Dec. 4, 1956 K. J. STALLER ET AL 2,772,469

SLIDE FASTENER

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Fig. 1

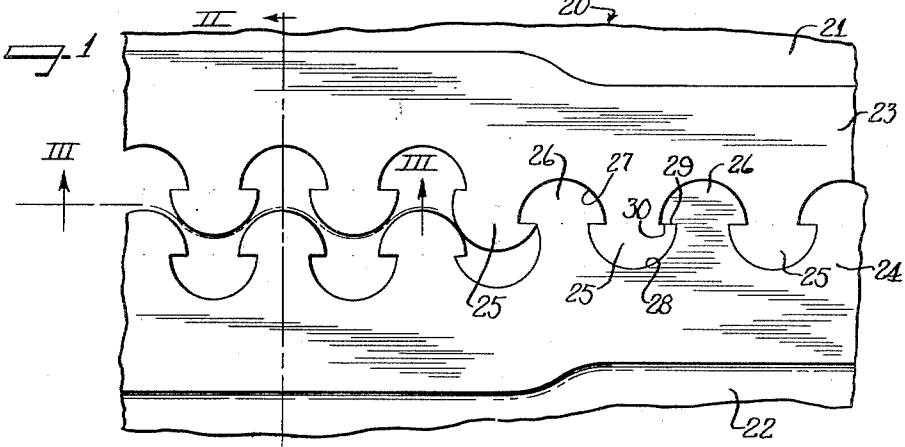


Fig. 2

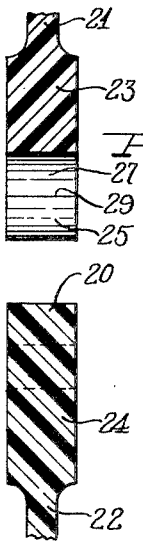


Fig. 3

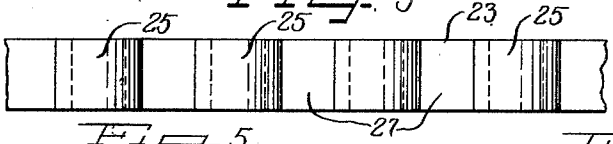
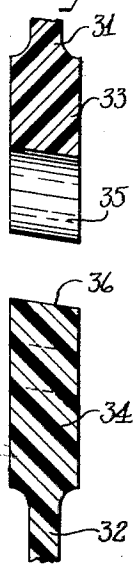


Fig. 5

Fig. 7

Fig. 4



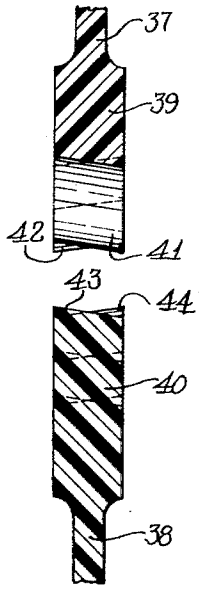
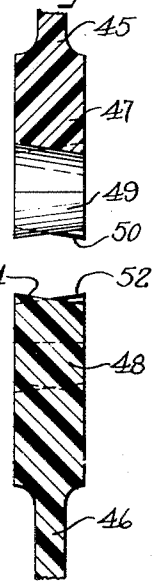
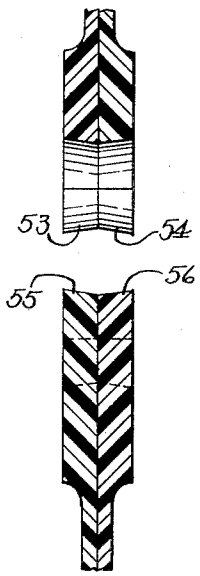


