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J. K. MATES

3,475,810

SEPARATION OF RIGID MEMBERS JOINED BY HOOK AND LOOP

Filed Jan. 12, 1967

FIG. 1

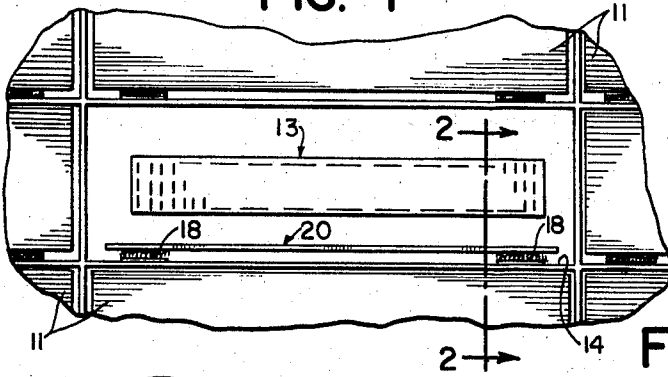


FIG. 3

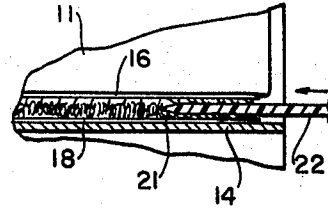


FIG. 2

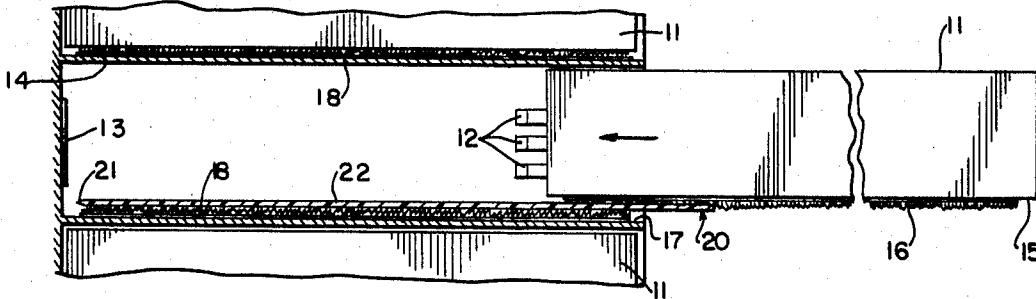


FIG. 4

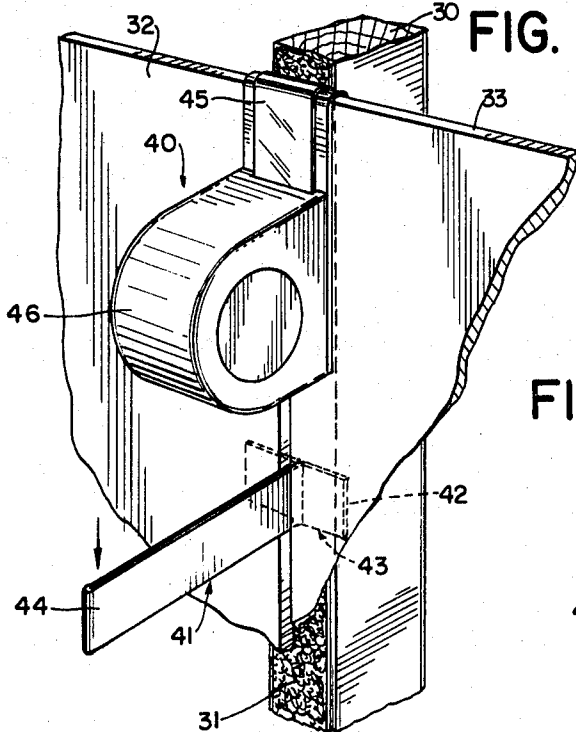


FIG. 5

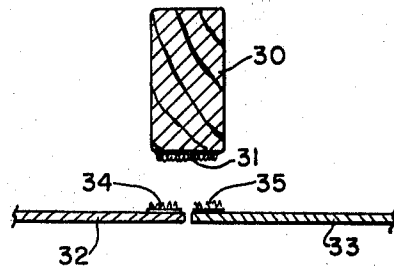
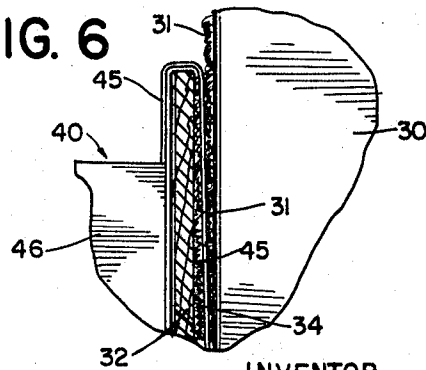


