

[54] **SEALING CLOSURE**

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[58] Field of Search **24/205.1**

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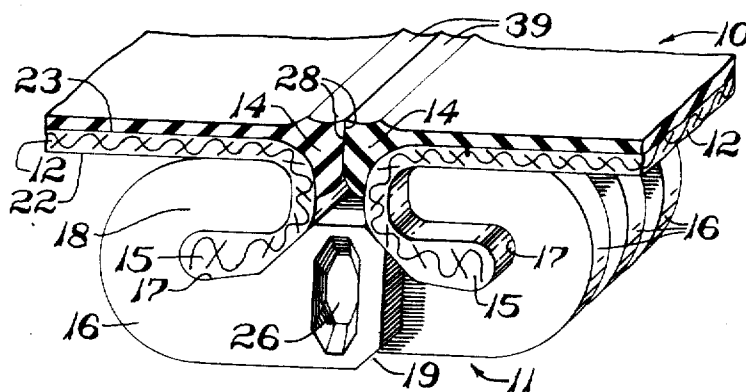
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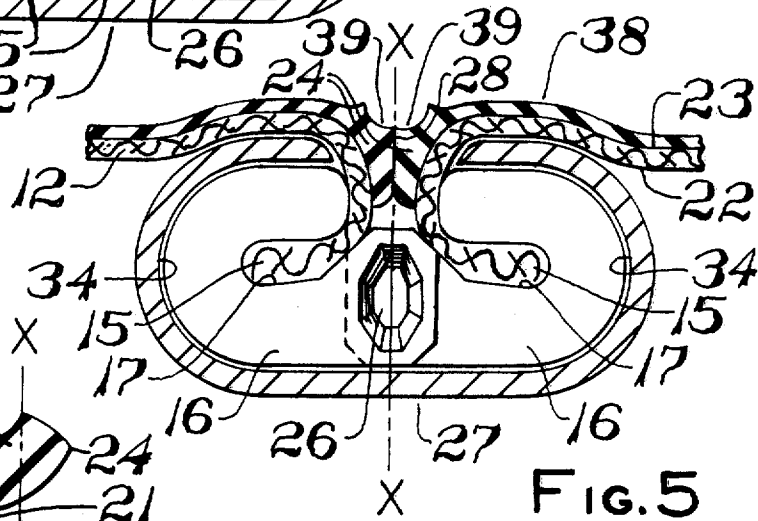
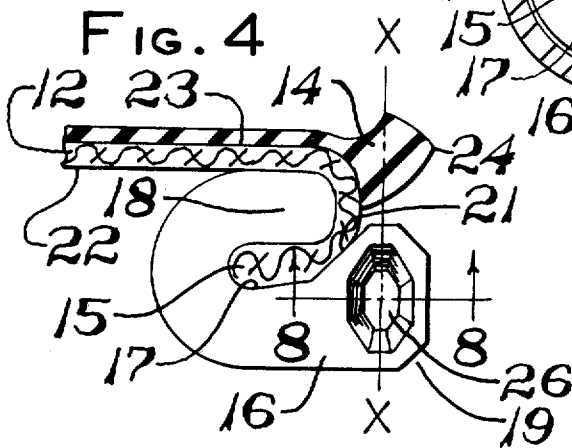
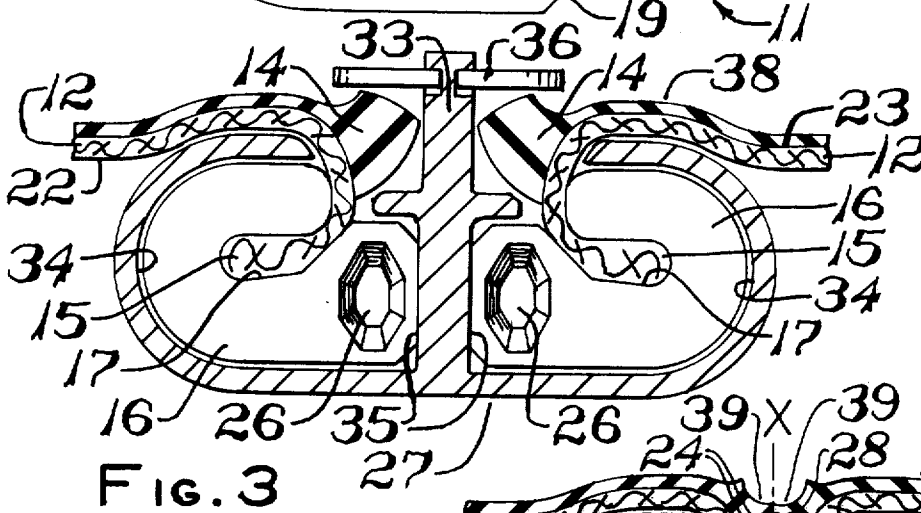
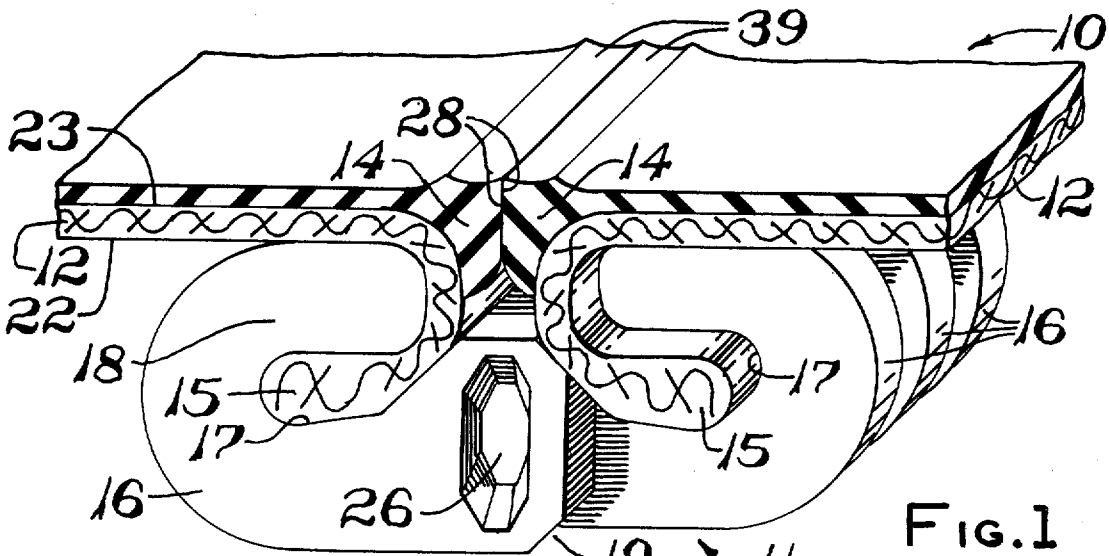
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ABSTRACT

