April 24, 1962 R. H. BISBING ET AL 3,030,849

RIVET WITH AUXILIARY HEAD FOR ENGAGEMENT BY SETTING TOOL

Filed June 6, 1958 2 Sheets-Sheet 1

FIG. 6.

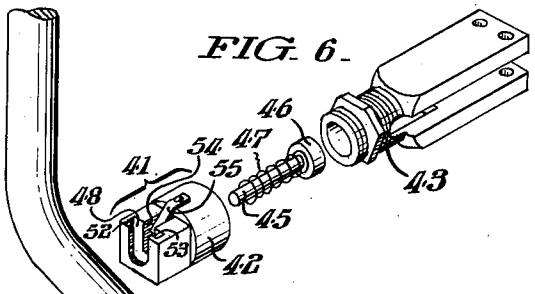


FIG. 1.

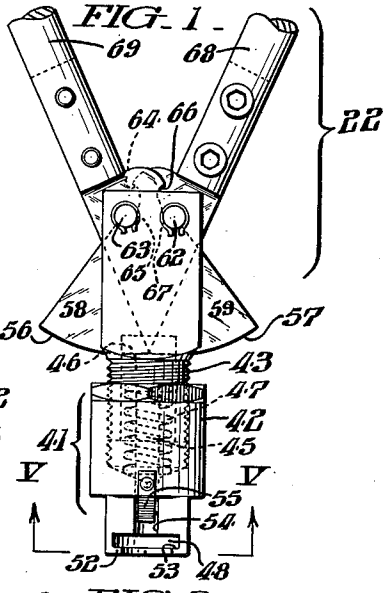


FIG. 5.

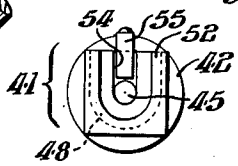


FIG. 3.

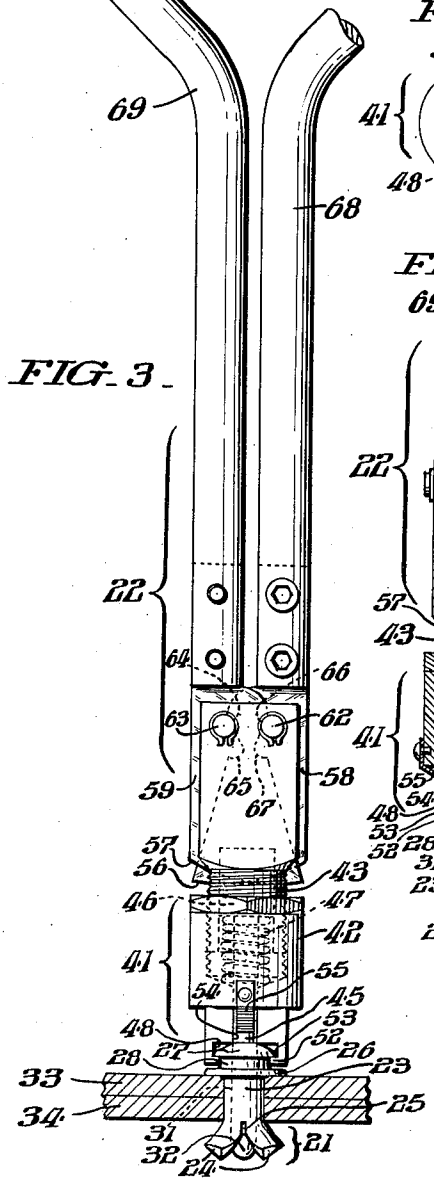


FIG. 4.

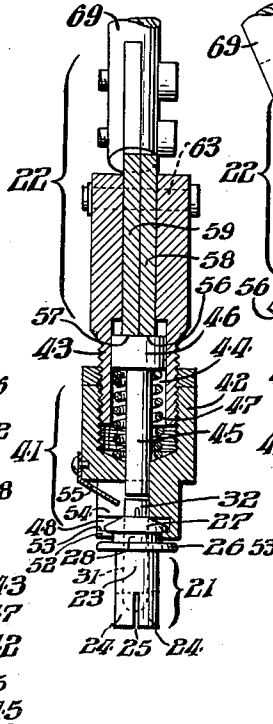


FIG. 2.

