Nov. 11, 1969 T. L. HUNTER 3,477,272

CRIMPING TOOL

Filed March 28, 1967 2 Sheets-Sheet 1

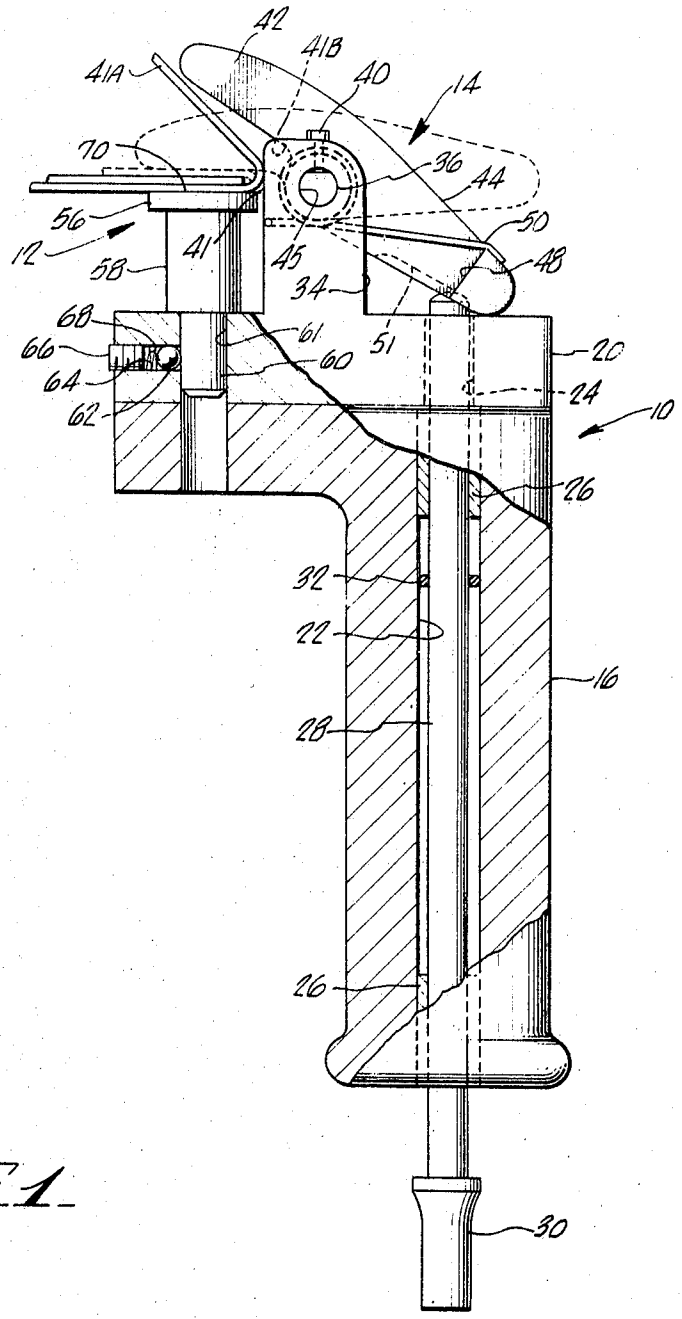

FIG. 1

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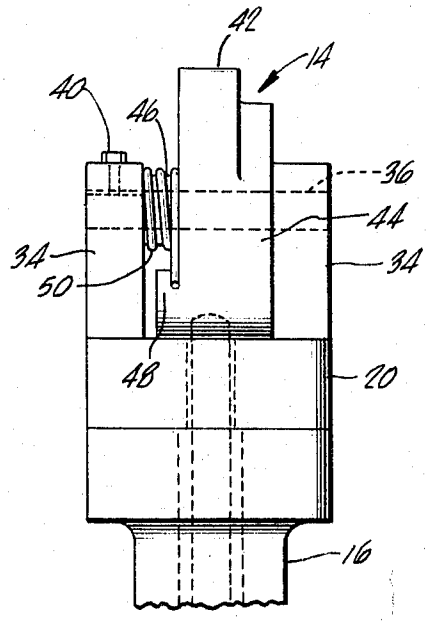

