

Dec. 19, 1944.

P. F. ROSSMANN

2,365,648

REAMING DEVICE

Filed Dec. 13, 1941

2 Sheets-Sheet 1

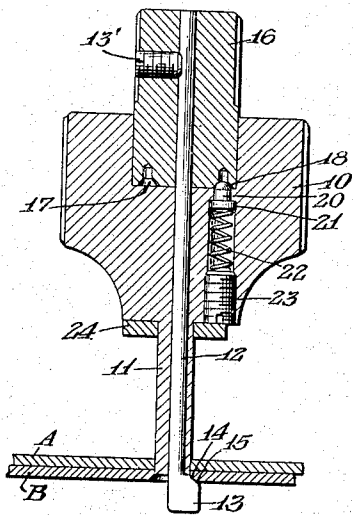


FIG. 2.

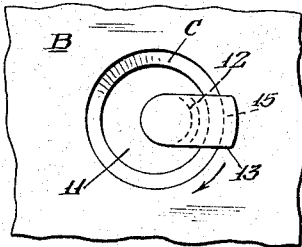


FIG. 3.

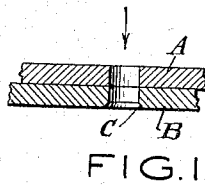


FIG. 1.

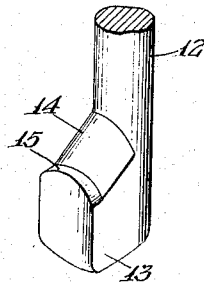


FIG. 9.

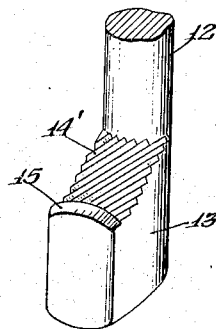


FIG. 10.

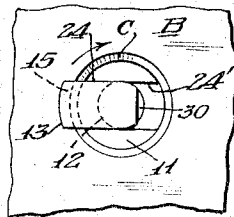


FIG. 7.

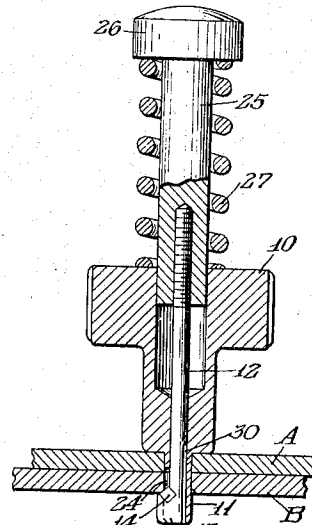


FIG. 4.

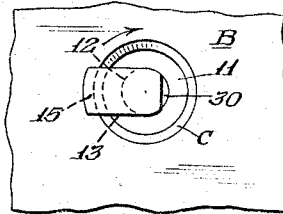


FIG. 5.

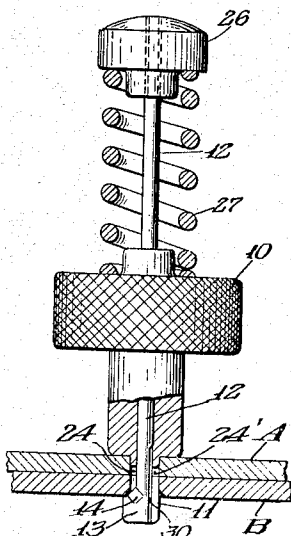


FIG. 6.

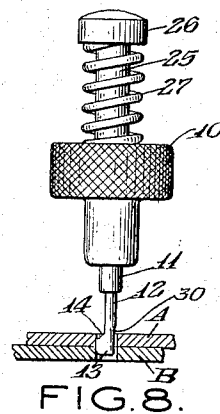


FIG. 8.

