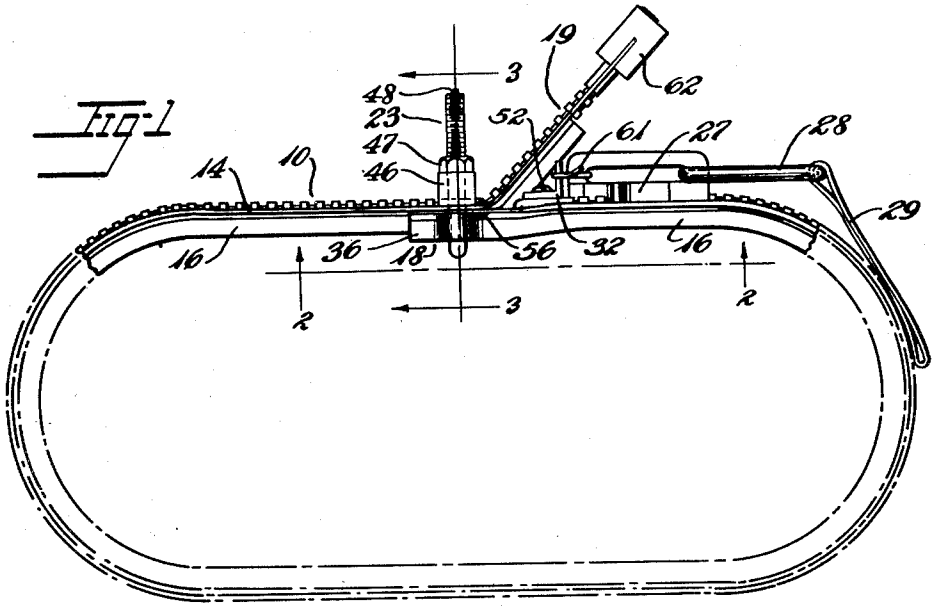
Sept. 5, 1950 C. P. KRUPP 2,521,174

PERIPHERAL CLOSURE

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Fig-1



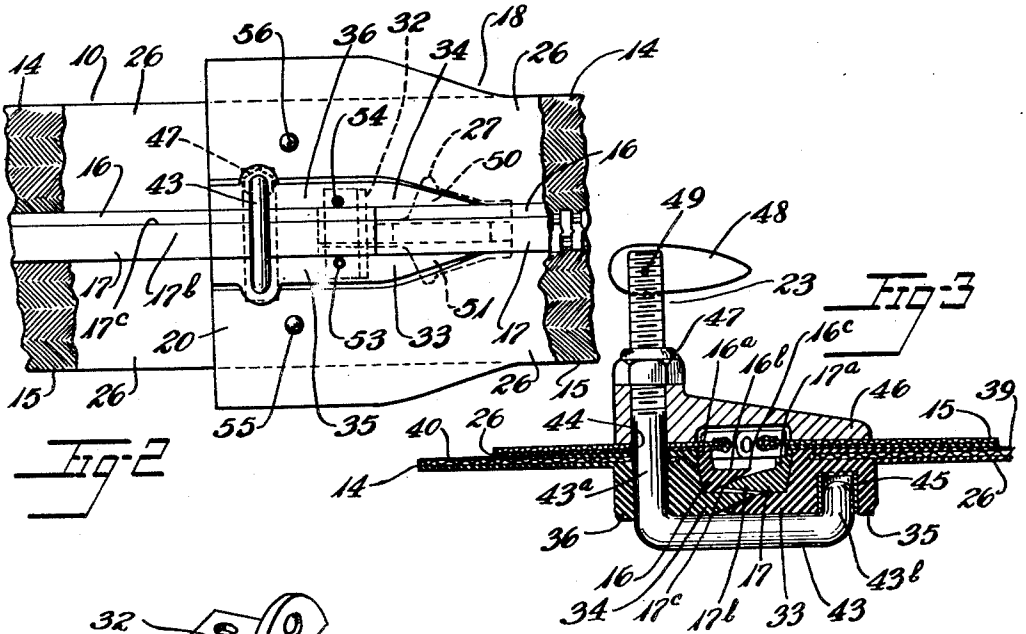


Fig-3

Fig-2

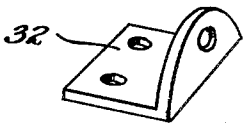


Fig-4

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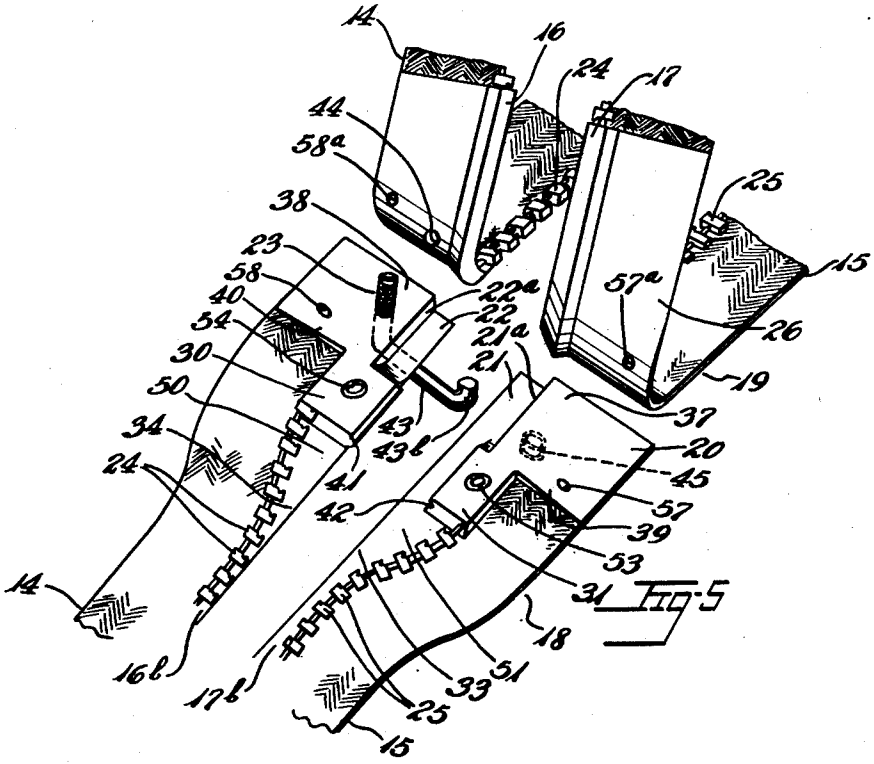


Fig-5

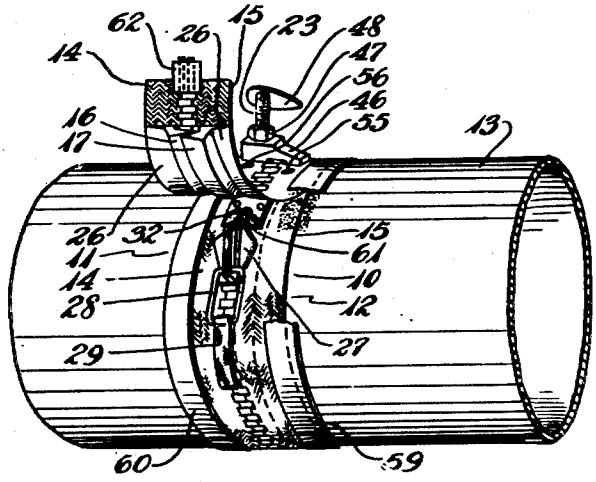


Fig-6

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Patented Sept. 5, 1950

2,521,174

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PERIPHERAL CLOSURE

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Application October 23, 1944, Serial No. 559,955

11 Claims. (Cl. 24—205.1)

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This invention relates to closures for adjacent margins extending peripherally about structures and especially to sealing slide fastener closures for such peripheral margins of the structures.

In prior closure constructions, slide fasteners, which have been assembled generally of strips, have been used for closing the margins of elongated openings terminating in one or more closed ends in the walls of articles, such, for example, as clothing, footwear and tents. However, the use of slide fasteners to join separably the adjacent margins extending peripherally about structures such, for example, as substantially rectangular or rounded in section fluid conduits, substantially rectangular, cubical, cylindrical, spherical and other containers, annular structures and the like, has been hindered or prevented largely by the lack of effective closing means for joining conveniently the end portions of the peripherally arranged slide fastener, yet permitting separating such structures into two or more parts, and the provision of effective sealing of such structures against fluids has involved difficulties.