FIG. 2

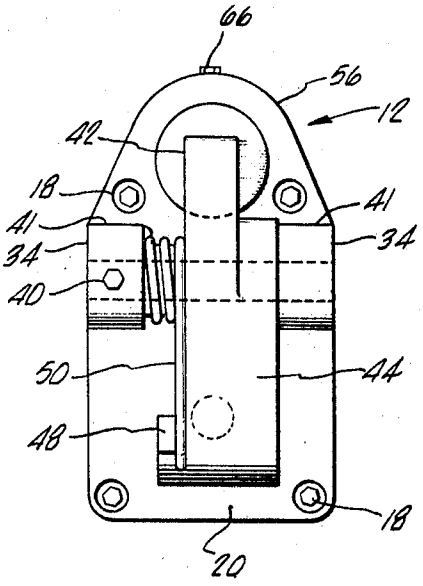

FIG. 3

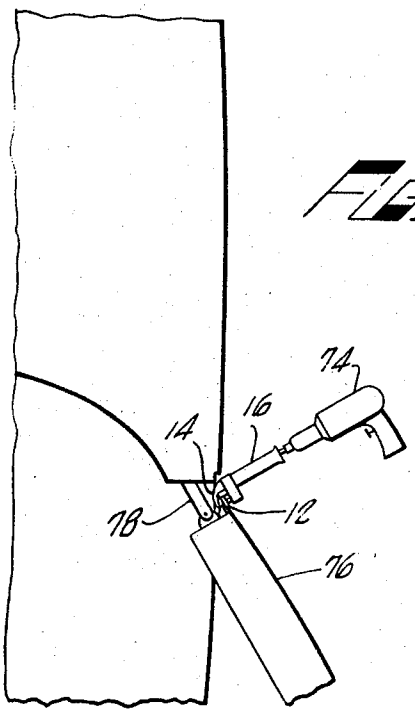

FIG. 5

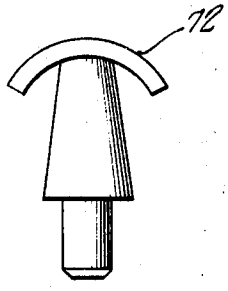

FIG. 4

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CRIMPING TOOL

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Int. Cl. B23p 11/00
U.S. Cl. 72—445 15 Claims

ABSTRACT OF THE DISCLOSURE

A crimping tool having a holder, a pivoting hammer and an anvil. The anvil is interchangeable to permit insertion of contoured anvils which prevents deformation of contoured parts to be crimped.

BACKGROUND OF THE INVENTION

This invention relates to crimping tools, and more particularly to hand crimping tools capable of reaching otherwise inaccessible areas and for crimping irregularly shaped parts.

Every aspect of sheet metal work requires a relatively large amount of crimping operations. Sheet metal parts are crimped to increase their strength, to fasten a plurality of sheet metal parts to each other, or to prepare them for subsequent welding, and to enhance the appearance of the parts.

Most crimping operations are performed in a workshop or a factory where the final part is being manufactured. Usually there are relatively large and expensive machines available that rapidly crimp long sections. These machines are also capable of crimping irregularly shaped sheet metal edges as long as it is economically feasible to adapt a relatively expensive machine to such a task.

A problem was encountered when a crimping operation had to be performed without the help of such machines. This is frequently the case where a last crimp had to be made upon installation of a part or where an already installed part had to be repaired. In those instances, the machines found in workshops and factories are not available or, due to their bulkiness, cannot be employed. The crimping operation then had to be performed by hand. This is done by supporting the part to be crimped with a block, such as a steel block, having a relatively large mass and manually hammering the other side of the sheet metal to deform and crimp it. Automobile repair work, and particularly the installation of door panels after the original door panel had been damaged in an accident, are recurring examples of such work.

A crimping operation performed in this manner is time-consuming and, therefore, uneconomical. Moreover, the final appearance of the crimped part is not always satisfactory since the workman has relatively little control when striking the sheet metal part with a hammer. This is particularly true when he has limited access for striking the part with the hammer.

