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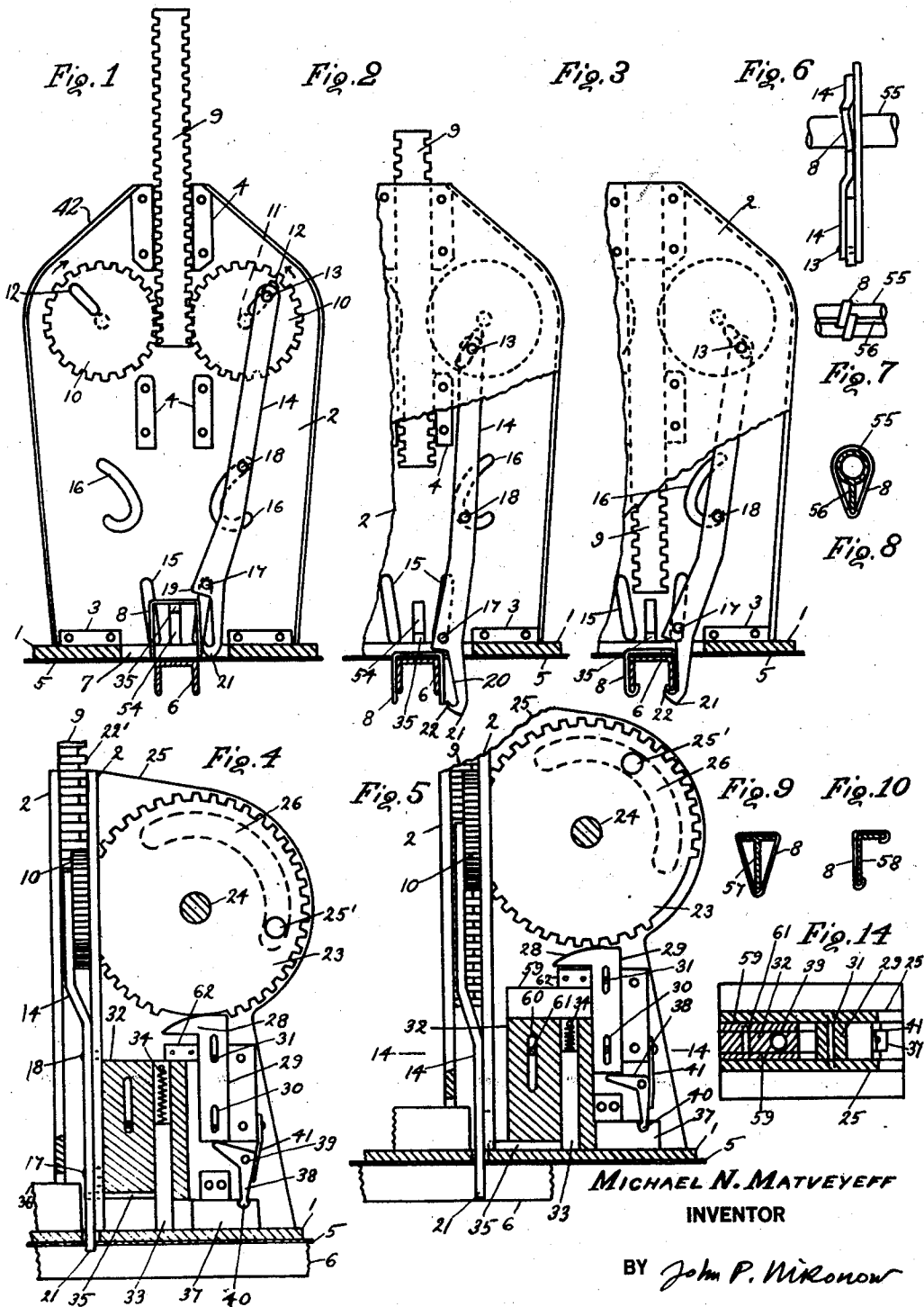
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DEVICE FOR ATTACHING FABRIC TO AIRPLANE RIBS

