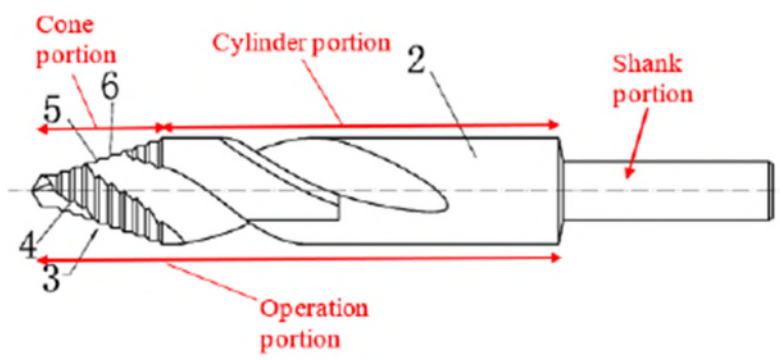
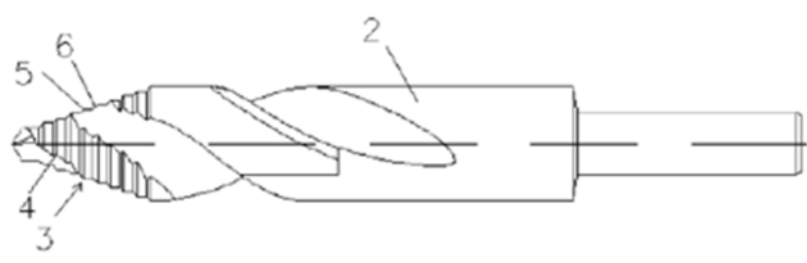
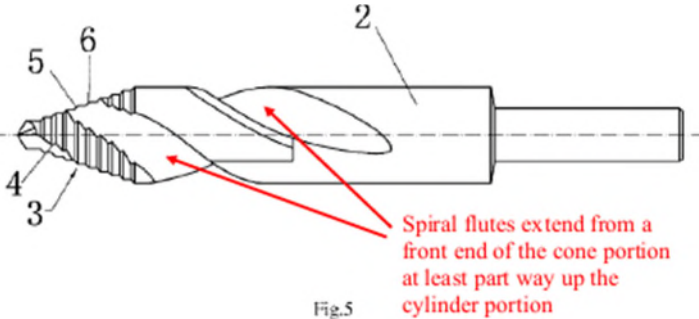
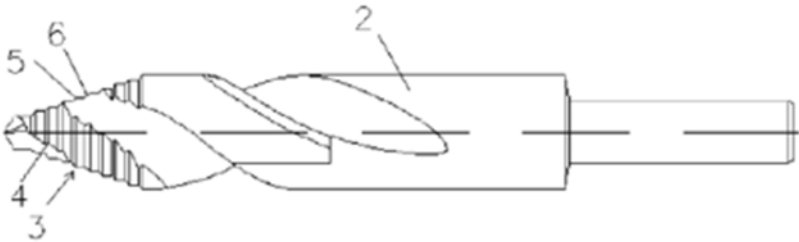


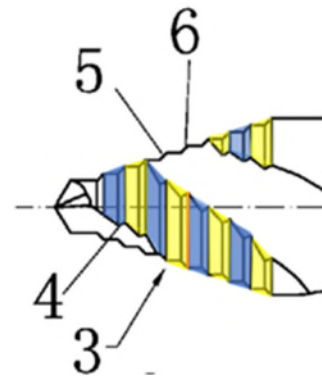
Tsteigen v. Viking Drill & Tool, Inc.

Priority Patent Claims Chart for U.S. Patent No. 11,007,583

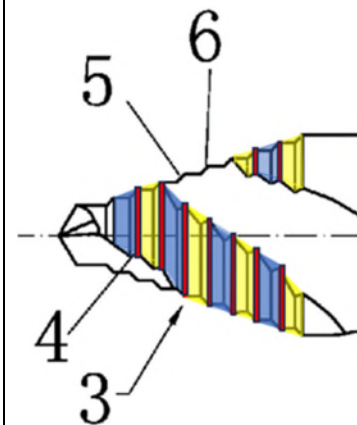
Claim 1	U.S. Patent App. 15/847,900 (“‘900 Application”, Ex. 1009, Ex. 1018)	PCT Patent Application No. PCT/CN2016/073767 (“‘767 Application”, Ex. 1019)
[’583: 1.a] A twist drill, comprising:	The ‘900 Application is entitled “Efficient Twist Drill for Layered Drilling” and refers to a “twist drill” throughout. Ex. 1009, Abstract and paragraphs [0006], [0031], [0038], and [0039]; Ex. 1018 at p.2 (“the present disclosure relates to an efficient twist drill for layered drilling”)	The ‘767 Application is entitled ‘High Efficiency Step-Structured Twist Drill” and refers to a twist drill throughout. Ex. 1019, pp. 1 (Abstract), 2 (Technical Field, Background Art, and Summary). For example, “A high efficiency step-structured twist drill comprises . . .” Ex. 1019, p.2.
[1.b] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	The ‘900 application teaches a drill body 2 comprising, an operation portion that has a “cutting portion at a front end and a guide portion at a rear end.” Ex. 1009 at ¶[0031]. Figure 5 of the ‘900 Application (as annotated below) shows that the “cutting portion at a front end” is a cone portion and the “guide portion at a rear end” is a cylinder portion, fixed axially to the cone portion. Ex. 1009 at p.6.  The diagram shows a side view of a twist drill. The front end is a cone portion (labeled 5) with a cutting edge (labeled 4). The cone portion is axially fixed to a cylinder portion (labeled 2). The cylinder portion is axially fixed to a shank portion (labeled 6). The operation portion (labeled 3) is the combination of the cone portion and the cylinder portion. Red arrows and labels indicate these parts.	The ‘767 Application teaches a drill body 2 comprising, an operation portion that has a “cutting portion at a front end thereof and a guide portion at a rear end thereof.” Ex. 1019 at p.4. Figure 5 of the ‘767 Application is substantially identical to Figure 5 of the ‘900 Application. Figure 5 shows that the “cutting portion at a front end” is a cone portion and the “guide portion at a rear end” is a cylinder portion, fixed axially to the cone portion. Ex. 1019 at p.9.  The diagram shows a side view of a twist drill, similar to the one in the '900 Application. It has a cone portion (labeled 5) with a cutting edge (labeled 4), a cylinder portion (labeled 2), and a shank portion (labeled 6). The operation portion (labeled 3) is the combination of the cone portion and the cylinder portion. Red arrows and labels indicate these parts.
[1.c] a shank portion axially fixed to the cylinder portion opposite the cone portion;	The ‘900 Application teaches that the drill body includes “a shank portion” that is “connected to the guide portion.” Ex. 1009 at ¶[0031]. As shown above, the “guide portion”	The ‘767 Application teaches that the drill body includes “a shank portion” that is “connected to the guide portion.” Ex. 1009 at p.4 As shown above, the “guide portion” corresponds

	corresponds to the “cylinder portion” of claim 1. Thus, the ‘900 Application teaches a shank portion axially fixed to the cylinder portion opposite the cone portion.	to the “cylinder portion” of claim 1. Thus, the ‘767 Application teaches a shank portion axially fixed to the cylinder portion opposite the cone portion.
[1.d] 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 ‘900 Application teaches the claimed spiral flutes 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, with the spiral flutes having a sidewall. This is shown in Figure 5 of the ‘900 Application, as annotated below. Ex. 1009 at p.6.  Fig.5	The ‘767 Application teaches the claimed spiral flutes 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, with the spiral flutes having a sidewall. This is shown in Figure 5 of the ‘767 Application, which is substantially identical to Figure 5 of the ‘900 Application, annotated on the left. 
[1.e] 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 ‘900 Application teaches 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. The ‘900 Application provides that “The flutes of the present disclosure may be arc-shaped flutes adapted to a radian of the flank surface, or the connecting lines of the flutes form a spiral structure.” Ex. 1009 at ¶¶[0035],[0006]. In context, a POSA would understand the term “flutes” in context to refer to the plurality of parallel grooves in the	The ‘767 Application teaches 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. The ‘767 Application provides that “The flutes in the present invention may be curved flutes adapted to the curvature of the rear surface, or the connecting line of the flutes is of a spiral structure.” Ex. 1019 at p. 5. In context, a POSA would understand the term “flutes” in context to refer to the plurality of parallel grooves in the nose-cone of the twist drill, as shown in blue and yellow in

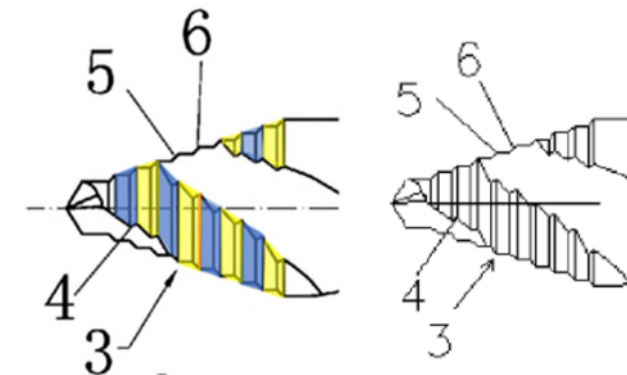
nose-cone of the twist drill, as shown in blue and yellow in the annotation of Figure 5, below. Ex. 1009 at p. 6.



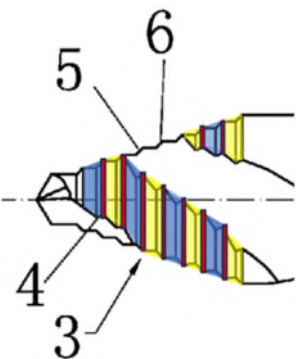
Each set of adjacent parallel flutes 4 (grooves) shares a single connecting line. A POSA would understand that the “connecting lines of the flutes” refers to shared line that each set of adjacent flutes shares with its neighbor, as shown in red below. Ex. 1009 at p. 6.



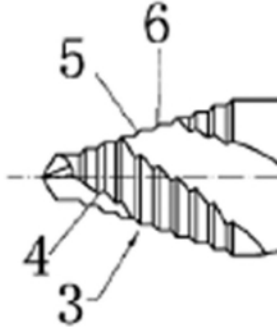
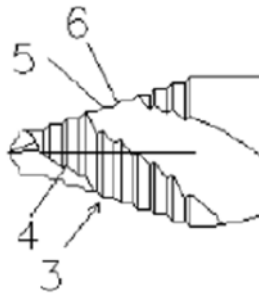
the annotation of Figure 5, below. Ex. 1019 at p. 9 (annotation is of the substantially identical Figure 5 of the ‘900 Application).