Fig. 6





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Fig. 8

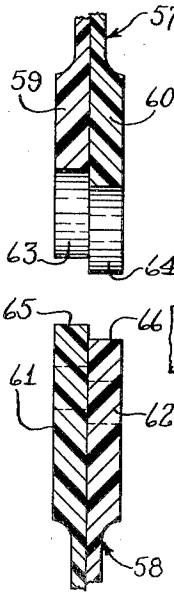


Fig. 9

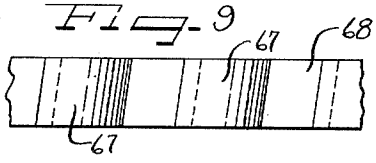


Fig. 10

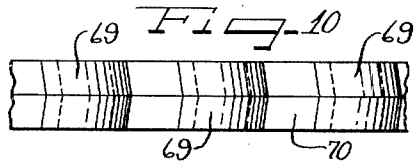


Fig. 11

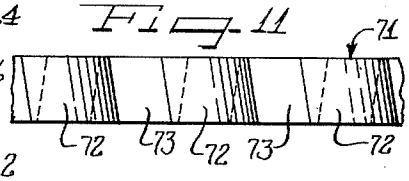


Fig. 12

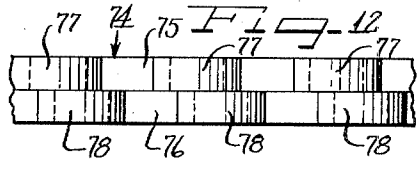


Fig. 13

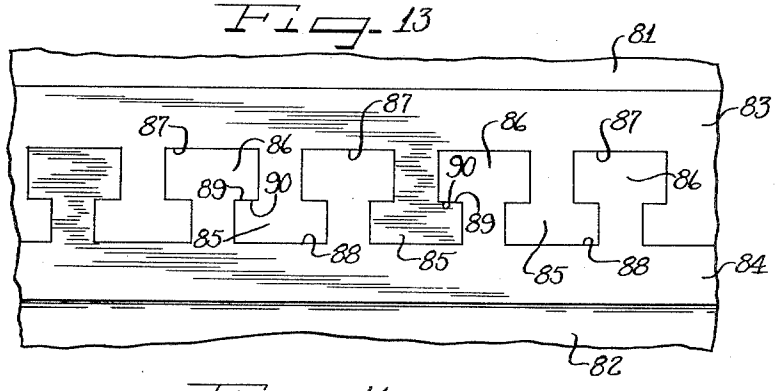
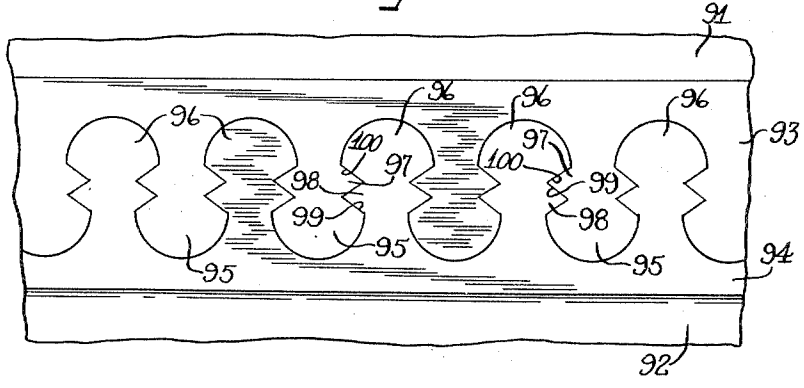


Fig. 14



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SLIDE FASTENER

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Application February 8, 1952, Serial No. 270,681

3 Claims. (Cl. 24—204)

This invention relates to a slide fastener and formed particularly to a slide fastener including releasably interlocking elements for securing marginal portions of a pair of members together.

According to this invention, a pair of flexible members have integral projections or beads spaced along adjacent marginal portions thereof and arranged to be pressed into interlocking engagement with each projection disposed in a recess defined by adjacent projections on the other member. The projections may be interlocked by movement of a slider in one direction along the marginal portions and may be readily released by flexure of the members away from each other, as by movement of a slider in an opposite direction along the marginal portions.

To provide the interlocking engagement, the projections have enlarged outer portions defining inwardly facing surfaces limiting relative movement of the members away from each other. Relative movement in other directions may be limited by inclining the projections, tapering the projections or by forming projections into off-set portions.

The projections are preferably shaped for interfitting sealing engagement with each other so as to provide a water-tight and air-tight juncture between the members. In one preferred embodiment, the outer portions of the projections are convexly rounded for sealing engagement with concavely rounded recesses between the projections. In another preferred form, the outer enlarged portions are generally rectangular and in a third form, the projections may have intermediate protuberances and recesses extending and facing in the direction of the marginal portions.

According to the principles of this invention, the projections may take a variety of configurations which will provide a secure interlocking sealing engagement therebetween and yet the projections may be readily shaped in a simple and economical manner.

