United States Patent

[11] 3,621,889

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[21] Appl. No. **875,219**
[22] Filed **Nov. 10, 1969**
[45] Patented **Nov. 23, 1971**
[73] Assignee **Thomas & Betts Corporation**
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[54] **TOOL JAWS**
7 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** ..... **140/93.2,** 140/93 A, 140/123
[51] **Int. Cl.** **B21f 9/02**
[50] **Field of Search** ..... 140/57, 93 A, 93.2, 93.6, 102.5, 117, 123, 123.5, 123.6; 254/134.3 R

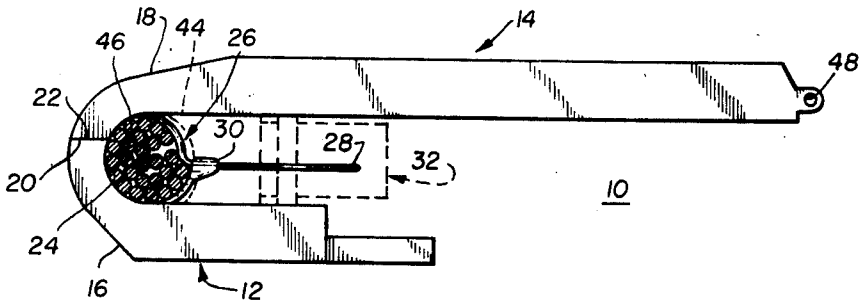
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Primary Examiner—Lowell A. Larson
Attorney—David Teschner

ABSTRACT: The invention is directed to improved selectively operable tool jaws. The jaws are movably coupled with respect to each other, and are operable to a first, closed, position and a second, open position. In the first closed position the jaws communicate to form a bight, wherein an elongated, substantially U-shaped partially restricted groove longitudinally disposed within a first jaw is aligned with a similar elongated, substantially U-shaped unrestricted groove in a second jaw, providing guiding and forming means for an elongated bundling strap introduced tail end forwardly of the head end within the partially restricted groove of the first jaw and advanced around the bight into the grooved second jaw, the ratio of the radius of curvature of the bight to the thickness of the bundling strap being controlled in such manner as to cause the bundling strap to be partially deformed thereby, and to assume a generally arcuate shape, the tail end portion of the bundling strap curling away from the elongated groove in the second jaw and towards the apertured head end portion which is partially restrained within the elongated groove in the first jaw.