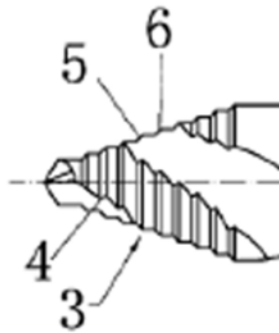
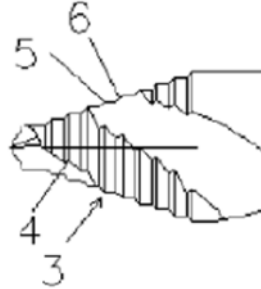


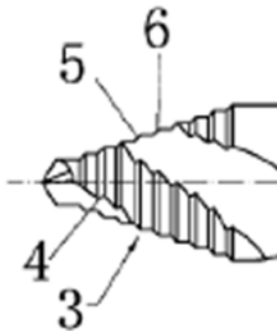
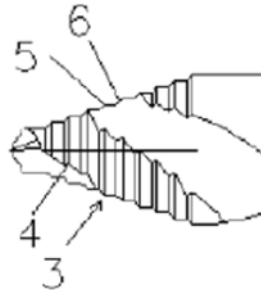
Each set of adjacent parallel flutes 4 (grooves) shares a single connecting line. A POSA would understand that the “connecting lines of the flutes” refers to shared line that each set of adjacent flutes shares with its neighbor, as shown in red below. Ex. 1019 at p. 9 (annotation is of the substantially identical Figure 5 of the ‘900 Application).

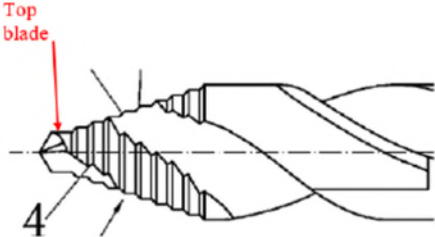
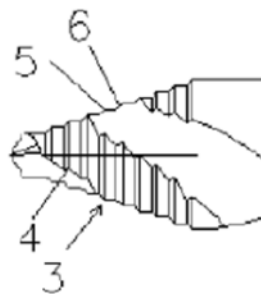
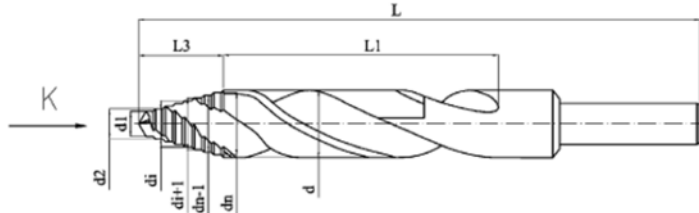
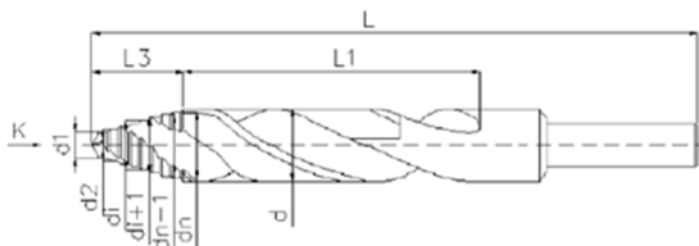


	This is the only plausible interpretation of the “connecting lines of the flutes” in the context of the ‘900 Application. The only actual line that connects two adjacent flutes 4 in the Wang Priority Applications is the line where the conical surface formed by one flute 4 intersects the cylindrical surface formed by the next flute 4. When that connecting line forms a spiral structure, that is the definition of common axial relief. It is further consistent with the ‘900 Application’s unambiguous teaching of axial relief in connection with the second cutting blade 6, which utilizes an identical structure to describe axial relief just a few paragraphs earlier. “The second cutting blades 6 are parallel to an axis line of the drill bit body, or an angle of 0-20 degrees is formed between the second cutting blades 6 and the axis line of the drill bit body so that tail ends of the second cutting blades 6 are inclined downwards, and only starting ends of the second cutting blades (i.e., tops of the first cutting blades) touch the workpieces during cutting, as shown in FIG. 13.” Ex. 1009 at ¶[0031].	This is the only plausible interpretation of the “connecting lines of the flutes” in the context of the ‘767 Application. It is further consistent with the ‘767 Application’s unambiguous teaching of axial relief in connection with the second cutting blade 6, which utilizes an identical structure to describe axial relief just a few paragraphs earlier. “The second cutting blades 6 are parallel to the axis of the drill bit body, or a 0- to 20-degree angle is formed between the second cutting blades 6 and the axis of the drill bit body, such that the tail ends of the second cutting blades 6 incline downwardly. During cutting, only start ends of the second cutting blades (i.e., the top of the first cutting blades) contact a workpiece, as shown in FIG. 13.” Ex. 1019 at p. 4.
[1.f] a conical first step surface;	The ‘900 Application teaches the first cutting blade, formed by the conical first step surface, as being at “an angle a of 90-140 degrees” to the second cutting blade, which is formed by the second cylindrical step surface. Ex. 1009 at ¶¶[0031]-[0032].	The ‘767 Application teaches the first cutting blade, formed by the conical first step surface, as being at “a 90- to 140-degree angle a” to the second cutting blade, which is formed by the second cylindrical step surface. Ex. 1019 at pp. 4-5.
[1.g] a cylindrical second step surface adjacent to the conical first step surface,	The ‘900 Application teaches the second cutting blade, formed by the cylindrical second step surface, as being “parallel to an axis line of the drill bit body” or at “an angle of 0-20 degrees.” Ex. 1009 at ¶¶[0031]-[0032].	The ‘767 Application teaches the second cutting blade, formed by the cylindrical second step surface, as being “parallel to the axis of the drill bit body” or at “a 0- to 20-

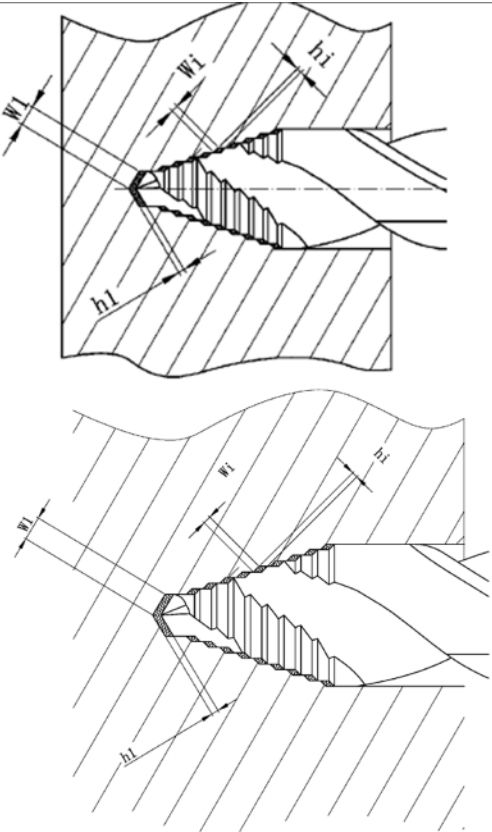
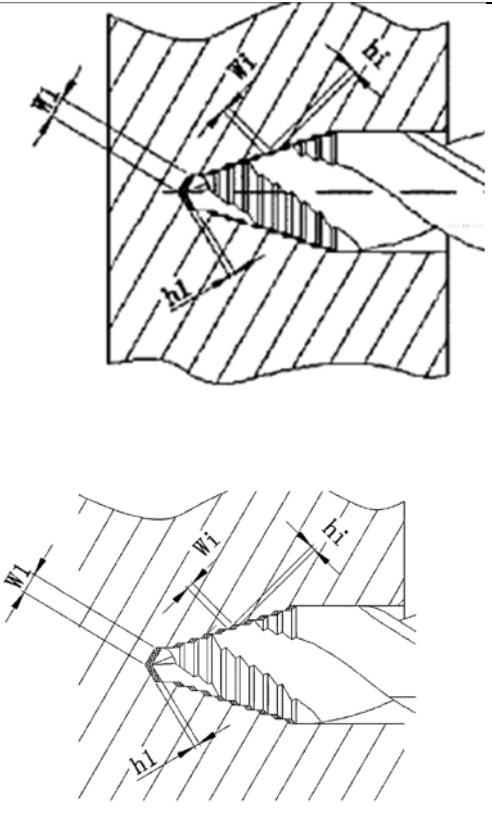
		degree angle” to the “axis of the drill bit body.” Ex. 1019 at p. 4.
[1.h] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	The ‘900 Application teaches a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1009 at p.6.  The ‘900 Application refers to the major cutting edges as the “first cutting blades 5.” Ex. 1009 at ¶¶[0031]-[0032].	The ‘767 Application teaches a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1019 at p.9.  The ‘767 Application refers to the major cutting edges as the “first cutting blades 5.” Ex. 1019 at pp. 4-5.
[1.i] a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the spiral flute	The ‘900 Application teaches a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1009 at p.6.	The ‘767 Application teaches a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1019 at p.9.

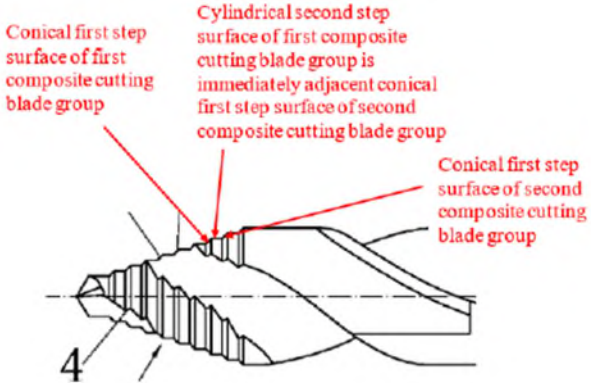
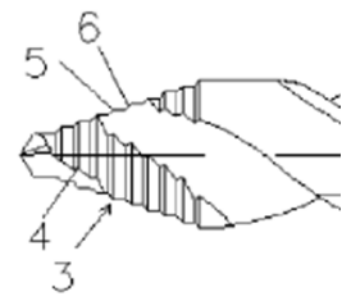
	 The '900 Application refers to the minor cutting edges as the "second cutting blades 6." Ex. 1009 at ¶¶[0031]-[0032]. A POSA would understand the second cutting blades as "minor" cutting blades, in light of the '900 Application's teaching of axial relief, where "an angle of 0-20 degrees is formed between the second cutting blades 6 and the axis line of the drill bit body so that tail ends of the second cutting blades 6 are inclined downwards, and only starting ends of the second cutting blades (i.e., tops of the first cutting blades) touch the workpieces during cutting." Ex. 1009 at ¶[0031].	 The '767 Application refers to the minor cutting edges as the "second cutting blades 6." Ex. 1019 at pp. 4-5. A POSA would understand the second cutting blades as "minor" cutting blades, in light of the '767 Application's teaching of axial relief, where "a 0- to 20-degree angle is formed between the second cutting blades 6 and the axis of the drill bit body, such that the tail ends of the second cutting blades 6 incline downwardly. During cutting, only start ends of the second cutting blades (i.e., the top of the first cutting blades) contact a workpiece." Ex. 1019 at p. 4.
[1.j] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute	The '900 Application teaches a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute, as shown in Figure 5 below. Ex. 1009 at p.6.	The '767 Application teaches a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute, as shown in Figure 5 below. Ex. 1019 at p.9.