An object of this invention, accordingly, is to provide a slide fastener including a pair of flexible members having integral interlocking projections along adjacent marginal portions thereof.

Another object of this invention is to provide a slide fastener with interlocking projections formed to sealingly engage in water-tight and air-tight assembly.

A further object of this invention is to provide an improved slide fastener which is efficient in operation and which is readily and economically manufacturable.

This invention contemplates other objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate preferred embodiments and in which:

Figure 1 is a plan view of a slide fastener constructed according to this invention with a pair of flexible members having spaced projections along the marginal portions thereof, the right-hand portion of this view illustrating projections in interlocking engagement and the left-hand portion of the view illustrating the projections out of interlocking engagement by flexure of the flexible members;

Figure 2 is a sectional view on a somewhat enlarged scale taken substantially along lines II—II of Figure 1 and illustrating one form of the projections;

Figure 3 is a view on an enlarged scale taken substantially along line III—III of Figure 1 looking directly at the ends of the projections;

Figures 4, 5, 6, 7 and 8 are sectional views similar to Figure 2 but illustrating various other preferred forms of the projections;

Figures 9, 10, 11 and 12 are views similar to Figure 3 but illustrating various other preferred forms of the projections;

Figure 13 is a plan view illustrating another preferred construction utilizing rectangularly shaped projections; and

Figure 14 is a plan view illustrating another preferred construction using projections having intermediate protruberances and recesses.

As shown in the drawings:

A slide fastener according to the principles of this invention is generally designated by reference numeral **20**, Figure 1. The slide fastener **20** includes a pair of flexible members **21** and **22** having marginal portions **23** and **24**, respectively, arranged to be releasably secured together by means of integral projections **25** and **26**, respectively, spaced therealong. The projections **25** define recesses **27** therebetween for receiving the projections **26** while the projections **26** define therebetween recesses **28** for receiving the projections **25**.

According to this invention, the projections or beads **25** and **26** have enlarged outer portions defining inwardly facing surfaces **29** and **30**, respectively, arranged to interengage and lock the marginal portions **23** and **24** against relative movement away from each other as shown in the right-hand portion of Figure 1. The projections **25** and **26** may be released from interlocking engagement by bending or flexing the marginal portions **23** and **24** away from each other as shown in the intermediate portion of Figure 1 to successively slide the interengaging surfaces **29** and **30** out of engagement and thus open the fastener as illustrated in the left-hand portion of Figure 1. The fastener **20** may, of course, be closed by a reverse operation, that is, by successively pressing the projections **25** and **26** into interlocking engagement. This opening and closing of the fastener may be accomplished by any desired means such as, for example, by a slider movable in opposite directions along the marginal portions **23** and **24**.

The members **21** and **22** may be of any desired flexible material but preferably are of an organic plastic such as, for example, the thermoplastic and thermosetting organic resins, polyvinyl chloride, polyvinyl acetate, polyvinyl chloride-polyvinyl acetate copolymers, and similar vinyl resins. The outstanding properties of such materials may be fully utilized in the fastener of this invention. Particularly, use may be made of the possibility of imparting non-uniform hardness to the projections or beads **25** and **26** by thermal or chemical treatment. For example, the projections **25** and **26** may be locally hardened at and adjacent to the interengaging surfaces **29** and **30**.

An important feature of this invention is in the attainment of a sealing engagement between the projections **25** and **26** to provide a water-tight and air-tight fastener. In the embodiment illustrated in Figure 1, the outer portions of the projections **25** and **26** are convexly rounded and the recesses **27** and **28** are concavely rounded to receive and sealingly engage the rounded outer portions

of the projections. It will be apparent that the preferred materials described above facilitate this sealing engagement. In particular, by locally hardening the projections at and adjacent to the surfaces **29** and **30**, a strong and durable fastener is provided, while the remaining portions of the projections may be sufficiently flexible to sealingly interengage.

Referring now to Figures 2 and 3, it will be noted that the interengaging surface portions of the projections **25** and **26** all extend in a direction normal to a plane through and in the direction of the projections, that is, a plane parallel to the drawing surface, Figure 1. Thus, relative movement of the members in that normal direction is prevented only by the frictional interengagement of the projections **25** and **26**. While this construction may be entirely satisfactory for some uses, it is highly desirable that such relative movement of the members be limited. According to this invention, the projections have a configuration such that they interengage to prevent such relative movement and, at the same time, they can be formed in a simple and economical manner.

