June 26, 1951

B. MADSEN

2,558,367

SEPARABLE FASTENER

Filed Dec. 14, 1949

FIG. 1.

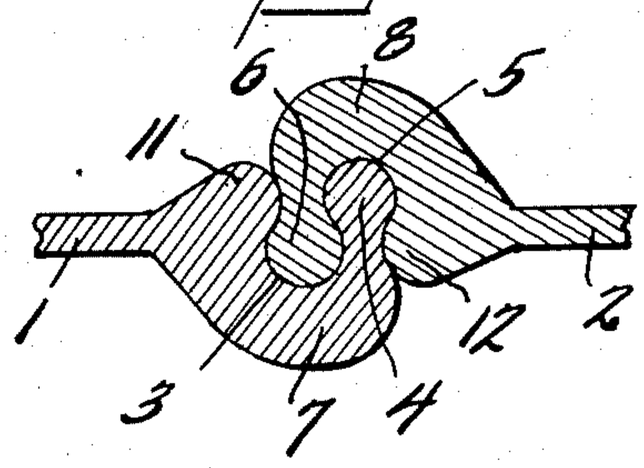


FIG. 2.

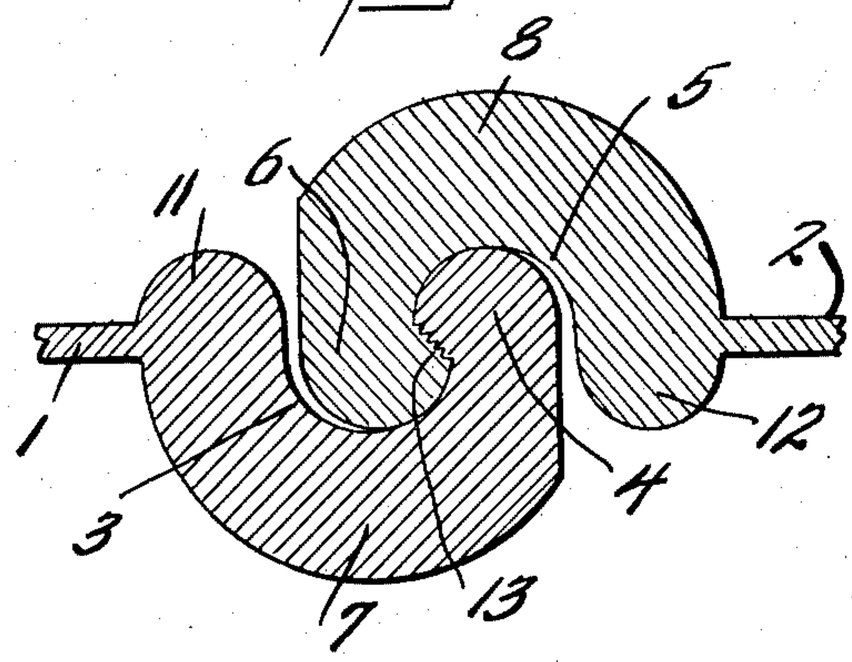
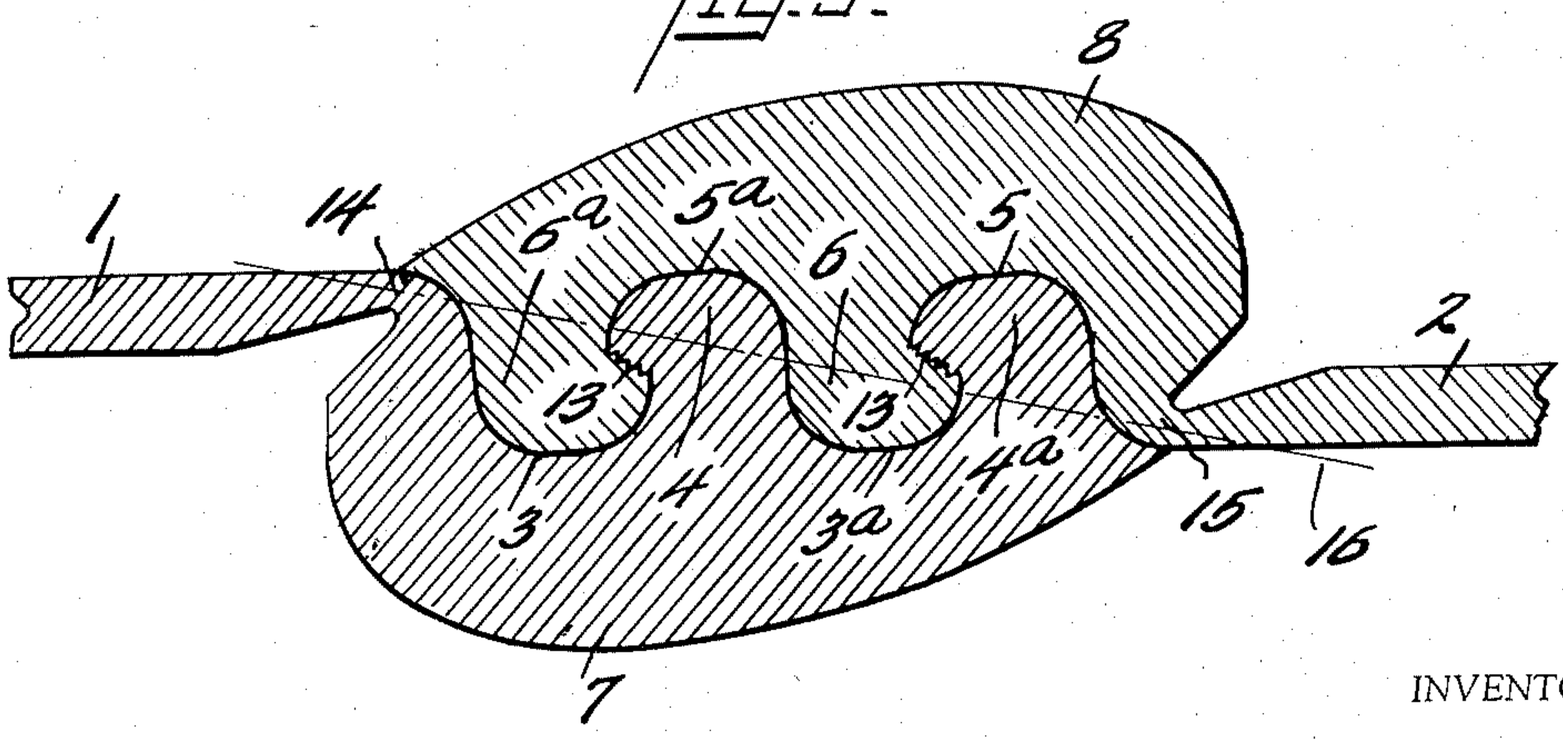


FIG. 3.



INVENTOR

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BY

ATTORNEY

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UNITED STATES PATENT OFFICE

2,558,367

SEPARABLE FASTENER

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Application December 14, 1949, Serial No. 132,891
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8 Claims. (Cl. 24—201)

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This invention relates to fasteners for garments, or the like, for joining two pieces of garment along their adjacent edges.

It has previously been proposed to provide fasteners of this kind by means of a pair of continuous strips of elastic or flexible material adapted to be made in a continuous operation. Fasteners of this kind comprise one part which is provided with a rim or projection along the edge adjacent the other part and a second part which is provided with a groove or slot corresponding to the said projection in the first-mentioned part.

All attempts to make a reliable and efficient fastener of this kind have so far failed owing to the fact that the two parts have a tendency to become disengaged when subjected to a pull tending to separate the two parts of the garment to which the fastener is attached.

It is an object of the present invention to provide an improved fastener having two continuous inter-engageable strips, whereby a firm grip is obtained so that the two strips are held tightly together.

It is another object of the present invention to increase the flexibility of the two strips constituting the fastener, so as to permit bending of the fastener in a lengthwise direction without risking disengagement of the two components.

