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Filed April 17, 1939

Serial No. 268,414

2 Sheets-Sheet 1

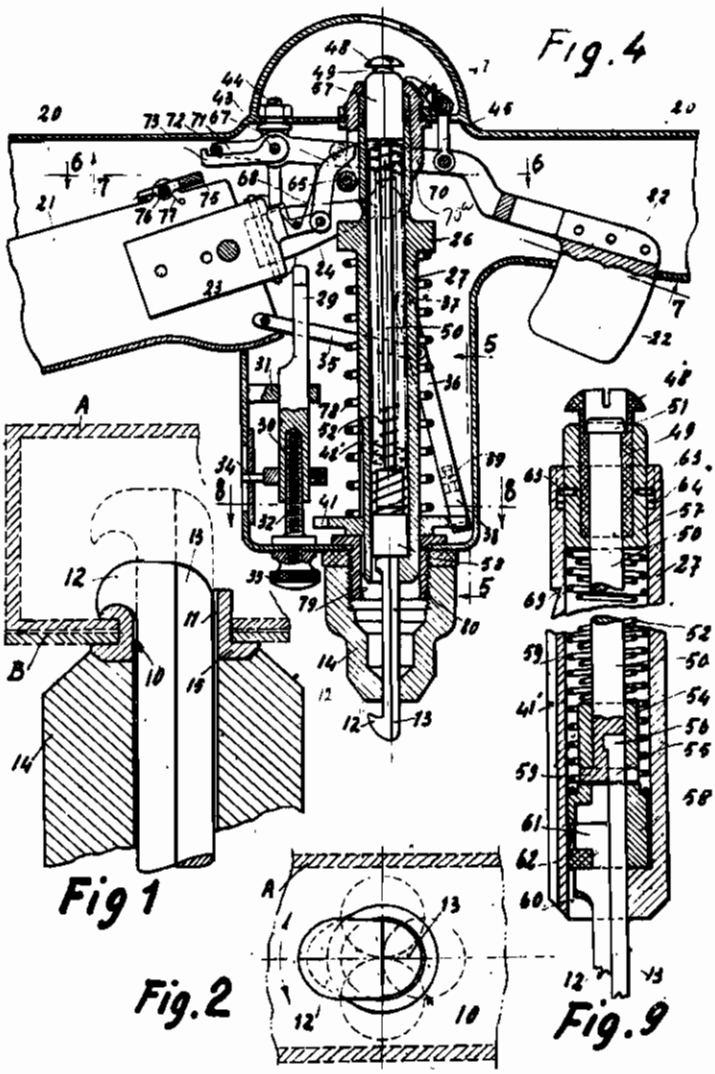

Fig. 4

Fig 1

Fig. 2

Fig. 9

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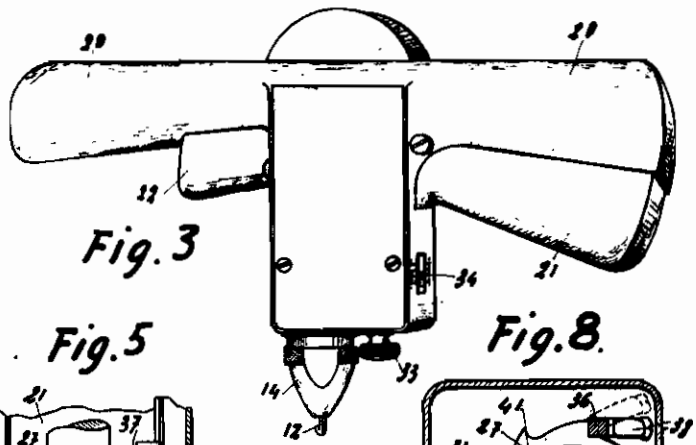

Fig. 3

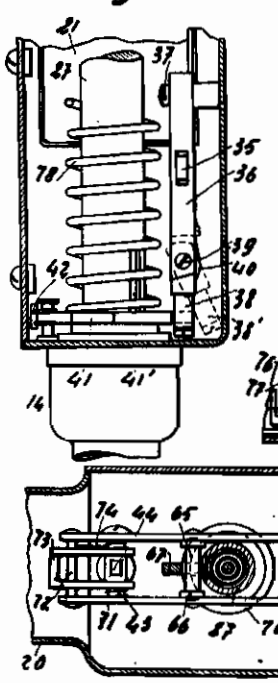

Fig. 5

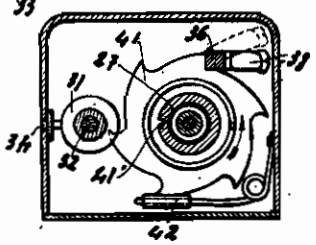

Fig. 8.

