

March 10, 1942.

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2,275,438

METHOD OF PREPARING SHEET MATERIAL

Filed Dec. 31, 1938

Fig 1

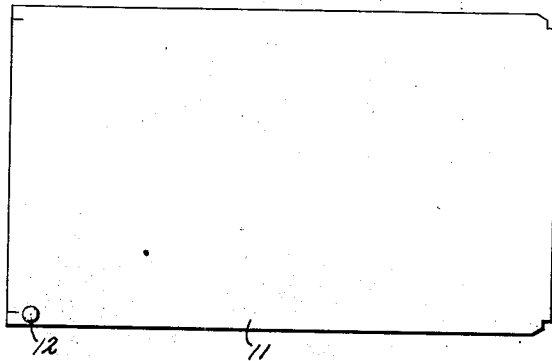


Fig 2

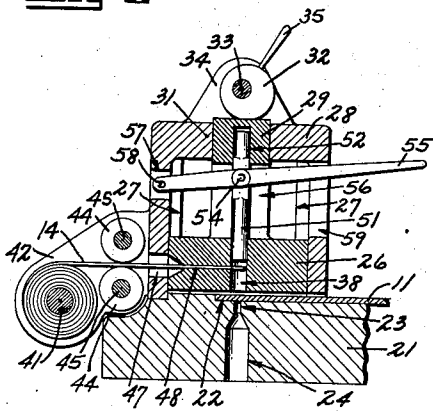


Fig 3

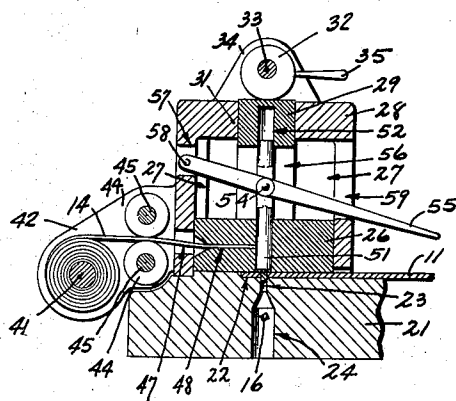
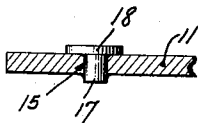


Fig 4



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UNITED STATES PATENT OFFICE

2,275,438

METHOD OF PREPARING SHEET MATERIAL

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Application December 31, 1938, Serial No. 248,845

4 Claims. (Cl. 29—148)

The present invention relates to a method of preparing and securing an article onto sheet metal and has particular reference to forming a metal rivet while driving it into an imperforate sheet of metallic material.

The invention contemplates a simple manner of joining two pieces of metal together in rivet fashion without the need of previously forming the rivet or preparing the sheet for the rivet and this is done in a way that permits the use of a rivet member which may be relatively softer, harder or of the same hardness as the piece to which it is attached, such a method utilizing the rivet for forming its own hole or seat in the sheet material.

One such use of a rivet in sheet material to which it is attached is found in certain tin or other metal cans for containing liquid beverages or food products of various kinds which react electrolytically with the metal of the can and in which a small quantity of a metal which is higher in the electro-chemical series than the metal of the can and which functions as an anodizing agent to off-set any undesirable reactions on the can contents. This use of a rivet in a container wall will be illustrated and described by way of example in connection with the present invention.

An object of the invention is the provision of a method of producing and securing a metal rivet in an imperforate sheet of metal wherein the metal from which the rivet is formed is forced into the sheet with a pressure great enough and in a particular manner to puncture the sheet while simultaneously forming the rivet and while securing it in the hole of its own making in a rapid and economical manner which facilitates high speed production and accuracy.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawing, discloses a preferred embodiment thereof.

Referring to the drawing:

Figure 1 is a plan view of a can body blank having a rivet formed and secured therein in accordance with the steps of the instant method invention;

Figs. 2 and 3 are sectional views of one form of apparatus for carrying out the instant method steps, Fig. 3 showing the moving parts of the apparatus in a different position to that shown in Fig. 2; and

Fig. 4 is an enlarged sectional detail of a portion of the blank and the finished rivet.

As a preferred embodiment of the instant method invention, the drawing illustrates a relatively hard metal imperforate can body blank 11 of tin plate or the like which prior to being formed into can body shape is adapted to receive a relatively soft metal rivet 12 of aluminum, zinc, magnesium or alloys of these or similar metals. The rivet is preferably located adjacent an edge of the blank and in position for electrolytically protecting the metal against corrosion when embodied in the wall of a container filled with a product which would otherwise attack the metal.

In accordance with the steps of the instant method the blank 11 is clamped tightly in a die which confines a portion of the blank and also leaves exposed that part of it which is to receive the rivet. While the blank is so clamped a wire 14 (Figs. 2 and 3) of aluminum, as an example, is fed into position adjacent the confined portion of the blank and a pellet is cut therefrom and deposited on the exposed part of the blank. A pressure is then exerted on the confined pellet and this pressure forces the soft pellet into the relatively hard tinplate, puncturing the latter with a clean hole 15 into which the soft metal flows, a portion 16 of the blank being completely punched out. At the same time the pellet is reformed into a rivet having a shank 17 (Fig. 4) which fits into the punctured hole and also having an enlarged flattened head 18 which lies flat against the surface of the blank.