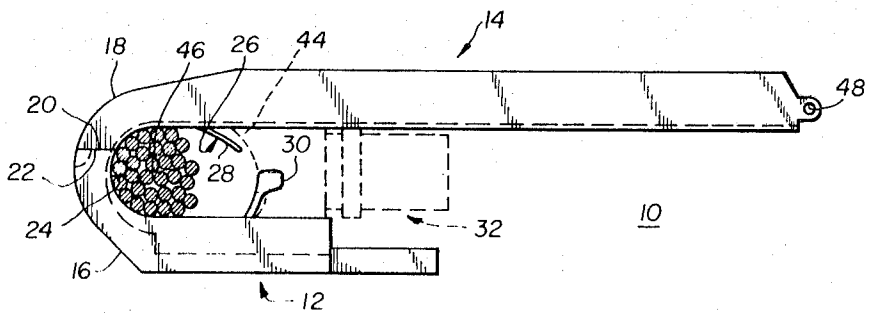


FIG. 1

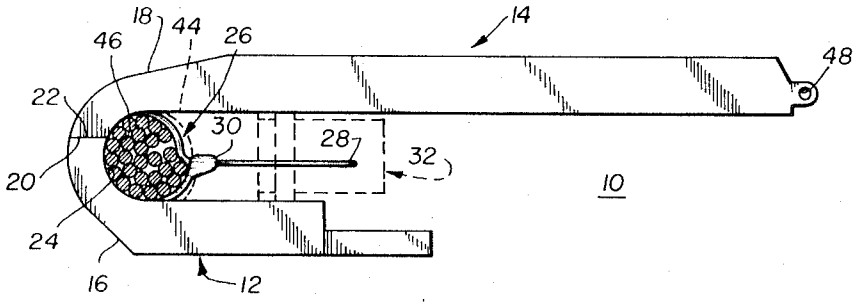


FIG. 2

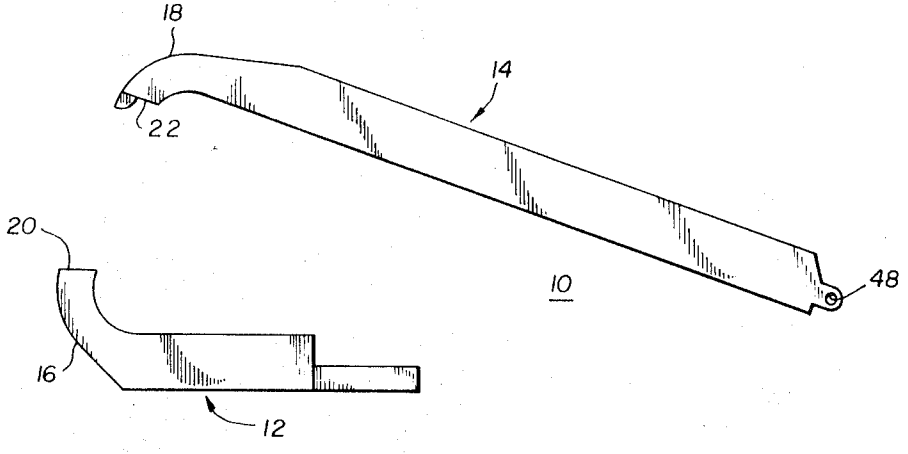


FIG. 3

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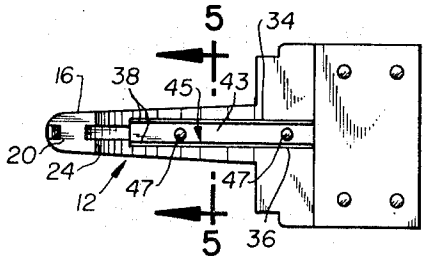


FIG. 4

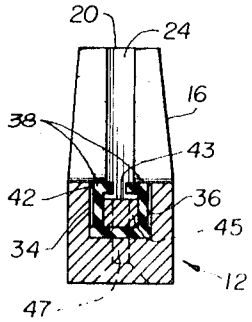


FIG. 5



FIG. 6

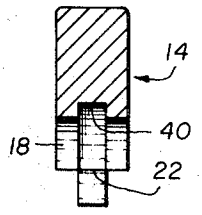


FIG. 7

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TOOL JAWS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention is directed to the field of tool jaws, and principally to selectively operable tool jaws applicable for use with automatic bundling strap installing tools of the type shown and described in my copending application, Ser. No. 705,046, filed Feb. 13, 1968, for an "Automatic Bundling Strap Installing Tool," assigned to the assignee of the instant invention. It is equally applicable to guiding and forming means for elongated straps.

2. Description of the Prior Art

Selectively operable tool jaws according to the prior art as exemplified in my copending application Ser. No. 705,046, filed Feb. 13, 1968, for an "Automatic Bundling Strap Installing Tool," now U.S. Pat. No. 3,515,178, assigned to the assignee of the instant invention, operated solely as guide means to attempt to direct the path of an elongated bundling strap inserted therein and advanced therethrough, about a plurality of articles, conductors or the like, placed within the jaws. The tail end portion of the bundling strap, inserted within a first jaw forwardly of the head end portion, would follow the general contour of the jaws. In order to form the bundling strap around articles within the jaws, it was necessary to mechanically deflect the tail end portion of the bundling strap downwardly by means of a plunger, the concave face of which was caused to contact the tail end portion which portion then attempted to follow the contoured face of the plunger, to engage the apertured head end portion seated therein. Any irregularity upon the concave plunger face or at the termination of the tail end portion of the bundling strap would tend to cause that portion of the bundling strap to jam and buckle, preventing engagement thereof with the aperture in the head end portion. Additionally, the elongated guiding groove in the first jaw provided an unrestricted channel for the advancing bundling strap, permitting the portion of the bundling strap contained therein to buckle away from the groove in the event the strap was advanced too rapidly or the tail end portion encountered an obstruction during the insertion cycle, thereby causing an improper bundling condition.