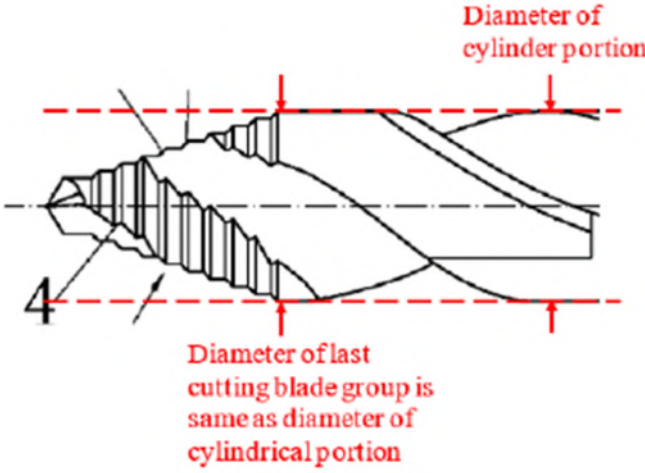
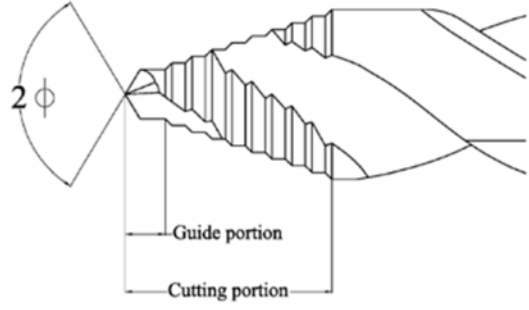
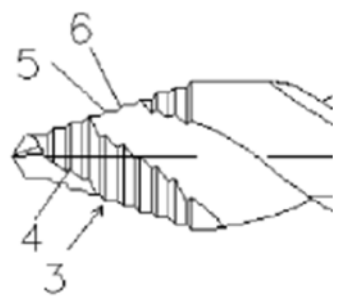
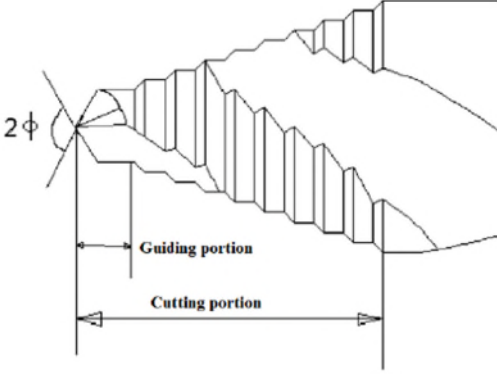
		
[1.k] a top blade provided on the front end of the cone portion;	The '900 Application teaches a top blade having a “first cutting blade and a second cutting blade at the foremost end of the drill bit body, the first cutting blade is in contact with the workpiece first.” Ex. 1009 at ¶[0033]. The '900 Application states that “[w]hen 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.” Ex. 1009 at ¶[0039]. This top blade is further depicted in the annotation of Figure 5, below. Ex. 1009 at p.6.	The '900 Application teaches a top blade, such that “the most front end of the drill bit body 2 is formed into a guiding portion (that is, the first cutting blade and the second cutting blade at the most front end of the drill bit body, where the first cutting blade is the first to contact a workpiece).” Ex. 1019 at p.5. The '900 Application states that “[w]hen the drill bit starts to contact the surface of the workpiece, a first section of a small drill tip having a very small size (i.e., the guiding portion) drills a guide hole. Since its diameter is very small, it is very easy to position and drill a small hole. Then, the following gradually increased stepped blades gradually expand the hole until the final size of the twist drill is reached. Compared with one time of continuous cutting by the linear cutting blade of a conventional twist drill, this process of gradually drilling and expanding a hole decreases the cutting resistance and progresses easily.” Ex. 1019 at p.6. This top blade is further depicted in Figure 5, below, which is substantially identical to the annotation of Figure 5, to the left. Ex. 1019 at p.9.

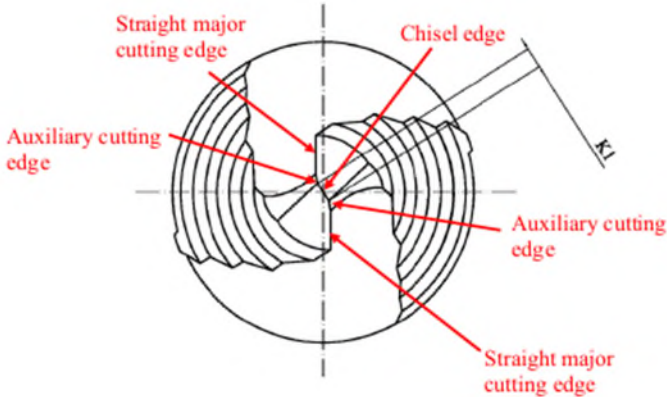
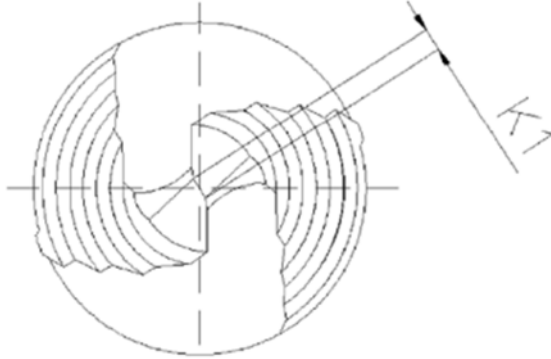
		
[1.1] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion;	The '900 Application teaches that “a diameter d of the circular arc between the two opposite second cutting blades is gradually increased to form a step-like structure. For example, from a diameter d_1 between the foremost second cutting blades to a diameter d_n between the last second cutting blades, the diameters show a gradually increasing trend; and the increased size can be constant or variable.” Ex. 1009 at ¶[0036]. This is shown in Figures 5-13 of the '900 Application, and illustrated in detail in Figure 11, below. Ex. 1009 at pp. 6-14 (Figs. 5-13), p.12 (Fig. 11): 	The '767 Application teaches that “the curve diameter d between two opposing second cutting blades increases gradually to form a stepped structure. For example, the diameter is in an incrementing trend from the diameter d_1 between the second cutting blades at the most front end to the diameter d_n between the last second cutting blades, and the incremental size may be constant or may be variable.” Ex. 1019 at p.5. This is shown in Figures 5-13 of the '767 Application, and illustrated in detail in Figure 11, below. Ex. 1019 at pp. 9-14 (Figs. 5-13), p.13 (Fig. 11): 
[1.m] each of the plurality of composite cutting blade groups is configured to	The '900 Application teaches that the cutting is distributed among the multiple major cutting blades of each composite	The '767 Application teaches that the cutting is distributed among the multiple major cutting blades of each composite

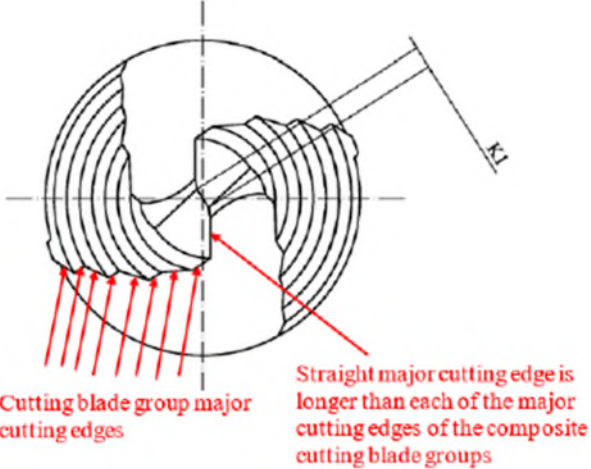
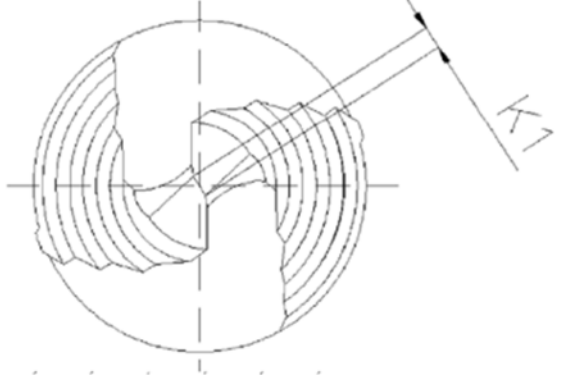
crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips;	cutting blade group. The ‘900 Application describes “a twist drill for layered drilling” which is distinguishes from the prior art twist drills, in which “[t]wo linear cutting blades (i.e., main cutting blades 1) always cut simultaneously during drilling” and which has “a single-blade cutting area of $S_1=S_2=Wxh$ and a total cutting area of $S=2S_1=2S_2=2xWxh$ during drilling.” Ex. 1009 at ¶¶[0029],[0031]. Unlike the traditional drill, the ‘900 Application teaches that “a cut large area block S is decomposed into n small blocks S_i; the area of each small block S_i is $S_i=Wixhi$, $S_n=Wnxhi$; and the total cutting area is $S=S_1+. . . +S_i+. . . S_n$.” Ex. 1009 at ¶[0038]. The ‘900 Application goes on to explain that “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.” Ex. 1009 at ¶[0039]. Figures 9 and 10 illustrate this relationship. Ex. 1009 at pp. 10-11. The ‘900 Application also teaches that the spiral flute is configured to shunt the finer chips.	cutting blade group. The ‘767 Application describes “a high efficiency step-structured twist drill” which is distinguishes from the prior art twist drills, in which “two linear cutting blades (i.e., main cutting blades 1) [always] cut[] simultaneously during drilling” and which has “a single-blade cutting area of $S_1=S_2=Wxh$ and a total cutting area of $S=2S_1=2S_2=2xWxh$ during drilling.” Ex. 1019 at p.4. Unlike the traditional drill, the ‘767 Application teaches that “a cut large block S is divided into n small blocks S_i, and the area of the small blocks S_i is $S_i = Wixhi$, $S_n = Wnxhi$, and the total cutting area is $S = S_1+...+S_i+...+S_n$.” Ex. 1019 at p.6. The ‘767 Application further explains that “[w]hen the drill bit starts to contact the surface of the workpiece, a first section of a small drill tip having a very small size (i.e., the guiding portion) drills a guide hole. Since its diameter is very small, it is very easy to position and drill a small hole. Then, the following gradually increased stepped blades gradually expand the hole until the final size of the twist drill is reached. Compared with one time of continuous cutting by the linear cutting blade of a conventional twist drill, this process of gradually drilling and expanding a hole decreases the cutting resistance and progresses easily.” Ex. 1019 at p.6. Figures 9 and 10 illustrate this relationship. Ex. 1019 at p. 12. The ‘767 Application also teaches that the spiral flute is configured to shunt the finer chips.
--	--	--

