June 27, 1944. N. C. SCHELLENGER ET AL 2,352,454

TAB MOUNTING VARIABLE RESISTOR

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Fig. 1.

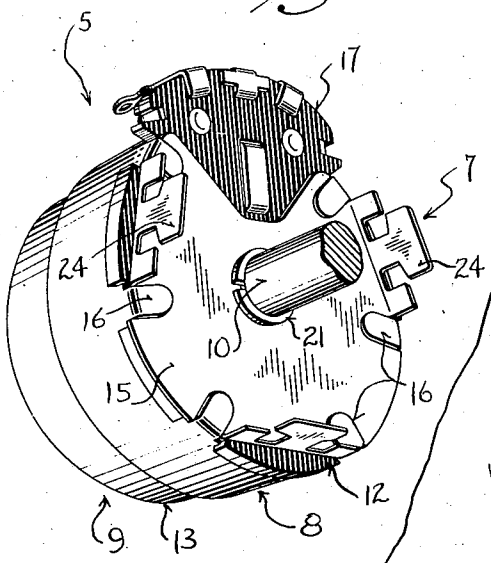



Fig. 2.

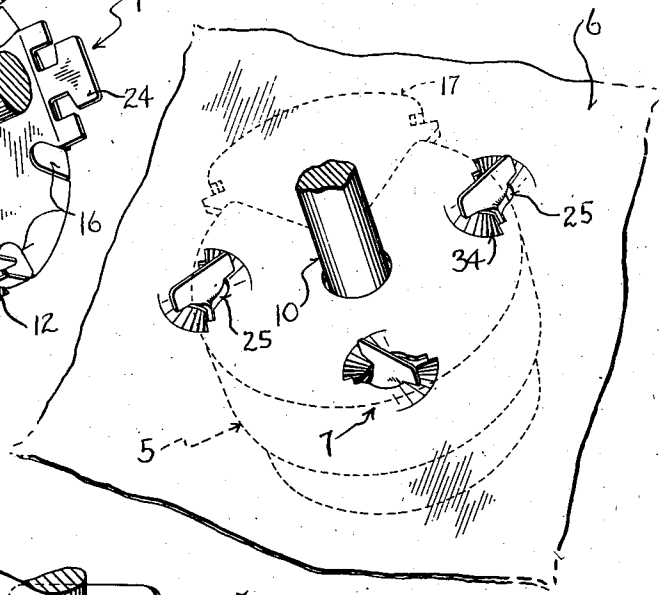
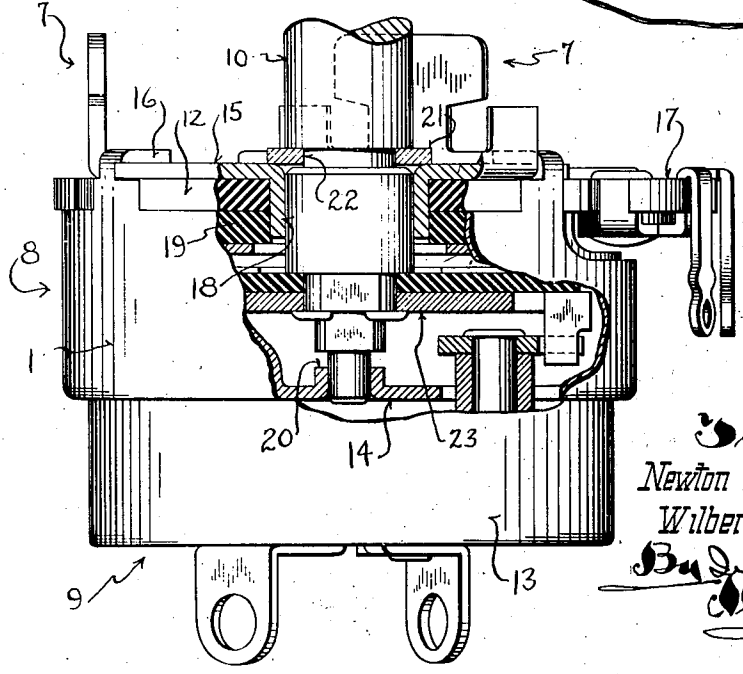



Fig. 3.