A sealing closure between two margins of sheet material in which each margin has a sealing strip continuously applied to one face of the margin at a position spaced from the edge thereof and interlocking teeth of a slide fastener fastened to the edge of the margin at the sides of the teeth so that the edges are turned under and the teeth overlie the other face of the margin when the slide fastener is in the locked position. As the slide fastener closes, sealing lips on the sealing strips are pulled into engagement and resiliently oppose the forces produced by the turning under of the edges of the margins.

9 Claims, 8 Drawing Figures





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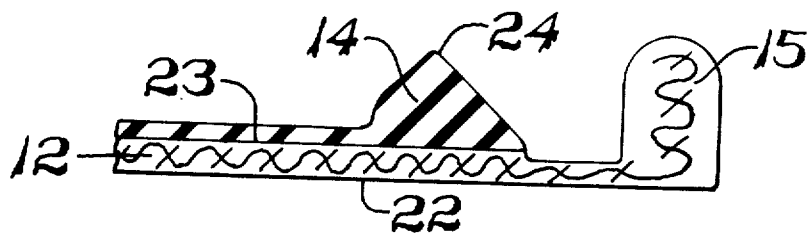


FIG. 7

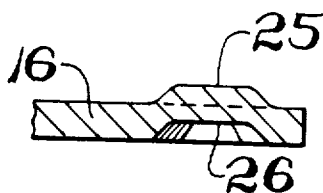
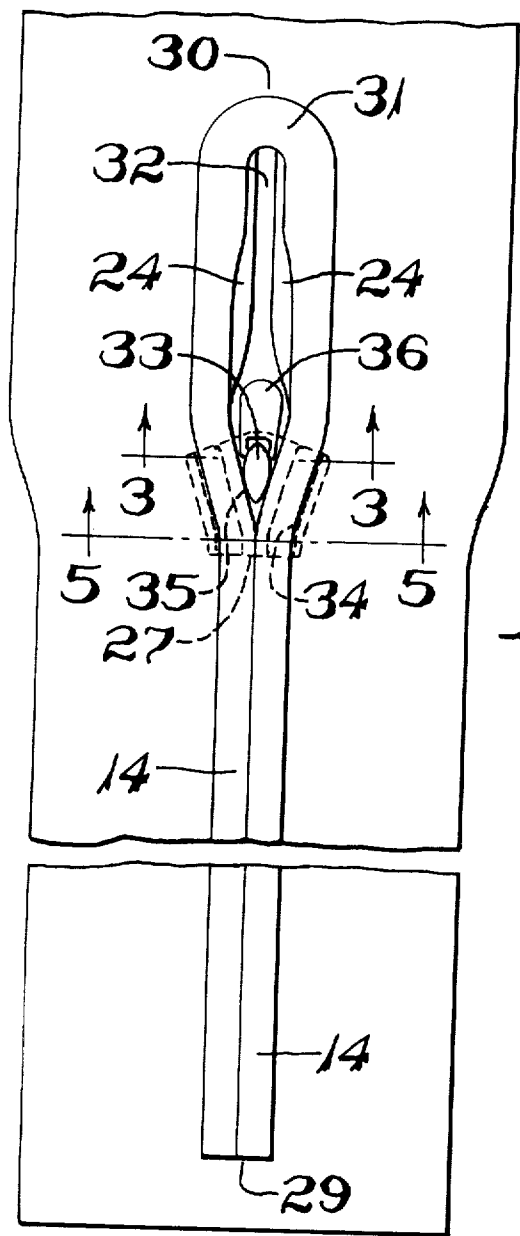


FIG. 8

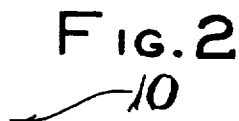
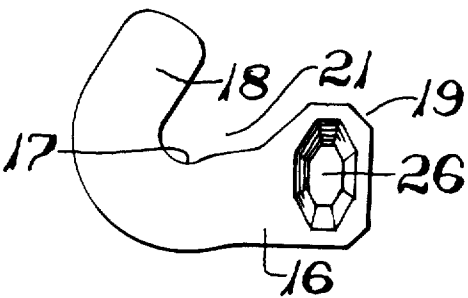


FIG. 2

FIG. 6



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SEALING CLOSURE

BACKGROUND OF THE INVENTION

This invention relates to a sealing closure and especially to slide fasteners having sealing lips providing a fluid-tight seal over the interlocking teeth. Existing sealing closures of this type have used slide fasteners in which the locking elements project beyond the edges of the stringers and the sealing lips have extended over the locking elements. This has necessitated the use of relatively wide lips to effect a seal and the lips have been subject to wear and damage because they were in a position where they would rub against the teeth of the slide fastener or other obstructions when in the open condition.

The sealing lips were also engaged by the slider during opening and closing which caused wear and the friction made it difficult to move the slider. In fact, in some applications lubricated sealing material compounds have been used in the lips to facilitate movement of the slider. To minimize or avoid the sliding action against the lips closures have been used in which the lips are spaced a sufficient distance from the teeth of the slide fastener. This spacing of the lips from the teeth has caused sealing problems when the closure is twisted or subjected to bending. It is also difficult to maintain a seal when there is hinging action between the slide fastener locking elements if the sealing lips are spaced an appreciable distance from the neutral axis of these locking elements.

In addition to these problems the existing sealing closures have been made by individually molding or assembling the sealing elements on the stringers of the slide fastener chains. This has caused sealing closures to be expensive to make.

Some sealing closures have been designed with special slide fasteners; however, the additional expense of making a special slide fastener has made these sealing closures undesirable for commercial use.

SUMMARY OF THE INVENTION

According to this invention a sealing closure is provided in which a slide fastener is used having locking elements that do not project beyond the edges of the stringers in the closed position. Relatively small sealing lips may be used which are close to the neutral axis of the locking elements. The locking elements are fastened to the stringers in such a manner that the edges of the stringers are turned over bringing together the sealing lips of resilient material. The slider does not come in contact with the sealing lips and moves along the closure lifting the stringer at a relatively thin portion which is spaced from the sealing lips so that the resistance to sliding for closing and opening the closure is kept at a minimum.

