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F. C. WALLACE

2,365,787

CLAMP

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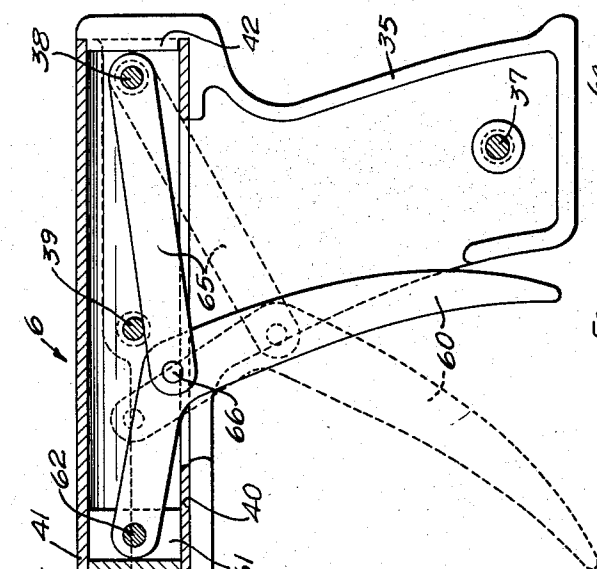


Fig. 1.

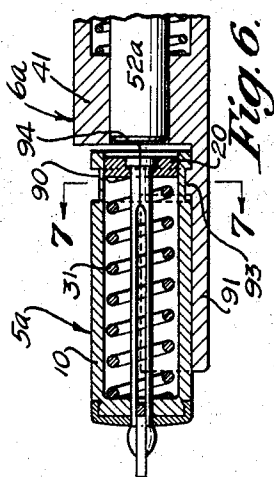


Fig. 6.

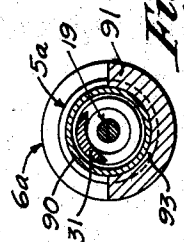


Fig. 7.

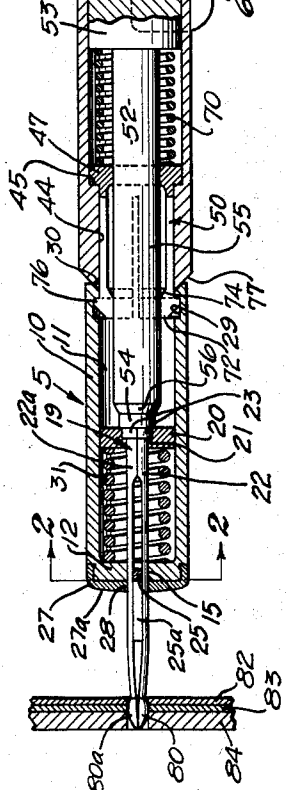


Fig. 2.

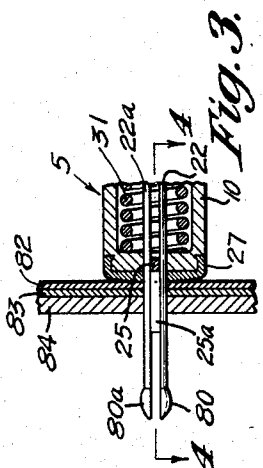


Fig. 3.

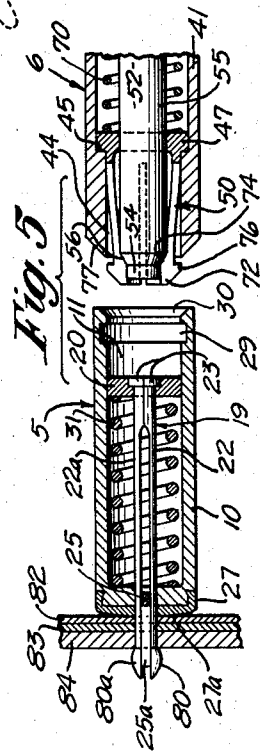


Fig. 5.

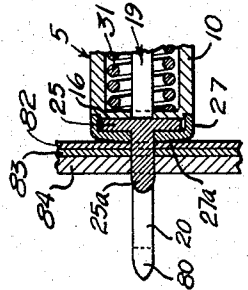


Fig. 4.

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UNITED STATES PATENT OFFICE

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CLAMP

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11 Claims. (Cl. 85—5)

My invention relates to clamps and, in its more particular aspects, it has to do with clamp devices adapted for holding metal plates and the like in proper position and relation for riveting. For instance, in the manufacture of airplanes and the like, sheet metal plates are preliminarily assembled in overlapping relation over the supporting ribs, with the rivet holes of the plates and ribs in register for the reception of the rivets. My device is adapted for clamping said plates in such relationship until the rivets are finally applied.

