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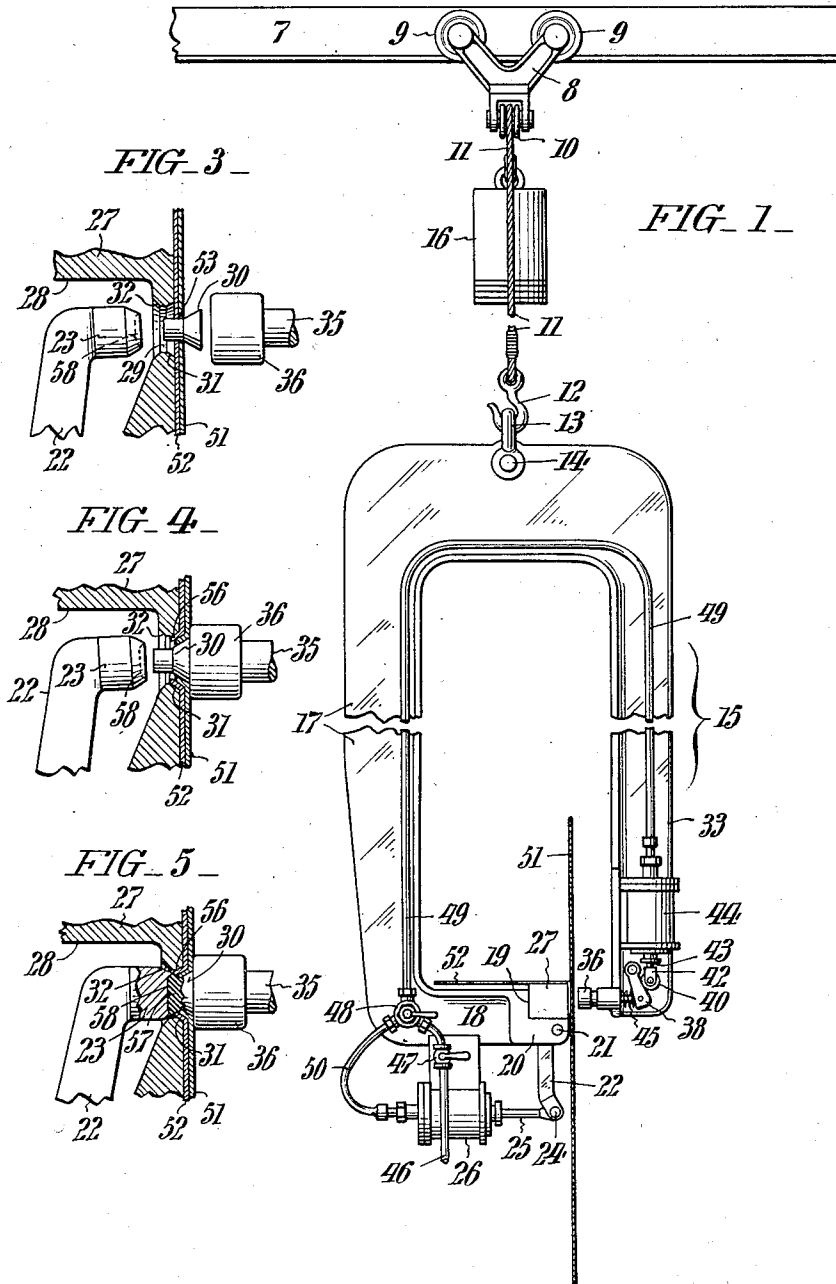
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2,312,554

RIVETING APPARATUS

Filed April 26, 1941

2 Sheets-Sheet 1



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FIG. 2.