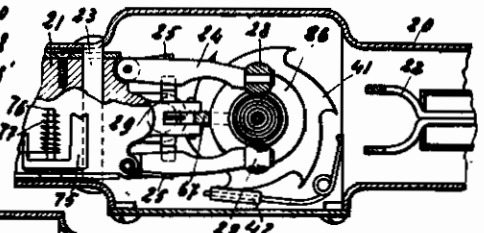

Fig. 6

Fig. 7

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METHOD FOR INSIDE RIVETING BY MEANS OF HOLLOW RIVETS AND MEANS FOR ACHIEVING THE SAME

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Application filed April 17, 1939

The object of the present invention is a method for riveting from the inside with hollow rivets for joining plates and the device for achieving said method.

It is known how difficult it is to obtain a perfect riveting of plates fixed against hollow bodies, whose inside is inaccessible. In said riveting, hollow rivets are used, namely small bushes with a flange at one end, forming the head of the rivet.

The problem consists in upsetting the tail-end of the bush, after it has been slipped in the corresponding hole, so that said tail may be flared and upset against the inside face of the plate, thus forming the other head of the rivet.

Device have been proposed to achieve such a work, but have proved slow in practice, due to the fact that the striking member has to increase its diameter after having been slipped into the rivets hole, and has again to diminish in diameter when taken out after the rivet is set.

Besides, the systems heretofore known can be achieved only with complicate and delicate devices.

The method according to the invention solves the problem in the simplest way and consists essentially in this, that it makes use of a beading-head, extending only for a small sector of the bushes periphery and that in the heading operation it revolves around its axis so as to operate gradually over the whole periphery of the bush.

Such an action is achieved with a series of successive blows or a hammering, accompanied by an automatic rotation of the hammer head.

But in another embodiment of the invention, one might just provide pressure, always accompanied by the characteristic rotation, automatic or non-automatic, so that the rivet's tail may be flared gradually and upset against the inner wall.

The device achieving the method disclosed above, consists substantially of a beading tool, slipped in a cavity of a matching snap or reaction member, said tool having its stem divided longitudinally in at least two parts, so that the beading head may enter the hole of the hollow-rivet when the other part of its stem is off, and cover the inside edge of the bush; then the said other part of the stem is replaced in working position. Thus the beading head extends along a sector of the periphery of said bushes' tail and can exert its beading action (by hammering or by simple pressure), when the tool is rotated around its own axis.

The tool is being operated through driving springs in the case of a hammer-riveting, each hammering impulse being combined with an automatic angular displacement of the same tool; but it is apparent that said drive might be obtained through other forces, pneumatic, electromechanic or simply mechanical, such as a pressure by screws, wedges, levers and so on.

The invention will be now disclosed with reference to the attached drawing, given solely as example of an embodiment, limiting in no way the range of the invention.

In the drawing, the first two figures are given just to explain the method, whilst the remaining figures show an embodiment of a hand apparatus, based on the beading-action of a hammer using a spring drive and with angular anutomatic displacements obtained step to step by a ratchet wheel. Namely:

Fig. 1 is an elevation in section, showing the riveting action obtained within an inaccessible shroud;

Fig. 2 is a plan view of the same, with certain parts missing;

Fig. 3 is a perspective view of the device for performing the riveting;

Fig. 4 is an elevation of the device in section, according to Fig. 3.

Fig. 5 is a lateral section obtained along line 5—5 of Fig. 4;

Figs. 6 and 7 and 8 are sections, cut respectivcly along lines 6—6, 7—7, 8—8 of Fig. 4;

Fig. 9 is a partial section in a larger scale of the riveting hammer.

With reference to Figs. 1 and 2: A is the box or shroud to be riveted on a proper side to B by means of hollow-rivets 10, having an axial hole 11 for passing into it the riveting tool or hammer 12 and a guiding bar 13. These slide within a counter-snap 14, whereupon the head of the rivet 15 comes to bear. If a rotation is given to the riveting tool around its axis, combined with a longitudinal motion along the same axis, as will be shown hereafter, the edge of the tail of the hollow-rivet 10 is beaded or upset by the hammer 12, towards the outside obtaining the fixture of the two members.