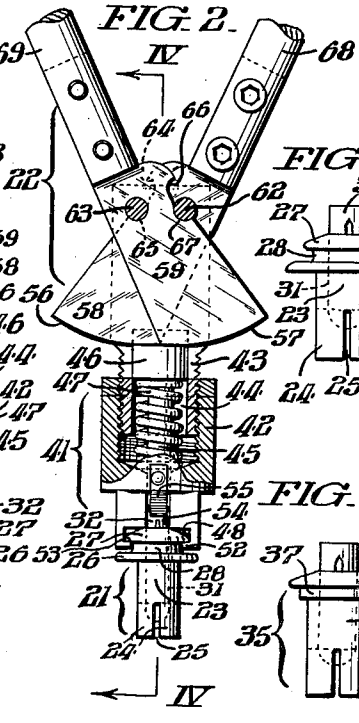


FIG. 7.

FIG. 8.

INVENTORS.
Robert H. Bisbing &
BY John K. Barry,
Paul & Paul
ATTORNEYS.

April 24, 1962 R. H. BISBING ET AL 3,030,849

RIVET WITH AUXILIARY HEAD FOR ENGAGEMENT BY SETTING TOOL

Filed June 6, 1958 2 Sheets-Sheet 2

FIG. 9.

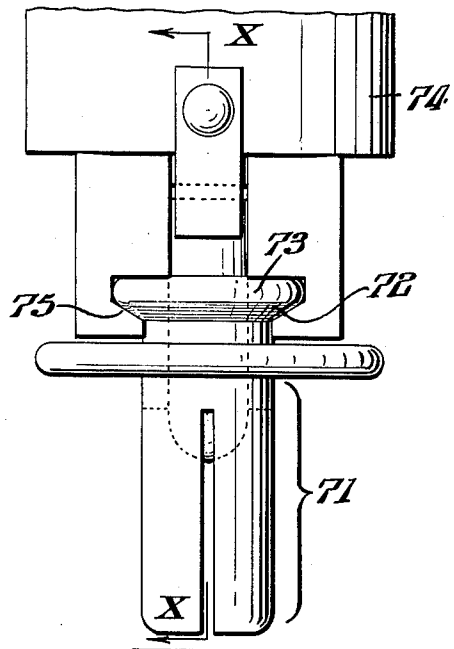


FIG. 10.

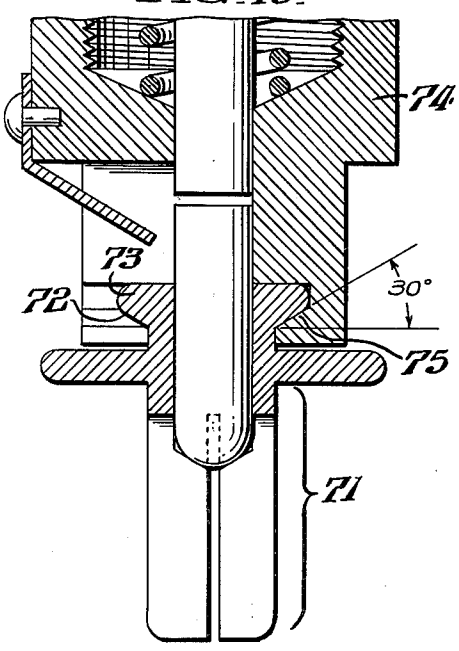


FIG. 11.

