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J. S. SANDERS ET AL

3,363,445

BLIND RIVETING

Filed April 3, 1964

FIG. 1.

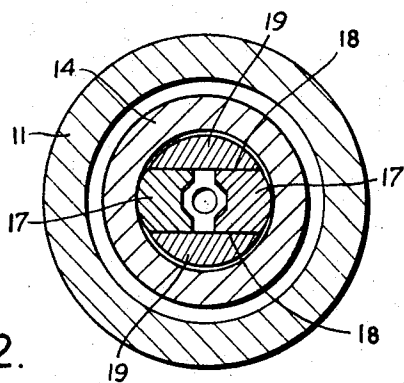
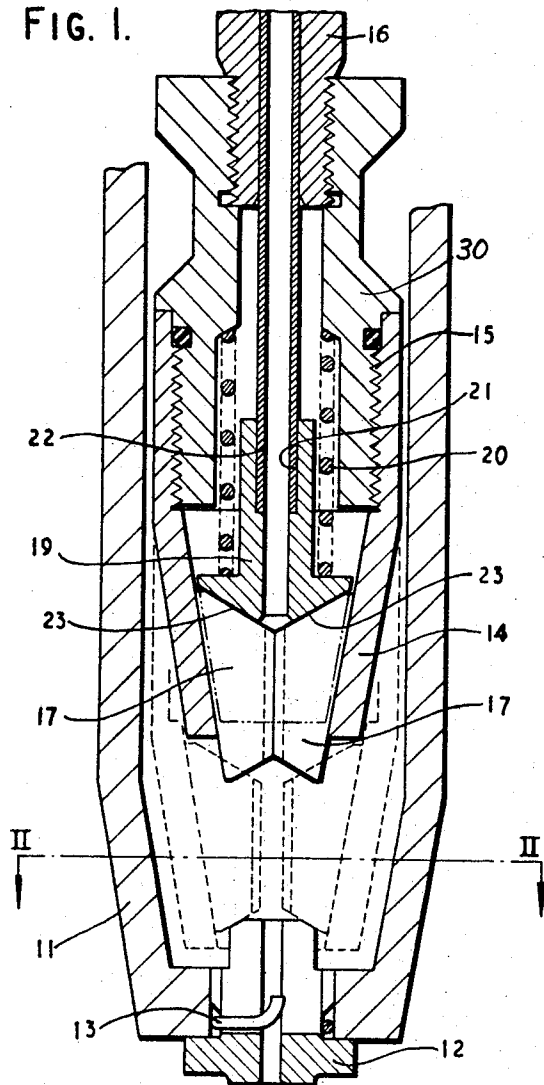


FIG. 2.

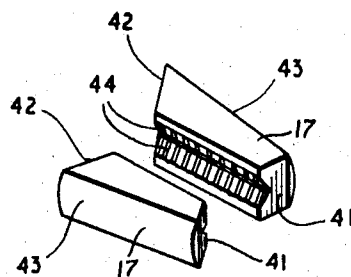


FIG. 3.

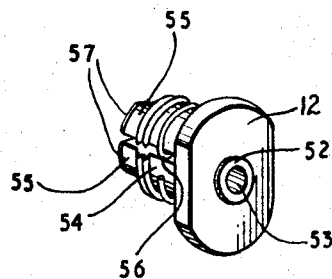


FIG. 4.



FIG. 5.

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1 Claim. (Cl. 72—391)

This invention relates to tubular rivets. It is already known to affix or "place" a tubular rivet by drawing the head of a mandrel through it from the rear to the headed front end thereof by means of a riveting tool by which also the rivet is inserted and held in position for the placing operation. It is also known to supply tubular rivets each with a locally frangible "self-plugging" mandrel of which after placement the head remains held firmly within the rivet as a plug or closure as a result of fracture of the mandrel at a "breaker" groove around the stem of the mandrel beyond which it extends from the head of the rivet for gripping by jaws of the riveting tool employed.

