United States Patent [19]

Frey, Jr. et al.

[11] **3,794,278**

[45] **Feb. 26, 1974**

[54] INSTRUMENT SUPPORTING DEVICE

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[73] Assignee: **Bourns, Inc.**, Riverside, Calif.

[22] Filed: **Jan. 10, 1972**

[21] Appl. No.: **216,400**

[52] **U.S. Cl.** **248/27**

[51] **Int. Cl.** **G12b 9/00**

[58] **Field of Search** . 248/27, 205, DIG. 6; 339/128; 211/86, 96

[56] **References Cited**

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Primary Examiner—William H. Schultz

Attorney, Agent, or Firm—William G. Becker

[57] **ABSTRACT**

An instrument supporting device adapted to be pressed directly into a hole or aperture in a panel of any of a plurality of thicknesses and secure therein or thereto any of a variety of instruments, the support device automatically compensating for wear caused by vibration or repetitive removal and reinsertion into the hole in the panel, and permitting easy removal of the support from the panel without twisting or turning. A plurality of stepped resilient fingers or limbs are resiliently stressed inwardly as the support enters the aperture, and spring outwardly to engage the aperture-edge of the panel at the rear thereof and retain a portion of the support tightly against the front face of the panel. Key means may engage in a seat in the panel edge to preclude rotation of the support in the aperture. Preferably the resilient limbs are provided in two or more sets, each set being of different configuration whereby to accommodate a wider variety of panel gages.

4 Claims, 6 Drawing Figures

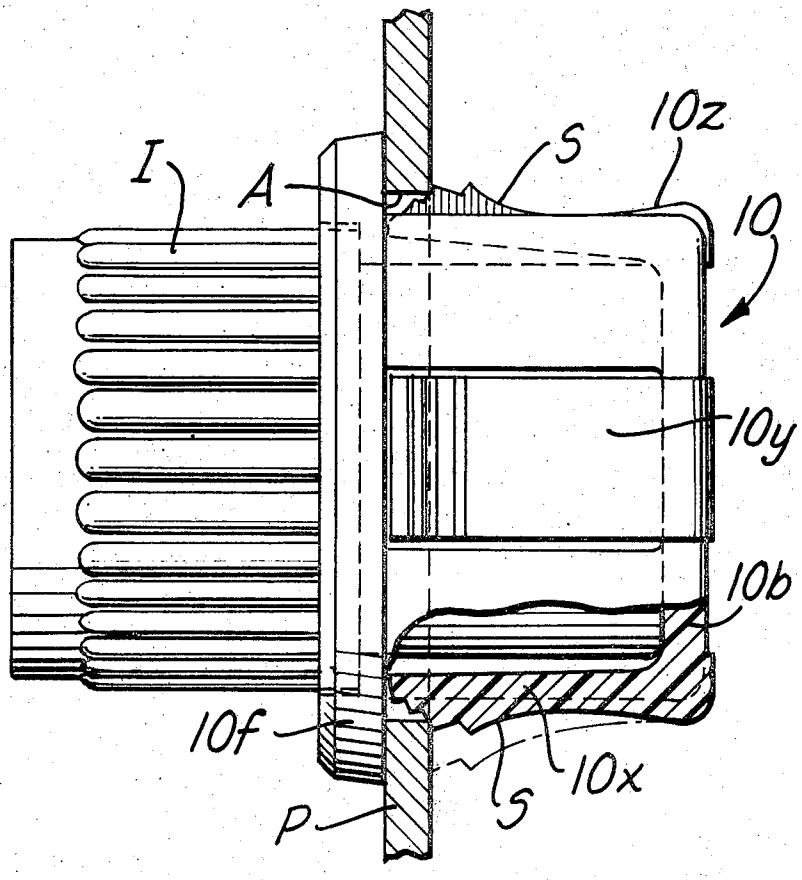


FIG. 1.