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2 Sheets-Sheet 2

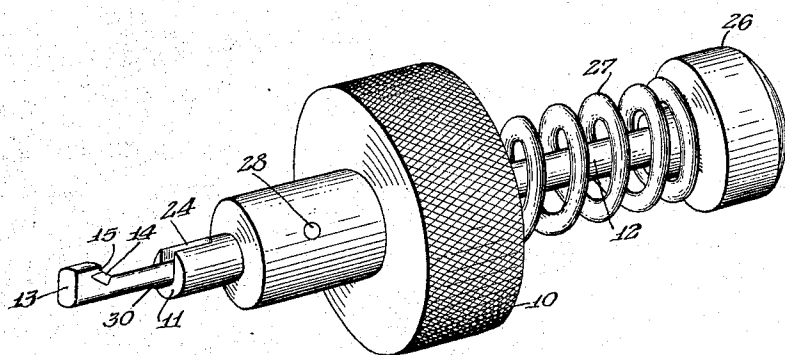


FIG. 11.

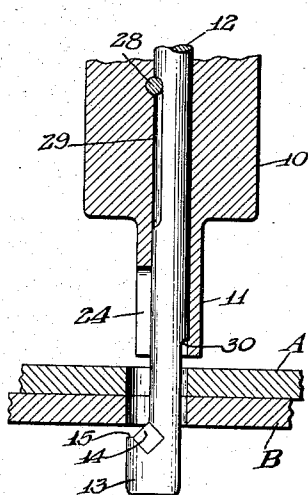


FIG.12.

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2,365,648

REAMING DEVICE

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Application December 13, 1941, Serial No. 422,814

6 Claims. (Cl. 77—73.5)

The present invention relates to a device or tool for reaming, burring or counter-sinking the openings, especially those drilled in sheet metal or plates for receiving a rivet in particular an explosive rivet or preparatory to any other operation that involves the removal of a sharp edge or burr which is inaccessible except from the outside.

An object of the invention is to provide a device of the above character which is both simple in design as well as easy and efficient in operation.

Another object is the provision of a burring and/or reaming tool which is quickly applied to or inserted into the riveting or other holes and which can be operated instantly.

A further object is to provide a simple device of the above character which is easily and quickly operated to burr and/or counter-sink the inner edge of drilled or other holes substantially without requiring a specially trained or skilled operator.

Still a further object is the provision of a burring or counter-sinking tool which can be inserted in a single movement with one hand of the operator and in the same motion released for burring or counter-sinking without removing the hand.

A further object of my invention is to provide a novel arrangement for locking a reamer into engagement with an edge to be reamed.

Another object is to substantially limit the amount of counter-sinking beyond the operator's control.

A further object is to provide an arrangement for automatically reaming a predetermined amount of the edge being treated.

Still a further object is to provide a device of the above character which will automatically adjust itself to any combination of sheet thickness within the physical limitations of the tool.

The above and further objects and aspects of the invention will become more apparent from the following detailed description taken with reference to the accompanying drawings forming part of this specification and wherein;

Figure 1 shows a pair of metal sheets having aligned perforations which are to be burred or counter-sunk.

Figure 2 is a vertical cross-section through a reamer embodying the principles of the invention.

Figure 3 is an enlarged bottom view of Figure 2.

Figure 4 is a vertical cross-sectional view of a

modified construction embodying the principles of the invention.

Figure 5 is an enlarged bottom view of Figure 4.

Figures 6 and 7 are cross-sectional and bottom views, respectively, of a slightly modified tool similar to Figures 4 and 5.

Figure 8 is a view illustrating the reamer in the initial position of insertion in the perforations during the operating cycle.

Figures 9 and 10 are perspective detailed views illustrating the cutting member used in the tool shown in the preceding figures.

Figure 11 is a perspective view showing the reamer in the inserting position, and

Figure 12 is a partial vertical cross-section showing the reamer just before its final position in the perforations during the insertion cycle and illustrating an optional feature to improve the operation.

Like reference characters identify like parts throughout the different views of the drawings.

With the above objects in view, the present invention contemplates the provision of a simple reaming or counter-sinking tool constructed in such a manner that the tool member or cutting knife can be quickly arranged in such a position as to permit the insertion of the tool within the opening, and upon insertion can be instantly arranged in a position by a simple movement in operative position for burring or counter-sinking the side of the opening opposite to the operator. In a similar manner the removal cycle is carried out in an opposition direction.