Figure 4 is a cross-sectional view corresponding to Figure 2, of a modified slide fastener including a pair of flexible members **31** and **32** having marginal portions **33** and **34**, respectively, which have integral projections **35** and **36**, respectively, spaced therealong. The projections **35** and **36** are generally similar to the projections **25** and **26** in the embodiment of Figure 1, but are inclined relative to a direction normal to a plane through and in the direction of the projections. Thus, relative movement of the members **31** and **32** in the above-mentioned normal direction is effectively prevented when the projections **35** and **36** are in interlocking engagement. At the same time, the projections **35** and **36** may be readily formed by a milling or shaping operation.

Figure 5 illustrates another preferred embodiment in which a pair of flexible slide fastener members **37** and **38** have marginal portions **39** and **40**, respectively, provided with interlockable projections spaced therealong, the engagement and disengagement of the marginal portions **39** and **40** being accomplished in a manner similar to the engagement and disengagement of the marginal portions **23** and **24** of the embodiment illustrated in Figure 1. In this embodiment, the marginal portion **39** has alternate projections **41** and **42** which are oppositely inclined with respect to a direction normal to a plane through and in the direction of the projections. The marginal portion **40**, likewise, has alternate oppositely inclined projections **43** and **44**. It will be apparent then, with this construction, relative movement of the members **37** and **38** in any and all directions is prevented. Again, the projections **41**, **42**, **43** and **44** may be readily formed by a conventional milling or shaping operation.

Figure 6 illustrates another preferred embodiment in which a pair of flexible members **45** and **46** have marginal portions **47** and **48**, respectively, which are provided with spaced projections therealong interlockable in a manner similar to the projections **25** and **26** of the embodiment illustrated in Figure 1. In this construction, however, the marginal portion **47** has alternate projections **49** and **50** which are oppositely tapered to provide surfaces oppositely inclined in relation to a direction normal to a plane through and in the direction of the projections. The marginal portion **48**, likewise, is provided with alternate, oppositely tapered, projections **51** and **52** arranged to interlock in sealing engagement with the projections **49** and **50**. With this structure, relative movement of the members **45** and **46** in any and all directions is prevented. If desired, the projections **49**, **50**, **51** and **52** may be of a generally conical shape.

Another preferred embodiment is illustrated in Figure 7 in which integral projections of one member have oppositely tapered portions **53** and **54** and integral projections of the other member have oppositely tapered portions **55** and **56** with the recesses between the projections formed to attain a sealing engagement with the portions **53**, **54**, **55** and **56**. It will be apparent that, with this construction, relative movement of the members in any direction is prevented. Although the projections of this embodiment may be formed by a molding process, each of the members is preferably formed from two portions, the projections being milled or shaped in each portion and the portions then cemented or bonded together, as illustrated in Figure 7.

Figure 8 illustrates still another preferred embodiment in which a pair of flexible slide fastener members **57** and **58** are respectively formed from a pair of members **59** and **60** and a pair of members **61** and **62**. The members **59**, **60**, **61** and **62** are provided with integral projections **63**, **64**, **65** and **66** respectively, spaced therealong and shaped in a manner similar to the projections **25** and **26** in the embodiment illustrated in Figures 1 to 3. The projections **63** and **64** and the projections **65** and **66** are off-set relative to each other to provide interengageable surfaces extending parallel to a plane through and in the direction of the projections to thus prevent relative movement of the members **57** and **58** in any direction. This construction, of course, permits the projections to be readily formed by a conventional milling or cutting operation.

Figure 9 is a view similar to Figure 3, looking directly at the ends of projections **67** of one member **68** of a modified slide fastener. The projections **67** are inclined in the direction of the margin of the member **68** and, accordingly, are inclined relative to a direction normal to a plane through and in the direction of the projections so as to resist relative movement of slide fastener members when the projections **67** are interlocked with like projections of another member.

Figure 10 is a view similar to Figure 3, looking directly at the ends of projections **69** of one member **70** of another modified slide fastener. Each projection **69** has a pair of portions oppositely inclined in the direction of the margin of the member **70** so as to prevent relative movement in any and all directions when interlocked with like projections of another member. The projections **69** may be readily formed by a conventional milling or shaping operation by making the member **70** of two parts cemented or bonded together, as illustrated.

