May 19, 1970 M. HALSTEAD 3,512,225

FASTENER STRUCTURE

Filed Oct. 4, 1965 2 Sheets-Sheet 1

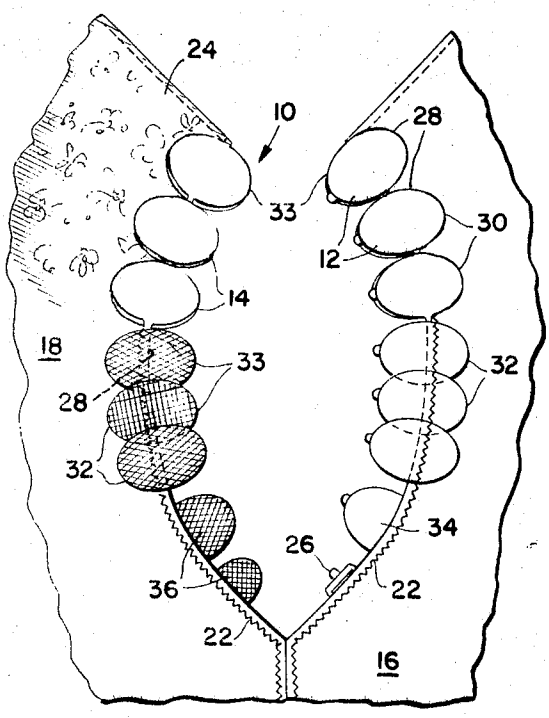


FIG. 1

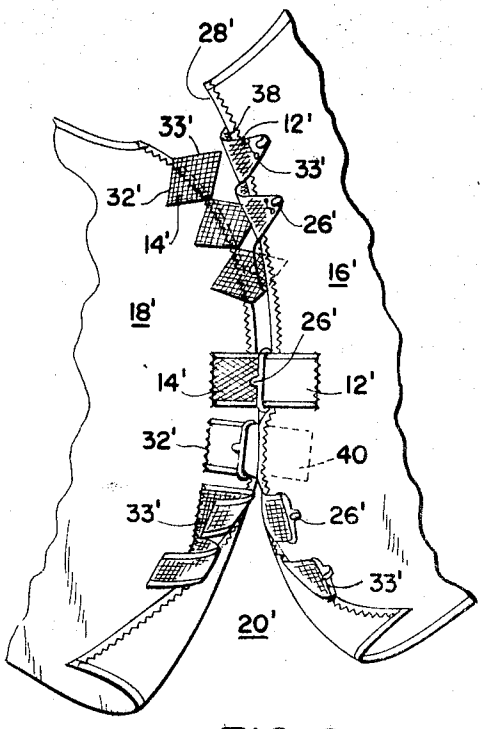


FIG. 2

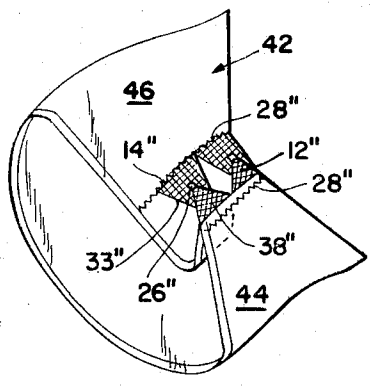


FIG. 3

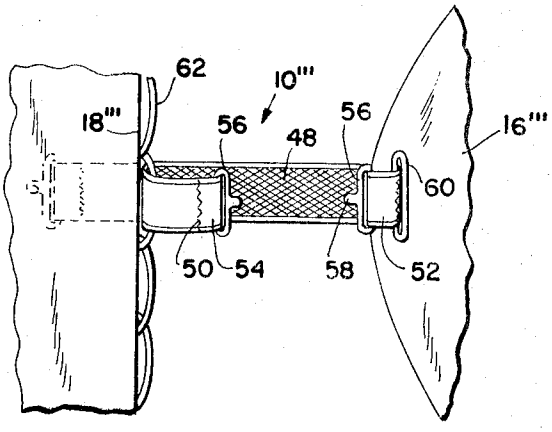


FIG. 4

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FASTENER STRUCTURE

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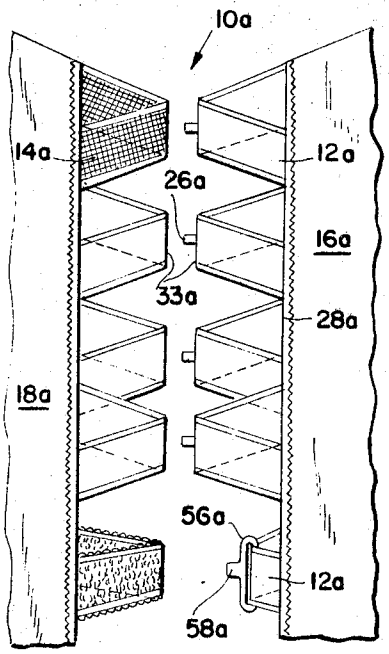


