

June 30, 1942.

H. E. VEIT

2,288,378

DIMPLING TOOL

Filed July 16, 1941

Fig. 1.



Fig. 2.

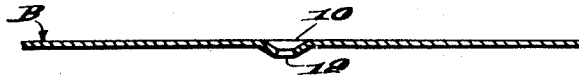


Fig. 3.

Fig. 4.

Fig. 5.

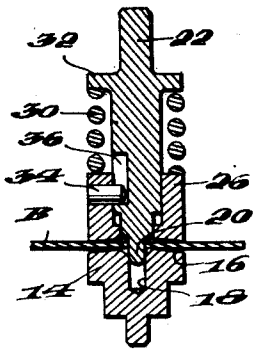
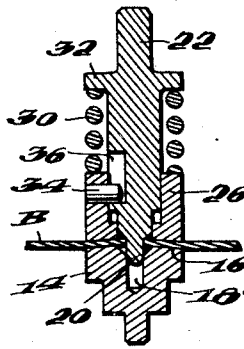
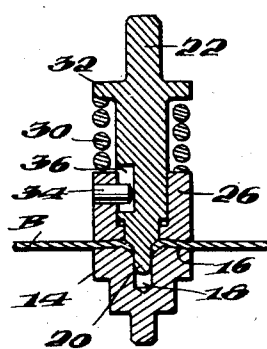
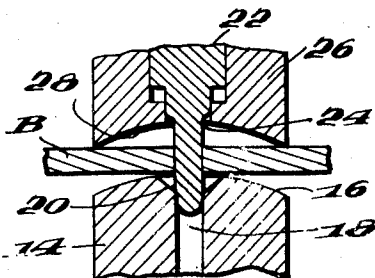


Fig. 6.



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DIMPLING TOOL

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1 Claim. (Cl. 153—10)

This invention is directed to the construction of a dimpling tool. In particular the invention is directed to the novel construction of a tool for producing a dimple around a rivet hole in a sheet of material, the dimple being adapted to receive a rivet head.

In the construction of metal surfaced aircraft the sheets of metal are thinner than the thickness of the rivet heads which are used to unite the sheets of metal to each other and the framework of the aircraft. For high speed modern aircraft it is essential that the rivet heads are countersunk so that an extremely smooth surface is produced, it being well known that even slight irregularities of surface produce large disturbances in the airfoil at high speeds. Hence it has been conventional to dimple the sheets of material about each rivet hole so that a depression is formed into which the rivet head is seated. This dimpling has been but partially satisfactory because not only the dimple depression is formed, but due to the stretching of the material adjacent the dimple an additional depressed area is formed. This additional depression, of course, is not filled by the rivet head and presents an undesirable irregular surface. This additional irregularity of surface is harmful both in the disturbance of the air foil and in presenting an area in which moisture and dirt collect and create corrosive conditions.

An object of the instant invention is to produce a tool for dimpling a thin sheet of metal about a rivet hole through the sheet so that a dimpled depression having a size only of the rivet head is formed.

Another object of the invention is to produce a dimple around the rivet hole in a thin sheet of material which, when filled with a rivet head, will form a substantially smooth surface.

Another object of the invention is to produce a tool for forming a dimple around a rivet hole in a thin sheet of material so that the material adjacent the dimple will not be stretched and distorted.

Generally the objects of the invention are obtained by constructing a dimpling tool in which the dimpling peen is surrounded by a pressure pad having a concave surface adjacent the material to be dimpled, while the anvil has a complementary convex surface. As the peen forms the desired dimple in the sheet of material, the pressure pad and anvil cooperate simultaneously to bend slightly the metal in a direction opposite that which the peen itself would do and at the same time hold the material against stretch-

ing, accordingly the sheet of metal after the dimpling operation presents its original flat surface except only for the dimple produced by the peen.

