June 7, 1960 H. HANSEN 2,939,192

SLIDE FASTENERS

Filed May 10, 1957 4 Sheets-Sheet 1

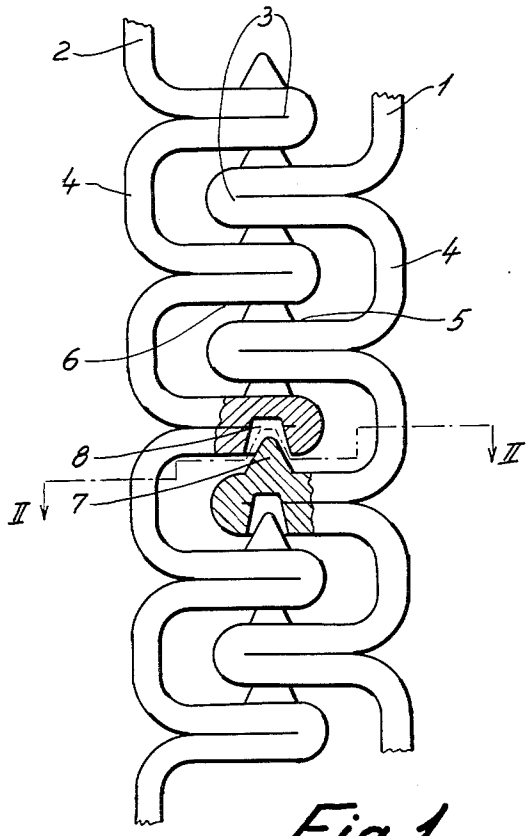

Fig. 1

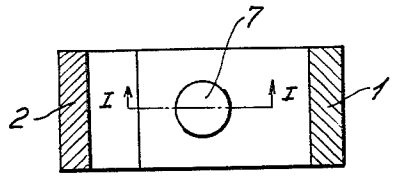

Fig. 2

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SLIDE FASTENERS

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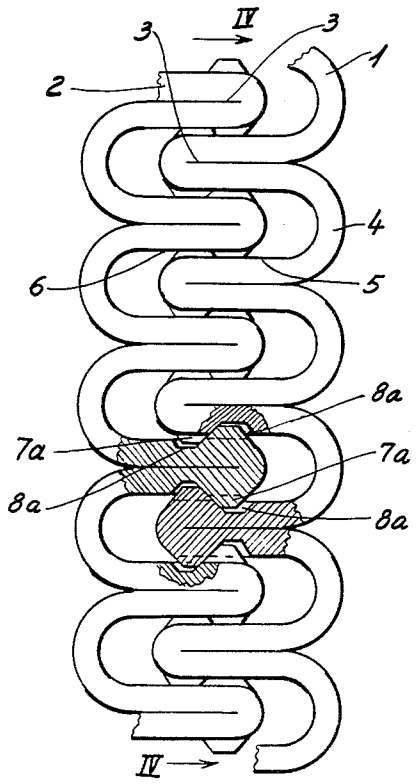