FIG. 5

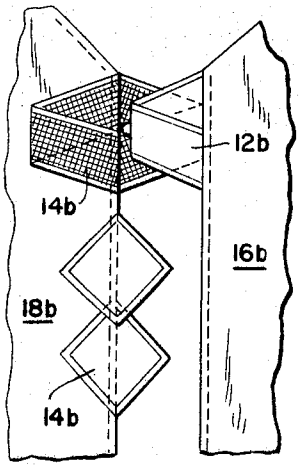


FIG. 6

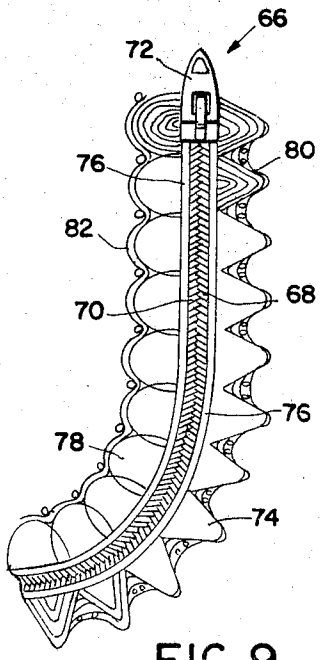


FIG. 9

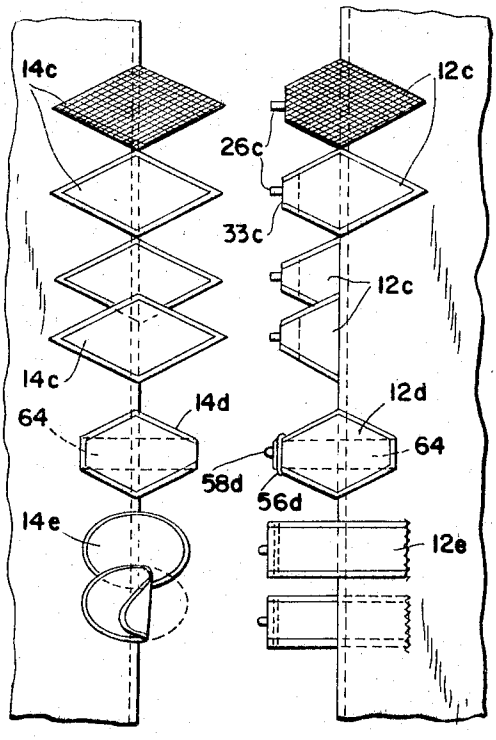


FIG. 7

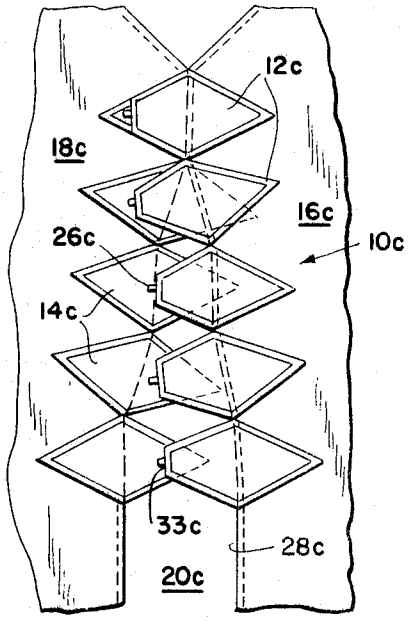


FIG. 8

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FASTENER STRUCTURE

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U.S. Cl. 24—203 8 Claims

ABSTRACT OF THE DISCLOSURE

The present invention pertains to fastener structure fabricated of a wrought or worked material, such as meshed, knitted, or irregularly spaced perforated material, that is capable of an unusual degree of articulation, arbitrary adjustment, pliability, and contour confirmation, which yet is strong, enables easy and ready adjustment, and variation of the tension applied a given surface, line, placket, or opening of an item.

STATEMENT OF THE PROBLEM

There is presently an increasing trend towards the use of unusually sheer apparel, control garments, bandages, and the like. Accordingly, there is an increasing need for fastener structure that is equally sheer, and is extremely flexible and adjustable. An example of such fastener structure might be tapes.

Fastener and tape structures as presently available are, in general, somewhat limited. This is particularly true with respect to the problems of spacing, adjustment, and rigidity. For example, presently existing flexible tapes and bands are limited to being utilized along a substantially straight or linear zone, or along a line that is capable of only a slight degree of curvature. This is true even though the presently available fastener structure may be fabricated of bias material. In addition, such fastener structure becomes puckered along an inner radius of curvature, or creates too great a tension, or curling, along an outer radius of curvature unless they are preshaped.

It has been found that many wrought or worked materials are capable of an unusual degree of articulation, arbitrary adjustment, pliability, contour conformation and strength, while yet enabling the tension applied along a given surface, line, placket, or opening of an item to be adjusted and varied. It has also been found that these materials will form an articulated tape that is capable of easily and readily assuming a linear, curvilinear or sinuous contour or configuration, as for example, the contour or configuration that might be assumed by a tape assembly comprising a zipper-type fastener structure. Generally, these wrought or worked materials are meshed, knitted, or comprise the regularly or haphazardly spaced perforations.