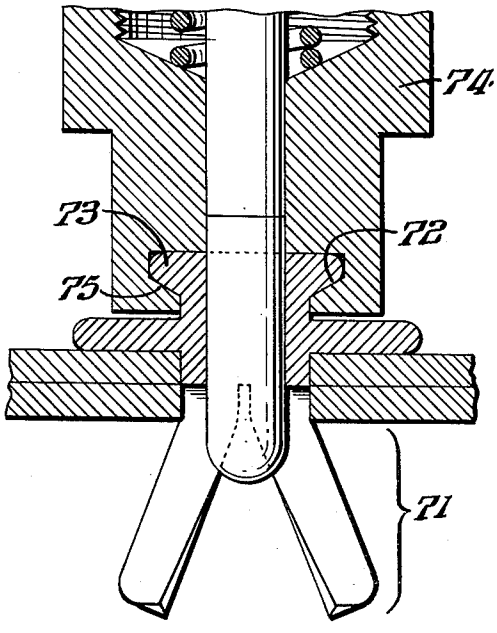
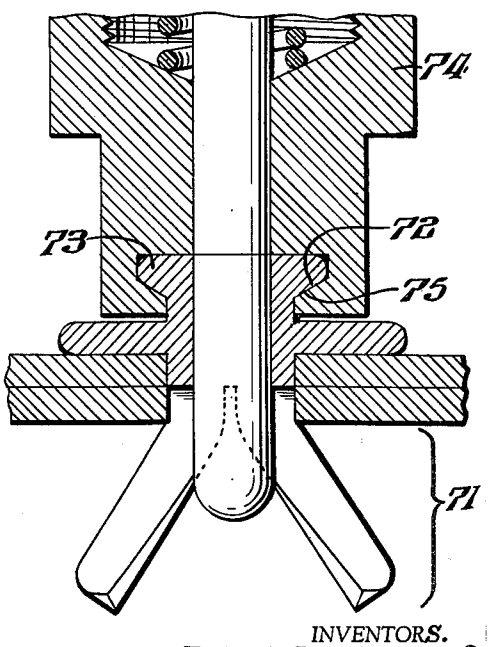


FIG. 12.



INVENTORS.
Robert H. Bisbing &
BY John K. Barry,
Paul & Paul
ATTORNEYS.

United States Patent Office 3,030,849 Patented Apr. 24, 1962

3,030,849

RIVET WITH AUXILIARY HEAD FOR ENGAGEMENT BY SETTING TOOL

Robert H. Bisbing, Upper Darby, and John K. Barry, Springfield, Pa., assignors to South Chester Corporation, Chester, Pa., a corporation of Delaware

Filed June 6, 1958, Ser. No. 740,284
1 Claim. (Cl. 85—40)

This invention relates to apparatus for riveting together sheets of metal and the like, and more particularly concerns a rivet expanding tool and rivet of the blind squeeze or drive type as opposed to the blind pull type.

It has long been desired to provide an expansion rivet and a rivet expander tool which in the operation of expanding the rivet does not subject the sheets being riveted together to stress or strain and thus does not deform them in any way. The design of previous expander tools has proved impractical in that they utilize a simple lever action and accordingly require excessive squeeze power to expand the rivet. For example, in some applications it takes 1500 pounds pressure to expand the rivet. Using a tool utilizing only a simple lever action, usually only a ten to one mechanical advantage can be obtained. This means that the operator must squeeze 150 pounds each time he drives a rivet, a very difficult, time consuming, and tiring operation.

Accordingly, it is an object of this invention to provide apparatus for riveting together thin sheets of metal and the like without deforming the sheets or subjecting them to stress or strain during the operation of expanding the rivet.

It is another object of this invention to provide an expansion rivet having an auxiliary head which is smaller than conventional auxiliary heads and yet is as strong.

It is another object of this invention to provide an expander tool for driving the spreader pin of an expansion rivet, said tool having an adjustable head whereby to accommodate spreader pins of different lengths.

It is another object of this invention to provide apparatus for installing a drive type blind rivet in sheets too thin or too poorly supported to withstand the blow of a hammer on the rivet spreader pin or to withstand the thrust of a pressed load thereon.

It is another object of this invention to provide apparatus for retaining an expansion rivet in an expander tool, which retaining apparatus is releasable to admit the unexpanded rivet into the expander tool.

It is another object of this invention to provide rivet installing apparatus which automatically returns to its normal position after the rivet expanding operation.

It is another object of this invention to provide an expander tool which requires only minimum exertion on the part of the operator.