Figure 11 illustrates another preferred embodiment in which a slide fastener member **71** has integral projections **72** spaced therealong. The outer portions of projections **72** are inclined in one direction with the inner portions oppositely inclined to define recesses **73** for interlockingly receiving like projections of another member and thereby serving to prevent relative movement of members in any direction.

Figure 12 illustrates still another preferred embodiment in which a slide fastener member **74** is formed from two members **75** and **76** having integral projections **77** and **78**, respectively, spaced therealong with the projections **77** and **78** off-set in the direction of the margin of the member **74**. When the projections **77** and **78** are interlocked with like projections of another member, relative movement of the two in any and all directions is prevented.

It will be apparent that the features of any one of the embodiments illustrated in Figures 4, 5, 6, 7 and 8 may be combined with the features of the embodiments illustrated in Figures 9, 10, 11 and 12. For example, projections may be oppositely inclined in the direction thereof as illustrated in Figure 5, or oppositely tapered in the direction thereof as illustrated in Figure 6, and be oppositely inclined in the directions of the margins as illustrated in Figure 11. Similarly, projections may be off-set in the direction thereof as illustrated in Figure 8 and off-set in the direction of the margins as illustrated in Figure 12.

Figure 13 illustrates still another preferred slide fastener construction including a pair of members **81** and **82** having marginal portions **83** and **84**, respectively, pro-

vided with integral projections 85 and 86, respectively, spaced therealong and defining recesses 87 and 88, respectively, therebetween with the recesses 87 receiving the projections 86 and the recesses 88 receiving the projections 85. The projections 85 and 86 have enlarged outer portions defining inwardly facing surfaces 89 and 90, respectively, which interengage to prevent relative movement of the members 81 and 82 away from each other. The marginal portions 83 and 84 may be engaged and disengaged in the same manner as the marginal portions 23 and 24 are engaged and disengaged in the embodiment illustrated in Figure 1. The projections 85 and 86 may be inclined, tapered or off-set in the same manner as illustrated in Figures 4 through 12 to prevent relative movement of the members 81 and 82 in any and all directions. It will be apparent that this modification of Figure 13 is highly advantageous since the rectangular shape of the projections permit ready formation thereof by a conventional milling or shaping operation.

Figure 14 illustrates another preferred slide fastener embodiment in which a pair of flexible members 91 and 92 have marginal portions 93 and 94, respectively, provided with integral projections 95 and 96, respectively, spaced therealong. The projections 95 and 96 are provided with protuberances 97 and 98, respectively, extending in the direction of the margins 93 and 94 and with recesses 99 and 100, respectively, also extending in the direction of the margins 93 and 94. The projections 95 and 96 may thus be interlocked with the protuberances 97 disposed in the recesses 100 and the protuberances 98 received in the recesses 99. Thus relative movement of the members 91 and 92 away from each other is prevented. The members 91 and 92 may, however, be engaged and disengaged from each other by bending or flexing the same in a manner similar to the engagement and disengagement of the members 21 and 22 in the embodiment illustrated in Figure 1. It will be noted that the projections 95 and 96 are formed to sealingly engage and provide a water-tight and air-tight assembly. The projections 95 and 96 may, if desired, be inclined, tapered or off-set in a manner similar to the projections of the embodiments illustrated in Figures 4 through 12, to prevent relative movement of the members 91 and 92 in any and all directions.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of the present invention.

We claim as our invention:

1. A slide fastener comprising: a pair of releasably engageable flexible members having integral interlocking projections spaced along adjoining marginal portions thereof, said projections having enlarged outer portions defining interengaging inwardly facing surfaces with alternate projections having surface portions oppositely inclined with respect to a line normal to a plane through and in the direction of said projections to limit relative movement of said members in any and all directions.

2. A slide fastener comprising: a pair of releasably engageable flexible members having integral interlocking projections spaced along adjacent marginal portions thereof, said projections having enlarged outer portions defining interengaging inwardly facing surfaces and having first and second interengaging surface portions oppositely inclined with respect to a line normal to a plane through and in the direction of said projections to limit relative movement of said members in any and all directions.

3. A slide fastener comprising: a pair of releasably engageable flexible members having integral interlocking projections spaced along adjoining marginal portions thereof, each of said projections having enlarged outer portions defining inwardly facing surfaces and having first and second surface portions oppositely inclined with respect to a line normal to a plane through and in the direction of said projections to limit relative movement of said members in any and all directions.

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