OBJECTS OF THE INVENTION

Having in mind the foregoing, it will be understood that a primary object of the present invention is to provide fastener and tape structure capable of an unusual degree of articulation, arbitrary adjustment, pliability, and contour conformation, while yet being strong, and capable of varying or adjusting the tension applied along a given surface, line placket, or opening of an item.

Another primary object of this invention, in addition to the foregoing objects, is to provide a structure that will form an articulated tape capable of easily and readily assuming a linear, curvilinear or sinuous contour or configuration.

Yet another primary object of the present invention, in addition to each of the foregoing objects, is to provide fastener structure fabricated of a wrought or worked material, such as a meshed, knitted, or irregularly spaced perforated material, capable of an unusual degree of articulation, arbitrary adjustment, pliability, and contour conformation, while yet being strong, and enabling easy and ready adjustment or variation of the tension applied along a given surface, line, placket, or opening of an item.

A still further object of this invention, in addition to each of the foregoing objects, is to provide fastener structure fabricated of a wrought or worked material, such as a meshed, knitted, or irregularly spaced perforated material, that is capable of easily and readily assuming a linear, curvilinear or sinuous contour or configuration.

A still further primary object of this invention, in addition to each of the foregoing objects, is to provide fastener structure fabricated of a wrought or worked material, such as a meshed, knitted, or irregularly spaced perforated material, comprising one or a combination of segmented geometrical plane shapes arranged in isolated, touching or overlapping alignment, such segments having at least one free edge.

