May 15, 1956 W. A. BARNES 2,745,300

COMPOUND ACTION GRIP AND WORK PERFORMING TOOL

Filed May 5, 1953 2 Sheets-Sheet 1

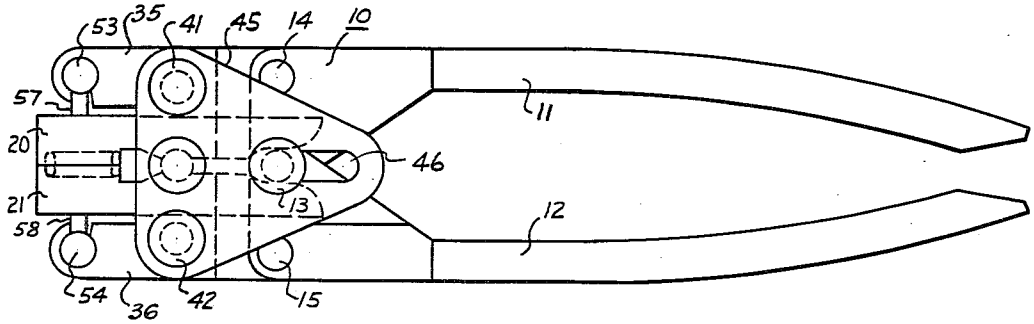


FIG. 1

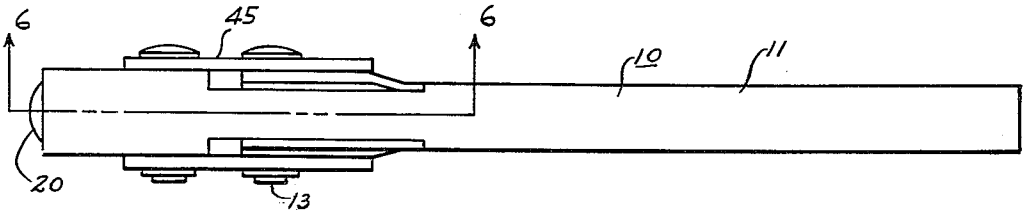


FIG. 2

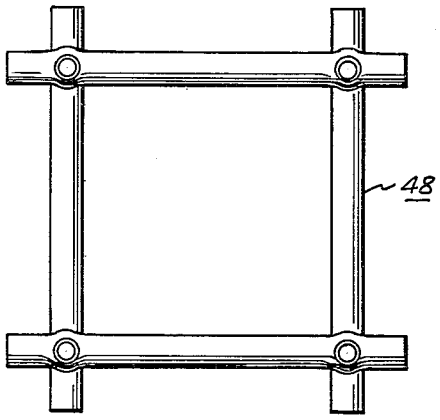


FIG. 5

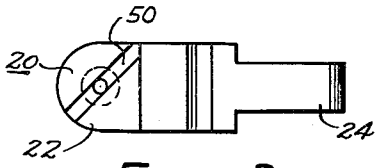


FIG. 3

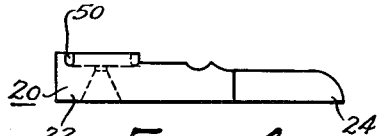


FIG. 4

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COMPOUND ACTION GRIP AND WORK PERFORMING TOOL

Filed May 5, 1953 2 Sheets-Sheet 2

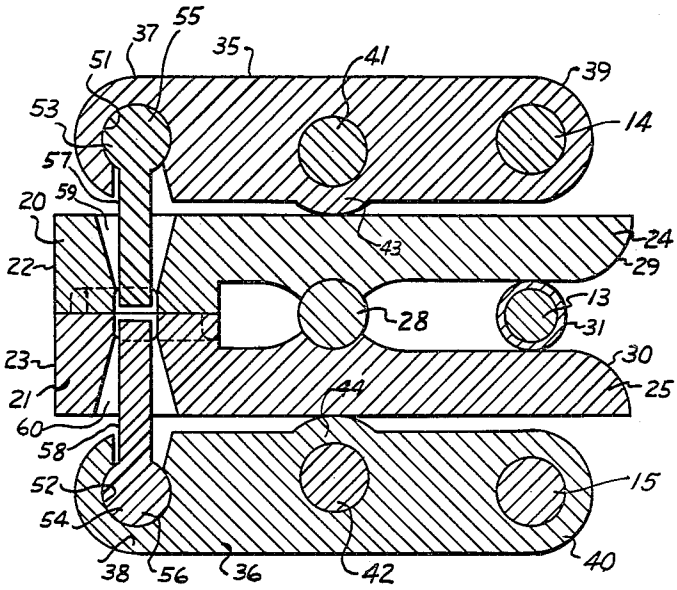


FIG. 6

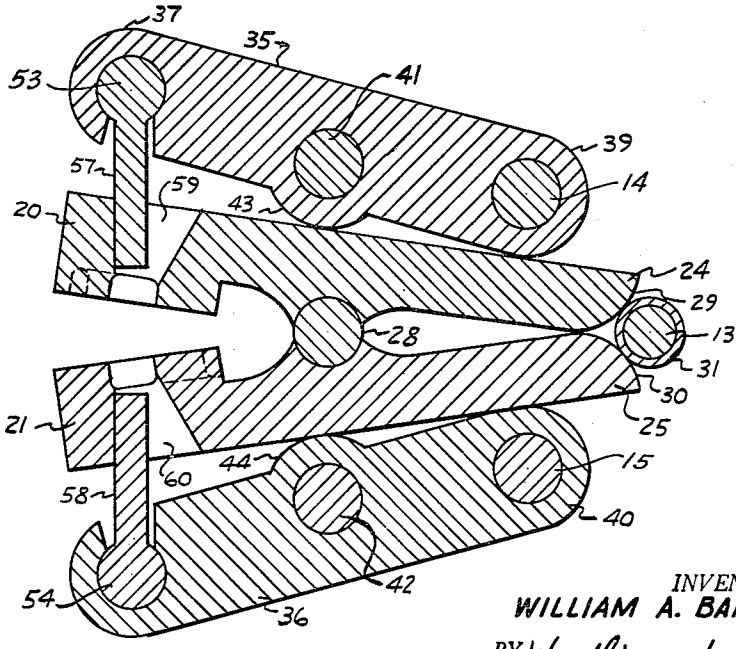


FIG. 7

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COMPOUND ACTION GRIP AND WORK PERFORMING TOOL

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5 Claims. (Cl. 78—82)

This invention relates in general to uniting of metal members by cold pressure uniting or welding of the metal structures under controlled conditions of pressure and confined flow of metal, and relates more specifically to tooling to produce the desired union.

The union of two metallic members by the use of controlled cold flow of the metal structures is relatively recent accomplishment insofar as reducing the basic principles to a practical and useable procedure is concerned. It has long been known that metal can flow at room temperature under proper conditions of loading. It is possible that the uniting, or welding, of two metal objects by controlled application of high pressure at room temperature has been known. However, the reduction of this knowledge to a practical level has only recently been accomplished. United States Patent No. 2,522,408 was granted to Sowter for his development in cold pressure welding.

Even with the further advance in knowledge of basic principles, there has not been provided practical tools for commercial application of these principles. Knowledge will seldom serve mankind unless made available on a practical level for mass use.

Some metals will actually diffuse in such manner that a polished section of the union will not reveal a distinct junction between the two original members. Other metals have a distinct line dividing the original members. It has not definitely been determined what the nature of the union is in this line. It is definitely established, however, that an exceptionally strong union is produced between the two original members whether or not there is an actual diffusion. It is not the concern of the present invention whether the union is achieved by actual diffusion or some other phenomena of metal union, but rather with the results obtained. Accordingly, in this specification and in the claims, reference will be made to a union between members caused by controlling cold flow of the metal structures, or to a cold weld. It is not intended that this invention should be limited by the choice of words to describe the junction between the members.