Since a relatively large space is required for swinging the hammer, parts must often be disassembled to give the workman access for striking his hammer. An example of this is again the door of an automobile that receives a new outside door panel. The edge of the door adjacent the door hinges cannot be reached with a manual hammer. In order to crimp this edge the door has to be removed from its hinges, which involves additional and time-consuming labor. Modern cars have a variety of electrical equipment in the door, such as cigarette lighters, power-operated windows, etc. which must be electrically disconnected first. To make the disconnections, the inside panel of the door must be taken off, which includes all handles, switches and armrests. After the door has thus been disassembled and the outside panel crimped thereto, all parts

have to be assembled again and the door installed thereafter.

Large amounts of labor, which is the most expensive part in automobile repair work, have to be expended in order to attach a new outside door panel to the door. All this labor was necessary only because crimping tools that were capable of reaching areas that could not be reached by a manual hammer used for crimping a part were not available in the past.

SUMMARY OF THE INVENTION

This invention provides a crimping tool that requires a minimum amount of space and which can be used for crimping parts that are not accessible to crimping tools heretofore available. The tool includes a holder for guiding it along an edge to be crimped, and support means such as an anvil for positioning a part to be crimped and for supporting it while a pivoting hammer strikes the part to crimp its edge. The anvil is preferably interchangeable such that it can be given a variety of contours to adequately support the part to be crimped and to prevent that part from being deformed when struck by the hammer. The contoured anvil is particularly important to eliminate the possibility that the part is unsupported in the area where it is struck by the hammer which would cause it to become deformed, would detract from its appearance, and might render the part defective and inoperable.

The crimping tool can be connected with suitable power means to permit rapid strokes of the hammer and substantially shorten the time required to crimp a part, as compared to the past, when these operations were performed manually.

A crimping tool constructed according to this invention requires relatively little space since the hammer, which is power-driven, is small and does not need a great amount of kinetic energy, as was the case where the hammers were manually operated. Thus, parts which heretofore had to be removed can now be crimped while they are installed. One such example is the door of an automobile which can be crimped without having to remove it from its hinges even on the side adjacent the hinges. This, of course, results in substantial savings since the difficult disassembly and assembly operations are eliminated.

In addition, the speed with which an edge of a given length can be crimped as compared to the past is greatly increased. This further reduces the overall cost of the necessary crimping operation.

By using this crimping tool the crimped edges are given a substantially better appearance since irregularities inherent in manual operations, and especially manual operations requiring a great amount of force, are eliminated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side elevational view, with parts broken away, of the crimping tool;

FIGURE 2 is a fragmentary rear elevational view of the tool;

FIGURE 3 is a plan view of the tool;

FIGURE 4 shows a side elevation of a contoured anvil; and

FIGURE 5 is a schematic plan view of an automobile having one of its doors partially opened, with the crimping tool shown in an operating position at the edge of the door adjacent the door's hinges and being connected with a power-operated hammer.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGURE 1, the crimping tool comprises holder **10**, an anvil **12**, and a hammer **14** pivotally mounted on the holder.

In the presently preferred embodiment the holder includes a guide sleeve or handle **16** and, secured thereto by machine screws **18**, a platform **20**. The guide sleeve includes an upper flange **21** for mounting the platform and is provided with a cylindrical bore **22** extending through the length of the sleeve and terminating in a similar bore **24** through the platform **20**. A bushing **26** is pressed into each end of the bore **22** in the sleeve to receive and guide an axially movable, elongated push rod **28**. The push rod is of a sufficient length to extend above platform **20** and below the lower end of the guide sleeve. The push rod also includes an annular flange **30** at its lower end for purposes to be described hereinafter. A grommet **32**, which is preferably constructed of rubber or a similarly resilient material, is disposed around the push rod and within the annular space defined by cylindrical bore **22** in sleeve **16** and the bushings **26**. The grommet frictionally restrains the push rod to the sleeve and prevents the rod from dropping out of the cylindrical bore when the sleeve is held in an upright position.

The platform **20** includes support blocks **34** which mount a shaft **36**. One end of the shaft is provided with a flat surface **38** which is engaged by a set screw **40** to prevent the shaft from rotating in the support blocks.