In order to start riveting, first the riveting hammer 12 is introduced in hole 11, the guide-bar 13 being off.

The riveting tool 12 is designed so as to freely go through hole 11 of hollow-rivet 10. The guiding-bar 13 is then slipped in the rivet's hole and riventing is begun. In a similar manner the riveting tool 12 can be taken off.

Figs. 3 to 9 show an embodiment of the riveting device: this has two handles 20, fixed to the outer shroud of the apparatus. Under one of

said handles projects a working-lever 21, whilst under the other handle is placed a lever 22 for lifting and extracting the guiding-bar 13 and for operating on the blocking member as will be disclosed hereafter. Lever 21, besides controlling the riveting hole 12, provides for its rotation so as to move the hammer tool to operate over the whole periphery of the hollow-rivet's tail. Besides, said lever is blocked as soon as the riveting action is terminated namely when the riveting hammer 12 has completed a revolution and is also combined with means for adjusting the spring of the tool 12, according to the length of the rivet and the thickness of the articles to be united.

Lever 21 is fulcrumed in 23 (see Figs. 4 and 6) and has two hinged arms 24, influenced by springs 25, which keep said arms engaged in a round groove 26 cut in a tube 27 to which are applied the riveting hammer and its guide-bar 13.

Arms 24 (see also Fig. 6) carry on their end, revolving balls 28 or rollers for reducing friction between the moving parts, and also cooperating with an appendix in form of a wedge 29 which, on getting between said arms during the action of lever 21, compels them to open, thus allowing tube 27 to disconnect from said arms.

The appendix 29 ends with a screwed stem 30, sliding in a collar 31 and cooperating with a screw 32 provided with an adjusting knob 33 projecting outside.

On the screwed stem 30 is fixed an index 34, running along a graduated scale or a multiple scale, placed outside, the graduation of said scales depending on the thickness of the plates to be united and on the material of the rivets.

To lever 21 is connected a bar 35, controlling a lever 36 fulcrumed in 37 to the body of the apparatus; said lever ends at its lower end with a small roller 38 hinged in 39 (see Fig. 5) to lever 36 and influenced by a flat spring 40, so that said roller 38, due to its lateral shift, can assume a new position 38', shown in dotted lines in Fig. 5.

A ratchet wheel 41 is made solid to tube 27 (see Fig. 8) by means of an appendix sealing in a longitudinal key-way 41', cut in said tube, so as to allow its axial motion. The ratchet-wheel 41 is rotated by lever 21 through roller 38, which, by engaging in its teeth, moves it on by a certain angle depending on the number of teeth of the wheel. The latter is also influenced by an elastic stop 42, or by a proper claw or tooth, which, on acting on the teeth of said wheel, prevents any involuntary or accidental rotation of the wheel.

Lever 22 is fulcrumed in 43 (see Fig. 4) to an appendix 44 operating as a stop for lever 21. A small link 45 is articulated on lever 22 and carries on its end small tooth 48 influenced by a spring 47, which compels it to cooperate with crown 48 of a sleeve 49, concentric with tube 27 (Fig. 9).

In the inside of said sleeve is fitted a bolt 50 with a head 51, which retains it within sleeve 49 by means of a helical spring 52, encircling bolt 50. Moreover said bolt has, at its lower end, a projection 53 retaining a ring 54 influenced by spring 52;

In said projection is cut a notch for fixing, by means of said ring, the end 55, provided with a projection 56, of the guide bar 13.

The sleeve 49 is placed in a second bush 57, retained by the action of spring 52 and both are coaxial with tube 27. On the mouth of this tube is cut a projection holding a bush 58 with a cavity, influenced by a second helical spring 59 concentric with spring 52, whilst in cavity 60 enters the end 61 of the riveting member 12, so that the latter moves with tube 27. The end 61 of said tool, carries a notch into which a projection 62 of bush 58 is lodged, so as to obtain the possibility of displacing the guide bar 13 independently from the riveting tool 12.