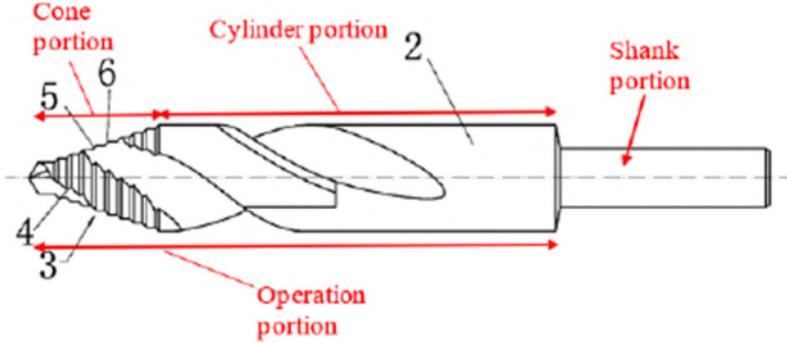
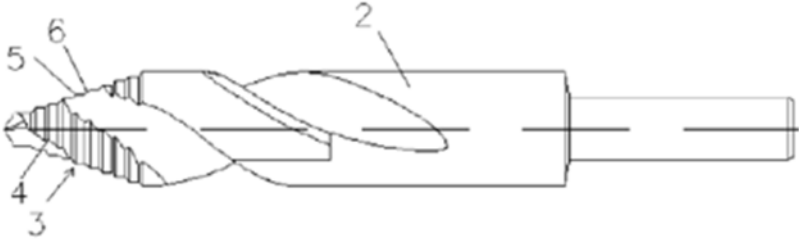
		
[1.n] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group	The ‘900 Application teaches that the cylindrical second step surface of a first composite cutting blade group is immediately adjacent to a conical first step surface of a next composite cutting blade group. The ‘900 Application provides that “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.” Ex. 1009 at ¶[0031].	The ‘767 Application teaches that the cylindrical second step surface of a first composite cutting blade group is immediately adjacent to a conical first step surface of a next composite cutting blade group. The ‘767 Application provides that “[c]onnecting lines of the first cutting blades 5 and the second cutting blades 6 form a stepped (which may also be referred to as tiered) structure, that is the shape of the main cutting blade in the present invention is a stepped structure, and at the same time, the cross section of the entire rear surface 3 is also a stepped structure.” Ex. 1019 at p. 4.

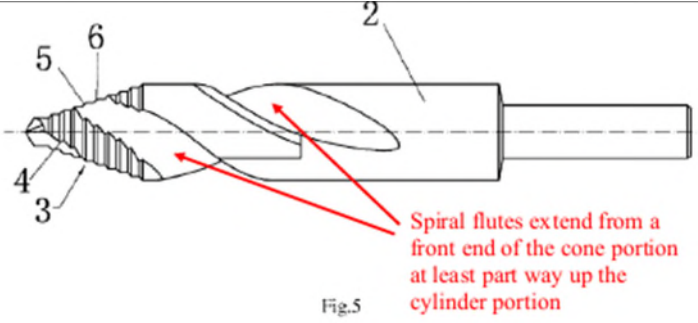
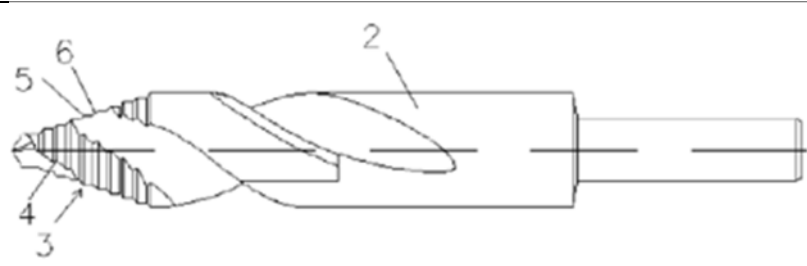
	This is particularly apparent where “an angle of 0-20 degrees is formed between the second cutting blades 6 and the axis line of the drill bit body so that tail ends of the second cutting blades 6 are inclined downwards, and only starting ends of the second cutting blades (i.e., tops of the first cutting blades) touch the workpieces during cutting.” <i>Id.</i> This is shown in the annotation of Figure 5 below. Ex. 1009 at p. 6. 	This is particularly apparent where “a 0- to 20-degree angle is formed between the second cutting blades 6 and the axis of the drill bit body, such that the tail ends of the second cutting blades 6 incline downwardly. During cutting, only start ends of the second cutting blades (i.e., the top of the first cutting blades) contact a workpiece.” <i>Id.</i> This is shown in Figure 5, below, which is substantially identical to the annotation of Figure 5 of the ‘900 Application, to the left. Ex. 1019 at p. 9. 
[1.o] 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	The ‘900 Application teaches that the diameter of the last composite cutting blade group, which is located at the rear end of the cone portion in Wang and immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter, as can be seen in the annotation of Figure 5, below. Ex. 1009 at p. 6 (Fig. 5):	The 767 Application teaches that the diameter of the last composite cutting blade group, which is located at the rear end of the cone portion in Wang and immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter, as can be seen in Figure 5, below, which is substantially identical to the annotation of Figure 5 of the ‘900 Application, to the left. Ex. 1019 at p. 9 (Fig. 5):

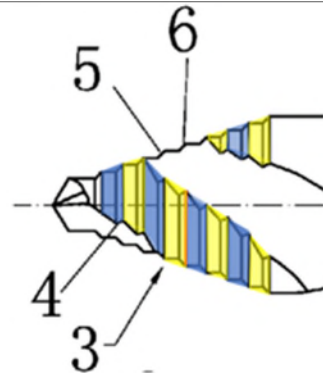
	 Figure 6 shows that the conical “cutting portion” extends to the diameter of the last cutting blade, which is of the same diameter of the cylindrical portion. Ex. 1009 at p. 7. 	 Figure 6 shows that the conical “cutting portion” extends to the diameter of the last cutting blade, which is of the same diameter of the cylindrical portion. Ex. 1019 at p. 10. 
Claim 2		
[2] The twist drill of claim 1 wherein, the minor cutting edge is configured to	The ‘900 Application teaches that the minor cutting edges are configured to smooth the machined surface of the workpiece to improve the surface quality. Due to the	The ‘767 Application teaches that the minor cutting edges are configured to smooth the machined surface of the workpiece to improve the surface quality. Due to the geometry of the

smooth the machined surface of the workpiece to improve surface quality	geometry of the minor cutting edges, which are positioned on the intersection of the flute sidewalls and the cylindrical step surfaces, the minor cutting edges must necessarily sweep in a cylindrical path around a portion of the workpiece first cut by the major cutting edges, thereby smoothing it.	minor cutting edges, which are positioned on the intersection of the flute sidewalls and the cylindrical step surfaces, the minor cutting edges must necessarily sweep in a cylindrical path around a portion of the workpiece first cut by the major cutting edges, thereby smoothing it.
Claim 5		
[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	The '900 Application teaches that the top blade comprises a chisel edge, two auxiliary cutting edges, and two straight major cutting edges, the auxiliary cutting edge is intersected with the straight major cutting edge and the chisel edge. This is shown in Figure 12 of the '900 Application, as annotated below. Ex. 1009 at p. 13.  The diagram shows a cross-section of a twist drill. It features a central chisel edge and two straight major cutting edges. Two auxiliary cutting edges are shown, each intersecting one of the straight major cutting edges and the chisel edge. Red arrows point to the 'Straight major cutting edge', 'Chisel edge', and 'Auxiliary cutting edge' labels.	The '767 Application teaches that the top blade comprises a chisel edge, two auxiliary cutting edges, and two straight major cutting edges, the auxiliary cutting edge is intersected with the straight major cutting edge and the chisel edge. This is shown in Figure 12 of the '767 Application, which is substantially identical to Figure 12 of the '900 patent, annotated to the left. Ex. 1019 at p. 13.  The diagram is identical to the one in the '900 Application, showing a cross-section of a twist drill with a chisel edge, two straight major cutting edges, and two auxiliary cutting edges intersecting them.
Claim 7		
[7] The twist drill of claim 1 wherein, a straight major cutting edge length of the top blade is greater than each of the	The '900 Application teaches that the straight major edge of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups, as shown in Figures 5-12 of the '900 Application. Ex. 1009 at pp. 6-	The '767 Application teaches that the straight major edge of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups, as shown in Figures 5-12 of the '767 Application. Ex. 1019 at pp. 9-13.

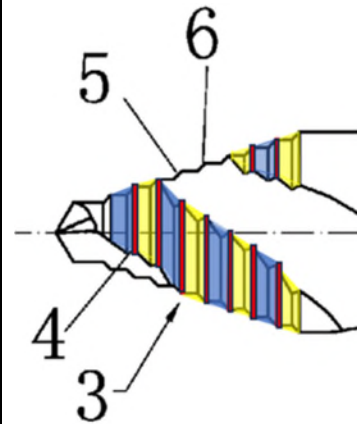
major cutting edges of the plurality of composite cutting blade groups.	13. The annotation of Figure 12 below shows the relationship between the straight top blade and the major edges of the composite cutting blade groups. Ex. 1009 at p. 13. 	Figure 12, below, clearly shows the relationship between the straight top blade and the major edges of the composite cutting blade groups; Figure 12 of the '767 Application is substantially identical to Figure 12 of the '900 Application, annotated to the left. Ex. 1019 at p. 13. 
Claim 8		
[8.a] A twist drill, comprising:	The '900 Application is entitled "Efficient Twist Drill for Layered Drilling" and refers to a "twist drill" throughout. Ex. 1009, Abstract and paragraphs [0006], [0031], [0038], and [0039]; Ex. 1018 at p.2 ("the present disclosure relates to an efficient twist drill for layered drilling")	The '767 Application is entitled 'High Efficiency Step-Structured Twist Drill" and refers to a twist drill throughout. Ex. 1019, pp. 1 (Abstract), 2 (Technical Field, Background Art, and Summary). For example, "A high efficiency step-structured twist drill comprises . . ." Ex. 1019, p.2.
[8.b] an operation portion comprising a cone portion and a cylinder portion axially fixed to the cone portion;	The '900 application teaches a drill body 2 comprising, an operation portion that has a "cutting portion at a front end and a guide portion at a rear end." Ex. 1009 at ¶[0031]. Figure 5 of the '900 Application (as annotated below) shows that the "cutting portion at a front end" is a cone portion and the "guide portion at a rear end" is a cylinder portion, fixed axially to the cone portion. Ex. 1009 at p.6.	The '767 Application teaches a drill body 2 comprising, an operation portion that has a "cutting portion at a front end thereof and a guide portion at a rear end thereof." Ex. 1019 at p.4. Figure 5 of the '767 Application is substantially identical to Figure 5 of the '900 Application. Figure 5 shows that the "cutting portion at a front end" is a cone portion and the