Fig. 3

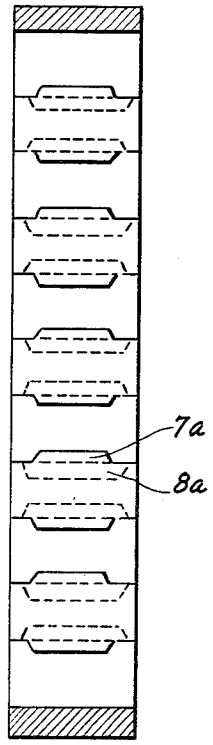

Fig. 4

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SLIDE FASTENERS

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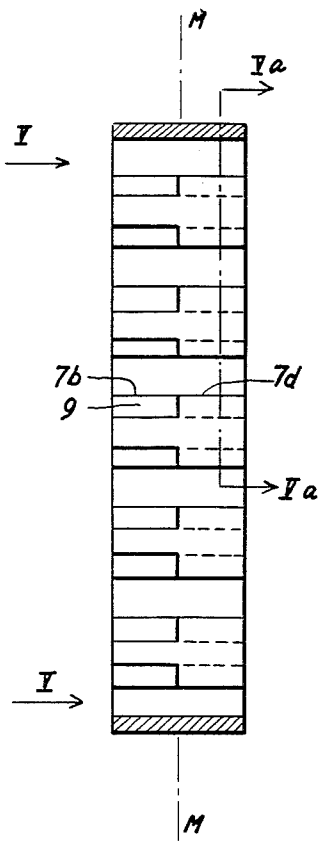

Fig. 6

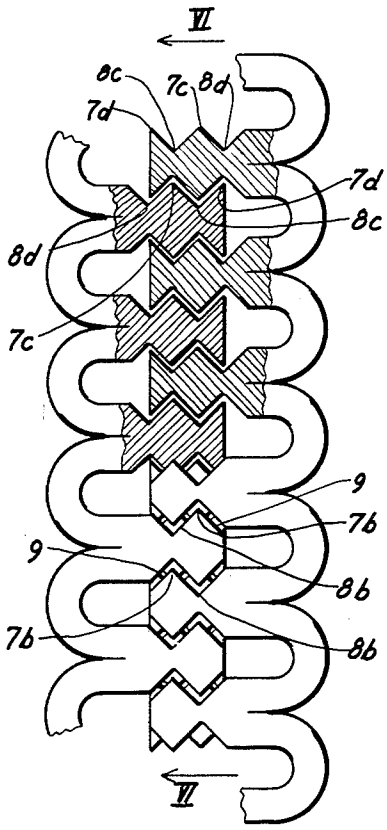

Fig. 5

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SLIDE FASTENERS

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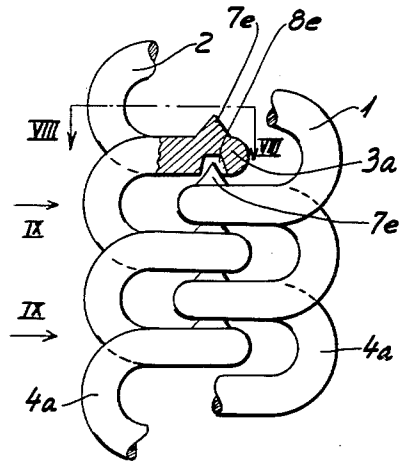

Fig. 7

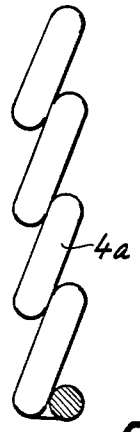

Fig. 9

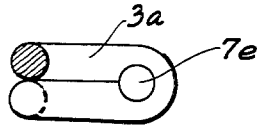

Fig. 8

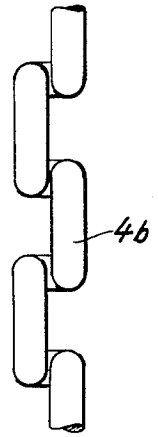

Fig. 10

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2,939,192

SLIDE FASTENERS

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Claims priority, application Denmark May 24, 1956

9 Claims. (Cl. 24—205.13)

This invention relates to a slide fastener of the kind, in which each row of coupling links consists of a continuous filament formed with a series of serpentine bends facing alternately one way and the other. The bends having their closed ends facing the middle of the slide fastener will be referred to in the following as the coupling bends, while the bends facing away from the middle of the slide fastener will be referred to as the connecting bends. In the closed position of the slide fastener the coupling bends of each filament engage between the coupling bends of the other. The term filament, as used in this specification, is intended to include any form of ribbon, strip or similar continuous element capable of being formed with serpentine bends.

