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2,880,488

SLIDE FASTENER

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Fig. 1.

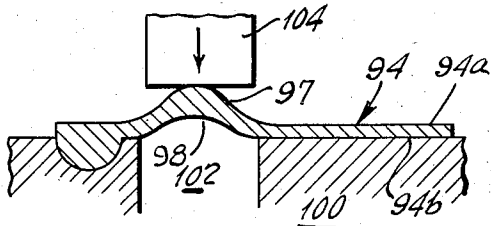


Fig. 2.

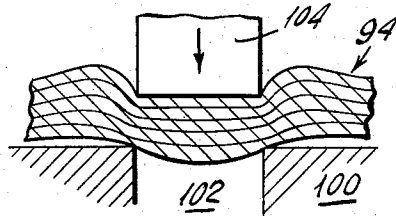


Fig. 4.

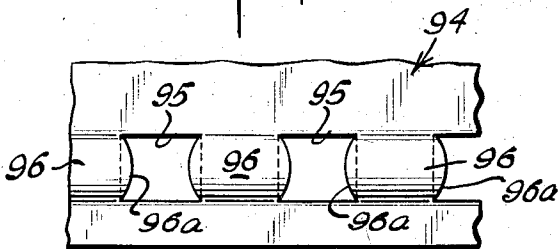


Fig. 3.

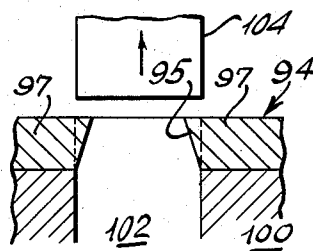


Fig. 5.

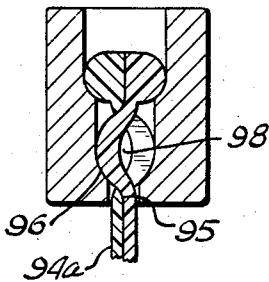
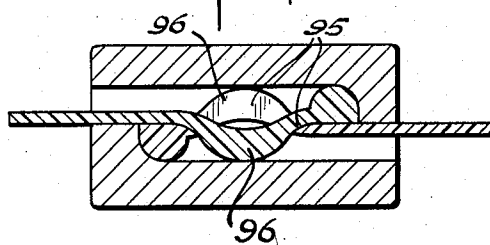


Fig. 6.



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## SLIDE FASTENER

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3 Claims. (Cl. 24—205.12)

This invention relates to slide fasteners, and particularly to slide fasteners of the type which can be stamped or otherwise economically fabricated from plastic or other inexpensive material, and to an improved process for making such fasteners.

In the copending application, Serial No. 772,245, now U. S. Patent No. 2,629,911, there is disclosed a slide fastener construction wherein the mating strips of the slide fastener are formed of relatively thin but stiffly flexible plastic material in which are stamped rows of spaced openings to give the strips a ladder-like construction with transverse rungs which can be interengaged with the rungs of the mating strips to secure the two strips together. Such slide fasteners are susceptible of very economical manufacture.

The present invention contemplates certain advantages over the invention of the prior application. A slide fastener strip embodying the present invention will ordinarily be thicker through the region in which the openings have been stamped than in adjacent regions with the result that the transverse rungs will be heavier and accordingly a stronger connection is possible. As in the prior application, each rung may include a pair of tab-like portions, one at its upper edge and one at its lower, which engage behind corresponding tab-like portions of a mating strip when the two strips are interengaged. With the present invention, however, it is no longer essential that a pair of tabs on each rung shall overlap behind a pair of corresponding tabs of the interengaging strip. The thickened portion in which the spaced openings are stamped gives greater depth to the surfaces which form the top and bottom of each rung, so that the fastener strips may be interengaged with the rungs of one strip lying between, but not necessarily behind, the rungs of the other, i. e., with all rungs in a common plane, with the frictional engagement between the abutting top and bottom surfaces of the adjacent rungs being sufficient to prevent accidental separation of the mating strips.