Among the objects of my invention, I aim to provide a clamp which may be readily applied and removed with minimum of effort; which is extremely durable and capable of long life; which is economical of manufacture and which is always capable of uniform clamping action.

Still further objects and attainments of my invention will become obvious from the following detailed description of a preferred adaptation thereof, for which purpose I shall refer to the accompanying drawing, in which:

Fig. 1 is a view partly in section and partly in elevation and showing the clamp being applied;

Fig. 2 is a cross-section on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view showing the clamp in another position which it occupies while being applied;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a longitudinal sectional view showing the clamping element in applied position and showing a fragment of the applying mechanism;

Fig. 6 is a longitudinal fragmentary sectional view showing a variational form; and

Fig. 7 is a section on line 7—7 of Fig. 6.

In general, my invention consists of the parts, combinations and associations of parts as will appear hereinafter.

In the drawing, the numeral 5 generally designates the clamp assembly and the numeral 6 generally designates the clamp applying tool. Referring now to the clamp 5 as shown in Figs. 1 to 5, inclusive, I show at 10 a round body having a central longitudinal bore 11 and an integral end wall 12 provided with a central opening 15 and a diametrically extending slot 16 in its outer face. A plunger 20 is slidably mounted in bore 11 and through the central opening 21 of the plunger a clamp pin 19 extends. Preferably, pin 19 is longitudinally split throughout its length whereby to present opposed segments 22, 22a headed at 23, the head fitting into a corresponding recess in plunger 20. Pin 19 is preferably of a diameter substantially equal to the

diameter of the rivet holes provided through the work to be clamped, so that the pin may enter but snugly bear against the side walls of the holes. The split is relatively wide from a point adjacent head 23 to the outer end of the pin and a cross bar 25, which has a thickness commensurate with the width of the split, extends transversely through the split. As best shown in Fig. 4, cross bar 25 is T-shaped, the cross leg of the bar being mounted in the slot 16 and the other or central leg 25a extends outwardly along the split between pin segments 22, 22a and through central opening 28 provided in an end cover cap 27, said cap being crimped or otherwise suitably secured to the end of the body 10. Cap 27 has an outer curved work engaging surface 27a so that as the device is held against the work only a minimum contact surface is presented whereby to minimize the chance of marring the surface of the work. Bar 25 is stationary with respect to the pin 19 and serves to separate the pin segments 22, 22a and maintain the pin at its full diameter throughout the length of the central leg 25a.

Pin segments 22, 22a have relatively enlarged ends 80, 80a and the segments are preferably of a resilient metal so that as the pin segments are moved outwardly from the bore 11 their outer ends are spaced outwardly from the outer end of the central leg 25a a sufficient distance to permit the outer ends of the segments to be flexed inwardly towards each other to allow the enlarged heads to be inserted through the registering rivet holes provided in the work. The outer faces of the enlarged pin portions 80, 80a are curved to facilitate inserting and removing them through the rivet holes. Typically, the work to be clamped is here illustrated as being comprised of metal sheets 82, 83 laid in overlapping relation on a supporting rib 84 with their rivet holes in register.

I have shown and described pin 19 as being split throughout its length, principally for the reason that it is more economical to manufacture when thus made in two separable segments. However, it will be understood that, within the broader spirit of my invention, the split need only be coextensive with that outer portion of the pin which rides astride cross bar 25, so that an otherwise solid pin bifurcated at its outer end would suffice. An annular groove 29 is provided around the inner surface of body 10 for receiving the clamp applying tool to be hereinafter described, the adjacent end of body 10 being beveled at 30 for the same purpose. Interposed

between the inner face of wall 12 and plunger 20, around the pin segments, I provide a compression spring 31.

