May 29, 1962 F. A. H. SANTERRE 3,036,673

DEVICE FOR CLAMPING PLATES TOGETHER WITH IMPERVIOUS JOINTING

Filed Oct. 20, 1959 2 Sheets-Sheet 1

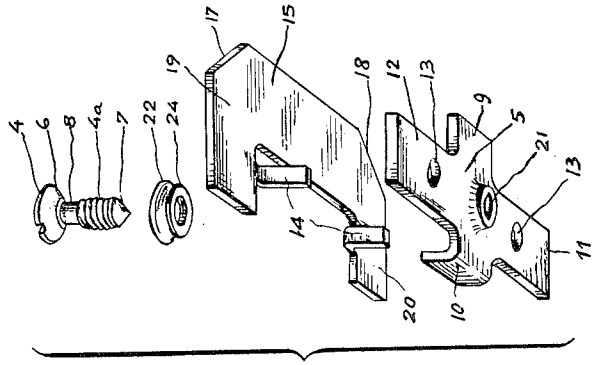

FIG.2.

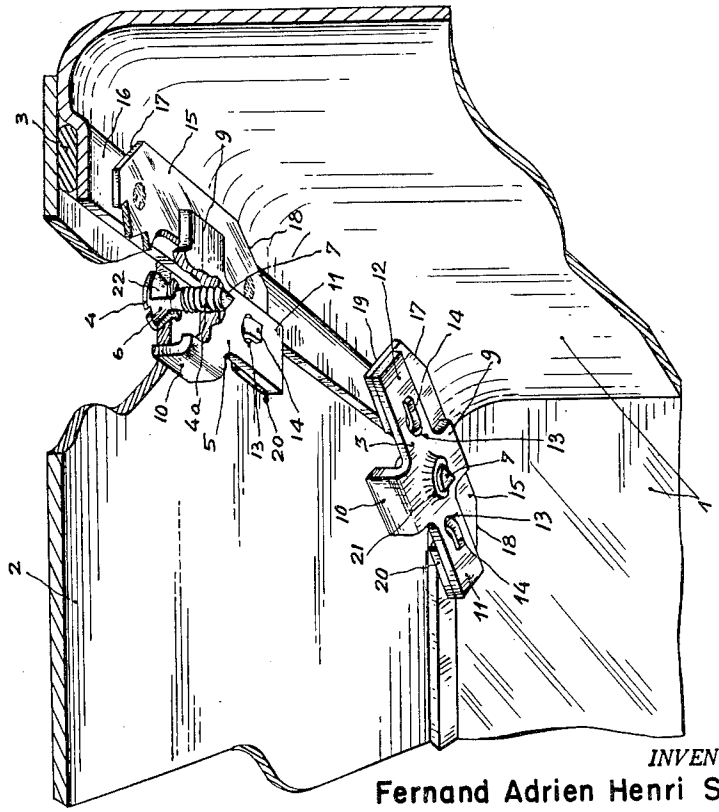

FIG.1.

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May 29, 1962 F. A. H. SANTERRE 3,036,673

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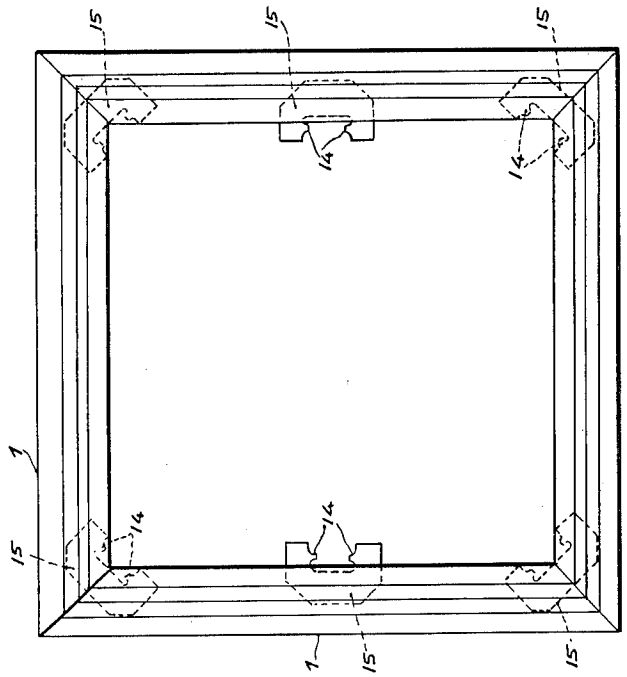
Filed Oct. 20, 1959 2 Sheets-Sheet 2

Fig.6.