In the open position of the closure the teeth of the slide fastener are at the edge of the stringer most likely to contact another body and the sealing lips are retracted away from the edge into a position where they are not subjected to wear and damage.

The sealing lips are in resilient engagement in the locked condition of the closure and provide a force opposing the turning force exerted by the slide fastener during closing. This is important to maintain a tight seal during bending and twisting of the closure. With this type of slide fastener the resilient action of the sealing lips opposes the bending forces which tend to distort the closure especially where covering materials such as rubber or plastics are used. The construction of the invention is also of a design which can be manufactured by an inexpensive process using slide fastener elements of standard design.

The accompanying drawings shown one preferred form made in accordance with and embodying this invention and which is representative of how this invention may be practiced.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a fragmentary perspective view of a sealing closure, parts being broken away and in section;

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FIG. 2 is a plan view of the sealing closure of FIG. 1, parts being broken away;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view of one edge of the sealing closure, parts being broken away;

FIG. 5 is an enlarged sectional view taken along the line 5—5 of FIG. 2;

FIG. 6 is a view like FIG. 4 of the fastener element prior to being clamped on the edge of the tape.

FIG. 7 is a cross-sectional view like FIG. 1 of the slide fastener tape with the sealing strip and lip as they are molded and adhered to the tape.

FIG. 8 is a sectional view of a slide fastener element taken along the line 8—8 of FIG. 4, parts being broken away.

DETAILED DESCRIPTION

Referring to FIG. 1, sealing closure 10 has a slide fastener structure 11 detachably uniting adjacent flexible margins of sheet material such as stringers or tapes 12 and a pair of opposed flexible sealing elements or strips 14 preferably of elastomeric sealing material attached to and integral with the tapes for closing the space between the tapes against the passage of fluid such as liquids, gas or other flowable foreign material. The slide fastener structure 11 includes a pair of flexible attaching edges 15 which may be beaded to better hold interlocking fastener elements or teeth 16 which have slots 17 in which the edges 15 are clamped. The teeth 16 may be of hard stiff material such, for example, as brass or bronze, aluminum alloy, steel or other suitable metal, or a rigid Nylon or other suitable strong heat-resistant plastic material.

The teeth 16 are spaced apart in series along the edges 15 of tapes 12 and each of the teeth 16 includes a mounting portion 18 at the beaded edges 15 and an engaging portion 19. As shown more clearly in FIGS. 4, 5 and 6, each of the slots 17 which are in the mounting portion 18 of teeth 16 has an opening 21 close to the end of the engaging portion 19 and in the side of the tooth rather than at the opposite end. This causes the edges 15 of the tape 12 to be turned under and the mounting portion 18 to overlie an under surface 22 of the tapes 12 when the teeth 16 are moved into the locked condition.

At the ends of the engaging portion 19 of the teeth 16 are interlocking connectors such as projections 25 and recesses 26 which are preferably elongated along the plane X—X of engagement as shown in FIGS. 4 and 5. This elongated configuration resists relative turning or hinging movement of the interlocked teeth 16 attached to opposite edges 15 of the closure.

Each of the sealing strips 14 is adhered to and integral with an upper surface 23 of one of the tapes 12 on the opposite side from the under surface 22 as shown in FIG. 4. Flexible sealing lips 24 of resilient material abut and extend along the opposing edges of the sealing strips 14 and are spaced from said teeth 16. Preferably in the closing position an engaging surface 28 of the sealing lips 24 extends outwardly at an angle to the plane of upper surface 23 as shown in FIG. 4. The sealing lips 24 also extend beyond the plane of engagement X—X passing through the engaging portions 18 of the teeth 16 to provide compressive contact and resilient engagement of opposing lips.