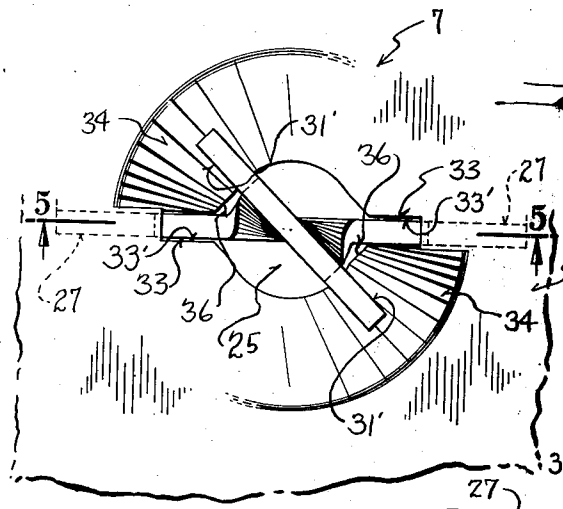

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Fig. 4.



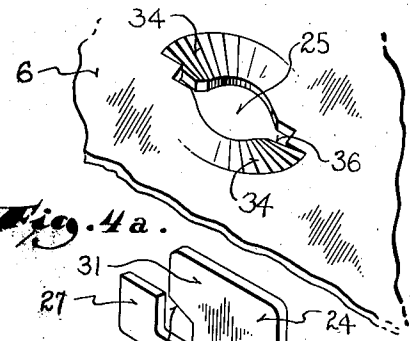
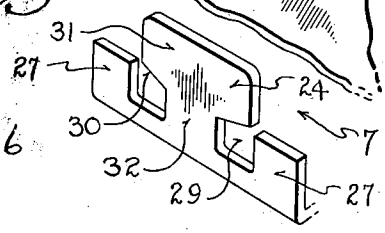




Fig. 4a.



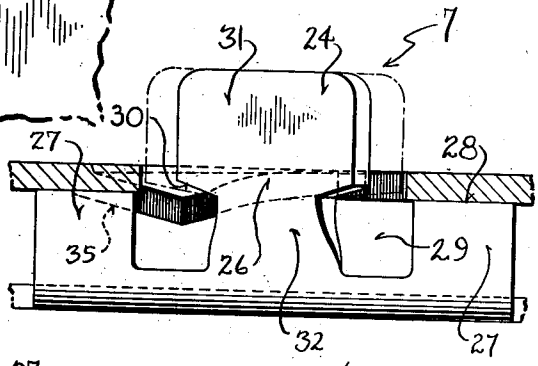




Fig. 6.

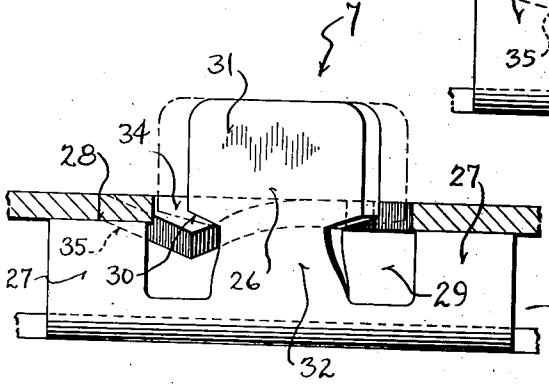
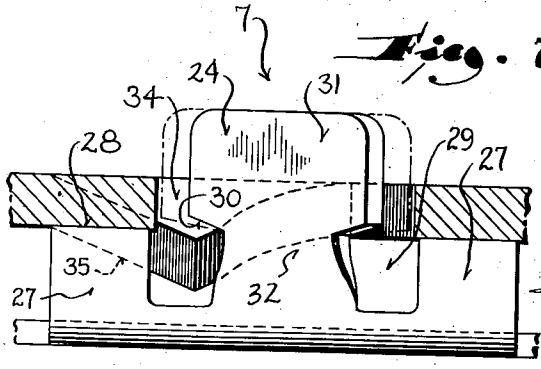



Fig. 5.

Fig. 7.




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# UNITED STATES PATENT OFFICE

2,352,454

## TAB MOUNTING VARIABLE RESISTOR

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Application September 2, 1941, Serial No. 409,266

10 Claims. (Cl. 248—361)

This invention relates to control devices such as volume and tone controls of radio receivers, and refers particularly to the attachment of such devices to their supporting panels.

