March 17, 1931. M. N. MATVEYEFF 1,796,572

DEVICE FOR ATTACHING FABRIC TO AIRPLANE RIBS

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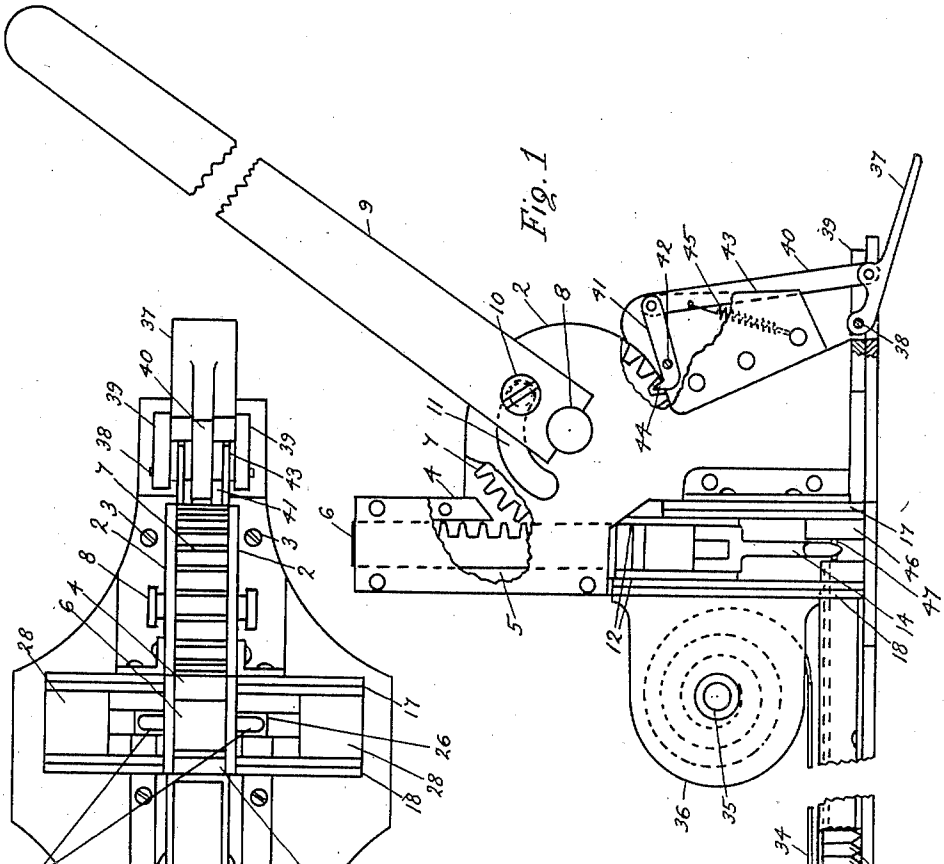