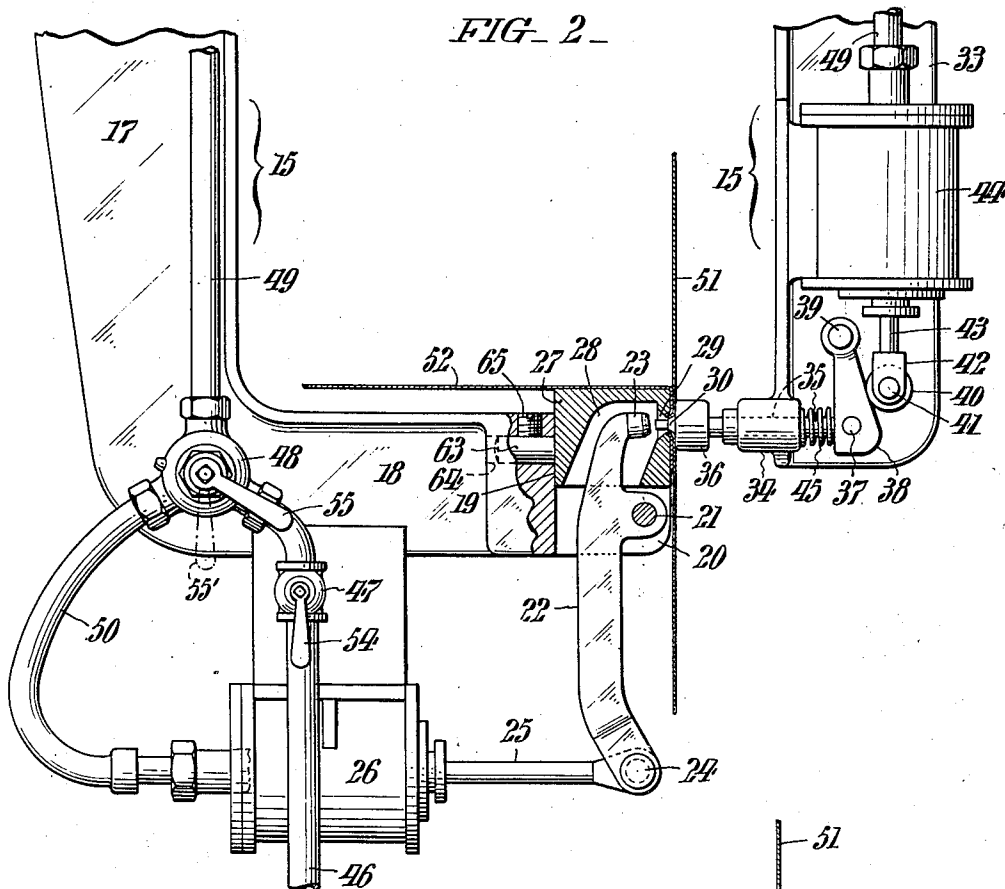
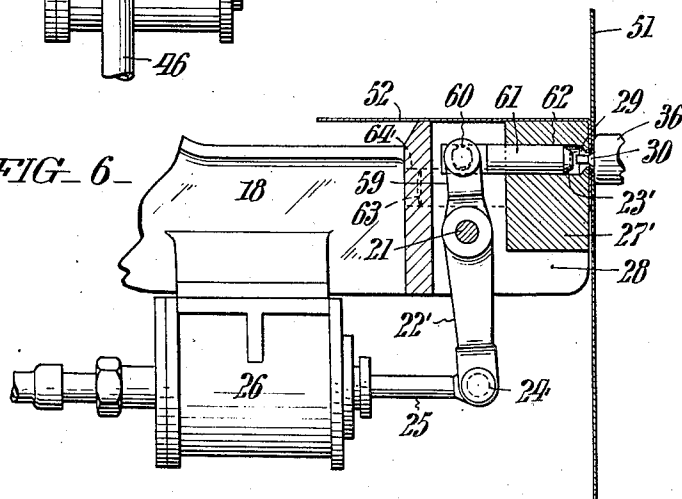


FIG. 6_



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RIVETING APPARATUS

Jean Jacques, Philadelphia, Pa.

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8 Claims. (Cl. 78—49)

This invention has reference to means for making riveted joints between sheet-plate and sections, while it has more particular reference to apparatus of the type preferably adapted for use in connection with aircraft construction.

Apparatus of the indicated species usually comprise means for riveting together thin sheet metal members and sections, with concurrent expansion of the aligned rivet holes by the inserted rivet, so that the head of the latter fills the expanded parts with a "flush" finish on the sheet metal outer face.

The primary object of this invention is to provide an improved easily portable and well-balanced riveting apparatus which can be raised, lowered, or laterally moved with a minimum of effort, whereby a saving of time and labor is effected.

Another object is the provision of an apparatus of the indicated species preferably adapted for riveting together the cover sheets and reinforcing ribs of airplane wings, rudders and analogous thin metal structural parts.

A further object is to provide in pressure actuated apparatus of the above defined species improved means in combination for effecting the rivet insertion and shank end deformation for completion of the joint in one operation.

While the foregoing objective definitions are indicative in a general way of the aims of this invention, other objects with ancillary advantages will be evident to those skilled in the art upon a full understanding of the construction, arrangement and operation of the means hereafter fully disclosed, but it will also be appreciated that said invention is susceptible of other embodiments, or structurally modified forms, coming equally within the terms and scope of the concluding claims.

In the drawings:

Fig. 1 is a broken elevation of a portable riveting apparatus embodying the present improvements.

Fig. 2 is a larger scale elevation of the lower portion, or riveting head, of the preceding illustration.

Fig. 3 is a still further increased scale, part elevation and part sectional, detail view of the rivet upsetting means in initial position.

Fig. 4 is a similar view but showing the die head or anvil member having advanced the rivet ready for upsetting.

Fig. 5 is a corresponding view with the "butter-up" means in position incidental to completion of the riveted joint; and,

Fig. 6 is a fragmentary part elevation and part sectional view of a modified form of the rivet upsetting and associated means.