		“guide portion at a rear end” is a cylinder portion, fixed axially to the cone portion. Ex. 1019 at p.9. 
[8.c] a shank portion axially fixed to the cylinder portion opposite the cone portion;	The ‘900 Application teaches that the drill body includes “a shank portion” that is “connected to the guide portion.” Ex. 1009 at ¶[0031]. As shown above, the “guide portion” corresponds to the “cylinder portion” of claim 8. Thus, the ‘900 Application teaches a shank portion axially fixed to the cylinder portion opposite the cone portion.	The ‘767 Application teaches that the drill body includes “a shank portion” that is “connected to the guide portion.” Ex. 1009 at p.4 As shown above, the “guide portion” corresponds to the “cylinder portion” of claim 8. Thus, the ‘767 Application teaches a shank portion axially fixed to the cylinder portion opposite the cone portion.
[8.d] 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 ‘900 Application teaches the claimed spiral flutes 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, with the spiral flutes having a sidewall. This is shown in Figure 5 of the ‘900 Application, as annotated below. Ex. 1009 at p.6.	The ‘767 Application teaches the claimed spiral flutes 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, with the spiral flutes having a sidewall. This is shown in Figure 5 of the ‘767 Application, which is substantially identical to Figure 5 of the ‘900 Application, annotated on the left.

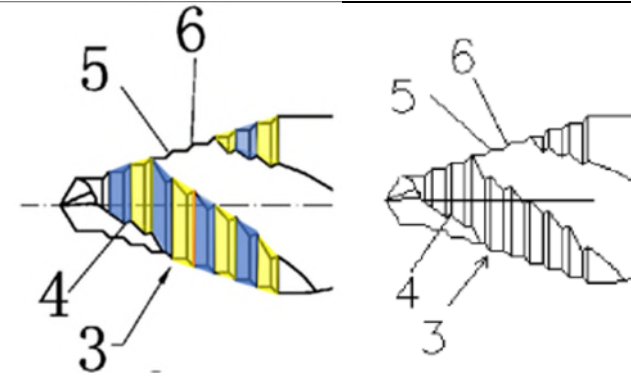
	 Fig.5 Spiral flutes extend from a front end of the cone portion at least part way up the cylinder portion	
[8.e] a plurality of composite cutting blade groups formed sequentially and spirally on a cone portion exterior from a front end of the cone portion to a rear end of the cone portion, each of the plurality of composite cutting blade groups comprising . . .	The '900 Application teaches 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. The '900 Application provides that "The flutes of the present disclosure may be arc-shaped flutes adapted to a radian of the flank surface, or the connecting lines of the flutes form a spiral structure." Ex. 1009 at ¶¶[0035],[0006]. In context, a POSA would understand the term "flutes" in context to refer to the plurality of parallel grooves in the nose-cone of the twist drill, as shown in blue and yellow in the annotation of Figure 5, below. Ex. 1009 at p. 6.	The '767 Application teaches 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. The '767 Application provides that "The flutes in the present invention may be curved flutes adapted to the curvature of the rear surface, or the connecting line of the flutes is of a spiral structure." Ex. 1019 at p. 5. In context, a POSA would understand the term "flutes" in context to refer to the plurality of parallel grooves in the nose-cone of the twist drill, as shown in blue and yellow in the annotation of Figure 5, below. Ex. 1019 at p. 9 (annotation is of the substantially identical Figure 5 of the '900 Application).



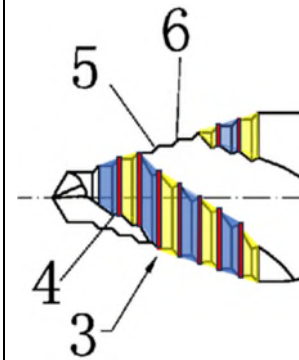
Each set of adjacent parallel flutes 4 (grooves) shares a single connecting line. A POSA would understand that the “connecting lines of the flutes” refers to shared line that each set of adjacent flutes shares with its neighbor, as shown in red below. Ex. 1009 at p. 6.



This is the only plausible interpretation of the “connecting lines of the flutes” in the context of the ‘900 Application. The only actual line that connects two adjacent flutes 4 in

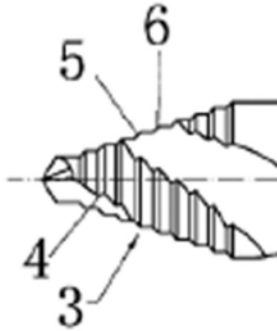
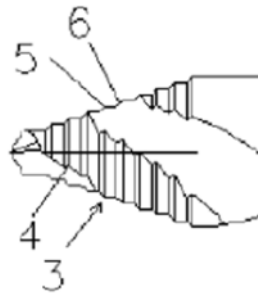


Each set of adjacent parallel flutes 4 (grooves) shares a single connecting line. A POSA would understand that the “connecting lines of the flutes” refers to shared line that each set of adjacent flutes shares with its neighbor, as shown in red below. Ex. 1019 at p. 9 (annotation is of the substantially identical Figure 5 of the ‘900 Application).

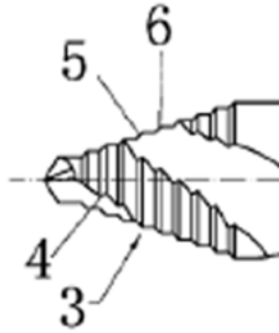
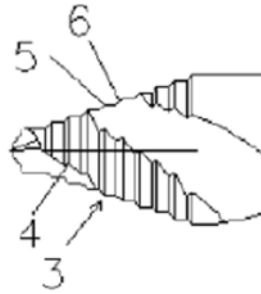


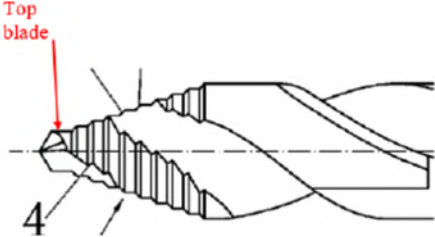
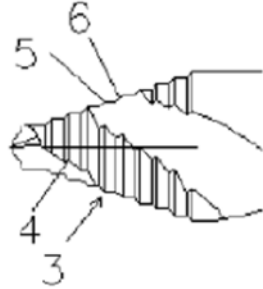
This is the only plausible interpretation of the “connecting lines of the flutes” in the context of the ‘767 Application.

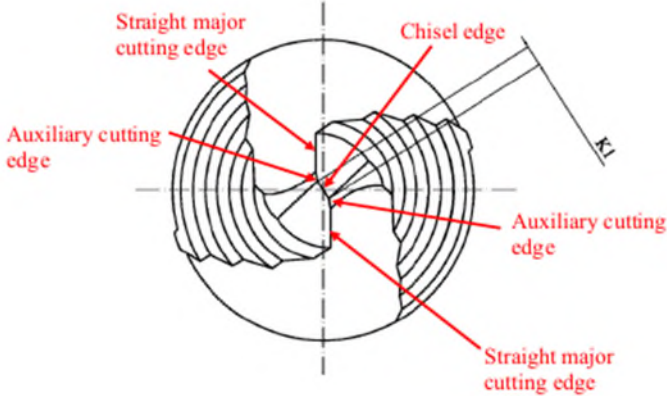
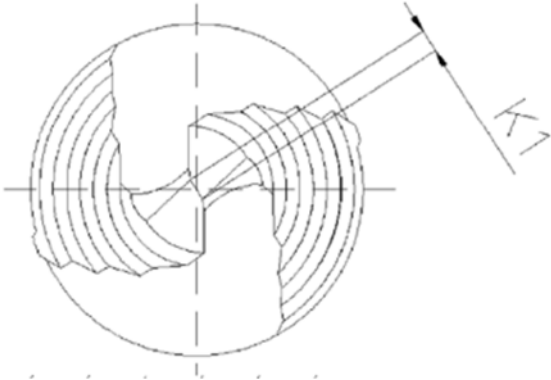
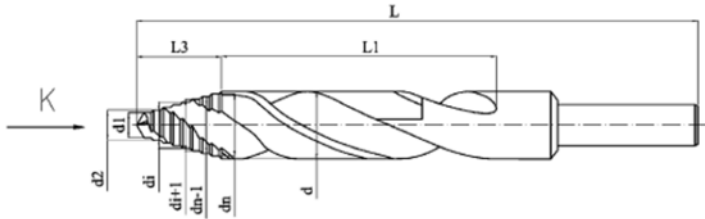
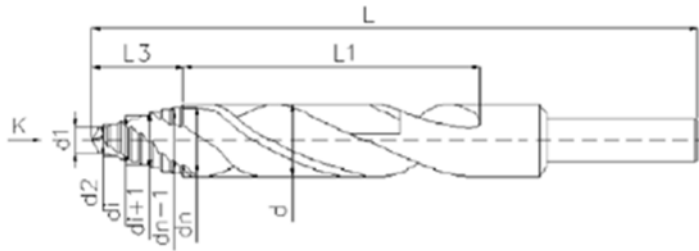
	the Wang Priority Applications is the line where the conical surface formed by one flute 4 intersects the cylindrical surface formed by the next flute 4. When that connecting line forms a spiral structure, that is the definition of common axial relief. It is further consistent with the ‘900 Application’s unambiguous teaching of axial relief in connection with the second cutting blade 6, which utilizes an identical structure to describe axial relief just a few paragraphs earlier. “The second cutting blades 6 are parallel to an axis line of the drill bit body, or an angle of 0-20 degrees is formed between the second cutting blades 6 and the axis line of the drill bit body so that tail ends of the second cutting blades 6 are inclined downwards, and only starting ends of the second cutting blades (i.e., tops of the first cutting blades) touch the workpieces during cutting, as shown in FIG. 13.” Ex. 1009 at ¶[0031].	It is further consistent with the ‘767 Application’s unambiguous teaching of axial relief in connection with the second cutting blade 6, which utilizes an identical structure to describe axial relief just a few paragraphs earlier. “The second cutting blades 6 are parallel to the axis of the drill bit body, or a 0- to 20-degree angle is formed between the second cutting blades 6 and the axis of the drill bit body, such that the tail ends of the second cutting blades 6 incline downwardly. During cutting, only start ends of the second cutting blades (i.e., the top of the first cutting blades) contact a workpiece, as shown in FIG. 13.” Ex. 1019 at p. 4.
[8.e] 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 . . . ,	[Insert]	
[8.f] a conical first step surface;	The ‘900 Application teaches the first cutting blade, formed by the conical first step surface, as being at “an angle a of 90-140 degrees” to the second cutting blade, which is formed by the second cylindrical step surface. Ex. 1009 at ¶¶[0031]-[0032].	The ‘767 Application teaches the first cutting blade, formed by the conical first step surface, as being at “a 90- to 140-degree angle a” to the second cutting blade, which is formed by the second cylindrical step surface. Ex. 1019 at pp. 4-5.