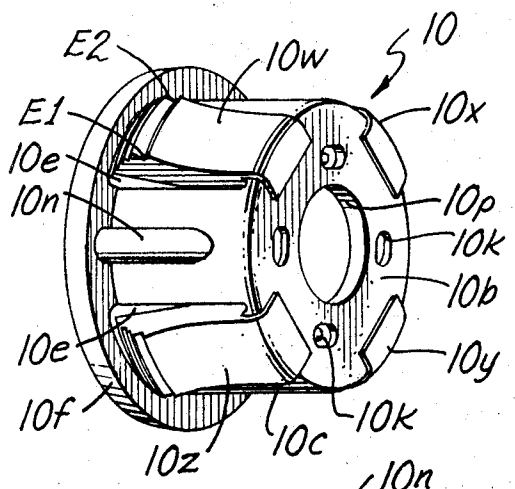


FIG. 2.

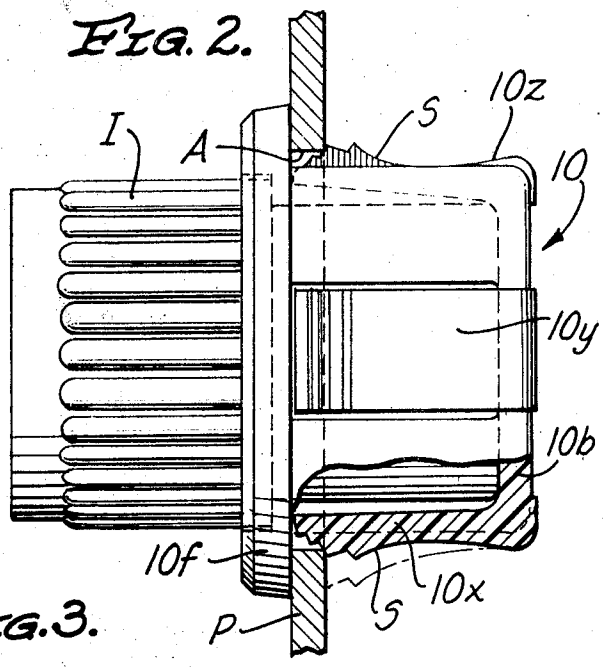


FIG. 3.

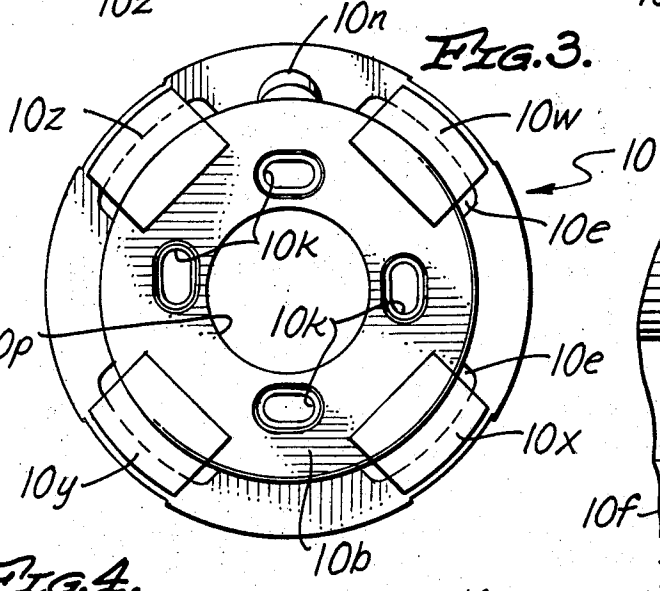


FIG. 4.

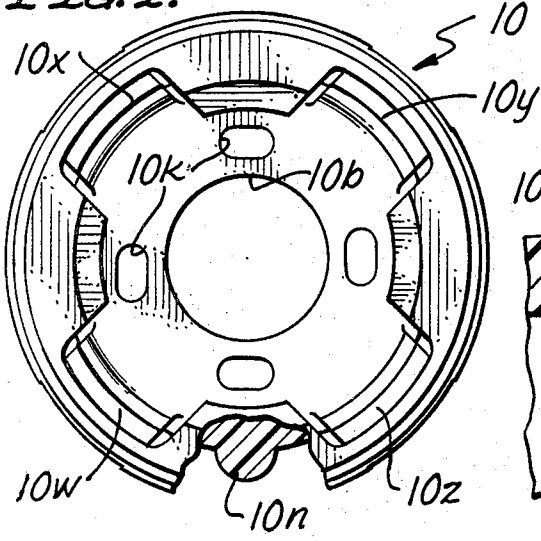


FIG. 6.