Owing to the fact that all the coupling links of each row are produced and attached to the tape as a unit, certain advantages are obtained as compared with slide fasteners with individually attached coupling links, particularly as regards the production, which can be made simpler and less expensive, but advantages are also obtained in use because plastic materials may be used with great advantage for the rows of coupling links, and also because it is easier than with individual coupling links to avoid the occurrence of sharp edges likely to damage fabrics in the vicinity of the slide fastener and to pull such fabrics into the slide fastener.

On the other hand, the known slide fasteners of this type are not entirely satisfactory as regards their resistance to unintentional opening. To prevent the rows of coupling links from being disengaged under the influence of forces in the plane of the slide fastener it has been proposed to construct the coupling bends with undercut shape, and to prevent the rows of coupling links from sliding out of engagement with one another perpendicularly to the plane of the slide fastener it has been proposed to construct the interengaging surfaces of the coupling bends with a slightly curved profile. None of these expedients has proved particularly efficient.

It is the object of the present invention to improve a slide fastener of the above mentioned type, so that it becomes possible, without sacrificing the advantages characteristic of the type, to obtain a considerably greater security against disengagement of the rows of coupling links both in the plane of the slide fastener and perpendicularly thereto.

To obtain this, according to the invention, the serpentine-like filaments are provided on the interengaging flanks of their bends with recesses and noses engaging with one another against displacement both in the plane of the slide fastener and in a plane perpendicular thereto.

By constructing the serpentine-like filaments in this manner a very reliable interlocking is obtained both in the plane of the slide fastener and perpendicularly thereto. This interlocking will on principle be of the same type as with individual coupling links, but may be made still more reliable because the interengaging parts are securely held in position relative to one another and to the tapes since they form parts of continuous filaments,

and may at the same time be constructed with a certain resiliency further contributing towards improvement of the interlocking. Moreover, the rows of coupling links can be constructed entirely without sharp edges so that there is very little danger of fabrics being pulled into the slide fastener when the slide is moved back and forth.

The interlocking by means of recesses and noses may if desired be combined with an undercut shape of the coupling bends, but according to the invention it is preferable to construct the serpentine-like filaments with the flanks of their coupling bends perpendicular to the longitudinal direction of the slide fastener, because a more reliable interengagement of the recesses and the noses is thereby obtained, particularly if the flank portions of each coupling bend are arranged to be closely clamped together, as is also proposed according to the invention.

In one embodiment of the invention, each of the coupling bends may be provided with a single projection on one flank and a recess on the other flank and located directly opposite the projection. With this construction, the interengagement between the rows of coupling links will be very much the same as with the conventional slide fasteners with individual coupling links.

However, with the slide fastener according to the invention there is a greater freedom in selecting the shape of the recesses and the projections than with slide fasteners comprising individual coupling links. Thus, according to one embodiment of the invention, the construction may be such that each of the coupling bends of the serpentines is provided with projections on both sides alternating with recesses in both sides. In this case it will be particularly advantageous to arrange a projection on each flank at the end of each coupling bend followed by a recess in each flank immediately inwardly of said projection.

According to a further embodiment of the invention, each of the coupling bends of the serpentines may be provided with differently located recesses and projections in the halves on either side of a middle plane parallel to the plane of the slide fastener. The projections and recesses may then advantageously be constructed as prisms and extend from the said middle plane to the sides of the filament. In this case, the locking perpendicularly to the plane of the slide fastener is obtained by one projection in one half of one row of coupling links engaging behind a projection in the other half of the other row. In this manner, an excellent locking may be obtained by means of two rows of coupling links which are exactly alike and are relatively simple to produce.

Since, in the slide fastener according to the invention the mutual locking is not effected by the direct engagement between the bends of the serpentines, but between shaped portions thereof, viz recesses and projections, it is not necessary to produce the rows of coupling links in a plane serpentine form, but they may be produced in a serpentine form differing considerably from the plane form. A good construction with suitable resilient properties can be obtained by twisting the coupling bends of the serpentines into a plane perpendicular to the plane of the slide fastener and providing the noses and recesses in the sides of the rounded end portions of said bends.