Referring now to the clamp applying tool 6, it will be seen to be pistol-shaped and consists of a handle portion 35 made of two half sections secured together by rivets 37, 38 and 39. The top portion of the handle is provided with an upwardly opening curved channel 40 to receive the barrel portion 41, the inner end of the barrel resting against boss 42 and being secured to the handle by rivets 38, 39. The outer end of the barrel 41 is provided with a portion 44 of reduced diameter to provide an inwardly facing shoulder 45 against which the flanged end 47 of a split sleeve 50 abuts. Slidably mounted in sleeve 50, there is a plunger 52 which has an inner head 53 and an outer reduced end 54 which engages the head 23 of the split pin member of the clamp. The portion of plunger 52 between end 54 and head 53 is slidable through the split sleeve 50 and acts to spread its segments with respect to each other. A beveled shoulder 56 is provided intermediate portions 54 and 55 of the plunger. For sliding plunger 52 to the left in Fig. 1, I provide a toggle trigger 60 which is pivotally connected at 62 to head 53 in slot 61 provided therein. Trigger 60 is somewhat L-shaped and has a link 65 pivotally connected to the trigger at 66 and pivotally mounted at its other end on rivet 38. Rivet 39 acts as a stop to arrest further upward movement of link 65. Between the plunger head 53 and inner end 47 of the sleeve 50, I interpose a compression spring 70 which is compressed when the trigger 60 is operated from the dotted line to the full line position in Fig. 1.

The outer end portion 72 of sleeve 50 is of relatively reduced diameter, there being a beveled shoulder 74 between said reduced end and the relatively larger adjacent bore; and around the outer surface of end portion 72 there is an annular flange 76, which flange, when the sleeve is in the expanded condition of Fig. 1, engages in groove 29 to hold the assembly 6 in operative association with the clamp assembly 5. The outer end of barrel 41 is beveled at 77 for engagement against the beveled portion 30 of body 10.

The operation of the device of Figs. 1 to 5, inclusive, is as follows. The work being clamped typically may be the overlapping metal sheets 82, 83 laid upon a supporting rib or the like 84, the rivet holes through said elements being in register. Usually a plurality of rivet holes are disposed in rows through the metal sheets. After the sheets are thus assembled and before the riveting begins, my clamps are applied in selected rivet holes sufficiently along the work to hold the plates in proper assembly. To insert a clamp, elements 5 and 6 are engaged end to end, as shown in Fig. 1, and trigger 60 is moved from the dotted line to the full line position of Fig. 1. This acts not only to lock elements 5 and 6 together by expanding sleeve 50 to engage its flange 76 in groove 29, but it also slides pin segments 22, 22a outwardly with respect to the stationary bar 25 until head portions 80, 80a are in the position of Fig. 1. In that position the heads 80, 80a are spaced outwardly a considerable distance from bar 25 so that they may be flexed together sufficiently to be inserted through the registering rivet holes. The clamp assembly is thus pushed against the top sheet 82, as shown in Fig. 3, and trigger 60 is then released, per-

mitting the springs 31, 70 to return the parts to normal position, after which the applying tool 6 may be removed until it is desired to remove the clamp. With the clamp thus applied, pin heads 80, 80a engage against the back surface of work element 84 (see Fig. 5) to prevent the plates from spreading apart, and the adjacent pin portions, being held in spread position by bar 25 to the full diameter of pin 19, bear against the side walls of the rivet holes to prevent relative sliding movement between the plates such as might move the rivet holes out of register. To release the clamp when it is desired to place a rivet in the hole occupied thereby, the applying tool 6 is again applied and trigger 60 is again operated as before described, which slides pin segments 22, 22a back to the position of Fig. 3 and permits the enlarged heads to be withdrawn through the holes as shown in Fig. 1.

In Fig. 6, I show a variational form which is in most respects like the device heretofore described, except that in lieu of the annular internal groove 29, I provide an annular exterior groove 90 in body 10 and in lieu of providing the split sleeve 50 as described hereinbefore, barrel 41 terminates in an upwardly opening trough portion 91 of curved cross-section. On the inner face of this trough a flange 93 is provided which engages in groove 90 of body 10 to hold the body 10 against longitudinal escape from the trough. Plunger element 52a is operated by means identical with those heretofore described and its outer end 94 engages the traveling washer 20 to operate the clamp device as heretofore described. As plunger 52a enters the bore 11 of body 10 the clamp element 5a and applying tool 6a become and remain secured together until the plunger 52a is retracted.

While I have resorted to considerable detail for the purpose of making my invention understood, I wish it understood that within the broader scope of my invention, as defined by the appended claims, various modifications and adaptations may be made without departing from the spirit of the invention.

I claim:

1. A clamp of the class described comprising a body having a bore therein, a wall closing one end of the bore, a slot extending diametrically across the outer face of said wall, a central opening through the wall between the ends of the slot, a cross bar mounted in the slot, a cap secured to the body and disposed over the exterior face of said wall, an opening through the cap in register with the opening through the wall, and a pin slidably mounted in the bore, said pin having a bifurcated outer end portion providing parallel legs extending through said openings and astride said bar.