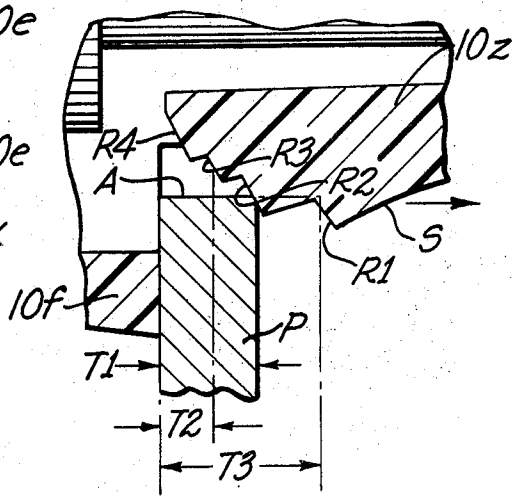
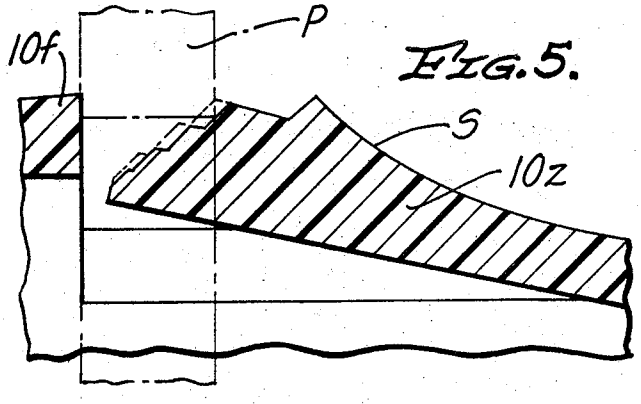


FIG. 5.



INSTRUMENT SUPPORTING DEVICE

CROSS-REFERENCED APPLICATIONS

In respect of certain details of the disclosure herein contained, this disclosure is related to that comprised in application for Letters Patent of Sydney W. Frey, Jr. entitled DIGITAL INDICATING KNOB-ENCLOSED MULTI-TURN POTENTIOMETER, Ser. No. 216,520, filed concurrently herewith, to which reference may be made as may be required.

BRIEF SUMMARY OF THE INVENTION

a. The Prior Art

There are known in the prior art a number of so-called "snap-in" mounting devices, either formed integrally with an instrument housing or support, or formed as a separate device adapted to have an instrument or the like secured thereto, and all devised to be pressed into an aperture in a flat thin panel and be therein retained by hooks or claws or the like that engage the rear face of the panel. An example of such devices, adapted to support a variable resistor or the like, is disclosed in U. S. Pat. No. 3,500,282. The prior-art devices were each designed to be used with a panel of a single specific thickness and were unsatisfactory for use with panels of other thickness. Further, there was no provision for compensation due to wear that occurred in instances wherein the panel was subject to vibration. It is evident that it would be of value if a device of the noted character could be used with a panel of any of several standard thicknesses, and of further value if any wearing of the device at the region of contact with the panel were automatically compensated.

b. The Present Invention

As illustrated herein in a preferred exemplary embodiment, the invention is used to support a multi-turn precision potentiometer, which is a typical panel-mounted instrument. The invention is in the form of a cup-like device adapted to encircle and protect a portion of the supported device, and in the preferred form, support the instrument by attachment of the base or floor of the cup-like instrument supporting device to the base of the supported instrument, which in the illustration is a knob-enclosed potentiometer. Other modes of attachment may be employed as will become evident as the description proceeds. The generally cylindrical body portion of the device or cup terminates at its forward end in a peripheral rim or flange that is dimensioned and shaped to abut against the front face of a panel adjacent the aperture. The cup body is interrupted at spaced locations to provide longitudinal openings or recesses between the base and rim of the device, to provide clearance for respective limbs comprised in sets of resilient limbs spaced around the body and each integral with the base and extending forwardly toward the rim and outwardly, and having at its forward end distant from the base a set or series of inclined steps or panel-engaging surfaces each adapted to coact with a panel inside and immediately to the rear of an aperture in the panel and to cooperate with the rim to grip therebetween a portion of the panel adjacent the aperture. In the preferred form the device is shaped for attachment in a circular aperture in a panel, but the aperture and supporting device may be of other mutually complementary configurations.