Figure 1 of the drawings shows a pair of superposed sheets A and B having aligned perforations to be connected by rivets or in any other manner involving the removal of the burr or on counter-sinking of the inner edge C, particularly in cases where the latter is accessible from the outside only in the direction indicated by the arrow. As will be evident, the use of burring and counter-sinking tool according to the invention is not limited to superposed sheets or plates as shown in Figure 1 but may be used with equal advantage in connection with a single perforated sheet or plate.

Referring more particularly to the embodiment of the invention shown in Figures 1 and 2, numeral 10 indicates the body member of the improved tool having the form of a knurled knob provided with extension 11 substantially fitting the holes in the sheets A and B in the inserted or operative position of the tool. Rotatably and, in the present example, eccentrically mounted within a bore in the knob 10 and extension member 11

is a rod-shaped tool member 12 provided with a square-shaped shoulder or lateral extension 13 at its lower end, said shoulder having a cutting surface or edge 14 at an oblique angle preferably 45° to the axis of the rod 12 and followed by a preferably rounded bearing surface or stop 15 at right angle to the rod 12 whose function will be described presently. The other end of rod 12 is secured to a further cylindrical knob 16 such as by means of a set screw 13' or in any other suitable manner. Adjusting knob 16 is rotatably mounted within a corresponding depression in the body member 10. In this manner, by rotating the knob 16 through an angle of 180°, the rod may be adjusted from the ineffective or non-use position for insertion through the holes in the sheets A and B to its operative position upon insertion as shown in the drawings. In the latter the extension 13 due to the eccentric mounting of rod 12 projects beyond the edge of sheet B in such a manner that rotation of the body member 10 will cause the knife edge 14 to cut into the inner edge of the hole in sheet B, thus carrying out the reaming or counter-sinking operation. The amount of counter-sinking is automatically limited by the stop or bearing surface 15 engaging the undersurface of the sheet B as shown in the drawings. However, this stop or limiting feature of the tool can be eliminated if necessary on certain applications. As is understood, the width of the shoulder 13 should be such that in the ineffective position, i. e., the position 180° opposite to the position shown in the drawing, its outer edge coincides with or is less than the outer dimension of the positioning or extension member 11 fitting in the holes in sheets A and B. In order to fix the ineffective (inserting) and the operative (reaming) positions of the tool member 12, there are provided a pair of depressions 17 and 18 arranged diametrically opposite to each other in the undersurface of the adjusting knob 16 bearing against the bottom of the depression in the body member 10. Depressions 17 and 18 are engaged by a pin 20 having an enlarged portion 21 arranged to slide in a cylindrical bore in the member 10 against the action of a spring 22 held therein by a screw 23. Spring 22 is under compression to cause pin 20 to snap into depressions 17 and 18 when the knob 16 is rotated to adjust the tool from the inserting to the operative or reaming position and vice versa.

In operation, the reaming head 13 is in its position 180° from that shown in Figure 2 with the knob 16 180° from the position shown and the pin 20 snapped into the opening 17. In this position, the over-all distance from the extreme edge of the reaming head 13 to the diametrically opposite edge of the extension 11 is equal or slightly less than the opening or perforations in the sheets A and B. The member is inserted until the reaming head 13 protrudes completely through the bottom of sheet B. Knob 16 is now again rotated with respect to the knob 10 by holding the latter stationary while exerting a rotational force on the knob 16. This rotational force has a component which presses on the spring 22, forcing the pin 20 out of its seat in 17 and into engagement with the undersurface of the knob 16. In this position, the knob is continued in rotation until 180° of rotation has been effected, at which point the seat 18 comes opposite the pin 20. Spring 22 thereupon presses the pin into the seat in the position shown in Figure 2. The reaming head 13 is now in an eccentric position with respect to the opening in the sheets, and therefore its

knife edge projects beyond the circumferential edge of the perforations. In this position, the knob 16 is rotated while an axial pull is exerted thereon to maintain the cutting surface 14 against the undersurface of the sheet B and the burrs on the perforations are removed. This reaming operation may proceed until the bearing surface 15 of the reaming head 13 engages the undersurface of sheet B, at which point further reaming is automatically made impossible.

