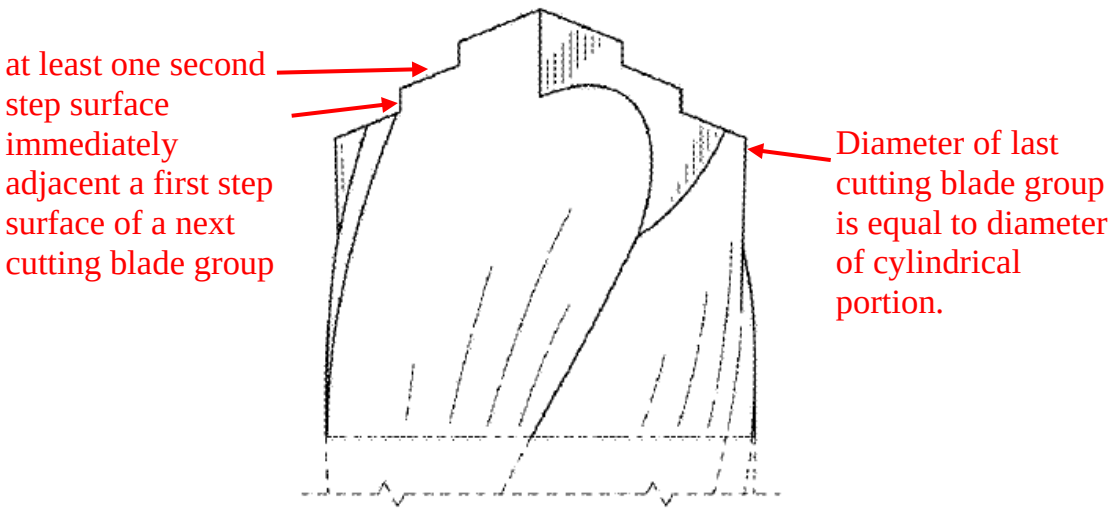


Wang II, FIG. 7.

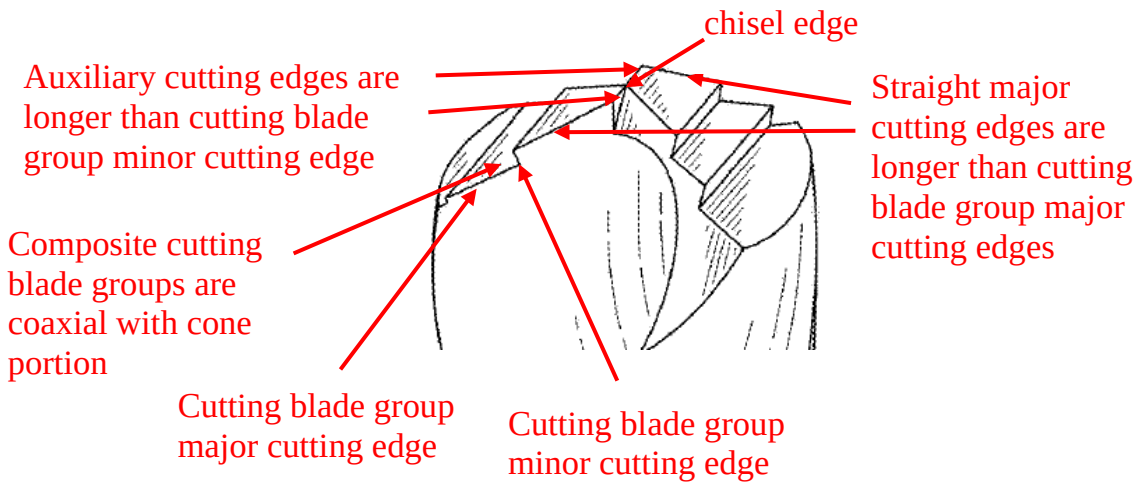


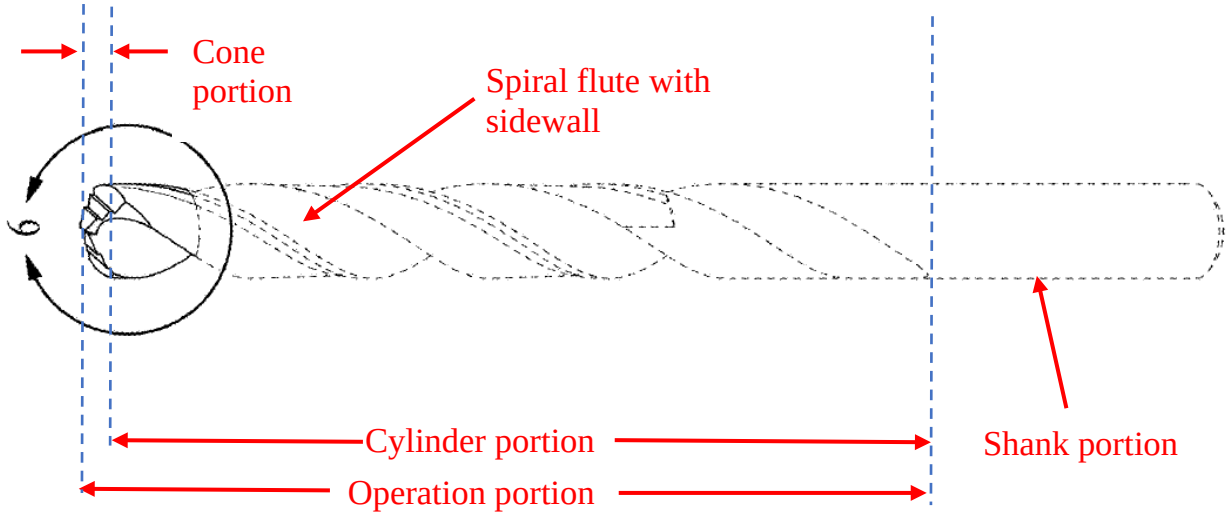
Wang II, FIG. 8.

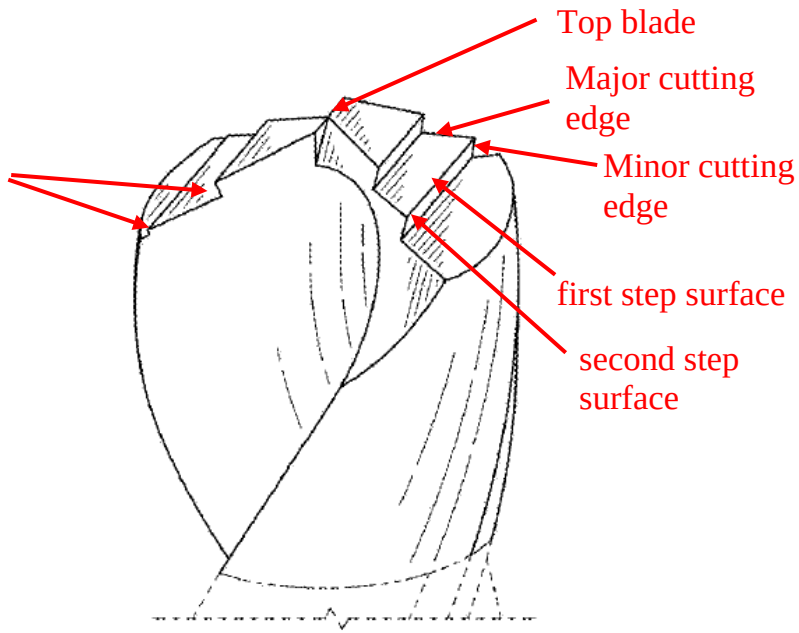
[’584: 1.d] a conical first step surface;	*See* [’583: 1.e] and the annotated representations of FIGs. 6-8 in [’584: 1.c].
[’584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* [’583: 1.f] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 1.c].
[’584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* [’583:1.g] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 1.c].
[’584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* [’583.1h] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 1.c].
[’584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* [’583: 1.i] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 1.c].
[’584: 1.i] a top blade provided on the front end of the cone portion;	*See* [’583: 1.j] and the annotated representation of Wang II’s FIG. 6 shown in [’584: 1.c].
[’584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated representation of Wang II’s FIG. 7 below.

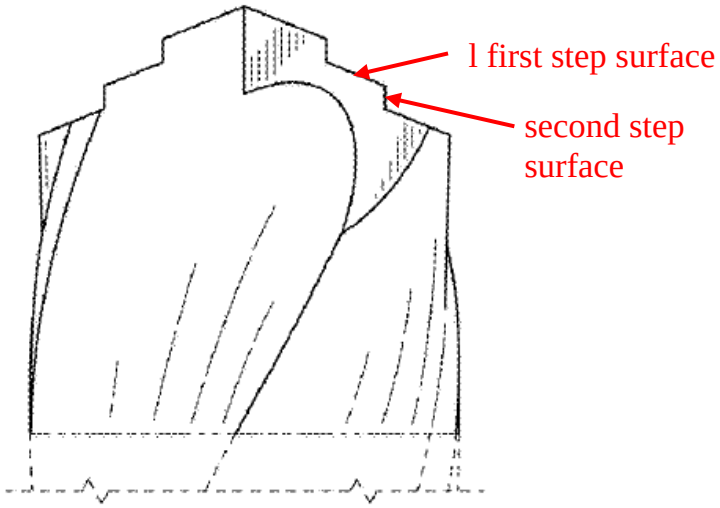
	
[’584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	*See* [’583: 1.n] and the annotated representation of Wang II’s FIG. 7 in [’584: 1.j].
[’584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II’s design to require positioning the twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill towards a workpiece. This claim is simply one step the drilling process that a person of ordinary skill would use Wang II to drill a hole in a workpiece. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6,

	13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; Li at ¶¶ [3, 24, 37, 44].
['584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require cutting the workpiece with the top blade to create a drill hole in the workpiece. *See* ['584: 1.l].
['584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end. *See* ['584: 1.l].
['584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion. *See* ['584: 1.l].
['584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design would result in a cutting allowance of the workpiece being distributed according to a drill hole diameter so that the workpiece is gradually cut. This is a natural outcome of the geometry of the cone portion of Wang II.
['584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece, depending on the thickness of the workpiece. *See* ['584: 1.l].
Claim 2	**Wang II**
['584: 2] The method of claim **1** wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface	*See* ['583: 2].

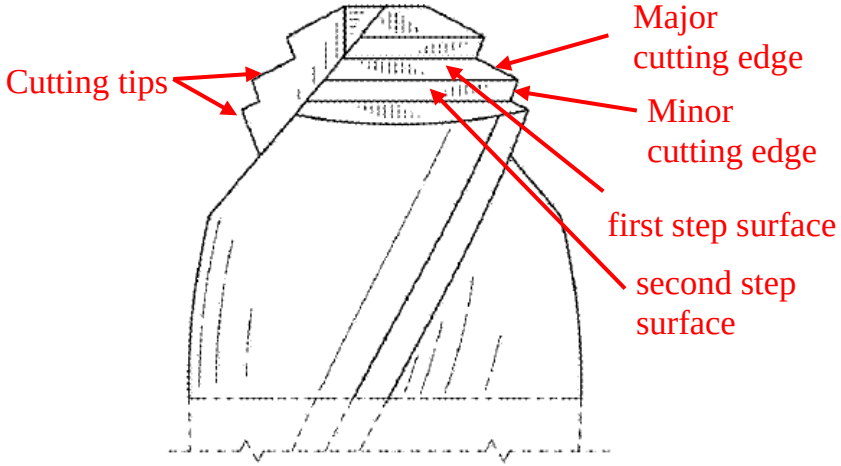
quality.	
Claim 4	**Wang II**
[’584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	*See* [’583: 5] and the annotated representation of FIG. 6 shown below. 
Claim 5	**Wang II**
[’584: 5] The method of claim **1** wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [‘583: 7].
Claim 6	**Wang II**
[’584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill	Upon examination of Wang II, one of ordinary skill would understand that use of Wang II’s design to improve centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion.

hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	
[6.a] providing a twist drill comprising: a shank portion;	Wang II shows a design for a twisted drill bit tip having a shank portion. *See* [’583: 1.b]. Also, see the annotated representation of Wang II’s FIG. 1 reproduced below. 
[’584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up	*See* [‘583: 1.a], [‘583: 1.c], and the annotated representation of Wang II’s FIG. 1 reproduced in [’584: 6.a].

the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	
['584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d] and ['583: 1.n]. For example, Wang II shows a plurality of composite cutting blade groups, as seen in annotated representations of FIGs. 6-8 reproduced below.  Wang II, FIG. 6.

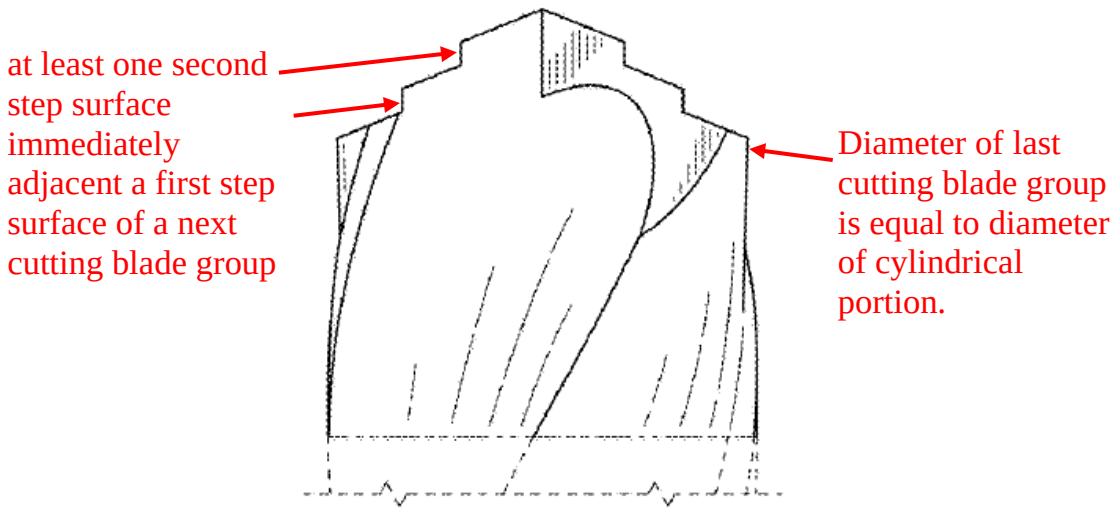


Wang II, FIG. 7.

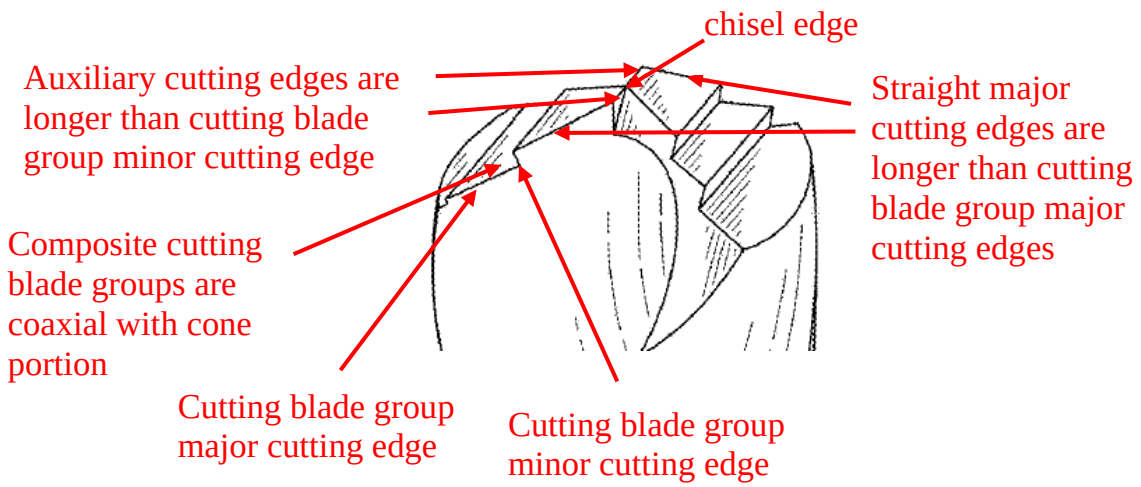


Wang II, FIG. 8.

