United States Patent

[11] 3,601,880

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[21] Appl. No. 796,497
[22] Filed Feb. 4, 1969
[45] Patented Aug. 31, 1971

[54] METAL-WORKING TOOL
19 Claims, 5 Drawing Figs.

[52] U.S. Cl. 29/200, 29/233, 30/363, 59/7
[51] Int. Cl. B23p 19/00
[50] Field of Search 72/391; 29/200, 243.5, 243.53, 233; 59/7; 7/3; 30/363

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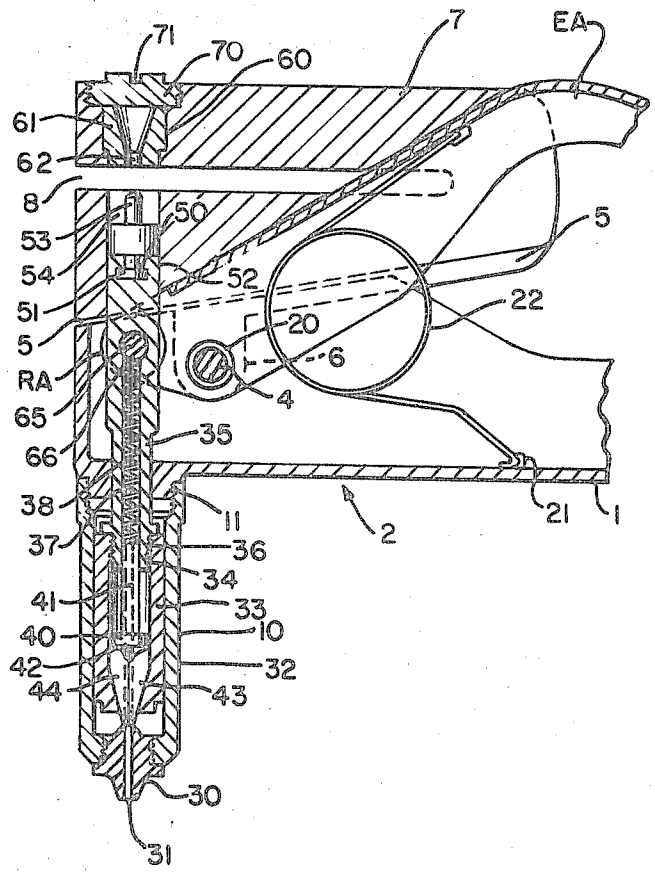
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Assistant Examiner—Donald P. Rooney
Attorney—William R. Price

ABSTRACT: Discloses a hand tool, comprising a combination punch and pop riveter. A drawbar actuated by means of a handle in the form of a lever moves the punch from retracted to extended position and in the same motion actuates the pop rivet assembly so as to pull the shaft of the pop rivet assembly through the collar forming the fastener so as to flare the collar and form a bottom flange. The combination of the two attachments operated off the same mechanism eliminates the necessity of carrying a separate punch or drill on the job for use with the pop riveter.