The resilient limbs of the device are integral with the body of the device at the base and are so formed and constructed as to diverge outwardly away from the longitudinal openings or interruptions in the body of the device when free, whereby when the device is forced, base first, through the receiving aperture in a panel, the limbs are forced or cammed inwardly toward the axis of the aperture, and stressed, by cam action of the aperture wall on the inclined outer surfaces of the limbs, until one or more of shoulders of the steps at the ends of the limbs pass through the aperture and are free to spread outwardly to the extent permitted by the next step of the series. The device is thus pressed or forced inwardly into the panel aperture until the flange or rim contacts the front face of the panel. At the termination of that movement, one of the inclined faces of the steps on the outer face of each of the limbs of at least one set of limbs engages the rear corner edge of the panel at the aperture. The engaged curved faces of the steps of the limbs exert forces on the panel that tend to pull or draw the device rearwardly, and hence serve to insure that the rim is firmly seated against the face of the panel. Further, since the risers and treads of the steps are not right-angled, but are inclined relative to both the axis through the aperture and the rear face of the panel, the limbs not only effect a secure locking of the device in the aperture but also automatically accommodate the limbs to a panel of any of a plurality of thicknesses or gages. Further, due to the continuing stress set up in the limbs during the insertion of the device into the aperture, the limbs automatically spring outwardly and compensate for any wearing at the risers or treads of the steps due to contact with the panel. Additionally, since the corners or lines of any particular juncture between the riser and tread portions of a selected step on each of the limbs coincide with a circle only when the limbs are fully splayed out and free, the rear marginal corner of the panel at the aperture is not engaged by the entire arc of the riser or tread of the step, but is engaged at spaced-apart regions by only the endmost portions of the step, due to the inward displacement of each of the limbs.

Preferably the limbs are formed in a plurality of different sets, each set comprising at least two limbs equally spaced around the body, and the limbs of each set differing from those of the other set or sets insofar as the riser-and-tread spacing and inclination of the steps are concerned. Thereby the device is effective for use with a greater variety of panel thicknesses, each set of limbs being individually designed and adapted for accommodation of any panel comprised in a respective family of panel thicknesses or gages between a designed minimum and maximum limits. However, as will be evident, a single set of two or three limbs is sufficient to provide for secure snap-in attachment of an instrument to a panel of any of a variety of gages. Further, while the inclined risers and treads of the resilient limbs are preferably formed along arcs of circles all of diameter greater than the diameter of the aperture in the panel, that is, formed along arcs coincident with circles when the limbs are in outermost and fully splayed positions, the limbs may be formed in position in their respective body openings or interruptions and with the step surfaces on arcs of circles of larger diameter than that of any aperture in which the device is to be used, and the limbs subsequently deformed outwardly under influence of heat and force so as to occupy positions

outside the circular outline of any such aperture, it is evident that most superior results are attained with the preferred form of the device herein disclosed in detail and illustrated in the accompanying drawings.

The preceding brief summary description makes it evident that it is a principal object of the invention to provide improvements in instrument supporting devices for attaching or mounting an instrument to an instrument panel.

It is another object to provide an instrument supporting device of inexpensive one-piece construction capable of use in mounting an instrument on any panel of several different thickness gages.

Another object of the invention is to provide an instrument supporting device adapted to support an instrument in an aperture in any of panels of differing thicknesses.

Another object of the invention is to provide a readily-removable snap-in instrument supporting device for mounting an instrument in an aperture in a panel, which device automatically compensates for wearing incident to moving contact with the panel.

An additional object of the invention is to provide an instrument supporting device comprising a rim portion for abutting the front face of a panel adjacent an aperture in the panel and having a rearwardly-extending body with forwardly-extending free-ended resilient cantilever limbs, the forward ends of which are stepped to engage the panel at the rear edge of the aperture and draw the rim portion snugly against the face of the panel irrespective that the panel may be of any of several different thicknesses.