[’584: 6.d] a conical first step surface;	*See* [’583: 1.e] and the annotated representations of FIGs. 6-8 in [’584: 6.c].
[’584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	*See* [’583: 1.f] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 6.c].
[’584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* [’583:1.g] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 6.c].
[’584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	*See* [’583.1h] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 1.c].
[’584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	*See* [’583: 1.i] and the annotated representations of Wang II’s FIGs. 6-8 shown in [’584: 6.c].
[’584: 6.i] a top blade provided on the front end of the cone portion;	*See* [’583: 1.j] and the annotated representation of Wang II’s FIG. 6 shown in [’584: 6.c].
[’584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated representation of Wang II’s FIG. 7 below.

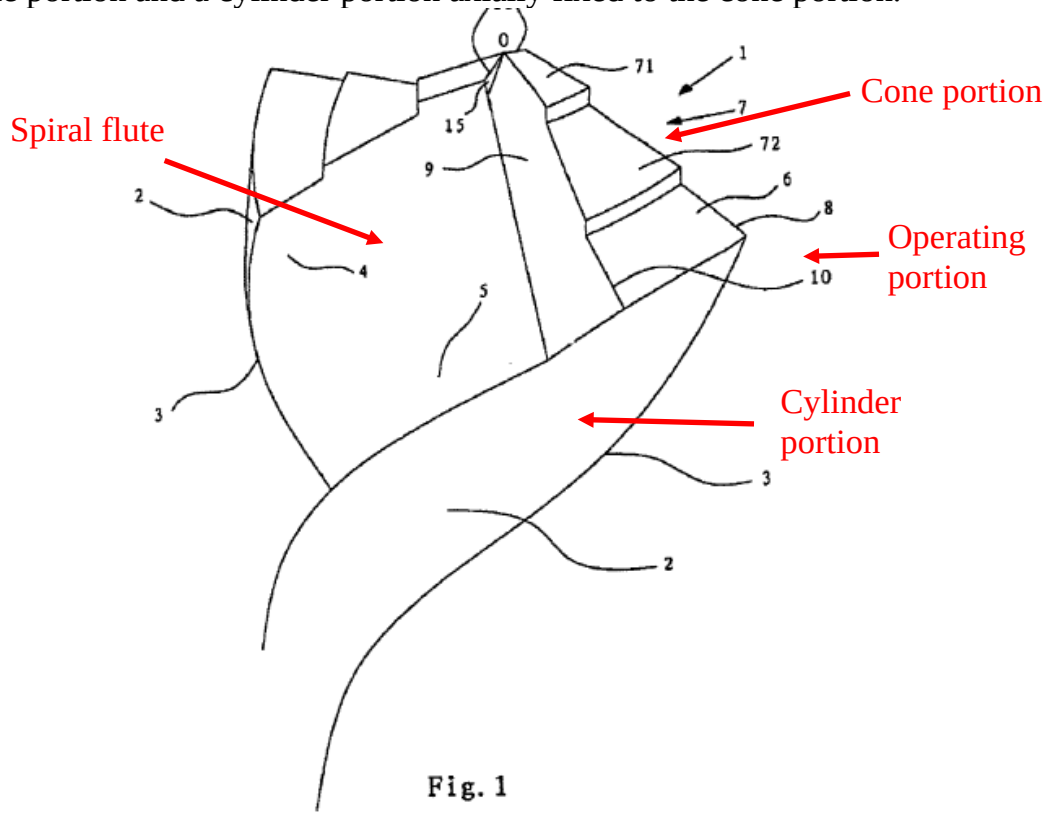
	
['584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	*See* ['583: 1.n] and the annotated representation of Wang II's FIG. 7 in ['584: 6.j].
['584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require positioning the twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill. This claim is simply one step the drilling process that a person of ordinary skill would use Wang II to drill a hole in a workpiece. Such a drilling, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. For example, see Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1, Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8]; Li at ¶¶ [3, 24, 37, 44].

['584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require cutting the workpiece with the top blade to create a drill hole in the workpiece. *See* ['584: 6.l].
['584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end. *See* ['584: 6.l].
['584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design to require continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion. *See* ['584: 6.l].
['584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	One of ordinary skill would, upon examination of Wang II, understand the use of Wang II's design would result in a cutting allowance of the workpiece being distributed according to a drill hole diameter so that the workpiece is gradually cut. This is a natural outcome of the geometry of the cone portion of Wang II.
Claim 7	**Wang II**
['584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	*See* ['583: 2].
Claim 9	**Wang II**
['584: 9] The method of claim 6 wherein, in the step of providing	*See* ['583: 5] and the annotated representation of FIG. 6 shown below.

a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 10	**Wang II**
[’584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [‘583: 7].
Claim 11	**Wang II**
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder	Wang II, FIGs. 1-8. One of ordinary skill would, upon examination of Wang II, understand that Wang II shows a drill having an operation portion configured to disperse a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece. This is a natural outcome of using a Wang II and is, therefore, inherent to the use of the drill.

portion is also within the workpiece.	

Exhibit H

’583 Patent	
Claim 1	**Li (U.S. Pat. App. Pub. No. 2011/0116884)**
[’583: 1.pre] A twist drill, comprising:	U.S. Patent App. Pub. No. 2011/0116884 (“Li”) discloses a twist drill, referred to as a “helical bit tool” having a flute that extends from a cone portion to a cylinder portion. *See, e.g.*, FIG. 1; Abstract; ¶¶ [0003], [0021]-[0024].
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. For example, in FIG. 1 (annotated below), Li shows an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion.  Fig. 1

[’583: 1.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li necessarily includes a shank portion axially fixed to the cylinder portion opposite the cone portion. A person of ordinary skill would understand that a shank would be necessary to operate Li’s helical bit tool.
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows spiral flutes, e.g., in FIG. 1, formed on an exterior surface of the operating portion, extending from a front end of the cone portion and at least partway up the cylinder portion. The flutes have sidewalls. *See* annotated FIG. 5 in [’583: 1.a]
[’583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. *See* annotated representation of FIG. 1 below.

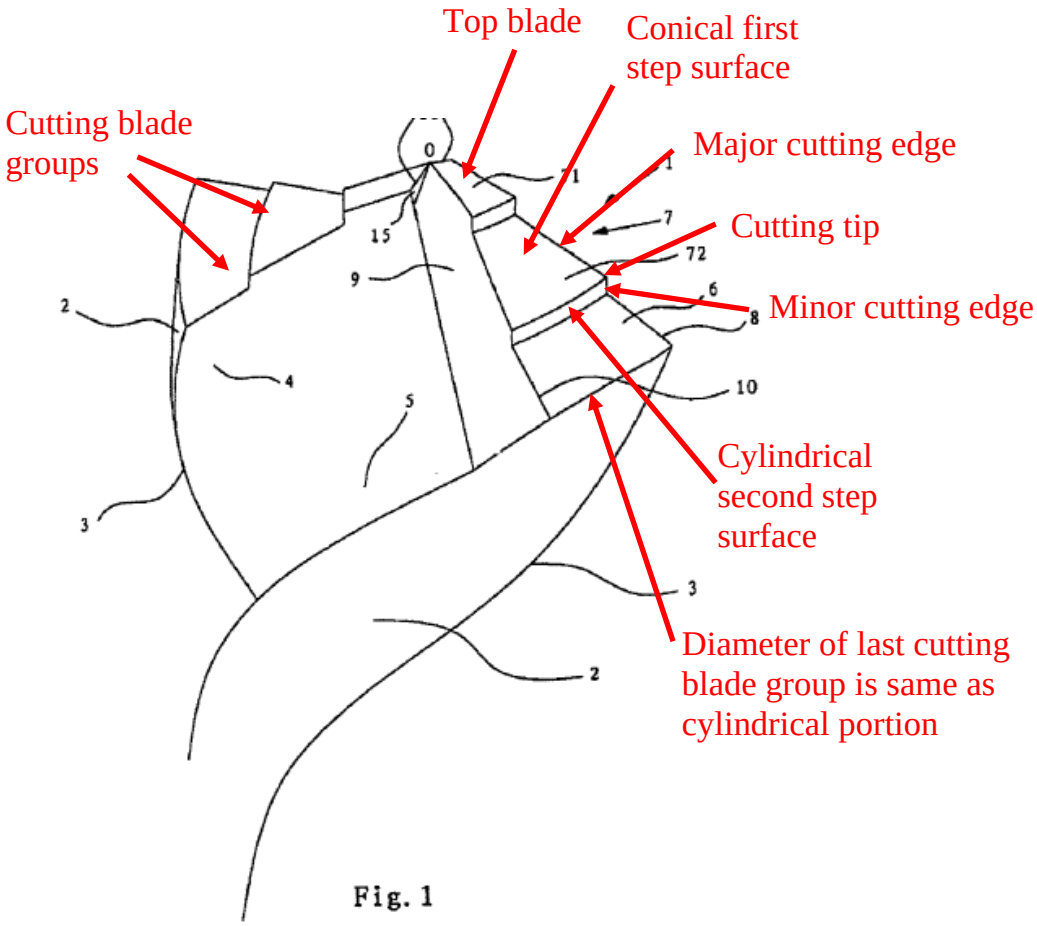
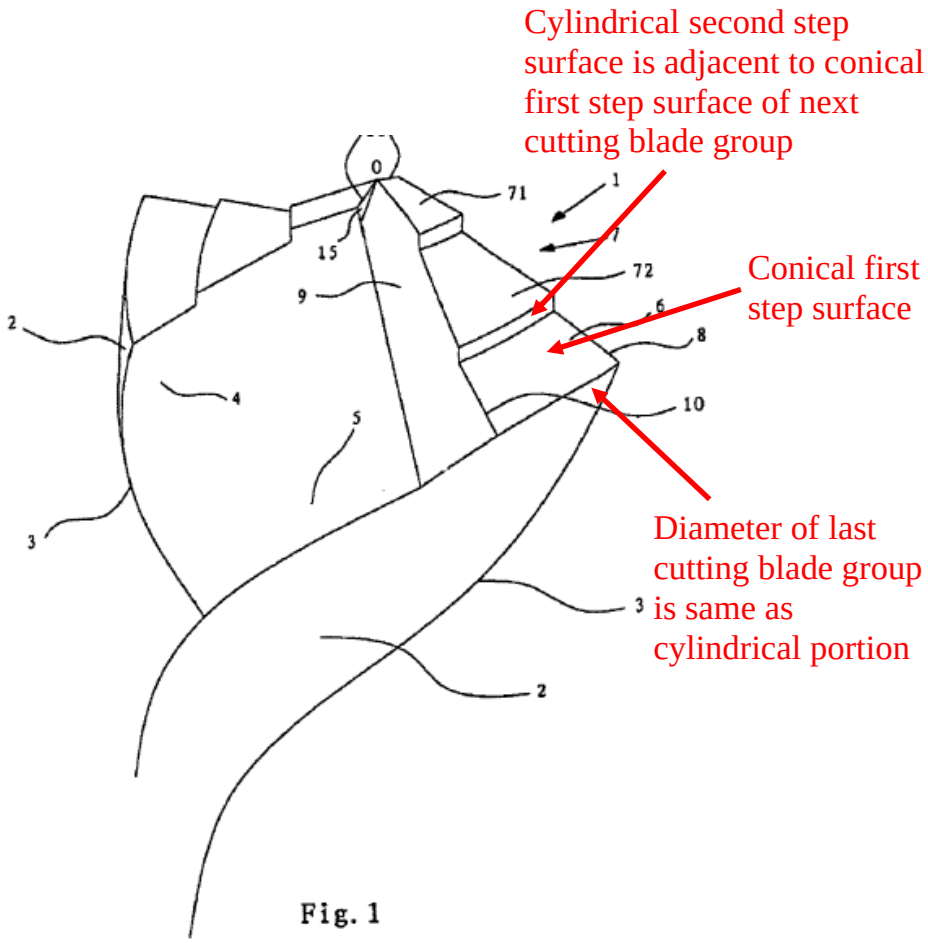


Fig. 1

Under the proper interpretation of "spirally," under which the Accused Products do not infringe, Li does not show or teach that the composite cutting blade groups are formed spirally. However, U.S. Patent No. 8,029,215 ("Gentry") shows spiral

	grooves on a conical drill bit. For example, FIG. 8 shows spiral (helical) grooves 270, 272. "Once the conically-shaped main body 206 has been formed, the helical grooves 270, 272 are turned onto the spiral drill bit 50 using two form tools…The helical grooves 270, 272 begin at diametrically-opposed positions and are offset by a phase angle of 180 degrees." *See* Gentry, 7:4-8. A person of ordinary skill would have been motivated to adopt this manufacturing approach because the manufacturing process for the drill bit reduces the amount of grinding required, thus reducing the time and cost of forming the spiral drill bit. *Id*., 2:67–3:3. Plaintiffs' infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." While Viking disagrees with this contention, to the extent the claims are construed such that the Accused Products meet this limitation, then it would have been obvious to add such axial relief to the cutting blade groups shown in Li. Examples of prior art drill bits having axial relief on similar cutting elements include the Viking 00693, 00694 and 00714 drills, Mackey, Durfee I, Durfee II, and Wetzel. It is well known that axial relief in such cutting elements improve the cutting efficiency of the drill bit and that, in the absence of axial relief, such drills will cut poorly. Thus, it would have been obvious to a person of ordinary skill to add the same axial relief to Li that is present in the accused products. It would be understood by a person of ordinary skill that Li's composite cutting blade groups, with the inclusion of axial relief. are spirally formed.
['583: 1.e] a conical first step surface;	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows a conical first step surface. *See* annotated representation of FIG. 1 in ['583: 1.d]
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent the second step surfaces from being considered "cylindrical." While Viking disagrees with this contention, based on

	Plaintiffs' assertion, Li shows a cylindrical second step surface adjacent to the conical first surface. *See* annotated representation of FIG. 1 in ['583: 1.d].
['583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* annotated representation of FIG. 1 in ['583: 1.d].
['583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute; and	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. *See* annotated representation of FIG. 1 in ['583: 1.d]
['583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge and the sidewall of the spiral flute. *See* annotated representation of FIG. 1 in ['583: 1.d]
['583: 1.j] a top blade provided on the front end of the cone portion;	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows a top blade provided on the front end of the cone portion. *See* annotated representation of FIG. 1 in ['583: 1.d]
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows that the diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion of the rear end of the cone portion. *See* annotated representation of FIG. 1 in ['583: 1.d]
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Li. A person of ordinary skill will understand that the spiral flutes flute shown in FIG. 1 will shunt chips from the cutting surface out of the drilled hole.

['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows that wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* annotated representation of FIG. 1 below.  Fig. 1

['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, Li shows in FIG. 1 that the diameter of the last composite cutting blade group located at the rear end of the cone portion, immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See* annotated representation of FIG. 1 in ['583: 1.m].
Claim 2	**Li**
['583: 2] The twist drill of claim 1 wherein, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Li because Li discloses the claimed minor cutting edge.

