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WATERTIGHT SLIDE FASTENER

The present invention relates to slide fasteners, and more particularly to a watertight slide fastener.

There have been proposed many watertight slide fasteners comprising a pair of opposed waterproof stringer tapes and seal means for protection against water leakage between intermeshing rows of coupling elements mounted by extrusion molding on the respective stringer tapes along their inner longitudinal edges.

10 Each stringer tape is composed of a woven or knit web having face and back layers of elastomer such as natural or synthetic rubber, and a sealing fin projecting from the longitudinal tape edge toward the coupling heads of companion coupling elements. When

15 the slide fastener is closed and immersed in water, the sealing fins are brought into contact with the coupling heads, thereby hermetically sealing the intermeshing coupling elements against water leakage. In such slide fastener closed position, those coupling elements

received in a slider body and the endmost coupling elements in particular are however held out of mutual coupling engagement with each other with the result that water might pass through a space between the
5 endmost coupling elements, thereby impairing watertightness of the slide fastener.

According to the present invention, there is provided a watertight slide fastener comprising a pair of rows of coupling elements mounted on a pair of
10 opposed waterproof stringer tapes along their respective inner longitudinal edges, and a slider having a slider body including a pair of spaced wings joined at their front end by a neck so as to define therebetween a Y-shaped guide channel for the passage
15 therethrough of said rows of coupling elements, each said wing having a pair of side flanges jointly defining a portion of said Y-shaped guide channel, characterized in that said slide fastener further includes a resilient bifurcated seal member mounted on
20 said stringer tapes adjacent to one end of said rows of coupling elements and snugly receivable in said Y-shaped guide channel, said seal member having a pair of resilient tongues, respectively, extending from said one end of said rows of coupling elements along said
25 longitudinal tape edges and a head interconnecting said tongues at their front end so as to define therebetween a first opening opening toward said one end of said rows of

coupling elements and snugly receivable therein said neck of said slider body, said tongues having outer sidewalls sealingly engageable with said side flanges of said slider body and opposed inner sidewalls sealingly engageable together when said slider is in its uppermost position, each said coupling element having a coupling head, one of said
5 tongues having at its rear end a recess opening toward and receivable therein said coupling head of the endmost coupling element on said stringer tape on which the other tongue is mounted.

It is believed possible with the present invention to provide a
10 watertight slide fastener which is protected against water leakage particularly between coupling elements received in a slider body when the fastener is fully closed.

The invention will be described by way of examples with reference to the accompanying drawings in which preferred embodiments of the present
15 invention are shown by way of illustrative example. In the drawings:-

Figure 1 is a fragmentary plan view, partly broken away, of a watertight slide fastener embodying the present invention, the fastener being shown as in open disposition;

Figure 2 is a view similar to Figure 1, showing the fastener as in
20 closed disposition;

Figure 3 is a cross-section view taken along line III-III of Figure 2;

Figure 4 is an enlarged cross-sectional view

taken along line IV - IV of Figure 2;

Figure 5 is an enlarged cross-sectional view taken along line V - V of Figure 2;

Figure 6 is a view similar to Figure 2, showing
5 a modification of the slide fastener; and

Figure 7 is a cross-sectional view taken along line VII - VII of Figure 6.

The present invention is particularly useful when embodied in a watertight slide fastener generally
10 designated by the reference numeral 10 in Figures 1 and 2.

The slide fastener 10 includes a pair of identical waterproof stringers 11, 11 each having a woven or knit stringer tape 12, a row of discrete
15 coupling elements 13 mounted on the stringer tape 12 along an inner longitudinal edge 14 (Figures 4 and 5) of the stringer tape, and a pair of face and back layers 15, 15 of resilient and waterproof elastomer such as natural or synthetic rubber covering opposite
20 surfaces of both the stringer tape 12 and the coupling elements 13, only the face layer 15 being shown in Figures 1 and 2. The layers 15, 15 are coated or extrusion-molded on the stringer tape 12 and the coupling elements 13. The coupling elements 13 are
25 formed of either synthetic resin by extrusion molding or metal by die casting. Each of the coupling element 13 includes a pair of upper and lower legs 16 disposed

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one on each surface of the stringer tape 12, a reduced neck 17 projecting from the legs 16 beyond the longitudinal tape edge 14, and a round coupling head 18 joined to the neck 17.