Therefore, an object of this invention is to provide a tool for holding two work-pieces in proper relative position and confined to a predetermined flow, while separately applying a work force causing the desired high pressure flow.

Another object is to provide a tool having separate work jaws for first grasping work-pieces and thereafter applying a work action upon the pieces so held.

And another object is to operate the separate work jaws from one continuous driving motion of the primary drive means.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a side elevation of a hand tool incorporating the principles of this invention;

Figure 2 is a top view of the tool;

Figure 3 is a face view of one work holding jaw;

Figure 4 is a side elevational view of the jaw;

Figure 5 is a section of a grid structure made by the tool and process of this invention;

Figure 6 is a sectional view taken along line 6—6 of Figure 2; and,

Figure 7 is a view similar to Figure 6 but with the jaws and activating mechanism in open position.

In order to illustrate the principles of the invention as adapted to a practical application, a hand type tool **10** is illustrated in the drawing. The tool **10**, in its broadest concept, comprises first and second handle members **11** and **12** with first and second jaws **20** and **21** for holding workpieces, and with first and second work performing jaws **35** and **36** movable relative to the work-holding jaws **20** and **21** for performing work on workpieces held between jaws **20** and **21**.

The handles **11** and **12** are pivotally interconnected with both sets of jaws by a compound pivot arrangement, sometimes referred to herein as first pivot means. The first pivot means comprises a pivot **13** which actually interlocks the two handles **11** and **12** together, and pivots **14** and **15** inter-connecting the handle **11** with jaw **35**, and handle **12** with jaw **36**, respectively.

Although the basic principles of this invention may well be applied to other types of work operations, the illustrated tool **10** is designed for uniting workpieces by confined flow of metal under restricted conditions of high pressure. Whenever two workpieces must be joined in a particular relationship, and especially when wire and rod members are to be joined in overlapping positions, it is difficult to hold the workpieces in the proper relationship and also confine the flow for causing a proper union of the workpieces. It has been found that the workpieces, such for example as the workpiece illustrated in the form of a grid **48**, may be successfully held in proper relationship and under confinement of flow by providing a work clamping set of jaws, such as jaws **20** and **21**, and then the work performed upon the workpieces by a second set of jaws, such as the jaws **35** and **36**, which are shown in a straddle position in the preferred embodiment of the tool.

In Figure 3 of the drawings, there is illustrated a slot **50** in the face of the jaw **20** for holding a wire. The face of jaw **21** is formed with the slot extending in an opposed direction for holding another wire. The slots are relieved at the point of union in order to allow a confined amount of flow sufficient to cause the metal to unite. The grid **48** is an example of the type of work which can be produced with the face of holding jaws grooved as illustrated. It is to be understood that the illustrated workpiece and the illustrated formation of the face of the holding dies is by way of example only, and that a wide variety of workpieces may be thus held and worked upon.

In order to produce the holding and working action, the jaw **20** is provided with a work end **22** and a drive end **24**. Jaw **21** is likewise formed with a work end **23** and a drive end **25**.

The jaws **20** and **21** are pivoted between the work ends and the drive ends by a separate pivot pin **28**, although other means of pivoting can be employed if desired.

The work performing jaws **35** and **36** are likewise provided with a work end **37** and a drive end **39** on the jaw **35**, and a work end **38** and a drive end **40** on the jaw **36**. The jaws **35** and **36** are pivoted between their ends by means of a pivot **41** and a pivot **42**. In addition to the pins **41** and **42**, a rocker surface **43** on jaw **35**, and a rocker surface **44** on jaw **36** is provided to ride on the outside surface of jaws **20** and **21**, respectively. The

rocker surfaces take the bulk of the pivot load whereas the pins 41 and 42 serve primarily as retainers and guides.