Claim 3	**Li**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	Defendant believes this claim to be indefinite, because it can be construed to mean that the height of each composite cutting blade group is the same as the height of the other composite blade groups or can be construed to mean that the height of each composite cutting blade group is uniform around its perimeter. If found to be definite, however, Li discloses this limitation under either interpretation of claim 3. *See* Fig. 2. Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, Li shows that the composite cutting blade groups are of the same height and that the height of a single composite cutting blade group is uniform around its perimeter.
Claim 5	**Li**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li shows, for example in FIG. 1, that the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges. The figures also show that the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge. *See* the annotated representation of FIG. 1 shown below.

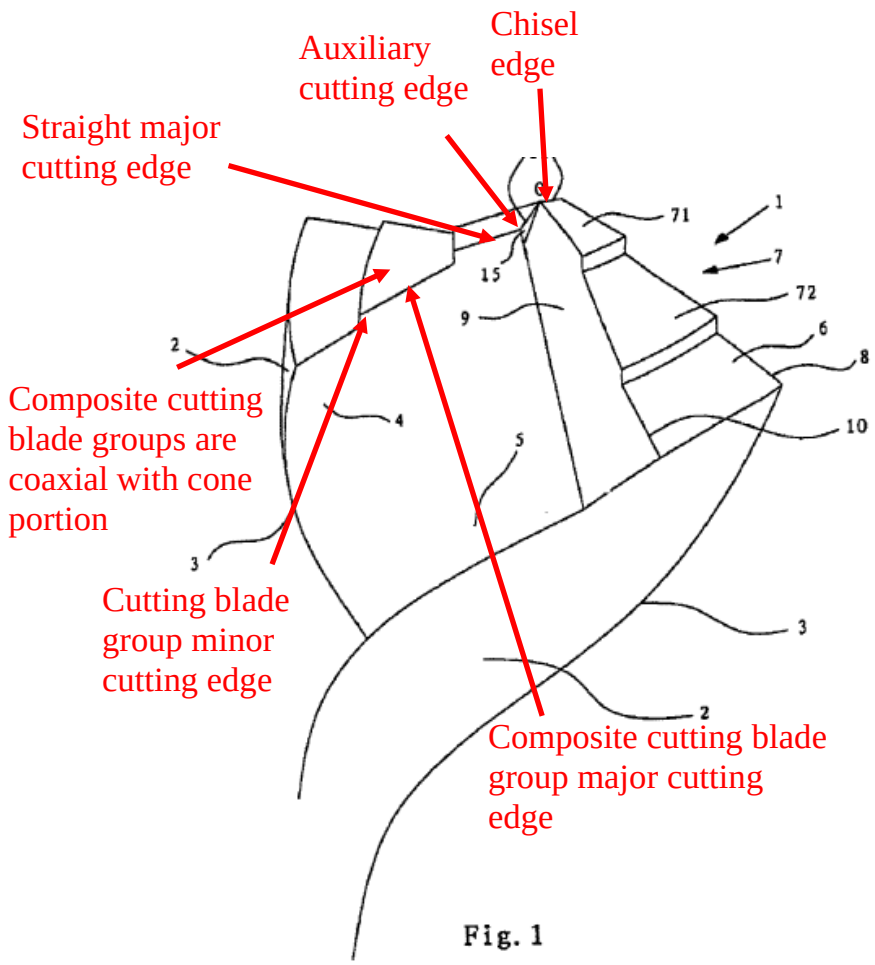
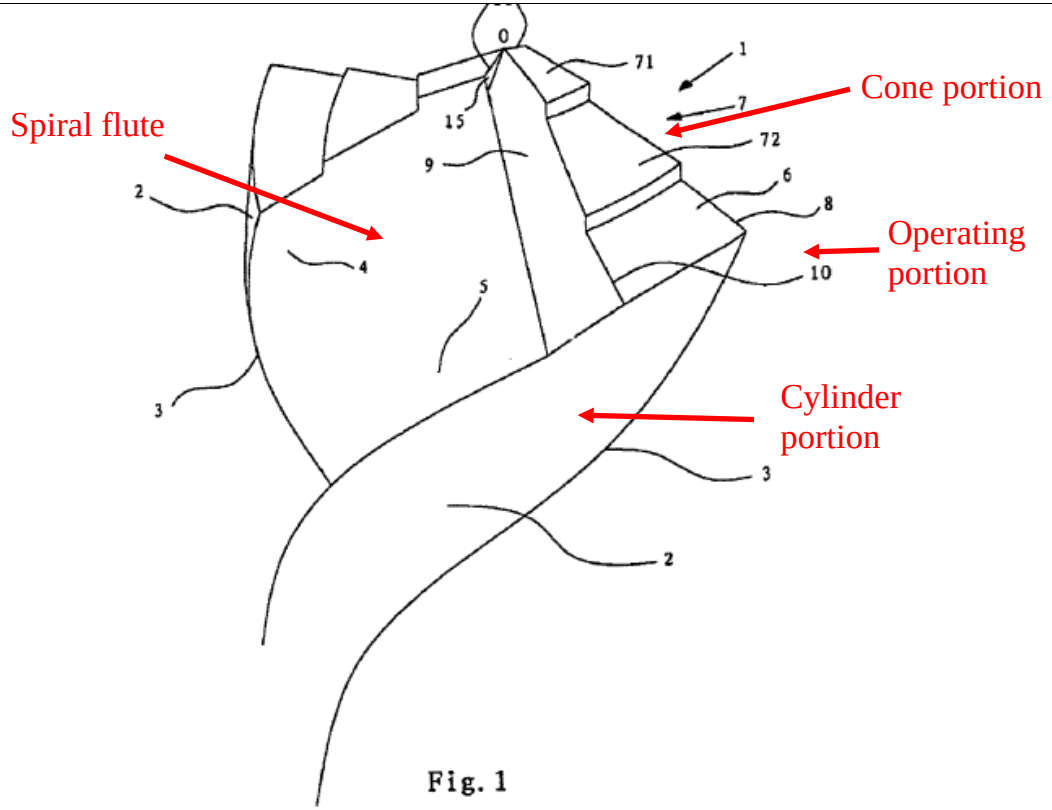
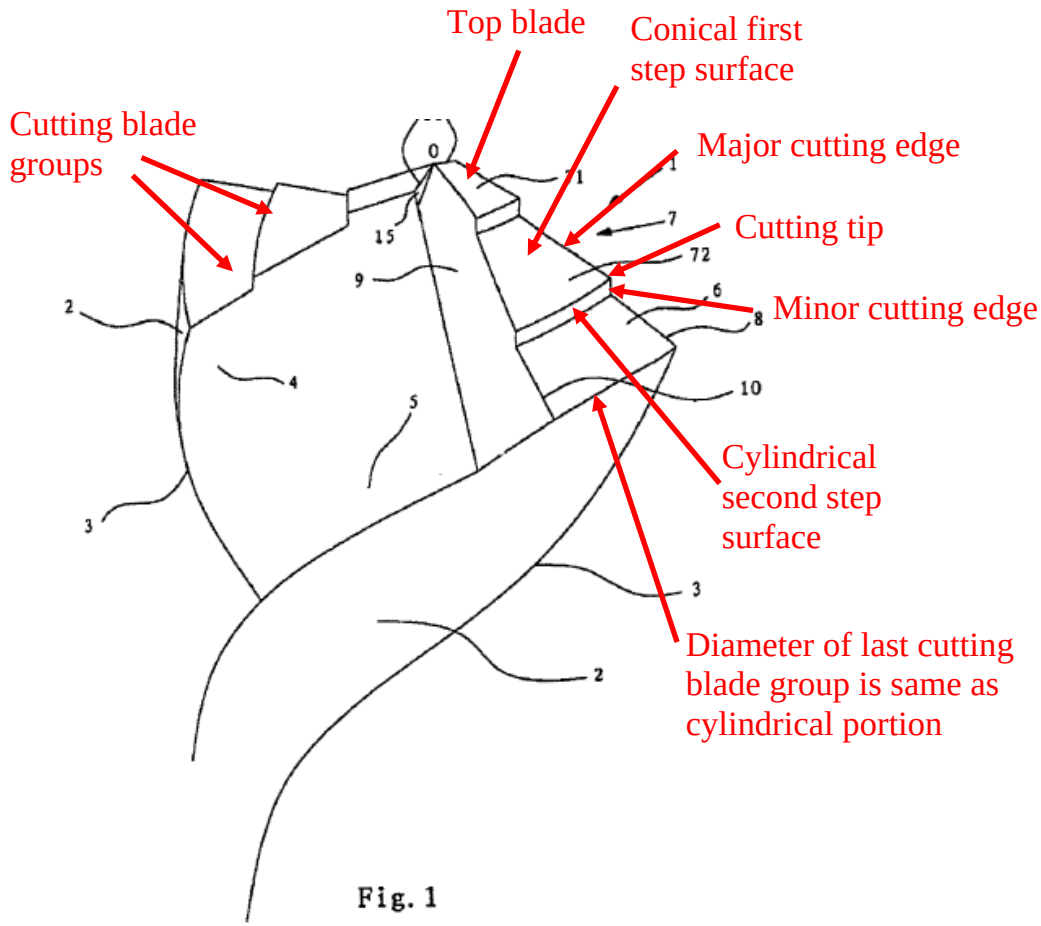
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Fig. 1

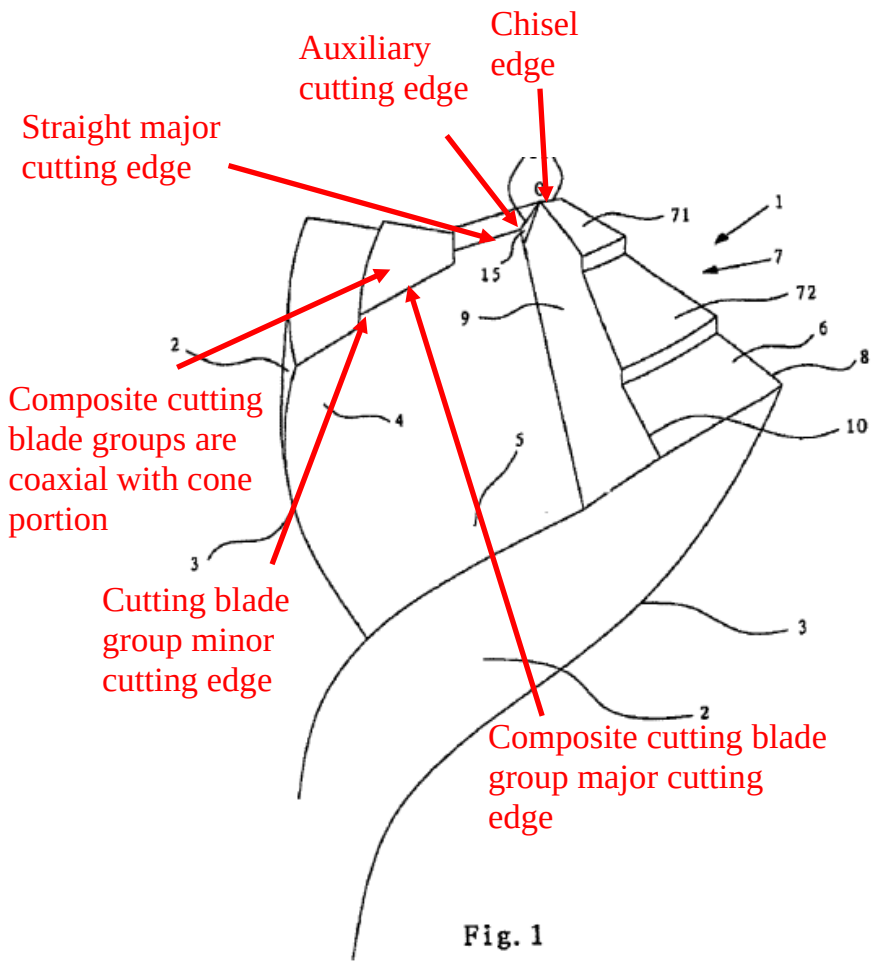
Additionally, Li discloses that “[t]he intersection of the upright cutting face and the step area at its back side forms a chisel edge 11.” Li, ¶ [0023], *see also* ¶ [0024].</td></tr>
<tr><td>Claim 6</td><td>Li</td></tr>
</table>

['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also present in the drill disclosed by Li. Li shows, for example in FIG. 1, that the plurality of composite cutting blade groups are each coaxial with the cone portion. *See* the annotated representation of FIG. 1 shown in ['583: 5].
Claim 7	**Li**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. To the extent that Li does not expressly disclose this limitation, it would have been obvious for one of ordinary skill to modify Li to include more steps in the conical portion, for example as shown in U.S. Patent App. Pub. No. 2018/0133808 ("Wang I"), and as is present in the Viking 00693, 00694 and 00714 drills. One would have been motivated to do this, for example to make the drilling force relatively small, uniform and reasonable, and to prolong the life of the tool by making the stepped cutting edge wear more uniformly. *See* Wang I, ¶¶ [40-47]. The thus modified drills, would, like the drill in Wang I, and the Viking 00693, 00694 and 00714 drills, include a top blade in which a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups. *See* the annotated representation of FIG. 1 shown in ['583: 5].
Claim 8	**Li**
['583: 8.pre] A twist drill, comprising:	Li discloses a twist drill, referred to as a "helical bit tool" having a flute that extends from a cone portion to a cylinder portion. *See, e.g.*, FIG. 1; Abstract; ¶¶ [0021]-[0024].
['583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* ['583: 1.a].

	 Fig. 1
['583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* ['583: 1.b] and ['583: 8.a]
['583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* ['583: 1.c] and ['583: 8.a]

['583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d]. For example, Li shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 1 shown below.  Fig. 1
['583: 8.e] a conical first step surface;	*See* ['583: 1.e] and ['583: 8.d].
['583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and ['583: 8.d].

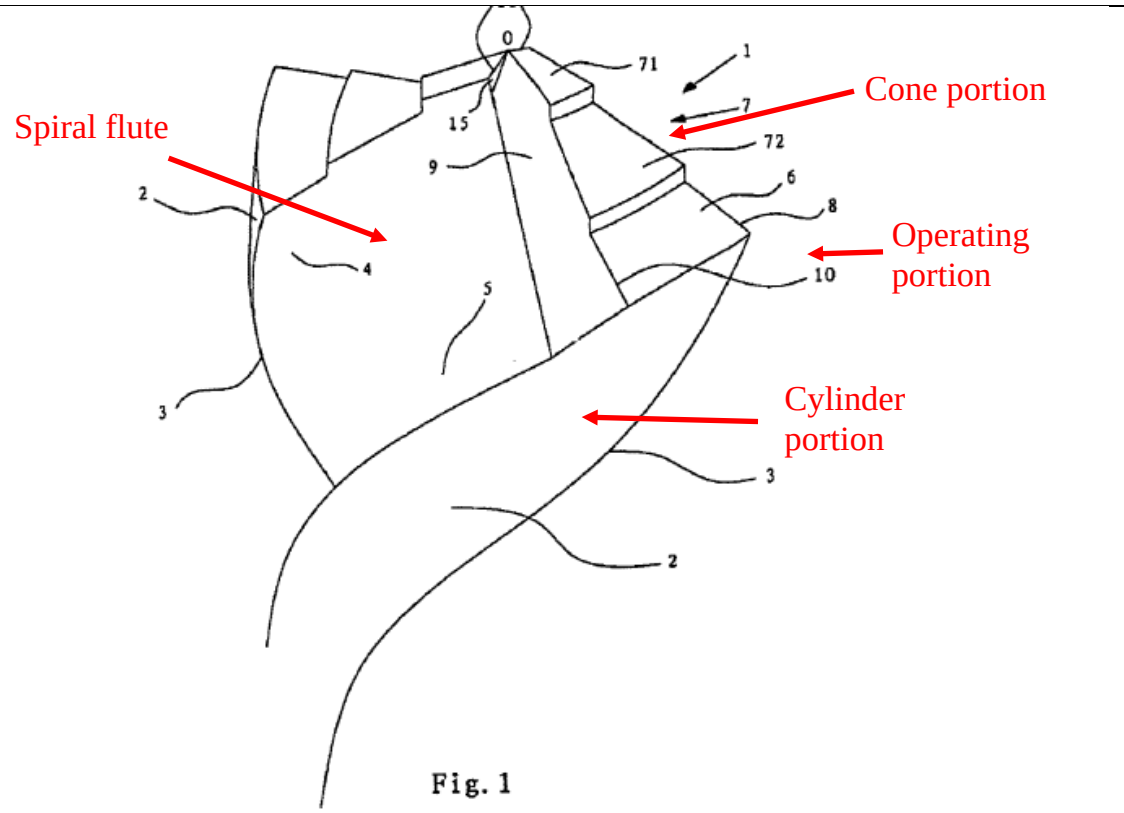
[’583: 8.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	*See* [’583: 1.g] and [’583: 8.d].
[’583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* [’583: 1.h], [’583: 2], and [’583: 8.d].
[’583: 8.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	*See* [’583: 1.i] and [’583: 8.d].
[’583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	*See* [’583: 1.j] and [’583: 5]. For example, see the annotated representation of Li’s FIG. 1 shown below.

