May 12, 1964 H. S. BOYD 3,132,540

METHOD FOR MAKING PERFORATING STRIPS

Filed Nov. 29, 1961

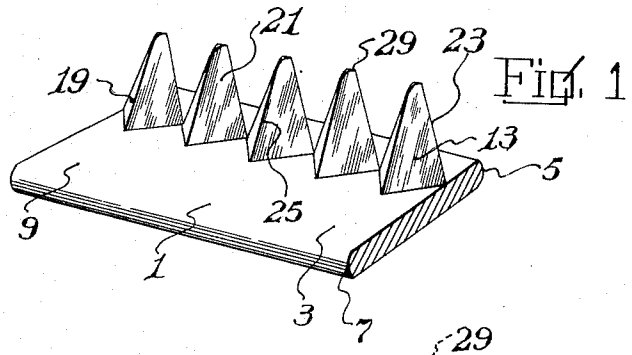


Fig. 1

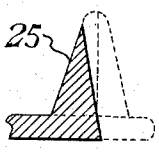


Fig. 2

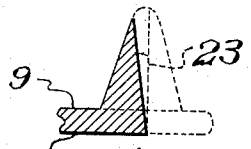


Fig. 3

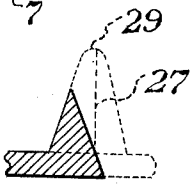


Fig. 4

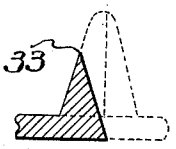


Fig. 5

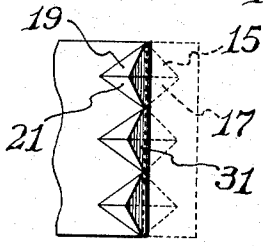


Fig. 6

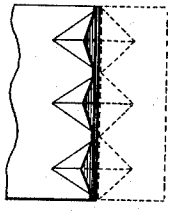


Fig. 7

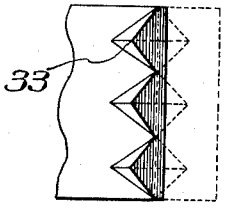


Fig. X

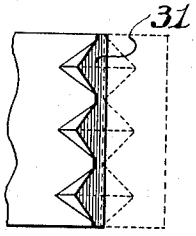


Fig. 9

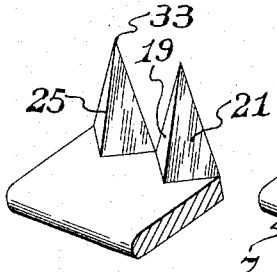


Fig. 10

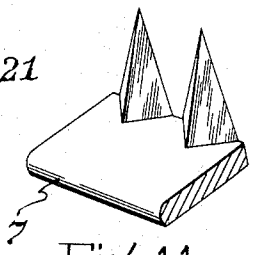


Fig. 11

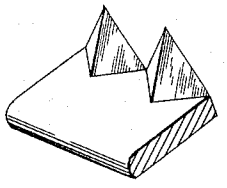


Fig. 12

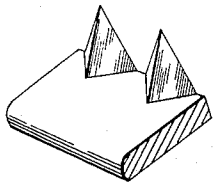


Fig. 13

INVENTOR.
Harry S. Boyd

BY
Robert J. Patch
ATTY.

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METHOD FOR MAKING PERFORATING STRIPS

Harry S. Boyd, 6525 E. 24th St., Tulsa, Okla.

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4 Claims. (Cl. 76—101)

The present invention relates to methods for making perforating strips, more particularly of the type disclosed in my copending patent application, Serial No. 155,657, filed November 29, 1961, entitled "Apparatus for Perforating Sheets."

The object of the present invention is the provision of methods for making perforating strips, which will be relatively simple and inexpensive to practice and which will produce perforating strips of uniformly even dimensions and desirably sharp edges.