Other objects and advantages of the invention will hereinafter be set out or made evident in the appended claims and detailed description of a preferred embodiment of the invention illustrated in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view, to no specific scale, depicting the presently-preferred exemplary embodiment of the invention;

FIG. 2 is a side view of the device of the invention depicted in FIG. 1, with portions sectioned and with an instrument nested in and supported by the device, the scale being somewhat enlarged and one feature exaggerated in the interest of clarity;

FIG. 3 is a rear face view of the device depicted in FIG. 1, to enlarged scale;

FIG. 4 is a front face view of the device depicted in FIG. 1, to enlarged scale;

FIG. 5 is a fragmentary sectional view, greatly enlarged, showing a detail of the stepped end of a resilient limb of the device depicted in FIG. 1, with other portions of the device; and

FIG. 6 is a fragementary enlarged sectional view illustrating details of the coaction of the device of the invention with a portion of an instrument supporting panel.

DETAILED DESCRIPTION

The device according to the invention, depicted in a preferred form in the drawings, and therein denoted generally by the number **10**, is preferably formed of glass-fiber filled thermoplastic synthetic resinous material such as nylon or polytetrafluorethylene or similar material, by injection-molding techniques well known in the plastics molding industry. The device **10** is formed with a flange or rim **10***f* of outer dimension or diameter somewhat in excess of the dimension or diameter of the panel aperture or hole into which the device is to fit, for example, one and one-eighth inch diameter in the case of a 1-inch diameter panel aperture. As is indicated in FIG. **2**, the rear face of the flange or rim of the exemplary device is adapted to repose in intimate contact with the front face of a panel P. The device **10** comprises a body portion **10***c* that terminates at its rear in a base **10***b*. The body portion is formed with sets of longitudinally-extending interruptions herein shown as openings, such as **10***e*, preferably uniformly spaced apart around the body. Aligned with respective ones of the interruptions and partly extending thereinto, are resilient cantilever limbs such as **10***w*, **10***x*, **10***y*, and **10***z*, which as indicated in FIGS. **1, 2** and **3** merge at their rear ends with the body portion **10***c* and base **10***b*. The resilient limbs shown are comprised in sets, limbs **10***x* and **10***z* in one set and **10***w* and **10***y* in another set. Excepting their specially-shaped forward ends, all of the limbs may be otherwise identical. Each of the limbs is of width less than the opening or interruption into which it may be pressed or forced in the manner of a cantilever beam spring anchored at its rear end; each of the openings such as **10***e* being dimensioned to comfortably receive its respective cantilever limb without frictional contact. As will be made evident, all of the limbs may be identical and thus be comprised in only one set of limbs; or, as is preferred and shown, are paired into two sets in each of which sets the limbs are alike but different from those of the other set.

As is indicated in the drawings and previous summary, the body **10***c* of the device **10** is adapted to be pressed into an aperture such as that indicated at A in FIG. **2**, the limbs resiliently entering into their respective interruptions or openings **10***e* as their curved outer surfaces contact and are cammed inwardly by the surface or edge corner of the panel in the aperture. The aperture A is shown exaggerated in diameter, in he interest of clarity. It is made only slightly greater in outline dimension or diameter than the outer outline dimension or diameter of the body **10***c* of the device immediately rearwardly of rim or flange **10***f*.

The forward ends of the resilient cantilever limbs are each formed with a plurality of steps the risers and treads of which are inclinded relative to the direction of the longitudinal axis of the device and are inclined also relative to the rear surface of the panel with which the limbs are in part adapted to coact, as is indicated in FIGS. **2, 5** and **6**. The principles of coaction of the steps of the limbs with the corner or marginal edge of the panel around the aperture are substantially the same for all the limbs, hence the relationship of only one will be described in detail. As the device is pressed or forced home in aperture A of panel P (FIG. **6**), in the direction indicated by the arrow in that figure, the panel surface in the aperture is engaged by the curved or sloping outer surface S of the limb; and the free forward end of each limb is thus by cam action forced radially inwardly, setting up stresses in the limb tending to return the free stepped end of the limb outwardly. As the device continues inwardly into the aperture in the panel, one or more of the treads and risers such as **R1**, **R2** or **R3** of the stepped outer end surfaces of the limbs move clear of the aperture and permit partial outward