In order to afford adequate mechanical strength as well as effective electrical shielding, such control devices generally have a grounded supporting metallic housing enclosing the control mechanism, and a centrally located rotatable operating shaft protruding from the front wall of the housing to project through a hole provided in the grounded metallic panel or wall upon which the control is to be mounted. In the case of a radio receiver, this panel or wall may be, and generally is, the front wall of the receiver chassis.

While it is realized that ear or tab mounting devices as such are not new, see Patent 2,063,343 issued to Newton C. Schellenger et al., December 8, 1935, nevertheless the present invention provides a much stronger and more rugged mounting device than has heretofore been achieved without the use of additional mounting members such as screws, bolts, threaded mounting bushings, mounting nuts, washers, etc.

It is essential in assembling the variable resistance control to the grounded metallic panel that positive electrical contact be made between control housing and the panel to effect electrical grounding of the housing for shielding purposes. The control must, therefore, be secured firmly to prevent any possibility of loosening so as to avoid interference with proper radio reception due to a poor grounding connection. Loose controls are also objectionable from a mechanical standpoint for if the knobs attached to the control operating shafts wobble excessively reflection on the quality of workmanship in the radio receiver is inevitable.

The most serious limitations of ear and tab mounting controls in general have been their failure to provide sufficient strength in the ears or tabs to prevent the controls from loosening mechanically and electrically when the end of the operating shaft receives a sharp blow or excess side pressure is applied either during assembling of the radio receiver in the factory or during use of the radio in the home. Because of these limitations, this type mounting has not been generally used for variable resistance controls.

The present invention, like the aforesaid patent, utilizes tabs formed integrally with a part of the control housing and effects the securement by having portions of the tabs twisted, but it is an object of this invention to provide tabs of novel design cooperating with a novel form of piercing in the panel so that when the tabs are twisted, their twisted portions lie wholly behind the front face of the panel and are merely placed in tension while the portions of the tabs which protrude through the holes or piercings are left undeformed so that the control is firmly and permanently secured to the palen without danger of having the tabs sheared off during the attachment.

More specifically, it is an object of this invention to provide a tab form of fastening for control devices of the character described which is so constructed that upon turning of the outer protruding portions of the tabs to twist their inner portions, the control unit is drawn firmly against the panel by having the outer undeformed portions of the tabs ride up inclined surfaces on the panel adjacent to or bounding the piercings in which the tabs are received.

Another object of this invention is to provide a twisted tab form of attachment so designed that the outer tab portions engaging the inclined panel surfaces bounding the piercings not only remain wholly undeformed but also bite into the panel surfaces to secure the outer portions of the tab against retrograde turning.

Another object of this invention is to provide a fastening of the character described which is so designed that the engagement between each tab and the panel has substantial area and is entirely free from any cutting or shearing effect on the tab.

Another object of this invention is to provide a fastening of the character described wherein the tab has a T-shaped formation with the head of the T protruding through the panel piercing to be turned or revolved about the axis of the tab to twist the neck of the T and dispose the laterally projecting ends of the head over the adjacent edges of the piercing without deforming any portion of the head to thus insure a permanent and strong attachment.

Another object of this invention is to provide a fastening for volume controls and other radio control devices which is so designed that the major part of the fastening lies below the front surface of the panel on which the control is mounted to thus obviate excessive protrusions from the front of the panel and allow closer disposition of the chassis of which the panel is a part to the front wall of its cabinet.

A further object of this invention is to provide a tab fastening of the character described

which may be used with equal facility on panels of different thickness.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiment of the invention, constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of a control unit of the character described equipped with the fastening tabs of this invention;

Figure 2 is a perspective view illustrating a mounted unit and showing particularly the manner in which the tabs cooperate with the edge portions of the pierced holes in the panel upon turning of the heads of the tabs to tightly secure the control in place;

Figure 3 is a side view of a control unit constructed in accordance with this invention with parts broken away and in section;

Figure 4 is a detail view on an enlarged scale of one of the fastenings;

Figure 4*a* is a perspective view on an enlarged scale showing one of the panel piercings and one of the tabs prior to their assembly;

Figure 5 is a sectional view taken through Figure 4 on the plane of the line **5—5**;

Figure 6 is a view similar to Figure 5 but showing a slightly modified form of panel piercing; and

Figure 7 is a view similar to Figure 5, but showing the fastening applied to a panel of greater thickness.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts, the numeral **5** designates generally an electrical control device which is mounted on a panel **6** by means of novel fastenings indicated generally by the numeral **7**.

