

Sept. 26, 1961

E. F. DOYLE
FASTENING DEVICE
Filed June 22, 1959

3,001,755

FIG. 1

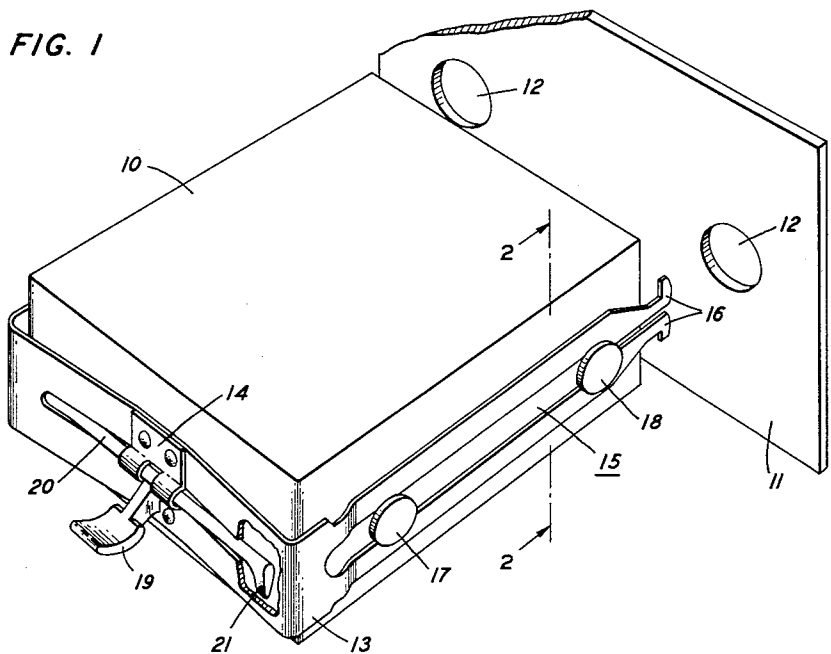


FIG. 3

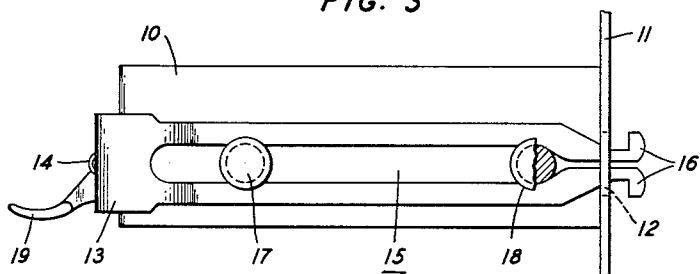


FIG. 2

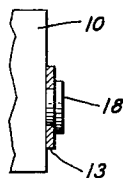
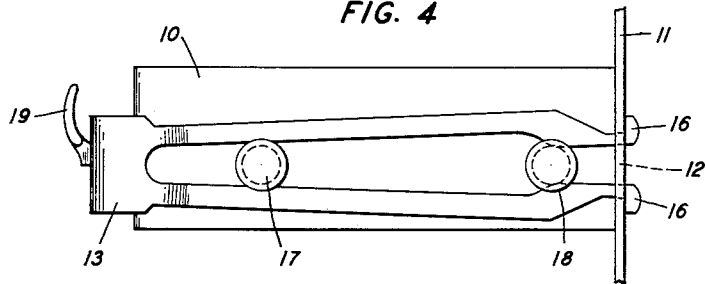


FIG. 4



INVENTOR
E. F. DOYLE
BY

Walter M. Kheel
ATTORNEY

1

3,001,755

FASTENING DEVICE

Edmund F. Doyle, Landing, N.J., assignor to Bell Telephone Laboratories, Incorporated, New York, N.Y., a corporation of New York

Filed June 22, 1959, Ser. No. 822,150

4 Claims. (Cl. 248-360)

This invention relates to fastening arrangements and, in particular, but not exclusively, to arrangements for fastening subassemblies to mounting bases.

Various techniques have been employed in the prior art for fastening subassemblies to mounting bases. One technique, disclosed in U.S. Patent No. 2,531,911, issued to E. L. Johnson on November 28, 1950, for example, employs a pair of elongated members each of which is secured at one extremity to a respective side of a subassembly. The remaining extremities of the members are bifurcated and have pairs of sidewardly extending latches that are compressed when forced through respective apertures in a mounting base during assembly. When the force is removed after assembly, the latches come into contact with the side of the mounting base opposite to the subassembly, thereby firmly holding the subassembly to the mounting base. In order to remove the subassembly, the bifurcated portions of the members are compressed and the latches are withdrawn from their apertures. Although this arrangement permits rapid fastening and provides a high degree of reliability in the resulting attachment, access to the bifurcated portions must be provided in order to remove the subassembly. It is not always possible, however, to provide this access.