In describing the forms of this invention exemplified in the above captioned drawings herewith, specific terms will be employed for the sake of clarity, but it is to be understood the scope of said invention is not thereby limited, while like reference characters are used to designate corresponding parts in all the views.

In Fig. 1 of the drawings there is shown a fragmentary portion of an overhead track 7 affording support for a trolley 8 having freely rotative rollers 9, coactive with said track, and a subjacent sheave 10 over which passes a cable 11, provided with a hook 12 at one end for engagement with a suspension element 13, pivotally attached at 14 to the riveting apparatus, comprehensively designated 15; while a weight 16 at the other end of the cable 11 serves to counterbalance said apparatus.

The riveting apparatus 15 comprises a somewhat horseshoe shaped body frame, one leg 17 whereof is formed with an inwardly directed extension 18 having an end step 19, defined by spaced lugs 20, affording oscillatory support, by a pivot pin 21, for a lever or "butter-up" device 22. This "butter-up" device 22 is provided at the upper part with a crusher head 23, and said device has the lower end operatively coupled at 24 to the piston rod 25, of a pneumatic actuator 26, for example, which is supported by the lateral extension 18 aforesaid.

Seated firmly on the step or cut-out 19 is a removable abutment block 27, having an elbowed hollow 28, for free reception of the upper portion of the "butter-up" device 22, said device including a crusher head 23 arcuallly movable into axial registration with a beveled aperture 29, in the block 27, adapted for reception of the rivet 30 to be clinched. It is to be here noted that the aperture 29, as best shown in Figs. 3-5, embodies an outer countersink 31 and an inner countersink 32, with the intervening part 29 cylindrical, for a purpose later on explained.

At the lower end of the body frame other leg 33 is a bearing 34 affording reciprocative guidance for the shank 35 of a tool or die 36, said shank having the outer end fulcrumed at 37 to a pendent cam device 38, supported by a pivot 39 rigid with the leg 33. Coactive with the cam device 38 is a freely rotative roller 40, journaled by a stationary pin 41 in the forked end 42 of the piston rod 43 of a second pneumatic actuator 44 rigidly sustained by the leg 33, while a

buffer spring 45, in compression, intervenes the cam device 38 and the confronting end of the bearing 34, for normally influencing said device in a counterclockwise direction.

For operating the riveting apparatus 15, use is preferably made of pressure air supplied from any convenient source by a suitable conduit 46, having a shut-off 47, in flow communication with a conventional three-way control 48; said control, in turn, having pipe connections 49, 50 to the actuators 44 and 26, respectively.

In operating the apparatus 15 and assuming it is being used for attaching an airplane wing cover sheet 51 to an angle section reinforcing rib 52, with the latter resting on the abutment block 27 as shown in Figs. 1 and 2, a rivet 30 is inserted through the registering holes 53, in such parts, see Fig. 3. The apparatus 15 is first moved, as obvious to those conversant with the art, to place the tool or die 36 in contact with the outer flat face of the countersink head of the rivet 30, when the handle 54 of the shut-off 47 and the handle 55 of the three-way control 48 are both turned clockwise from the positions shown in Fig. 1 to those of Fig. 2; or, respectively through an angle of ninety degrees and forty-five degrees, whereupon flow communication from the source of pressure supply by way of the conduit 46, control 48 and pipe 49 to the actuator 44, with the resultant forcing of the rivet 30 into the position of Fig. 4, whereby the lapping sheet 51 and rib 52 are locally countersunk inwards, as indicated at 55, until the flat head face of said rivet is flush with the outer surface of the sheet 51, as clearly understandable from said figure. The control handle 55 is now turned clockwise, through a further angle of forty-five degrees, to the position indicated by dot-and-dash lines 55' in Fig. 2, with establishment of pressure flow through the connection 50 to the actuator 26, whereupon the piston rod 25 is retracted inwardly, and the "butter-up" 22 rocked on its pivot 21, with movement of the crusher head 23 outwardly to effect clinching distortion of the rivet shank, into the rivet head formation 57 illustrated in Fig. 5. It will now be clearly apparent that the recession 58 in the crusher head 23 effects compact interlocking of the deformed rivet shank with the inner edges of the countersunk portions 56 of the plate sheet 51 and reinforcing rib 52.

In the modified form of the invention shown in Fig. 6, the "butter-up" device 22' is in the form of a fork ended lever coupled at 24 to the piston rod 25 as before described, but having the upper fork end 59 pivoted at 60 to a plunger 61, having a crusher head formation 23' at its free end; said plunger being reciprocative in a bore 62 in the abutment block 27', in an obvious manner.