The device **5** may be any one of a number of different controls but the invention is chiefly concerned with the mounting of variable resistance devices such as volume and tone controls used in radio receivers where it is essential that the fastening of the control on its supporting panel, which may be part of the receiver chassis or not, shall provide a permanently good electrical ground for the control. This is accomplished by the present invention.

The specific control device here shown is a combination volume control and power switch. It consists of a variable resistance device **8** and a switch **9** jointly operable by a single rotatable operating shaft **10**.

The variable resistance device is enclosed within a metallic housing formed by a substantially cup-shaped metal casing or cover **11** and a base **12** of insulating material covered by a metal grounding plate **15**. This plate covers substantially the entire area of the base and is secured in place by ears or tangs **16** integral with the side wall of the casing or cover **11** and clinched over the face of the grounding plate. Inasmuch as the tangs or ears **16** engage in notches in the base **12** and the grounding plate, these parts are accurately located with respect to the casing **11**, and as will be readily apparent the grounding plate may be considered part of the housing for the resistance device.

The switch is housed within a substantially cup-shaped casing **13** having its open end fitted to the back wall **14** of the resistance casing **11**, the wall **14** having a hole to accommodate the driving connection between the resistance device and the switch.

Adjacent to the usual projection **17** on the base upon which the terminals of the resistance device are mounted, the grounding plate is cut away to provide the necessary electrical clearance.

At its center the grounding plate has an extruded bearing **18** formed therein which passes through a hole in the base and extends into the hole of the spacing washer **19** usually located on the inner face of the base. It is to be observed that the length of the extruded bearing **18** is less than the combined thickness of the base and the washer **19**. This protects the inner parts of the variable resistance device from contact with the grounded bearing and thus facilitates compactness.

The bearing **18** and another extruded bearing **20** in the back or end wall **14** of the casing **11** support the shaft **10**. Inasmuch as the grounding plate is accurately located in the manner described with relation to the casing and as the extruded bearings **18** and **20** are accurately formed in their respective parts, it follows that the two bearings are accurately aligned so that the shaft will be free to revolve therein without binding.

A C washer **21** engaging in a groove **22** in the shaft bears against the outer face of the grounding plate to hold the shaft against inward displacement. Outward displacement of the shaft is prevented by the contactor mechanism **23** of the resistance device which is fixed to the shaft inside the casing **11**.

Attention is directed to the fact that inasmuch as the C washer bears against the grounding plate, any inward force applied to the projecting end of the shaft is transmitted directly to the strong grounding plate to thus preclude the transmission of deranging forces to the internal structure of the control.

The fastenings or projections **7** by which the control is secured to the panel and with which this invention is primarily concerned comprise tabs **24** bent up from the edge of the grounding plate, which as hereinbefore brought out constitutes part of the metallic housing.

These tabs project perpendicularly from the housing wall provided by the grounding plate to have portions thereof protrude through pierced holes **25** in the panel and be turned or revolved about the axes of the tabs into positions overlying the edges of the holes. There are three such tabs **24**, substantially equispaced about the circumference of the housing, and as clearly shown in Figure 1, each tab is positioned between two of the notches which receive the tangs or ears **16**.

As best shown in Figures 5 and 6, each tab consists of a substantially T-shaped central portion **26** flanked by and rising above locating shoulders **27**. In the initial condition of the tabs, that is, before the attachment is effected, the central T-shaped portion of each tab and its locating shoulders lie in a common plane.

The top edges **28** of all of the locating shoulders lie in a common plane to seat squarely on

the panel, and the height of the shoulders is sufficient to maintain adequate electrical clearance between the panel and the control terminals mounted on its base extension 17.

The central T-shaped portion of each tab is formed by undercut notches 29 which extend down from the shoulder edges 28, inwardly toward the axis of the tab, and then upwardly to a point adjacent to the plane of the shoulder edges 28 from which the boundary of the notches slants upwardly and outwardly to define the inclined lower surfaces 30 of the head 31 of the T. This construction gives the central T-shaped portion 26 a neck 32 of substantial length.