The side of the support blocks adjacent anvil **12** is straight (shown in FIGURE 1) and defines a guide edge **41** against which a workpiece **41A** is positioned. The guide edge prevent damage to the workpiece from contacting throat **41B** of the hammer during the crimping operation. In addition, the guide edge enables the operator to guide the workpiece and the crimping tool relative to each other along the contour of the edge to be crimped.

The hammer **14** is mounted on shaft **36** and pivots thereon within the limits defined by the anvil **12** and the platform **20**. The hammer includes an elongated and relatively thin finger **42** extending from the shaft toward the anvil and a more massive body **44** that includes a hole **45** for mounting the hammer on the shaft. As best seen in FIGURE 2, one side of the hammer is recessed and is provided with a hub **46**. The hub is preferably integral with the body and spaces the body between the support blocks to prevent the hammer from sliding on shaft **36** parallel to the axis of the shaft. The lowermost portion of the body, which is in contact with the platform, includes a protrusion **48** extending sideways in the same direction as does the hub. The protrusion has a roughly triangular shape, as best seen in FIGURE 1, and restrains one end of a torsion spring **50** to the hammer. The torsion spring is wrapped around the hub **46** and its other end engages one of the support blocks **34**. The torsion spring thereby biases the hammer in a clockwise direction, as viewed in FIGURE 1, away from the anvil and into contact with platform **20**. Body **44** includes a recess **51** in the side of the body facing the platform **20**. The recess is positioned such that the end of push rod **28** contacts the body in the recess.

The anvil **12** includes a circular support surface or table **56** that is integrally formed with a downwardly extending cylindrical portion **58** resting against platform **20**. A coaxial shaft **60** is recessed from the cylindrical portion **58** and extends into a hole **61** in the platform **20** and the guide sleeve **16**. A spring-loaded friction ball **62** is located in a bore **64** extending horizontally and transverse to hole **61**. A set screw **66** restrains the ball and a compression spring **68** to bore **64**. The force exerted by the ball is sufficient to keep the anvil from inadvertently dropping out of hole **61**. Should a greater restraining force be desired, the shaft **60** can be provided with an annular undercut (not shown) that is engaged by the ball when the anvil is inserted into the hole in the platform.

The anvil **12** shown in FIGURE 1 is provided with a flat surface **70** which is used when the workpiece **41A** has a flat shape. Should the workpiece have a convex contour, anvil **12** is removed from the crimping tool and a convexly contoured anvil **72** (shown in FIGURE 4) is inserted in its place. Similarly, the anvil could be given a concave or any other contour. By giving the anvil a contoured shape, the danger of deforming the workpiece when the hammer strikes against it is avoided. For example, if the anvil shown in FIGURE 1 and having a flat support surface were used for crimping a workpiece with a convex contour, the center portion of the workpiece which is being struck by the hammer is unsupported and the hammer would tend to not only crimp it but also bend and deform it. This would at least give an unsightly appearance to the workpiece and might at the same time, in cases where the piece mates with another one, deform it to such an extent that it becomes defective and unusable.

Table **56** of the anvil can be constructed of a plastic having a high impact strength, such as polyurethane, rubber, also known as polyester rubber, if the crimping tool is to be used on an easily damaged surface. Alternatively, the table **56** can be provided with a plastic insert to achieve the same effect.

To use the crimping tool, an operator grasps the guide sleeve or handle **16** and inserts the push rod **28** extending beyond the lower end of the handle into a power-operated actuator **74** (shown in FIGURE 5) such as a power-operated hammer. It is most convenient to utilize a hammer giving relatively rapid strokes, such as air-operated hand hammers which are widely available on the market. These hammers are generally provided with a socket (not shown) that receives and centers a shaft and that acts against an annular flange secured to the shaft a short distance above the shaft's end. The annular flange **30** shown in FIGURE 1 performs this function and is especially adapted for use in conjunction with such pneumatically-operated hand hammers.

The use of a power-operated hammer having a rapid succession of strokes is preferred since this eliminates the need of securing the crimping tool to such a hammer. This would be necessary if the power-operated hammer emitted relatively long lasting strokes coupled with a large force, since the inertia of the crimping tool would be of little or no aid in preventing the hammer from forcing the hand tool away from it. This principle is well known and is utilized in most pneumatically operated tools.