In the illustrated embodiment of the tool, the pivots 28, 41, and 42 are held in alignment with respect to one another, and the pivot 13 is guided for longitudinal movement with respect to the center line of jaws 20 and 21 by means of a plate 45. A slot 46 in the plate 45 allows the pivot 13 to move longitudinally, but the fixed relationship of pins 28, 41, and 42, together with the longitudinal slot 46, maintains the two sets of jaws and the handles in proper operative alignment. The pin 28 is provided in order to prevent longitudinal shifting of the jaws 20 and 21, and may be replaced with mutually formed faces between the jaw members, providing other means is substituted to prevent longitudinal shifting of these jaws.

The drive ends 24 and 25 of jaws 20 and 21 are tapered, as illustrated best in Figures 6 and 7, to present cam surface ends 29 and 30. The pivot pin 13, carried by the handles 11 and 12, tends to move between the cam surfaces 29 and 30 as the handles are closed, and thus wedge the drive ends 24 and 25 apart and close the work ends 22 and 23 upon a workpiece. A sleeve 31 around the pin 13 may be provided as a replaceable wear member, if desired.

As previously indicated, the pivots 14 and 15, which are placed, as illustrated, in lateral position with respect to pivot pin 13, unite the drive ends 39 and 40 of jaws 35 and 36 with the handles 11 and 12, respectively.

The first pivot means previously referred to therefore can be considered illustrated as the compound action of pivots 13, 14, and 15. The handles pivot above all three of these points during a closing action. During operation the handles may be considered to be closing together from a maximum spread position. In the maximum spread position the pivot pin 13 will be retracted in slot 46 to the position illustrated in Figure 7. Because any retraction of pin 13 must be accompanied by a reduction of the distance between pivots 14 and 15, the jaws 35 and 36 will be pivoted to the open position illustrated in Figure 7 and will consequently press down upon the drive end of the jaws 20 and 21 and cause an opening of these jaws. As the handles are closed, however, the end 13 will wedge between the drive ends 24 and 25, and simultaneously the pins 14 and 15 will separate. As a consequence, the jaws 20 and 21 close upon a workpiece or workpieces, and the jaws 35 and 36 close to perform a work action upon the workpieces. By a choice of design of the cam surfaces 29 and 30, the relative speed of closing between the work holding dies 20 and 21, and the work performing jaws 35 and 36 may be altered as desired. Steep surfaces will cause a rapid closing, whereas slow tapered surfaces will cause a slow closing.

The particular illustrated tool 10 is adapted to form the type of union which will produce a workpiece such as grid 48 by means of hammers 53 and 54 extending through suitable tapered openings 59 and 60 in the jaws 20 and 21, respectively. The jaw 35 is provided with a lateral keyhole slot 51, and the jaw 36 is provided with a similar lateral keyhole slot 52. The hammers 53 and 54 are provided with plug portions 55 and 56, respectively, and also with stems 57 and 58, respectively. The stems extend into the openings 59 and 60, and are guided into proper alignment by means of the taper of these openings. Preferably, the thickness of the jaws 20 and 21, and the length of the stems 57 and 58 are such that the stems will always be engaged in the jaw. The keyhole slot arrangement, and the matching plug and stem type of construction provide interchangeability of the hammer members and also allow these hammer members to swing for self-alignment with respect to the closed position of the jaws 20 and 21.

It should be noted that the jaws 20 and 21 are formed to produce the desired holding and confining without actually doing an appreciable amount of deformation upon the workpieces. Therefore, although the jaws 20 and 21 actually come in contact in the illustrated embodiment of the invention, with wider members or with sheet stock, the jaws may be relieved such that they would not touch in their unloaded condition, but will produce a firm holding action upon the workpieces when loaded.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A tool adapted to grip workpieces and separately perform work thereon, comprising, first and second handle members, first and second work-member holding jaws, first linkage means between the handle members and the work-member holding jaws providing closing movement of the work-member holding jaws upon closing movement of the handles, first and second work performing jaws movable relative to said work-member holding jaws for performing work on work pieces held thereby, and second linkage means between the handles and work performing jaws providing driving movement of said work performing jaws upon closing movement of the handles.