Objects of the invention are to provide for closing effectively adjacent peripheral margins of structures; to provide for closing such margins while permitting their separation along the periphery thereof; to provide for sealing effectively such margins substantially throughout their extent; to provide for maintaining such sealing of the peripheral margins under differential fluid pressures at the walls of inflatable or other hollow structures; and to provide for simplicity of construction, ease of manufacture, and convenience and effectiveness of operation.

Other objects are to provide a sealing slide fastener closure adapted for closing effectively adjacent peripherally extending margins of a structure; to provide for joining separably the end portions of such closure; to provide continuity of closing at the junction of such end portions; to provide for bracing the end portions for resisting separating movement of parts thereof and resisting breakage of the seal; to provide for pressing together and holding the end portions in overlapping relation; and to provide substantially continual definite sealing of the closure for the closed condition thereof.

These and other objects and advantages of the invention will be apparent from the following description.

In the accompanying drawings which form a part of this specification and in which like numerals are employed to designate like parts throughout the same,

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Fig. 1 is a side view of a sealing slide fastener closure arranged for joining peripherally extending margins of a structure, and constructed in accordance with and embodying the invention,

Fig. 2 is a plan from below of end portions of the closure taken along line 2—2 of Fig. 1, parts being broken away,

Fig. 3 is a sectional view on an enlarged scale taken along line 3—3 of Fig. 1,

Fig. 4 is a perspective view from above of a bracing tie plate for the closure,

Fig. 5 is a perspective view from above on an enlarged scale of overlapping end portions of the closure, the margins being in a separated condition and parts being broken away, and

Fig. 6 is a perspective view of the closure arranged for joining separably the adjacent parts of a fluid conduit, parts being broken away and in section.

In the illustrative form of the invention shown in the drawings, a sealing slide fastener closure 10 arranged as shown in Fig. 1, may be applied to a structure 13 for joining separably and closing the adjacent margins 11 and 12 extending peripherally about the structure 13, which structure may, for example, be a divided fluid conduit of suitable impervious flexible material such, for example, as treated fabric for conducting air under pressure. The closure 10 includes a pair of flexible margins 14 and 15 or stringers for attachment to the peripheral margins 11 and 12 of the structure 13 and a pair of closing elements 16 and 17 of resilient rubber or other rubber-like material extending along the adjacent margins 14 and 15 and mounted at a face of the closure 10, preferably the inner face of the closure as shown in the drawings. For closing the overlapping end portions of the closure 10, the closing elements 16 and 17 include end portions at 18 and 19 in overlapping relation one to the other, the end portions at 18 of the respective elements 16 and 17, as shown especially in Figs. 1 to 3 and 5, being outwardly flared providing parts forming a platform 20, when fitted together, and terminating in an elongated recess comprising recesses 21 and 22 in said end portions at 18 open at the opposite or outer face of the closure 10 for receiving therein parts of a zone of the closing elements at the other end portion at 19. Suitable means including a clamping structure 23 are provided at the recessed end of the platform 20 for holding the end portions at 18 and 19 of the closing elements in the desired overlapping engagement and pressing the closing elements against one another, as shown especially in Fig. 3. Such an arrangement makes possible con-

tinuity of substantial sealing and closing of the margins, especially at the overlapping end portions of the closure.

For positioning the closing elements 16 and 17 in closing relation one with the other along the margins 14 and 15, cooperating fastener elements 24 and 25 in series at the adjacent edges of the margins may be attached to the flexible material thereof, which material may be woven fabric of cotton, linen, silk, or other natural or synthetic textile material impregnated or coated with suitable rubber-like material 26 to make such margins relatively impervious to fluid. A runner 27 engages and disengages the fastener elements 24 and 25 by manipulation, desirably, from the opposite or outer face of the closure and is moved by a pull-tab 28 and a flexible thong, as shown especially in Fig. 1, whereby the closure 10 may be opened and closed from the exterior of the fluid conduit 13.

The closing elements 16 and 17 may be of any suitable shape in section to effect sealing of the margins and preferably are generally L-shaped in section providing base portions 16a and 17a mounted desirably in part on the fastener elements 24 and 25 and in part on the margins, and providing lateral portions 16b and 17b extending from the base portions for disposition in overlapping relation and tapering to edges 16c and 17c for sealing by lip-action of one of the edges against the other closing element. The base portion of each closing element may be in continuation of the rubber coating 26 on the margin for assuring sealing the margin substantially throughout its extent. The closing elements are united with the margins and the fastener elements as by a vulcanized bond and molded and vulcanized under heat and pressure. This construction makes possible sealing the margins 14 and 15 along their peripheral extent despite flexure of the closing elements.