It will then be necessary to construct the connecting bends of the serpentines in such a manner that they will form links between the coupling bends located in a plane perpendicular to that of the slide fastener. According to the invention, this may be obtained by arranging the connecting bends of the serpentines at an inclination to the longitudinal direction of the slide fastener or, alternatively, these bends may be located alternately in two different planes parallel to the longitudinal direction of the slide fastener.

The invention will now be described in further detail

with reference to the accompanying drawing, in which

Fig. 1 shows one form of the rows of coupling links of a slide fastener according to the invention, as viewed perpendicularly to the plane of the slide fastener and partly in section along the line I—I in Figure 2,

Fig. 2 a cross section through same along the broken line II—II in Figure 1,

Fig. 3 a second form of the rows of coupling links of a slide fastener according to the invention, as viewed perpendicularly to the plane of the slide fastener and partly in section,

Fig. 4 is a side view of one row of coupling links of same, as indicated by the arrows IV—IV in Figure 3,

Fig. 5 a third form of a slide fastener according to the invention, as viewed perpendicularly to the plane of the slide fastener in the direction of the arrows V—V in Figure 6, and partly in section along the line V*a*—V*a* in Figure 6,

Fig. 6 one row of coupling links of same in side view as indicated by the arrows VI—VI in Figure 5,

Fig. 7 a fourth form of a slide fastener according to the invention as viewed perpendicularly to the plane of the slide fastener and partly in section,

Fig. 8 a cross section through one row of coupling links of same along the line VIII—VIII in Figure 7,

Fig. 9 a side view of the same in the direction of the arrows IX—IX in Figure 7, and

Fig. 10 a fifth form of a slide fastener according to the invention, in a view similar to Figure 9.

In Figure 1, **1** and **2** are two strips of rectangular cross section formed with serpentine bends to form the coupling links of a slide fastener. The coupling bends **3** of these serpentine-like strips are flatly compressed, while the connecting bends **4** are relatively open. On the flanks **5** and **6** of the coupling bends **3**, noses **7** and recesses **8** are formed similar to those of conventional slide fasteners comprising individual coupling links. The noses **7** and the recesses **8** on the flanks of the couplings bends of the two serpentine-like strips engage with one another in the closed position of the slide fastener and thereby prevent the latter from sliding out of engagement both in the plane of the slide fastener and perpendicularly thereto.

The embodiment illustrated in Figures 3 and 4 differs from that of Figures 1 and 2 only in that each of the coupling bends **3** of the two serpentine-like strips is provided both with a nose **7***a* and with a recess **8***a* in each of its flanks **5** and **6**. The two noses **7***a* are located opposite one another immediately at the end of the bend, and these are immediately followed by the two recesses **8***a*, which are also located opposite one another. In use the noses **7***a* of one of the serpentines engage with the recesses **8***a* of the other serpentine and thereby behind the noses **7***a* of the last named serpentine, whereby a reliable engagement is obtained with noses and recesses of relatively small height and depth respectively.

In the embodiment illustrated in Figures 5 and 6, each of the serpentines is differently shaped, as regards the location of the noses and the recesses, in the two halves on either side of a middle plane **14**, Figure 6, parallel to the plane of the slide fastener. Considering first the serpentine **2** to the left in Figure 5, it will be seen that this is constructed in its front half, i.e. the half facing the observer, in each flank of each of its bends with a single prismatic recess **8***b*, outside which a nose **7***b* is formed, which however does not extend beyond the flanks of the bend and which outwardly, i.e. at the end of the bend is terminated by an inclined surface **9** corresponding to the shape of the walls of the recess **8***b*. In its rear half, i.e. in the half remote from the observer, each bend is provided in each of its flanks with an outer recess **8***c*, the bottom of which is located in line with the top of the nose **7***b*, and also an inner recess **8***d*, the bottom of which is located in line with the inner edge of the recess **8***b*. Between the recesses **8***c* and **8***d* a nose **7***c* is formed and outside the recess **8***c* a "half" nose **7***d* is formed, which is terminated at an acute angle at the end of the bend.