FIG. 6



INVENTOR
JACK K. MATES

BY
Rennie Edwards, Morton,
Taylor & Adams ATTORNEYS

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SEPARATION OF RIGID MEMBERS JOINED BY HOOK AND LOOP

Jack K. Mates, Scarsdale, N.Y., assignor to American Velcro, Inc., a corporation of New Hampshire

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7 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a method of separating rigid members joined together at an interface by hook and loop fasteners by displacing the hook and loop fasteners out of their interfacial plane of engagement by moving a member through the interfacial plane and forcing the hook and loop members out of and essentially normal to the interfacial plane to progressively separate the hook and loop fasteners, and by then maintaining the fasteners out of contact with one another by inserting a barrier between the separated hook and loop fasteners. Also disclosed is an instrument having a beveled leading edge and a flat elongated separator portion for separating rigid members joined by hook and loop fasteners.

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for separating two or more rigid members joined to each other by hook and loop fasteners. The invention particularly relates to a method and apparatus for severing the bond between elements of a hook and loop fastener.

Hook and loop fasteners such as those described in U.S. Patents 2,717,437 and 3,009,235 include separable tape members, each comprising a sheet of woven fabric having raised threads of synthetic material such as super polyamide wherein the loops of one tape member are cut at their outer extremities to form hooks but the loops of the other tape member remain uncut. It is also possible that a given strip of tape may comprise both hooks and loops.

When the two tape members of the fastener are pressed together in face-to-face relationship, there is substantial engagement of the hook threads with the loop threads. A considerable effort must be applied to release simultaneously a large number of hooks either by forcing the tapes in a direction normal to their interface or in a direction parallel to their interface. The magnitude of the force required is such as to make impractical this means of separating the tapes. It has been found that the tape members may be peeled apart by application of a small force but this method requires that at least one of the tape members be mounted on a flexible backing. As a result, the practical use of hook and loop fasteners to secure rigid members to each other has heretofore been impossible.

The present invention is based upon the discovery that the tape members of a hook and loop fastener may be separated by the progressive application of a small force in a direction substantially normal to the interface between them if they are maintained out of contact with one another until the bond is completely severed.

SUMMARY OF THE INVENTION

The present invention is a method for separating rigid members which are joined together at an interface by hook and loop fasteners and comprises displacing the hook and loop fasteners out of their interfacial plane of engagement by moving a member through the interfacial plane of engagement and forcing the hook and loop members out of and essentially normal to the interfacial plane

to progressively separate the hook and loop fasteners. The hook and loop fasteners are then maintained out of contact with one another by inserting a barrier between the separated hook and loop fasteners.

The device of the invention is an instrument having a beveled leading edge and a flat elongated separator portion.

As noted above, the present method and apparatus make possible for the first time the use of hook and loop fasteners in joining rigid members. This invention is particularly useful when the rigid members to be joined are in a confined space so that it is possible to separate one from the other only by displacing one of the members in a direction substantially parallel to the plane of the interface between them. For example, many electronic installations are of modular construction allowing a defective component to be removed easily and replaced immediately by a similar component. This practice of replacing a defective "black box" with a substitute which may be "plugged in" in short order substantially reduces the "down-time" of the entire complex and thus increases efficiency. It is important not only that these "black boxes" be easily accessible for replacement but that they be securely held in position during operation. In this connection it has been found that hook and loop fasteners might be employed if a method could be found to facilitate the removal of the components when desired, but since the supporting frames are generally designed to slidably receive the components, it has been impossible to effectively employ hook and loop fasteners because the contact between the tape members, once established, could not be broken. The present method and apparatus, however, make possible the use of hook and loop fasteners in this field.

Other applications of this principle are readily apparent. For example, in the construction of temporary structures or displays where ease of assembly and disassembly are essential requirements.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention is described hereinbelow with reference to the drawings wherein:

FIG. 1 is a view of an electronic modular component partially inserted in a supporting frame;

FIG. 2 is a sectional view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a detail of FIG. 2 showing the use of one embodiment of the present apparatus in removing an electronic component from its supporting frame;

FIG. 4 is a perspective view of two panels being separated from a support by another embodiment of the present apparatus;

FIG. 5 is an exploded plan view of FIG. 4; and

FIG. 6 is a detail of a side view of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring initially to FIGS. 1-3, an electronic component 11 has a male plug 12 which is to be inserted in a socket 13. A frame 14 is dimensioned so as to slidably receive component 11. To a lower surface 15 of component 11 are secured at least two tape members 16 and in opposed relation thereto on a lower surface 17 of frame 14 are secured at least two other tape members 18. Tape members 16 and 18 comprise sheets of woven fabric having raised threads in the form of loops. The loops of one tape member may be cut at their outer extremities to form hooks but the loops of the other tape member remain uncut. It is not important which tape member 16 or 18 has hooks and which has loops; in fact, it is contemplated that a given tape member may have both hooks and loops.