Other objects and advantages of the present invention will become apparent from a consideration of the following description, taken in connection with the accompanying drawing, in which:

FIGURE 1 is a fragmentary perspective view of a length of preformed blank from which the perforating strip is made;

FIGURES 2–5 are fragmentary cross-sectional views of the structure of FIGURE 1, showing alternative ways of forming the final product;

FIGURES 6–9 are plan views of the structure of FIGURES 2–5, respectively; and

FIGURES 10–13 are fragmentary perspective views of the finished product corresponding to FIGURES 2–5 and 6–9, respectively.

Referring now to the drawing in greater detail, there is shown a perforating strip blank 1 which has been formed by rolling from a length of metal wire. Blank 1 comprises a thin flat strip 3 having opposite parallel rounded side edges 5 and 7 and a flat upper surface 9 parallel to a flat under surface 11. A multiplicity of projections 13 is disposed in a straight line along upper surface 9. Each projection 13 has generally pyramidal form bounded on its exposed sides by flat surfaces 15, 17, 19 and 21. Projections 13 thus have coplanar edges 23 extending parallel to the length of but perpendicular to the plane of strip 3, the edges 23 being defined on one side of each projection 13 by the junction of surfaces 15 and 19, and on the other side of each projection 13 by the junction of surfaces 17 and 21. Projections 13 also have sharp edges 25 extending generally transverse to edges 23 and disposed in parallel planes perpendicular both to the length and to the plane of strip 3. Thus, edge 25 is defined on one side of each projection 13 by the junction of surfaces 15 and 17, and on the other side of each projection 13 by the junction of surfaces 19 and 21. Edges 23 lie on the midplane 27 of the group of projections 13.

As indicated above, blank 1 is formed by rolling between two cylindrical rollers, one of which forms the plain under surface 11 and thus has a plain cylindrical periphery, and the other of which forms upper surface 9 with projections 13 and for this purpose has a cylindrical periphery which is provided with a multiplicity of indentations complementary to projections 13. When wire is run between these two opposed rollers (not shown), the wire is flattened and at the same time projections 13 are formed. It should be noticed that that portion of the wire which is not consumed in forming projections 13 is formed into flat strip 3 with the original round edges of the wire converted into rounded side edges 5 and 7 of the strip. It should also be noted that projections 13 are spaced from both side edges 5 and 7 but are closer to side edge 5 than to side edge 7, and that projections 13 are bisymmetric on both sides of the midplane 27. By this arrangement, it is possible to roll for example circular wire into the shape shown in FIGURE 1 without distorting the wire and without

causing it to twist or turn upon the formation of projections 13 thereon. The projections are thus formed with rounded contours immediately adjacent their original apices 29 and the rolling operation is facilitated by making no attempt to roll these apices to sharp points in the blank as originally formed.

The second step is to grind blank 1 into final form, and this is done in a single grinding operation which reduces blank 1 from the form shown in FIGURE 1, or shown in dotted line in FIGURES 2–9, to the form shown in full line in FIGURES 2–9 or in FIGURES 10–13. Specifically, side edge 5 and at least half of each projection 13 are ground away on a bias, until what remains is a ground uniplanar surface 31 that is disposed at an acute angle to surfaces 9 and 11 and to the plane of strip 3 and that extends from surface 11 to a new apex 33 on each projection 13, the new apex 33 being disposed intermediate the length of what formerly was edge 25 on the same side of strip 3 as side edge 7 thereof.

FIGURES 2–5 show respectively in side cross section and FIGURES 6–9 show respectively in plan four of the many ways in which this grinding step may be performed. In general, of course, to produce the most slender and the tallest teeth, the angle between newly ground surface 31 and midplane 27 should be the least, as in FIGURES 2 and 3. FIGURES 2 and 3 differ from each other in that in FIGURE 2 ground surface 31 intersects upper surface 9 at midplane 27, while in FIGURE 3 newly ground surface 31 intersects under surface 11 at midplane 27. The resulting teeth are of the same height in either case, which means that their apices 33 are the same distance from strip 3 as seen in FIGURES 2 and 3. As a result, therefore, surface 31 in FIGURE 3 can be a little steeper and the resulting teeth a little thinner than in the case of FIGURE 2.