2. A tool adapted to grip workpieces and separately perform work thereon, comprising, first and second handle members, first and second work-member holding jaws in opposed facing relationship, first linkage means between the handle members and the work-member holding jaws providing closing movement of the work-member holding jaws along a fixed path toward one another upon closing movement of the handles, first and second work performing jaws in lateral position with respect to said holding jaws and movable relative to one another and the holding jaws along said fixed path for performing work on workpieces held thereby, and second linkage means between the handles and work performing jaws providing driving movement of said work performing jaws upon closing movement of the handles.

3. A tool adapted to grip workpieces and separately perform work thereon, comprising, first and second handle members, first and second work-member holding jaws in opposed facing relationship, first linkage means between the handle members and the work-member holding jaws providing closing movement of the work-member holding jaws along a fixed path toward one another upon closing movement of the handles, first and second work performing jaws in lateral position with respect to said holding jaws and movable relative to one another and the holding jaws along said fixed path for performing work on workpieces held thereby, second linkage means between the handles and work performing jaws providing driving movement of said work performing jaws upon closing movement of the handles, said work-member holding jaws have contactable face surfaces with workpiece receiving socket portions proportioned to interfit with particular workpieces and restrict the flow of the workpieces to a predetermined pattern, a work-tool receiving opening through each holding jaw from the back thereof opening in said face surface, a lateral keyhole slot in each work performing jaw, a rotatable plug in each keyhole slot, and a work ram carried by each plug, said ram extending into the opening through the adjacent holding jaw, said rams proportioned to extend toward one another a predetermined distance in the closed position of said holding and work-performing jaws.

4. A tool adapted to grip workpieces and separately perform work thereon, comprising first and second handle members, first pivot means pivotally mounting

said handle members, first and second work-member holding jaws, each holding jaw having a work end and a drive end, second pivot means pivotally mounting said holding jaws for pivotal movement about a position between the said ends, cam and cam follower surfaces interconnecting the said drive ends of said holding jaws and said handle members and thereby providing pivotal closing movement of said holding jaws upon closing movement of the handles, first and second work performing jaws in lateral position with respect to said holding jaws, said work performing jaws having a work end and a drive end, third pivot means pivotally mounting said holding jaws for pivotal movement about a position between the said ends, means holding said second and third pivot means in relatively fixed location with respect to one another, said first pivot means for the handle members including a central pivot joining said handle members and two jaw pivots laterally spaced with respect to said central pivot, said jaw pivots interconnecting a said drive end of a said work-performing jaw with a said handle member, said central pivot being free to shift as the handle members operate, said work-performing jaws thereby closing as the handle members close, the relative speed of closing of the holding jaws and the work-performing jaws being controlled by the slope of said cam and cam follower means.

5. A tool for joining workpieces by confined flow and pressure, comprising, first and second jaw couples in lateral relationship, said first jaw couple in facing position and having surface forms cooperating to define positioning and flow restricting recesses for holding workpieces, means to close said first jaw couple in a tight clamping action upon workpieces, said second jaw couple in lateral position with respect to said first jaw couple, and means to close said second jaw couple with respect to said first jaw couple, said second jaw couple having workpieces forming surfaces to contact and perform work upon workpieces held by said first jaw couple.

References Cited in the file of this patent

UNITED STATES PATENTS

358,016	Clark	Feb. 22, 1887
673,193	Callison et al.	Apr. 30, 1901
1,153,391	Hughes	Sept. 14, 1915
2,328,747	Schweidler	Sept. 7, 1943
2,359,083	Carlson	Sept. 26, 1944
2,575,630	Klenk	Nov. 20, 1951