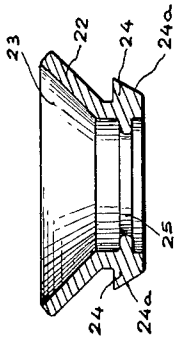


Fig.5.

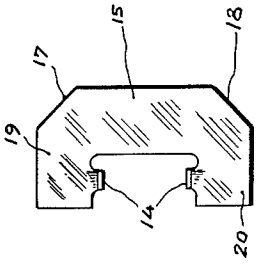


Fig.4.

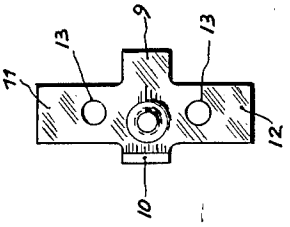


Fig.3

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DEVICE FOR CLAMPING PLATES TOGETHER WITH IMPERVIOUS JOINTING

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7 Claims. (Cl. 189—36)

The present invention is particularly, but not exclusively, directed to a closure means for metal panels of electric control boards or boxes to be clamped about a resilient joint-seal to render said boards or boxes water- and/or dust-proof.

It is known that the imperviousness of such boxes is generally achieved by clamping the cover onto a joint-seal which can be of rubber, tallowed braid or of plastic material inserted between said cover and the associated flange of the box.

The technical problem is to exert an adequate clamping stress at spaced points on the cover edge, without however entirely crushing the resilient joint-seal which would otherwise rapidly deteriorate or crack and would lose its impervious properties.

In known constuctions, the cover is pressed by cam members or screws pivotally mounted on hinges welded onto the outside of the box, but this solution to the problem is tedious and closing the device is a long and complicated procedure.

According to a further known construction, the inner edges of the boxes have lugs provided with tapped holes welded thereto, screws extending through the cover to be clamped registering with the tapped holes in the lugs. However, such an arrangement meets with certain difficulties; the cover must be suitably centered on the opening for the joint-seal to be correctly compressed by the cover and the screw holes must be accurately aligned with the axes of the tapped holes in the lug, this not being easy to achieve when there are numerous holes and in repetitive work.

Imperviousness must also be maintained at the holes provided in the cover for the passage of the screws, this requirement being usually afforded by means of washers of deformable metal, such as lead, placed under the screw head. Lastly, the screws extending through the cover are generally additionally provided with a device of the so-called "safety" type in order that the said screws will be held captive when the cover member is removed.

This device complicates the construction and is not always effective.

The object of the present invention is to provide a solution to the triple problem of compensating for the inaccuracies in boring, of ensuring imperviousness and of holding the screws captive to one of the plates.

The present invention concerns a device adapted to clamp two plates to one another, and more specifically to clamp a cover onto an iron box, with a joint-seal inserted there between, of the type in which a screw, mounted on the cover member in such a manner as to prevent it from being misaligned, is threaded into a corresponding tapped hole which is bored in the box, and is able to be slightly displaced with respect to the latter.

It comprises essentially a base plate fixed on one face of the box edge, a floating nut, means for securing the floating nut onto the base plate, while leaving a certain amount of play to the nut, a partly screw-threaded and partly plain-shanked pin with a guiding end, capable of being threaded into the floating nut, and a cup-shaped washer of resilient material, inserted into a hole formed in the cover member, said cup-shaped washer providing a

seating for the head of said threaded pin and comprising means to effect a seal with the threaded pin on the one hand, and with the cover member on the other hand.

