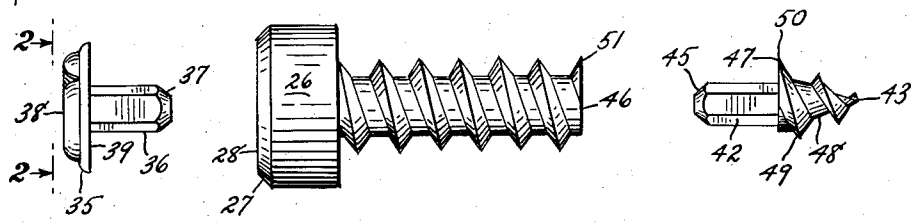
July 25, 1961 B. G. FORMAN 2,993,950

SELF-TAPPING NON-CONDUCTIVE FASTENER

Filed June 17, 1959

Fig. 1



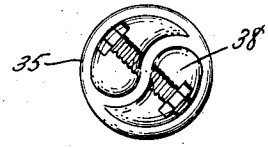


Fig. 2

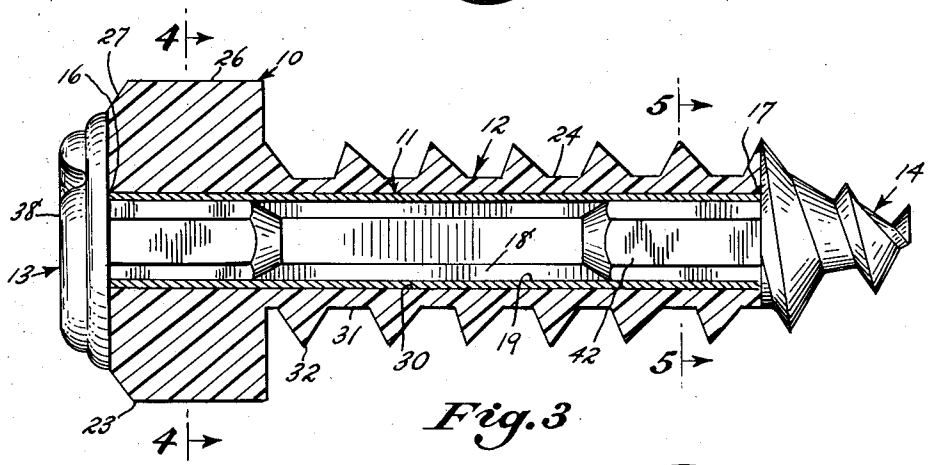


Fig. 3

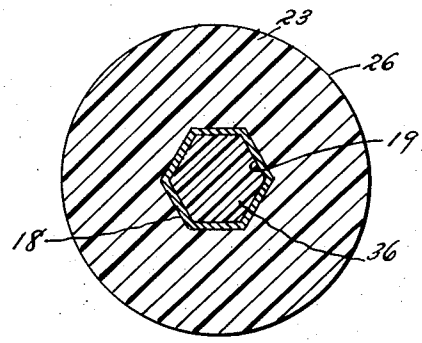


Fig. 4

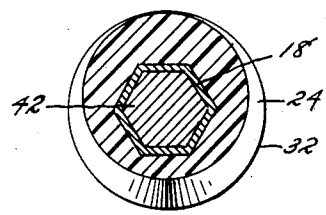


Fig. 5

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SELF-TAPPING NON-CONDUCTIVE FASTENER

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3 Claims. (Cl. 174—138)

This invention relates generally to the field of non-conductive fasteners of a type in which a metallic core element is substantially enclosed within a synthetic resinous outer casing element.

Devices of this type are generally known in the art, and the invention lies in the specific constructional details permitting the device to be used as a self-tapping threaded fastener by providing a metallic thread-cutting tap which extends outwardly of the basic casing element, and which is provided with a cutting thread segment which forms a continuation with the plastic threads on the casing element at a point where the threaded opening in which the device is engaged is completely formed.

It is among the principal objects of the invention to provide an improved non-conductive fastener possessed of the above characteristic which may be manufactured by mass production techniques existing in the art, thereby permitting devices embodying the invention to be manufactured at reasonably low cost, with consequent wide sale, distribution and use.

Another object of the invention lies in the provision of an improved index means whereby the correct and rapid assembly of the component parts is facilitated.

A feature of the invention lies in the provision of an improved self tapping non-conductive fastener possessed of the above advantages, which will be so constructed as to be completely insulative with respect to those portions of the same which will be exposed not withstanding the presence of an exposed tapping portion at the leading end of the threaded shank.

A feature of the invention lies in the ready adaptability of the same to such well known molding techniques as injection molding, insert molding and the like.

Another feature of the invention lies in the fact that a wide range of synthetic resinous and metallic materials may be employed in the manufacture of the inventive devices.

These advantages and features, as well as other incidental ends and advantages will become more clearly apparent during the course of the following disclosure, and be pointed out in the appended claims.

In the drawing, to which reference will be made in the specifications, similar reference characteristics have been employed to designate corresponding parts in the several views.

FIGURE 1 is an exploded view in elevation of an embodiment of the invention.

FIGURE 2 is an end elevational view as seen from the plane 2—2.

FIGURE 3 is an enlarged central longitudinal sectional view partly in elevation.

FIGURE 4 is a transverse sectional view as seen in the plane 4—4 in FIGURE 3.

FIGURE 5 is a transverse sectional view as seen from the plane 5—5 in FIGURE 3.

In accordance with the invention, the device, generally indicated by reference character **10**, comprises broadly: a metallic core element **11**, a synthetic resinous body or casing element **12**, an insulating plug element **13**, and a metallic tapping element **14**.