For continuity of closing and substantially sealing the margins 14 and 15 at the junction of the overlapping end portions, the platform arrangement 20 comprising suitable rubber-like material may be provided, as shown especially in Fig. 5. It is desirable that the margins 14 and 15 be flared outwardly and embedded in the platform, and the fastener elements 24 and 25 at the end portion at 18 may be embedded and terminated in bracing projections 30 and 31.

The closing elements 16 and 17 at the inner face of the closure 10 along the platform 20 include tapered lateral portions 33 and 34 extending integrally in continuation with the lateral portions 16b and 17b at the region immediately preceding the platform thereby providing continuity of the lip-seal, especially along the platform, at the peripheral overlapping region of such closing elements at the end portions of the closure, as shown especially in Figs. 2 and 5. The closing elements 16 and 17 at the platform also include outwardly flared portions 35 and 36 or shoulders of suitable rubber-like material in continuation of the base portions of such closing elements, which shoulders terminate in the recesses 21 and 22 open at the opposite or outer face of the closure. The recesses are defined in part by the shoulders and the tapered lateral portions 33 and 34 and in part by the bracing projections 30 and 31. The construction and arrangement is such that, for the closed condition of the platform 20, the walls of the recesses 21 and 22 embrace a zone of the closing elements 16 and 17 at the end portion at 19 and the sidewalls 21a and 22a of such recesses conform to and are in abutting contact with the base portions of the closing elements along such zone for providing substantial sealing throughout said zone.

At the opposite or outer face of the closure 10, the platform 20 includes desirably, relatively flat portions 37 and 38 in continuation of the outwardly flared portions 35 and 36 and also in continuation of the bracing projections 30 and 31. The platform 20 also may include tapered portions 39 and 40 extending outwardly in continuation of the flat portions to the opposite edges of the margins 14 and 15 for providing additional support at the end of the platform.

The bracing projections 30 and 31 of suitable rubber-like material may have relatively flat surfaces at said opposite or outer face of the closure upon which surfaces may be mounted a bracing tie plate 32 of stiff material such, for example, as brass or sheet steel. The bracing projection 30 extends desirably, substantially to the edge of and is integral with the lateral portion 34 and the inner end face of such projection may be provided with a ribbed surface 41 for registering in abutting contact with the walls of a suitably shaped groove 42 in the inner end face of the bracing projection 31. The bracing projection 31 terminates desirably, short of the edge of the lateral portion 33 but is not integrally united with the lateral portion 33.

For the closed condition of the platform 20 with the bracing projections 30 and 31 in abutting contact at the inner end faces thereof, the lateral portions 33 and 34 are disposed in the desired overlapping and contacting relation one with the other, as shown especially in Fig. 3. The bracing projections 30 and 31 overlying the tapered lateral portions 33 and 34 resist breakage of the lip-seal by separating movement of such portions in the direction normal to the margins under the action of the internal pressure upon the closing elements; since the lateral portions 33 and 34 are otherwise relatively unsupported because of the outward flare of the latter elements and the margins 14 and 15.

The clamping structure 23 which holds together the end portions at 18 and 19 of the closure 10 in addition to pressing the closing elements 16 and 17 against one another at the recessed end of the platform 20, includes a generally U-shaped member 43 of suitable stiff material, preferably a bent steel rod, one leg 43a of which member may be threaded and disposed in sealing contact with the walls of an aperture in the platform 20 at the margin 14 adjacent the recess 22, and also is positionable in an aperture 44 in the margin 14 at the end portion at 19, the leg 43a extending beyond the opposite face of the closure. The other relatively short leg 43b of the member is adapted to be seated in the aperture defined by a brass cup element 45 imbedded in the flared portion 35. The threaded leg 43a, as shown especially in Fig. 3, slidably positions at the opposite or outer face of the closure a backing element 46 of suitable stiff material. A tightening nut 47 of suitable stiff material threadedly engages the leg 43a making possible retaining adjustably the backing element 46 against the margins 14 and 15 at the end portion at 19, and drawing together the element 46 and the member 43 whereby such member cooperatively supports the lateral portions 16b and 17b and 33 and 34 in overlying and overlapping relation, while maintaining the walls of the recess in sealing contact with the base por-

tions 16a and 17a of the closing elements at the end portion at 19. An indicating element 48 of suitable stiff material may be positioned at the threaded end of the leg 43a and attached as by a suitable pin 49 for facilitating positioning the member 43 from the opposite face of the closure for registering with the aperture in the cup element 45.