Similarly, in FIGURES 4 and 5, surface 31 is steeper in FIGURE 4 than in FIGURE 5, and in FIGURE 5 surface 31 intersects midplane 27 at under surface 11, while in FIGURE 4 the surface 31 intersects midplane 27 at upper surface 9. Apices 33 in FIGURES 4 and 5 are at the same height, but this height is less than in the case of FIGURES 2 and 3.

Representative inclinations of surfaces 31 in FIGURES 2–5 from the vertical might be, for example, 11°, 8°, 21°, and 18°, respectively.

FIGURES 6–9 show in phantom line the material ground away during the formation of surfaces 31, and also illustrate the relative merits of causing surfaces 31 to intersect midplane 27 at upper surface 9 or under surface 11. When surface 31 intersects midplane 27 at upper surface 9, the newly-formed serrated edges along surface 31 meet each other at the bottom of V-shaped grooves in surface 31, as in FIGURES 2 and 4; whereas in FIGURES 3 and 5, when the surfaces 31 intersect midplane 27 at under surface 11 and the width of the base of the final tooth is less than half the width of the base of the original tooth, the converging adjacent edges of surface 31 do not meet but rather are spaced apart at surface 9, thereby to provide gaps between the bases of the final teeth, as seen in FIGURES 7 and 9. These gaps are useful if the material to be perforated is relatively weak, as the gaps provide wider and hence stronger bridges between perforations than in the case of teeth that meet at their bases.

As seen in FIGURES 10–13, it is thus possible to provide long slender teeth or short stubby teeth by manipulation of the angle of surface 31; and it is possible to provide teeth that are either immediately adjacent each other or spaced apart at their bases depending on how much of the material of projections 13 is cut away.

The grinding step is not a laborious one, for the strip material of the present invention is really quite small and is greatly enlarged in the drawings for clarity of illustration.

For example, flat strip 3 might have a thickness of only 0.006 inch. If projection 13 were ground down, say, 0.007 inch at an angle of 11° as in the embodiment of FIGURE 2, then new apex 33 would have a height above surface 11 of 0.023 inch. This same height of new apex 33 could be achieved by grinding down as in FIGURE 3 at an angle of 8° for ground surface 31. In FIGURE 4, if surface 31 were ground at an angle from the vertical of 21° as shown, then the lower height of new apex 33 would be achieved by grinding through only 0.010 inch of projection 13. The same height of apex 33 in FIGURE 5 would be achieved by grinding surface 31 at an angle of 18°. In any event, however, it should be noted that all of surfaces 15 and 17 and part of surfaces 19 and 21 are ground away, so that everything on the same side of midplane 27 as the nearer of the edges 5 and 7 will be ground away, and in addition part of what lies on the other side of midplane 27.

From a consideration of the foregoing disclosure, it will be obvious that all of the initially recited objects of the present invention have been achieved.

Although the present invention has been described and illustrated in connection with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit of the invention, as those skilled in this art will readily understand. Such modifications and variations are considered to be within the purview and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A method for making perforating strips, comprising rolling a metal filament into the form of a thin flat strip having a multiplicity of projections disposed along the length of the strip and extending away from one side of the strip and spaced from both side edges of the strip and being tapered from greatest size at their bases to least size at their original apices, and grinding away one side edge of the strip and adjacent portions of the projections to leave a ground uniplanar surface that is displaced at an acute angle to the remainder of the flat strip and that extends from the side of the strip opposite the projections to new apices of the projections which are nearer the strip than the original apices.

2. A method as claimed in claim 1, in which said grinding is continued until at least half of the width of the base of the projection measured transversely of the strip has been ground away.

3. A method as claimed in claim 1, in which said projections are formed having sharp edges disposed in the planes which are perpendicular to the length of the strip and which include the original apices, the new apices lying on and being disposed intermediate the length of said edges.

4. A method as claimed in claim 2, the projections as formed prior to grinding being bisymmetrical about the plane which is perpendicular to the strip and which includes the original apices.

References Cited in the file of this patent

UNITED STATES PATENTS

92,600	Gaston	July 13, 1869
2,842,202	Boyd	July 8, 1958