Fig. 1

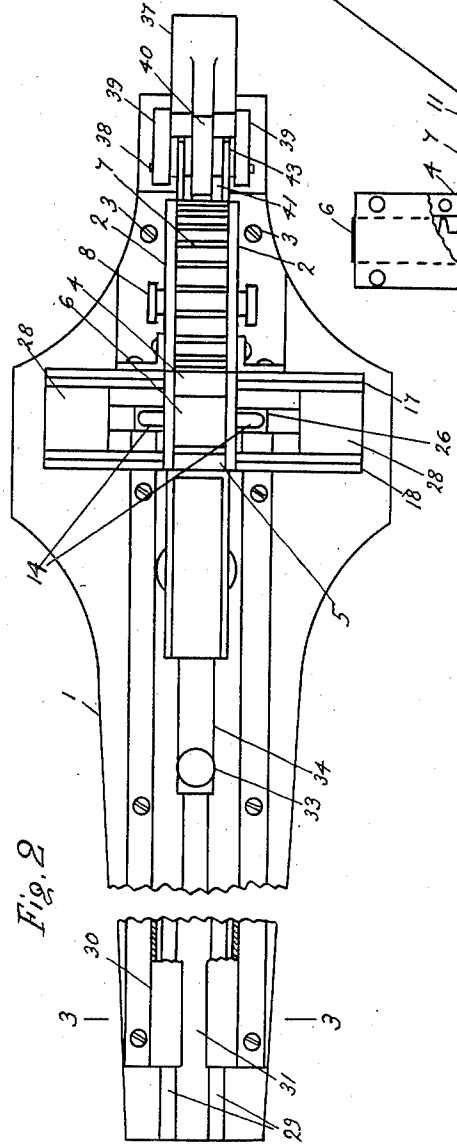


Fig. 2

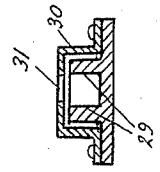
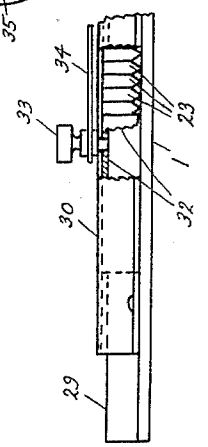


Fig. 3



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DEVICE FOR ATTACHING FABRIC TO AIRPLANE RIBS

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Fig. 4

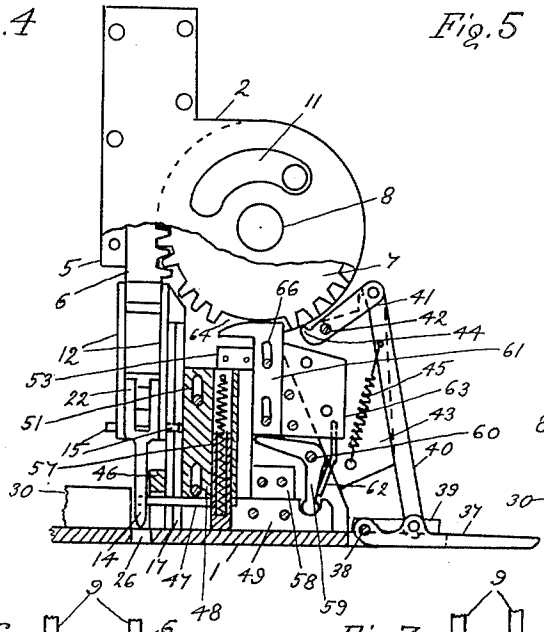


Fig. 5

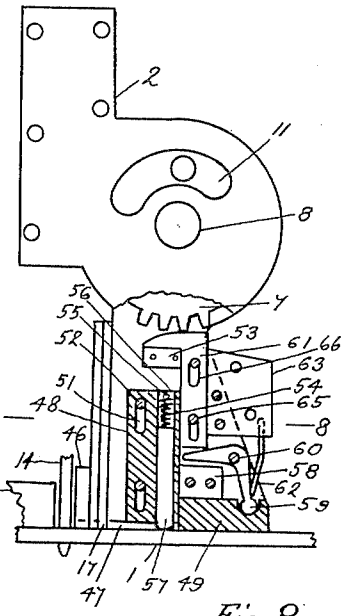


Fig. 6

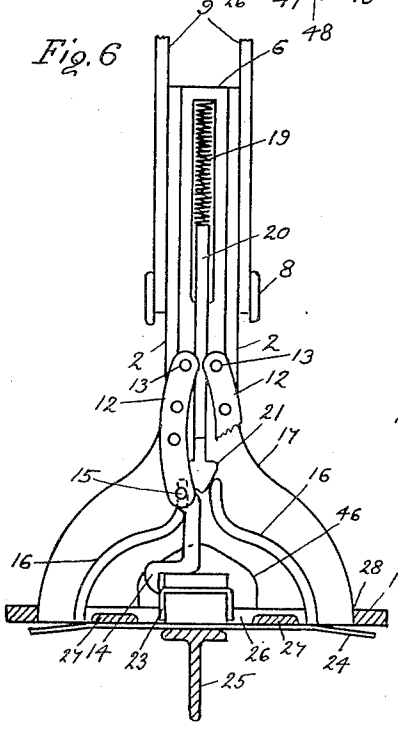


Fig. 7

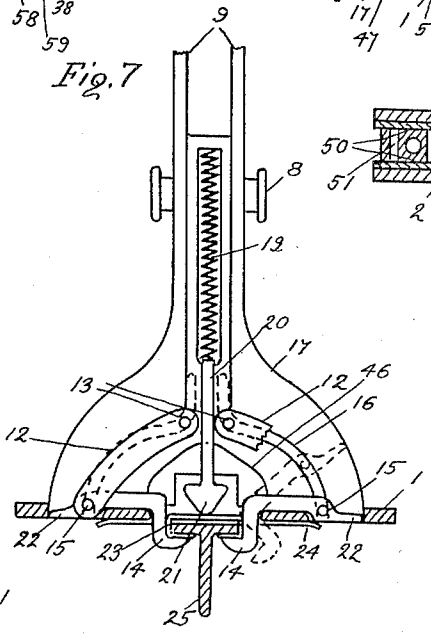
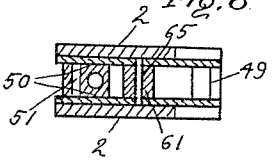


