United States Patent

Allen

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[54] **COMPOUND ACTION TOOL**

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[52] **U.S. Cl.** **72/409,** 81/347

[51] **Int. Cl.** **B21d 9/08**

[58] **Field of Search** ..... 72/409, 410; 29/203 H, 29/203 HC, 203 HM, 203 HT, 212 R, 212 D; 81/347–351, 385, 386, 405, 406, 418

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Assistant Examiner—Michael J. Keenan
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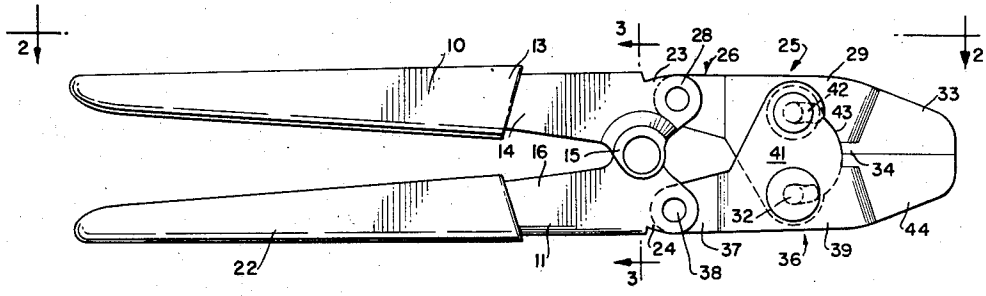
[57] **ABSTRACT**

The specification discloses a compound action tool of the pliers type which is commonly employed for crimping purposes. The tool comprises a pair of handles each having a laterally extending ear at one end with the ears overlapping and pivotally connected. An arm is pivoted to the end of each handle and terminates in a jaw. Each arm has a lobe extending laterally towards the other arm. Each arm is formed with an arcuate slot in the region of the lobe with each slot receiving a pin carried by the other lobe. The end edge of each lobe is formed as a curved cam surface which is engaged by a portion of the jaw on the other arm which projects therefrom and overhangs the cam surface.

4 Claims, 5 Drawing Figures



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SHEET 1 OF 2

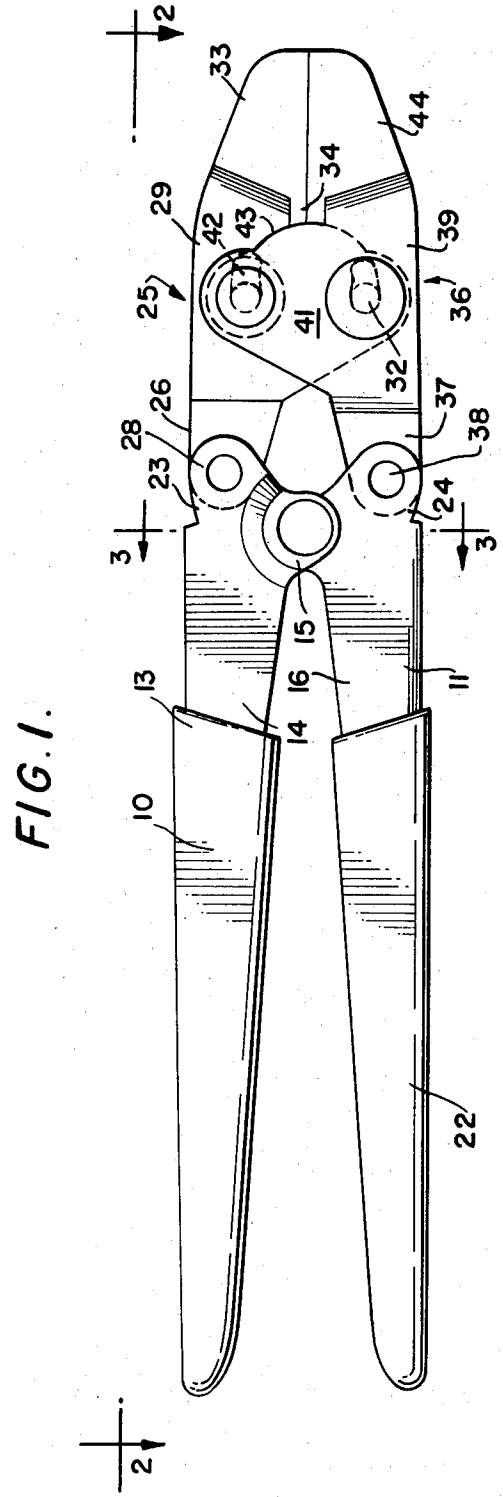

FIG. 1.