The present invention comprises in combination two flat strips consisting of resilient material and having overlapping edge portions, and a groove and a ridge arranged in each of the edge portions of the strips substantially at right angles to the planes of the strips, respectively, the groove in one of the strips corresponding in shape to the ridge in the other of the strips and vice versa, whereby the strips can be fastened to, or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of the strips.

In an embodiment of the present invention each of the overlapping edge portions has a substantially S-shaped cross section having the axes of its bends substantially at right angles to the planes of said strips.

In a preferred embodiment of this invention means for increasing the friction between the edge portions are provided. These means include preferably a plurality of small grooves arranged in each of the edge portions in the longitudinal direction thereof, the grooves in one of the edge portions being adapted to engage the grooves in the other of the edge portions, the small grooves allowing small displacements of the strips in the

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longitudinal direction thereof when the strips are fastened to each other.

Preferably the edge portions are designed as reinforcements having substantially S-shaped cross sections.

According to a preferred embodiment of the present invention each edge portion is provided with two ridges and two grooves substantially at right angles to the planes of strips, respectively, the grooves in one of the strips corresponding in shape to the ridges in the other of the strips and vice versa.

Preferably the reinforcements of the edge portions carrying the grooves and ridges form, when engaged with each other, a body having an elongated preferably an elliptical cross section, the planes of the strips being displaced in relation to each other. Preferably indentations are provided in the strips separating the bulk of the strips from the reinforcements.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a cross section of a fastener according to an embodiment of my invention;

Fig. 2 is a cross section of a fastener according to a second embodiment; and

Fig. 3 is a cross section of a fastener according to a third embodiment.

Referring to the drawings, 1 and 2 are the two components of the fastener adapted to be engaged. Each of these components comprises, according to the invention, a ridge and a groove, the groove in the component 1 being designated by 3, and the ridge in this component by 4. The ridge on component 2 is designated by 6, and the groove therein by 5. Both components are made of a strip or band of a flexible or elastic material such as, for example, a thermo-plastic or a thermosetting material, e. g. a polyvinyl-chloride or poly-ethylene.

In the embodiments illustrated in Figs. 1 and 2, the profiles of the two strips 1 and 2 are identical, and these strips may consequently be extruded by means of one tool, having a cross section corresponding to parts 4, 3, 7, 11 of strip 1 and 5, 6, 8, 12 of strip 2, respectively. Each of the strips is in the form of a clamp having two jaws, one

of which is the ridge 4 or 6, the other jaw being the projection or rim 11 or 12.

It will be observed that in the closed position of the fastener illustrated in Fig. 1, the distance between the two jaws is somewhat smaller than the maximum width of the corresponding ridges 4, 6 and grooves 3, 5, thereby insuring a firm grip which tends to hold the two strips closely together. The fastening effect of the strips 1, 2 illustrated in Fig. 1 depends chiefly on the stiffness of the two ridges 4 and 6, and on the friction between the adjacent surfaces thereof.

The friction may be increased by providing friction means on the said surfaces, illustrated at 13 in the embodiment shown in Fig. 2. As shown in Fig. 2, the groves 3 and 5 are somewhat wider than the corresponding ridges 6 and 4, which provides for a displacement in a lengthwise direction, when the garment to which the fastener is attached is bent thereby preventing the two strips from being disengaged from one another when exposed to such bending.

In the embodiment illustrated in Fig. 3, each of the two components comprises a flat strip 1 and 2, respectively, of a flexible, resilient thermo-plastic material, such as polyvinyl-chloride or the like, and each strip is provided with a reinforcement 7 and 8, respectively, the cross sections of which are identical in shape, so that only one mould is required for producing the two components 1, 7 and 2, 8, respectively, when extruding the same from a thermo-plastic material of the kind referred to.