Fig. 8



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UNITED STATES PATENT OFFICE

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DEVICE FOR ATTACHING FABRIC TO AIRPLANE RIBS

Application filed July 16, 1930. Serial No. 468,290.

My invention relates to devices for attaching fabric to airplane ribs and has a particular reference to devices for fastening or clamping the covering fabric to the metal ribs forming the carcass of the airplane wings.

In ordinary practice the fabric is attached by tying it with cords. The process of drawing the cords through the thickness of the wing by means of long needles is slow and expensive, the cords become tighter or looser according to the moisture content of the outside air, and they form knots on the outside of the wing which represent an extra resistance to the air flow, marring also the general appearance of the wing.

In order to eliminate these difficulties I developed a special device or tool for clamping the fabric to metal ribs by means of metal cleats, passing through the fabric and bent around the top shelf of the T-shaped rib such as are generally used in the construction of wing carcasses. I found that these cleats and the device itself leave no larger holes in the fabric than those made by the ordinary needles (which are usually $\frac{3}{32}$ in. in dia.) also that these cleats clamp the fabric very securely and do not change their hold with the changes in atmospheric conditions. The operation of attaching the fabric with my device is very rapid and efficient, leaving the outside surface of the wing perfectly smooth.

My invention is more fully described in the accompanying specification and drawings in which—

Fig. 1 is an elevation of my device partly in section, Fig. 2 is a top plan view of same. Fig. 3 is a section taken on the line 3—3 (Fig. 2), Fig. 4 is a sectional view of the operating portions of the device when ready for operation, Fig. 5 is a similar view with the operating gear partly rotated, Fig. 6 is an inside view of the device ready for operation, Fig. 7 is a similar view when the operation is completed, and Fig. 8 is a top view of sliding blocks.

My device consists of a base plate 1 on which brackets 2 are mounted by screws 3 passing through their lower flanges. The upper extensions of these brackets are connected together by spacing blocks 4 and 5 forming a rectangular channel for a plunger 6, which is provided with gear teeth on one side in mesh with an operating gear 7. The latter is mounted on a shaft 8 passing through the sides of the brackets 2. Handle bars 9 pivot on the extensions of the shaft 8 and are fastened to the gear 7 by a screw 10 passing through slots 11 in the brackets 2. The screw 10 is shown in Fig. 1 resting against the front end of the slot which corresponds to an inoperative position of the device. The other end of the slot corresponds to the end of the operation of the device.

The lower end of the plunger 6 has on each side a pair of links 12 pivoted on pins 13. The lower ends of the links pivotally support operating or clamping tongues 14 on pins 15 which extend on both sides and fit in cam-shaped grooves 16 in the front guiding plate 17 and in the rear guiding plate or bracket 18.

The plunger 6 is hollow inside and has a helical spring 19 pressing against a sliding rod 20 with a spear-shaped end 21. This rod is shown in Fig. 6 in its upper position corresponding to the inoperative or raised position of the plunger. It is pushed to this position by the tail ends 22 of the tongues 14 pressing against the sides of the spear-shaped end. The tongues are shaped so that in their upper position they are adapted to fit over a staple or cleat 23 thereby forcing it down through a fabric 24 and over the edges of the upper shelf of a rib 25 on which the base plate 1 is placed.

The base plate 1 has a central slot 26 for the tongues 14. The inner edges of the bridges 27 at the ends of the slot are rounded off to form fulcrums for the tongues 14 in their rotation as shown in Fig. 7. Additional slots 28 receive tail ends of the tongues in their lowest position and also receive the corresponding lugs at the bottom of plates 17 and 18.

The rear portion of the device has a magazine feeding attachment for the staples 23. This attachment consists of a bar (which may be hollow in the middle as shown in Fig. 3) extending to within a short distance from the tongues 14 as shown in Fig. 1. This bar receive staples which slide on it under a cover

30 with a slot 31 on top. The bar 29 extends in the rear beyond the cover 30 to receive the staples.

