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HOOK-LIKE FASTENING ASSEMBLY

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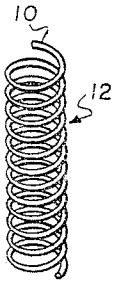


FIG. 1

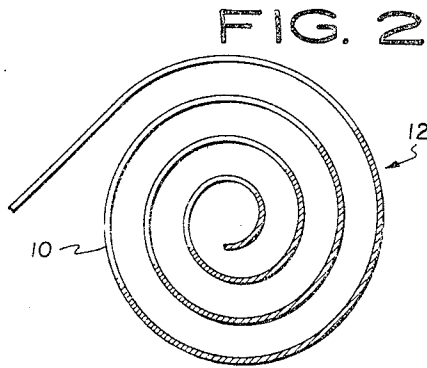


FIG. 3

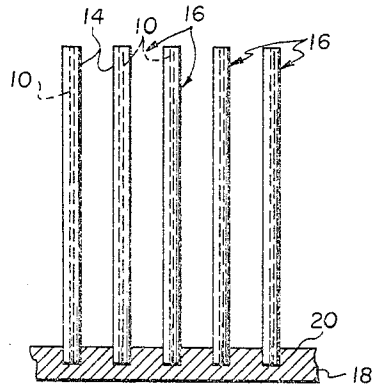


FIG. 4

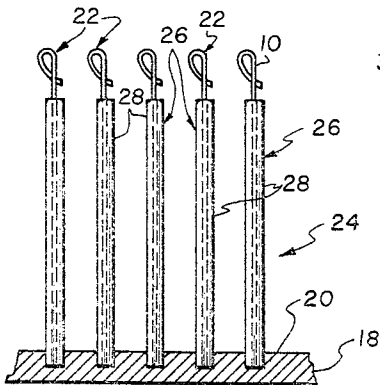


FIG. 5

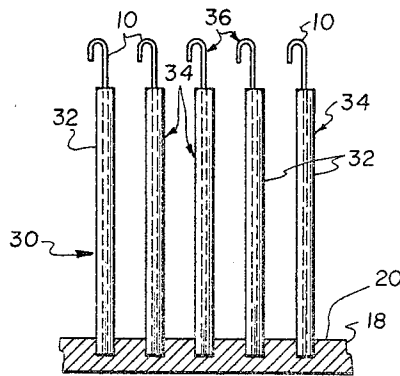


FIG. 6

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ABSTRACT OF THE DISCLOSURE

A self-gripping fastening assembly consisting of a plurality of fastening members secured in upstanding condition from the surface of an article, wherein the fastening members are formed of a length of wire filament prestressed into helical or spiral form and maintained in straightened condition by a coating capable of being shrink-treated. The coated, straightened wire is cut into small pieces which are mounted in thick profusion on the article surface and the end portion of each coating is treated to cause it to shrink and recede, exposing an end section of wire which bends to its pre-stressed shape to provide the finished fastening member in the form of a rigid coated body terminating in a wire hook.

The present invention relates to fastening devices, and in particular to a novel and improved fastening means attachable to one surface and capable of gripping an opposed surface in a self-adhering action. In particular, the invention relates to a novel type of fastening element and to a new and improved method for making the same.

A self-gripping fastening assembly is presently marketed under the trademark "Velcro," and is employed for releasably fastening fabrics or other articles to each other. Such fastening assembly is commercially provided in the form of pairs of fabric strips which are sewn or otherwise secured to the opposed surfaces of the fabrics or other articles to be attached to each other. On one of these strips, the outer surface is covered by rows of upstanding plastic loops of small size, while the outer surface of the other strip is covered by matching rows of upstanding plastic loops. When the covered strip surfaces are pressed together, the hooks on one strip engage and grip the loops on the opposite strip so that the strip surfaces grip tightly together and the attached fabric or articles are releasably secured to each other.

While such conventional fastening assemblies provide convenient and effective gripping action, they are subject to the disadvantage of being relatively expensive since the formation of the loops and hooks and the mounting thereof on the fabric strips involves costly manufacturing operations. In addition, there is a further disadvantage in that the assembly is such that a pair of strips must be employed for each gripping application, and a strip must be individually sewn or otherwise secured to each of the articles to be fastened together.