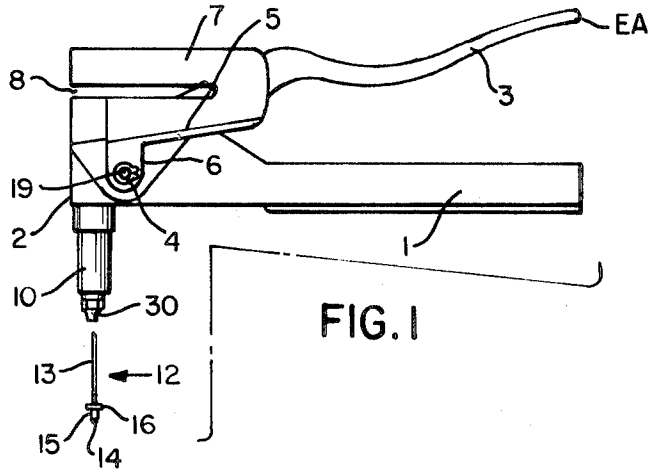


FIG. 1

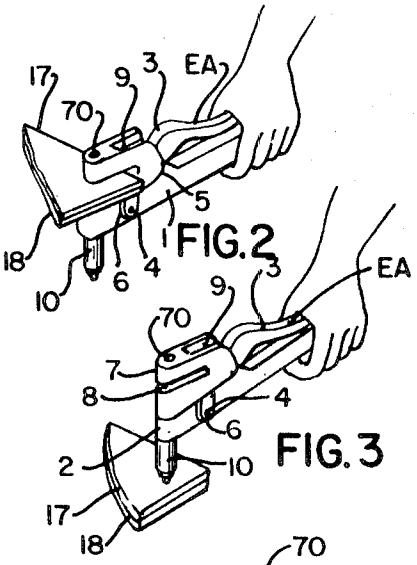


FIG. 2

FIG. 3

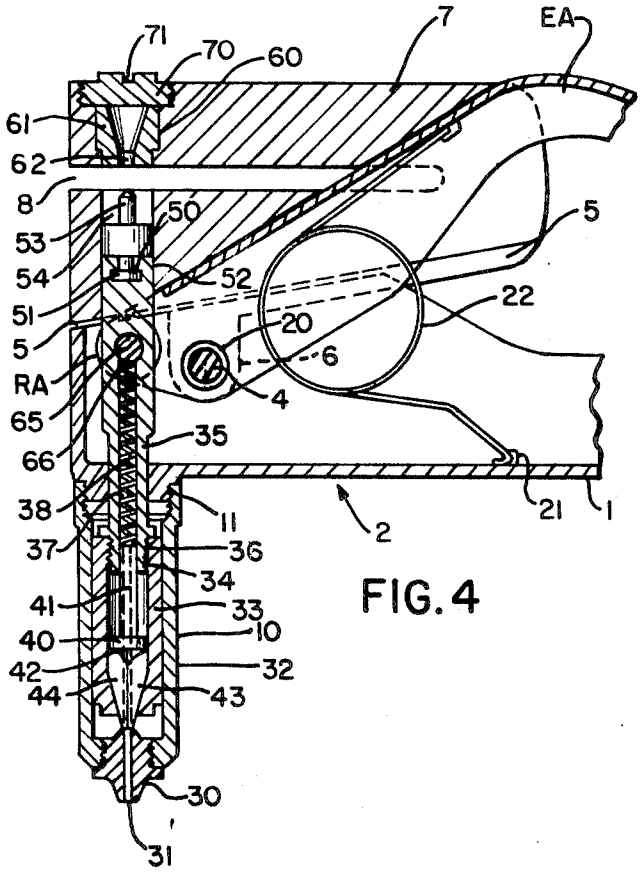


FIG. 4

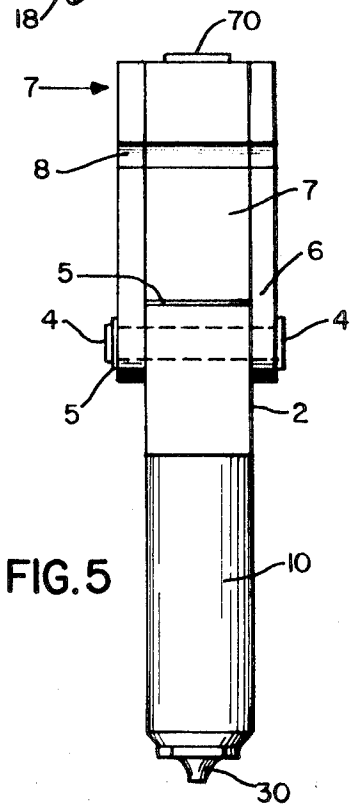


FIG. 5

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METAL-WORKING TOOL

FIELD OF THE INVENTION

This invention relates generally to hand tools and more specifically, to tools for punching holes in sheet metal, and for joining sheet metal pieces together by means of pop rivets. More specifically, this invention relates to a combination punch and die assembly and a pop rivet assembly whereby holes may be punched in sheet metal and pop rivets set in the holes thus formed for joining the piece of sheet metal together.