The invention resides in the combination, construction, arrangement and disposition of the various component parts or elements incorporated in an improved fastener structure constructed in accordance herewith. The present invention will best be understood, and objects and important features other than those specifically enumerated above, will become apparent when consideration is given to the following detailed description which, when taken in conjunction with the annexed drawing, describes, discloses, shows and illustrates referred embodiments of the present invention and what is presently considered to be the best mode of practicing the principles thereof. Other embodiments or modifications may be suggested to those having the benefit of the teachings herein, and such other embodiments or modifications are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

DESCRIPTION

In the drawings:

FIG. 1 is a schismatic view of one form of fastener structure constructed in accordance herewith, illustrating an exemplary application thereof;

FIG. 2 is a schismatic view of additional forms of fastener structure, also illustrating exemplary application thereof;

FIG. 3 is an isometric view illustrating another application of one of the forms of fastener structure shown in FIG. 2;

FIG. 4 is a schismatic representation of still another form of fastener structure, and an exemplary application thereof;

FIGS. 5–8 are schismatic representations of still further forms of fastener structure constructed in accordance with the present invention; and

FIG. 9 is a partial elevational view of a tape structure of the present invention comprising sliding interlocking elements of the zipper type.

With reference now to the drawings, and particularly to FIG. 1 thereof, there is illustrated therein fastener or tape structure **10** constructed in accordance herewith. The fastener structure comprises a plurality of male segments **12**, and a plurality of female segments **14**. The fastener structure **10** is particularly adapted to adjustably fasten together opposing portions **16** and **18**. These portions may be considered as representing any article or device that desirably should comprise structure enabling its size or fit relative to a form to be varied or adjusted. For example only, and not by way of limitation, the portions **16** and **18** may be considered representative of an article of wearing apparel, such as a skirt, pair of slacks, and the like. The portions, since they are con-

nectable with respect to one another, define a separation, opening or placket **20** therebetween. The article of which the portions **16** and **18** are representative may be fabricated of any suitable material, and for example, may be fabricated of the sheerest materials of lightest weight. The exemplary article of which the portions **16** and **18** are representative, namely, a skirt, pair of slacks, and the like, is desirably adjustable with respect to the torso (male or female) through the medium of the fastener structure **10**.

To this end, the male and female segments **12** and **14**, respectively, of the fastener structure are connected to the portions **16** and **18**. This may be accomplished in any suitable manner, as through the medium of stitching **22**. The segments preferably are of planar configuration, and assume some definitive geometric contour or shape. For example, and not by way of limitation, the male and female segments **12** and **14** in FIG. 1 are of oval or elliptical configuration. They may be fabricated of any suitable wrought or worked material that inherently presents a very substantial number of irregularly or haphazardly spaced perforations, which are not designated by a reference character in the drawings because of their quantity. For example, the material may be of a meshed or knitted construction. The material may also be of a lace construction, as designated in FIG. 1 by the reference character **24**. The male segments **12** comprise fastening elements **26** which may, for example only, and not by way of limitation, comprise conventional hooks **26** that may be connected to the male elements in a suitable manner.

It will now be understood that the male segments **12** may be removably and selectively positioned or connected to the female segments **14** by simply bringing the opposing portions **16** and **18** together, and inserting the hooks **26** into any desired one of the numerous perforations presented by the female segments. The position of the male segments **12** relative to the female segments **14** is therefore capable of a great degree of adjustment. Similarly, the fit and size of the article of which the opposing portions **16** and **18** are representative will also be capable of a great degree of adjustment relative to the torso upon which it is adapted to be disposed. To enhance the adjustability of the fastener structure **10**, and the article utilizing this structure, the male and female segments **12** and **14** may be fabricated of a material that is distensible or stretchable. Of course, if desired, the material from which these segments are fabricated may be substantially rigid, that is, non-distensible or non-stretchable, or a combination thereof.

