Oct. 15, 1968 A. SIDELMAN 3,405,430

CLOSURES

Filed July 29, 1966

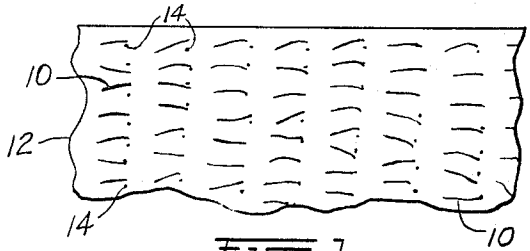

Fig. 1

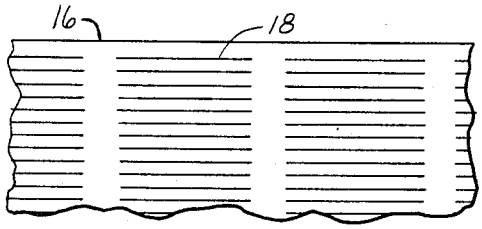

Fig. 2

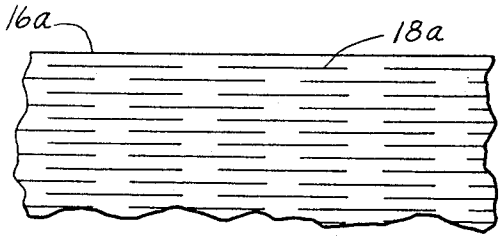

Fig. 2a

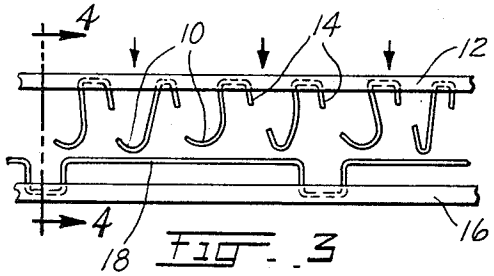

Fig. 3

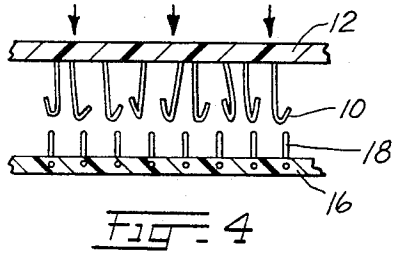

Fig. 4

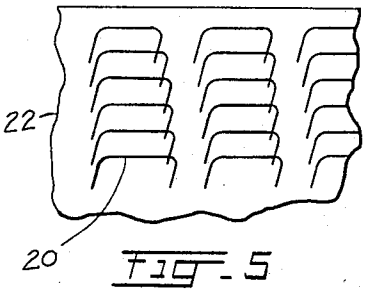

Fig. 5

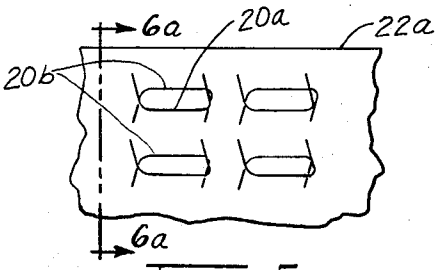

Fig. 5a

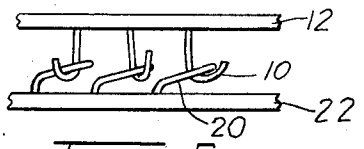

Fig. 6

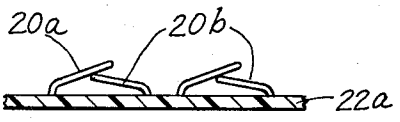

Fig. 6a

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CLOSURES

Abraham Sidelman, Spring Valley, N.Y., assignor to H. Goodman & Sons, Inc., New York, N.Y., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

The novel two-part fastening device employs numerous upstanding hooks distributed over an area of one part of the fastening device and numerous loops, especially of monofilaments, whose sides are secured to a base member and extend for most of the length thereof laterally along but spaced from the base member so that most of the length of the strands included in the loops are favorably disposed for being hooked.

The present invention relates to closures or fastening devices of the type involving areas of one member bearing erect hooks and a companion member that bears threads for interengagement with the hooks. Such devices are used for various purposes. For example they can be sewed to two parts of a garment, and then the two parts of the garment can be attached to each other quickly and securely but in a manner allowing easy parting by deliberate peeling effort.

An object of the present invention resides in the provision of novel closures of this type, wherein secure attachment of the closure members can be achieved readily without resort to numerous exceedingly fine and hence frail filaments to be engaged by the hooks of the opposite closure member.