DESCRIPTION OF THE PRIOR ART

Pop rivets have found considerable acceptance in the sheet metal industry. Pop rivets consist of a metal collar, having an upper flange and containing a shaft with an enlarged head extending through the collar. If the shaft is pulled through the collar, the enlarged head flares the bottom portion of the collar to form a lower flange. Thus, it is necessary in the use of the pop rivets to first form a hole that the metallic fastening collar can be inserted into, prior to flaring the bottom portion of same to form a fastening lower flange. Since much sheet metal work is done in construction sites where power is not yet available, in many instances, a power drill is not feasible so that hand-operated punches must be utilized This necessitates, then, that the workmen carry both a hand-operated punch and a pop riveter or have available power and a power drill for drilling the holes through the sheet metal pieces to be joined together by pop rivets. Previously, Granberg in U.S. Pat. No. 3,156,087 and 3,182,442 has proposed tools for removing rivets from a chainsaw and a separate attachment for application of a new rivet in the chainsaw. Essentially, this tool consisted of a plier-type hand tool containing a punching head which fit over a recess between two anvils so that the punch could force the rivet through the chainsaw pieces into the recess. A separate spinning attachment was contained in the tool and a socket for a rivethead so that a new rivet could be spun around into position as the saw was put back together. A similar type arrangement was proposed by Urbaitis for a chainsaw in U.S. Pat. No. 3,233,402 and another type of tool for the same general purpose was disclosed in U.S. Pat. No. 3,234,643 by Johnson et al., for repair of mower blades et cetera. Insofar as I am aware, however, there has not been proposed a mechanism for punching a hole in sheet metal in combination with an attachment for inserting a pop rivet through the holes punched to join pieces of sheet metal together. Further, insofar as I am aware, there has not been proposed a tool wherein the action of extending the punch simultaneously actuated the pop rivet assembly.

SUMMARY OF THE INVENTION

According to my invention, there is provided a hand metal working tool, containing a punch and die assembly and a pop rivet assembly with a common drawbar action and means for actuating said drawbar to move the punch from a retracted to extended position and to simultaneously actuate the pop rivet assembly. Further, there is provided a tool whereby the workmen may punch holes in sheet metal of a specific size and thereafter join the sheet metal pieces together by means of a pop rivet. Further, there is provided a punch and die assembly which may be interchanged with punch and die assemblies of different sizes for use with various size pop rivets. Other advantages will occur to those skilled in the art from the detailed description of the invention hereinafter provided. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation illustrating the overall configuration of the tool of this invention.

FIG. 2 is a view in perspective, illustrating the use of the tool to punch holes in two pieces of sheet metal.

FIG. 3 is another view in perspective, illustrating the use of the tool in joining the pieces of sheet metal together with a pop rivet.

FIG. 4 is a sectional view, partially in elevation, illustrating the mechanism of both the pop rivet assembly and the punch and die attachment and the drawbar, actuating both of these attachments.

FIG. 5 is a front elevational view, illustrating generally the tool and the relationship of the pop rivet assembly and the punch assembly to the first housing. DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to the drawings in detail, the tool consists of a bottom essentially immovable handle 1, which in the front portion forms a main or first housing 2 for the various parts of the actuating mechanism. The upper handle 3 consists of an effort arm EA, and a resistance arm RA, forming a lever with its fulcrum at 4, which consists of a pin driven through the main housing 2 and the upper handle 3 and the depending ears 6 of punch attachment 7, so as to hold the inclined surface 5 of the punch attachment in registry with the upper surface of the main housing 2. The upper portion of the punch attachment 7 contains a throat 8 for insertion of the sheet metal pieces 17 and 18 and the attachment contains a bifurcation 9 in the rear portion for provision of the effort arm EA of upper handle 3. The pop rivet attachment 10 is threadably attached to a threaded boss 11 on the lower surface of the first housing 2.

As previously mentioned, the pop rivet 12 consists of a fastener collar 15 containing an upper flange 16 through which is inserted a shaft 13 containing an enlarged head 14. If the fastener collar 15 is inserted through two holes in registry in two pieces of sheet metal so that the upper flange 16 is in abutment with the upper surface surrounding the upper hole of sheet metal piece 17 and the shaft 13 is drawn upwardly through the fastener collar 15, the enlarged head 14 of the shaft 13 will flare the lower portion of the fastener collar 15 to form a lower fastening flange on the bottom surface of the sheet metal piece 18. If sufficient stress is exerted on the shaft 13, the shaft will break and the upper and lower flanges of the fastener collar will hold the sheet metal pieces 17 and 18 together.