It is an object of the present invention to provide improved fastening means attachable to the surface of any article and capable of gripping another article of soft or penetrable composition, with which the first article is brought into surface contact.

Another object of the invention is to provide self-gripping fastening means of the character described, which is mounted on the surface of only one of the articles to be fastened together.

A further object of the invention is to provide a novel and improved method of making and mounting fastening means of the type described, which method provides an inexpensive manufacturing operation and a product which may be made available at low cost.

In accordance with the invention, there is provided a self-gripping fastening assembly comprising a plurality of fastening members secured to the surface of an article. Each of the fastening members includes a substantially rigid, elongated body mounted on said article and projecting perpendicularly from the surface thereof. Embedded in said body member is a thin filament which extends longitudinally through the center thereof and has an exposed portion which projects from the unmounted end of said body, this exposed filament portion being shaped in the form of a hook. The hook is shape-retaining and results from the prestressed helical or spiral form of the embedded thin filament.

This invention also contemplates a method for making the aforementioned fastening assembly which includes the steps of straightening a pre-stressed coiled thin filament, coating the straightened filament with a shrinkable coating material of sufficient rigidity and thickness to maintain the filament in straightened condition, cutting the coated filament into small pieces, mounting the small pieces in upstanding condition from the surface of an article, and subjecting the end portions of the coating of the mounted pieces to shrink treatment to cause said end coating portion to recede and expose a bare filament portion which bends into an exposed terminal hook.

Additional objects and advantages of the invention will become apparent during the course of the following specification when taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of a length of wire filament of helical form which is employed to form an element of the fastening assembly of the invention;

FIG. 2 is a plan view of a length of wire filament of spiral form which may be alternately employed to form an element of the fastening assembly;

FIG. 3 is an enlarged sectional view of a portion of the wire filament of FIG. 1 in straightened condition and covered by a coating in accordance with the invention;

FIG. 4 is a sectional view showing a plurality of pieces of coated wire mounted on the surface of an article;

FIG. 5 is an elevational view showing the mounted pieces of FIG. 4 after they have been subjected to heat treatment to form the finished fastening assembly of the invention; and

FIG. 6 is an elevational view, similar to FIG. 5, but showing an alternate form of fastening assembly employing the spirally stressed wire filament of FIG. 2.

Referring in detail to the drawings, FIG. 1 shows a length of thin wire 10 which is pre-formed into the three-dimensional shape of a helix 12. The wire 10 is of very small diameter, being in the nature of a filament, and is made of flexible material such as springy metal, which may be stretched into straight linear form, but which will tend to spring back to its pre-formed helical shape. The filament may also be made of glass or plastic.

The helically formed spring wire 10 is used as the basic constituent of the fastening elements of the present invention, and for this purpose, the length of wire 10 is stretched out into straight linear form and is coated with plastic to maintain it in straight condition. FIG. 3 shows a small section of the straightened wire 10 to which has been applied to an external coating 14 of rigid material.

The coating 14 may be made of any material capable of coating the stretched wire 10 and of hardening sufficiently to maintain the wire in its straight linear condition. It must also be capable of shrinking when subjected to heat or similar treatment. For example, the coating 14 may be made of glass or of such plastics as cellulose acetate, cellulose butyrate, nylon, polyacetal or polyvinyl chloride, which possess the aforementioned properties.

It will be observed in FIG. 3 that the coating 14 is applied in a thickness which is substantially greater than

the diameter of the spring wire 10. Thus, the thickness of the outer coating is sufficient to maintain the inner springwire 10 in its straightened form and to restrain it from bending. The coating 14 may be applied to the wire by conventional co-extrusion process, by dipping, or in any other suitable manner.

After the length of wire is stretched out and coated to form a straight length of substantial extent, the coated wire is chopped or cut into small pieces 16 of substantially equal length. These are themselves of narrow diameter and in the nature of small filaments, and are mounted in upstanding position and in relatively thick profusion on the surface of an article to be fastened. In FIG. 4 there is shown an article 18 which may be a piece of leather, for example, and which has an upper surface 20. The coated pieces 16 may be blown under high air pressure onto the surface of the article so that they become partially embedded in the surface, as shown in FIG. 4. Alternately, the pieces may be applied to the article surface by flocking methods, weaving processes, or other embedding methods. In any event, the pieces are so mounted that they cover the selected area surface of the article in closely spaced random formation, and so that each is upstanding from the article surface and substantially perpendicular thereto.