5 The slide fastener stringer 11 further has a series of sealing fins 19 (Figure 1) integral with the face and back layers 15,15 and projecting laterally from the longitudinal tape edge 14 in the plane of the stringer tape 12, each fin 19 extending between the
10 necks 17 of two adjacent coupling elements 13. The sealing fin 19 is made of the same material as that of the layers 15,15 and thinner than the stringer tape 12 as covered with the layers 15,15. Each of the layers 15,15 includes a groove 20 extending longitudinally of
15 the stringer tape 12 along the length of each row of coupling elements 13 adjacent to the upper or lower legs 16 of the coupling elements 13.

 A top stop 21 is mounted on and between the stringer tapes 12,12 at a distance from an upper end of
20 the rows of coupling elements 13,13 and interconnects the stringers 11,11. The top stop 21 is made of the same material as that of the layers 15,15 and thicker than a slider 22. The top stop 21 may be made of
 synthetic resin or metal coated with a layer of
25 elastomer. The slider 22 has a conventional construction and comprises a slider body including a pair of spaced upper and lower wings 23,24 (Figure 3)

joined at their front end by a neck 25 so as to define therebetween a Y-shaped guide channel 26 for the passage therethrough of the rows of the coupling elements 13,13. Each of the wings 23,24 has a pair of side flanges 27,27 jointly defining a portion of the Y-shaped guide channel 26.

A resilient, bifurcated seal member 28 is mounted on the stringer tapes 12,12 between the upper end of the rows of coupling elements 13,13 and the top stop 21. The seal member 28 is made of the same material as that of the layers 15,15 and has a thickness smaller than the thickness of the coupling elements 13. The seal member 28 includes a pair of elongate resilient tongues 29,30 extending from the end of the respective rows of coupling elements 13,13 along the longitudinal tape edges 14,14 toward the top stop 21 and are joined at their front end by a narrow head 31 which is integral with the top stop 21 and extends between the longitudinal tape edges 14, there being defined between the tongues 29,30 and the head 31 an opening 32 opening toward the upper end of the rows of the coupling elements 13,13 for receiving therein the neck 25 of the slider 22. The seal member 28 has a generally segmental shape which is complementary in contour to the Y-shaped guide channel 26 in the slider body.

The seal member 28 has a continuous fin 33

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projecting inwardly from opposed inner sidewalls 34,34 of the tongues 29,30 and from the inner wall of the head 31. The fin 33 is made of the same material as that of the fins 19 of the stringers 11,11 and has a thickness substantially equal to that of the fins 19. Each tongue 29,30 has an outer sidewall 35 inclining divergently toward the top stop 21, and an end wall 36 inclining convergently toward the top stop 21 so as to define therebetween a triangular opening 37. The sidewalls 35,35 are sealingly engageable with the side flanges 27,27 of the slider 22 when the latter is in its uppermost position shown in Figure 2. The tongues 29,30 further have, in their outer sidewalls 35,35 adjacent to respective rear ends, a pair of laterally aligned, semicircular notches 38,38 opening away from each other. One of the tongues 29 has in its inner sidewall 34 a recess 39 opening toward and receivable therein the coupling head 18 of the uppermost coupling element 13a on the stringer tape 11 on which the other tongue 30 is mounted. The groove 20 also extends along the sidewall 35 and the end wall 36 of each tongue 29,30. The side flanges 27,27 of the slider 22 are received in the grooves 20 when the slider 22 is moved along the coupling elements 13 to and from the top stop 21 so as to close and open the slide fastener 10.