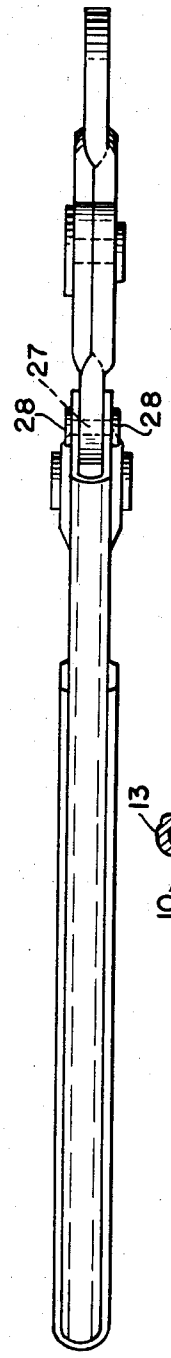

FIG. 2.

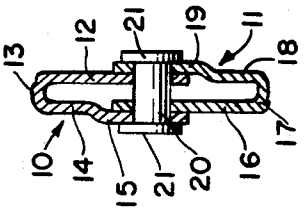

FIG. 3.

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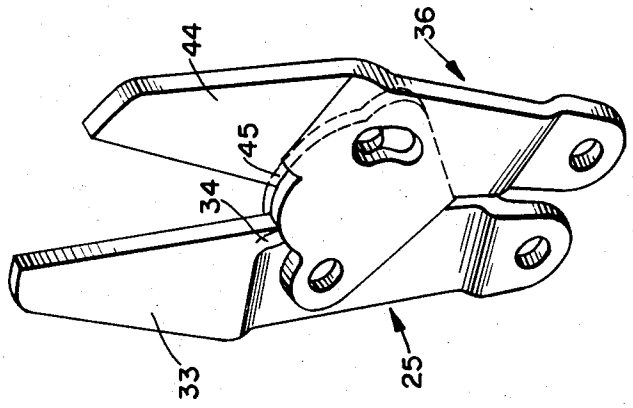
FIG. 5.