Other features and advantages of the present invention will become clear on reading the following description, with reference to the accompanying drawings, showing one embodiment of the invention. In these drawings:

FIGURE 1 is a perspective view, partly in section, of a box provided with the devices of the invention;

FIGURE 2 is an exploded perspective view of the various components of one of said devices;

FIGURE 3 is the plan of the floating nut;

FIGURE 4 is the plan of an auxiliary element;

FIGURE 5 is a section on a larger scale of the sealing washer; and

FIGURE 6 is the plan of a box with the cover removed.

In the embodiment shown, the device in accordance with the invention permits the closing of an electric control box 1 by a panel 2, a resilient joint-seal 3 being inserted therebetween.

This device comprises a threaded pin 4 which is threaded at 4*a* and received in a floating nut 5.

The threaded pin 4 has a countersink head 6 and a conical tip 7 for centering. The portion 8 of the shank adjacent to the head and above threaded portion 4*a* is unthreaded.

The floating nut is advantageously cross-shaped. It comprises two short legs 9 and 10 and two long legs 11 and 12 perpendicular to the short legs. The short leg 10 is bent at 90°. The two long legs 11 and 12 are each pierced by a circular or elongated hole 13. The second short leg 9 is substantially in the same plane as the two long legs 11 and 12.

The floating nut 5 has a certain freedom of movement in a plane perpendicular to the threaded pin 4. This movement is confined by prongs 14 of an element 15 welded on the inside of the flange 16 of the box. This plate-like member 15 can be placed in a corner at an angle of the box or parallel to the edges thereof when clampings are required along a certain length of the sheet (FIGURES 1 and 6). In order to enable the plate 15 to be positioned in a corner of the box, the angles of said plate which would have interfered with the positioning are cut off to present a pair of chamfered edges 17 and 18.

In general, the plate 15 is U-shaped. The tongues or prongs 14 perpendicular to the plate are provided on the inner edge of the legs 19 and 20 of the U-shaped member. The space existing between said legs 19 and 20 enables the threaded pin 4 to pass through into the central tapped hole 21 in the floating nut 5.

Prongs 14 of plate 15 extend through the holes 13 of said floating nut and are then bent outwards.

The threaded pin 4 passes through a washer 22, whereby the clamping area is sealed and the threaded pin cannot by mislaid. This washer is formed of a sufficiently resilient material, such as plastic, rubber or the like. It comprises a flared cup-shaped portion 23 which acts as a seat for the countersink of the screw head 6. The washer 22 is held captive to the sheet metal panel 2 through which it passes, by means of an outer retaining bead 24 with which it is provided. The washer is further provided with an inner retention collar 25.

The closing of the box by means of the clamping devices in accordance with the invention is carried out as follows:

Plate-members 15 are welded to the inside of flange 16 of the box at locations where clampings are desired to be effected.

The floating nuts 5 are slid onto the prongs 14 of the plates 15 and these prongs are folded down without

being clamped, so as to leave the permitted freedom of movement to the nuts.

The cover panel **2** is bored with counter-sunk holes for the passage of the screws, so that these holes are as far as possible in alignment with the tapped holes **21** in the floating nuts **5**.

The cup-shaped washers **22** are then threaded or force-fitted onto the screws **4**, so that the inner collars **25** of the washers are at least engaged into the threads **4***a* of the screws. Upon being provided with their respective washers, the screws are inserted into the holes bored in the cover panel. These washers **22** then abut, by a bevelled edge **24***a* of their outer beads **24**, the countersunk portion of the holes bored in the panel.

The next step is to screw the threaded pins **4** perpendicularly to the box. In the course of this screwing step, the boring inaccuracies are taken up, the sealing effect is achieved and the screws are safe-guarded from being lost in the case of removal of the panel;

The conical tips **7** of the screws centre themselves in the tapped holes **21** of the floating nut **5** which, by virtue of their relative mobility, automatically take up the boring inaccuracies;

The countersink heads **6** of the screws are clamped against the seatings provided by the flared portion **23** of washers **22**, and the retention collars **25** of said washers penetrate to the unthreaded shank portion **8** of the screws, unless they have been positioned there earlier, so that a double sealing effect is achieved;

The outer beads **24** of washers **22** are forced into the holes bored in the cover panel and take up their initial shape again immediately upon passing therethrough. Thus the screw-washer assemblies cannot be mislaid.