Each of the two reinforcements 7 and 8 comprises two continuous grooves 3, 3*a* and 5, 5*a*, respectively, and is further provided with two continuous solid ridges 4, 4*a* and 6, 6*a*, respectively. Friction means, such as small longitudinal grooves 13 are provided between the ridges 4*a* and 6 and between the ridges 4 and 6*a*, respectively. Adjacent each of the reinforcements 7 and 8 the two components are provided with a contraction 14 and 15, formed by indentations in the body constituting the components intermediate the reinforcements 7, 8 and their corresponding strips 1, 2, respectively. The planes of the two strips 1 and 2 are displaced with relation to one another as indicated by the dotted line 16. This provides for a hinge action when a pull tending to separate the two components is exerted on the two strips 1 and 2. Thus, the planes of the two strips, when subjected to a pull, will tend to rotate in such a manner that the two reinforcements will be pressed more firmly together, thereby counteracting any tendency of the ridges to become disengaged from their corresponding grooves. It will be realized that the torque exerted on the two inter-engageable reinforcements, when pulling the strips 1 and 2 away from one another, will depend on the distance between the planes of the two components 1 and 2.

The use of two or more inter-engageable grooves and ridges in each component will provide for a considerable increase of the grip between the two components owing to the fact that the two ridges will cooperate in such a manner that they will offer a considerable resistance against separation of the components. This resistance to separation by a pull in opposite directions along the planes of the strips 1 and 2 is enhanced by the particular shape and arrangement of the ridges and grooves. The head portion of each ridge is enlarged and the neck portion of each ridge is constricted to form an adjacent complementary groove in the same strip as the ridge, the groove therefore having a restricted opening thereinto and an enlarged bottom portion. In Figs. 2 and 3, each ridge is formed with an undercut surface 13 joining the head and neck portions of the ridge and providing an overhanging portion facing in each instace toward the plane portion of the strip 1 or 2 with which the particular ridge is integrally formed. It is these undercut surfaces 13 that are provided with friction means in the form of small longitudinal grooves, or serration, and that serve to resist separation when a pull is applied in opposite directions along the planes of the plane strip portions 1 or 2. As shown in Fig. 3 the undercut surfaces lie between the planes of the strip portions 1 and 2. Also, in each of the embodiments of my invention, a plane joining the planes of the web portions 1 and 2 at their junction with their respective reinforced edge portions passes through each of the inter-engaged ridges so that a pull in opposite directions along the planes of the web portions tends to cause the ridges to interengage more firmly than would be the case if a component of the pulling force acted along the height axes of the ridges, as in the prior art structures. It will also be noted that in each of the embodiments of my invention, the median plane of each web portion 1 or 2 passes through each of the ridges with which such web portion is integrally formed and, in fact, passes through each such ridge outwardly of its most constricted neck portion. Thus, laterally applied forces in the planes of the web portions 1 and 2 acting in opposite directions, pass through the head portions, respectively, formed integrally with said web portions and tend, in conjunction with the undercut surfaces 13, to interengage said head portions all the more firmly. It will further be realized that the elongated shape of the two reinforcements 7 and 8 which when fastened together as shown in the drawing, preferably form an ellipse, will tend to increase the moment of inertia of the body 7, 8 formed by the two reinforcements, whereby the flexibility of the fastener in a lengthwise direction will be substantially increased.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of fasteners differing from the types described above.

While I have illustrated and described the invention as embodied in a fastener comprising flat strips consisting of resilient material, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. A fastener comprising a pair of flexible strips of resilient material, each strip having a plane portion and an integral reinforced edge portion, the edge portions being of corresponding cross-section but reversed when in overlapping relation, each edge portion having a continuous solid

ridge and a continuous groove arranged longitudinally of said edge portion and substantially at right angles to the planes of said plane portions, the head portion of each ridge being enlarged and the neck portion of each ridge being constricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, the groove in one of said strips corresponding in shape to the ridge in the other of said strips and vice versa, the head portion of each of said ridges having an inclined surface providing a portion overhanging the adjacent groove in the same edge portion and the inclined surface of one ridge being in opposed contact with the inclined surface of another ridge when the respective edge portions are inter-engaged, the median plane of each of the plane portions of each strip passing through the head portion of the ridge integral therewith outwardly of its constricted neck portion, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said strips but cannot be readily separated by a pull acting in opposite directions in the planes of said strips.