movement of the limbs. The action continues until flange **10f** contacts the panel. At that stage of the movement, one or another of the inclined surfaces such as **R1, R2,** etc. is left in contact with the rear corner edge of the panel at the aperture, as shown, for example in FIG. **6** wherein the inclined riser **R2** of a step is in contact with the corner edge of the panel P at aperture A. The limb **10z**, there shown in fragmentary form, is urged radially outwardly (downwardly in the figure), and hence acts to lock the device with the flange or rim seated against the front face of the panel. The locking effect is illustrated in FIG. **2.** As is indicated in FIG. **6,** while a different one of the inclined faces of the steps will become the active locking surface is different thicknesses of panel, such as of minimum thickness **T2,** or maximum thickness **T3,** or any intermediate thickness, e.g., **T1,** are encountered, the action is the same.

As is evident, with different sets of the resilient limbs formed with respectively differently dimensioned step formations, a greater range of panel gages can be accommodated by the device. For example, referring to FIGS. **3** and **4,** if one set of the limbs, such as **10*x*** and **10*z***, is formed with steps as indicated in solid lines in FIG. **5** and another set such as **10*w*** and **10*y*** is formed with steps as indicated in dash lines, either set is adequate to lock the device to a panel, and a larger range of gages or thicknesses of panels may be accommodated. Obviously, in some instances limbs of both sets may concurrently act to lock or secure the device on the panel, and it is evident that, for example, the step formations on all of the limbs of the device may be identical.

While two sets of limbs, each set comprising a plurality of limbs, have been illustrated, it is evident that a single set of three identical limbs will effectively act to secure the device to a panel, as would two sets each comprising three limbs, or other plural-limb sets. A single set of two limbs has been found to be effective, since the flange **10f** is effective to prevent wobbling of the device in the aperture.

It will be noted that with the limbs free, as depicted in FIG. **1,** and with the face corners of the risers and treads formed to coincide with respective circles of progressively changing diametral dimensions indicated, the limbs and steps when forced inwardly will not present to the rear corner edge of the panel at the aperture, step surfaces of the same radii as that of the aperture, since the radial distance of the step from the axis has decreased. As a consequence, each limb will contact the panel only at and immediately adjacent its side edges, such as at the locations indicated at **E1** and **E2** in FIG. **1,** and not at any portion of the riser or tread of the step between those locations. Thus, as possible wearing and abrasions occurs, as may be caused by frequent removal and replacement of the device in the aperture, the wear occurs at the locations such as **E1** and **E2** and the contacting surface area of the riser or tread of the step merely becomes somewhat wider but does not adversely affect the locking action of the inclined-step resilient limbs.

To aid in orienting the device and an attached instrument in a particular desired attitude relative to the panel, the device is formed with an external key or ridge **10*n*** (FIG. **1**), dimensioned to be snugly received in an appropriately located notch in the periphery of aperture A in the panel. Additionally, the base **10*b*** is formed with a central aperture **10*p*** for accommodation of electrical terminals or leads, or other means extending from the instrument to be supported. Also, the base is formed with specially located and/or specially shaped and spaced-apart key holes, such as **10*k***, adapted to receive complementary and complementarily spaced-apart rearwardly-extending fastener pins protruding from the rear of the instrument case. The pins may be specially oriented as shown in FIG. **3** and may be thermoplastic and thus may be heat-swaged over the base **10*b*** adjacent the respective key holes, to firmly secure the instrument I (FIG. **2**) to the device **10,** as shown and described more completely in the aforementioned application Ser. No. 216,520 now U.S. Pat. No. 3,757,732 of Sydney W. Frey, Jr. Thus an instrument, which may snugly fit inside the body of the device, may be firmly but removably affixed to the panel by merely pressing the device home in the aperture. As is evident, the instrument I may be permanently affixed to device **10** as indicated, or by other means such as adhesive, prior to insertion of the device into the aperture in the panel. Thus affixing the instrument to a panel in a desired oriented attitude, secure against loosening by vibration, etc., is reduced to the simple act of pressing the assembled instrument and mounting device **10** into the aperture in a panel. Removal of the device from the panel is easily accomplished by pressing a cylindrical tube, of internal diameter or area and dimensions equal to that of the aperture A, forwardly over the resilient limbs so as to move the stepped ends inwardly out of contact with the panel, and pulling the instrument and device forwardly out of the tube and panel aperture.