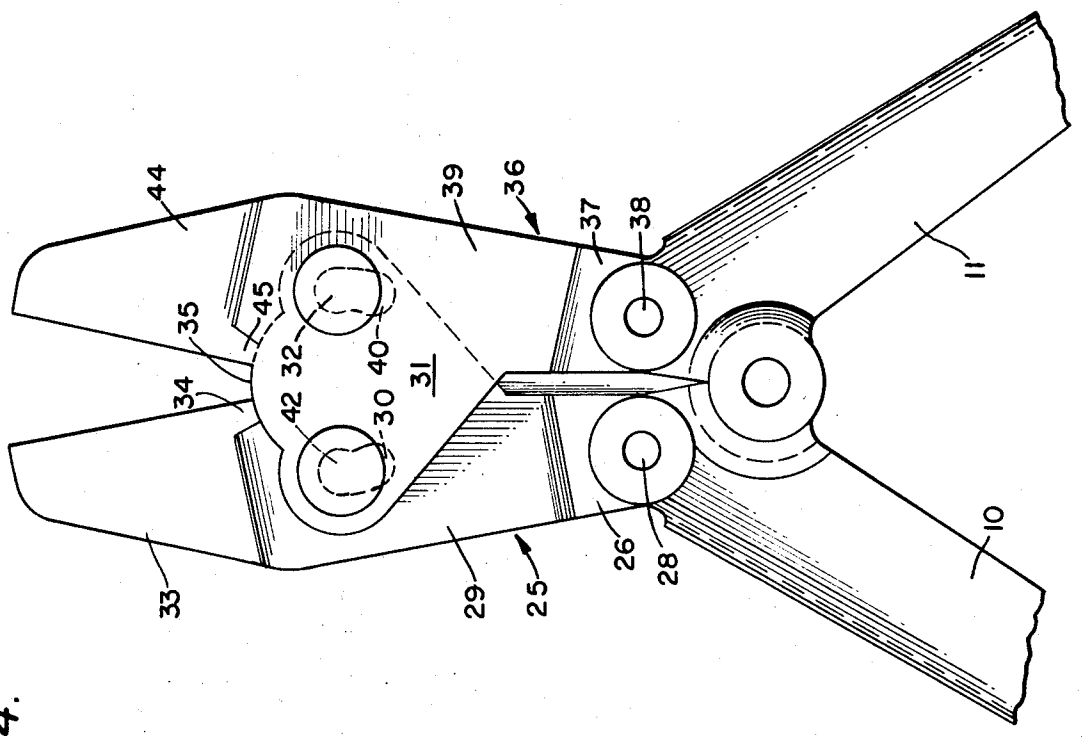


FIG. 4.

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COMPOUND ACTION TOOL

The present invention relates to tools of the pliers type which are employed for crimping purposes and is concerned primarily with such a tool which includes a compound action for transferring compressive forces on the handles to jaws which move together and under conditions of high mechanical advantage and in which the movements of the jaws are properly oriented until work is engaged by the jaws.

BACKGROUND OF THE INVENTION

Tools of the general type with which the present invention is concerned are now in widespread use. A tool of one class includes as characteristic and essential elements a pair of handle levers each having a laterally extending ears at one end with the ears on the two levers overlapping and pivotally connected. A jaw carrying arm is pivotally connected at one end to each lever at the end adjacent the ear thereon. Each of these arms is formed with a pivot hole and crosspieces extend across the arms and have pins received in the holes. Thus a certain degree of mechanical advantage is provided. A third pivot pin is located in the region of the crosspieces and is received in recesses in the edges of the arms. This pin provides for a rocking motion of the arms and serves to assist the movement of the jaws as they move together to engage the work.

The now known tools of this type are fairly complex and the mechanical advantage offered thereby is determined by the distance between the pivotal connection of an arm to a handle lever and the pivot pin. If a tool is to be compact the mechanical advantage is limited by this distance.

OBJECTS OF THE INVENTION

With the foregoing conditions in mind the present invention has in view the following objectives:

1. To provide a tool of the character aforesaid which is highly simplified.
2. To provide a tool of the type noted which is compact and which includes a novel compound action which affords a maximum of mechanical advantage for the size limitation of the compact mechanism.
3. To provide in a tool of the kind describe, a new and improved arrangement for orienting the movement of the jaws as they approach the work.

Various other more detailed objects and advantages of the invention such as arise in connection with carrying out the above noted ideas in a practical embodiment will in part become apparent and in part be hereinafter stated as the description of the invention proceeds.

SUMMARY OF THE INVENTION

The foregoing objects are achieved by providing a compound action tool comprising a pair of handle levers each having a laterally extending ear at one end with the ears overlapping and pivotally connected. Pivoted on the end of each handle lever at the end adjacent to the ear thereon is an arm which is formed with a jaw at its free end. Each of these arms is formed with a laterally extending lobe which overlaps the other arm. Each arm is formed with an arcuate slot that receives a guide pin on the lobe of the other arm. Each lobe has an end edge including a curved cam surface. Each jaw is formed with a portion that projects from the plane of a side face thereof and engages the cam surface on the lobe of the other arm. The engagement of these overhanging portions of the jaws with the cam surfaces orients the movement of the jaws as they approach the work to be gripped by the jaws.

For a full and more complete understanding of the invention reference may be had to the following description and accompanying drawings wherein:

FIG. 1 is an elevation of a compound action tool embodying the precepts of the present invention with the jaws in closed position.

FIG. 2 is a side elevation of the tool looking in a direction normal to the showing of FIG. 1.

FIG. 3 is a cross section through the pivotal connection of the handle levers, being taken on the plane of the line 3—3 of FIG. 1.

FIG. 4 is a detailed elevation, taken on an enlarged scale depicting the jaws in opened position; and

FIG. 5 is a detailed perspective, also on an enlarged scale of the jaws and lobes, bringing out particularly the relation of the overhanging portions of the jaws and the cam surfaces on the lobes.