The serpentine **1** to the right in Figure 5 is constructed in exactly the same manner as the serpentine **2**. The two serpentines are displaced relative to one another in such a manner that their coupling bends are engaged between one another. In this engaging position the nose **7***b* of the front half of the serpentine **1** is received in the recess **8***b* of the front half of the serpentine **2** and vice versa. In the rear half, the noses **7***c* and **7***d* of each of the serpentines are received in the recesses **8***c* and **8***d* of the other serpentine. By these engagements the serpentines are locked against disengagement in the plane of the slide fastener.

Moreover, the noses **7***b* of each of the serpentines engage in front of the noses **7***c* of the other, while conversely the noses **7***d* of each of the serpentines engage behind the zone at the inner side of the recess **8***d* of the other. By these engagements the two serpentines are locked against disengagement perpendicularly to the plane of the slide fastener.

The embodiment illustrated in Figures 7–9 corresponds on principle to that illustrated in Figures 1 and 2, only the coupling bends **3***a* of the serpentine-like strips, which are in this case illustrated as having a circular cross-sectional shape, are twisted into a plane perpendicular to that of the slide fastener instead of being located in that plane as was the case in Figures 1 and 2. The noses **7***e* and the recesses **8***e* are consequently formed in the sides of the rounded end portions of the bends **3***a*. The connecting bends **4***a* of the serpentines may in this case be arranged at an inclination to the longitudinal direction of the slide fastener as illustrated in Figure 9, or alternatively these connecting bends may be arranged alternately in two different planes in the longitudinal direction of the slide fastener, as illustrated in Figure 10, where these bends are indicated by **4***b*.

I claim:

1. A slide fastener having a plurality of rows of coupling links comprising a continuous serpentine filament formed with a series of coupling bends facing one way interconnected by means of connecting bends facing the other way, each of said coupling bends having its shanks extending perpendicularly to the longitudinal direction of the slide fastener and in direct contact with one another over a considerable distance from the tip of the bend and inwards to form a compact element, said connecting bends forming wide, rounded loops merging smoothly into the transverse shanks of said coupling bends, thereby permitting said compact elements of one row to be received between the corresponding elements of the other row in parallel relationship thereto, said elements being provided in their adjacent parallel faces with recesses and noses engaging with one another against displacement both in the plane of the slide fastener and in a plane perpendicular thereto, said filaments having a uniform and solid cross-section in the entire length except the noses and recesses.

2. A slide fastener as in claim 1, in which said recesses and noses comprise a single nose in one face of each coupling bend of each serpentine filament and a recess in the other face located opposite the last-mentioned nose.

3. A slide fastener as in claim 1, in which said recesses and noses comprise a plurality of noses on both faces alternating with a plurality of recesses in both faces of each coupling bend of each serpentine filament.

4. A slide fastener as in claim 1, in which said recesses and noses comprise a nose on each face at the end of each coupling bend followed by a recess in each face immediately inwardly of said last-mentioned nose.

5. A slide fastener as in claim 1, in which said recesses and noses comprise alternately located recesses and noses in halves of the serpentine filaments formed by a middle

plane parallel to the plane of the slide fastener on one and the other side respectively of said plane.

6. A slide fastener as in claim 5, in which said noses and recesses are of prismatic shape and extend from the said middle plane to the sides of the filament.

7. A slide fastener as in claim 1, in which the coupling bends of the serpentines are twisted into a plane perpendicular to that of the slide fastener and said noses and recesses are in the sides of their rounded end portions.

8. A slide fastener as in claim 7, in which the connecting bends of the serpentines are arranged at an inclination to the longitudinal direction of the slide fastener.

9. A slide fastener as in claim 7, in which the connecting bends of the serpentines are arranged alternately in two different planes parallel to the longitudinal direction of the slide fastener.

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