The slide fastener structure 11 is closed and opened by the sliding action of a joining and separating member such as slider 27 of suitable metal or rigid plastic. In the closing operation, the teeth 16 on the opposing edges 15 of tapes 12 are drawn towards each other and turned under so that the engaging portion 19 attached to one of the tapes 12 laterally overlaps the engaging portion attached to opposing tapes an increasing amount until they are fully overlapped and the projections 25 are in interlocking relationship with the recesses 26. As the edges 15 of the tapes 12 are turned under during the closing operation, the sealing strips 14 are pulled toward the axis of engagement X—X as shown in FIGS. 4 and 5 and the lips 24 of the opposing strips are compressed in resilient

engagement at surface 28 which lies in the plane of engagement X—X as shown in FIG. 5.

During the opening of the slide fastener structure 11, the slider 27 separates the teeth 16 and permits the edges 15 of the tapes 12 to turn outward and separate the sealing strips 14 which permits movement of the slider 27 between the sealing strips without engagement as shown in FIG. 3.

The sealing closure 10 may be made of any desired length and, as shown in FIG. 2, may have a bottom end seal 29 in which the lips 24 are cemented together. A conventional metal stop may be used to mechanically hold the tapes together at the top and bottom. The top end seal 30 may be molded to the sealing strips 14 in a spot-curing mold or similar suitable equipment with the lips 24 joined at 31 and spaced apart providing an opening 32 having a width less than the width of a slider pull post 33 which is preferably of teardrop shape. Then as the slider 27 is moved into the opening 32 at the top end seal 30, the lips 24 form a continuous seal around the slider pull post.

The slider 27 shown in FIGS. 2, 3 and 5 has channeled outer plates 34, channeled inner plates 35 and the slider pull post 33 extending between and integral with the inner and outer plates. Each plate has dependent guide flanges along the straight diverging sides of its tapered front portion and its rear portion. These flanges are spaced apart adjacent the mounting portion 18 of the teeth 16 to permit sliding over the tapes 12 and are joined adjacent to the engaging portion of the teeth to connect the outer plates 34 to the inner plates 35. This arrangement provides for the inner plate 35 closely and slidably embracing the exposed parts of the teeth 16 and for the outer plate 34 closely and exteriorly embracing the teeth 16 with the slider pull post extending upwardly between the sealing strips 14.

The slider 27 not only pulls the teeth 16 laterally together but also turns the edges 15 of the tapes 12 under with the teeth adjoining the under surface 22 of the tapes. This closing action moves the sealing strips 14 laterally into engagement with the opposing surfaces 28 in abutting relationship and the lips 24 resiliently compressed to form a seal which will prevent the passage of fluids through the slide fastener structure 11. A pull tab 36 is fastened to the slider pull post 33 and provides a gripping element for manually operating the slider 27. The effort necessary to open and close the slide fastener structure 11 is relatively small since the turning action of the edges 15 takes place gradually and continuously with the rubbing action being confined to the surfaces of the teeth 16 and the slider 27 with no rubbing action against the sealing lips 24 which are of an elastic composition having a high coefficient of friction. Also as shown in FIG. 5, portions 38 of the tapes 12 are lifted by the channels 34 of the slider 27 and are spaced from the relatively thick sealing lips 24 so that there is a minimum of resistance to the lifting action which reduces the force necessary to open and close the slide fastener structure 11.

In FIG. 6 one of the teeth 16 is shown before it is clamped on one of the beaded edges 15 of tapes 12. A cross section of one of the tapes 12 is shown in FIG. 7 as it is made with the sealing strips 14 and lips 24 adhered to the upper surface 23. The beaded edges 15 of tapes 12 are disposed in the slots 17 of the teeth 16 with the teeth at spaced-apart positions and the teeth are bent from the shape shown in FIG. 6 into the shape shown in FIG. 4 whereupon the opening 21 is closed and the edges 15 are clamped in the slots 17.

In FIG. 7 one of the sealing lips 24 is shown in the unstressed condition and in FIG. 4 it is shown in a stretched condition with one of the tapes 12 turned around the teeth 16 which is the condition of the tapes as they are embraced by the slider 27 upon closing of the slide fastener structure 11. The resilient material of the lips 24 is deformed and the slider 27 must provide enough turning force to overcome the resilient force exerted by the lips 24 tending to return the tapes 12 to the condition shown in FIG. 7. The lips 24 will tend to lift the portions 38 of the tapes 12; however, this may be overcome by

the closing tension in the tapes which will flatten the tapes. This lifting action is desirable during closing of the slide fastener structure 11 as explained heretofore and shown in FIG. 5 to facilitate movement of the slider 27.