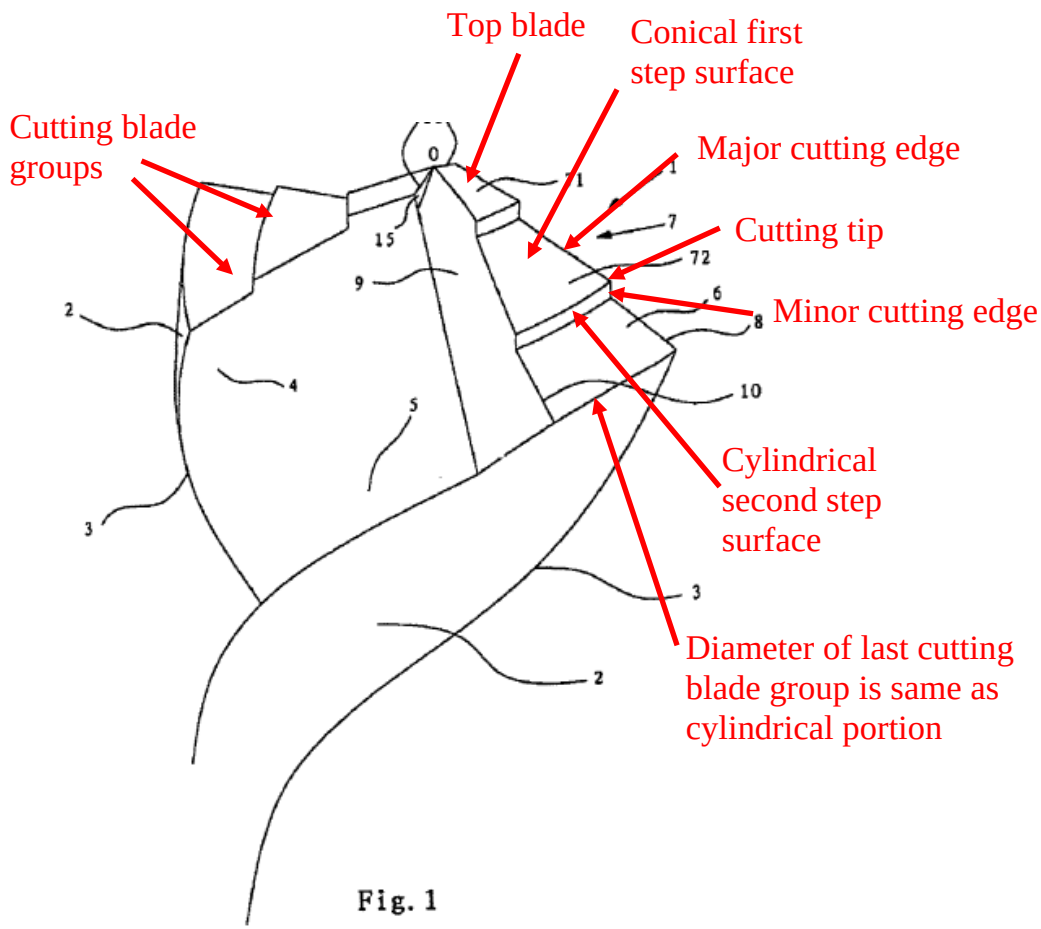
	
['583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the	*See* ['583: 1.k] and the annotated representation of Li's FIG. 1 shown in ['583: 8.j]

front end of the cone portion to the rear end of the cone portion; and	
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m].
[’583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	*See* [’583: 1.n] and the annotated representation of FIG. 5 shown in [’583: 8.d].
Claim 9	**Li**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* [’583: 3].
Claim 11	**Li**
[’583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* [’583: 6]; *See also* the annotated representation of FIG. 1 shown in [’583: 8.j].
Claim 12	**Li**

['583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* ['583: 7]; *See also* the annotated representation of FIG. 1 shown in ['583: 8.j].
Claim 13	**Li**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. If this construction is correct, then Li, modified in the manner suggested in ['583: 7] would have a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See e.g.*, Wang I, FIG. 5, and the Viking 00693, 00694 and 00714 drills.
Claim 14	**Li**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Li teaches that the operation portion of the drill disperses a cutting force on each of the plurality of cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.

’584 Patent	
Claim 1	**Li**
[’584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	Li teaches improving centering accuracy of a twist drill when drilling a hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion. Li at ¶¶ [0002-3], [0024], [0037], and [0044].
[’584: 1.a] providing a twist drill comprising: a shank portion;	Li provides a twist drill having a shank portion. *See* [’583: 1.b].
[’584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	Li describes a twist drill having an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* [’583: 1.a], [’583: 1.c], and the annotated representation of Li’s FIG. 1 reproduced below.

	 Fig. 1
['584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d]. For example, Li shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 1 shown below.

	
[’584: 1.d] a conical first step surface;	Li shows a composite cutting blade group having a conical first step surface. *See* [’583:1.e] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c]

[’584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	Li shows a composite cutting blade group having a cylindrical second step surface adjacent to the conical first step surface. *See* [’583:1.f] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c]
[’584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Li shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* [’583:1.g] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c].
[’584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Li shows minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* [’583.1h] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c].
[’584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Li shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* [’583: 1.i] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c].
[’584: 1.i] a top blade provided on the front end of the cone portion;	Li shows a top blade provided on the front end of the cone portion. See [’583: 1.j] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c].
[’584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	*See* [’583: 1.m] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c].
[’584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	Assuming the Accused Products are found to meet this limitation, then Li shows the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion being equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated representation of Li’s FIG. 1 shown in [’584: 1.c].

['584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	Li, FIG. 1; Abstract; ¶¶ [0003], [0021]-[0024], [0027], [0037], [0044]. This claim is simply one step in the drilling process that a person of ordinary skill would use to drill a hole in a workpiece. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I at ¶¶ [5, 6, 13, and 37-39]; U.S. Patent No. 2,193,186 ("Bannister") at p. 1, Left:1-11, 25-34, Right:32-49; U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl") at ¶¶ [6-8].
['584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* ['584: 1.l].
['584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	*See* ['584: 1.l].
['584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* ['584: 1.l].
['584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	This is a natural outcome of the geometry of the cone portion taught by Li.
['584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	*See* ['584: 1.l].
Claim 2	**Li**
['584: 2] The method of claim 1 wherein, in the step of providing a twist drill, the	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024].

minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Li because Li teaches a minor cutting edge.
Claim 4	**Li**
['584: 4]The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	Li teaches the top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge being respectively intersected with the straight major cutting edge and the chisel edge. *See* ['583: 5] and the annotated representation of FIG. 1 shown below.

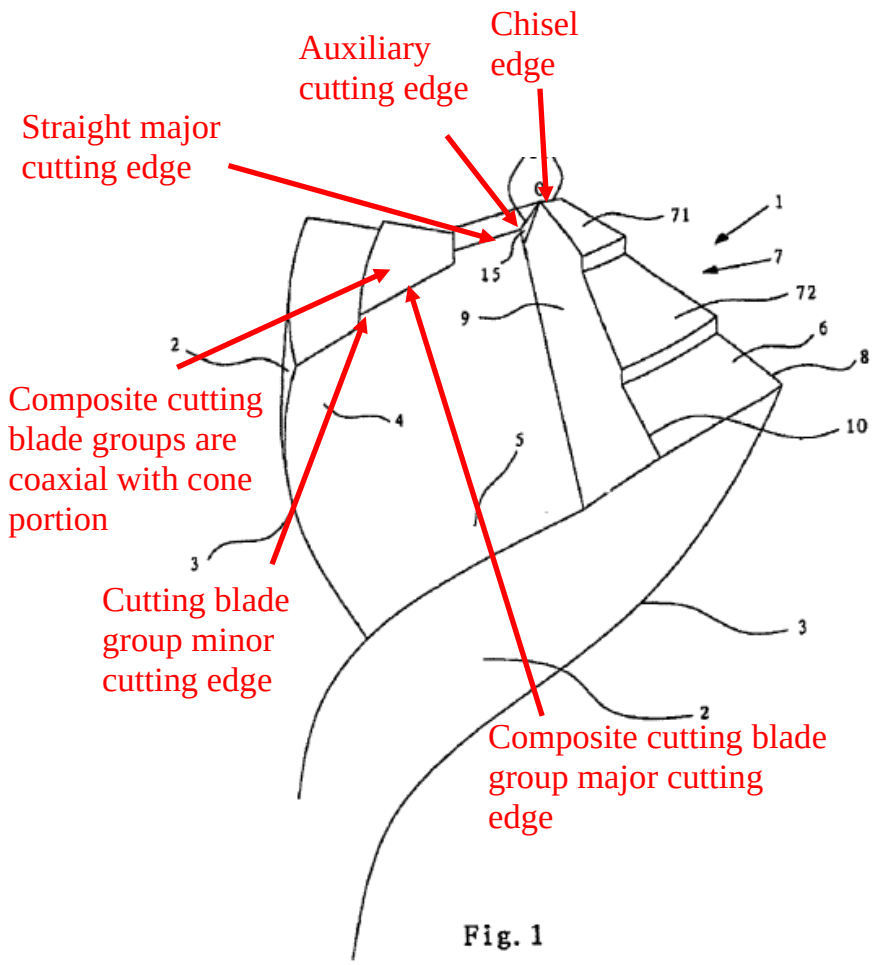
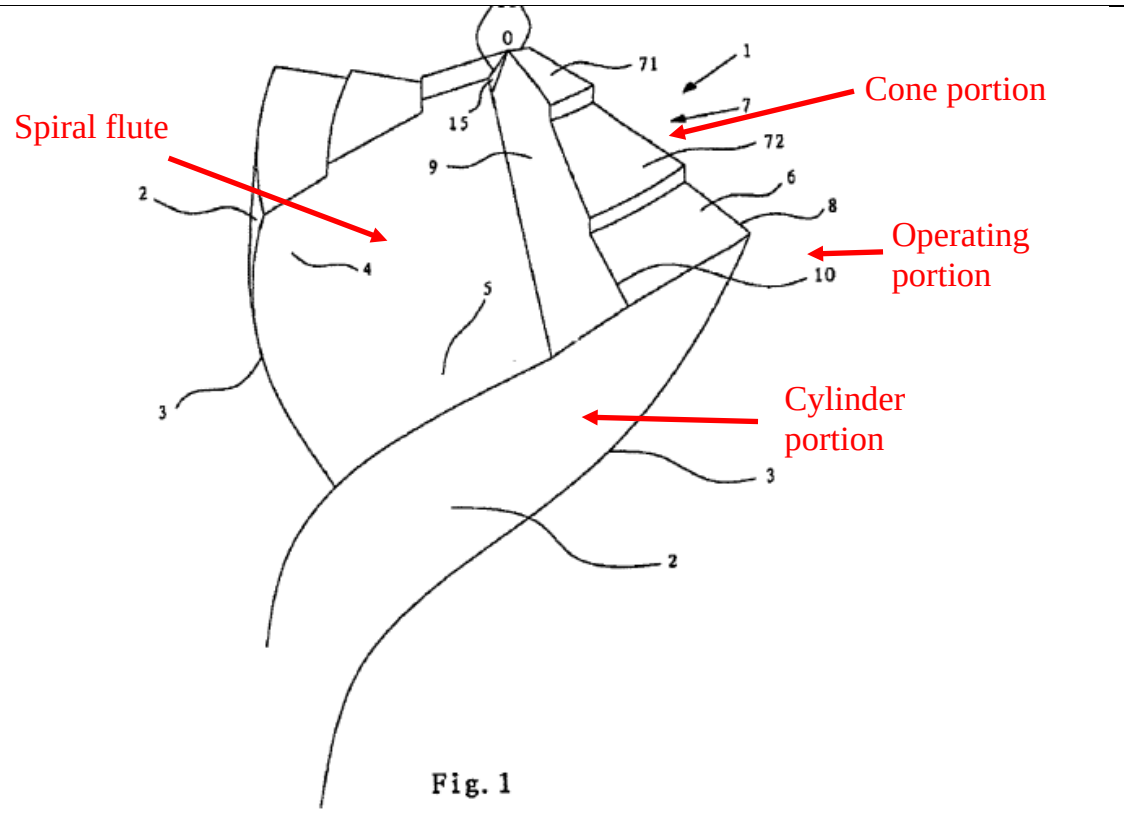
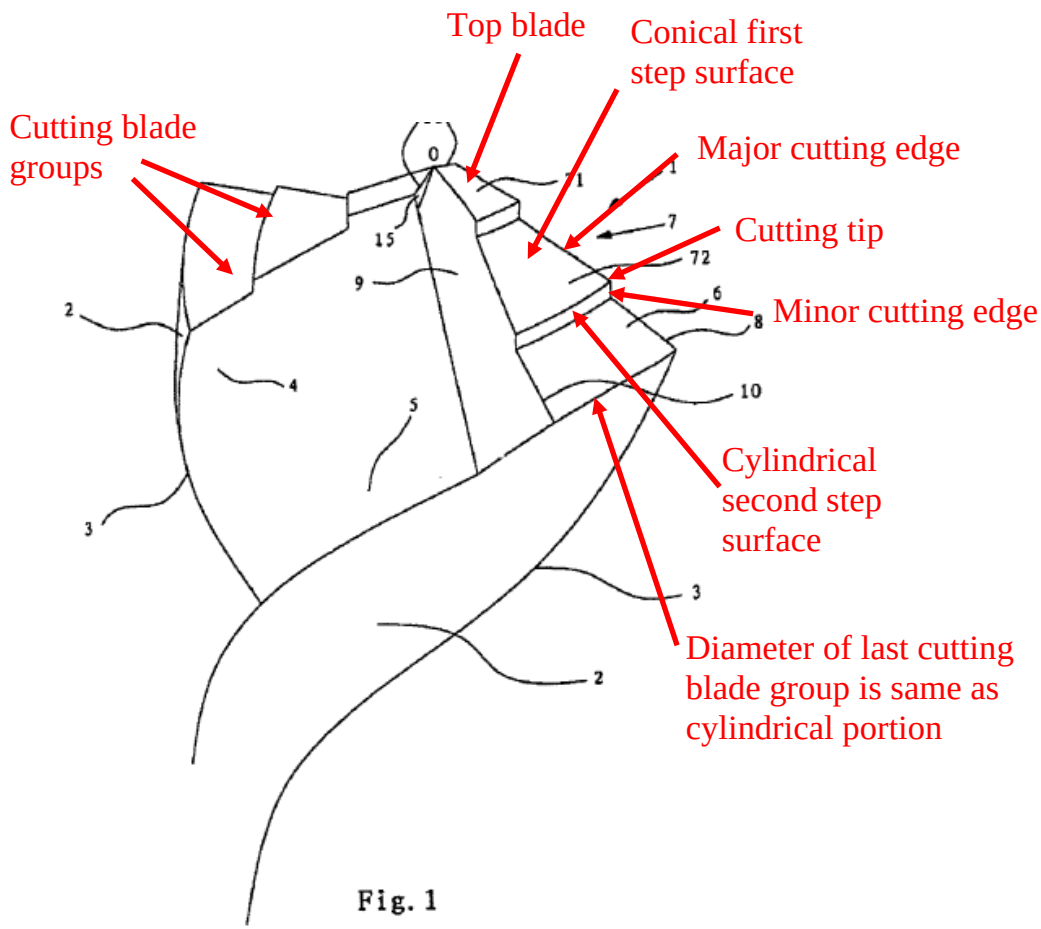


Fig. 1

Claim 5	**Li**
[’584: 5] The method of claim 1 wherein, in the step of providing a twist drill, a straight major cutting edge length of the	*See* [‘583: 7] and the annotated representation of Li’s FIG. 1 shown under [’584: 4].

top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	
Claim 6	**Li**
[’584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	Li teaches improving centering accuracy of a twist drill when drilling a hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion. Li at ¶¶ [0002-3], [0024], [0037], and [0044].
[’584: 6.a] providing a twist drill comprising: a shank portion;	Li provides a twist drill having a shank portion. *See* [’583: 1.b].
[’584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	Li describes a twist drill having an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* [’583: 1.a], [’583: 1.c], and the annotated representation of Li’s FIG. 1 reproduced below.