I contemplate that these strips may advantageously be extruded vinyl resins, vinylidene chloride, nylon, etc., of suitable known characteristics and hence may be slightly resiliently elastic. Accordingly the desired cross section of strip may readily be obtained in the extruding operation and the rungs or blocks between the stamped, spaced openings along the thickened portion in effect may act as slightly resilient, plugs to seal the openings of the mating strip by engagement with all of the side-walls of the openings over substantially this full depth, and form a liquid-tight and gas-tight barrier. Each plug-like rung may be tapered or wedge-shaped, being wider at its outwardly projecting end than at its root so that once the rungs are seated by the slider, they are effectively locked in place to resist separation of the mating strips.

As set forth more fully hereinafter, I have also discovered commercially feasible ways in which the optimum taper of the side walls of the spaced openings may

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be obtained to give the diverging surfaces desired on each plug-like rung.

It is accordingly among the objects of the present invention to provide an improved fastener construction comprising strips which can be fabricated economically, which are easily interengageable by means of a slider, and which have a high resistance to accidental separation of the mating fastener strips.

It is also an object of the invention to provide a simple and economical method of punching tapered openings in a slide fastener strip to give the intermediate rungs wedge-like cross-sectional shapes so that they will interlock with the corresponding elements of a similar mating slide fastener strip.

A further objective resides in the provision of a commercially feasible slide fastener for securing two marginal edge portions together in face-to-face relationship.

A still further objective is to provide a slide fastener in which the plane of bending required for operation of the slider coincides with the plane of maximum flexibility of the fastener strip.

An additional object of the invention is the provision of a simple and economical method of making a ladder-like slide fastener strip having rungs with interengageable double-convex edges.

Another object of the invention is to provide a slider for a slide fastener which can be molded in a simple, two-piece mold having integrally formed mold halves without separate cores, movable pins (other than knock-out pins) or undercut blocks.

A further object is the provision of a simple slide fastener construction which is substantially liquid-tight.

Other objects will be in part apparent and in part pointed out hereinafter.

In the drawings:

Figure 1 is a fragmentary and somewhat diagrammatic sectional view showing the method of making a form of slide fastener strip in accordance with the present invention;

Figures 2 and 3 show successive steps of the method illustrated in Figure 1;

Figure 4 is a top plan view of a fastener strip after the fastener elements have been cut therein by the method shown in Figures 1-3;

Figures 5 and 6 are sectional views showing the interengagement of fastener strips of the type shown in Figure 4;

Figures 1-6 illustrate an alternative form of slide-fastener strip 94 having a generally ladder-like construction (see Figure 4) with a row of equally spaced, generally rectangular openings 95 with transversely extending "rungs" 96 therebetween. As may be seen in Figure 1, the fastener strip has at one of its faces 94a a longitudinal ridge 97 and on its opposite face 94b, in line with the ridge 97, a groove 98. The groove 98 is slightly deeper than the thickness of the laterally adjacent portion of the fastener strip, as indicated in broken lines in Figure 1, so that the bottom of the groove 98 is beyond the plane of the opposite face 94a of the fastener strip. The ridge 97 is slightly higher than the groove 98 is deep so that the material of the strip in the region of the ridge 97 and groove 98 is slightly thicker than the laterally adjacent material, to give this portion of the fastener strip a generally crescent-like or concavo-convex cross-sectional shape.

The longitudinal dimension of the rungs 96 is of the same order as the longitudinal dimension of the openings 95 so that the rungs 96 can enter the openings 95 of the mating fastener strip.

At the outer or convex surface of the fastener strip, the transverse edges 96a (Figure 4) of the rungs are

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curved so as to give the rungs a generally double-convex shape. Thus, when the mating fastener strips are fully engaged as shown in Figures 5 and 6, with the proximate surfaces 94a of the two strips in abutment, the rungs 96 of each strip project through the openings 95 in the mating strip into the groove 98 on the remote face 94b of the mating strip. The convex surfaces of the rungs 96 positively interlock with the material around the openings 95 of the mating strip to give the mating strip a high resistance to accidental separation. The thickness of the rungs 96 and the depth to which they are overlapped with the material of the mating strip contribute to the strength of the assembled fastener.