A means by which the objects of the invention are obtained is shown more clearly in the accompanying drawing in which:

Fig. 1 is a cross-sectional view of a sheet of material having a dimple formed therein according to prior art methods;

Fig. 2 is a similar view of a sheet of material having a dimple formed therein according to the instant invention;

Fig. 3 is a cross-sectional view of the dimpling tool of this invention with the material in place for the dimpling operation;

Fig. 4 is a similar cross-sectional view but showing the position of the dimpling tool at the first bending of the sheet material;

Fig. 5 is a similar view but showing the final bending and dimpling step performed by the tool; and

Fig. 6 is an enlarged fragmental view of Fig. 3.

In Fig. 1 the sheet of material A has had a dimple 2 surrounding the rivet hole 4 produced therein according to prior art methods. As shown the depth of the dimple depression 2 is greater than the thickness of the material, and the depression extends beyond the edge 6 of the dimple desired. Edge 6 should be flush with the surface of sheet A, but because of the bending and stretching of the material an additional depression 8 has been formed. This additional depression is undesirable and not only prevents a smooth surface after the rivet has been inserted into the sheet, but also provides a hollow in which moisture and dirt can collect and corrode the metal sheet and rivet.

Fig. 2 illustrates the form of dimple sought and attained by the instant invention. As shown the sheet B is provided with a dimple 10 about the rivet hole 12, and the periphery of the dimple lies in the plane of the surface of sheet B. No additional depression as at 8 in Fig. 1 is found in Fig. 2.

In order to obtain the ideal structure of Fig. 2, a dimpling tool as illustrated in Figs. 3 to 6, inclusive, is used. This tool consists of an anvil 14 provided with a convex upper surface 16 and a centrally located bore 18. The pilot point 20 of the peen 22 extends through the rivet hole in the sheet of material B, and the conical surface 24 on the peen produces upon downward movement the desired dimple in the sheet. The or-

dinary anvil has a flat surface instead of the concave surface 16 and produces the dimple of Fig. 1.

To compensate for the spring back and stretching of the material of sheet B and to prevent the depression 8 of Fig. 1, the tool of Fig. 3 is provided with a cylindrical pressure pad 26 slidably mounted on peen 22. Pressure pad 26 has a lower concave surface 28 which is complementary to the surface 16 on anvil 14. The pressure pad is urged downwardly by spring 30 extending between a collar 32 on peen 22 and bearing upon the upper edge of pressure pad 26. A pin 34 engaging in a slot 36 in peen 22 holds pressure pad 26 on the peen.

The operation of this tool is as follows:

The sheet of material B is placed upon anvil 14 as shown in Fig. 3 and pilot point 20 lowered through the rivet hole. Spring 30 forces pressure pad 26 against the area of the sheet B about the rivet hole. As the pressure stroke is started, Fig. 4, the area of the sheet material between complementary surfaces 16 and 28 of the anvil and pressure pad, respectively, is slightly bent upwardly. As the pressure stroke of peen 22 continues and is completed, Fig. 5, the conical surface 24 of the peen produces the desired dimple in the sheet. At the same time spring 30 is compressed due to the downward movement of

peen 22 and increases the pressure upon pressure pad 26 so that the sheet of material between the anvil and the pressure pad is held firmly and is not stretched.

When the sheet of material B is removed from the tool, the portion of the sheet about the rivet hole which has been slightly bent upwardly springs back and takes a position which is substantially in the plane of the remainder of the sheet of material, as shown in Fig. 2.

The novel dimpling tool is of simple construction and produces the ideal dimple in the sheet of material as quickly and efficiently as the conventional devices of the prior art have produced an unsatisfactory dimple. The operation is entirely automatic and results in a superior product than heretofore obtainable.

Having now disclosed a means by which the objects of the invention are obtained, I claim:

A dimpling tool comprising a peen and an anvil adapted to engage a sheet of material for producing a dimple therein, and means for bending slightly the material in an area immediately adjacent said peen in a direction opposite the dimpling movement of said peen, and means for holding said material in said area against stretching while the peen forms a dimple therein.

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