2. A fastener comprising a pair of flexible strips of resilient material, each strip having a plane portion and a reinforced edge portion, the edge portions being of corresponding cross-section but reversed when in overlapping relation, each edge portion having a continuous solid ridge and a continuous groove arranged longitudinally of said edge portion and substantially at right angles to the planes of said strips, the head portion of each ridge being enlarged and the neck portion of each ridge being constricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, the groove in one of said strips corresponding in shape to the ridge in the other of said strips and vice versa, each ridge on its side toward its plane portion only having a portion overhanging the adjacent groove in the same strip and provided with an undercut surface, the undercut surface of one ridge being in opposed contact with the undercut surface of another ridge when the respective edge portions are interengaged, the median plane of each of the plane portions of each strip passing through the head portion of the ridge integral therewith outwardly of its constricted neck portion, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said strips but cannot be readily separated by a pull acting in opposite directions in the planes of said strips.

3. A fastener comprising, in combination, two strips of resilient material having overlapping edge portions, and a continuous groove and a continuous solid ridge arranged in each of said edge portions of said strips longitudinally thereof and substantially at right angles to the planes of said strips, respectively, said groove in one of said strips corresponding substantially in shape to the ridge in the other of said strips and vice versa, the head portion of each ridge being enlarged and the neck portion of each ridge being constricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, said ridges having inclined surfaces between their head portions and neck portions provided with serrations the serrated surface of one ridge frictionally engaging with

the serrated surface of another ridge when said fastener is closed, the median plane of each of said strips passing through the head portion of the ridge of the corresponding edge portion outwardly of its constricted neck portion, whereby said strips can be fastened to, or separated from, each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said strips but the stiffness of the ridges and the friction between the contacting serrated surfaces of the ridges and grooves being such that said strips cannot readily be separated by a pull in opposite directions in the planes of said strips.

4. A fastener comprising, in combination two flexible strips of resilient material, each having a plane portion and an integral thickened edge portion, the edge portions overlapping when the fastener is closed, and a continuous groove and a continuous solid ridge arranged in each of said edge portions of said strips longitudinally thereof and substantially at right angles to the planes of said plane portions, respectively, the head portion of each ridge being enlarged and the neck portion of each ridge being constricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, said groove in one of said strips corresponding generaly in shape to the ridge in the other of said strips and vice versa, but each groove when the fastener is closed providing a slight lateral clearance between that surface of the groove nearer its plane portion and the surface of the adjacent side of the ridge entering such groove, each ridge on its side toward its plane portion having a portion overhanging the adjacent groove in the same strip and provided with an undercut surface, the undercut surfaces of the ridges being in opposed contact with each other when the fastener is closed, the median plane of each of the plane portions of each strip passing through the head portion of the ridge integral therewith outwardly of its constricted neck portion, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said strips but the stiffness of the ridges and the friction between the contacting undercut surfaces of the ridges being such that said strips cannot readily be separated by a pull in opposite directions in the planes of said strips.

5. A fastener comprising a pair of flexible strips of resilient material, each strip having a plane portion and an offset reinforced edge portion, said reinforced edge portions being of functionally identical cross-section and each having parallel grooves and ridges with a ridge adjacent to and between two grooves and a second ridge along the free edge, the ridges and grooves being arranged longitudinaly of said strips and substantially at right angles to the planes of said plane portions, the head portion of each ridge being enlarged and the neck portion of each ridge being constricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, each of said ridges on the side toward its plane portion only having an undercut surface joining the head and neck portion of the ridge and providing a portion overhanging an adjacent groove in the same strip, pairs of said undercut surfaces being in opposed substantially complete contact when the respective edge portions are inter-engaged and continuations of the planes of said plane portions then lying on opposite sides of said undercut surfaces and including the same therebetween, the median

plane of each of said strip plane portions passing through the head portions of the ridges of the corresponding edge portion outwardly of the constricted neck portions of such ridges, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said plane portions but cannot be readily separated by a pull acting in opposite directions in the planes of said respective plane portions.