A hand operated form of apparatus is illustrated in the drawing for carrying out the method steps of the invention and includes a die 21 having a flat recess 22 in its top surface for receiving the blank 11. The die is also formed with a small hole or die recess 23 which merges into a larger clearance hole 24 for the discharge of the scrap portion 16 which is punched out of the blank by the soft rivet.

Clamping of the blank 11 in its die recess 22 is effected by a movable clamp block 26 disposed in a vertical slideway 27 formed in the side walls of a housing 28, preferably mounted on the die 21. The block is formed with a vertical stem 29 which slides in a bearing 31 formed in the top of the housing. The upper end of the block stem is engaged by a rotatable eccentric clamping member 32 which is carried on a pivot pin 33 secured in lugs 34 extended up from the housing 28. A handle 35 is secured in the clamping member and by manipulating this handle the

clamping member may be rocked so that the stem 29 and its clamping block 26 will be pressed down tightly against the positioned blank 11.

Within the clamping block 26 there is provided a vertical bore 38 which is located directly above the die hole 23 and preferably concentric therewith. It is this bore which sets off the exposed part of the blank where the rivet is to be inserted, the walls of the block surrounding the bore providing a medium which confines this exposed area.

The aluminum wire 14 hereinbefore mentioned is fed into the bore 38 from a supply of the wire which is preferably retained on a spool or reel carried on a pin or axis 41 secured in a pair of webs 42 which extend out from the housing 28. The wire is fed by a pair of feed rollers 44 mounted on roller shafts 45 carried in the webs 42, the rollers being moved in any suitable manner in the proper time for feeding. These rollers advance the wire through a clearance hole 47 formed in the housing side wall and also through a horizontal passageway 48 formed in the clamping block 26. This passageway communicates with the bore 38, the end of the wire projecting into the bore at right angles thereto.

The bore 38 also serves as a bearing for a plunger 51 which is disposed above the end of the wire 14 extending into the bore. The upper end of the plunger is carried in a bearing bore 52 formed in the upper end of the clamping block stem 29. Intermediate its length the plunger is fastened by a pivot pin 54 to a lever 55 disposed in a slot 56 formed in the block stem 29. One end of the lever is located in a slot or recess 57 formed in the housing side wall and is pivotally mounted or retained in place on a pivot pin 58 secured in the housing. The opposite end of the lever is free and serves as a handle for moving the plunger vertically within its bearing. This handle also extends through a guide slot 59 formed in the adjacent housing side wall.

When downward pressure is applied to the handle of the lever 55, the plunger 51 moves down in its bore 38 and cuts off the end of the aluminum wire projecting inside the bore. The pellet thus produced moves to the bottom end of the bore where it comes to rest on the confined portion of the can body blank 11 beneath the bore 38. The plunger moves down with the pellet and squeezes the latter between it and the blank, as further pressure is built up by the descending plunger, the pellet being confined on all sides can only escape along the line of least resistance. This least resistance is by way of that portion of the blank which is unsupported at the die recess or hole 23 there being heavier metal walls on the top and sides.

The pellet thus punctures the blank from the position over the hole and flows into the puncture as shown in Fig. 4 thus forming the shank 17 of the rivet. Descent of the plunger 51 terminates and that portion of the pellet which is left in the bore 38 provides and constitutes the head 18 of the rivet.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the steps of the process described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the process hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A method of producing a soft metal rivet in a relatively hard metal imperforate sheet, which comprises clamping said sheet in a die with a confined portion of the sheet unsupported, feeding a wire of relatively soft metal into a position relative to said confined portion of the sheet, severing a portion of said wire and simultaneously in the same single movement and axially of the severing operation squeezing a portion of said wire into said sheet, thereby producing a hole in said sheet, and by said single movement reforming the remaining portion of the relatively soft metal over the hole to produce a headed rivet secured therein.

2. A method of producing a soft metal rivet in a relatively hard metal imperforate sheet, which comprises clamping said sheet in a die with a confined portion of the sheet unsupported, feeding a wire of relatively soft metal into a position relative to said confined portion of the sheet, severing a portion of said wire to provide a pellet, and simultaneously in the same movement driving a portion of said relatively soft metal pellet through said sheet, thereby producing a hole in said sheet and simultaneously in the same movement upsetting the remaining portion of the relatively soft metal above the hole to produce a rivet secured therein.

3. A method of producing an aluminum rivet or the like in a sheet of tin plate, which comprises clamping said sheet in a die with a confined portion of the sheet unsupported, feeding a wire of aluminum into position above said confined portion of the sheet, cutting off a pellet from the aluminum wire and punching said pellet into said sheet in a single operation, thereby producing a hole in the sheet and simultaneously reforming said pellet into a rivet which fills said hole.

4. A method of producing and securing a metal rivet in an imperforate sheet, which comprises clamping the sheet between upper and lower unyielding surfaces, said upper surface having an opening and said lower surface having a smaller axially aligned opening forming an unsupported section for the sheet at the lower side, positioning an elongated pellet of metal transversely of said upper opening, and then in a single movement compressing said pellet while confining it against undue lateral spreading to force the metal through the clamped metal sheet at its unsupported section, thereby forming a rivet and securing it in the hole made in said sheet.

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