As pointed out above, it is desirable that the fastener structure **10** be capable of a great degree of adjustment at least with respect to the plane or surface in or along which portions are disposed or extend. It is equally as desirable that the fastener structure be capable of an unusual or extreme degree of articulation, namely, that the fastener structure be arbitrarily pliable and capable of conforming with any contour or configuration, whether it be linear, curvilinear or sinuous. To this end, and in addition to being fabricated of some definitive geometrical configuration, the male and female segments **12** and **14** may be connected to the opposing portions **16** and **18** so that each segment has one edge connected to the opposing portions, and another edge that is free or unencumbered with respect thereto. For example, and as shown in the upper portion of FIG. 1 the edge **28** of the portion **16** is contoured to conform with one edge **30** of each of the male segments **12** along which the latter are connected to the former. This is, of course, equally true of the female segments **14**. Accordingly, the male and female segments also define a free and unencumbered edge **33**. It is not necessary, however, that the edge **28** of the portions **16** and **18** be contoured to conform with the configuration of the segments **12** and **14**. Thus, as illustrated in the lower portion of FIG. 1, the

edge **28** is of a regular, as opposed to an irregular, curvilinear configuration. In this instance, the male and female segments are connected to the opposing portions **16** and **18**, respectively, along the edges **32**, so that a portion of the segments are disposed in overlapping relationship with the portions **16** and **18** along their edges **28**. The segments still define their free edge **33**. It is also possible to construct the fastener structure **10** of male and female segments **34** and **36**, respectively, which are simply in effect one-half of the ovals or ellipsis shown in the remainder of FIG. 1.

To further enhance the ability of the fastener structure **10** to be capable of an unusual degree of articulation, the male and female segments preferably are arranged in isolated, overlapping or touching alignment with one another. Thus, as clearly shown in the lower portion of FIG. 1, the male and female segments **34** and **36** are isolated, that is, they do not touch or contact one another at any point along their peripheries. As shown in the upper portion of this figure, the male and female segments **12** and **14** are disposed in touching relationship with respect to one another along their peripheries at the minor axes thereof which, in that portion of the figure, corresponds generally with the edge **28** of the portions **16** and **18**. The male and female segments may also be disposed in overlapping relationship with respect to one another, as clearly illustrated in the remainder of this figure.

With reference now to FIG. 2, wherein like reference characters indicate like parts, but wherein the reference characters are primed, the male and female segments **12'** and **14'** of the fastener structure **10'** are of substantially diamond-shape configuration. The female segments **14'** are connected to the opposing portion **18'** along their fastened edge **32'**. The male segments **12'** comprise, in effect, one-half of the female segments and are connected along the edge **28'** of the opposing portion **16'** along their connected edge **38**. Though illustrated in touching relationship, as hereinbefore defined, the male and female segments may also be connected to the opposing portions **16'** and **18'**, respectively, in the aforementioned overlapping or isolated relationship. It is to be understood that the male segments, as illustrated in this figure, may also be denoted as of triangular configuration connected to the opposing portion **16'** along the edge or base **38**.

As also illustrated in this figure, the male and female segments **12'** and **14'** may be of substantially rectangular configuration, as clearly illustrated in the bottom portion thereof. Again, the segments may be disposed in an overlapping or isolated relationship, as defined hereinbefore, though they are illustrated therein as being disposed in an isolated relationship. Moreover, the male or female segments may be connected to the opposing portions **16'** or **18'**, respectively, in underlying relationship, rather than overlying relationship, as indicated in this figure in an exemplary manner by the male segment **40**. The opposing portions **16'** and **18'** may be considered representative of an article having the opening or placket **20'** extending completely along the length thereof, such as a Corselette or other similar foundation garment. Of course, these opposing portions may be considered representative of any article that desirably is adjustable relative to a form.

With particular reference now to FIG. 3, wherein like reference characters indicate like parts, but wherein the reference characters are primed twice over, the fastener structure **10''** is illustrated as being applied to a surgical bandage **42**, or the like. The bandage comprises opposing portions **44** and **46**. The female segments **14''**, as well as the male segments **12''** are of generally triangular configuration. Again, the male and female segments may be disposed in overlapping or isolated relationship, though illustrated in this figure in touching relationship.