SUMMARY OF THE INVENTION

The invention is directed to improved selectively operable tool jaws which overcome the problems noted above with respect to prior art devices by providing a means for guiding and preforming elongated bundling straps introduced therein. A bundling strap having a tail end portion and an apertured head end portion is introduced, tail end forward, into a first jaw member having an elongated, substantially U-shaped, partially enclosed groove longitudinally disposed therein the first jaw member communicating with a second jaw member in a first, closed, position. The strap is then advanced around the bight formed by the arcuate portions of the first and second jaw members, and into an elongated, substantially U-shaped, unrestricted groove in the second jaw member. The radius of curvature of the bight formed by the communication of the arcuate portions of the first and second jaw members is such that the tail end portion of the elongated bundling strap advancing therethrough is partially deformed into a generally arcuate shape. As a result, the tail end portion of the bundling strap is caused to curve away from the elongated groove in the second jaw member, and towards the apertured head end portion which is releasably restrained within the partially enclosed elongated groove in the first jaw member. The tail end portion may then be introduced into the aperture in the head end portion by guiding means adapted to support the head end portion in proper angular relationship with respect to the advancing arcuately formed tail end portion. It is therefore an object of this invention to provide improved selectively operable tool jaws.

It is another object of this invention to provide improved selectively operable tool jaws having a partially enclosed elongated groove in a first jaw member to guide and releasably restrain an elongated bundling strap introduced therein.

It is another object of this invention to provide improved selectively operable tool jaws having arcuate portions communicating in a first, closed, position to form a bight, the radius of curvature of which is adapted to preform an elongated bundling strap advanced therethrough, into a generally arcuate shape, to thereby direct the tail end portion of the strap into engagement with the apertured head end portion thereof in proper relationship thereto.

Other objects and features of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention, and the best mode which has been contemplated for carrying it out.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings

FIG. **1** is a side elevation view of tool jaws constructed in accordance with the concepts of the invention, with an elongated bundling strap shown in a partially looped configuration within the jaws, and the jaws in a first, closed, position.

FIG. **2** is a side elevation of the tool jaws of FIG. **1**, illustrating the entry of the tail end portion of an elongated bundling strap within the apertured head portion thereof.

FIG. **3** is a side elevation of the tool jaws of FIG. **1**, shown in a second, open, position.

FIG. **4** is a top plan view of the first jaw member of the tool jaws of FIG. **1**.

FIG. **5** is an end elevation, in section, of a portion of the first jaw member of FIG. **4** taken along the lines **5—5**.

FIG. **6** is a bottom plan view of the second jaw member of the tool jaws of FIG. **1**.

FIG. **7** is an end elevation, in section, of a portion of the second jaw member of FIG. **6** taken along the lines **7—7**.