Bush 57 carries pins 63, which form a bayonet fixture with grooves 64 cut within the tube 27, being maintained engaged in said grooves by the action of spring 59. Lever 22 provides also a small roller 65 (see Figs. 4 and 7) carried by links 66 and which can operate on a tooth 67 carried by lever 21. Said tooth is influenced by a spring 68 and engages at the proper moment a notch 69 (see Fig. 9) in tube 27, at such a height preventing any further operation of lever 21.

Roller 65 rolls on an inclined surface cut into guiding sleeve 70 of tube 27, so as to be displaced laterally.

Lever 22 carries also extensions 71 (see Figs. 4 and 7) united by a cross-bar 72, which forms a stop for a fork 73, pivoted in 43 and influenced by a spring 74.

Said fork can cooperate, as will be disclosed hereafter, with a stop in the shape of a small frame 75 (see Fig. 6) carried by pivot 76 fixed to lever 21, and influenced by a spring 77.

The apparatus is completed by a driving spring 78, wound round tube 27 and the lever guiding bush of the latter 79, ending with a threaded projection 80, to which is screwed-on the counter-snap 14, which eventually can bear against the rivet's head.

After the above description, the operation of the apparatus appears evident.

In order to proceed riveting, first the riveting tool 12 is slipped in the hole of the rivet, by means of the operation of levers 21 and 22. By pressing on the latter, the tooth 46 engages crown 48 of bush 49, lifting it; this will lift also the guide-bar 13 carried by rod 50. Then on pressing lever 21 and due to a small clearance left between the fork 73 and stop 75, the riveting tool 13 is partly pushed out and passes in the hole of the rivet. By letting levers 22 go, the guide-bar 13 enters also in the rivet's hole and by letting lever 21 go, the initial conditions will be restored.

Now, on pressing again on lever 21, it will swing freely and arms 24 will cause the drop of tube 27 and also of the whole mechanism solid with it, thus compressing the driving springs 78.

On dropping, arms 24 engage appendix 29, which, due to its wedged shape, will open said arms disconnecting them from grooves 26 and allowing the quick return of the tube 27 under the action of spring 78. Thus the riveting tool 12 on its return stroke, causes the upsetting of a part of the projecting tail of the rivet.

By operating on lever 21, lever 39 is displaced in such a manner that the roller 38 is actuated and moves on by one pitch, ratchet wheel 41, rotating with it the tube 27 and its mechanism. In this way the active part of the riveting tool 12 works over the whole circumference of the rivet's tail, automatically, without requiring any hand-rotation of the apparatus, and obtaining at each stroke the upsetting of a part of the rivet, so that after a certain number of strokes the riveting is completed.

In the case illustrated, the ratchet wheel 41 having six teeth, the riveting is completed after six strokes. As soon as this is completed the tube 27 reaches such a position that tooth 67, carried by lever 21 engages in notch 69, blocking said lever and keeping it lifted or reentering. Thus the operator is advised that the operation

is completed and can take out the riveting tool 12.

To do this he presses lever 22, which, besides lifting guide-bar 13, in the manner shown above, sets the tooth 67 free by means of roller 65, which rolls on the inclined surface of bush 70, setting lever 21 free. On pressing now on the latter, the riveting tool 12 comes out partially, as stated above, and so it can be taken out to go on with the same cycle of operations with the next rivet.

Springs 52 and 59, placed inside tube 27, besides maintaining in position the members attached thereto exert also a safety function, when the riveting tool 12 and the guide-bar 13 should encounter, on being depressed, an obstacle preventing them to complete their stroke, on an obstacle to the return of the tube.

This also, the tools 12 and 13 are protected from breakages, so that on their meeting with an obstacle, they can reenter the tube 27, compressing springs 52 and 59.

It appears also evident that the replacement of the riveting tool 12, of the guide-bar 13 and of the counter-snap 14, to fit them for different diameters of rivets, is quite simple.

It is sufficient to take out said counter-snap and to block temporarily, with known means, the tube 27 and, acting on bush 49 with a screwdriver or other tool, disengage it from the bayonet fitting.

Thus the whole mechanism mounted in tube 27 is taken out and the riveting tool 12 with its guide-bar 13 can be easily changed or replaced.

Notwithstanding our having specified and illustrated a very practical embodiment of the invention, the same may vary and be driven for instance with other known means (electrically) with compressed air, etc. It is to be understood that, in practice, particulars in design and construction may vary without thereby exceeding the limits of the invention and of the patent's protection.

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