A further object resides in the provision of novel highly effective closures of the foregoing type that are readily and economically manufacturable.

Two principal forms of novel closures are represented in the detailed description that follows. These illustrative closures or fasteners utilize plastic strips as base members, from which extend hooks and strands, respectively. It is important to effective securing action that a large proportion of the hooks shall "find" strands for retention, when the parts of the closure are being pressed together. The illustrative embodiments utilize strands each of which is fixed at its ends to its supporting base. Virtually the whole length of each strand is laterally exposed, the strand extending generally along the surface of the support (but spaced away from it) rather than being erect. This attitude of the strands greatly enhances the likelihood that a companion hook will become interengaged with a strand. In aggregate, this signifies effective retention of the closure parts. With such an arrangement, stronger and more durable strands can be used; and in particular the use of monofilament strands becomes practical. Use of multifiber threads composed of unduly fine and hence easily broken fibers can be avoided. It should be understood, however, that multiple-filament strands disposed as described below are of distinct advantage, since enhanced probability of engagement by hooks is realized.

Each of the two broad forms of extended-strand closure member described below has its own special merits. And while modifications of both forms are illustrated in the accompanying drawings, it is evident that this specification will prompt those skilled in the art to devise still other variations.

In the drawings, in which the views are diagrammatic and fragmentary:

FIGURE 1 represents a plan view of a hook-bearing ribbon as one part of a closure, the hooks being exaggerated in size;

FIGURE 2 and 2A represent plan views of two different forms of closure members companion to the hook members, embodying features of the invention;

FIGURE 3 is a view of the member in FIG. 1 as it is being assembled to the member in FIG. 2 or 2A, this view being a cross-section transverse to the members in FIGS. 2 and 2A;

FIGURE 4 is an enlarged lateral view of a closure part as in FIG. 1, as said closure part is being assembled to a mating closure part of the form in FIG. 2 or 2A;

FIGURES 5 and 5A are enlarged plan views of other forms of closure members that may be used instead of the forms in FIGS. 2 and 2A;

FIGURE 6 is an enlarged detail of a closure with closure members of FIG. 1 and FIG. 5 assembled; and

FIGURE 6A is a fragmentary enlarged view of a portion of the closure member in FIG. 5A as viewed from the left.

In FIG. 4, one series of erect resilient hooks **10** is shown extending from a base member **12**, constituting a closure member. These parts are made of thermoplastic materials, hooks **10** being of nylon monofilament and base member **12** being of polyethylene in an example. This closure member may be fabricated as in Canadian Patent No. 709,760. That method involves embedding base loops of an undulating formed filament in an extruded molten thermoplastic, and cutting the projecting loops to provide the hooks as shown. Residual filament parts **14** remain.

FIG. 1 is a plan view of the hook-bearing closure member **10, 12**. Many of the hooks **10** remain aligned with residual parts **14** of the filament, and many other hooks twist to various degrees out of alignment with parts **14**, as illustrated.

Opposite member **10, 12** in FIG. 4 is a companion closure member, including base member **16** and strands such as strand **18** whose extremities are anchored in member **16**. Strand **18** is resilient. It is of nylon in a base of polyethylene, for example, and it may be made essentially in the same way as closure member **10, 12.** Many strands **18** are fixed to strip **16** as shown in FIG. 2, extending along the surface of the base but spaced from base **16** sufficiently to allow hooks **10** to function.

Closure member **10, 12** and opposite companion closure member **16, 18** are viewed laterally in FIG. 4, and they are shown in transverse cross-section in FIG. 3. Each strand is equal in length to the space occupied by plural hooks **10**, strand **18** extending along five hooks in FIG. 4. Because virtually the entire length of the strand is exposed for retentive engagement by the hooks, and there may be more strands **18** than sequences of hooks, a large proportion of the hooks will engage the strands when the closure **10, 12** is pushed in the direction of the arrows in FIGS. 3 and 4.

In FIG. 3, the distribution of the hooks is the same as that of the strands; but it could be made somewhat differently. Strand **18** preferably is a monofilament, and may be of the same denier or nearly the same as the hooks. Alternatively, strand **18** may be of several readily spreadable filaments, each of considerable strength. The arrangement affords a high probability of engagement of hooks and strands, and hence it affords a secure closure.