For moving the staples forward a U-shaped carriage 32 is used which also slides in the space between the bar 29 and the cover 30. The carriage has a screw 33 on top which slides in the slot 31 and is used to attach the end of a flat spring 34 to the carriage. The other end of this spring is wound in a spiral and attached to a shaft 35 in a housing 36 attached to the rear side of the rear bracket or guiding plate 18.

The tongues do not function properly unless the device rests on the rib 25. In order to prevent its operation without the rib, a safety device is provided. This device consists of a swinging plate 37 pivotally supported on a pin 38 passing through blocks 39 attached to the base plate 1. A link 40 is also pivoted to the middle portion of the plate 37. The other end of this link is pivotally connected with the end of a lever 41 pivoted on a pin 42 passing through side plates 43. The inner end of this lever has a hook 44 adapted to engage the teeth of the gear 7 when the plate 37 is deflected downward under action of a helical spring 45. In this position the gear 7 is locked and cannot be rotated.

When the device is placed on the rib, the plate 37 is raised as shown in Fig. 4, deflecting the lever 41 so that it releases the gear 7.

The last staple pushed by the spring 34 is pressed against a block 46 attached to the rear guiding plate 17. The space between this block and the end of the magazine bar 29 is wide enough for only one staple. It is temporarily supported by a lug 47 attached underneath to a sliding block 48.

The block 48 is slidably fitted between L-shaped plates 50 fastened to a bottom block 49, thereby forming an L-shaped block which can slide between the plates 2.

The block 48 has vertical slots 51 for pins 52 passing through the plates 50. The block 48 is pushed up against a stationary block 53 by a spring 54 which rests on top against a pin 55 in a cylindrical slot 56, and at the bottom is enclosed in a tube 57. The block 53 is riveted or otherwise attached to the plates 2. Another stationary block 58 serves to guide the block 49. A bell crank 59 is pivotally mounted on a pin 60 and fits with its lower end in a slot in the end of the block 49. The other end of this bell crank rests against the bottom end of a vertical sliding L-shaped block 61. A spring 62 attached with its upper end to a block 63 tends to raise the block 61 to a position shown in Fig. 4 in which it fits in a space 64 on the gear 7 where the teeth are removed. The upper end of the block 61 is curved so that the pressure from the teeth of the gear, when the latter is rotated, tends to push the block 61 down to a position shown in Fig. 5. The block 61 is guided by stationary pins 65 passing through slots 66 in this block. The pins 65 are fastened in the plates 2.

The operation of my device is as follows.

With the device in an inoperating position, the plate 37 is deflected down thereby locking the gear 7 by the tooth 44 of the locking lever 41. The handles 9 are in their extreme forward position as shown in Figs. 1 and 4, with the screw 10 resting against the front edge of the slot 11.

The L-block 61 is raised by the lever 59 and fits with its upper end in the space between the teeth 64 on the gear 7. The horizontally sliding block 49 is pushed to the left by the lower end of the bell crank 59 so that the supporting plate 47 is moved to the left under the tongues 14 and receives the last clip from the magazine. It is supported in the upper position by the spring 54 which raises up the vertical block 48 to which the clip supporting plate 47 is attached.

As soon as the device is placed longitudinally on a rib 25, the safety plate 37 is raised, turning the lever 41 and releasing the gear 7. The latter can be then turned by pulling on the handle 9 to the rear. The next position is shown in Fig. 5 with the gear partly turned in the counterclockwise direction. The L-shaped block with the cam-shaped top surface is forced down by the pressure from the gear teeth, deflecting the bell crank 59 in a counterclockwise direction. The lower end of the crank pushes the sliding block 49 to the right carrying with it the vertically sliding block 48 and the supporting lug 47. The clip 23, being released, rests on the fabric 24 which is placed over the rib 25.

The plunger 6 begins to move down under pressure from the gear 7. The guiding pins 15 traverse at first the straight portions of the guiding slots 16 until the sharp points of the tongues 14 pierce the fabric forcing also the clips through. The rod 21 follows after the tongues preventing the other clips to come into the working space.

The tongues begin to turn around when the pins 15 enter the curved portions of the guiding slots 16, resting against the inner edges of the bridges 27 as on fulcrums (Fig. 7). The end of the rod 20 presses against the upper portion of the clip preventing same from buckling.