The full line positions of the tab shown in Figures 5, 6 and 7 illustrates the same after the head 31 has been turned and the neck 32 twisted. Prior to this turning and twisting when the central T-shaped portion is in planar alignment with the shoulders, the shape is as illustrated by dot and dash lines in Figure 5.

The pierced holes 25 have a round central portion from which diametrically opposite substantially rectangular notches or recesses 33 extend. The diameter of the round central portion of each hole is slightly larger than the width of the neck of the tab to permit the same to twist freely when the head of the tab is turned.

The rectangular notches or recesses 33 are so located and of such size that the heads 31 of the tabs pass therethrough as the control is placed on the panel with its shaft projecting through a hole in the panel.

The areas of the panel immediately adjacent to each hole at opposite sides of its round central part, or in other words, the boundaries of the holes lying between their notches or recesses 33 are bent down or otherwise formed to provide two opposite inclined surfaces 34. These surfaces 34 are, thus, in effect, inclined planes slanted radially to correspond to the taper of the undersurfaces 30 of the T-shaped heads and extending helically from the edge of one rectangular notch substantially to the adjacent edge of the other notch, the up-grade of each incline being clockwise. To secure the necessary depth for the beginning or bottom of the incline in each instance the edge of the rectangular notch from which the incline starts is sheared back to allow the necessary depression of the metal.

Shearing back one edge of each notch in this manner also provides abutments 35 to support the shoulders of the tabs against turning when the heads of the tabs are turned to twist the necks.

The extent to which the edge portions of the hole must be bent down depends upon the thickness of the panel for in each case it is necessary that the start of the inclined plane shall be somewhat lower than the undersurface 30 of the T-shaped head of the tab, and the location of these undersurfaces 30 with relation to the plane of the outer face of the panel depends upon the thickness of the panel. This is clearly seen from a comparison of Figures 5 and 7, the latter of which shows a panel of greater thickness than that of the former.

In the embodiment of the invention specifically illustrated in Figures 5 and 7 the inclined planes are formed by merely bending down diametrically opposite edge portions of the hole but if desired the panel may be embossed as shown in Figure 6 to form the inclined planes.

When the control is applied to the panel and the tabs are inserted into their respective pierced holes, each tab is individually located and held against shifting during the turning of its head to guard against displacement of the control on the panel.

In the direction of the long axis of the tab location is effected by the ends of its head engaging the ends of the rectangular notched portions of the piercing, as shown in Figure 5 (the dot and dash position of the tab). In a clockwise turning direction location is obtained by the engagement of the shoulders 27 with the abutments 35 provided by the sheared down portions of the panel at the bottoms of the inclined planes. In a counterclockwise direction location is obtained by the sides 31' of the head of the tab engaging the sides 33' of the rectangular notched portions of the piercing.

Thus, when the control is properly positioned on the panel, the heads on the central T-shaped portions of the tabs may be readily turned in a clockwise direction to dispose their laterally projecting ends over the adjacent edges of the piercings, and as the turning takes place the wedge action produced by the inclined planes as a result of their being twisted tightens the fastenings and firmly clamps the panel between the locating shoulders on the tabs and their T-shaped heads. The further the head is turned and forced up the taper or incline the tighter the tab is drawn against the panel; and inasmuch as the leading edge of the underside of the head of the tab is quite sharp due to its being a blanked edge, it bites into the surface of the panel incline to securely frictionally hold the head against retrograde turning.

Turning the heads of the tabs to tighten the control against the panel is analogous to the tightening of a screw in a nut. The taper of the panel is equivalent to the thread of the nut and the under edge of the T-shaped head is equivalent to the thread of the screw. As the head is turned, the under edge travels up the inclined surface of the panel the same as the thread of the screw travels up the helical incline formed by the thread of the nut. Advantage is thus taken of the well known properties of rigid and tightly locking connections possible with screw threads, and by providing ample strength in the tabs, a rugged mounting means is obtained without the use of any additional parts.

It is important to note that turning the head 31 does not deform it. It turns bodily about the axis of the tab but is not deformed. All twisting occurs in the neck portion 32 of the tab where the stresses are essentially the result of tension. An exceptionally strong construction is thus obtained.

It is also to be observed that the twisting of the neck of the tab and in fact the entire locking action of the tab against the panel takes place below the front surface of the panel. This saves valuable space in mounting the chassis in the receiver cabinet since only sufficient space must be allowed for the comparatively shallow heads on the tabs thereby making it possible to mount the chassis closer to the inside surface of the cabinet than would otherwise be possible.