[8.g] a cylindrical second step surface adjacent to the conical first step surface,	The '900 Application teaches the second cutting blade, formed by the cylindrical second step surface, as being "parallel to an axis line of the drill bit body" or at "an angle of 0-20 degrees." Ex. 1009 at ¶¶[0031]-[0032].	The '767 Application teaches the second cutting blade, formed by the cylindrical second step surface, as being "parallel to the axis of the drill bit body" or at "a 0- to 20-degree angle" to the "axis of the drill bit body." Ex. 1019 at p. 4.
[8.h] a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the spiral flute;	The '900 Application teaches a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1009 at p.6.  The '900 Application refers to the major cutting edges as the "first cutting blades 5." Ex. 1009 at ¶¶[0031]-[0032].	The '767 Application teaches a major cutting edge defined by the intersection of the conical first step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1019 at p.9.  The '767 Application refers to the major cutting edges as the "first cutting blades 5." Ex. 1019 at pp. 4-5.
[8.i] a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the spiral flute	The '900 Application teaches a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1009 at p.6.	The '767 Application teaches a minor cutting edge defined by the intersection of the cylindrical second step surface and the sidewall of the flute, as shown in Figure 5 below. Ex. 1019 at p.9.

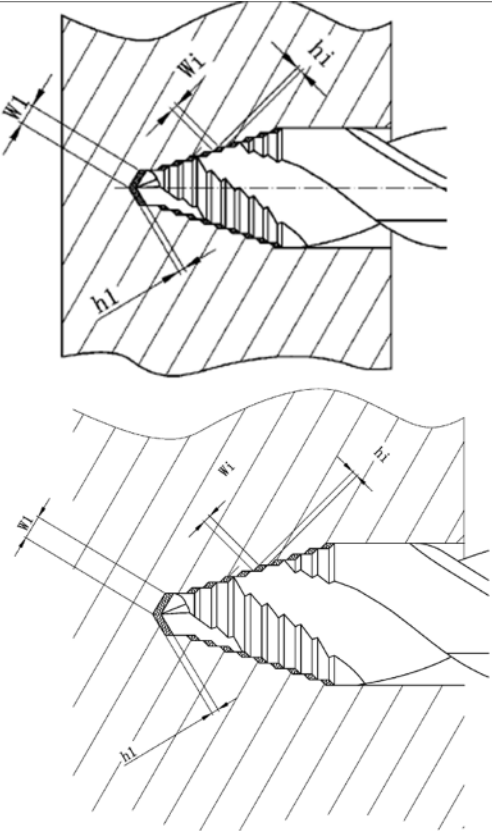
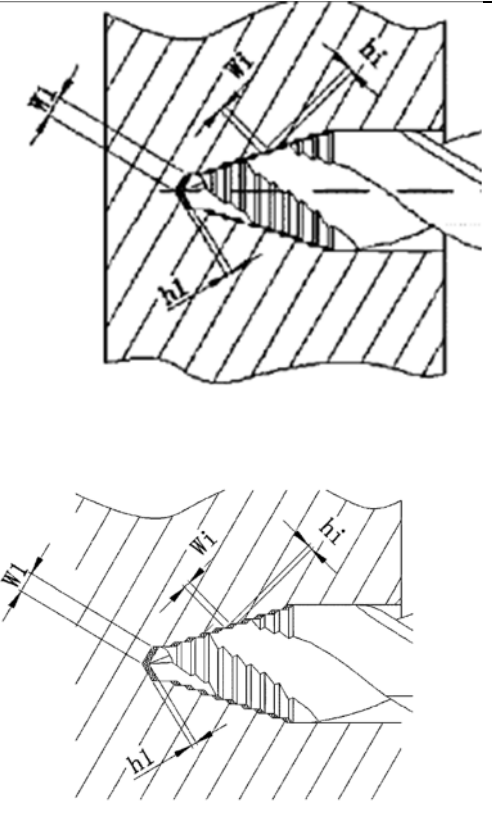
	The ‘900 Application refers to the minor cutting edges as the “second cutting blades 6.” Ex. 1009 at ¶¶[0031]-[0032]. A POSA would understand the second cutting blades as “minor” cutting blades, in light of the ‘900 Application’s teaching of axial relief, where “an angle of 0-20 degrees is formed between the second cutting blades 6 and the axis line of the drill bit body so that tail ends of the second cutting blades 6 are inclined downwards, and only starting ends of the second cutting blades (i.e., tops of the first cutting blades) touch the workpieces during cutting.” Ex. 1009 at ¶[0031].	The ‘767 Application refers to the minor cutting edges as the “second cutting blades 6.” Ex. 1019 at pp. 4-5. A POSA would understand the second cutting blades as “minor” cutting blades, in light of the ‘767 Application’s teaching of axial relief, where “a 0- to 20-degree angle is formed between the second cutting blades 6 and the axis of the drill bit body, such that the tail ends of the second cutting blades 6 incline downwardly. During cutting, only start ends of the second cutting blades (i.e., the top of the first cutting blades) contact a workpiece.” Ex. 1019 at p. 4.
[8.i’] the minor cutting edge being configured to smooth the machined surface of the workpiece to improve surface quality	The ‘900 Application teaches that the minor cutting edges are configured to smooth the machined surface of the workpiece to improve the surface quality. Due to the geometry of the minor cutting edges, which are positioned on the intersection of the flute sidewalls and the cylindrical step surfaces, the minor cutting edges must necessarily sweep in a cylindrical path around a portion of the	The ‘767 Application teaches that the minor cutting edges are configured to smooth the machined surface of the workpiece to improve the surface quality. Due to the geometry of the minor cutting edges, which are positioned on the intersection of the flute sidewalls and the cylindrical step surfaces, the minor cutting edges must necessarily sweep in a cylindrical

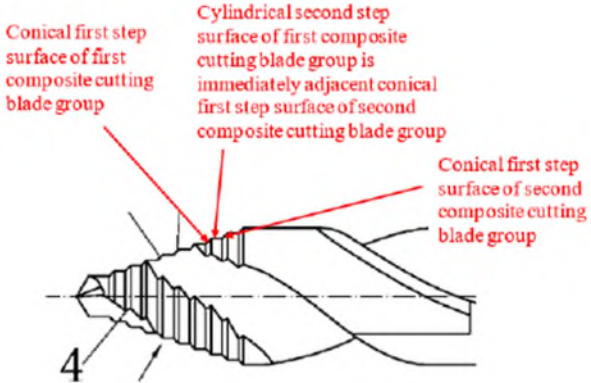
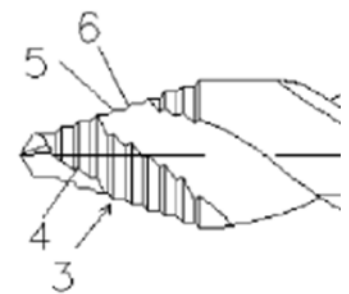
	workpiece first cut by the major cutting edges, thereby smoothing it.	path around a portion of the workpiece first cut by the major cutting edges, thereby smoothing it.
[8.j] a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute	The '900 Application teaches a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute, as shown in Figure 5 below. Ex. 1009 at p.6. 	The '767 Application teaches a cutting tip defined by the intersection of the major cutting edge, the minor cutting edge, and the sidewall of the spiral flute, as shown in Figure 5 below. Ex. 1019 at p.9. 
[8.k] a top blade provided on the front end of the cone portion;	The '900 Application teaches a top blade having a “first cutting blade and a second cutting blade at the foremost end of the drill bit body, the first cutting blade is in contact with the workpiece first.” Ex. 1009 at ¶[0033]. The '900 Application states that “[w]hen 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	The '900 Application teaches a top blade, such that “the most front end of the drill bit body 2 is formed into a guiding portion (that is, the first cutting blade and the second cutting blade at the most front end of the drill bit body, where the first cutting blade is the first to contact a workpiece).” Ex. 1019 at p.5. The '900 Application states that “[w]hen the drill bit starts to contact the surface of the workpiece, a first section of a small drill tip having a very small size (i.e., the guiding portion) drills a guide hole. Since its diameter is very small, it is very easy to position and drill a small hole. Then, the following gradually increased stepped blades gradually expand the hole until the final size of the twist drill is reached. Compared with one time of continuous cutting by

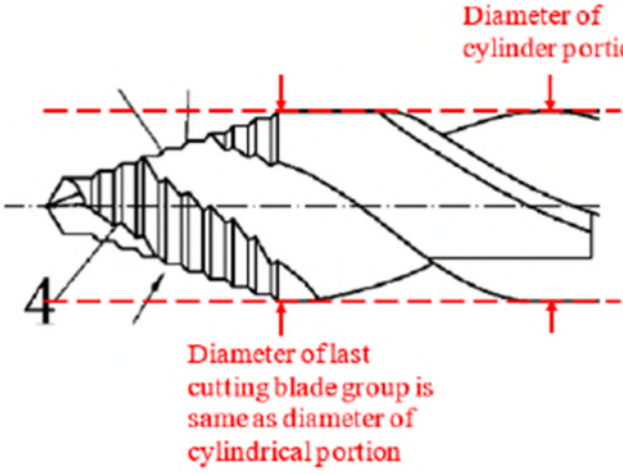
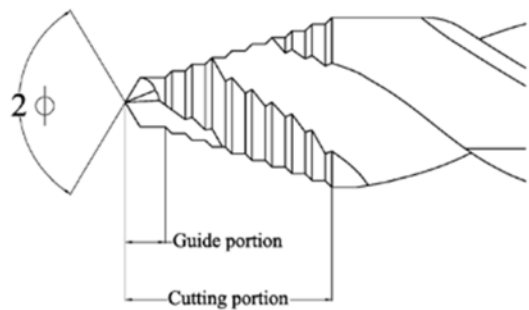
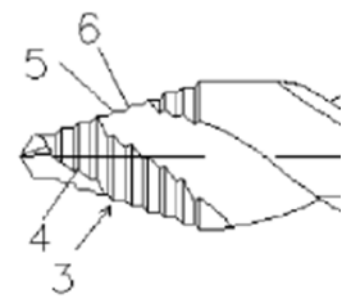
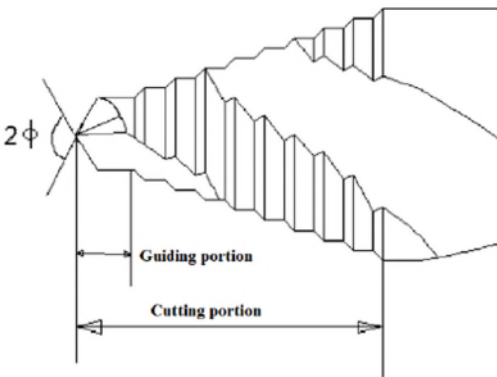
	continuous cutting of the linear cutting blade of a conventional twist drill, the cutting resistance is reduced and the feeding is easy and fast.” Ex. 1009 at ¶[0039]. This top blade is further depicted in the annotation of Figure 5, below. Ex. 1009 at p.6. 	the linear cutting blade of a conventional twist drill, this process of gradually drilling and expanding a hole decreases the cutting resistance and progresses easily.” Ex. 1019 at p.6. This top blade is further depicted in Figure 5, below, which is substantially identical to the annotation of Figure 5, to the left. Ex. 1019 at p.9. 
[8.k’] 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 ’900 Application teaches that the top blade comprises a chisel edge, two auxiliary cutting edges, and two straight major cutting edges, the auxiliary cutting edge is intersected with the straight major cutting edge and the chisel edge. This is shown in Figure 12 of the ’900 Application, as annotated below. Ex. 1009 at p. 13.	The ’767 Application teaches that the top blade comprises a chisel edge, two auxiliary cutting edges, and two straight major cutting edges, the auxiliary cutting edge is intersected with the straight major cutting edge and the chisel edge. This is shown in Figure 12 of the ’767 Application, which is substantially identical to Figure 12 of the ’900 patent, annotated to the left. Ex. 1019 at p. 13.