In FIG. 2, the extremities of the strands are aligned transversely of strip **16**. This need not be so. As shown in FIG. 2A, the extremities of the strands may be staggered, that is, the extremities of each strand **18***a* may be out of alignment, transversely of the ribbon, with the extremities of the adjacent strands **18***a*. This further enhances the probability of large numbers of hooks becoming engaged with strands, to hold the closure parts securely together.

The filaments constituting the strands can be quite strong, without sacrificing the feature of large numbers of active or engaged hooks, and achieving the other advantages previously mentioned.

FIGS. 5 and 6 illustrate another form of closure using the erect resilient hooks of FIGS. 1, 3 and 4. The strands **20** on base member **22** are formed as resilient U-shaped parts. For example, they are made of the same materials and in the same way as the hook-bearing member described above, but omitting the cutting step. Thereafter they are heat-softened and pressed laterally and lengthwise relative to the supporting base ribbon so as to dispose virtually the whole length of the U (including the sides of the U and its transverse portion) in position to be retentively engaged by a hook. Various manners of hook engagement are shown in FIG. 6. There may be the same number of hooks and strands per inch of length, and per unit area of the closure parts. However, there may be a slight difference, e.g. 20 strands per inch versus 25 hooks per inch, in an example. Where there is such difference, there is a further enhanced probability of hook effectiveness. In both cases, any given area of the hook-bearing closure member has the same or nearly the same number of hooks as there are strands on the companion member. Making the strands of monofilament is an advantage, because of the various considerations already mentioned. Multifilament strands may also be used instead, if desired.

The end-anchored strands distributed as in FIG. 5A may be divided into groups **20***a* and **20***b*. Within each group the strands can be heat-formed to slope relative to base **22***a* in a common direction, whereas the strands of the different groups can be made to slope differently as illustrated in FIGS. 5A and 6A, for use as in FIG. 6. This arrangement also exposes not only the crossing portion of each U for engagement by a hook, but it also exposes the sides of each U for engagement by hooks. The slope in each instance is such that the strand laterally confronts the base for virtually its whole length, that is, the U is very far from being erect on the base.

The foregoing illustrative embodiments will of course be subject to further variations by those skilled in the art. Consequently, the invention should be construed broadly in accordance with its full spirit and scope.

What is claimed is:

1. A closure, including first and second companion closure members to be placed one against the other and pressed into mutual attachment, said first closure member including a base member and a close-spaced pattern of erect resilient hooks occupying a given area thereof, and said second closure member including a second base member having a close-spaced pattern of strands occupying a corresponding area adapted to confront said given area of the first closure member, each said strand having the extremities thereof fixed to said second base member and being formed as a loop and substantially all of the loops of said corresponding area extending laterally from the extremities thereof and being spaced from said second base member so as to have virtually the entire length thereof extending along said second base member but spaced therefrom and being thereby accessible to said erect hooks for interengagement therewith.

2. A closure in accordance with claim **1**, wherein said strands are monofilaments.

3. A closure in accordance with claim **1**, wherein said sides of said loops extend from said fixed extremities thereof in generally the same direction, whereby the sides and the transverse position of each loop are laterally exposed for interengagement with an approaching hook during assembly of the companion closure members.

4. A closure in accordance with claim **2**, wherein equal areas of said first and second closure members have at least approximately equal numbers of hooks and monofilament strands, respectively.

5. A closure in accordance with claim **1**, wherein the loops occupying at least part of the area of said second base member are divided regularly into groups, each of the loops of a group sloping in generally the same direction and the loops of the different groups sloping in different directions.

6. A closure in accordance with claim **1**, wherein each loop is a monofilament whose extremities are spaced from the extremities of the other loops.

7. A closure in accordance with claim **1**, wherein each said extremity of each loop joins a respective side thereof at a prominent bend.

8. A closure in accordance with claim **1**, wherein the extremities of each loop are spaced apart along a respective line, whereby each of said loops extends along but spaced from said second base member and laterally of its respective line.

9. A closure, including first and second companion closure members to be placed one against the other and pressed into mutual attachment, said first closure member including a base member and a close-spaced pattern of erect resilient hooks occupying a given area thereof, and said second closure member including a second base member having a close-spaced pattern of strands occupying a corresponding area adapted to confront said given area of the first closure member, each said strand having the extremities thereof fixed to said second base member, each of said strands being formed as a loop having sides and a transverse portion interconnecting the sides, the sides of the loops being spaced from said second base member and extending from said fixed extremities thereof in generally the same direction and along the second base member, whereby the sides and transverse portions of the loops are laterally exposed for interengagement with an approaching erect hook during assembly of the companion closure members.

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BERNARD A. GELAK, *Primary Examiner.*