The article 18 may be a piece of leather, as described, or it may be fabric or any other material capable of supporting the pieces 16 by the application method employed.

After the coated pieces 16 are mounted on the article 18, as described above, the outer free ends thereof are treated to cause the coating material to shrink and retract from the tip of the piece, exposing the inner spring wire 10 therein. For example, where the coating material is made of glass or the heat-shrinkable plastics previously identified, the tips of the pieces may be subjected to a flame, causing the coating material to shrink or melt, but in any event to recede downwardly away from the tip. This exposes a short end section of bare inner wire 10 which, because of its pre-tensional condition, bends into the form of a hook 22. Because of the original helical form 12 of the wire 10, the hook 22 takes the three-dimensional volute form shown in FIG. 5.

The finished fastening assembly 24 is thus illustrated in FIG. 5 as comprising a plurality of fastened members 26 mounted in closely spaced relationship upon the surface 20 of the article 18 in an upstanding position substantially normal to the surface 20. Each of the fastening members 26 comprises a straight, filament-like body member 28 formed of the coating material 14 and inserted wire 10, and terminating at its upper end in the exposed wire hook 22. The body members 28 are substantially stiff.

The surface 20 of the article 18 may now be pressed into engagement with the surface of another article, which latter surface is soft or frangible and thus capable of being penetrated by the wire hooks 22 to cause the two articles to adhere to each other. The other article may be fabric, for example, or may be soft leather or provided with a nubby surface, etc. When the articles are pressed together, the hooks 22 will grip the opposed surface and the combined gripping action of the multitude of hooks will cause the articles to become tightly fastened to each other, until they are forcibly pulled apart and separated.

It will be appreciated, that instead of applying a flame to the coated pieces 16 for causing shrinkage of the coating, or otherwise heat treating the ends of the pieces, the

coating may be made of a plastic or other material which will shrink upon chemical treatment, in which case it is only necessary to dip the ends of the mounted pieces in the appropriate chemical until the desired degree of shrinkage has been achieved. Similarly, certain coatings will shrink upon the application of corona discharge.

FIG. 6 shows an alternate form of fastening assembly 30 which is identical to the assembly 24 shown in FIG. 5 and previously described, except that the bodies 32 of each of the fastening members 34 terminate in wire hooks 36 which are of different shape than the hooks 22. These wire hooks 36 are flat and two-dimensional, being generally in the form of a fish hook. This hook shape is achieved by employing in the process previously described a length of wire 40 pre-tensioned to take the form of the flat spiral 42 shown in FIG. 2. The spiral wire is straightened, coated, cut, and applied to the surface 20 of an article 18 in the same manner as previously described, but when the coating is treated to shrink, the exposed wire 40 will return to its spiral form, resulting in the hooks 36.

While the filament is shown and described herein by way of example, as being made of spring metal wire, as previously indicated, it may be made of glass, plastic or similar non-metal material which is capable of being pre-stressed in filament form to retain a spiral or helical shape. In any event, the filament is of such small diameter that the exposed hooks 22 or 36 formed thereby are in the nature of tiny sharp hooks which can easily penetrate soft materials.

While preferred embodiments of the invention have been shown and described herein, it is obvious that numerous additions, changes and omissions may be made in such embodiment without departing from the spirit and scope of the invention.

What is claimed is:

1. A self-gripping fastening assembly for releasably connecting together a pair of articles, said fastening assembly comprising a plurality of fastening members secured to the surface of one of said articles, each of said fastening members comprising a substantially rigid, linear, non-metallic elongated body mounted on said one article and projecting perpendicularly from said surface, a single thin filament embedded within said body and extending longitudinally entirely through the center thereof, and having an exposed portion projecting from the unmounted end of said body, said exposed filament portion being shaped in the form of a sharp hook.

2. A self-gripping fastening assembly according to claim 1 in which said thin filament is pre-stressed into coiled configuration.

3. A self-gripping fastening assembly according to claim 2 in which said thin filament is pre-stressed into helical form and said hook is a portion of a helical turn.

4. A self-gripping fastening assembly according to claim 2 in which said thin filament is pre-stressed into flat spiral form and said hook is a portion of a spiral turn.

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