In their final position (Fig. 7) the tongues with their ends reach under the upper shelf of the rib bending over the ends of the clip and thereby securely fastening the fabric to the rib. The ends 22 fit in the slots 28.

The holes made in the fabric by the tongues are no larger than the holes left by ordinary $\frac{3}{32}$ in. needles.

The downward movement of the tongues begins before the lug 47 is fully withdrawn, but the latter is depressed down by the tongues against the tension of the spring 54.

The return movement takes place in the same manner, the tongues retracing their paths. Their inner portions press against the spear-shaped end 21 of the rod 20, thereby forcing same up into the inoperative position as shown in Fig. 6.

I claim as my invention:

1. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said base plate, a plunger slidably fitted in said brackets, means to reciprocate said plunger in a vertical direction, tongues pivotally supported at the lower end of said plunger, said tongues being adapted to insert clamping clips through the fabric over the edges of an airplane rib, and means to rotate said tongues thereby bending the ends of said clip over the edges of said rib.

2. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said base plate, a plunger slidably mounted in said brackets, means to reciprocate said plunger, tongues pivotally supported at the end of said plunger, said tongues being adapted to insert clamping clips through said fabric over the edges of an airplane rib, and means to rotate said tongues, said rotating means being rendered operative by the movement of said plunger, said tongues being adapted by their rotation to bend the ends of said clip over the edges of said rib.

3. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said base plate, a plunger slidably mounted in said brackets, means to reciprocate said plunger, tongues pivotally supported at the end of said plunger, said base plate being provided with a slot for said tongues, means to deliver clips one at a time under said tongues, means to support said clip in said slot, means to withdraw said support when said plunger with said tongues is moved down, said tongues being adapted to insert said clip through said fabric over the edges of an airplane rib, and means to rotate said tongues thereby bending said clips over the edges of said rib.

4. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said plate, a plunger slidably mounted on said brackets, means to reciprocate said plunger, tongues pivotally supported at the end of said plunger, said tongues being adapted to insert clamping clips through fabric over the edges of an airplane rib, means to rotate said tongue by the movement of said plunger thereby bending said clips over the edges of said rib, and means to hold said clip against said fabric and said rib when said clips are being bent.

5. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said base plate, a plunger slidably mounted on said brackets, means to reciprocate said plunger, links pivotally supported at the lower end of said plunger, tongues at the ends of said links, means to deliver clips one at a time under said tongues, said tongues being adapted to force said clips through a fabric over the edges of an airplane rib, and means to guide said links with said tongues in their movement thereby causing said tongues to rotate and to bend the ends of said clips over the edges of said rib.

6. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets on said base plate, a plunger slidably mounted on said brackets, tongues pivotally supported at the end of said plunger, said base plate being provided with a slot for said tongues, means to guide said tongues in their movement through said slot, said tongues being adapted to insert a clip through said fabric over the edges of a rib, said guiding means being adapted to cause rotation of said tongues around the edges of said plate at said slot thereby bending said clip around the edges of said rib.

7. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets on said base plate, a plunger slidably mounted in said brackets, means to reciprocate said plunger, tongues pivotally supported at the end of said plunger, means to deliver clips under said tongues, said tongues being adapted to insert said clips through a fabric around the edges of an airplane rib, means to prevent the rest of said clips from being moved when one clip is being inserted, and means to rotate said tongues in their movement with said plunger thereby bending the ends of said clips around the edges of said rib.

8. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets on said plate, a plunger slidably mounted in said brackets, means to reciprocate said plunger, tongues at the end of said plunger, means to deliver clips under said tongues, said tongues being adapted to insert said clips through a fabric over the edges of an airplane rib, means to rotate said tongues by the movement of said plunger thereby bending the ends of said clips over the edges of said rib, and means to render said plunger inoperative until said base plate is placed over said rib.

9. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets on said plate, a plunger slidably mounted in said brackets, a rack on one side of said plunger, a gear rotatively mounted in said brackets and in mesh with said rack, means to manually rotate said gear thereby operating said plunger, means to limit the rotation of said gear, tongues at the end of said plunger, means to deliver clips under said

tongues, said tongues being adapted to insert said clips through said fabric around the edges of said rib, and means to rotate said tongues by the movement of said plunger thereby bending the ends of said clips around the edges of said rib.

In testimony whereof I affix my signature.

MICHAEL N. MATVEYEFF.