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2 Sheets-Sheet 1



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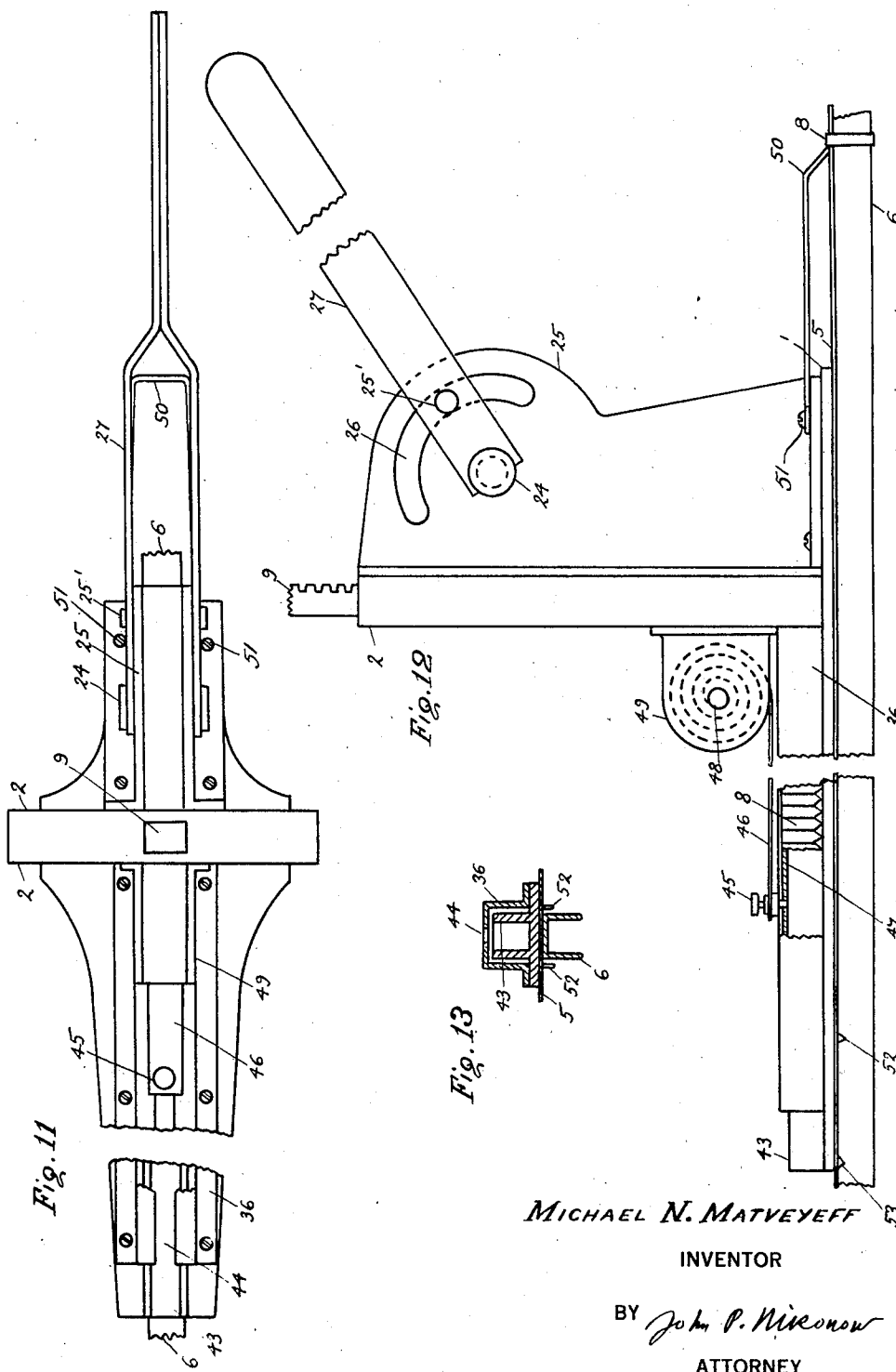
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DEVICE FOR ATTACHING FABRIC TO AIRPLANE RIBS

Application filed December 1, 1931. Serial No. 578,328.

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 metal ribs forming the carcass of the airplane wings.

The object of my invention is to provide a device for attaching fabric to metal ribs by means of metal clamps or cleats. One such device I have already disclosed in my Patent No. 1,796,572, which covered an arrangement for attaching fabric to T-shaped ribs. A somewhat different mechanism is required for attaching fabric to other shapes of ribs used in the airplane construction, such as C-ribs, angle ribs, bulb ribs etc.

For this purpose it is necessary not only to force the cleat over the rib, but, also, to press its sides against the sides of the cleat, then bend the ends of the cleat and to turn them upward. I accomplish a series of movements for this purpose by means of arms actuated by cam-shaped surfaces.