Referring now to the drawings the compound action tool of this invention is shown as including a pair of handle levers **10** and **11**. While these levers may be of any construction which affords the ears results they are illustrated as being of the channel structure depicted in FIG. 3. Thus lever **10** is of U cross section and preferably of sheet metal providing a wall **12** that is flat throughout its extent and joined by a bend **13** to a second wall **14** that has an offset ear **15** integral therewith. Lever **11** is also of U cross section and includes a flat wall **16** that is fitted beneath ear **15**, a bend **17** and a wall **18** having an offset ear **19** integral therewith which overlies wall **12**. Walls **12** and **16** and ears **15** and **19** are formed with aligned openings which receive a pivot in the form of a rivet **20** having upset ends **21** which maintain the assembled relation.

As shown in FIG. 1 handle levers **10** and **11** are provided with a hand grip **22** which may be of any appropriate material.

Walls **12** and **14** of lever **10** are continued beyond ear **15** to provide a pair of spaced end tabs **23**, one of which appears in FIG. 1. Likewise, walls **16** and **18** are continued beyond ear **19** to provide a pair of spaced end tabs **24**.

An arm is identified in its entirety at **25**. It includes an end tab **26** that is fitted between end tabs **23** and pivotally connected thereto by a pivot pin in the form of a rivet **27** (FIG. 2) having headed ends **28** which maintain the assembled relation. Arm **25** is formed with an offset centered portion **29** formed with an arcuate slot **30** (FIG. 4) and from which laterally extends a lobe **31** which is integral with offset portion **29**. Lobe **31** carries a guide pin **32** which also may be in the form of a rivet with headed ends for a purpose to be later described. Arm **25** terminates in a jaw **33** having a portion **34** which projects from a side face thereof and, in a sense, overhangs central portion **29**. Lobe **31** has an end edge including a curved cam surface **35**.

A second arm designated generally **36** has an end tab **37** that is fitted between end tabs **24** on lever **11** and is pivotally secured thereto by headed rivet **38**. It includes

a central offset portion **39** formed with an arcuate slot **40** which received guide pin **32**. Extending laterally from central portion **39** and integral therewith is a lobe **41** which overlies central portion **29** of arm **25** and carries a guide pin **42** which is received in slot **30**. Lobe **41** has an end edge including a curved cam surface **43** which is engaged by overhanging portion **34** of jaw **33**.

Arm **36** terminates in a jaw **44** having a projecting or overhanging portion **45** which rides on cam surface **35** of lobe **31**.

In operation, with handle levers **10** and **11** in a spaced or open position as illustrated in FIG. **4**, jaws **33** and **44** are spaced. Pin **42** is in the one end of slot **30**, pin **32** is in one end of slot **40** and overhanging jaw portion **34** and **45** are in contact with cam surfaces **35** and **43**. As levers **10** and **11** are moved towards one another the jaws **33** and **44** are similarly moved and oriented in such movement by the overhanging jaw portions riding on the cam surfaces which they engage.

At the same time pins **32** and **42** move towards the other ends of slots **30** and **40** and a high degree of mechanical advantage is achieved by the effective distance between pivot pin **28** and guide pin **32** on arm **25** and between pivot pin **38** and guide pin **42** on arm **36**. The headed ends of guide pins **32** and **42** maintain the lobes in sliding engagement with the offset central portions of the arms respectively.

While preferred specific embodiments of the invention are hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact constructions, mechanism and devices illustrated and described because various modification of these details may be provided in putting the invention into practice.

What is claimed is:

1. In a compound action tool:

a. a pair of handle levers each having an ear extending laterally therefrom adjacent to one end thereof,

b. said ears overlapping and being pivotally connected,

c. an arm pivotally connected at one end to each of said levers at the end thereof adjacent to the ear thereon,

d. each arm having a central portion formed with an arcuate slot and a lobe extending laterally therefrom with the lobe on one arm overlying the central portion of the other arm,

e. a guide pin carried by each lobe and received in the slot in the other arm,

f. each lobe having an edge including a curved cam surface,

g. a jaw on each arm at the end thereof, and

h. a projecting portion on each jaw overhanging and engaging the cam surface or the lobe of the arm other than that by which the jaw is carried.

2. The compound action tool of claim **1** in which the central portion of each arm is offset with respect to the jaw thereon.

3. The compound action tool of claim **1** in which each handle lever has a pair of spaced end tabs and each arm has an end tab received between the spaced end tabs of a handle lever with the pivotal connections being provided by pivot pins passing through aligned opening in the end tabs.

4. The compound action tool of claim **3** in which the central portion of each arm is offset with respect to the end tab and jaw thereon.

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