With reference now to FIG. 4, wherein like reference characters indicate like parts, but wherein the reference characters are primed thrice over, the fastener structure **10'''** comprises a band or strip **48** which is adapted to

perform the functions of the male and female segments hereinbefore described, and, like them, is fabricated of a material that inherently provides an unusually large quantity or number of irregularly or haphazardly spaced perforations. The band or strip **48** is turned upon and connected to itself at each end thereof in any suitable manner, as by stitching **50**, to present loops **52** and **54**. Before actually constructing the loops **52** and **54**, each end of the band or strip **48** is inserted through the loop **56** of each fastening element **58**, which may be a hook, or the like, adapted to and capable of being selectively and removably inserted within the many apertures of the band.

Since each end of the band or strip **48** comprises a fastening element, it will now be understood that the fastener structure **10'''** can be adjusted with respect to itself at either end thereof. This type of fastening structure is therefore particularly adapted to be operatively associated with the opposing portions **16'''** and **18'''** of an article such as a belt, a surgical bandage, a knapsack, and the like. In the exemplary form illustrated, the opposing portion **16'''** comprises an eye or a buttonhole **60** adjustably connected with one end of the band or strip **48** by inserting one end therethrough and adjustably connecting it to itself through the medium of hook **58** at that end. Additionally, the opposing portion **18'''** in the exemplary form illustrated comprises loops **62** through which the other end of the band or strip is inserted and adjustably connected to itself in a similar manner. Accordingly, either end of the band, or both ends, can be utilized to pull or draw the opposing portions **16'''** and **18'''** towards one another. Though only one fastener structure or assembly **10'''** is illustrated, it will also be understood that any number may be utilized.

With particular reference now to FIG. 5, wherein like reference characters indicate like parts, but wherein the suffix "*a*" is added, the fastener structure or assembly **10***a* will be seen to comprise male segments **12***a* and female segments **14***a* that are turned upon themselves and connected to the opposing portions **16***a* and **18***a* to present a zig-zag configuration or arrangement. In the upper portion of this figure, the male and female segments are shown as being disposed in a touching relationship, while in the middle portion of the figure, they are shown as being disposed in an overlapping relationship with respect to one another In the lower portion of the figure, the male and female segments are shown as disposed in an isolated relationship with respect to one another, the male segment **12***a* comprising a fastening element or hook **58***a* which is operatively associated with the male segment through the medium of the loop **56***a*.

In FIG. 6, wherein the suffix "*b*" is added to the reference characters utilized therein, the male segment **14***b* is illustrated as assuming a configuration substantially similar to that of a cube. The male segment **12***b* is substantially the same as the male segments **12***a* illustrated in FIG. 5. It will now be understood that a combination of male and female segments that are of differing but definitive geometrical configuration can be used. In the lower portion of this figure, the female segment **14***b* is illustrated as assuming the configuration or shape of a square.

In FIG. 7, wherein the suffix "*c*" is added to the reference characters utilized therein, the male and female segments **12***c* and **14***c* are shown as assuming a substantially diamond-shaped configuration. In the upper portion of the figure, the male and female segments are illustrated as being disposed in touching relationship with respect to one another, while in the medial portion of the figure, they are shown as disposed in an overlapping relationship. In addition, the male segments **12***c* in the medial portion of this figure are shown as comprising, in effect, substantiantially one-half of their companion female segments. The male segments are truncated along their free edge **33***c* to facilitate connecting the fastening elements or hooks **26***c* thereto.

In the lower portion of FIG. 7, wherein the suffix "*d*" and the suffix "*e*" are added to the reference characters utilized therein, the male segments and female segments **12***d* and **14***d* assume a substantially truncated configuration. The male and female segments comprise reinforcing strips **64** which may be connected thereto in any suitable manner. The reinforcing strips may be fabricated of any suitable material, and may also be disposed in overlying relationship with respect to the male and female segments, though illustrated as being disposed in underlying relationship relative thereto. The male segment **12***d* is illustrated as utilizing the fastening element or hook **58***d*, in lieu of the fastening element or hook **26***c*, for example.