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

Fig. 1 is an elevation of the operating arms in their raised position, ready for operation, Fig. 2 is a partial view of the arm mechanism in position when the cleat is forced over the rib, Fig. 3 is a similar view showing the sides of the cleat pressed against the sides of the C-rib (channel) and the ends of the cleat bent over the edges of the rib, Fig. 4 is a partial sectional elevation of the mechanism taken in another plane with arms in raised position, Fig. 5 is a similar view showing the arms in a lowered position, Fig. 6 is a top view of a bulb beam with a skewed cleat and staggered arms, Fig. 7 is a bottom view of the bulb rib, Fig. 8 is an end view of the bulb rib, Figs. 9 and 10 are end views of other rib sections, Fig. 11 is a top plan view of my device, Fig. 12 is a side view of same, Fig. 13 is a sectional view of the rear end of same and Fig. 14 is a section on the line 14—14, Fig. 5.

My device consists of a base plate 1 on which brackets 2 are mounted with spacing blocks 3 and 4 between them. The plate 1 can be placed over a fabric 5 with a rib 6

under it. An aperture 7 permits the placement of cleats or clips 8 over the rib 6.

The blocks 4 also serve as guides for a sliding rack 9 in mesh on both sides with gears 10 which rotate on shafts 11. The gears 10 are provided with cam-shaped slots 12 engaging pins 13 on the ends of arms 14. Additional slots with cam-shaped surfaces 15 and 16 are provided in the front bracket 2 for pins 17 and 18 in the arms 14.

The lower ends of the arms 14 have shoulders 19 for pushing the clips 8 through the fabric and over the rib 6. They also have flat portions 20 for pressing the clips against the sides of the rib. The lower tips 21 are made sharp pointed for piercing the fabric, and they have hooks 22 for bending the ends of clips upward and around the edges of the rib.

The front side of the rack 9 also has teeth 22' in mesh with a gear 23 supported on a shaft 24 in brackets 25 attached to the front bracket 2. The gear 23 has a shaft or pin 25' passing through circular slots 26 in the brackets 25. The ends of the pin 25' are attached to the sides of a handle 27 which is also supported on the central shaft 24.

Some of the teeth are removed from the gear 23 so as to provide a clearance for the head 28 of a sliding plunger 29. This plunger has slots 30 for guiding pins 31 fitted in the brackets 25. A block 32 is kept in a raised position by a plunger 33 with a spring 34. A bar 35 extends underneath the block 32 and serves to support clips 8 as they come from the magazine feeder 36.

The block 32 has a slot 60 for a pin 61 fitted in side plates 59. These plates have extensions attached to a block 37. The latter can slide in a horizontal direction under action of a crank lever 38. This lever is pivotally supported on a pin 39 and has a rounded lower end 40 fitting in a corresponding slot in the block 37. The other end of the lever supports the vertical block 29. A spring 41 tends to keep the crank lever 38 turned thereby raising the block 29 and pushing the block 37 to the rear. A block 62 serves as a guide for the plates 59.

Cover strips 42 may be provided for the

sides of the brackets 2. These covers are shown removed in Figs. 4 and 5.

The magazine feeder represents a bar 43 extending to the rear end of the plate 1 and adapted to support clips 8. It has a cover 36 attached to the plate 1 and is provided with a slot 44 on top for a screw 45 attached to the end of a flat spring 46. The lower end of the screw 45 is fitted into a carriage 47 which serves to push the clips 8 toward the slot 7. The spring 46 is wound on a drum 48 supported in brackets 49 attached to the rear bracket 2.

A guiding bar 50 is attached to the front end of the plate 1 with screws 51. Sharp pointed guiding pins 52 are fitted underneath the rear end of the plate 1. These pins are spaced at the same distance apart as the legs of a clip and serve for punching holes in the fabric for the clips.

Additional guiding lugs 53 are provided at the rear end of the plate 1. They are spaced apart for a distance corresponding to the width of the upper portion of the rib 6.

The pins 52 are located at the same distance from the central aperture 7 as the front edge of the bar 50.

The operation of my device is as follows.

The device is placed on the fabric 5 over the rib 6 so as to straddle it with the lugs 53, of which there may be several sets along the plate 1. Two holes in the fabric are punched with pins or punches 52 and then the device is replaced to a new position back so that the aperture 7 will come opposite the holes in the fabric. New holes will be then punched by the pins 52 at a distance at which it is intended to space the clips on the fabric.

One clip from the magazine is always supported on the bar 35 which is kept in its raised position sliding in the vertical slot 54 (Fig. 2). The arms 14 are then kept in the raised position as shown in Fig. 1 with the rack plunger 9 in its upper position. The handle 27 is lowered down to its inoperative position. The block 29 is in its raised position with its head 28 resting against the portion of the gear 23 where the teeth are removed (Fig. 4).