Attention is directed to the fact that the abutment blocks 27, 27', Figs. 2 and 6 respectively, are preferably made removable by provision of a projection 63 engaging in a bore 64 of the lateral extension 18, and locked therein by a set screw 65, whereby provision is afforded for the use of variable sized crusher heads 23, 23'.

While there has been disclosed specific embodiments of the inventive idea, it is to be understood the same are not necessarily limitative; as detail changes may obviously be made to meet different requirements of practice or adaptation without departing from the scope of said invention.

Having thus described my invention, I claim:

1. In apparatus for riveting together sheet metal elements having aligned rivet holes, the combination of a frame including a lateral portion; a stationary abutment carried by the lateral portion, said abutment having a cavity and communicating die-aperture including opposed recessions with an intervening bore; presser means actuable to force a suitably-headed rivet, axially relative to the aligned holes aforesaid, with local displacement of the sheet metal elements into the adjoining recession of the die-aperture; a pivotal element carried by the frame lateral portion and having a crusher-head actuable in the abutment cavity; and means to rock said pivotal element, whereby the crusher-head is caused to deform the outer end of the rivet shank into head formation while said rivet is restrained from movement by the presser means.
2. In apparatus for riveting together sheet metal elements having aligned rivet holes, the combination of a portable frame including an inward projection; a rigid abutment removably carried by the frame inward projection, said abutment having a cavity and communicating die-aperture including taper-recessions with an intervening straight bore; a presser device aligned with the die-aperture and actuable to force a countersink-headed rivet axially relative to the rivet holes aforesaid, for local displacement of the sheet metal elements into the confronting taper-recession of the abutment die-aperture; a butter-up pivotally supported by the frame inward projection and including an angularly related crusher-head located within the abutment cavity; and means to rock the butter-up whereby the crusher-head is caused to deform the free end of the rivet shank into a head formation, abutting and within the outer circumferential edge confines of the displaced sheet metal, while said rivet is restrained against axial movement by the presser device.
3. In apparatus for riveting together sheet metal and reinforcing-sections having aligned rivet holes therein, the combination of a portable counterbalanced horseshoe-like frame embodying an inwardly-directed lateral-extension of one leg; a removable abutment-block rigidly supported by the free end of said leg inward extension, such abutment block having an elbowed-cavity and communicating die-aperture including outwardly-flared recessions with an intervening cylindrical bore; a cam-operable presser device supported by the other leg of the frame in alignment with the abutment-block die-aperture; means for activating the cam-operable presser device to effect forced local expansion of the sheet metal, by aid of a countersink-headed rivet, into engagement with the surface of the adjoining die-aperture flared-recession; and an oscillatable element pivoted intermediate its ends in the frame lateral extension, said element having an upper crusher-head portion located within the abutment-block elbowed-cavity and approximately aligned with the die-aperture; and means operatively coordinated with the lower end of the oscillatable element, whereby the latter is rocked on its pivot to butt-up the outer end of the rivet shank while said rivet is restrained against axial movement by the presser device aforesaid.
4. Apparatus for riveting together sheet metal and reinforcing-sections in accordance with claim 3, wherein the frame inwardly-directed extension has a terminal step defined by laterally

spaced lugs, the removable abutment block embodies a projection engaged in the frame lateral extension, and means rigidly securing said projection to the abutment block.

5. Apparatus for riveting sheet metal and reinforcing-sections in accordance with claim 3, wherein the presser is operated by a pendently supported cam carried by the frame leg and operatively coupled to the presser, and a shiftable actuator roller coacts with the cam to move the presser into active position in opposition to retractile means.

6. Apparatus for riveting sheet metal and reinforcing-sections in accordance with claim 3, wherein the crusher device is in the form of a fork-ended pivotal lever, a plunger is operatively coordinated to the upper end of said lever, said plunger being slidable in a complementary bore in the abutment-block, and a die having a recess adapted to form a rivet head within the confines of the inwardly forced sheet metal edges is provided at the free end of said plunger.

7. Apparatus for riveting sheet metal and reinforcing-sections in accordance with claim 3, wherein the cam-operable presser device and the

crusher oscillatable element are respectively pneumatically actuated; and a three-way device controls supply of pressure air first to the presser service, and then jointly therewith to the oscillatable crusher means.

8. Apparatus for securing together multiple metallic sheets or the like having aligned rivet holes therein, by means of taper head rivets, comprising a stationary abutment with a die-aperture including an outwardly-flared recession adapted to the head taper of the rivets employed; a presser for forcing the sheet metal, by aid of the head of a rivet thrust shank foremost, through the metal and into the die aperture, against the flared surface of the said die-aperture; and an oscillatable lever having a crusher-head operative while the rivet is held to the abutment by the presser to head over the end of the rivet shank upon the peripheral edges of the sheet metal around the rivet head, said crusher having a recess to determine formation of a head of a size corresponding to the minimum diameter of the die-aperture in the stationary abutment.

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