	 Fig. 1
['584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d]. For example, Li shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 1 below.

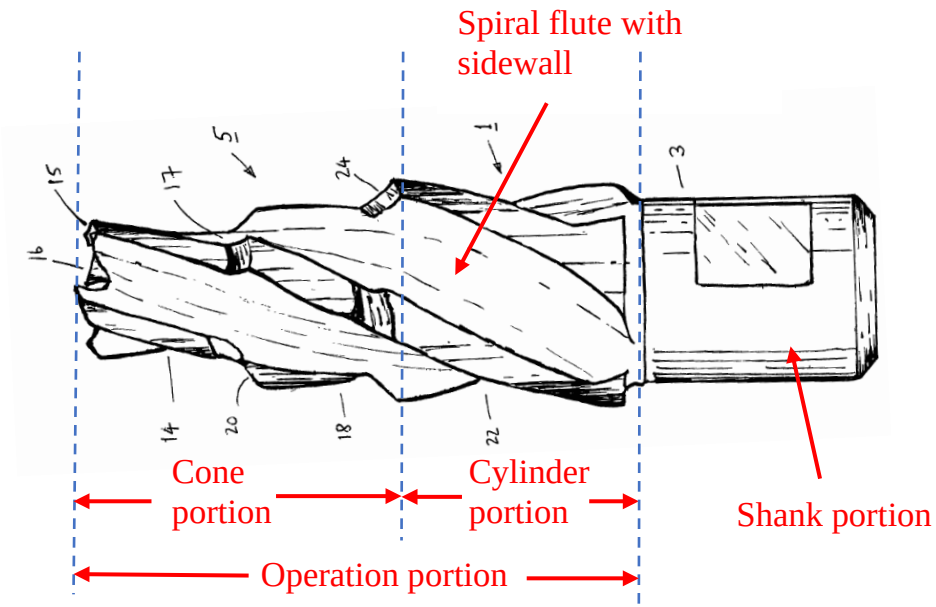
	
[’584: 6.d] a conical first step surface;	Li shows a composite cutting blade group having a conical first step surface. *See* [’583:1.e] and the annotated representation of FIG. 1 shown in [’584: 6.c].

[’584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	Li shows a composite cutting blade group having a cylindrical second step surface adjacent to the conical first step surface. *See* [’583:1.f] and the annotated representation of FIG. 1 shown in [’584: 6.c].
[’584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Li shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* [’583:1.g] and the annotated representation of FIG. 1 shown in [’584: 6.c].
[’584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Li shows minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute. *See* [’583.1h] and the annotated representation of FIG. 1 shown in [’584: 6.c].
[’584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Li shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* [’583: 1.i] and the annotated representation of FIG. 1 shown in [’584: 6.c].
[’584: 6.i] a top blade provided on the front end of the cone portion;	Li shows a top blade provided on the front end of the cone portion. *See* [’583: 1.j] and the annotated representation of FIG. 1 shown in [’584: 6.c].
[’584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	Li shows the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. *See* [’583: 1.m].
[’584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	*See* [’583: 1.n] and the annotated representation of FIG. 1 shown in [’584: 6.c].

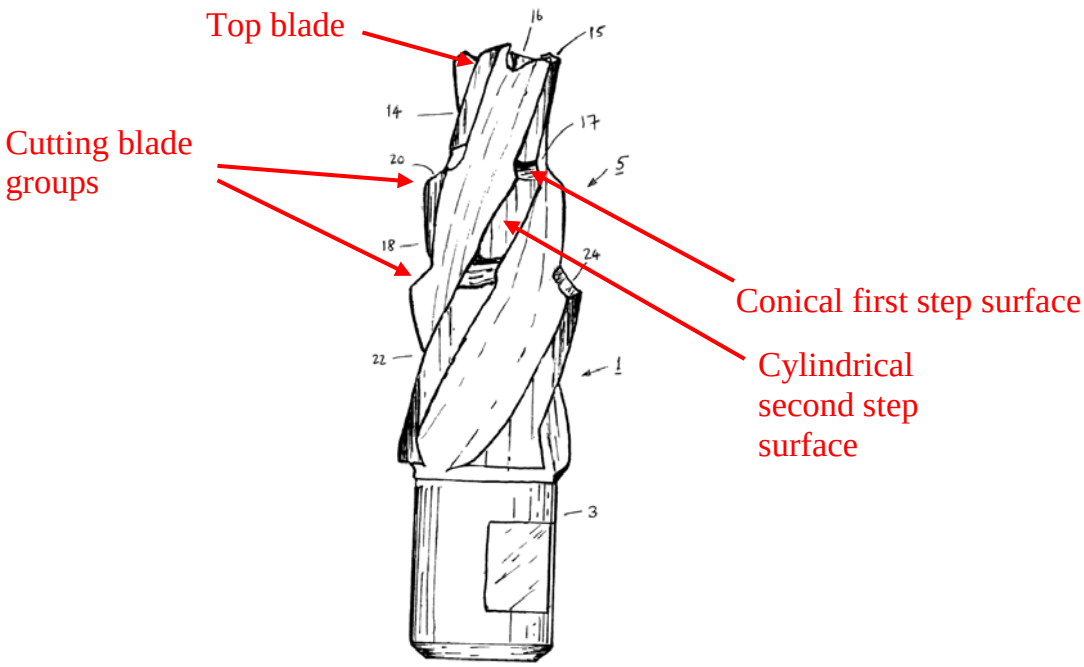
['584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	Li, FIG. 1; Abstract; ¶¶ [0003], [0021]-[0024], [0027], [0037], [0044]. This claim is simply one step the drilling process that a person of ordinary skill would use to drill a hole in a workpiece. Such a drilling, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See*Wang I at ¶¶ [5, 6, 13, and 37-39]; Bannister at p. 1,. Left:1-11, 25-34, Right:32-49; Wetzl at ¶¶ [6-8].
['584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* ['584: 6.l].
['584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	*See* ['584: 6.l].
['584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion,	*See* ['584: 6.l].
['584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	*See* ['584: 6.l].
Claim 7	**Li**
['584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Li, FIG. 1; Abstract; ¶¶ [0021]-[0024]. Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Li. *See* ['584: 2].

Claim 9	**Li**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	Li teaches the top blade comprising a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge being respectively intersected with the straight major cutting edge and the chisel edge. *See* [’583: 5] and the annotated FIG. 1 shown in [’584: 5].
Claim 10	**Li**
[’584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [’583: 7].
Claim 11	**Li**
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	This is a natural outcome of the geometry of the cone portion taught by Li.

Exhibit I

’583 Patent	
Claim 1	**Sheldon (GB 2,240,820A)**
[’583: 1.pre] A twist drill, comprising:	The preamble carries no patentable weight. Sheldon discloses a drill having a flute that extends from a cone portion to a cylinder portion. *See, e.g.*, Sheldon, FIG. 1.
[’583: 1.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	Sheldon, FIG. 1; 1:3-3:16. For example, in FIG. 1 (annotated below) shows an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion. 
[’583: 1.b] a shank portion axially fixed to the cylinder portion	Sheldon, FIG. 1; 1:3-3:16. For example, in FIG. 1, Sheldon shows a shank portion axially fixed to the cylinder portion opposite the cone portion. *See* annotated FIG. 1 in [’583: 1.a].

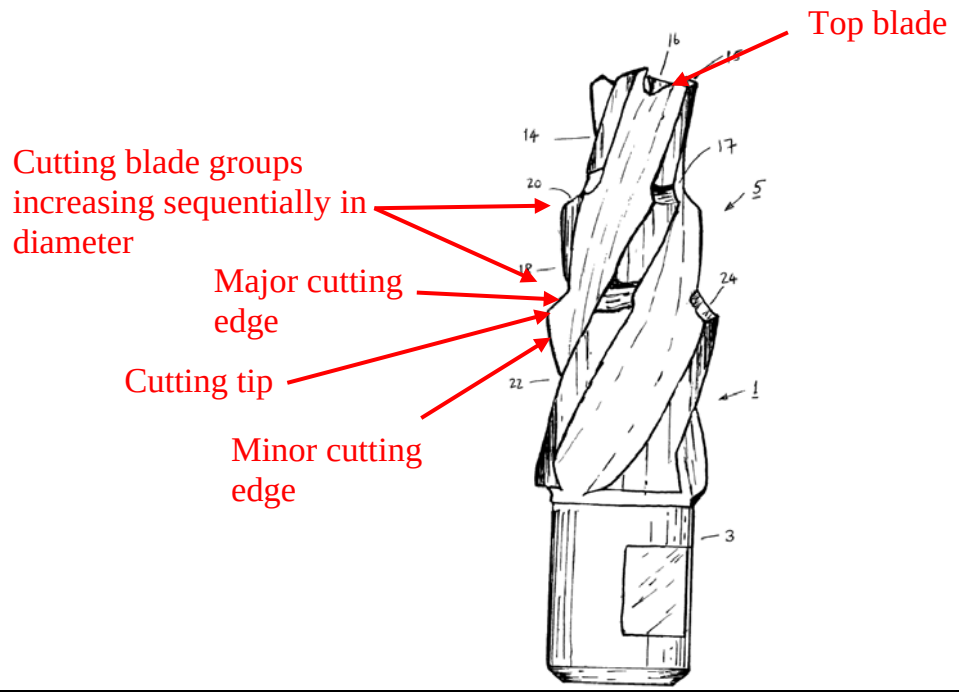
opposite the cone portion;	
[’583: 1.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows spiral flutes, *e.g.*, in FIG. 1, formed on an exterior surface of the operating portion, extending from a front end of the cone portion and at least partway up the cylinder portion. The spiral flutes have sidewalls. *See* Sheldon at 2:24-27 (“The drill portion has teeth 15 at its axial front with *spiral, i.e. generally helical, fluting* 17 extending from the teach….” (emphasis added)). *See* annotated FIG. 1 in [’583: 1.a].
[’583: 1.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows composite cutting blade groups formed sequentially on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion. *See* Sheldon at 2:24-27 (“The drill portion has teeth 15 at its axial front end with spiral, i.e. generally helical, fluting 17 extending from between the teeth, *forming spiral ridges which do the drilling*.” (emphasis added)). *See also* annotated FIG. 1 below. Sheldon’s composite cutting blade groups are formed with axial relief, in other words the cutting edge of the composite cutting blade group is closer to the drill tip than the trailing edge.



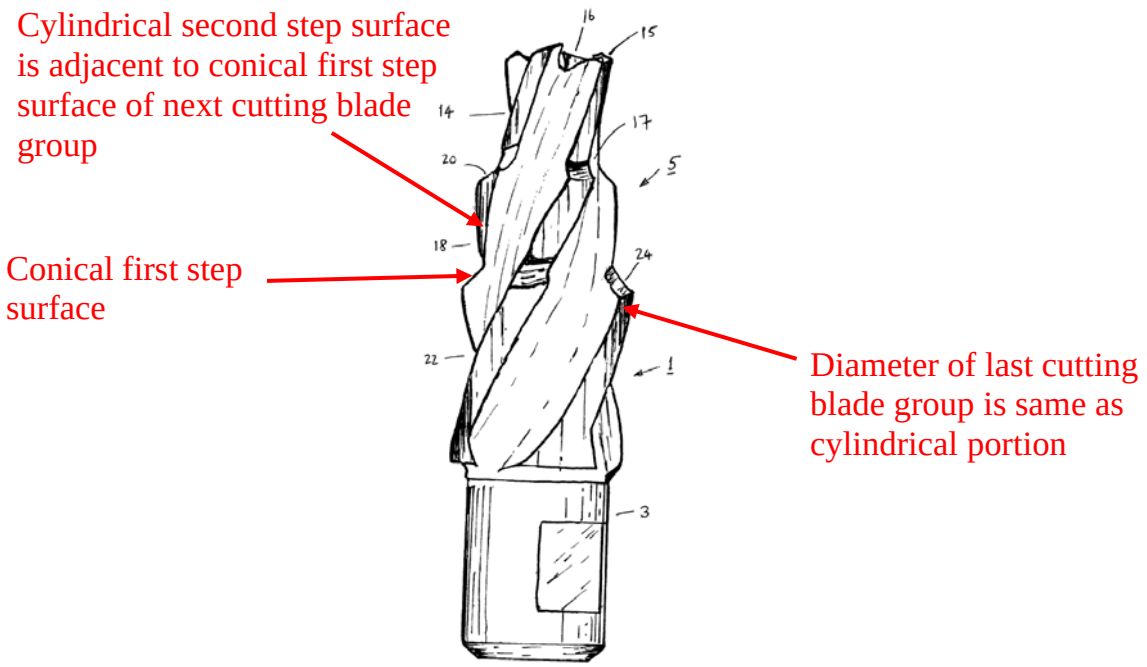
Under the proper interpretation of "spirally," under which the Accused Products do not infringe, Sheldon does not show or teach that the composite cutting blade groups are formed spirally. However, Gentry shows spiral grooves on a conical drill bit. For example, FIG. 8 shows spiral (helical) grooves 270, 272. "Once the conically-shaped main body 206 has been formed, the helical grooves 270, 272 are turned onto the spiral drill bit 50 using two form tools…The helical grooves 270, 272 begin at diametrically-opposed positions and are offset by a phase angle of 180 degrees." *See* Gentry, col. 7, ll. 4-8. A person of ordinary skill would have been motivated to adopt this manufacturing approach because the manufacturing process for the drill bit reduces the amount of grinding required, thus reducing the time and cost of forming the spiral drill bit. Gentry, 2:67 – 3:3.