Having disclosed a preferred embodiment of our invention in detail, we claim:

1. An instrument supporting device for detachably supporting an instrument in an aperture in a panel, said device comprising:

a front rim portion to abut against the front face of a panel adjacent an aperture in the panel;

a body portion integral with said rim portion, of configuration complementary to the aperture and dimensioned to extend through and rearwardly beyond the aperture, the body portion terminating at a rear end and having a plurality of longitudinally-extending spaced-apart interruptions therein between the front rim portion and the rear end; and

a plurality of resilient cantilever limbs spaced around said body portion and each integral with said body portion at a respective location rearwardly from said rim portion and extending forwardly from that location and outwardly away from the body portion toward said rim portion and each having a free end rearwardly of said rim portion;

said body portion having interruptions therein for accommodating radial inward movement of the free ends of respective ones of said resilient limbs incident to movement of the body portion into and through the aperture in a panel,

and said resilient limbs each having a plurality of inclined steps on the free end thereof positioned and shaped to present a forwardly and inwardly inclined surface to the rear marginal edge at the aperture in a panel of any of a plurality of different thickness dimensions, and said limbs comprising at least first and second sets thereof each of the sets

comprising at least two limbs and the inclined steps of the limbs of any set thereof differing in dimensional spacing from said rim portion from the dimensional spacing of the inclined steps of the limbs of another set thereof,

whereby said device may be quickly, easily and firmly attached and removed from apertured panels of various different thicknesses.

2. An instrument supporting device as defined in claim 1, in which said device is of generally circular configuration and thereby adapted to be mounted in a circular aperture in a panel.

3. An instrument supporting device as defined in claim 1, in which said limbs are uniformly spaced around the circumference of said body portion, and in which said interruptions are in the form of longitudinally-extending openings in said body portions.

4. An instrument supporting device for detachably supporting an instrument in an aperture in a panel, said device comprising:

a front rim portion to abut against the front face of a panel adjacent an aperture in the panel;

a body portion integral with said rim portion, of configuration complementary to the aperture and dimensioned to extend through and rearwardly beyond the aperture, the body portion terminating at a rear end and having a plurality of longitudinally-extending spaced-apart interruptions therein between the front rim portion and the rear end; and

a plurality of resilient cantilever limbs spaced around said body portion and each integral with said body portion at a respective location rearwardly from said rim portion and extending forwardly from that location and outwardly away from the body portion toward said rim portion and each having a free end rearwardly of said rim portion;

said body portion having interruptions therein for accommodating radial inward movement of the free ends of respective ones of said resilient limbs incident to movement of the body portion into and through the aperture in a panel,

said resilient limbs each having a plurality of inclined steps on the free end thereof positioned and shaped to present a forwardly and inwardly inclined surface to the rear marginal edge at the aperture in a panel of any of a plurality of different thickness dimensions;

and said rear end of said device being in the form of a base parallel to said rim portion, said base having apertures therein for reception of attachment means for an instrument, and said body portion being of spatial configuration adapted to receive and support an instrument attached to said base.

whereby said device may be quickly, easily and firmly attached and removed from apertured panels of various different thicknesses.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,794,278 Dated February 26, 1974

Inventor(s) Sydney W. Frey, Jr. and Donald L. Gaa

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, Line 57, "fragementary" should read --fragmentary--.

Column 4, Line 41, "he" should read --the--.

Column 4, Line 49, "inclinded" should read --inclined--.

Column 5, Line 14, "is" should read --if--.

Column 8, Line 25, "base." should read --base,--.

Signed and sealed this 12th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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