In use, the slide fastener 10 shown in Figure 1 is closed by manipulating the slider 22 to slide along

the coupling elements 13,13 toward the top stop 21. As the slider 21 approaches its uppermost position shown in Figure 2, the slider's neck 25 is received in the opening 32 in the seal member 28 and, at the same time, the slider's side flanges 27 engage the outer sidewalls 35,35 of the tongues 29,30 to urge the tongues 29,30 toward each other. During that time, the openings 37,37 and the notches 38,38 in the tongues 29,30 serve to allow the tongues 29,30 to resiliently deform and to smoothly fit in the Y-shaped guide channel 26 in the slider 22. When the slider 22 is in its uppermost position shown in Figure 2, the slider's neck 25 is sealingly embraced with the fin 33 (Figure 4) and portions of the fin 33 on the inner sidewalls 34,34 are pressed edgewise together (Figure 5). The sealing fins 19 of the stringers 11,11 are pressed edgewise against peripheral surfaces of the coupling heads 18 of the opposite coupling elements 13. The coupling head 18 of the endmost coupling element 13a is received in the recess 39 in the tongue 29 so that the opposed rows of coupling elements 13 are held into mutual coupling engagement together throughout the length thereof, thus providing a hermetic seal between the opposed stringers 11,11 against water leakage therebetween.

25 A modified slide fastener 40 shown in Figs. 6 and 7 has a construction substantially the same as that of the slide fastener 10 with the exception that each

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tongue 41 of a resilient seal member 42 has a core 43 made of rigid plastic or metal mounted on the inner longitudinal edge 14 of a stringer tape 12, and a layer 44 of elastomer coated or extrusion-molded around the core 43 except opposite surfaces of the core 43.

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CLAIMS:-

1. A watertight slide fastener comprising:

(a) a pair of rows of coupling elements mounted on a pair of opposed waterproof stringer tapes along their respective inner longitudinal edges;

(b) a slider having a slider body including a pair of spaced wings joined at their front end by a neck so as to define therebetween a Y-shaped guide channel for the passage therethrough of said rows of coupling elements, each said wing having a pair of side flanges jointly defining a portion of said Y-shaped guide channel; and

(c) a resilient bifurcated seal member mounted on said stringer tapes adjacent to one end of said rows of coupling elements and snugly receivable in said Y-shaped guide channel, said seal member having a pair of resilient tongues, respectively, extending from said one end of said rows of coupling elements along said longitudinal tape edges and a head interconnecting said tongues at their front end so as to define therebetween a first opening opening toward said one end of said rows of coupling elements and snugly receivable therein said neck of said slider body, said tongues having outer sidewalls sealingly engageable with said side flanges of said slider body and opposed inner sidewalls sealingly engageable together when said slider is in its uppermost position, each said coupling element having a coupling head, one of said tongues having at its rear end a recess opening toward and receivable therein said coupling head of the endmost coupling element on said stringer tape on which the other tongue is mounted.



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2. A watertight slide fastener according to Claim 1, said seal member being made of resilient and waterproof elastomer.

5 3. A watertight slide fastener according to Claim 1 or 2, each said tongue including a rigid core secured to said longitudinal tape edge and a layer of resilient and waterproof elastomer covering circumferentially around said rigid core.

10 4. A watertight slide fastener according to Claim 1,2 or 3, said seal member having a fin projecting inwardly from inner sidewalls of said tongues and an inner wall of said head.

15 5. A watertight slide fastener according to any preceding claim, said tongues having in their outer sidewalls a pair of laterally aligned notches opening away from each other at their rear end, and a pair of second opening laterally away from each other at said front end.

20 6. A watertight slide fastener according to any preceding claim, including a top stop mounted on and between said stringer tapes and integral with said head of said seal member.



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7. A watertight slide fastener according to claim 5, said top stop being made of resilient and waterproof elastomer.

5 8. A watertight slide fastener according to any preceding claim, including face and back layers of resilient and waterproof elastomer covering opposite surfaces of each said stringer tape and said coupling elements, said seal member being integral with said layers.

10 9. A watertight slide fastener substantially as described with reference to and as illustrated in Figures 1 to 5 of the accompanying drawings.

10. A watertight slide fastener substantially as described with reference to and as illustrated in Figures 1 to 5 modified as
15 in Figures 6 and 7 of the accompanying drawings.