An object of the present invention is to fasten a subassembly to a mounting base by bifurcated members without the necessity of providing access to the bifurcated portions in order to remove the subassembly.

In one of its broader aspects, the present invention utilizes elongated bifurcated members having pairs of sidewardly extending latches at their bifurcated ends similar to the latches shown in the previously mentioned patent. Unlike the patent, however, these latches may be inserted in their respective apertures in a mounting plate without compressing the bifurcated portions of the members or distorting the members in any other manner. In accordance with one feature of the invention, a first action is produced, after the members are inserted in their respective apertures, which tends to withdraw the members from their apertures while a second action causes the bifurcated portions of the members to be spread apart. Because the bifurcated portions are spread apart as they are being withdrawn from their apertures, the sidewardly extending latches come into firm contact with the side of the mounting plate opposite to the subassembly, thereby firmly holding the subassembly to the plate. Detachment of the subassembly is achieved by merely reversing the first action which permits the latches to return to their initial conditions so that they may be removed from their apertures.

In one embodiment of the present invention, a pair of elongated members takes the form of a U-shaped piece of spring sheet metal which is fitted around a subassembly and secured at its midpoint to the subassembly. The legs of the U-shaped metal are long enough to extend through respective holes in a mounting base on which the subassembly is to be fastened. Each of the legs has a pair of sidewardly extending latches at its extremity and is bifurcated throughout most of its length to form an opening having a taper over a portion of its length which increases in width as the distance from the extremity increases. A pair of studs are mounted on the subassembly and extend through the leg openings adjacent to the taper. As the legs are moved relative to these studs, the tapers

2

are drawn over the studs to spread the bifurcated portions of the legs apart. This action separates each pair of latches to engage the mounting plate and secure the subassembly thereto. The legs are moved by the actuation of a pair of cams mounted to the subassembly. When the cams are reversed, the latches disengage from the mounting plate and return to their initial positions, permitting removal of the subassembly from the mounting plate.

Other objects and features of the invention will be apparent from a study of the following detailed description of a specific embodiment.

In the drawings:

FIG. 1 is a perspective view of one embodiment of the invention;

FIG. 2 is a sectional view of the embodiment taken at line 2-2 of FIG. 1;

FIG. 3 is a side view of the embodiment of FIG. 1 in a partially attached state; and

FIG. 4 is a side view of the embodiment of FIG. 1 shown in its attached state.

FIG. 1 shows a subassembly 10 and a mounting base 11 having a pair of apertures 12. A U-shaped piece of spring sheet metal 13, preferably steel, is secured at its midpoint 14 to subassembly 10. Each of the legs of U-shaped piece of metal 13 is bifurcated to provide an opening 15 and shaped to provide a pair of latches 16 at its extremity. Two shoulder studs 17 and 18 are inserted in each of the openings 15 and secured to the sides of subassembly 10. FIG. 2, which is a sectional view taken at line 2-2 of FIG. 1, illustrates in greater detail the relationship between subassembly 10, U-shaped piece of metal 13 and studs 18. A portion of each of the openings 15 between its stud 18 and its latch 16 is tapered with the widest part of the taper adjacent to the stud. The tapered portions of opening 15 are more clearly defined in the side view illustrated in FIG. 3 where a portion of stud 18 has been removed for purposes of illustration.

Also secured to subassembly 10 at midpoint 14 is a cam mechanism comprising a cam lever 19 for actuating a pair of cams 21 integral with opposite ends of a cam shaft 20. Shaft 20 passes through a pair of holes in U-shaped metal 13 so that the two cams 21 are located on opposite sides of midpoint 14 and between U-shaped metal 13 and subassembly 10. A cam action is produced by pushing on lever 19 so as to cause shaft 20 and cams 21 to rotate. As cams 21 are rotated the legs of U-shaped piece of metal 13 are caused to move in a direction whereby latches 16 are moved closer to subassembly 10.

The co-operation between the various elements of the embodiment of FIG. 1 may be better understood by referring to FIGS. 3 and 4. In FIG. 3 lever 19 is in its unactuating position so that latches 16 are in their forwardmost positions. Under these conditions the legs of U-shaped piece of metal 13 are positioned so that studs 18 are in the widest part of the tapered portions of openings 15. The legs of U-shaped piece of metal 13 are, therefore, in their normal positions with minimum spacings between the latches 16 on each of the legs. The dimensions of latches 16 permit them to be passed through their respective apertures 12 when the legs are in their normal positions. As shown in FIG. 3 the legs are in their normal positions and latches 16 have been passed through their respective apertures 12.