Other objects and advantages of this invention, including the simplicity and economy of the same, will further become apparent hereinafter and in the drawings, in which:

FIG. 1 is a view in side elevation of a rivet expander tool constructed in accordance with this invention;

FIG. 2 is a view partly in longitudinal section and partly in elevation and shows the rivet expander tool of FIG. 1 and an expansion rivet constructed in accordance with this invention;

FIG. 3 is a view in elevation and shows the apparatus of FIG. 2 as it appears upon expanding the rivet;

FIG. 4 is a view in longitudinal cross section taken as indicated by the lines and arrows IV—IV which appear in FIG. 2;

FIG. 5 is a view in bottom plan taken as indicated by the lines and arrows V—V which appear in FIG. 1;

FIG. 6 is an exploded view in perspective of the head of the expander tool;

FIG. 7 is a view in elevation showing the expansion rivet constructed in accordance with this invention;

FIG. 8 is a view in elevation showing another embodiment of expansion rivet constructed in accordance with this invention;

FIG. 9 is a view in elevation showing another embodiment of expansion rivet and another embodiment of expander tool head constructed in accordance with this invention;

FIG. 10 shows a view in longitudinal cross section taken as indicated by the lines and arrows X—X which appear in FIG. 9;

FIG. 11 shows the apparatus of FIG. 10 as it appears approximately half-way through the rivet expanding operation; and

FIG. 12 shows the apparatus of FIGS. 10 and 11 as it appears at the completion of the rivet expanding operation.

In describing the preferred embodiment of the invention illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, it is not intended to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

Turning now to the specific embodiments of the invention selected for illustration in the drawings, there is shown apparatus for riveting together sheets of metal and the like, which apparatus comprises a combination expansion rivet 21 and rivet expander tool 22.

Expansion rivet 21 is illustrated in FIGS. 2, 3, 4, and 7 and comprises a tubular shank 23, four prongs 24 formed by slots 25, a main head 26 which is of greater diameter than shank 23, and auxiliary head 27 which is positioned outwardly from main head 26 and which is separated therefrom by a groove 28. Shank 23 has a chamber 31 formed therein in which is seated a rivet spreader pin 32 which is normally positioned as shown in FIG. 7 with one end of pin 32 extending outwardly from rivet chamber 31 when rivet 21 is in its unexpanded condition.

FIG. 3 shows rivet 21 in its expanded condition with the top of spreader pin 32 flush with the top of auxiliary head 27 and with prongs 24 expanded outwardly to hold sheets 33, 34 together against the undersurface of main head 26.

FIG. 8 shows another embodiment of expansion rivet 35. Except for the construction of the rivet heads, rivet 35 is of the same construction as rivet 21. In rivet 35 there is no groove separating the rivet heads. Auxiliary rivet head 36 is of greater diameter than main rivet head 37, and main rivet head 37 is of greater diameter than shank 38.

Rivet expander tool 22 comprises a removable and adjustable tool head 41 which has a cap 42 which is threaded onto body member 43. Positioned within a chamber 44 in tool head 41 is a plunger 45 having a plunger head 46, plunger 45 being spring-urged upwardly by a spring 47. Plunger 45 is adapted to contact rivet spreader pin 32 and to drive it forwardly into the expansion rivet 21.

Tool head 41 has formed therein a transverse U-shaped recess 48 which is adapted to receive rivet auxiliary head 27 through an opening at one side, and has an overhanging portion which forms a lip 52 having an inner holding surface 53 which makes contact with the underside of rivet auxiliary head 27 during the rivet expanding operation.

Also provided in tool head 41 is a longitudinal recess 54 which receives, positions, and guides rivet spreader pin 32. A leaf spring 55 is provided for retaining rivet spreader pin 32 within longitudinal recess 54. Leaf spring 55 bends to admit rivet spreader pin 32 to recess 54.

Plunger 45 is driven forwardly by the camming action of cam surfaces 56, 57 of cams 58, 59 which are pivotally mounted on body member 43 by pivot pins 62, 63. Cams 58, 59 are provided with stop surfaces 64—67 which limit the extent of rotation of cams 58, 59 about pivot pins 52, 63. Attached to cams 58, 59 are handles 68, 69.

Referring now to FIGS. 9–12, there is shown another embodiment of an expansion rivet 71 which is of the same construction as expansion rivet 21 except that the undersurface 72 of rivet auxiliary head 73 forms an angle of about 30 degrees with a plane passing through the rivet 71 perpendicular to the axis of the rivet. There is also shown an expander tool cap 74 which is constructed the same as expander tool cap 42 except that the holding surface 75 is at a 30 degree angle to conform to the undersurface 72 of expansion rivet 71. This is of advantage since the forces exerted during the rivet expanding operation act at an angle normal to the surfaces 72 and 75 and are accordingly directed toward the thicker and therefore stronger portions of rivet auxiliary head 73 and expander tool cap 74. FIGS. 10–12 show the position of the elements during the rivet expanding operation.