The metallic core element **11** is of rectilinear elongated polygonal configuration, and includes a first end **16**, a second end **17**, and a plurality of planar sides generally indicated by reference character **18** which define a hollow bore **19**. In the form illustrated in the drawings, the

bore **19** is of a configuration corresponding to that of a standard recessed head screw, so that the first end **16** may be readily engaged by a conventional driving tool of polygonal cross-section, as for example, the well known Allen-type wrench.

The casing or body element **12** is preferably formed in situ about the core element **11** by any well known molding technique, as for example, insert molding, and is formed of nylon, or other suitable synthetic resin having similar properties. It includes a head portion **23** and a threaded integrally formed shank portion **24**. The head portion **23** may be of any desired configuration, including a cylindrical outer surface **26**, an upper conically shaped surface **27** and a top surface **28** coextensive with the first end **16** of the core element **11**. The threaded shank portion **24** includes an inner surface **30** in intimate contact with the outer surface of the sides **18** of the core element **11** and an outer surface **31** having a continuous thread **32** thereon.

The plug element **13** is adapted to be inserted into the open first end **16** of the core element **11**, in order to completely cover the exposed metal surface thereof after the device **10** has been installed within a threaded opening. It includes a top or cap member **35**, and a polygonal shank member **36**, the cross-section of which corresponds to that of the end **16**, and the dimensions of which are such as to permit frictional retention of the plug element **13** within the end **16**. As best seen in FIGURES 1 and 3, the shank member **36** is provided with a chamfered portion **37** to permit easy insertion.

The top or cap member **35** includes an upper surface **38** which may be impressed with a suitable decorative design as suggested in FIGURE 2, and a lower surface **39**, the area of which is sufficient to completely overlie exposed end **16** of the core element **11**.

The metallic tapping element **14** is preferably formed as a small die casting, and includes a polygonal shank member **42** as well as a cutting tip member **43** integrally formed therewith. As is the case with the plug element **13**, the free end **45** of the shank member **42** is preferably chamfered to facilitate insertion and engagement with the second end **17** of the core element **11**. The cutting tip member **43** includes an abutting surface **47** engageable with the end surface **46** of the threaded shank portion **24**. The quasi-conical body portion **48** is provided with cutting thread **49** in such manner that when the element **14** is engaged within the second end **17** of the core element **11**, the thread **49** forms a continuation of the thread **32**, as best seen in FIGURE 3.

Since the elements **14** and **12** are formed by molding processes in which accuracy may be maintained to reasonably small tolerances, accurate fit is obtained by merely indexing the polygonal shank member **42** with respect to the bore **19** to the position where the end **50** of the thread **49** is aligned with the end **51** of the thread **32**. Where the device is assembled by mechanical means, suitable keying means (not shown) may be provided to insure that proper indexing will be obtained during each assembly operation.

In use, the device may be installed within an untapped opening in the normal manner, a tool being engaged with the first end **16** of the core element **11**, the metallic cutting thread **49** simultaneously expanding and tapping the hole to full diameter. The tapping operation is completed before the engagement of the threads **32** enters the now tapped hole, so that no damage occurs to the threads **32** which are formed of synthetic resinous material. Upon completion of the tightening of the device **10** within the tapped opening, the driving tool (not shown) is removed to be replaced by the insertion of the shank member **36**, following which pressure is applied upon the top or cap member **35** to fully seat the plug ele-

ment within the opening formed by the first end **16**. In this condition, no metallic parts of the device are exposed to contact, and should the metallic tapping element **14** contact a source of electrical potential, current can be transmitted only through the metallic core element **11**, so that it is not transmitted to the edge of the tapped opening, or the head of the device itself.

Should it be desirable to remove the device from contact with the tapped hole, it is necessary only to pry off the plug element **13**, and reinsert the tool used for tightening the device, to drive the device in a reverse direction.

It may thus be seen that I have invented novel and highly useful improvements in self-tapping non-conductive fastener devices, in which a metallic tapping element is incorporated into the device in such manner that electrical shorting, or shocking a user of a device in which the fastener is installed is substantially impossible. By resort to injection and insert molding techniques, the cost of manufacture of the devices may be kept at a reasonably low order, and in mass production assembly of large electrical devices, the additional cost involved is more than justified by the elimination of potential shock hazard.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention relates.

I claim:

1. A self-tapping non-conducting fastener, comprising: a metallic hollow core element, an outer body element of synthetic resinous non-conductive material surrounding co-extensively said core element, and having a threaded outer surface thereon, a metallic thread cutting tip engageable with one end of said hollow core element, said tip having a cutting thread thereon forming a continuation of said threaded outer surface of said body element.

2. A self-tapping non-conductive fastener, comprising: a hollow metallic core element having a polygonally shaped cross section, an outer body element of synthetic resinous non-conductive material surrounding co-extensively said core element and having a threaded outer surface thereon, a metallic thread cutting tip having a polygonally shaped shank member thereon engageable within one end of said hollow core element, said tip having a cutting thread thereon forming a continuation of said threaded outer surface of said body element.

3. A self-tapping non-conductive fastener, comprising: a hollow metallic core element having a polygonally shaped cross section, an outer body element of synthetic resinous non-conductive material surrounding co-extensively said core element and having a threaded outer surface thereon, a metallic thread cutting tip having a polygonally shaped shank member thereon engageable within one end of said hollow core element, said tip having a cutting thread thereon forming a continuation of said threaded outer surface of said body element; the opposite end of said core element forming tool engaging means, and plug means selectively engageable within said tool engaging means to completely close the same.

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