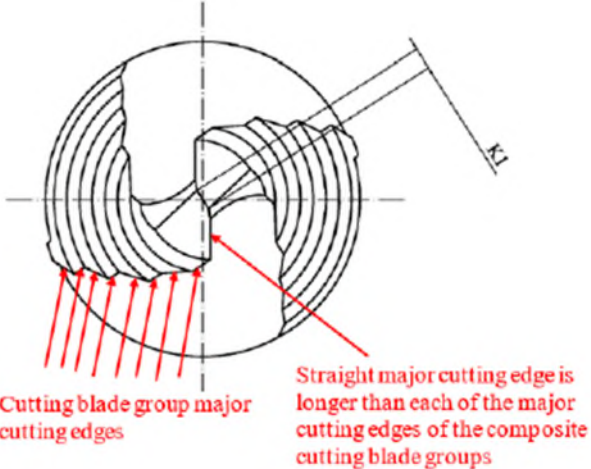
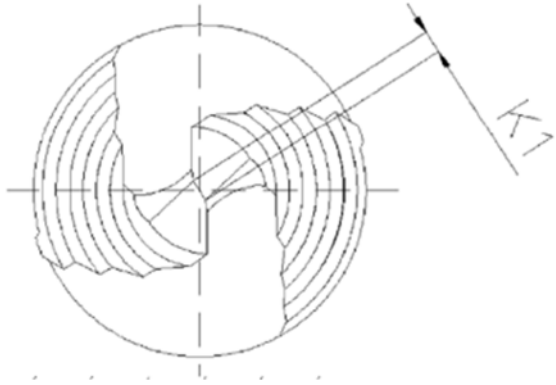
		
[8.1] wherein a diameter of each of the plurality of composite cutting blade groups increases sequentially from the front end of the cone portion to the rear end of the cone portion;	The '900 Application teaches that "a diameter d of the circular arc between the two opposite second cutting blades is gradually increased to form a step-like structure. For example, from a diameter d_1 between the foremost second cutting blades to a diameter d_n between the last second cutting blades, the diameters show a gradually increasing trend; and the increased size can be constant or variable." Ex. 1009 at ¶[0036]. This is shown in Figures 5-13 of the '900 Application, and illustrated in detail in Figure 11, below. Ex. 1009 at pp. 6-14 (Figs. 5-13), p.12 (Fig. 11): 	The '767 Application teaches that "the curve diameter d between two opposing second cutting blades increases gradually to form a stepped structure. For example, the diameter is in an incrementing trend from the diameter d_1 between the second cutting blades at the most front end to the diameter d_n between the last second cutting blades, and the incremental size may be constant or may be variable." Ex. 1019 at p.5. This is shown in Figures 5-13 of the '767 Application, and illustrated in detail in Figure 11, below. Ex. 1019 at pp. 9-14 (Figs. 5-13), p.13 (Fig. 11): 

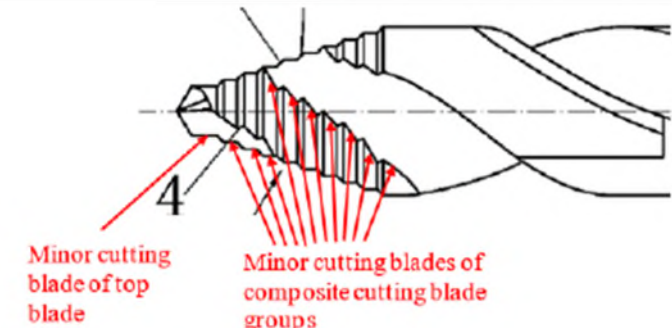
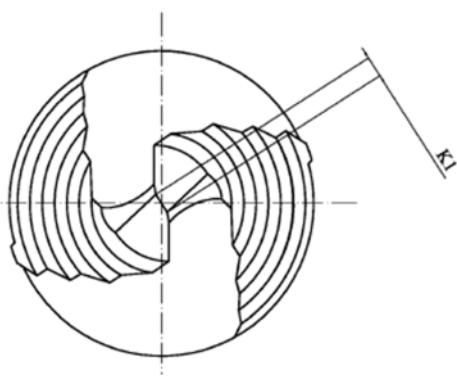
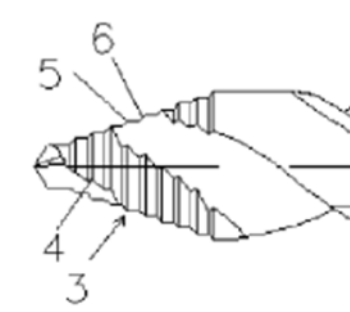
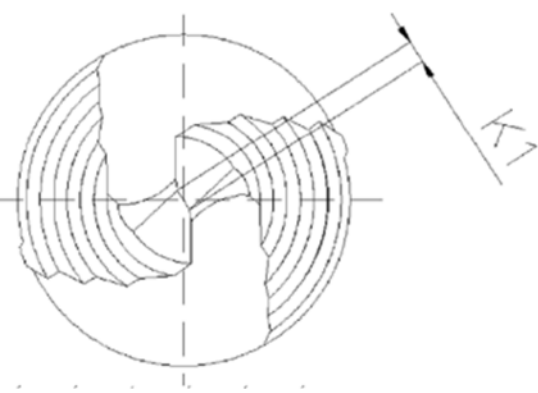
[8.m] each of the plurality of composite cutting blade groups is configured to crush cutting chips into finer chips and the spiral flute is configured to shunt the finer chips;	The ‘900 Application teaches that the cutting is distributed among the multiple major cutting blades of each composite cutting blade group. The ‘900 Application describes “a twist drill for layered drilling” which is distinguishes from the prior art twist drills, in which “[t]wo linear cutting blades (i.e., main cutting blades 1) always cut simultaneously during drilling” and which has “a single-blade cutting area of $S_1=S_2=Wxh$ and a total cutting area of $S=2S_1=2S_2=2xWxh$ during drilling.” Ex. 1009 at ¶¶[0029],[0031]. Unlike the traditional drill, the ‘900 Application teaches that “a cut large area block S is decomposed into n small blocks S_i; the area of each small block S_i is $S_i=Wixhi$, $S_n=Wnxhi$; and the total cutting area is $S=S_1+. . . +S_i+. . . S_n$.” Ex. 1009 at ¶[0038]. The ‘900 Application goes on to explain that “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.” Ex. 1009 at ¶[0039]. Figures 9 and 10 illustrate this relationship. Ex. 1009 at pp. 10-11. The ‘900 Application also teaches that the spiral flute is configured to shunt the finer chips.	The ‘767 Application teaches that the cutting is distributed among the multiple major cutting blades of each composite cutting blade group. The ‘767 Application describes “a high efficiency step-structured twist drill” which is distinguishes from the prior art twist drills, in which “two linear cutting blades (i.e., main cutting blades 1) [always] cut[] simultaneously during drilling” and which has “a single-blade cutting area of $S_1=S_2=Wxh$ and a total cutting area of $S=2S_1=2S_2=2xWxh$ during drilling.” Ex. 1019 at p.4. Unlike the traditional drill, the ‘767 Application teaches that “a cut large block S is divided into n small blocks S_i, and the area of the small blocks S_i is $S_i = Wixhi$, $S_n = Wnxhi$, and the total cutting area is $S = S_1+...+S_i+...+S_n$.” Ex. 1019 at p.6. The ‘767 Application further explains that “[w]hen the drill bit starts to contact the surface of the workpiece, a first section of a small drill tip having a very small size (i.e., the guiding portion) drills a guide hole. Since its diameter is very small, it is very easy to position and drill a small hole. Then, the following gradually increased stepped blades gradually expand the hole until the final size of the twist drill is reached. Compared with one time of continuous cutting by the linear cutting blade of a conventional twist drill, this process of gradually drilling and expanding a hole decreases the cutting resistance and progresses easily.” Ex. 1019 at p.6. Figures 9 and 10 illustrate this relationship. Ex. 1019 at p. 12. The ‘767 Application also teaches that the spiral flute is configured to shunt the finer chips.
---	---	---

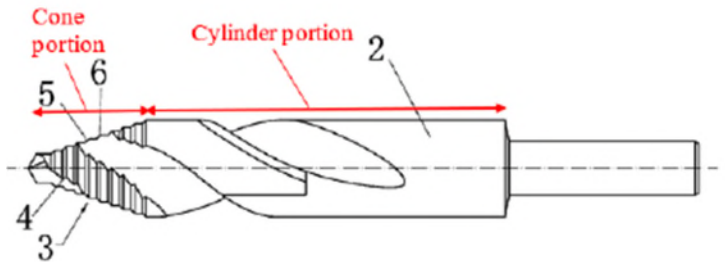
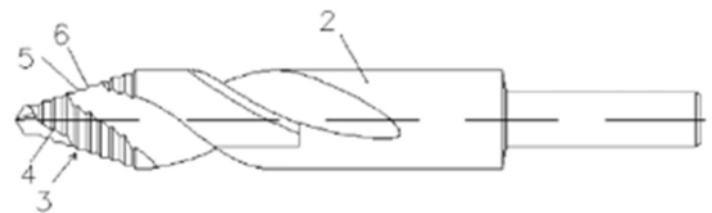
		
[8.n] wherein at least one cylindrical second step surface is immediately adjacent to a conical first step surface of a next composite cutting blade group	The ‘900 Application teaches that the cylindrical second step surface of a first composite cutting blade group is immediately adjacent to a conical first step surface of a next composite cutting blade group. The ‘900 Application provides that “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.” Ex. 1009 at ¶[0031].	The ‘767 Application teaches that the cylindrical second step surface of a first composite cutting blade group is immediately adjacent to a conical first step surface of a next composite cutting blade group. The ‘767 Application provides that “[c]onnecting lines of the first cutting blades 5 and the second cutting blades 6 form a stepped (which may also be referred to as tiered) structure, that is the shape of the main cutting blade in the present invention is a stepped structure, and at the same time, the cross section of the entire rear surface 3 is also a stepped structure.” Ex. 1019 at p. 4.