Plaintiff's infringement allegations appear to be based on the contention that the presence of axial relief on the Accused Products results in composite cutting blades groups that are formed "spirally." Viking

	disagrees with this contention because it is contrary to arguments previously made by the owner of the '583 patent to the Patent Office while responding to an anticipation rejection of this claim language based on Sheldon. In that response, it was argued that the claim language was not covered by Sheldon's axially-relieved composite cutting blade groups and that "spirally" formed meant that the composite cutting blade groups "[spiral] downward from the front end of the cone portion…to the rear end." *See* '583 patent reexamination, response dated June 2, 2022, p. 8 of 19. Despite this representation to the Patent Office, Plaintiffs now assert that the presence of axial relief on composite cutting blade groups means they are "spirally" formed. According to Plaintiffs' new position, Sheldon shows this element.
['583: 1.e] a conical first step surface;	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows a conical first step surface. *See* Sheldon, 3:1-3:3 ("inclined steps or countersinks 20 and 24, whose shoulders are angled at about 45° to the axis."). *See also* annotated FIG. 6 in ['583: 1.d].
['583: 1.f] a cylindrical second step surface adjacent to the conical first step surface,	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows a cylindrical second step surface adjacent to the conical first surface. *See* annotated FIG. 1 in ['583: 1.d].
['583: 1.g] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* annotated FIG. 1 below.

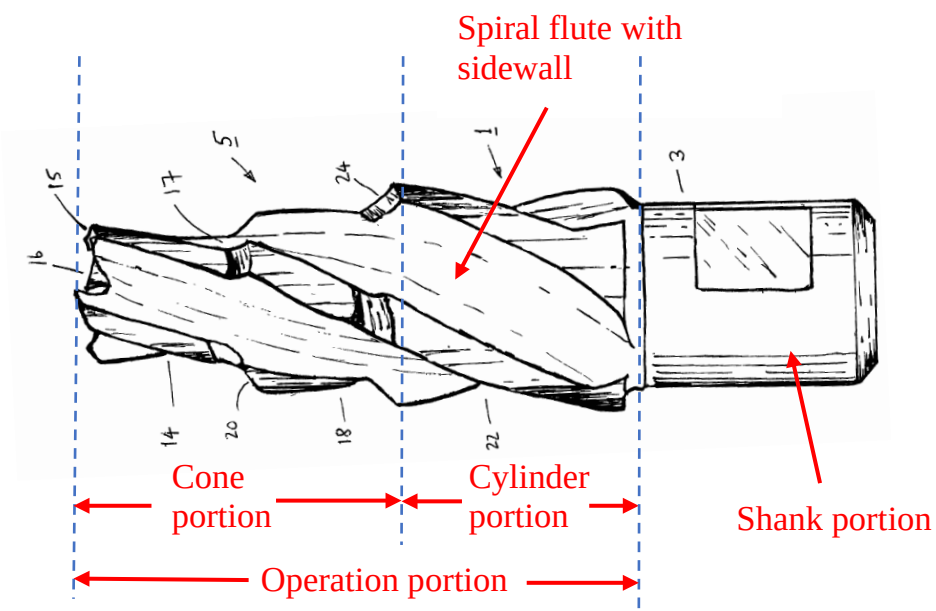
	
['583: 1.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. *See* annotated FIG. 1 in ['583: l.g].
['583: 1.i] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* annotated FIG. 1 in ['583: l.g].

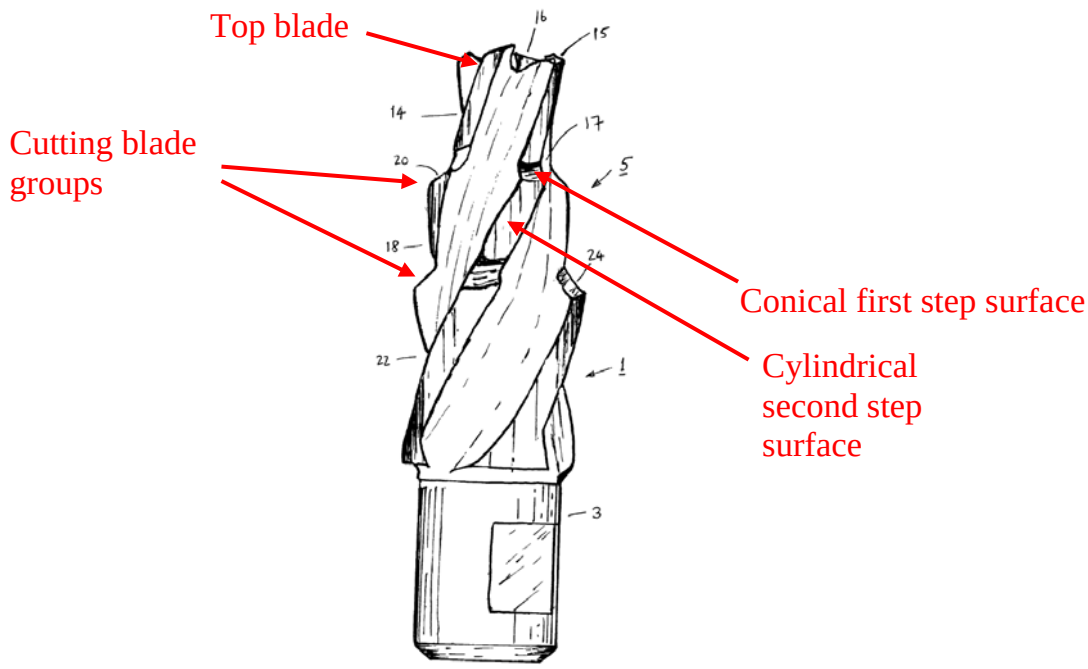
['583: 1.j] a top blade provided on the front end of the cone portion;	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows a top blade provided on the front end of the cone portion. *See* annotated FIG. 1 in ['583: l.g].
['583: 1.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows that the diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion of the rear end of the cone portion. Sheldon at 1:23-25 ("There may be three diameters (two steps), for instance, the increase from one step to the next, in the direction away from the business end"). *See* also annotated FIG. 1 in ['583: l.g].
['583: 1.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	Sheldon, FIG. 1; 1:3-3:16. Plaintiff's infringement allegations appear to be based on the contention that crushing of cutting chips into finer chips inherently results from having multiple composite blade cutting groups. While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Sheldon. A person of ordinary skill will understand that the spiral flutes shown in FIG. 1 will shunt chips from the cutting surface out of the drilled hole.
['583: 1.m] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group; and	Sheldon, FIG. 1; 1:3-3:16. Sheldon shows that at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group. *See* annotated FIG. 1 below.

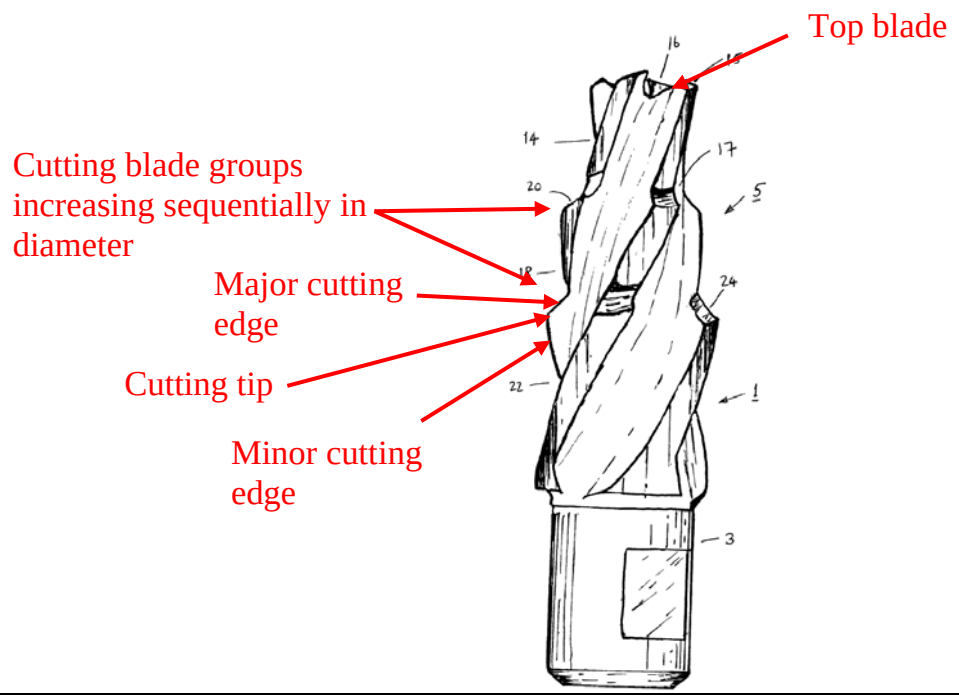
	
['583: 1.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	Sheldon, FIG. 1; 1:3-3:16. Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, the diameter of the last composite cutting blade group located at the rear end of the cone portion in Sheldon, immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter. *See* annotated FIG. 1 in ['583: 1.m].
Claim 2	**Sheldon**
['583: 2] The twist drill of claim 1 wherein, the	Plaintiffs' infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute.

minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	While Viking disagrees with this contention, based on Plaintiffs' assertion, this limitation is also inherent in Sheldon.
Claim 3	**Sheldon**
['583: 3] The twist drill of claim 1 wherein, a height of each composite cutting blade group is uniform.	Sheldon, FIG. 1; 1:3-3:16. Sheldon describes that "The drill portion has three sections of constant diameter stepped to increase away from the business end. The section 14 at the front end has a diameter of 14mm, the second section 18 has a diameter of 18mm and the third section 22 has a diameter of 22mm. Each of these sections is 15mm in axial length." Sheldon, 2:32-37. Plaintiffs' infringement allegations appear to be based on designating an arbitrary length of the upper end of the cylinder portion to be part of the last composite cutting blade group. While Viking disagrees with this contention, based on Plaintiffs' assertion, Sheldon shows that the composite cutting blade groups are of the same height and that the height of a single composite cutting blade group is uniform around its perimeter.
Claim 5	**Sheldon**
['583: 5] The twist drill of claim 1 wherein, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	This claim language is directed to a well-known type of drill tip, commonly referred to as a split point tip. *See* U.S. Patent No. 4,582,458 ("Korb") FIG. 8 and 3:26-27; and U.S. Patent App. Pub. No. 2005/0053438 ("Wetzl"), ¶¶ [6, 10, 28, and 39], NAS 907 High Speed Drill Standard, 2001, at sheet 5 of 27, and Norseman 2014 catalog at pp. 6 - 15, 26, 26, 28, 29. It was known that this type of point provides fast penetration into the workpiece and accurate starting. *See, e.g.*, Norseman 2014 catalog p. 8 Such designs were well known and were widely used, for example, in the Viking 00693, 00694, and 00714 drills. Split point tips were also described in at least U.S. Patent App. Pub. No. 2018/0133808 ("Wang I"), Wetzl, U.S. Patent App. Pub. No. 2011/0116884 ("Li"), and U.S. Patent No. D840,449 ("Wang II"). It would have been obvious for a person of ordinary skill to provide Sheldon's drill with the well-known split point tip for the advantages of accurate starting and fast penetration.
Claim 6	**Sheldon**

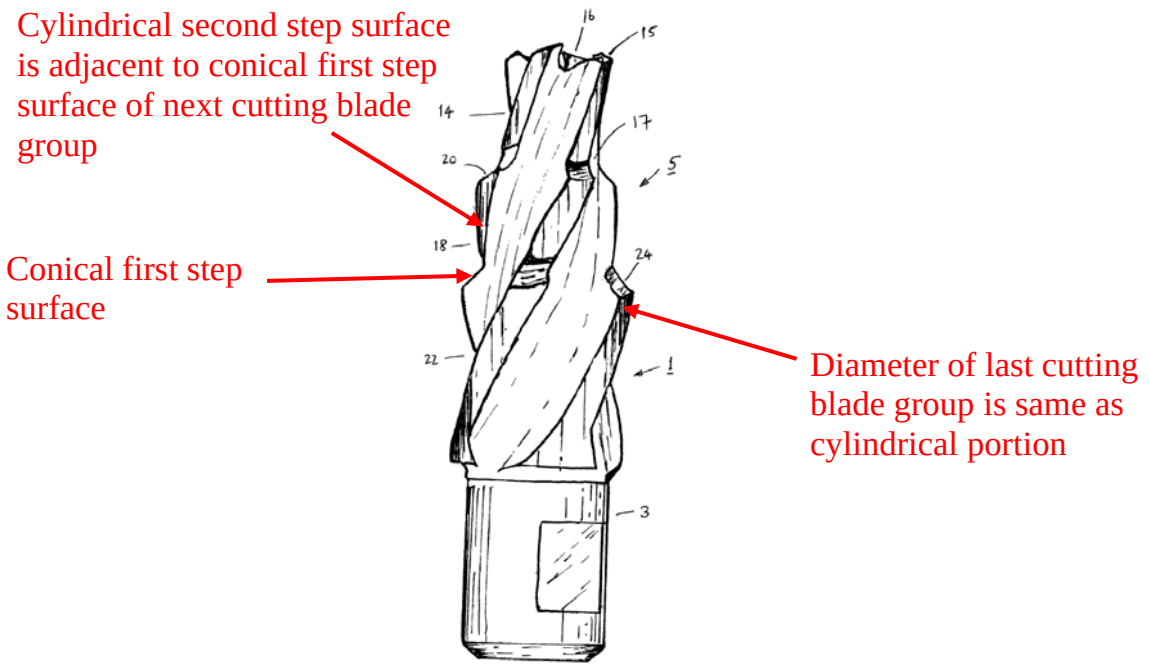
['583: 6] The twist drill of claim 1 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	Plaintiffs' infringement allegations appear to be based on a contention that the presence of axial and radial relief does not prevent composite cutting edge groups from being coaxial with the cone portion. While Viking disagrees, based on Plaintiffs' contention, then this limitation is also present in Sheldon, *see* FIG. 1, p. 1, l. 3 – p. 3, l. 16.
Claim 7	**Sheldon**
['583: 7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	To the extent that Sheldon does not expressly disclose this limitation, it would have been obvious for one of ordinary skill to modify Sheldon in the manner discussed above in ['583: 5] to include a split point tip as is shown in Wang I and as is present in the Viking 00693, 00694 and 00714 drills. One would have been motivated to do this, for example to make the drilling force relatively small, uniform and reasonable, and to prolong the life of the tool by making the stepped cutting edge wear more uniformly. *See* Wang I, ¶¶ [40-47]. Wang I, and the Viking 00693, 00694 and 00714 drills all include a top blade, in which a straight major cutting edge length of the top blade is greater than each of the major cutting edges.
Claim 8	**Sheldon**
['583: 8.pre] A twist drill, comprising:	The preamble carries no patentable weight. Sheldon discloses a drill having a flute that extends from a cone portion to a cylinder portion. *See, e.g.*, Sheldon, FIG. 1.
['583: 8.a] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	*See* ['583: 1.a]

	
['583: 8.b] a shank portion axially fixed to the cylinder portion opposite the cone portion;	*See* ['583: 1.b] and ['583: 8.a]
['583: 8.c] a spiral flute formed on an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the spiral flute having a sidewall;	*See* ['583: 1.c] and ['583: 8.a]

['583: 8.d] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d]. For example, Sheldon shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG.1 shown below. 
['583: 8.e] a conical first step surface;	*See* ['583: 1.e] and ['583: 8.d].
['583: 8.f] a cylindrical second step surface adjacent to the conical first step surface,	*See* ['583: 1.f] and ['583: 8.d].
['583: 8.g] a major cutting edge defined by the intersection of the	*See* ['583: 1.g] and annotated the annotated representation of FIG. 1 shown below.