The concave-edged openings 95 of the strip may be cut with a simple, rectangular punch, according to the method illustrated in Figures 1-3. As shown in Figure 1, the strip is placed on a lower die member 100 having a die opening 102 therein of generally rectangular shape, and a rectangular punch member 104 is moved down through the strip 94 into the die opening 102 to stamp the openings 95 in the strip. The punch 104 and die opening 102 may be mounted on a pair of relatively rotatable perforating wheels or they may be mounted on the ram and table of a conventional punch press, for relative reciprocatory movement, with the material being advanced incrementally between successive strokes of the punch 104 to properly space the perforations 95 along the strip 94.

Where the material of which the strip 94 is formed is resiliently yieldable, the punch 104 will compress the material, as shown in Figure 2 until the shearing strength of the material is exceeded. As the material adjacent the convex surface of the strip is compressed, it will flow laterally, to a slight extent, from under the end of the punch 104.

Thus, when the punch is withdrawn after the opening 95 has been cut in the strip, the material at the upper surface of the strip will tend to flow back into the opening 95, as shown in Figure 3, to give the outer surface of the rungs 96 the concave shape shown in Figure 4. However, due to the fact that this "squeeze-out" effect is greatest near the outer surface of the rungs, the rungs will have a generally wedge-like shape in longitudinal section, as shown in Figure 3. This will enable easy interengagement of the rungs with the elements of the mating fastener strip; but, due to the convex shape of the edges of the rungs, they will be positively interlocked to strongly resist separation of the mating fastener strips.

The sliders illustrated in Figures 5 and 6 are similar to those described hereinabove, in that they can be molded in a simple, two-piece mold having only integral blades for forming of the channels and flanges of the slider. However, the sliders are designed to accommodate crescent-section fastener strips of the type shown in Figures 1-4, rather than the T-section strips shown in the preceding figures. The two figures, 5 and 6, are sections through the narrow or converging end of the sliders and accordingly show the mating fastener strips in full interengagement. The slider of Figure 5 will be recognized as being adapted for use with envelope relation fasteners and that of Figure 6 as being adapted for overlapping relation fasteners.

It will thus be seen that the present invention provides fastener strips which may very economically be fabricated, as by a simple and rapid punching operation, from an integral strip of inexpensive material which may be extruded, molded or formed of material folded back upon itself with or without the inclusion of separate thickening strips. The rungs or blocks in the strips may be formed with wedge-like shapes in longitudinal section

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and/or with convex edges for positive interlocking with the corresponding elements of the mating fastener strip even though rectangular, straight-sided punches are used. It will thus be seen that the aforementioned as well as other desirable objects have been achieved. However, it should be emphasized that the particular embodiments described and shown herein are intended as merely illustrative of the invention and not as restrictive thereof.

I claim:

1. In a slide fastener strip, the combination including: a longitudinal ridge along one face of the strip and along the opposite face a longitudinal groove aligned with said ridge, said strip being thicker in the region of said ridge and said groove than in the laterally adjacent portions of said strip to give said strip a generally concavo-convex shape in a section taken transversely of said strip and perpendicularly to said faces, uniformly spaced openings in said ridge, said openings extending through said strip and leaving between said openings projecting rungs having a longitudinal dimension of the same order as the longitudinal dimension of said openings so that said rungs can enter the openings of a similar mating fastener strip, the material of the rungs overlapping the material around the openings by a depthwise distance greater than the thickness of said adjacent portions and interengaging the same to resist separation of said strips.

2. In a slide fastener strip, the combination including: a longitudinal groove along one face of the strip of a depth at least equal to the thickness of the laterally adjacent portions of said strip and along the opposite face a longitudinal ridge aligned with said groove and having a height exceeding the depth of said groove so that said strip has a crescent-shaped cross-section and is thicker in the region of said groove and said ridge than in said laterally adjacent portions, said ridge and said groove having uniformly spaced openings, said openings extending therethrough and slightly wedge-like in shape and leaving between said openings projecting rungs having a longitudinal dimension of the same order as the longitudinal dimension of said openings so that said rungs can extend through the openings into the groove of a similar mating fastener strip.

3. The combination of claim 2 wherein the longitudinal dimension of said rungs is greater in their centers than at their sides to give said rungs a generally double-convex shape at the convex surface of said strip, and wherein the longitudinal dimension of the center portion of said rungs at the convex surface of said strip is greater than at the concave surface of said strip so that the convex edges of said rungs can interlock with the edges of the openings of the mating fastener strip.

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