To install the component 11 in frame 14, an instrument 20 must first be placed over each of the tape members 18. The instrument 20 has a beveled leading edge 21 and an elongated separator portion 22. It is also contemplated that leading edge 21 may be double-beveled. Instrument 20 must be at least equal in width and length to tape member 18 that it may completely overlie tape member 18. As will be seen later, the thickness of instrument 20 should be such that it will not buckle under an axial compressive stress, and preferably is less than the combined thickness of the formed hook and loop fasteners for ease of insertion.

Once an instrument 20 is placed in overlying relationship with each tape member 18, component 11 may be slidably inserted into frame 14 and traversed until plug 12 engages socket 13. Thereafter, instruments 20 are withdrawn and allowing tape members 16 and 18 to engage. Component 11 is now held securely in place.

To remove component 11 from frame 14, the beveled leading edge 21 of the instrument 20 is inserted along the plane of the interface between tape members 16, 18. As it is moved through the interface of engagement of the hook and loop fasteners and in this interfacial plane, the beveled leading edge 21 of the instrument moves through the more flexible pile defined by the loop and slides along the surface defined by rounded ends of the semi-rigid hooks and progressively displaces the loops in the direction of movement of the edge 21 and normal to this interfacial plane until separation is effected; the hook and loop are then further separated and maintained separated by the elongated separator portion 22 of the instrument. When the respective tape members 16, 18 are completely separated, component 11 may be slidably removed from frame 14.

Another application of the present invention is illustrated in FIGS. 4-6. There, a structural support 30 has a tape member 31 secured to one face thereof. Panels 32 and 33 also have tape members 34, 35 along one of their respective marginal edges as shown best in FIG. 5. The tape members 31, 34, 35 are constructed in a manner similar to tape members 16, 18 described above.

To assemble a partition or other structure, panels 32 and 33 need only be pressed firmly against support 30 as shown in FIG. 4; the respective hook and loop fastener members will engage to form a secure joint.

An instrument 40 is employed to disassemble the structure. The instrument 40 has a T-shaped portion 41 the head 42 of which has a beveled leading edge 43 and the stem 44 of which serves as a handle. An elongated flexible separator portion 45 is secured to head 42 at one end thereof. Separator portion 45 may be stored on spool 46 when instrument 40 is not in use. In operation, head 42 of instrument 40 is inserted in the interface between tape members 31 and 34, 35 with the stem 44 along the interface between panels 32, 33 as shown in FIG. 4. As head 42 is traversed along the length of the interface between support 30 and panels 32, 33 by the application of force to handle 44, the respective tape members 31 and 34, 35 are completely separated by the action of the beveled edge 43 in the same manner described above with respect to the first embodiment. The flexible separator

portion 45 pays out of spool 46 and maintains the tape members 31 and 34, 35 out of engagement. The position of separator portion 45 during this operation is shown most clearly in FIG. 6.

I claim:

1. In combination with rigid members joined to one another at an interface by hook and loop fasteners secured to the respective joined surfaces of the rigid members, a device insertable at the interface for separating the rigid members comprising an instrument having a beveled leading portion and a flat elongated separator portion, the width of the beveled leading edge and separator portion being at least as great as the width of the interface and the length of the separator portion being at least as great as the length of the interface.

2. A device according to claim 1 wherein the leading edge has a double bevel.

3. A device according to claim 1 wherein the separator portion is rigid.

4. A device according to claim 1 wherein the separator portion is a flexible tape.

5. A device according to claim 1 wherein the thickness of the separator portion is less than the combined thickness of the hook and loop fasteners.

6. A method for separating rigid members joined together at an interface by hook and loop fasteners comprising progressively displacing the hook and loop fasteners out of their interfacial plane of engagement in a direction essentially normal to the interfacial plane and then maintaining the respective fasteners out of contact with one another while the rigid members are separated.

7. A method for separating rigid members so confined that movement of one with respect to the other when separated can be effected only in a direction parallel to the interfacial plane of engagement which comprises separating and maintaining separated the rigid members according to claim 6 and sliding one of the members relative to the other in the parallel direction.

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BERNARD A. GELAK, Primary Examiner

U.S. Cl. X.R.

24—12, 201, 204, 205; 29—203, 239, 270; 52—127; 81—3; 317—101; 339—75