Although each tab is independently and properly centered in its piercing in the manner described, to guard against the possibility of having the neck of the tab snag against the edge of the incline as it begins to twist; the corners 36 of

each incline are tapered or cut off as best shown in Figure 4. These tapered corners, thus, feed the neck into the round portion of the piercing when the head of the tab is turned.

Attention is also directed to the fact that the engagement by the undersurfaces of the head of the tab and the inclined edge portions of the panel piercing has substantial area, and except for the slight angle between the plane of the undersurface of the head of the tab and the inclined panel portion which is minimized by the leading edge of the tab biting into the panel, there is substantially a surface to surface engagement between the tab head and the panel.

An exceedingly strong and permanently secure connection is thus obtained, for before the fastenings will loosen due to the application of force on the projecting end of the control shaft as sometimes results from an accidental blow on the control knob of a radio, the neck of the tab would have to stretch and this is highly unlikely due to its substantial size.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which this invention appertains that the manner here provided for fastening a variable resistance device or other similar control to a supporting panel materially simplifies and lessens the cost of assembly of such controls to their supporting panels and actually secures a permanently tight fastening and grounding connection.

What we claim as our invention is:

1. In combination: a supporting panel; a part to be secured to the supporting panel; and attaching means for securing said part to the supporting panel, said attaching means comprising a tab having a neck extending outwardly of said part through a hole in the panel; a laterally extended head on the outer extremity of the neck, the hole in the panel being shaped to permit free passage of the tab therethrough in the normal undeformed position of the tab but to provide a surface underlying the laterally extended head of the tab when the neck of the tab is twisted in said hole relative to said part to secure the part to the panel; and said surface of the panel adjacent to the hole therein being inclined to effect a wedge action operable to draw the part toward said panel upon twisting of the neck of the tab in the hole in the panel.

2. In combination: a supporting panel; a part to be secured to the supporting panel; and means for securing said part to one side of the supporting panel comprising a normally flat tab integral with said part projecting through a slotted hole in the panel to the opposite side thereof, said hole being of a shape to receive the tab in one position of the tab relative to the panel and said part; and cooperating cam surfaces on the tab and a portion of the panel at the opposite side thereof engageable upon twisting of the tab in the hole out of said position for drawing the part toward the panel and for securely attaching the part to the panel.

3. In combination: a metal supporting panel; a metal part; and means for fastening the part to the panel and grounding the same thereto comprising a substantially T-shaped tab integral with said part and having its T-shaped head protruding through a hole in the panel so as to be disposed on the side of the panel opposite said part, said hole having a sbstantially round portion of a diameter less than the width of the head of the T-shaped tab but greater than the width of the neck connecting the head with said part and having diametrically opposite notches in the edge thereof to permit the passage of the head of the tab, the neck of said tab being twisted relative to said part to dispose its head portion over and into engagement with the adjacent edge portions of the round part of the hole.

4. In combination: a supporting panel; a part adapted to be secured to the panel; attaching means for fastening said part to the panel comprising a substantially T-shaped tab having its stem projecting from said part and protruding through a hole in the panel so that its T-shaped head is disposed at the side of the panel opposite said part, said hole being substantially round with a diameter less than the width of the head of the tab but greater than the width of its stem and having diametrically opposite notches in the edge thereof to permit the passage of said head, the stem of said tab being twisted on its axis to dispose its head portion over the adjacent edge portions of the round part of the hole, said edge portions being inclined to the plane of the panel in a manner to form parts of a screw thread so that twisting of the stem of the tab in a direction to cause the head to ride up the incline tightens the fastening; and interengaging means on said attaching means and the panel for precluding turning of said part in consequence to twisting of the stem.

5. In combination: a part requiring support; a panel upon which the part is supported; and means for securely fastening said part to the panel comprising a tab projecting from said part and having an edge engageable with one face of the panel, said tab being substantially T-shaped and projecting from said edge to protrude through a hole in the panel and having a neck joining its T-shaped portion with said part twisted relative to said part to dispose the undersurface of its head over the adjacent surface at the opposite face of the panel so that the panel is confined between said edge of the tab and the undersurface of its head, said surface at the opposite face of the panel being tapered to provide a wedge action which tightens the fastening upon twisting of the neck of the tab.