The screws are tightened up to a moderate clamping stress, the limit of the squeeze-clamping of the joint-seal **3** being controlled by the bent leg **10** of the cross-shaped nuts **5** which acts as a stop.

It is to be understood that the above description has been given merely by way of explanation, without any intent of limitation, and that various modifications can be made therein without falling outside the scope of the invention.

Thus, according to one embodiment, the prongs or tongues **14** can be made integral with the flange **16** of the box or be cut from said flange.

I claim:

1. A joint assembly comprising two juxtaposed members, one of said members including an aperture portion, the other of said members including an edge portion spaced from said aperture portion, a base plate on the other of said members, a floating nut, means for securing the floating nut onto said base plate, said base plate and nut including portions affording relative lateral movement therebetween, a partly screw-threaded headed pin with a guiding end threaded in said floating nut and a resilient washer circumposed about said pin and retained in said aperture portion of said one member, said washer including a portion providing a seat for the head and said threaded pin and effecting a seal thereabout with said one member, the base plate and nut portions comprising two tongues integral with said baseplate and disposed on opposite sides of a portion forming a notched portion in said base plate, said nut including two aperture portions freely receiving said tongues therethrough.

2. A joint assembly comprising two juxtaposed members, one of said members including an aperture portion, the other of said members including an edge portion spaced from said aperture portion, a base plate on the other of said members, a floating nut, means for securing the floating nut onto said base plate, said base plate and nut including portions affording relative lateral movement therebetween, a partly screw-threaded headed pin with a guiding end threaded in said floating nut, and a resilient washer circumposed about said pin and retained in said aperture portion of said one member, said washer including a portion providing a seat for the head of said threaded pin and effecting a seal thereabout with said one member, said threaded pin including a countersink head, said washer comprising a conical portion receiving said countersink head, said washer includes an annular projection on an inner base portion thereof grippingly engaging the shank beneath said head.

3. A device according to claim 2, wherein said washer includes two circumferentially spaced beads formed at an outer portion of said washer and sealingly disposed about opposite sides of said one member at the aperture portion thereof.

4. A device according to claim 3, wherein said washer includes a bevelled lower edge portion to facilitate the positioning thereof in the aperture portion of said one member.

5. A device according to claim 1, wherein said floating nut is cross-shaped and includes two opposed coplanar legs each including one of said apertured portions.

6. A joint assembly comprising two juxtaposed members, one of said members including an aperture portion, the other of said members including an edge portion spaced from said aperture portion, a base plate on the other of said members, a floating nut, means for securing the floating nut onto said base plate, said base plate and nut including portions affording relative lateral movement therebetween, a partly screw-threaded headed pin with a guiding end threaded in said floating nut and a resilient washer circumposed about said pin and retained in said aperture portion of said one member, said washer including a portion providing a seat for the head and said threaded pin and effecting a seal thereabout with said one member, a joint seal between said members, said nut including an abutment portion engaged with an under surface portion of said one member for preventing an excessive crushing pressure to be imposed on said joint seal.

7. A joint assembly comprising two juxtaposed members, one of said members including an aperture portion, the other of said members including an edge portion spaced from said aperture portion, a base plate on said other member, a floating nut disposed beneath said base plate and including a vertically extending abutment portion extending beyond said base plate and engageable with the under surface of the one of said members, and a threaded fastener extending through the aperture portion of the one of said members and threadedly engaged with said floating nut for drawing the same toward the one of said members in clamped relationship with respect to the other of said members and the base plate thereon, said base plate including fastening means depending therefrom and engaged with said floating nut for retaining the floating nut in secured relationship to said base plate.

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