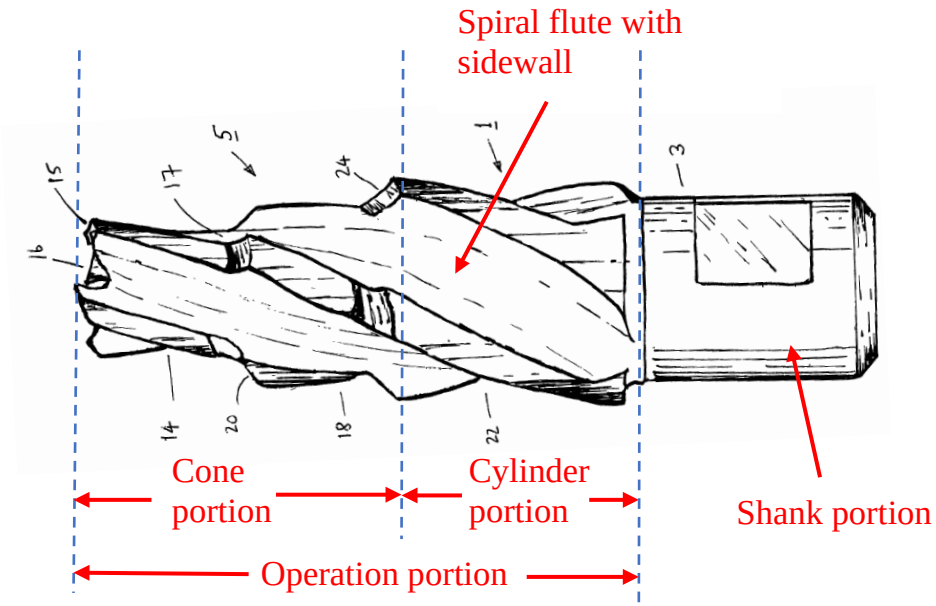
conical first step surface and the sidewall of the spiral flute;	
[’583: 8.h] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute, the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality; and	*See* [’583: 1.h], [’583: 2], and [’583: 8.g].
[’583: 8.i] a cutting tip defined by the	*See* [’583: 1:i] and [’583: 8.g].

intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute;	
['583: 8.j] a top blade provided on the front end of the cone portion, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge;	Sheldon discloses a top blade provided on the front end of the cone portion. *See* ['583: 1.j] and ['583: 8.g]. This claim language covering the chisel edge, two auxiliary cutting edges and two straight major cutting edges is directed to a well-known type of drill tip, commonly referred to as a split point tip. *See* Korb FIG. 8 and 3:26-27; and Wetzl, ¶¶ [6, 10, 28, and 39], NAS 907 High Speed Drill Standard, 2001, and Norseman 2014 catalog at pp. 6 - 15, 26, 26, 28, 29. It was known that this type of point provides fast penetration into the workpiece and accurate starting. *See*, *e.g.*, Norseman 2014 catalog p. 8. Such designs were well known and were widely used, for example, in the Viking 00693, 00694, and 00714 drills. Split point tips were also shown in at least Wang I, Wetzl, Li, and Wang II. It would have been obvious for a person of ordinary skill to provide Sheldon's drill with the well-known split point tip for the advantages of accurate starting and fast penetration.
['583: 8.k] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion; and	*See* ['583: 1.k] and ['583: 8.g].

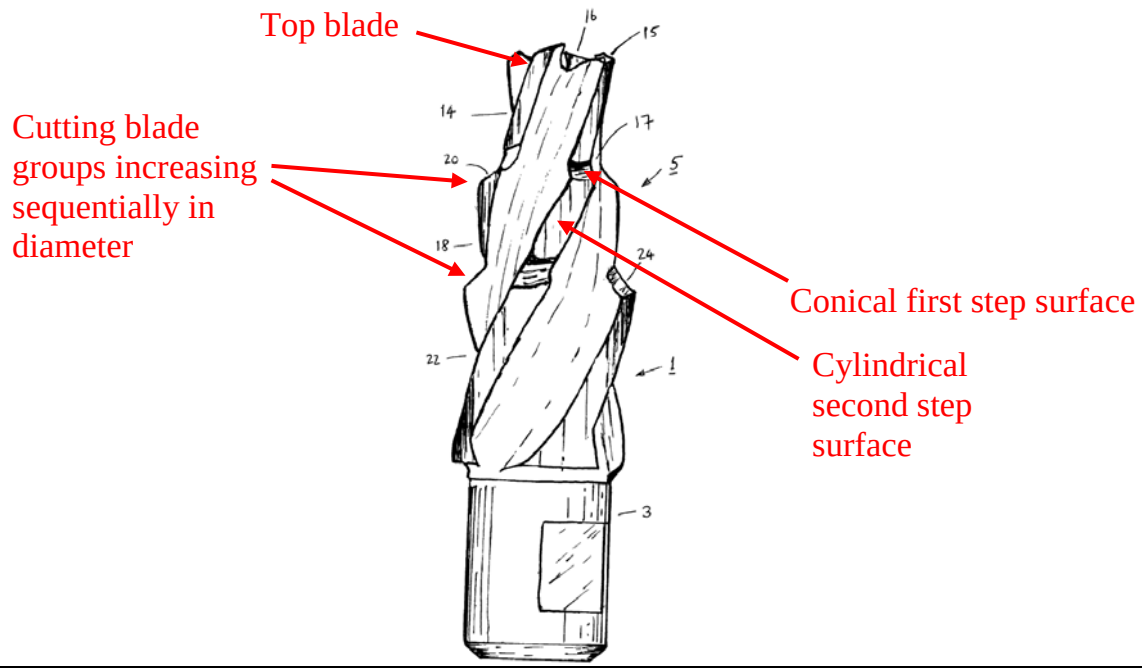
	
[’583: 8.l] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips; and	*See* [’583: 1.l].
[’583: 8.m] wherein at least one cylindrical second step surface is immediately adjacent to	*See* [’583: 1.m] and [’583: 8.k].

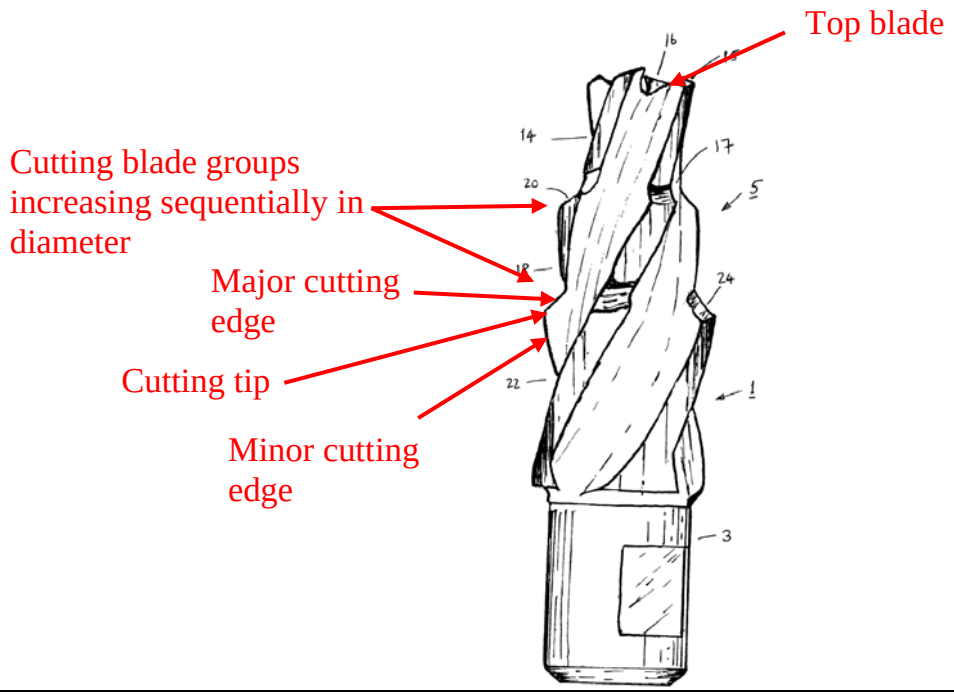
a conical first step surface of a next composite cutting blade group; and	
[’583: 8.n] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter.	*See* [’583: 1.n] and [’583: 8.k].
Claim 9	**Sheldon**
[’583: 9] The twist drill of claim 8 wherein, a height of each composite cutting blade group is uniform.	*See* [’583: 3].
Claim 11	**Sheldon**
[’583: 11] The twist drill of claim 8 wherein, each of the plurality of composite cutting blade groups is coaxial with the cone portion.	*See* [’583: 6].
Claim 12	**Sheldon**
[’583: 12] The twist drill of claim 8 wherein, a straight major cutting edge length of the top	*See* [’583: 7].

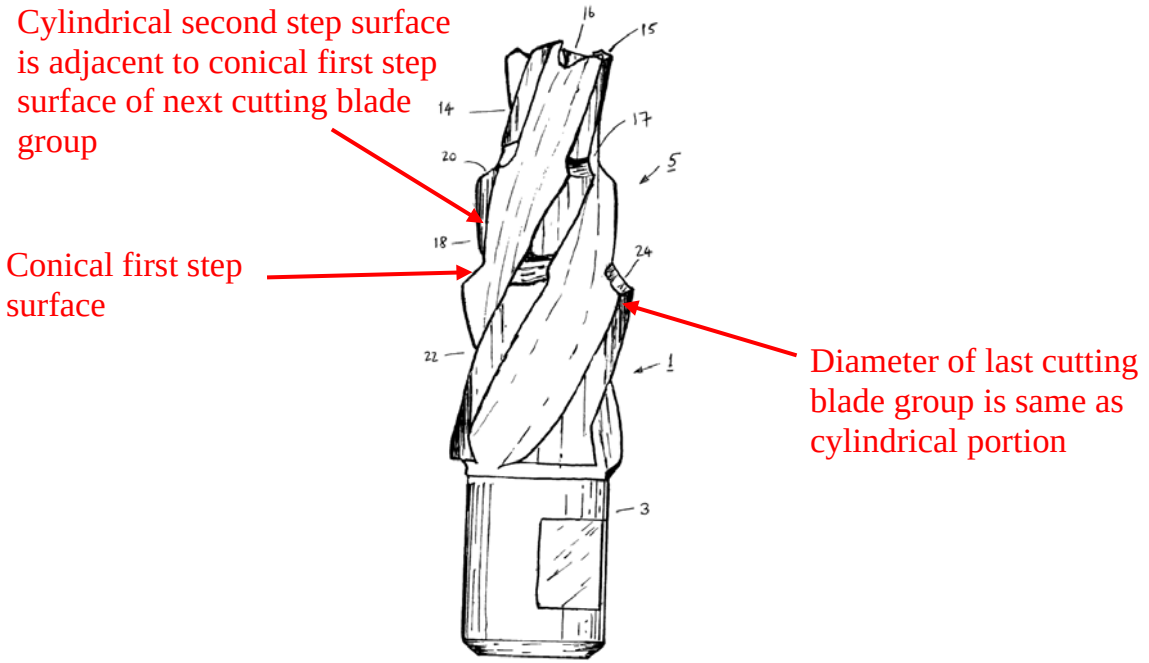
blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	
Claim 13	**Sheldon**
['583: 13] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the minor cutting edges of the plurality of composite cutting blade groups.	This claim is invalid because it is indefinite. Defendant is unable to determine what a "straight minor cutting edge" is and so cannot determine whether this element is present in the prior art. Defendant reserves the right to update this chart if the meaning of "straight minor cutting edge" is clarified during the course of this litigation. Plaintiffs have proposed that "a straight minor cutting edge" is a cutting edge parallel to the drill axis and descending from the outermost point of the "straight major cutting edge" of the top blade in a direction away from the tip of the drill. If this construction is correct, then Sheldon, modified in the manner suggested in ['583: 3] would have a straight minor cutting edge length of the top blade that is greater than each of the minor cutting edges of the plurality of composite cutting blade groups. *See, e.g.,* Wang I, FIG. 5, and the Viking 00693, 00694 and 00714 drills.
Claim 14	**Sheldon**
['583: 14] The twist drill of claim 8 wherein, the operation portion is configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of a workpiece when at least a portion of the cylinder portion is also within the workpiece.	Sheldon, FIG. 1; 1:3-3:16. One of ordinary skill would understand that Sheldon shows a drill having an operation portion configured to disperse a cutting force on each of the plurality of composite cutting blade groups within a drill hole of an arbitrarily thick workpiece when at least a portion of the cylinder portion is also within the workpiece.

’584 Patent	
Claim 1	**Sheldon**
[’584: 1.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	Sheldon discloses a drill having a flute that extends from a cone portion to a cylinder portion. Upon examination of Sheldon, one of ordinary skill would understand that use of Sheldon to improve centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion.
[’584: 1.a] providing a twist drill comprising: a shank portion;	Sheldon provides a twist drill having a shank portion. *See* [’583: 1.b]. *See also* the annotated representation of Sheldon’s FIG. 1 reproduced below. 

['584: 1.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	Sheldon shows a twist drill having an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated representation of Sheldon's FIG. 1 reproduced in ['584: 1.a].
['584: 1.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups	*See* ['583: 1.d] and ['583: 1.n]. For example, Sheldon shows a plurality of composite cutting blade groups, as seen in annotated representation of FIG. 1 reproduced below.

sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	
[’584: 1.d] a conical first step surface;	Sheldon shows a composite cutting blade group having a conical first step surface. *See* [’583: 1.e] and the annotated representation of FIG. 1 in [’584: 1.c].
[’584: 1.e] a cylindrical second step surface adjacent to the conical first step surface,	Sheldon shows a composite cutting blade group having a cylindrical second step surface adjacent to the conical first step surface. *See* [’583: 1.f] and the annotated representation of Sheldon’s FIG. 1 shown in [’584: 1.c].
[’584: 1.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Sheldon shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* [’583: 1.g] and the annotated representation of Sheldon’s FIG. 1 shown below.

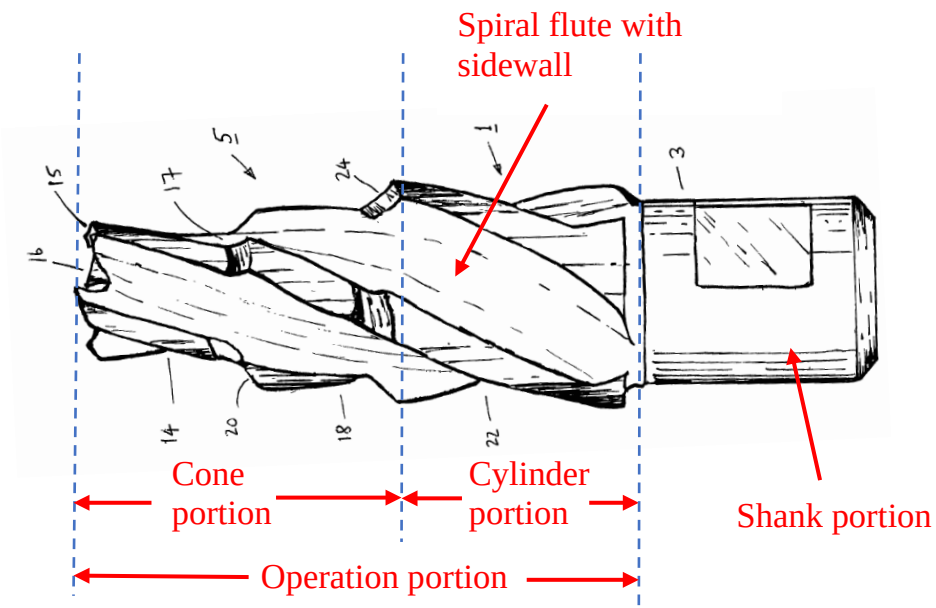
	
['584: 1.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Sheldon shows minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. *See* ['583.1h] and the annotated representation of Sheldon's FIG. 1 shown in ['584: 1.f].
['584: 1.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Sheldon shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* ['583: 1.i] and the annotated representations of Sheldon's FIG. 1 shown in ['584: 1.f].