A riveting tool for placing such self-plugging mandrel rivets, according to the invention, has slidable therein towards and away from a rivet and mandrel receiving nose or tip thereof, a tubular jaw housing in which latter a jaw-carrier, having at least two jaw members slidable therein, is slidable coaxially under spring influence to cause the jaw members to co-operate with inclined internal faces of the jaw housing and tend to move radially inwardly to grip a rivet mandrel between them, and, each of said jaw members has faces at its ends which converge towards its radially inner or mandrel gripping face for cam-wise co-operation with complementary faces in the jaw-carrier and in the nose or tip of the tool to move the jaws apart radially to receive the stem of a mandrel between them when the jaw housing is fully advanced to the nose or tip or the tool.

According to a feature of the invention the jaw-carrier has an axial bore extending completely through it from the jaws to a tubular extension thereof which extends therefrom, slidably through a piston and cylinder or other actuating means for drawing the jaw housing (with the stem of a mandrel gripped between the jaws therein) away from the tip of the riveting tool to effect placement of a rivet, to the exterior of the tool for the easy and certain discharge of the mandrel stem portions that are broken off during use of the tool.

According to another feature of the invention, there are two opposed jaw members in a single diametral opening in the jaw-carrier, each of which members is formed with two rows of spaced "saw"-like teeth along the two sides, respectively, of a substantially V-section groove along the length of its inner or gripping face, the teeth of the one row being preferably in staggered relationship to those of the other to minimize weakening of the mandrel stem when the teeth bite into it.

According to yet another feature of the invention, a separately formed and, preferably interchangeable, tip piece through which the stem of the mandrel of a rivet is inserted for gripping between the jaws has extending into the passage through it a light spring member for frictionally retaining an inserted mandrel stem in position and which may also serve to prevent discharge of broken off mandrel stem portions through the nose of the tool.

One form of the invention is illustrated by the accompanying drawings of which:

FIG. 1 is a fragmentary view showing the nose and adjacent part of a rivet gun with the jaw housing and other associated parts in longitudinal section;

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FIG. 2 is a cross-sectional view on the line II—II of FIG. 1 with the jaw housing parts in the positions shown in broken lines in FIG. 1;

FIG. 3 is a perspective view of a jaw member;

FIG. 4 is a perspective view of a nose tip piece with its spring; and

FIG. 5 shows in longitudinal section a headed tubular rivet with a frangible stem self-plugging mandrel ready for use.

The nose and adjacent portion of the riveting tool or gun which are indicated generally at 11 has screwed into an opening at the end or tip thereof a separately formed headed nose tip piece 12 which extends for some distance inside the nose portion 11 as clearly shown. Below its head the tip piece 12 is slotted diametrically to give passage to the bent end of a wire spring 13 the remainder of which extends loosely around the tip piece 12 in a circumferential groove just below the head. The bent end of the spring 13 extends into the path of, and is deflected by the stem of a rivet mandrel as it is inserted through the tip piece 12 for engagement by the jaws. The spring 13 thus serves frictionally to retain a mandrel against accidental removal and also to prevent the mandrel end from being discharged by way of the nose of the gun after it has been broken off.

Inside the nose portion 11 there is slidable coaxially a two-piece jaw housing, indicated generally at 14, which is in screw threaded engagement at 15 with a jaw carrier housing 30 which in turn is in threaded engagement with a hollow rod 16 extending from a piston (not shown) which operates in a cylinder (also not shown) to move the jaw housing away from the nose tip from the "receiving" position in which it is shown in broken lines to the position shown in full lines, against the influence of a return spring (not shown).

At that end nearer to the tip piece 12 the jaw housing 14 is conical, both externally and internally and it accommodates two like jaw members 17, 17 located between the two sides 18, 18 (see FIGURE 2) of the bifurcated, conical head of a jaw-carrier 19, which is slidable coaxially under the influence of a coiled compression spring 20. This jaw-carrier is formed with a coaxial bore 21 and has extending from it a tube 22 which extends slidably through and beyond the piston rod 16 and piston (not shown) for the easy and reliable discharge of broken off mandrel stems from the gun.