2. A clamp of the class described comprising a body having a bore therein, a wall closing one end of the bore, a slot extending diametrically across the outer face of said wall, a central opening through the wall between the ends of the slot, a cross bar mounted in the slot, a cap secured to the body and disposed over the exterior face of said wall, an opening through the cap in register with the opening through the wall, and a pin slidably mounted in the bore, said pin having a bifurcated outer end portion providing parallel legs extending through said openings and astride said bar, said bar having a portion extending through the opening in the cap and longitudinally between said legs.

3. A clamp for holding perforated sheets in superposed relation with their perforations in register comprising a body presenting a spherical sheet engaging end surface having a central opening therethrough, an elongated retainer member slidably mounted in the body and being projectable therefrom through said opening whereby to be inserted through said perforations, said retaining member having a sheet engaging outer end portion and being retractable with respect to the body whereby to clamp said sheets between said sheet engaging portion and said spherical end surface, and means carried by the body for retracting said retainer member.

4. A clamp device comprising a cylindric body having an end wall, an opening through the end wall, a cap carried by the body in position covering the outer face of the end wall, an opening through the cap concentric with the first-mentioned opening, a retaining pin slidably mounted in the body and being protractable and retractable through said openings, said pin being bifurcated to provide parallel spaced segments, and a separator member disposed longitudinally between said segments, said separator member having its inner end mounted between the body end wall and said cap.

5. A device of the class described for temporarily clamping perforated sheets in superposed relation, including a tubular body presenting an end closure member having a central opening therethrough, an elongated retaining pin mounted in the body for protraction and retraction with respect thereto, the outer end portion of said pin being longitudinally split to present diametrically expansible legs, coil spring means mounted in the body exteriorly around the pin whereby normally to urge the pin into retracted position, and means for diametrically expanding said legs apart upon retraction of said pin, said last mentioned means comprising a substantially flat spreader having a cross-arm portion held against outward longitudinal movement by said end closure member and disposed between said legs and a central elongated portion projecting outwardly from the body through said central opening between said legs, whereby upon retraction said legs slide over the opposite faces of said cross-arm portion and central elongated portion of said spreader.

6. In a clamp of the class described, a cylindric body having an end closure member, one portion of said closure member presenting a transverse slot and another portion thereof presenting a work engaging surface overhanging the slot, a central opening in the end closure member, a retaining pin slidably mounted in the body and having bifurcations projecting through said central opening, and a spreader member having a cross arm disposed in said slot and a central arm projecting outwardly through the central opening between the bifurcations.

7. In a clamp for clamping a piece through a perforation therethrough, a body member having an outwardly vaulted bearing surface provided with a central opening and engaging the piece to be clamped, a clamping element projecting through said opening, and means including spring means for causing clamping action between said body and said element.

8. In a clamp for clamping a piece through a perforation therethrough, a body member having an outwardly vaulted bearing surface provided with a central opening and engaging the piece to be clamped, a clamping element projecting through said opening, and means including spring means for causing clamping action between said body and said element upon movement of said element towards said body and compression and subsequent release of said spring means.

9. In a clamp for clamping sheets through perforations therethrough, a body member having an outwardly vaulted bearing surface provided with a central opening and engaging said sheets, a clamping element projecting through said opening and the aligned perforations of said sheets, and means including spring means interposed between said body and said element for causing clamping action between said body and said element.

10. In a clamp for clamping sheets through perforations therethrough, a body member having an outwardly vaulted bearing surface provided with a central opening and engaging said sheets, a clamping element projecting through said opening and the aligned perforations of said sheets, and means including spring means interposed between said body and said element for causing clamping action between said body and said element upon movement of said element towards said body and compression and subsequent release of said spring means.

11. A clamp for holding perforated sheets together in superposed relation, comprising a cylindrical body, a laterally flexible retaining member reciprocally mounted in the body for protraction and retraction through the outer end of the body, a spreader bar having lateral sliding engagement with the retaining member, said spreader having an angularly disposed inner end portion, and means for holding the spreader bar against outward longitudinal movement relative to the body, the last-named means consisting of a cover cap having a cylindrical skirt secured to the outer end portion of the body periphery and an end wall whose inner surface provides an abutment for the angular portion of the spreader bar and whose outer surface provides a sheet-engaging portion.

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