Similar elements are given similar reference characters in each of the respective drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. **1** and **2**, there is shown tool jaws **10** constructed in accordance with the concepts of the invention. Tool jaws **10** are shown in a first, closed, position wherein a first end **20** of a first jaw member **12** is in communication with a first end **22** of a second jaw member **14**. A generally arcuate portion **16** of the first jaw member **12** combines with a similar generally arcuate portion **18** of the second jaw member **14** to define a generally curved portion **24**, providing preforming means for an elongated bundling strap **26** advanced therethrough. As may be better seen in FIG. **1**, the portion of elongated bundling strap **26** adjacent the apertured head portion **30** is releasably restrained within a partially enclosed generally U-shaped elongated groove **34** (seen in FIG. **4**) in first jaw member **12**, as strap **26** is advanced within the tool jaws **10**. A portion of contoured surface **44** of a bundling strap advancing means **32** is appropriately recessed to receive the apertured head end portion **30** of bundling strap **26**, the head end portion **30** being supported thereby in proper angular relationship to receive tail end portion **28** therein upon completion of an advance stroke. As illustrated in FIG. **1**, bundling strap **26** has been partially advanced about a plurality of conductors **46**, or the like, the tail end portion **28** of bundling strap **26** curling away from the generally U-shaped groove **40** (seen in FIG. **6**) longitudinally disposed within second jaw means **14**, as a result of the deformation of the tail end portion **28** caused by its traversal through the curved portion **24** of tool jaws **10**. In FIG. **2**, strap **26** is shown further advanced within tool jaws **10** by advancing means **32**, wherein tail end portion **28** of bundling strap **26** has been received by and has entered the apertured head end portion **30** thereof, the generally arcuate shape imparted to tail end portion **28** by means of the deformation caused by curved portion **24**, thereby directing the tail end portion **28** into engagement with apertured head end portion **30** in proper relationship thereto.

Turning now to FIG. 3 there is shown tool jaws **10** in a second, open, position. Second jaw member **14** is pivoted about a pivoting means such as **48** to permit selective operation between the first, closed, position and the second, open, position, allowing placement of conductors **46** or like items (seen in FIGS. **1** and **2**) within the jaws **12** and **14**, or removal therefrom.

Referring now to FIGS. **4** and **5**, there is shown a first jaw member **12** of tool jaws **10** constructed in accordance with the concepts of the invention. An elongated, substantially U-shaped, partially enclosed channel **34** is longitudinally disposed within first jaw member **12**, terminating at the first end **20** thereof. Positioned within channel **34** and coupled thereto by means of a support block **45** and fastening means **47**, along a portion thereof, is resilient means **36**, having substantially parallel upstanding sides **42** and inwardly protruding portions **38** thereon along one edge thereof, partially restricting the opening between upstanding sides **42**. An elongated bundling strap **26** of a proper predetermined width is introduced within the slot defined by upstanding resilient portions **42**, inwardly protruding portions **38**, and the top surface **43** of support block **45**. Strap **26** is releasably restrained therein, and removable therefrom by the exertion of sufficient releasing force upon bundling strap **26** to cause upstanding portions **42** and inturned portions **38** to be deformed generally outwardly.

Turning now to FIGS. **6** and **7**, second jaw member **14** of tool jaws **10** is shown. Second jaw member **14** has, longitudinally disposed therein, an elongated, substantially U-shaped, unrestricted groove **40** terminating at first end **22** of second jaw member **14**. In the first, closed, position of tool jaws **10**, first end **22** of second jaw member **14** at the termination of second arcuate portion **18** thereof, communicates with first end **20** at the termination of first arcuate portion **16** of first jaw member **12**, wherein groove **40** in second jaw member **14** is axially aligned in longitudinal relationship with groove **34** in first jaw member **12**, providing a generally continuous smooth strap guiding and preforming means. FIG. **7** represents a sectional view of FIG. **6**, taken along the lines **7—7** and illustrates more clearly the elongated, substantially U-shaped unrestricted groove **40** within second jaw member **14**. In practice, elongated bundling strap **26** is introduced, tail end portion **28** forwardly of head end portion **30**, within the partially enclosed slot defined by upstanding sides **42**, inturned portions **38** of resilient means **36**, and surface **43** of support block **45**, in first jaw member **12**, the head end portion **30** of bundling strap **26** being elevated thereabove in such manner as to prevent its engagement within the partially enclosed slot (see FIGS. **1** and **2**). Strap **26** is thereafter advanced forwardly around curved portion **24** defined by the communication of first arcuate portion **16** and second arcuate portion **18** of first and second jaw members **12** and **14**, respectively, the tail end portion **28** of bundling strap **26** being deformed into a generally arcuate shape thereby, and curling away from elongated groove **40** in second jaw member **14** and towards the apertured head end portion **30** of bundling strap **26**. It has been found in practice that the loop-shaped portion or curved portion **24** defined by the first arcuate portion **16** and second arcuate portion **18** of the first and second jaw members **12** and **14** respectively should have a predetermined curvature with respect to the thickness of the elongated bundling strap **26**. It has been found that the ratio of predetermined curvature of curved portion **24** to the thickness of the bundling strap **26** should be in the range of from 10 to 20. At the completion of the advance stroke, elongated bundling strap **26** is formed into a complete loop about articles **46** contained within tool jaws **10**, tail end portion **26** having been received by apertured head end portion **30** of strap **26** and displaced therethrough. First and second jaw members **12** and **14**, respectively, may then be operated to a second, open, position, permitting bundled articles **46** to be removed therefrom. The portion of elongated bundling strap **26** adjacent the apertured head end portion **30**, and releasably restrained within the partially enclosed groove **34** in first jaw member **12** may be released therefrom upon the exertion of a slight disengaging force.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiment, it will be understood that various omissions and substitutions and changes of the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