FIGURE 5 schematically shows a plan view of an automobile having one of its doors at least partially open and showing the crimping tool in a position for crimping a door panel **76** to the frame of the door adjacent the door hinges **78**. A narrow space of about one to two inches is left between the edge of the door and the fender of the automobile such that finger **42** of the hammer **14** can reach into that space and anvil **12** rests against the outside of the door. The operator next energizes the pneumatically-operated hammer **74** which causes the push rod **28** to be forced in a direction toward hammer **14**. The hammer, together with finger **42**, is thereby pivoted until the finger contacts the door panel located intermediate the finger and the anvil and crimps it around the frame of the door. Following a power stroke by the pneumatic hammer, the socket (not shown) is deenergized and moves in a direction away from the crimping tool. This permits torsion spring **50** to pivot the hammer in the opposite and counterclockwise direction, as viewed in FIGURE 1, until body **44** of hammer **14** contacts platform **20**. Thereafter, the socket in the pneumatic hammer is energized again and the cyclic is repeated. After every completed cyclic, the operator moves the crimping tool approximately the width of finger **42** until the full length of an edge has been crimped. The rapid succession of strokes from the pneumatic hammer permits an operator to move along the edge at a steady pace and enables him to crimp an edge within minutes, whereas it took him as much as a half hour in the past where he had to crimp the edge manually.

The subject invention has been described with reference to certain preferred embodiments; it will be understood by those skilled in the art to which this invention pertains that the scope and spirit of the appended claims

should not necessarily be limited to the embodiments described, as certain typical replacements and refinements have been mentioned hereinbefore.

I claim:

1. A portable crimping tool for crimping sheet metal edges, the tool comprising a hand-held holder, a hammer pivotally mounted on the holder, support means mounted on the holder for supporting a part intermediate the hammer and the support means while the part is being crimped and wherein the surface of the support means is contoured to correspond to the contour of the part to be crimped and wherein the hammer coacts with the support means to crimp a portion of the part being in contact with the support means when the hammer is pivoted toward the support means, and means located on the holder between the hammer and the support means contacting the edge of the part to be crimped for guiding the crimping tool and the part to be crimped relative to each other along the edge to be crimped.

2. A crimping tool according to claim 1 wherein the support means include an anvil.

3. A crimping tool according to claim 2 wherein a portion of the anvil supporting the part to be crimped is constructed of a plastic.

4. A crimping tool according to claim 2 wherein the anvil is releasably secured to the holder.

5. A crimping tool according to claim 4 wherein the hammer is spring-biased away from the anvil.

6. A crimping tool according to claim 5 wherein the holder includes a support block for mounting a shaft and wherein the hammer pivots on the shaft.

7. A crimping tool for use in conjunction with a power-operated actuator, the tool comprising a holder, a hammer pivotally mounted on the holder, support means mounted on the holder for supporting a part to be crimped intermediate the support means and the hammer, the support means including an anvil releasably attached to the holder, and means for operatively connecting the hammer with the actuator.

8. A crimping tool according to claim 7 wherein a surface of the support means supporting the part is constructed of plastic.

9. A crimping tool according to claim 7 wherein the actuator is a pneumatic hammer and the holder comprises a sleeve and a platform secured to the sleeve, the sleeve being provided with a bore to receive the means for connecting the hammer with the power-operated actuator.

10. A crimping tool according to claim 9 wherein the platform is provided with a bore for receiving the anvil and including means for restraining the anvil to the platform.

11. A crimping tool according to claim 9 wherein the platform includes a support block for mounting a shaft and wherein the hammer pivots on the shaft.

12. A crimping tool according to claim 11 wherein the hammer is spring-biased away from the anvil.

13. A crimping tool according to claim 12 wherein the means for connecting the hammer with the power-operated hammer include an axially movable rod disposed in the sleeve and in contact with the hammer.

14. A crimping tool according to claim 13 including means for restraining the rod to the sleeve.

15. A crimping tool according to claim 14 wherein the means for restraining the rod to the sleeve include a grommet disposed around the rod.

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U.S. Cl. X.R.

29—243.58; 113—54