Operation

After auxiliary rivet head 27 is inserted in U-shaped transverse recess 48 of rivet expander tool 22, and rivet shank 23 is inserted through aligned holes in two or more sheets 33, 34 of material which are to be riveted together (see for example, FIG. 3), rivet 21 is expanded by squeezing the handles 68, 69 of expander tool 22 toward each other. This action causes cams 58, 59 to rotate about pivot pins 62 and 63 so that the cam surfaces 56, 57 drive the plunger 45 forwardly. This double camming action causes plunger 45 to contact rivet spreader pin 32 and force it forwardly within rivet 21 until the rivet spreader pin 32 is flush with the top of auxiliary head 27. This is accomplished with a very light hand squeeze on the part of the operator. The reaction forces are taken up against auxiliary rivet head 27 and no impact thrust or pressure is brought to bear against the sheets 33, 34 being riveted together.

It takes up to 1500 pounds to expand rivets 21 in certain applications, and this is done by the operator with minimum effort. This ease of operation is the result of the camming action of cams 58, 59 acting on plunger 45 when the handles 68, 69 are squeezed together.

There is an advantage to the 30 degree angle of auxiliary head 73 shown in FIGS. 9 to 12. Holding surface 75 of expander tool cap 74 is also tapered at a 30 degree angle to conform to the undersurface 72 of auxiliary head 73. This construction allows auxiliary head 73 and expander tool cap 74 to withstand much higher loads when driving pressure is being applied to the rivet spreader pin since the force is applied in the direction normal to the surface and thus is applied to a thicker portion of rivet auxiliary head 73 and tool cap 74 than if rivet auxiliary head 73 and the tool cap 74 were constructed with right angle surfaces, that is with surfaces perpendicular to the axis of the tool. If the surfaces 72 and 75 were perpendicular to the axis of the tool, either the rivet auxiliary head 73 or the tool cap 74 would break under loading unless they were made much thicker. Thickening the rivet auxiliary head beyond a certain point is impractical and unsightly. Accordingly, this 30 degree construction provides an expansion rivet which is more compact and which uses less material than has heretofore been the case.

It is to be understood that the form of the invention herein shown and described is to be taken as a preferred embodiment. Various changes may be made in the shape, size, and arrangement of parts. Equivalent elements may be substituted for those described herein, parts may be reversed, and certain features of the invention may be utilized independently of the use of other features, all without departing from the spirit of the invention or the scope of the subjoined claim.

Having thus described our invention, we claim:

An expansion rivet comprising a tubular shank having a head end and a prong end, prongs formed by slots located in the prong end of the shank, a main head formed at the head end of the shank and having a greater diameter than the shank, an auxiliary head also formed at the head end of the shank and positioned upwardly from said main head, said main and auxiliary heads being formed integrally and having a groove formed therebetween, said shank having a chamber formed in its head end, a spreader pin normally positioned in said chamber with one end of the pin extending outwardly therefrom when said rivet is in its unexpanded condition, the undersurface of said auxiliary head being angled away from said main head and forming an acute angle of approximately 60° with the upper axis of said spreader pin, whereby forces applied to said undersurface are directed somewhat in compression, said pin and shank having cooperating means whereby the spreader pin in being forced downwardly into said shank spreads said prongs to rivet together the desired material.

References Cited in the file of this patent

UNITED STATES PATENTS

1,361,340	Ledwinka	Dec. 7, 1920
1,705,371	Mehlman	Mar. 12, 1929
2,283,766	Sbicca	May 19, 1942
2,306,619	Flachbarth	Dec. 29, 1942
2,326,855	Hathorn	Aug. 17, 1943
2,389,479	Austin	Nov. 20, 1945
2,531,049	Huck	Nov. 21, 1950
2,616,328	Kingsmore	Nov. 4, 1952
2,668,468	Flogaus	Feb. 9, 1954
2,782,827	Rosan	Feb. 26, 1957