I claim:

1. In an automatic installing tool for placing and fastening elongated bundling straps, having apertured head end portions and tail end portions at their respective ends, about a plurality of articles to be bundled, of the type having selectively operable jaw means, the improvement comprising: a first jaw means; a second jaw means movable coupled with respect to said first jaw means, said second jaw means communicating at a first end thereof with a first end of said first jaw means when said first and second jaw means are in a first position; said first jaw means having a first elongated groove longitudinally disposed therein for receiving and guiding a bundling strap introduced therein; said second jaw means having a second elongated groove longitudinally disposed therein for further receiving and guiding a bundling strap introduced therein; said first elongated groove being contoured to define a first generally U-shaped channel, the surfaces of said first jaw means defining said first elongated groove extending generally in parallel to the surface of said first jaw means adjacent said second jaw means; and further comprising resilient means positioned within said first elongated groove and coupled thereto along a portion thereof; said resilient means comprising a pair of substantially parallel, spaced-apart, upstanding portions, defining a channel therebetween; inwardly protruding portions, one for each of said upstanding portions coupled to a free end thereof along the length thereof to partially restrict the opening therebetween, to releasably restrain the removal of an elongated bundling strap introduced therein.

2. The improved structure of claim **1** wherein said second elongated groove in said second jaw means is contoured to define a second generally U-shaped channel, the surfaces of said second jaw means defining said second elongated groove extending generally in parallel to the surface of said second jaw means adjacent said first jaw means.

3. The improved structure of claim **4** wherein said second generally U-shaped channel is of sufficient width to permit loose engagement between said second generally U-shaped channel and an elongated bundling strap introduced therein.

4. The improved structure of claim **3** wherein said first jaw means has a first generally arcuate portion adjacent said first end thereof.

5. The improved structure of claim **4** wherein said second jaw means has a second generally arcuate portion adjacent said first end thereof.

6. The improved structure of claim **7** wherein said first and second generally arcuate portions, in said first position, define a generally loop-shaped portion, said first elongated groove and said second elongated groove in said first and second jaw means, respectively, being axially aligned longitudinally therein, said first and second elongated grooves in said generally loop shaped portion providing preforming means, wherein an elongated bundling strap introduced therein and forcibly displaced therethrough is caused to assume a generally arcuate shape.

7. The improved structure of claim **6** wherein said loop-shaped portion has a predetermined curvature, and said elongated bundling strap has a predetermined thickness, a ratio of said predetermined curvature to said predetermined thickness being in a range of from 10 to 20, to cause an elongated bundling strap introduced with said tail end portion forwardly of said apertured head end portion within said first generally arcuate portion of said first jaw means and advanced about said loop-shaped portion into said second generally arcuate portion of said second jaw means, said jaw means being disposed in said first position, to be substantially deformed thereby into

a generally arcuate shape, said tail end portion of said elongated bundling strap curling away from said second elongated groove in said second jaw means and towards said apertured head end portion of said elongated bundling strap.

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