Referring now to the embodiment illustrated in Figures 4 and 5, there is shown a tool which can be adjusted to its inserting position, inserted in the holes in the sheets A and B, turned into its operative position and operated for reaming or counter-sinking the holes in the sheet B, as well as removed upon completion of the reaming operation, all by means of the movement of a single hand of the operator. In addition, there is insured a constant pressure exerted by the cutting knife upon the edge of the hole, thus rendering the reaming operation substantially independent of any special training or skill on the part of the operator. In the construction shown in Figures 4 and 5, contrary to Figures 2 and 3, the tool member is mounted slidably and concentrically within the body member 10, the extension 11 of which is provided with a lateral slot 24 extending to the lower end thereof and serving as a guide for the shoulder or extension 13. The upper part of member 13 is screwed into or otherwise secured to a plunger 25 arranged to slide within a corresponding opening in the body member 10 and having a flange or head 26 at its upper end. A coil spring 27 is interposed between the member 10 and the head 26 to urge the member 12 into a position wherein the cutting knife 14 and limiting surface 15, respectively, bear against the edge of the hole of sheet B or the upper edge of slot 24 if the device is in the ineffective position removed from the sheets A and B.

In operation, the head 26 is pressed towards the body member 10 against the action of spring 27 by holding the device in one hand with the thumb pressed against head 26 and the middle finger and index bearing against the undersurface of member 10, as shown in Figure 8 in which position the tool may be inserted with the extension 13 readily passing the holes in the sheets. The insertion is complete when the extension 11 of member 10 is finally seated and in the holes after a slight lateral movement of the device as shown in Figure 4, the amount of movement being predetermined by the member 10 whose undersurface rests against the outer surface of sheet A in the example shown. The device is now securely seated and the reaming operation may be begun by rotating the entire assembly by gripping the knurled edge of body member 10 until the stop or bearing surface 15 engages the undersurface of sheet B, thus preventing any further reaming or counter-sinking. The device may then be removed by a reversal of the cycle. The latter merely requires pressing the head 26 towards the member 10 to cause the extension 13 of tool 21 to pass beyond the extension 11 of the body member, thus permitting the removal of the device from the holes in the sheets as is readily understood from the above. The entire operation including inserting, reaming, and removal can be carried out by means of a single hand and requires no training since the amount of counter-sinking is substantially controlled in the manner described.

Referring further to the operation of the tool

shown in Figures 4 and 5, in order to insert the reaming head 13, the knobs 26 and 10 are gripped by applying the fore and middle fingers to the under portions of the knob 10 and the thumb to the top of the knob 26, and compressing the spring 27. The rod 25 is moved axially and carries with it the tool member 12 carrying the reaming head 13 beyond the projection 11 until the upper portions of the reaming head 13 protrudes sufficiently beyond the lowermost edge of the projection 11. The reaming head 13 has an overall width which is approximately equal to or slightly less—such as by the provision of a profile 30 in the edge opposite to the head—than the diameter of the perforations and so in this compressed position the head 13 may be inserted through the opening as shown in Figure 8.

When the reamer projects entirely through the perforations, the lowermost portion of the knob 10 comes into contact with the upper portion of the perforation or sheet A as shown in Figure 4.

Since the diameter of the extension 11 is such as to provide a slip fit in the perforations, and provided the head 13 is extended sufficiently downwards, a lateral movement of extension 11 is possible upon reaching the position shown in Figure 12 during the insertion cycle to seat the extension in the perforations as shown in Figure 4. When the projection 11 has itself been completely inserted into the opening to the position predetermined by the lowermost edge of the member 10, as shown in Figure 4, the thumb may be removed from the knob 26, whereupon the spring 27 acts upon the rod or plunger 25 to move it upwardly until the knife edge of the reamer head 13 comes into contact with the under-surface of the sheet at the circumference or edge which is to be reamed. In this position the reaming head 13 is again excentric with respect to the perforations. By rotation of the knob 10, rotary force is transmitted to the tool member 12 held in fixed relation to the knob by the slot 24, thus starting the burring or reaming operation.