In order to operate the device the handle 27 is moved up thereby rotating the gear 23. Teeth of the gear slide over the rounded head 28 pressing it down and turning the bell crank 38 which forces the block 37 to slide forward thereby withdrawing the bar 35. The clip 8 becomes free and slides with its sharpened ends into holes in the fabric previously punched by the pins 52.

The gear 23 by its rotation pushes the rack bar 9 down thereby rotating the gears 10. The cam-shaped surfaces in the slots 12 force the arms 14 down so that the shoulders 19 push the clip over the sides of the rib 6 as shown in Fig. 2. The arm 14 is also guided in its movement by the pins 17 and

18 sliding in the cam-shaped slots 15 and 16.

With further rotation of the gears 10 the arms 14 are rotated on pins 17 so that the tips 22 bend the ends of the clips over the edges of the rib and the side 20 presses the side of the clip (or its leg) against the side of the rib. At the end of the rotary movement the end of the clip is bent at right-angles. Continuation of rotation of the gears will cause the arms 14 to move upward forcing the hooks 22 over the ends of the clips, thereby bending them over, as shown in Fig. 3.

My device can be also used for various other shapes of ribs used in the airplane construction. Figs. 6, 7 and 8 illustrate its application to the bulb rib 55. The lower ends of the arms 14 in this case are bent so that they meet in the center over the edge of the flat portion 56 of the rib. To avoid interference between the ends of the arms they are staggered as shown in Fig. 6, and the clips are skewed, as shown in Figs. 6 and 7, so that their ends lie side by side. It is not necessary to use staggered arms for the C-ribs as shown in Figs. 1, 2 and 3. Straight arms are therefore shown in Figs. 4 and 5.

The same principle can be applied to T-shaped ribs 57, Fig. 9. For angle ribs 58, Fig. 10, the arms must be asymmetrical, one arm being like those shown in Figs. 1, 2 and 3, and the other with a shortened end.

The guiding bar 50 is used to control the proper position of the device in relation to already clamped clips. For this purpose the device is placed on the ribs with the front end of the bar resting against the clip. The ends of the arms 14 will be then exactly opposite the holes punched in the fabric by the pins 52.

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, cam-shaped surfaces on said brackets, movable cam-shaped members on said brackets, arms movably supported on said cam-shaped members and surfaces and having dependent operating ends, said plate being adapted to be placed over a fabric on a rib, means to feed clips one at a time under the operating ends of said arms, and means to operate said movable cam-shaped members thereby operating said arms, said operating ends of the arms being adapted to press said clips over said rib and to bend the ends of said clips over the edges of said rib when said arms are being moved by said cam-shaped members.

2. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said plate, cam-shaped members movably supported on said brackets, stationary cam-shaped surfaces on said brackets, arms having operating ends, said arms being operatively supported on said cam-shaped members and surfaces, said

plate being adapted to be placed on a fabric with a rib under said fabric, means to feed clips under the operating ends of said arms, and means to operate said cam-shaped members thereby operating said arms, the operating ends of said arms being adapted to force said clips through said fabric over said rib and to bend the ends of said clips 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 plate, cam-shaped members movably supported on said brackets, arms having operating ends, said arms being operatively connected with said members, said plate being adapted to be placed on a fabric with a rib under said fabric, means to feed clips under the operating ends of said arms, means to move said cam-shaped members thereby operating said arms, the operating ends of said arms being adapted to push said clips over said rib and to bend the ends of said clips over the edges of said rib, and means to control the spacing of said clips on said rib.

4. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said plate, cam-shaped members movably supported on said brackets, arms having operating ends, said arms being movably supported on said brackets and adapted to be operated by said members, means to guide said arms, said plate being adapted to be placed on a fabric and on a rib, means to feed clips under the operating ends of said arms, said arms being adapted to be moved down when said cam-shaped members are being operated, thereby forcing said clips over said rib, then being adapted to be moved sideways thereby pressing the legs of said clips to the sides of said rib, and, finally, to be moved upward thereby bending the ends of said clips over said rib edges.

5. In a device for attaching fabric to airplane ribs, the combination with a base plate, of brackets mounted on said base plate, gears rotatively supported on said brackets, means to rotate said gears, cam-shaped portions on said gears, arms having operating ends, said arms being movably supported on said brackets, and adapted to be engaged by said cam-shaped portions, said plate being adapted to be placed on a fabric over a rib, means to deliver clips under operating ends of said arms, and means to guide said arms, the operating ends of said arms being adapted to bend said clips over the edges of said ribs.

In testimony whereof, I affix my signature.
MICHAEL N. MATVEYEFF.