In FIG. 4 lever 19 has been moved so that the two cams 21 have caused the legs of U-shaped piece of metal 13 to be moved longitudinally in a direction tending to withdraw latches 16 from their apertures 12. The bifurcated portions of the legs have been spread apart by studs 18 and the tapered portions of openings 15 as the legs were moved longitudinally. The narrowest parts of the tapered portions of openings 15 are now over studs

18. As a result of the bifurcated portions of the legs being both spread apart and moved longitudinally, latches 16 have also been spread apart and moved longitudinally so as to come into contact with the side of mounting base 11 opposite to subassembly 10. The longitudinal movement produced by the two cams 21 is of such an amount that, in co-operation with the spring-like quality of U-shaped piece of metal 13, latches 16 are brought into firm contact with mounting base 11, thereby firmly holding subassembly 10 to the mounting base. Therefore, in accordance with the present invention, subassembly 10 has been attached to mounting base 11 without the necessity of providing access to the bifurcated portions of the legs.

In accordance with the invention, detachment of subassembly 10 from mounting base 11 is also accomplished without the necessity of providing access to the bifurcated portions of the legs. In particular, detachment of subassembly 10 from mounting base 11 is accomplished by simply pushing lever 19 which rotates cams 21 to permit the legs of U-shaped piece of metal 13 to assume their normal positions with latches 16 spaced their minimum distances apart so that they may be withdrawn from apertures 12.

Although the invention has been described through the use of a single subassembly mounted on an unobstructed mounting base, it should be readily appreciated that the invention finds particular use in those cases where one or more subassemblies must be removably attached to a mounting base where access to the sides of the subassemblies and to the rear of the base is not possible. Furthermore, the term "subassembly" is used in a broad sense in the specification so that a subassembly may comprise, for example, a single electronic component.

Various modifications of the illustrated embodiment may be made without department from the scope of the invention. While U-shaped piece of metal 13 is preferably made of steel, for example, other materials may be substituter therefor. Latches equivalent to those shown in the illustrated embodiment may also be used. Furthermore, although a single embodiment of the invention has been illustrated, various other embodiments may be constructed without departing from the scope of the invention.

What is claimed is:

1. In combination, a subassembly, a mounting base, a fastener comprising a piece of spring material being substantially U-shaped and fitted around said subassembly with the extremities of said material projecting through holes in said mounting base, each of the legs of said U-shaped material being bifurcated and having a pair of sidewardly extending latching portions at the extremity thereof, means securing said material to said subassembly at substantially the midpoint between said extremities, means for causing said legs to project to a lesser degree beyond said subassembly, and means for causing the bifurcated portions of said legs to spread apart when said legs project to a lesser degree beyond said subassembly.

2. In combination, a subassembly, a mounting base, a fastener comprising a piece of elongated spring material

having bifurcated ends, the width of a first portion of each of the openings thus formed in said ends being greater than that of a second portion more remote from the midpoint of said material, each section of the bifurcated ends having a latching portion extending sidewardly at the extremity thereof, said material being bent in a substantially U shape and fitted around said subassembly with said latching portions projecting through holes in said mounting base, means securing said material to said subassembly at substantially said midpoint, a pair of members mounted on said subassembly and extending through respective ones of the first portions of said openings to cause said latching portions at each of the ends to spread apart as they are moved towards said subassembly, and a cam means for moving said latching portions towards said subassembly.

3. In combination, a subassembly, a mounting base, a fastener comprising a substantially U-shaped piece of elongated spring material fitted around said subassembly with the leg portions thereof projecting through holes in said mounting base, each of said leg portions being at least partially bifurcated so that the width a first point of the opening thus formed in each of said leg portions is less than that at a second point more remote from the extremity of the leg portion, each section of the bifurcated legs having a sidewardly extending latching portion at the extremity thereof, means securing said material to said subassembly at substantially the midpoint of said material, a pair of members mounted on said subassembly and extending through respective ones of said openings to cause said sections of each leg to spread when said legs are moved to project to a lesser degree beyond said subassembly, and a cam means on either side of said securing means for moving said legs so that said legs project to a lesser degree beyond said subassembly.

4. In combination, a subassembly, a mounting base, a fastener comprising a piece of spring material having a pair of sidewardly extending latching portions at each extremity thereof and bent in a substantially U shape and fitted around said subassembly with said latching portions projecting through holes in said mounting base, each leg portion of said U-shaped material being at least partially bifurcated so that the width at one point of the opening thus formed is less than that of a second point more remote from the extremity of said leg portion, means securing said material to said subassembly at substantially the midpoint between said extremities, a pair of members mounted on said subassembly so that said members are in respective ones of said openings at substantially said second points to cause said latching portions of each of said legs to spread with respect to one another when said latching portions are moved towards said subassembly, and a cam means on both sides of said securing means for moving said latching portions towards said subassembly.

References Cited in the file of this patent

UNITED STATES PATENTS

2,346,431	Head	Apr. 11, 1944
2,531,911	Johnson	Nov. 28, 1950