CLAIMS

What is claimed is:

1. A method for manufacturing a self-clinching rivet through extrusion forming, the method comprising:

upset-extruding a first end of a wire blank to shape the first end into a material pushing portion and an annular shank portion billet, wherein the shank portion billet extends axially along the wire blank, and

wherein the shank portion billet is located at a lower side of the material pushing portion, and a lower side surface of the shank portion billet has a downwardly convex tapered portion with a cross-sectional area gradually decreasing from top to bottom; or

wherein the shank portion billet is located at an upper side of the material pushing portion, and an upper side surface of the shank portion billet has an upwardly convex tapered portion with a cross-sectional area gradually increasing from top to bottom;

upset-extruding the shank portion billet, such that the tapered portion flows in a direction away from the wire blank, thereby forming a shank portion extending in a radial direction of the wire blank and a groove portion between the shank portion and the material pushing portion, wherein the shank portion has a cross-sectional area which gradually increases from its first end adjacent to the material pushing portion to its second end away from the material pushing portion;

upset-extruding a second end of the wire blank to shape the second end into a slot shaft portion, thereby forming a slot portion by the slot shaft portion, the wire blank formed between the first end and the second end, and the material pushing portion or the shank portion, wherein the second end of the wire blank is disposed opposite to the first end of the wire blank.

2. The method of claim 1, wherein before the step of upset-extruding the first end of the wire blank, the method further comprises: providing the wire blank, wherein a volume of the wire blank is equal to a volume of the self-fastening rivet manufactured by the method.

3. The method of claim 2, wherein between the step of providing the wire blank and the step of upset-extruding the first end of the wire blank, the method further comprises: upset-extruding the wire blank to shape the first end into a head billet that facilitates forming of the material pushing portion and the shank portion billet by a first extrusion mechanism.

4. The method of claim 2, wherein the step of providing the wire blank comprises: clipping a wire by a clipping mechanism to obtain the wire blank.

5. The method of claim 1, wherein the step of upset-extruding the shank portion billet comprises: forming a round transition between the shank portion and the material pushing portion.

6. The method of claim 1, wherein the step of upset-extruding the second end of the wire blank comprises: forming the slot shaft portion by open-close segment dies forming.

7. An extrusion forming apparatus for manufacturing a self-clinching rivet, the extrusion forming apparatus comprising:

a first extrusion mechanism for upset-extruding a first end of the wire blank to shape the first end into a material pushing portion and an annular shank portion billet, wherein the shank portion billet extends axially along the wire blank, and

wherein the shank portion billet is located at a lower side of the material pushing portion, and a lower side surface of the shank portion billet has a downwardly convex tapered portion with a cross-sectional area gradually decreasing from top to bottom; or

wherein the shank portion billet is located at an upper side of the material pushing portion, and an upper side surface of the shank portion billet has an upwardly convex tapered portion with a gradually increasing cross-sectional area from top to bottom;

a second extrusion mechanism for upset-extruding the shank portion billet, such that the tapered portion flows in a direction away from the wire blank, thereby forming a shank portion

extending in a radial direction of the wire blank and a groove portion between the shank portion and the material pushing portion, wherein the shank portion has a cross-sectional area which gradually increases from its first end adjacent to the material pushing portion to its second end away from the material pushing portion;

a third extrusion mechanism for upset-extruding a second end of the wire blank to shape the second end of the wire blank into a slot shaft portion, thereby forming a slot portion by the slot shaft portion, the wire blank formed between the first end and the second end, and the material pushing portion or the shank portion, wherein the second end of the wire blank is disposed opposite to the first end of the wire blank.

8. The extrusion forming apparatus of claim 7, further comprising a clipping mechanism for clipping a wire to obtain the wire blank.

9. The extrusion forming apparatus of claim 8, further comprising

a fourth extrusion mechanism configured to upset-extrude the wire blank obtained through clipping by the clipping mechanism to shape the first end of the wire blank into a head billet that facilitates forming of the material pushing portion and the shank portion billet by the first extrusion mechanism.

10. The extrusion forming apparatus of claim 9, wherein the fourth extrusion mechanism, the first extrusion mechanism, the second extrusion mechanism, and the third extrusion mechanism of the extrusion forming apparatus process the wire blank sequentially.