6. In combination: a part requiring support; a panel adjacent to the part upon which said part is mounted; and means for securely fastening said part to the panel comprising a plurality of substantially T-shaped tabs connected to the part by their stems and having flanking supporting shoulders engaging the adjacent face of the panel while the T-shaped heads project through holes in the panel, each hole having a central portion to receive said stems shaped to permit twisting of the stems therein and having substantially rectangular diametrically opposite notches in the edge thereof of a size to enable passage of the head of the tab through the hole, the entire head of each tab being turned in one direction about the axis of its stem out of planar alignment with said shoulders to dispose the undersurfaces of the heads over the panel portions bounding the central portions of the holes, and the surfaces of said panel portions engaged by the undersurfaces of the heads of the tabs being inclined to form parts of helixes around the axes of the tab stems so that turning of the heads of the tabs draws the shoulders of the tabs firmly against the panel.

7. In combination: a part requiring support; a panel adjacent to said part upon which the part is mounted; means for securely fastening said part to the panel comprising a plurality of substantially T-shaped tabs connected to the part

by their stems and having flanking supporting shoulders at opposite sides of said stems engaging the adjacent face of the panel while the T-shaped heads project through holes in the panel, each hole having a central portion to receive said stems shaped to permit twisting of the stems therein and having substantially rectangular diametrically opposite notches in the edge thereof of a size to enable passage of the head of the tab through the hole; the entire head of each tab being turned about the axis of its stem relative to said shoulders to dispose the undersurfaces of the heads over the panel portions bounding the central portions of the holes, the surfaces of said panel portions engaged by the undersurfaces of the heads being inclined to form parts of helixes around the axis of the stems so that turning of the heads draws the shoulders of the tabs firmly against the panel; and abutments on the panel engaging the shoulders to support them against lateral forces incidental to the turning of the tab heads.

8. In combination: a part requiring support; a panel adjacent to said part upon which the part is mounted; and means for securely fastening said part to the panel comprising a plurality of substantially T-shaped tabs connected with the part by their stems and having flanking supporting shoulders at opposite sides of their stems engaging the adjacent face of the panel while the T-shaped heads project through holes in the panel, each hole having a central portion to receive said stems shaped to permit twisting of the stems therein and having substantially rectangular diametrically opposite notches in the edge thereof of a size to enable passage of the head of the tab through the hole; the portions of the panel bounding the round central part of each hole being recessed down out of the plane of the panel and deformed so as to form parts of helixes around the central portions of the holes and to provide an abrupt abutment at the bottom of each helical incline directly adjacent to one notch to be engageable by the adjacent tab shoulder; the stems being twisted and the heads forced up the inclines as the result of turning the heads about the axes of their stems to positions out of alignment with respect to said diametrically opposite notches.

9. In combination: a supporting panel; a part to be secured to the supporting panel; and attaching means for securing said part to one side of the supporting panel comprising a projection extending from said part and passing axially through a hole in the supporting panel to the opposite side thereof, the edge portion of said hole having at least a portion thereof depressed below the plane of said opposite side of the panel; means integral with said projection engaging the first mentioned side of the supporting panel so as to hold said part spaced away from the panel, said space accommodating the depressed edge portion of the hole; and a laterally extending head on said projection overlying said opposite side of the panel, said head being turned on the axis of said projection to dispose the same out of the plane of the projection with its lateral extension over the depressed edge portion of the hole, and said edge portion of the hole being inclined to form substantially part of a helix up which the panel engaging under edge of the head extension is slid by twisting of the projection.

10. In combination with a supporting panel and a part to be secured to one face thereof: means for securing said part to said face of the supporting panel comprising an attaching member having spaced shoulders engaging said face of the panel at diametrically opposite sides of a hole in the panel; a neck extending through said hole to the opposite face of the panel; and laterally extending portions on the neck forming a head having surfaces engageable with the opposite face of the panel; the hole in the panel being of such shape as to permit passage of the head therethrough when the same is in planar alignment with the shoulders, and the entire head being turned about the axis of its neck out of alignment with respect to said shoulders to engage said surfaces on the head over the adjacent edge portions of the hole at the opposite face of the panel thereby confining portions of the panel bounding said hole therein between said shoulders and the surfaces on the head.

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