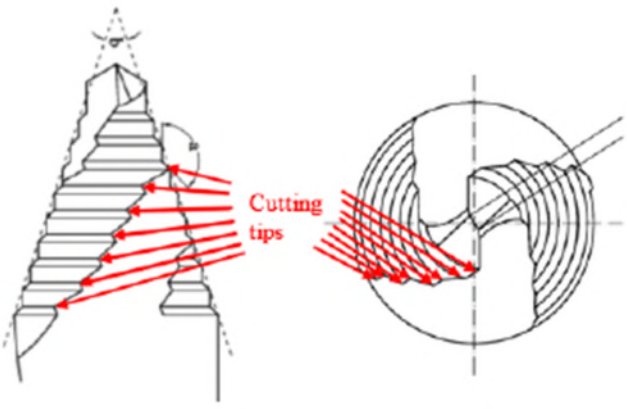
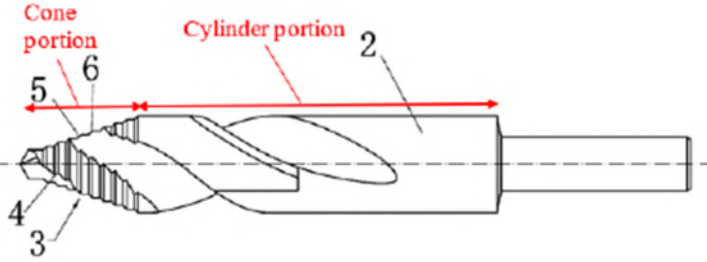
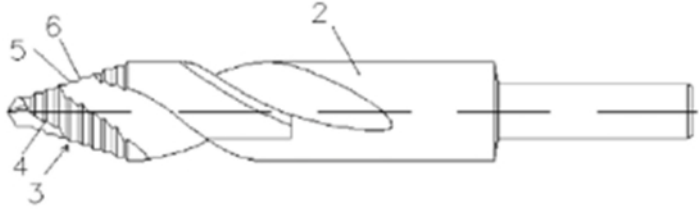
	This is particularly apparent where “an angle of 0-20 degrees is formed between the second cutting blades 6 and the axis line of the drill bit body so that tail ends of the second cutting blades 6 are inclined downwards, and only starting ends of the second cutting blades (i.e., tops of the first cutting blades) touch the workpieces during cutting.” <i>Id.</i> This is shown in the annotation of Figure 5 below. Ex. 1009 at p. 6. 	This is particularly apparent where “a 0- to 20-degree angle is formed between the second cutting blades 6 and the axis of the drill bit body, such that the tail ends of the second cutting blades 6 incline downwardly. During cutting, only start ends of the second cutting blades (i.e., the top of the first cutting blades) contact a workpiece.” <i>Id.</i> This is shown in Figure 5, below, which is substantially identical to the annotation of Figure 5 of the ‘900 Application, to the left. Ex. 1019 at p. 9. 
[8.o] 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	The ‘900 Application teaches that the diameter of the last composite cutting blade group, which is located at the rear end of the cone portion in Wang and immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter, as can be seen in the annotation of Figure 5, below. Ex. 1009 at p. 6 (Fig. 5):	The 767 Application teaches that the diameter of the last composite cutting blade group, which is located at the rear end of the cone portion in Wang and immediately adjacent to the cylinder portion, is equal to the cylinder portion diameter, as can be seen in Figure 5, below, which is substantially identical to the annotation of Figure 5 of the ‘900 Application, to the left. Ex. 1019 at p. 9 (Fig. 5):

	 Figure 6 shows that the conical “cutting portion” extends to the diameter of the last cutting blade, which is of the same diameter of the cylindrical portion. Ex. 1009 at p. 7. 	 Figure 6 shows that the conical “cutting portion” extends to the diameter of the last cutting blade, which is of the same diameter of the cylindrical portion. Ex. 1019 at p. 10. 
Claim 12 [12] The twist drill of claim 8 wherein, a straight minor cutting edge length of the top blade is greater than each of the	The '900 Application teaches that the straight major edge of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups, as shown	The '767 Application teaches that the straight major edge of the top blade is greater than each of the major cutting edges of the plurality of composite cutting blade groups, as shown

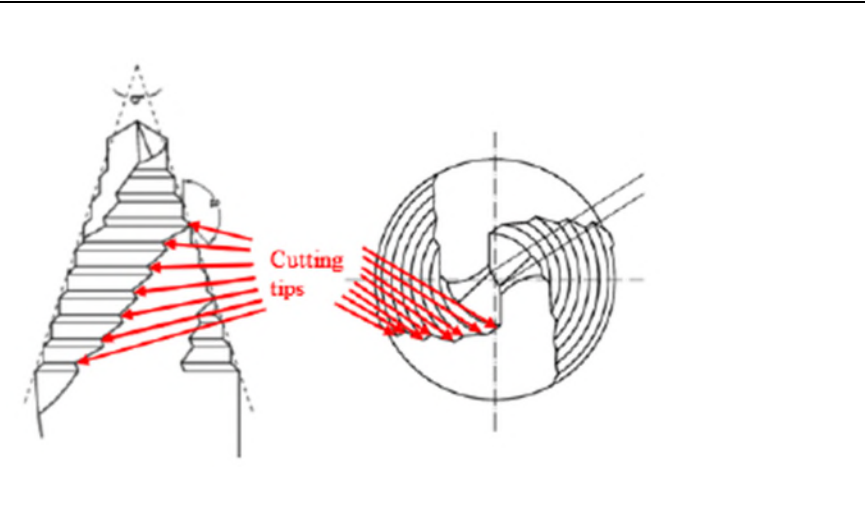
minor cutting edges of the plurality of composite cutting blade groups	in Figures 5-12 of the ‘900 Application. Ex. 1009 at pp. 6-13. The annotation of Figure 12 below shows the relationship between the straight top blade and the major edges of the composite cutting blade groups. Ex. 1009 at p. 13. 	in Figures 5-12 of the ‘767 Application. Ex. 1019 at pp. 9-13. Figure 12, below, clearly shows the relationship between the straight top blade and the major edges of the composite cutting blade groups; Figure 12 of the ‘767 Application is substantially identical to Figure 12 of the ‘900 Application, annotated to the left. Ex. 1019 at p. 13. 
Claim 13		
[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.	The ‘900 Application teaches that the top blade has a straight minor cutting edge with a length that is greater than the length of the minor cutting edges of the plurality of composite cutting blade groups. This is illustrated in the annotation of Figure 5, below. Ex. 1009 at p. 6.	The ‘767 Application teaches that the top blade has a straight minor cutting edge with a length that is greater than the length of the minor cutting edges of the plurality of composite cutting blade groups. This is illustrated in Figure 5, below, which is substantially identical Figure 5 of the ‘900 Application, annotated to the left. Ex. 1019 at p. 9.

	 Figure 12 also shows the relationship between the straight top blade and the minor edges of the composite cutting blade groups. Ex. 1009 at p. 13. 	 Figure 12 also shows the relationship between the straight top blade and the minor edges of the composite cutting blade groups. Ex. 1009 at p. 13. 
Claim 14		
[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	The '900 Application teaches that the operating 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 '900 Application states that "the main cutting blades are divided into the first cutting	The '767 Application teaches that the operating 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 '767 Application states that "the main cutting blade is divided into the first cutting blades

when at least a portion of the cylinder portion is also within the workpiece.	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.” Ex. 1009 at ¶[0034].	with a relatively small area, the first cutting blades disperse the cutting torque and power. As a result, it requires less effort when applying a force to drill. It should be noted that the first cutting blade at the most front end that is the first to contact a workpiece in the present utility model may be not parallel to following first cutting blades.” Ex. 1009 at p. 5.
Claim 15		
[15] The twist drill of claim 8 wherein the cylinder portion is longer than the cone portion.	The ‘900 Application teaches that the twist drill has a cylinder portion that is longer than the cone portion, as shown in the annotation of Figure 5 below. Ex. 1009 at p. 6. 	The ‘767 Application teaches that the twist drill has a cylinder portion that is longer than the cone portion, as shown in Figure 5 below, which is substantially identical to Figure 5 of the ‘900 Application, which is annotated to the left. Ex. 1019 at p. 9.  FIG. 5
Claim 18		
[18] The twist drill of claim 8 wherein the cutting tips of the plurality of composite cutting blade groups are formed spirally a cone portion exterior from a front end of the cone portion to a rear end of the cone portion.	The ‘900 Application teaches that the cutting tips are formed at the edges of the spiral flutes, and so the cutting tips are formed spirally on the cone portion. This is shown in Figures 7 and 8 of the ‘900 Application, which are annotated below. Ex. 1009 at pp. 8-9.	The ‘767 Application teaches that the cutting tips are formed at the edges of the spiral flutes, and so the cutting tips are formed spirally on the cone portion. This is shown in Figures 7 and 8 of the ‘767 Application, below, which are substantially identical to Figures 7 and 8 of the ‘900 Application, annotated to the left. Ex. 1019 at p. 11.

		
Claim 19		
[19] The twist drill of claim 1 wherein the cylinder portion is longer than the cone portion.	The '900 Application teaches that the twist drill has a cylinder portion that is longer than the cone portion, as shown in the annotation of Figure 5 below. Ex. 1009 at p. 6. 	The '767 Application teaches that the twist drill has a cylinder portion that is longer than the cone portion, as shown in Figure 5 below, which is substantially identical to Figure 5 of the '900 Application, which is annotated to the left. Ex. 1019 at p. 9.  FIG. 5
Claim 22		
[22] The twist drill of claim 1 wherein the cutting tips of the plurality of composite cutting blade groups are formed spirally a cone portion exterior	The '900 Application teaches that the cutting tips are formed at the edges of the spiral flutes, and so the cutting tips are formed spirally on the cone portion. This is shown in Figures 7 and 8 of the '900 Application, which are annotated below. Ex. 1009 at pp. 8-9.	The '767 Application teaches that the cutting tips are formed at the edges of the spiral flutes, and so the cutting tips are formed spirally on the cone portion. This is shown in Figures 7 and 8 of the '767 Application, below, which are

from a front end of the cone portion to a rear end of the cone portion.



substantially identical to Figures 7 and 8 of the '900 Application, annotated to the left. Ex. 1019 at p. 11.