The male segments **12***e* shown in this figure are illustrated as assuming a generally rectangular configuration, while the female segments **14***e* are shown as assuming an oval or elliptical configuration. It will therefore again be understood that any combination of definitive geometrical contours or configurations may be utilized in the same fastener structure or assembly. In fact, it is conceivable that a fastener structure or assembly might comprise all of the male segments and female segments illustrated in FIG. 7. Additionally, some of the segments may be disposed in touching relationship, some may be disposed in an overlapping relationship, and others may be disposed in an isolated relationship with respect to one another, as illustrated therein.

Accordingly, it will now be understood that fastener structure constructed in accordance herewith in addition to presenting the characteristic of an unusual degree of adjustability, presents the characteristics of an equal degree of articulation. That is, such fastener structure or assemblies are capable of readily and smoothly conforming to any contour or configuration, whether it be linear, curvilinear or sinuous. In addition, such fastener structure is capable of manufacture at minimal cost, will meet a great variety of needs, and can be produced under existing facilities, for example, for weaving, knitting, felting or matting, screening, dye-cutting, edge embroidering, edge-fusing, and the like. This is true, since, as pointed out above, fastener structure constructed in accordance herewith preferably is fabricated of a wrought or worked material, such as one that is meshed or knitted, that inherently provides a great number of irregularly or haphazardly spaced perforations. The adjustability and flexibility is achieved by fabricating the male and female segments of planar configuration. In addition, the segments take the form of some definitive geometric shape, such as any one of those hereinbefore described. Still further, the segments are disposed either in a touching, overlapping or isolated relationship, or any combination thereof, said segments having at least one free or unencumbered edge. The achieved results of an unusual degree of flexibility and adjustability are clearly illustrated in FIG. 8, wherein the male segments **12***c* and the female segments **14***c* are illustrated as adjustably fastening together the opposing portions **16***c* and **18***c* that define the placket or opening **20***c* defined therebetween. The user or wearer can adjust the tension along the plane in which the opposing portions **16***c* and **18***c* lie by simply positioning the fastener elements **26***c* in any of the perforations defined by the female segments **14***c*. The fastener structure or assembly **10***c* will assume the contour necessitated by the applied tension easily and readily.

The ability of fastener or tape structure of the present invention to conform to any contour or configuration, whether it be linear, curvilinear or sinuous, is of particular importance when the structure comprises sliding type fastening elements of the zipper-type, such as illusrtated in FIG. 9. The fastener structure **66** comprises opposed fastening elements **68** and **70** that are conventionally defined by interlocking jaws generally fabricated of metal or plastic. A slide member **72** closes or opens the zipper. The fastening element **68** is connected to the segments **74** by

interweaving or clipping onto the straight edge of the tape **76**, for example, and the fastening element **70** connected to the segments **78** in a similar manner. Since the fastener elements **68** and **70** are interlocking relative to one another, the segments **74** may be considered as male segments, and the segments **78** considered as female segments, though on a single slide type fastener they would be alike. The male segments **74** have a free edge **80**, and the female segments **78** have a free edge **82**. The fastener structure or assembly **66** may now be connected to the opposing portions (not shown) of a garment, for example (also not shown), defining a placket or opening (also not shown) therebetween. The location at which the fastener structure is connected to the opposing portions corresponding generally with the lines of stitching **76**. In actual practice, the fastener structure is connected to the opposing portions approximately one-eighth of an inch away from the segments **68** and **70**. The fastener structure can now be used in a manner that is usual for this type of assembly, except that the structure **66** will readily and easily conform with or assume any contour, even if it be curvilinear or sinuous, rather than being limited to a straight line. Again, that is particularly true since the male and female segments **74** and **78** are of planar configuration, and take a definitive geometrical shape. In addition, they can overlap one another, as clearly illustrated in the lower portion of FIG. 9. If desired, the free edges **80** and **82** of the male and female segments **74** and **78** can be connected to the opposing portions (not shown) along a predetermined contour; thereby stabilizing the contour.