In this operation also, the movement of the reamer is limited by the surface 15. When the reaming has been completed, the unit may again be removed by depressing the knob 26 with respect to the knob 10 in the manner described above until the upper surface of the reamer 14 projects sufficiently beyond the under-surface of the projection 11 to permit complete removal of the projection 11 before the reaming head 13 enters the perforation, thus enabling removal of the unit. In this operation, it will be understood that the spring 27 may be of such dimension and have such compression that it produces a greater frictional force between the members 10 and 26 than the resisting friction of the surface being reamed, since otherwise a relative rotation would occur between the knobs 10 and 26 during reaming.

In place of a single cutting edge upon the extension or shoulder 13 as shown more clearly in perspective view in Figure 9, several cutting edges or a roughened or file-like reaming surface may be provided as shown at 14' in Figure 10.

The embodiment according to Figures 6 and 7 is substantially similar to that according to Figures 4 and 5 with the exception that the extension or positioning member 11 is provided with a pair of opposite slots 24 and 24' and in the manner of mounting the tool member 12. The latter is slidably arranged within the body member 10 and its upper end provided with a flange or head 26 screwed or otherwise secured thereto.

The remaining details are substantially similar to and readily understood from the description of Figures 4 and 5.

Figure 11 is a perspective view of the reamer in its inserting position corresponding to the view shown in Figure 8.

Figure 12 is a partial cross-sectional view showing the reamer at an intermediate position during the insertion cycle as described hereinbefore and including means to prevent relative rotative movement between the members 10 and 12 when the head 13 is beyond the extension 11 during the insertion cycle. This consists, in the example shown, of a pin 28 passed through the lower part of member 10 and arranged to move within a recess 29 of member 12. As is understood any other suitable key and groove or limiting arrangement may be provided for obtaining the same purpose.

It will be understood that the extension 11 should project sufficiently through the perforations to insure a firm seat of the reamer and facilitate the operation, and to this end, if desirable, it may project beyond the head 13 in the inserted or operative reaming position as shown in Figure 4.

Furthermore, the bearing surface of 10 resting upon the outer surface of the sheet may be round or curved instead of flat as shown in the drawings to prevent damage to the sheet while insuring efficient locking of the device for the reaming operation.

It will be evident from the foregoing that the invention is not limited to the specific constructions, arrangements of parts, and details shown and disclosed herein for illustration, but that the underlying and basic principle will be susceptible to numerous variations and modifications coming within the broader scope and spirit of the invention as defined in the appended claims.

I claim:

1. A tool for working the inaccessible edge of a perforation comprising a body having a hollow cylindrical extension fitting said perforation for positioning said body in predetermined relation to the piece to be worked, a rod-shaped tool member slidable within said extension and projectable and retractable with respect to said body, a working head at the outer end of said rod projecting laterally thereof beyond the circumference of said extension and slidable within a longitudinal slot of said extension, the projecting portion of said head adjacent to said extension having a cutting edge forming an angle greater than a right angle with the axis of said rod and terminating in a surface substantially radial and at right angle to said rod, and spring means interposed between the inner end of said member and said body to normally urge said member into the retracted position and to maintain said cutting edge in resilient predetermined pressure engagement with said perforation, whereby to enable working of said perforation by rotation of said body, said head and rod having a combined width to be readily insertable through said perforation in the projected position of said member.

