CLAIMS:

We claim:

1. A cutter comprising a cutter body having a cutting face, a peripheral sidewall flank, and a base, the base having a recessed channel that extends inwardly from the peripheral sidewall flank and provides an inlet opening therein.

2. The cutter of claim 1, wherein the recessed channel has a depth, a width and a length.

3. The cutter of claim 2, wherein one of the one of the width or height varies along the length of the channel.

4. The cutter of claim 2, wherein both the width and height vary along the length of the channel.

5. The cutter of claim 2, wherein the height varies across the width of the channel.

6. The cutter of claim 5, wherein one of the one of the width or height varies along the length of the channel.

7. The cutter of claim 5, wherein both the width and height vary along the length of the channel.

8. The cutter of claim 2, wherein the width is at least three times the height.

9. The cutter of claim 2, wherein the channel has a longitudinal axis and the base of the channel has a longitudinally extending raised portion.

10. The cutter of claim 6, wherein the longitudinally extending raised portion has a height, and wherein the height of the raised portion is less than the height of the channel.

11. The cutter of claim 7, wherein the longitudinally extending raised portion comprises a plurality of adjoining portions of a plurality of adjoining longitudinally extending grooves.

12. The cutter of claim 1, wherein the recessed channel comprises a plurality of recessed channels, each extending inwardly from the peripheral sidewall flank and providing an inlet opening therein.

13. The cutter of claim 1, wherein the recessed channel is a cross-body channel that extends from the inlet opening to an outlet opening.

14. The cutter of claim 10, wherein the recessed channel has a depth, a width and a length.

15. The cutter of claim 11, wherein one of the one of the width or length varies along the length of the channel.

16. The cutter of claim 11, wherein both the width and length vary along the length of the channel.

17. The cutter of claim 1, wherein the cutting face has a protruding portion.

18. The cutter of claim 14, wherein the protruding portion is located on a periphery of the cutting face or a central portion of the cutting face, or a combination thereof.

19. The cutter of claim 1, wherein the base is substantially parallel to the cutting face.

20. The cutter of claim 1, wherein the periphery of the sidewall has an elliptical, rounded rectangle or circular shape.

21. A downhole cutting tool, comprising:

a cutting tool having a bonding surface;

a cutter body having a cutting face, a peripheral sidewall flank, and a base, the base having a recessed channel that extends inwardly from the peripheral sidewall flank and provides an inlet opening therein; and

a braze joint between the cutting face and the bonding surface.

CLAIMS:

We claim:

1. A cutter comprising a cutter body having a cutting face, a peripheral sidewall flank, and a base, the base comprising a planar raised portion and a recessed channel that extends inwardly from an inlet opening in the peripheral sidewall flank continuously to an outlet opening therein, the recessed channel having a height, a width and a length and comprising a pair of opposed sidewalls extending from a base surface of the recessed channel to the planar raised portion, wherein one of the width or height varies along the length of the recessed channel, the base configured for brazing to a planar substrate bonding surface that does not intrude into the recessed channel.

2. The cutter of claim 1, wherein both the width and height vary along the length of the recessed channel.

3. The cutter of claim 1, wherein the height varies across the width of the recessed channel.

4. The cutter of claim 1, wherein the width varies along the length of the recessed channel.

5. The cutter of claim 1, wherein the height varies along the length of the recessed channel.

6. The cutter of claim 1, wherein the width is at least three times the height.

7. The cutter of claim 1, wherein the recessed channel has a longitudinal axis and the base surface of the channel has a longitudinally extending raised portion.

8. The cutter of claim 7, wherein the longitudinally extending raised portion has a height, and wherein the height of the raised portion is less than the height of the recessed channel.

9. The cutter of claim 7, wherein the longitudinally extending raised portion comprises a plurality of adjoining portions of a plurality of adjoining longitudinally extending grooves having a lenticular pattern.

10. The cutter of claim 1, wherein the recessed channel comprises a plurality of recessed channels, each extending inwardly from an inlet opening in the peripheral sidewall flank to an outlet opening therein.

11. The cutter of claim 1, wherein the cutting face has a protruding portion.

12. The cutter of claim 11, wherein the protruding portion is located on a periphery of the cutting face or a central portion of the cutting face, or a combination thereof.