The segmented planar male and female segments may take any definitive geometrical shape, such as bands, rectangles, squares, diamonds, cubes, triangles, circles, ellipses, ovals, cones, and may define any arrangement, such as zig-zag, serpentine or flat spiral. The complemental fastening elements, such as the elements **26**, may be hooks, clasps, buttons, ties, knobs, balls, rings, toggles, or loops.

While the invention has been shown, illustrated, described and disclosed in terms of embodiments or modifications that it has assumed in practice, the scope of the invention should not be deemed limited by the precise embodiments or modifications herein shown, illustrated, described or disclosed, since other embodiments or modifications intended to be reserved especially as they fall within the scope of the invention.

What is claimed is:

1. Fastener structure for releasably, adjustably joining mating, opposed edges, as for closing an opening of a garment comprising, in combination, a first series and a second series of independent, separate fastener segments extending along each of said opposed edges, respectively; each segment comprising a fabric panel having a width substantially less than the length of the respective opposed edges and disposed therealong so that a substantial number of the segments are required to encompass the dimensional extent thereof, each of said fabric panels comprising a base secured adjacent the respective one of said opposed edges and a free end portion extending generally laterally outwardly past the respective one of said edges towards the other one of said edges in general alignment with an opposing segment of the other of said series to define therewith a substantial plurality of mating pairs of segments extending along and between said opposed edges; wherein at least one segment of each mating pair is of generally perforate construction to define a large plurality of generally non-directionally oriented engageable openings; the fastener structure further comprising means carried by the free end portion of at least the other segment of each mating pair for releasably, selectively engaging said one segment of said pair in substantially any of said openings and in substantially any relative position and angular orientation substantially independently of the relative positions and angular orientations of the adjacent segment pairs so that the edge portions may be readily, easily, releasably, pliably and adjustably joined along a substantial range of arbitrary and adjustable contours, conformations, tensions and articulations.

2. Fastener structure as defined in claim **1**, wherein adjacent mating pairs of said segments are disposed in spaced apart relationship with respect to one another so that a minimum degree of restraint against relative movement of the edge portions connected thereby and a minimum tensioning therebetween may be provided at that portion of the fastener.

3. Fastener structure as defined in claim **1**, wherein adjacent mating pairs of said segments are disposed in close relationship with respect to one another so that a moderate degree of restraint against relative movement of the edge portions connected thereby and a moderate tensioning therebetween may be provided at that portion of the fastener.

4. Fastener structure as defined in claim **1**, wherein adjacent mating pairs of said segments are disposed in overlapping relationship with respect to one another so that a maximum degree of tensioning therebetween may be provided at that portion of the fastener.

5. Fastener structure as defined in claim **1**, wherein some adjacent mating pairs of said segments are disposed in close relationship with respect to one another, some adjacent mating pairs of said segments are disposed in spaced apart relationship with respect to one another, and some adjacent mating pairs of said segments are disposed in overlapping relationship with respect to one another so that differing degrees of restraint against relative movement of the differing regions of the edge portions connected thereby and differing tensions therebetween may be provided.

6. Fastener structure defined in claim **1** wherein at least one of said segments is fabricated of a material that exhibits substantial deformation under tension so that the assembled fastener presents a maximum pliability between the joined opposed edges at that region.

7. Fastener structure defined in claim **1** wherein at least one pair of said segments are fabricated of a substantially rigid material which exhibits substantial resistance to deformation under tension so that the assembled fastener presents a minimum pliability between the joined opposed edges at that region.

8. Fastener structure defined in claim **1** wherein at least one pair of said segments are fabricated of a material that exhibits substantial deformation under tension and at least another pair of said segments are fabricated of a material that exhibits substantial resistance to deformation under tension so that differing regions of the adjoining connected edges may react differently and controllably to articulation.

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