As previously indicated, the fulcrum for the upper handle is a pin 4, which is journaled in bushing 20 in upper handle 3 and which extends through depending ears 6 of the punch attachment 7 and is held in position by means of snap ring 19. The upper handle 3 is held in open position as shown in FIG. 4 by means of spring 22, mounted in detent openings 21 on upper and lower handles 1 and 3.

Referring now to the pop rivet attachment 10; this consists of an immovable outer shell, threadably attached to threaded boss 11, located on the lower surface of the first housing 2. At the bottom of the outer shell 32 is a threaded fitting 30 containing a central bore 31 for provision of shaft 13 of the pop rivet 12. The fitting 30 fits against the upper flange 16 of the fastener collar 15 of the pop rivet 12. Inner shell 33 is internally threaded at point 34 for threaded attachment to the external threads 36 of drawbar 35 which extends through the bore of threaded boss 11. The lower portion of drawbar 35 contains a central bore 37, running from the bottom of the drawbar to a point adjacent hole 66 in which the pin 65 is fitted. Contained in the central bore 37 is a spring 38 which is biased against the upper end of plunger 40, which, in turn, contains a central bore 41 in registry with the central bore 37 of the drawbar 35. Plunger 40 contains a conical head 42, which fits into a conical depression formed in the top of the pair of jaws which fit in the tapered recess 44 of inner shell 33 and project therefrom. Thus, it will be seen that shaft 13 of pop rivet 12 extends through the central bore 31 of fitting 30 through the jaws 43 and into the central bore 41 of plunger 40 and into the central bore 37 of the drawbar 35 to be surrounded by spring 38. The drawbar is attached to the resistance arm RA of the lever formed by upper handle 3 by means of pin 65, fitted through the hole 66 in the middle of the drawbar 35 so that when the effort arm EA is closed, as shown in FIG. 2 and 3, the resistance arm RA of the upper handle 3, moves drawbar attachment upwardly so that the plunger 40 is biased against the spring 38 and causes jaws 43 to increase their grip on the shaft 13 of pop rivet 12 and thus draw the

shaft including the enlarged head **14** through the fastening collar **15**. Since the upper flange **16** is in engagement with the fitting **31**, this flares the fastening collar and forms a lower flange to join two pieces of sheet metal together. Sufficient stress is placed on shaft **13** that the shaft breaks. As pressure is released on the effort arm EA of handle **3**, spring **22** pulls the handle **3** into open position as illustrated in FIG. **1**, thus reversing the rectilinear movement of drawbar **35** downwardly so as to relieve the pressure of spring **38** against plunger **40**, thus allowing the jaws **43** to open and release the broken part of shaft **13**.

At the upper end of the drawbar **35** is located a recess **50** for provision of head **51** of the punch **53**, which, as illustrated in FIG. **2**, has its body **52**, slidably positioned in the bore **54** of the punch attachment **7**. In alignment with bore **54**, is a recess **60** in which die button **61** containing die **62** is fitted and secured into position by means of threaded cap **70** having a slot **71** for provision of the blade of a screwdriver.

It will be appreciated that the punch **53** can be provided in several sizes, since the only criterion is the size of the head **51** so it fits in the recess of drawbar **35** and the diameter of the body **52** so that it slidably fits in bore **54**. Further, the die **62** may be removed so that a die of different size corresponding to the size of punch **53** may be inserted therein, since again the only criterion is the size of the die button **61**.

It will be appreciated, of course, that the fitting **30** and the bottom of the outer shell **32** may be interchanged with another fitting **30**, having a different bore **31** so that various size pop rivets can be utilized. Insofar as the jaws **43** are concerned, of course, there is sufficient play that minor variations in shaft size **13** are immaterial with the various sized pop rivets.

It will be appreciated that I have provided a useful combination tool wherein the action provided through the resistance arm RA of the lever of handle **3** in the rectilinear movement of drawbar **35** simultaneously extends punch **53** and actuates the mechanism of the pop rivet attachment **10**. This allows the operator to use the punch and pop rivet assembly simultaneously or alternately as preferred.