2. A tool for working the inaccessible edge of a perforation in a sheet-like piece comprising a body having a hollow cylindrical extension fitting said perforation for positioning said body in predetermined relation to said piece, a rod-shaped tool member slidable within said extension and projectable and retractable with respect to said body, a flat working head at the outer end of said rod having a thickness of the order of the

diameter of said rod and projecting lateral thereof beyond the circumference of said extension, said head sliding within a longitudinal guide slot of said extension and having a portion adjacent to said extension provided with a cutting edge forming an angle greater than a right angle with the axis of said rod and terminating in a surface substantially radial and at right angle with said rod, and spring means interposed between the inner end of said member and said body to normally urge said member into retracted position and to maintain said cutting edge in resilient predetermined pressure engagement with the edge of said perforation, whereby to allow of working said perforation by rotation of said body, said head and rod having a combined width to be readily insertable through said perforation in the projected position of said member.

3. A tool for removing the burr from the inaccessible edge of a perforation in a sheet-like piece comprising a body having a hollow cylindrical extension fitting said perforation for positioning said body in predetermined relation to said piece, a rod-shaped member slidable within said extension and projectable and retractable with respect to said body, a working head at the outer end of said rod projecting laterally thereof beyond the circumference of said extension and slidable within a longitudinal slot of said extension, the portion of said head adjacent to said extension having a working surface forming an angle greater than a right angle with the axis of said rod, and spring means interposed between inner end of said member and said body to normally urge said member into retracted position and to maintain said working surface in resilient predetermined pressure engagement with the edge of said perforation, whereby to enable working of said perforation by rotation of said body, said working surface terminating in an outer surface substantially radial to the axis of said rod to limit the depth of cut by said head, said head and rod having a combined width to be readily insertable through said perforation in the projected position of said member.

4. In a tool for removing the burr from the inaccessible edge of a perforation in a sheet-like piece comprising a body having a hollow cylindrical extension fitting said perforation for positioning said body in predetermined relation to said piece, a rod-shaped member slidable within said extension and projectable and retractable with respect to said body, a flat burring head at the outer end of said rod projecting laterally thereof and slidable within a longitudinal slot of said extension, and spring means interposed between the inner end of said member and said body to normally urge said member into the retracted position and to maintain said burring head in resilient predetermined pressure engagement with the edge of said perforation, whereby to allow of deburring of said perforation by rotation of said body said head terminating in an outer surface radial to and substantially at right

angle to the axis of said rod to limit the action of said head and/or produce a predetermined counter-sink of said perforation, said head and rod having a combined width to be readily insertable through said perforation in the projected position of said member.

5. A tool for working the inaccessible edge of a perforation comprising a body having a hollow cylindrical extension fitting said perforation for positioning said body in predetermined relation to the piece to be worked, a rod-shaped tool member slidable within said extension and projectable and retractable with respect to said body, a working head at the outer end of said rod projecting laterally thereof beyond the circumference of said extension and slidable within a longitudinal slot of said extension, the projecting portion of said head adjacent to said extension having a cutting edge forming an angle greater than a right angle with the axis of said rod and terminating in a surface substantially radial and at right angles to said rod, spring means interposed between the inner end of said member and said body to normally urge said member into the retracted position and to maintain said cutting edge in resilient predetermined pressure engagement with said perforation, whereby to enable working of said perforation by rotation of said body, said head and rod having a combined width to be readily insertable through said perforation in the projected position of said member, and means to prevent relative rotation between said body and said tool member in the projected position.

6. A tool for working the inaccessible edge of a perforation in a sheet-like piece comprising a body having a hollow cylindrical extension fitting said perforation for positioning said body in predetermined relation to said piece, a rod-shaped tool member slidable within said extension and projectable and retractable with respect to said body, a flat working head at the outer end of said rod having a thickness of the order of the diameter of said rod and projecting laterally thereof beyond the circumference of said extension, said head sliding within a longitudinal guide slot of said extension and having a portion adjacent to said extension provided with a cutting edge forming an angle greater than a right angle with the axis of said rod and terminating in a surface substantially radial and at right angle with said rod, spring means interposed between the inner end of said member and said body to normally urge said member into retracted position and to maintain said cutting edge in resilient predetermined pressure engagement with the edge of said perforation, whereby to allow of said perforation by rotation of said body, said head and rod having a combined width to be readily insertable through said perforation in the projected position of said member, and means to prevent relative rotation between said body and said tool member in the projected position.

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