6. A fastener comprising flexible strips of resilient material, each strip having a plane portion and a reinforced edge portion, said reinforced edge portions being of corresponding cross-section and each having parallel grooves and solid ridges with a ridge between two grooves and a second ridge along the free edge, the ridges and grooves being arranged substantially at right angles to the planes of said plane portions, the head portion of each ridge being enlarged and the neck portion of each ridge being restricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, the head and neck portions of each ridge being joined by sloping surfaces having serrations, the sloping serrated surfaces of the ridges in one edge portion being in substantially complete contact with the sloping serrated surfaces of the ridges in the other edge portion when the respective edge portions are inter-engaged, the median plane of each of said strip plane portions passing through the head portions of the ridges of the corresponding edge portion outwardly of the constricted neck portions of such ridges, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said plane portions but cannot be readily separated by a pull acting in opposite directions in the planes of said respective plane portions.

7. A fastener comprising a pair of flexible strips of resilient material, each strip having a plane portion and a reinforced edge portion, there being a longitudinally extending indentation between said plane and reinforced edge portion increasing the flexibility therebetween, the edge portions being of corresponding cross-section but reversed when in overlapping relation, each edge portion having a plurality of ridges and grooves arranged substantially at right angles to the planes of said strips, the head portion of each ridge being enlarged and the neck portion of each ridge being constricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, the head portion of each of said ridges having an inclined surface providing a portion overhanging the adjacent groove in the same edge portion and the inclined surface of one ridge being in opposed contact with the inclined surface of another ridge when the respective edge portions are inter-engaged, a plane joining the plane portions of said strips at their junctions with their respective reinforced edge portions when the same are inter-engaged passing through each of the ridges, the median plane of each of said strip plane portions passing through the head portions of the ridges of the corresponding edge portion outwardly of the constricted neck portions of such ridges, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said strips but cannot be readily separated by a pull acting in opposite directions in the planes of said strips.

8. A fastener comprising, in combination, a pair of flexible strips of resilient material, each strip having a plane portion and an integral reinforced edge portion, there being a longitudinally extending indentation between said plane and reinforced edge portion to increase the flexibility therebetween, the edge portions being of identical cross-section but reversed when in overlapping relation, each edge portion having a plurality of ridges and a plurality of grooves arranged substantially longitudinally of said edge portion and substantially at right angles to the planes of said strips, repectively, the head portion of each ridge being enlarged and the neck portion of each ridge being restricted to form an adjacent complementary groove with a restricted opening thereinto and an enlarged bottom portion, each of said ridges being solid and having on the side toward its plane portion only an undercut surface joining the head and neck portion of the ridge and providing a portion overhanging an adjacent groove in the same edge portion, pairs of said undercut surfaces being in opposed contact when the respective edge portions are inter-engaged, the median plane of each of said strip plane portions passing through the head portions of the ridges of the corresponding edge portion outwardly of the constricted neck portions of such ridges, whereby said strips can be fastened to or separated from each other by a pressure or a pull, respectively, acting substantially at right angles to the planes of said plane portions but cannot be readily separated by a pull acting in opposite directions in the planes of said plane portions.

BORGE MADSEN.

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The following references are of record in the file of this patent:

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2,144,755	Freedman	Jan. 24, 1939
2,353,858	Tedesco	July 18, 1944

Certificate of Correction

Patent No. 2,558,367 June 26, 1951

BORGE MADSEN

It is hereby certified that the above numbered patent was erroneously issued to "Flexico (U. S. A.) S. A., of Tangier, North Africa, a corporation of Tangier, assignee by mesne assignments," whereas said patent should have issued to *Flexigrip, Inc., of New York, N. Y., a corporation of New York, assignee by mesne assignments*,; and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of October, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.