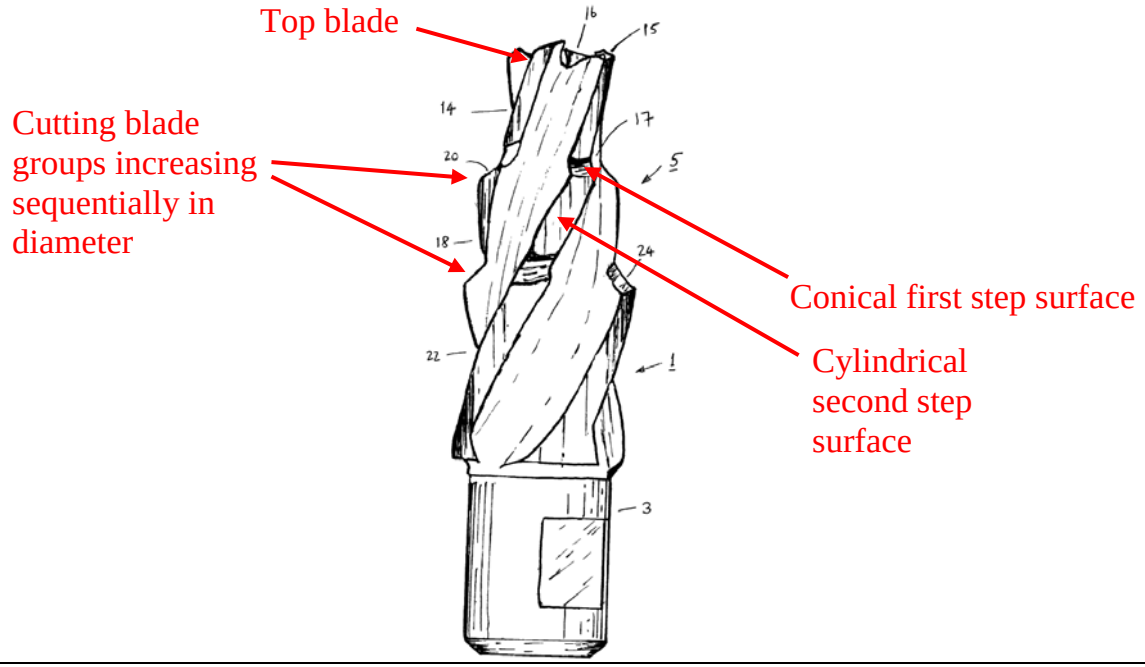
[’584: 1.i] a top blade provided on the front end of the cone portion;	Sheldon shows a top blade provided on the front end of the cone portion. *See* [’583: 1.j] and the annotated representation of Sheldon’s FIG. 1 shown in [’584: 1.f].
[’584: 1.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	Sheldon shows the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. *See* [’583: 1.m] and the annotated representation of Sheldon’s FIG. 1 below. 
[’584: 1.k] wherein the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is	Assuming the Accused Products are found to meet this limitation, then Sheldon shows the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter. *See* [’583: 1.n] and the annotated representation of Sheldon’s FIG. 1 in [’584: 1.j].

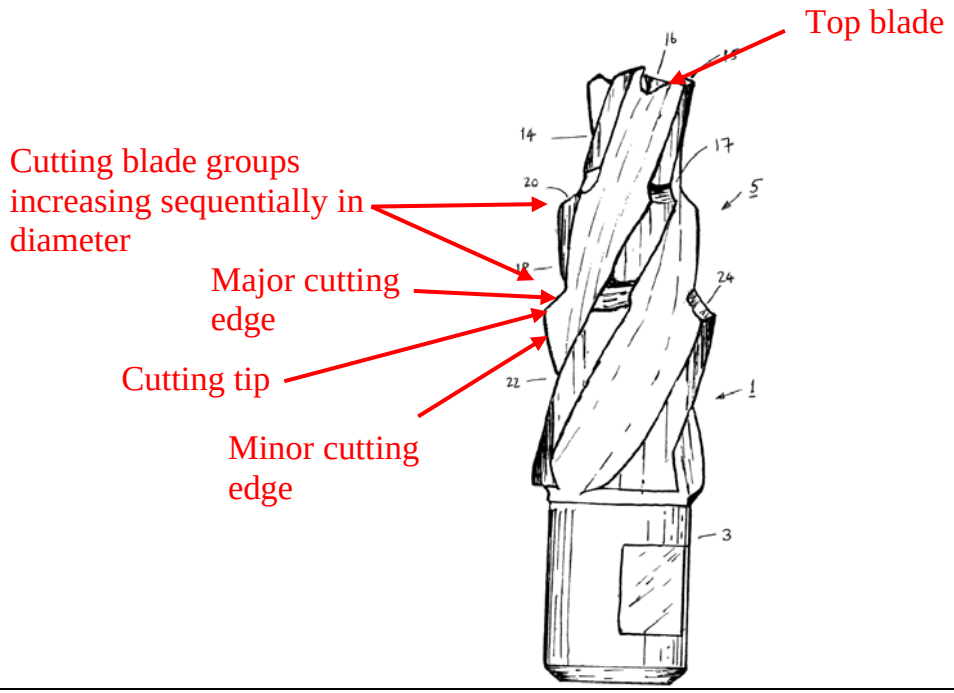
equal to the cylinder portion diameter;	
[’584: 1.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	One of ordinary skill would understand the use of Sheldon to require positioning the twist drill atop the workpiece and applying a torque and an axial drilling force to the twist drill. This claim is simply one step the drilling process that a person of ordinary skill would use Sheldon to drill a hole in a workpiece. Such a drilling process, that includes positioning the rotating drill and progressing it through the workpiece, was commonly known. *See* Wang I, ¶¶ [5, 6, 13, 37-39]; U.S. Patent No. 2,193,186 (“Bannister”), p. 1, Left:1-11, 25-34, R:32-49; Wetzl, ¶¶ [6-8]; and Li, ¶¶ [3, 24, 37, 44]. Specifically, Sheldon discloses “Fig. 2a shows the cutter having completed an 18mm-diameter hole in 15mm thick steel plate 40. Previously the first section 14 had removed a plug 42 corresponding to the 14mm diameter, as illustrated in Fig. 2b. Fig. 2b also shows the 45 inclination of the countersink 24 between the 18mm and 22mm-diameter sections.” Sheldon, 3:18-23
[’584: 1.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	One of ordinary skill would understand the use of Sheldon to require cutting the workpiece with the top blade to create a drill hole in the workpiece. *See* [’584: 1.l].
[’584: 1.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end;	One of ordinary skill would understand the use of Sheldon to require continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end. *See* [’584: 1.l].
[’584: 1.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups	One of ordinary skill would understand the use of Sheldon to require continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the cylinder portion. *See* [’584: 1.l] and [’584: 1.n].

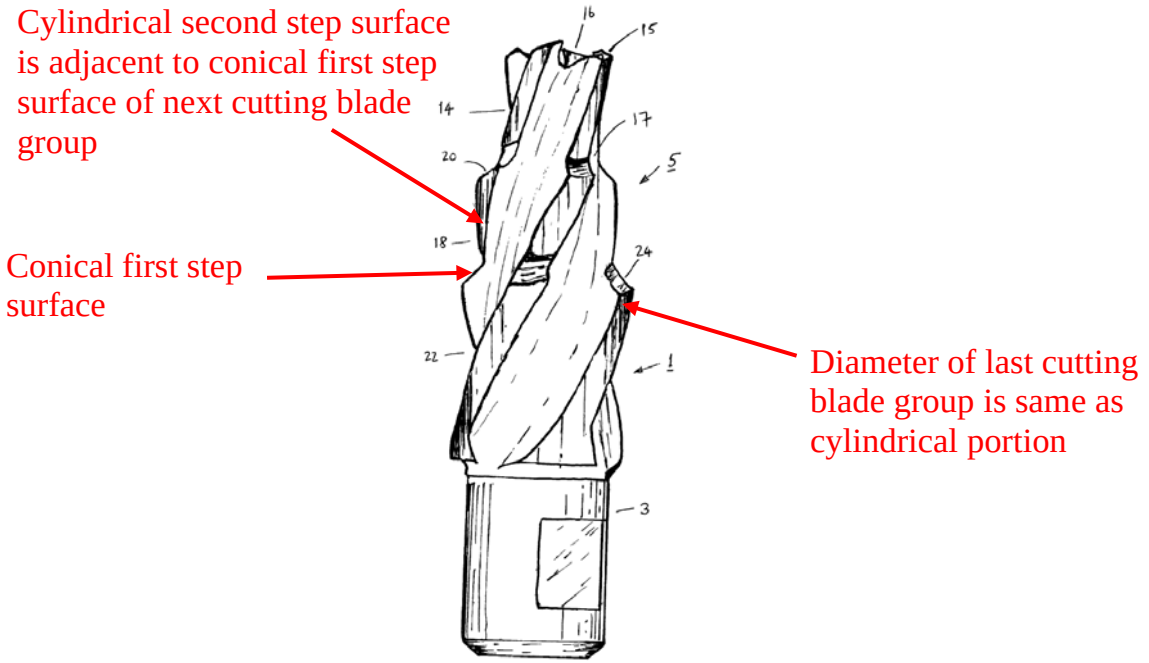
situated closest to the cylinder portion,	
[’584: 1.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut; and	One of ordinary skill would understand the use of Sheldon would result in a cutting allowance of the workpiece being distributed according to a drill hole diameter so that the workpiece is gradually cut. This is a natural outcome of the geometry of the cone portion taught by Sheldon. *See* [’584: 1.l] and [’584: 1.n].
[’584: 1.q] continuing cutting the workpiece while at least a portion of the cylinder portion is within the workpiece.	One of ordinary skill would understand the use of Sheldon to require continuing cutting the workpiece of arbitrary thickness while at least a portion of the cylinder portion is within the workpiece, for example, in order to drill a hole having a diameter equal to the largest step diameter (e.g. 22 mm) in a material having a thickness greater than the axial length of the final step (e.g. 15 mm). Sheldon, FIGs. 2A-3.
Claim 2	**Sheldon**
[’584: 2] The method of claim **1** wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs’ infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in Sheldon.
Claim 4	**Sheldon**
[’584: 4] The method of claim 1 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting	*See* [’583: 1.j] and [’583: 5].

edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major cutting edge and the chisel edge.	
Claim 5	**Sheldon**
[’584: 5] The method of claim **1** wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [’583: 7].
Claim 6	**Sheldon**
[’584: 6.pre] A method for improving centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion, the method comprising:	Sheldon is a drill having a flute that extends from a cone portion to a cylinder portion. Upon examination of Sheldon, one of ordinary skill would understand that use of Sheldon to improve centering accuracy of a twist drill when drilling a drill hole in a workpiece using multistage centering and using both a cone portion and a cylinder portion.
[6.a] providing a twist drill comprising:	Sheldon provides a twist drill having a shank portion. *See* [’583: 1.b]. *See also* the annotated representation of Sheldon’s FIG. 1 reproduced below.

a shank portion;	
['584: 6.b] an operating portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder	Sheldon describes a twist drill having an operation portion axially fixed to the shank portion, the operating portion comprising the cone portion axially fixed to the cylinder portion and a spiral flute having a sidewall and being formed into an exterior surface of the operating portion extending from a front end of the cone portion and at least partway up the cylinder portion, the shank portion axially fixed to the cylinder portion opposite the cone portion. *See* ['583: 1.a], ['583: 1.c], and the annotated representation of Sheldon's FIG. 1 reproduced in ['584: 6.a].

portion, the shank portion axially fixed to the cylinder portion opposite the cone portion;	
['584: 6.c] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from the front end of the cone portion to a rear end of the cone portion, and diameters of the composite cutting blade groups sequentially increase from the front end to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising:	*See* ['583: 1.d] and ['583: 1.n]. For example, Sheldon shows a plurality of composite cutting blade groups, as seen in the annotated representation of FIG. 1 reproduced below. 
['584: 6.d] a conical first step surface;	Sheldon shows a composite cutting blade group having a conical first step surface. *See* ['583: 1.e] and the annotated representation of FIG. 1 in ['584: 6.c].

['584: 6.e] a cylindrical second step surface adjacent to the conical first step surface,	Sheldon shows a composite cutting blade group having a cylindrical second step surface adjacent to the conical first step surface. *See* ['583: 1.f] and the annotated representation of Sheldon's FIG. 1 shown in ['584: 6.c].
['584: 6.f] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	Sheldon shows a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute. *See* ['583:1.g] and the annotated representation of Sheldon's FIG. 1 shown below. 
['584: 6.g] a minor cutting edge defined by the intersection of the cylindrical second step and the and the sidewall of the spiral flute; and	Sheldon shows a minor cutting edge defined by the intersection of the cylindrical second step and the sidewall of the spiral flute. *See* ['583.1h] and the annotated representation of Sheldon's FIG. 1 shown in ['584: 1.f].

['584: 6.h] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute; and	Sheldon shows a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute. *See* ['583: 1.i] and the annotated representations of Sheldon's FIG. 1 shown in ['584: 6.f].
['584: 6.i] a top blade provided on the front end of the cone portion;	Sheldon shows a top blade provided on the front end of the cone portion. *See* ['583: 1.j] and the annotated representation of Sheldon's FIG. 1 shown in ['584: 6.f].
['584: 6.j] wherein the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group; and	Sheldon shows the cylindrical second step surface of at least one composite cutting blade group is immediately adjacent to the conical first step surface of a next composite cutting blade group. *See* ['583: 1.m] and the annotated representation of Sheldon's FIG. 1 below. 

[’584: 6.k] the diameter of the last composite cutting blade group located at the rear end of the cone portion immediately adjacent to the cylinder portion is equal to the cylinder portion diameter;	*See* [’583: 1.n] and the annotated representation of Sheldon’s FIG. 1 in [’584: 6.j].
[’584: 6.l] positioning the twist drill atop the workpiece; applying a torque and an axial drilling force to the twist drill;	*See* [’584: 1.l]
[’584: 6.m] cutting the workpiece with the top blade to create a drill hole in the workpiece;	*See* [’584: 1.m]
[’584: 6.n] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups situated closest to the front end; and	*See* [’584: 1.n]
[’584: 6.o] continuing cutting the workpiece using one or more of the plurality of composite cutting blade groups	*See* [’584: 1.o]

situated closest to the cylinder portion,	
[’584: 6.p] wherein a cutting allowance of the workpiece is distributed according to a drill hole diameter so that the workpiece is gradually cut.	*See* [’584: 1.p]
Claim 7	**Sheldon**
[’584: 7] The method of claim 6 wherein, in the step of providing a twist drill, the minor cutting edge is configured to smooth the machined surface of the workpiece to improve surface quality.	Plaintiffs’ infringement allegations appear to be based on the contention that this smoothing of the machined surface of the workpiece inherently results from having a minor cutting edge along the flute. While Viking disagrees with this contention, based on Plaintiffs’ assertion, this limitation is also inherent in Sheldon. *See* [’584: 2].
Claim 9	**Sheldon**
[’584: 9] The method of claim 6 wherein, in the step of providing a twist drill, the top blade comprises a chisel edge, two auxiliary cutting edges and two straight major cutting edges, the auxiliary cutting edge is respectively intersected with the straight major	*See* [’583: 1.j] and [’583: 5].

cutting edge and the chisel edge.	
Claim 10	**Sheldon**
[’584: 10] The method of claim 6 wherein, in the step of providing a twist drill, a straight major cutting edge length of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups.	*See* [‘583: 7].
Claim 11	**Sheldon**
[’584: 11] The method of claim 6 further: dispersing a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece.	One of ordinary skill would understand that Sheldon shows a drill having an operation portion configured to disperse a cutting force on all of the plurality of composite cutting blade groups within a drill hole of a workpiece when a portion of the cylinder portion is also within the workpiece. This is a natural outcome of using Sheldon and is, therefore, inherent to the use of the drill.