In the closed position of the closure 10 as shown in FIG. 1, the lips 24 have been resiliently engaged by the slider 27 as shown in FIG. 5 and are held in compression with edges 25 in engagement sealing the openings between the tapes 12. The compressive forces hold the lips 24 in sealing engagement when the closure is subject to twisting and bending. The lips 24 are also closely adjacent the neutral axis of the teeth 16 which reduces the movement resulting from twisting and bending of the closure 10. It is also apparent that where pressure from fluids or gases are exerted against outer faces 39 of the lips 24, this pressure will tend to force the surfaces 28 together and provide a better seal.

In the sealing condition shown in FIG. 1, the tapes 12 will lie flat even though the lips 24 are under tension due to the turning action of the slide fastener structure 11. This results from the resilient engagement of the lips 24 putting them under compression and producing a turning force counteracting the forces tending to lift the tapes 12. Part of the strain is also taken off the engaging portion 19 of the teeth 16 and the forces which may cause hinging of the teeth are reduced.

Upon opening of the closure 10 the resilient lips 24 will tend to return to the condition shown in FIG. 7, which will move the engaging surface 28 away from the edges 15 of the tapes 12 and move the teeth 16 into the opening between the tapes. In this way the wear at the edges is taken by the hard material of the teeth 16 and the soft resilient engaging surfaces 28 of the sealing lips 24 are retracted into a protected position.

I claim:

1. A sealing closure for uniting in sealing relationship margins of flexible fabric sheet material comprising an opposed series of spaced interlocking fastener elements attached to edges of said margins, each of said fastener elements having interlocking connectors located at one end and clamping means for attachment to said edges located at the side and adjacent said one end with said edges turned under and said fastener elements overlying a surface of one side of said margins when said fastener elements are in the locked condition, sealing material impervious to fluids covering and laminated on the opposite side of said margins and extending to enlarged sealing lips spaced from said fastener elements to facilitate hinging action of said fastener elements and a low friction surface for passage of a joining and separating member during locking and unlocking of said fastener elements, and said flexible enlarged sealing lips having abutting engaging surfaces along a plane of engagement in the locked condition of the closure and at least one of said sealing lips having an engaging surface extending beyond the plane of engagement in the open position of the closure whereby said sealing lips will be under substantial compression and displacement of the engaging surfaces providing an opposing force to the forces produced by the turning of said edges during locking of said fastener elements and maintaining resilient sealing engagement during relative movement of said fastener elements and said margins.

2. A sealing closure according to claim 1 wherein each of said fastener elements has a mounting portion containing said clamping means and an engaging portion including said interlocking connectors, said mounting portion having a slot with an opening adjacent said engaging portion in which the said edges of said flexible fabric sheet material are clamped.

3. A sealing closure according to claim 1 wherein said interlocking connectors include interengaging projections and recesses for engagement with opposing interlocking connectors and said projections and recesses being elongated to resist relative hinging action of the interlocked fastener elements.

4. A sealing closure according to claim 1 wherein said sealing lips have engaging surfaces which deflect away from said fastener elements during resilient engagement of said sealing lips to provide increased sealing when subjected to fluid pressure on the other surfaces of said sealing lips.

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5. A sealing closure according to claim 1 wherein said fastener elements are moved into interlocking engagement by a joining and separating member having converging channels which pull the slide fastener elements together and also turn them into an aligned position in order that interlocking will occur and turn under said edges of the margins for sealing engagement of said sealing lips.

6. A sealing closure according to claim 5 in which said joining and separating member moves between said fastener elements and said surface on one side of said margin and lifts portions of said margins contacted by said member, and said portions being spaced from said sealing lips to provide a minimum resistance to lifting and movement of said member during locking and unlocking of said fastener elements.

7. A sealing closure according to claim 1 wherein said plane

of engagement extends through the interlocking fastener elements to provide compressive contact and resilient engagement of said sealing lips.

8. A sealing closure according to claim 1 wherein said engaging surface which extends beyond the plane of engagement is at an angle to said plane of engagement in the open position to provide a greater area of sealing engagement in the locked condition of the closure.

9. A sealing closure according to claim 1 wherein both of said sealing lips have the same cross sectional shape whereby the opposing forces from abutting engagement of said lips are balanced for maintaining sealing engagement in the locked condition.

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