When the jaw housing 14 is retracted as shown in full lines the spring 20 holds the jaw-carrier 19 fully advanced within the housing 14 and this, in turn, holds the jaw members 17, 17 in cam-wise engagement with the internally tapering wall of the housing 14 and so in contact with one another at their inner or gripping faces. Between the root ends of the two sides 18, 18 of its bifurcated conical head, however, the jaw-carrier 19 is formed with two inclined faces which bear upon similarly inclined faces of the two jaws 17, 17 as indicated at 23, 23. Also, the jaws 17, 17 have inclined faces for similar co-operation with the inner end of the headed tip piece 12, which is appropriately chamfered or bevelled for the purpose. Normally, the jaw housing 14 is held by the return spring (not shown) in the position shown in broken lines ready to receive the stem of a frangible mandrel which extends through a rivet as shown in FIGURE 5, and from the rivet through the tip piece 12, past the spring 13 (which bears against it) into the space between the jaws 17, 17 which are spaced apart by their cam-wise co-operation at their ends with the tip piece 12 and the head of the jaw-carrier 19 at 23, 23 under the action of the spring 20.

Once the mandrel stem has been thus inserted and held by the spring 13, the piston (not shown) is operated to

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move the jaw housing 14 to the rear, as shown in FIGURE 1, and the resulting cam-action between the housing 14 and the jaws 17, 17 as the latter are carried away from the tip piece 12, moves the jaws together to grip the mandrel stem and thereafter draw the mandrel head into the rivet to plug the latter and then, as the tension in the stem increases, to break it off at the breaker groove, i.e. at the weakened region (see FIGURE 5). When this operative stroke is completed the return spring (not shown) returns the jaw housing 14 to the (broken line) "receiving" position and the cam-action between the ends of the jaws 17, 17, on the one hand, and the jaw-carrier 19 and the tip piece 12, on the other, moves the jaw 17, 17 apart again, thus positively disengaging them from the broken off part of the mandrel stem which is prevented from passing forwardly through the tip piece 12 but is able to pass freely through the jaw-carrier 19 and its tube 22 to be exterior of the gun.

As shown in FIGURE 3, each of the two like jaw members 17, 17 is of generally tapering form with inclined end faces 41 and 42, an outer face 43 which is curved transversally for engagement with the conical inner surface of the jaw housing 14 and formed with a substantially V-section groove along its inner face. Two rows 44, 44 of spaced "saw"-like teeth extend along the two sides, respectively, of the groove with the teeth in the one row in staggered relationship to those of the other row so as to lessen the effective cross-section of the mandrel stem where the teeth bite into it to a lesser extent than would be the case if the teeth of each row registered with the teeth of the other (instead of with the spaces between the teeth of the other row).

The teeth have their longer sides directed towards the nose tip for easy insertion of the mandrel and their shorter faces away from the nose tip for maximum grip on the mandrel during the placement operation.

In FIGURE 4 the head of a nose tip piece is indicated at 52, a bore therethrough for receiving the mandrel stem at 53, a spring-retaining groove at 54, the bifurcations at 55 and the spring 13 (in FIGURE 1) extending around the groove 54 and into the space between the bifurcations and across the bore 53 is indicated at 56, the bevelling

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of the bifurcations 55, 55 for cooperation with the end faces 41, 41 of the jaws 17, 17 being indicated at 57, 57.

What we claim is:

1. A riveting tool of the type used for setting blind tubular rivets having self-plugging separable mandrels preassembled therein, which tool comprises:

a housing;

a hollow jaw support slidably mounted within said housing;

two opposed mandrel-gripping jaw members mounted within and slidable with respect to said support;

cooperating cam means on the inner face of said support and the outer surfaces of said jaw members, said cam means being effective, when a mandrel is inserted between said jaws and said support is urged to move in a direction away from said mandrel, to cam said jaw members together to grip said mandrel securely;

said jaw members having a substantially V-section groove along the face thereof which is towards the other said jaw member, and each jaw member having two rows of spaced saw-like teeth along the two sides respectively of said groove, the teeth of one row being in staggered relationship to those of the other row.

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