13. The cutter of claim 1, wherein the base is substantially parallel to the cutting face.

14. The cutter of claim 1, wherein the periphery of the sidewall has an elliptical, rounded rectangle or circular shape.

15. A downhole cutting tool, comprising:

a cutting tool having a planar substrate bonding surface, the cutting tool formed from steel, a Ni-base alloy or a Co-base alloy;

a cutter body having a cutting face, a peripheral sidewall flank, and a base, the base comprising a planar raised portion and a recessed channel that extends inwardly from an inlet opening in the peripheral sidewall flank continuously to an outlet opening therein, the recessed channel having a height, a width and a length and comprising a pair of opposed sidewalls extending from a base surface of the recessed channel to the planar raised portion, wherein one of the width or height varies along the length of the recessed channel, the cutter body formed from tungsten carbide; and

a braze joint comprising a braze material between the base and the planar substrate bonding surface, the braze joint disposed in the recessed channel and defined by the planar substrate bonding surface, wherein the planar substrate bonding surface does not intrude into the recessed channel.

16. The downhole cutting tool of claim 15, wherein both the width and height vary along the length of the recessed channel.

17. The downhole cutting tool of claim 15, wherein the height varies across the width of the recessed channel.

18. The downhole cutting tool of claim 15, wherein the width varies along the length of the recessed channel.

19. The downhole cutting tool of claim 15, wherein the height varies along the length of the recessed channel.

20. The downhole cutting tool of claim 15, wherein the width is at least three times the height.

21. The downhole cutting tool of claim 15, wherein the recessed channel has a longitudinal axis and the base surface of the recessed channel has a longitudinally extending raised portion.

22. The downhole cutting tool of claim 15, wherein the braze material comprises a nickel bronze alloy, a solder alloy or a NiCrB alloy.

23. A cutter for a downhole cutting tool, comprising:

a cutter body comprising tungsten carbide having a cutting face, a peripheral sidewall flank, and a base, the base comprising a planar raised portion and a recessed channel that extends inwardly from an inlet opening in the peripheral sidewall flank continuously to an outlet opening therein, the recessed channel having a height, a width and a length and comprising a pair of opposed sidewalls, wherein one of the width or height varies along the length of the recessed channel, the base configured for brazing to a planar substrate bonding surface that does not intrude into the recessed channel; and

a braze joint comprising a braze material, the braze joint disposed in recessed channel and defined by the planar substrate bonding surface.

24. A cutter comprising a tungsten carbide cutter body having a cutting face, a peripheral sidewall flank, and a base, the base comprising a planar raised portion and a recessed braze channel that extends inwardly from an inlet opening in the peripheral sidewall flank continuously to an outlet opening therein, the recessed braze channel having a height, a width and a length and comprising a pair of opposed sidewalls extending from a base surface of the recessed braze channel to the planar raised portion, at least one of the width or height varies along the length of the recessed braze channel, the base configured for brazing to a planar substrate bonding surface that does not intrude into the recessed channel.

25. A method of making a downhole cutting tool, comprising:

providing a cutting tool having a planar substrate bonding surface, the cutting tool formed from steel, a Ni-base alloy or a Co-base alloy;

providing a cutter body comprising tungsten carbide and having a cutting face, a peripheral sidewall flank, and a base, the base comprising a planar raised portion and a recessed channel that extends inwardly from an inlet opening in the peripheral sidewall flank continuously to an outlet opening therein, the recessed channel having a height, a width and a length and comprising a pair of opposed sidewalls extending from a base

surface of the recessed channel to the planar raised portion, wherein one of the width or height varies along the length of the recessed channel, the base configured for brazing to the planar substrate bonding surface;

placing the base of the cutter body in contact with the planar substrate bonding surface, wherein the planar substrate bonding surface does not intrude into the recessed channel;

providing a molten braze material proximate the recessed channel, the recessed channel providing variable capillarity and flow of the molten braze material between the recessed channel and the planar substrate bonding surface; and

cooling and solidifying the molten braze material to form a braze joint disposed in the recessed channel and defined by the planar substrate bonding surface of the cutting tool.

26. A method of using a downhole cutting tool, comprising:

providing a downhole cutting tool, comprising:

a cutting tool having a planar substrate bonding surface, the cutting tool formed from steel, a Ni-base alloy or a Co-base alloy;

a cutter body comprising tungsten carbide having a cutting face, a peripheral sidewall flank, and a base, the base comprising a planar raised portion and a recessed channel that extends inwardly from an inlet opening in the peripheral sidewall flank continuously to an outlet opening therein, the recessed channel having a height, a width and a length and comprising a pair of opposed sidewalls extending from a base surface of the recessed channel to the planar raised portion, wherein one of the width or height varies along the length of the recessed channel; and

a braze joint comprising a braze material between the base and the planar substrate bonding surface, the braze joint disposed in the recessed channel and defined by the planar substrate bonding surface, wherein the planar substrate bonding surface does not intrude into the recessed channel; and

using the downhole cutting tool to perform a downhole cutting operation.