I claim:

1. A metalworking hand tool, including, in combinations:
- A. a pop rivet assembly for joining sheet metal pieces together;
- B. a punch assembly including a punch and die for punching holes in sheet metal for insertion of a pop rivet;
- C. a first housing;
- D. a drawbar, operatively connected to said pop rivet assembly and to said punch and mounted in axial alignment with said pop rivet assembly and said punch in said first housing for rectilinear movement to actuate said pop rivet assembly to draw a pop rivet shaft into said housing and for simultaneously moving said punch between retracted and extended positions;
  - 1. said rectilinear movement of said drawbar which acts to extend said punch being the same rectilinear movement which draws a pop rivet shaft into said housing;
- E. means for moving said drawbar;
- F. said pop rivet assembly comprising:
  - 1. an inner shell attached to said drawbar so as to move with said drawbar:
  - 2. a pair of jaws disposed within said inner shell for grasping the shaft of a pop rivet;
  - 3. an exterior shell, forming part of said first housing and being immovable relative to said inner shell;
  - 4. a fitting at the end of said exterior shell to engage the upper flange of the fastener of said pop rivet as the shaft is drawn through said fastener and into said housing so as to flare the bottom of the fastener and form a lower flange.

2. a metal working tool, as defined in claim **1**, in which said pop rivet assembly includes:
- A. pressure means for applying increased pressure to said pair of jaws as the jaws move with said inner shell to move said shaft of said pop rivet.

3. A metal working tool, as defined in claim **1** in which said drawbar contains an internal bore at one end, for insertion of the end of the shaft of said pop rivet.

4. A metalworking tool, as defined in claim **2** in which drawbar contains an internal bore at one end, the further combination therewith of a spring contained in the bore of said drawbar and mounted so as to exert pressure on said pressure means.

5. A metal working tool, as defined in claim **2**, in which said pressure means include a plunger having a central bore through which said shaft of said pop rivet projects.

6. A metalworking tool, as defined in claim l, in which said inner shell contains a tapered recess, open at its lower end, for provision of said jaws.

7. A metalworking tool, as defined in claim **6**, in which the lower end of said jaws are tapered so as to fit into the tapered recess of said inner shell and project through the open end of said tapered recess.

8. A metal working tool, as defined in claim **4**, in which said plunger has a shaped head, and in which the upper end of each of said pair of jaws is shaped so that the pair of jaws form a depression which registers with said shaped head.

9. A metal working tool, as defined in claim **1**, in which said punch assembly includes:
- A. a second metal housing adapted to register with the first housing and including:
  - 1. a bore for slidably mounting said punch in operative relation with said drawbar;
  - 2. a recess in alignment with said bore for mounting of said die in alignment with said punch;
  - 3. mounting means for mounting said second metal housing to said first housing.

10. A metal working tool, as defined in claim **9** in which:
- A. said housing contains a throat disposed between the bore for said punch and the recess for said die.

11. A metalworking tool, as defined in claim **9**, in which said mounting means include depending ears, mounted over said first housing.

12. A metal working tool, as defined in claim **9**, in which:
- A. said bore for said punch contains the end of said drawbar.

13. A metal working tool, as defined in claim **9**, in which said drawbar contains a recess for engagement with the head of said punch.

14. A metalworking tool, as defined in claim **9**, in which said die is removably secured in said recess by means of a threaded cap.

15. A metalworking tool, as defined in claim l, in which:
- A. said means for moving said drawbar includes a handle forming a lever and having a resistance arm and an effort arm, said resistance arm being inoperative connection with said drawbar to effect said rectilinear movement of said drawbar.

16. A metalworking tool, as defined in claim **15**, in which:
- A. said operative connection of s said drawbar with the resistance arm of said lever is by means of a first pin passing through the end of said resistance arm and the middle portion of the body of said drawbar.

17. A metalworking tool, as defined in claim **15**, the further combination therewith of a spring, mounted so as to exert pressure against said effort arm of said lever.

18. A metalworking tool, as defined in claim **15**, in which said handle and said first housing are joined together by means of a second pin which serves as a fulcrum for said lever.

19. A metalworking tool, as defined in claim **18**, the further combination therewith of a second housing for said metal punch assembly:
- A. said second housing containing a pair of depending ears which extend over either side of said first housing:
  - 1. said depending ears being pierced by the pin joining said first housing and said handle and serving as the fulcrum for said handle.