For the closed condition of the closure, the runner 27 is positioned within the space at the region at 50 and 51 opposite the recessed end of the closing elements for additionally supporting such elements to resist breakage of the seal. However, the bracing portions 30 and 31, although in contact with one another at their adjacent end faces, are substantially unsupported against relative separating movement. To assure their support and alignment and further resist breakage of the seal by outward movement of the closing elements in the direction normal to the margins at such bracing projections, the bracing tie plate 32 may be mounted detachably thereon by screw fasteners 52, 52 extending through spaced-apart apertures in the face of the tie plate 32 and engaging threaded ferrules 53 and 54 of suitable stiff material imbedded in such bracing projections 30 and 31.

The margins 14 and 15 of the end portions at 18 and 19 may be, if desired, secured together as by rivets 55 and 56 extending through suitable apertures 57, 57a, 58, and 58a for further assuring maintaining the end portions in overlapping relation and preventing the accidental tearing apart thereof. The fastener elements 24 and 25 at the end portion at 19 are secured together by a stop member 62 for preventing operation of the runner 27 beyond the ends of the margins.

In the construction shown espectially in Fig. 6, the sealing slide fastener closure 10 may be assembled with the adjacent parts of the divided fluid conduit 13, the flexible margins or stringers 14 and 15 being attached desirably adhesively to the flexible margins 11 and 12 of the conduit such that the closing elements 16 and 17 are disposed at the interior of such conduit. The stringers 14 and 15 extend peripherally about the conduit or structure 13; and for attachment purposes and for further assuring sealing of such stringers, tape elements 59 and 60 may be secured adhesively to and in overlapping relation with the stringers 14 and 15 and the margins 11 and 12 at the opposite edges of such stringers, the tape elements also extending peripherally and coextensively about such margins and stringers. With this arrangement the sealing closure may be opened and closed by manipulation of the runner 27 from the exterior of the fluid conduit.

The closing elements 16 and 17 extending peripherally about the margins 14 and 15 within the structure are elastically maintained in overlapping relation to one another throughout their peripheral extent during engagement of the fastener elements 24 and 25, the element 17 being resiliently held flexed against the other element 17 by lip-action of the edge 17c against the lateral portion 16b. For a differential pressure at the walls of the conduit, the greater pressure being at the interior thereof, the closing elements are additionally maintained in such sealing relation by the pressing action of the internal pressure upon such elements. Also, the closing elements by virtue of their resilient construction maintain advantageously their sealing relation even though the stringers 14 and 15 be flexed and bent transversely due to relative movement of the adjacent parts of the conduit.

In the operation of the closure 10 after assembly with the structure 13, as shown especially in Fig. 6, the closure may be placed in the open position by suitably manipulating the runner 27. However, since the runner may be secured to the clamping plate 32 by a flexible tie element 61 such, for example, as a wire or a cord, to prevent opening the closure by accidental movement of the runner away from the bracing plate 32, it is necessary to disengage first the runner 27 from such bracing plate before manipulation thereof in the direction away from the latter to open the closure 10. Upon movement of the runner 27 away from the space defined at 50 and 51 of the platform 20, the margins 14 and 15 are spread apart coincidental with the disengagement of the fastener elements 24 and 25 and such movement likewise spreads apart the closing elements 16 and 17. Manipulation of the runner 27 peripherally about the structure permits opening the closure substantially throughout its entire extent facilitating entrance to the structure 13.

Manipulating the runner in the reverse direction to the position shown especially in Figs. 1 and 6 arranges the closure again in the closed position, the fastener elements 24 and 25 being reengaged and the closing elements being positioned in overlapping sealing relation to one another about the peripheral extent thereof. Since the end portions at 18 and 19 of the closure are held in overlapping relation by the clamping structure 23 in cooperation with the platform 20 and the bracing tie plate 32 as described hereinabove, the sealing elements 16 and 17 in a zone thereof at the end portion at 19 are seated in the recess of the platform in abutting contact with the sidewalls of the recesses 21 and 22 and also maintain lip-sealing contact with one another at the lateral portions 16b and 17b in said zone in the manner described above. The remainder of the end portion at 19 of the closure extends outwardly from the opposite or outer face of the closure 10. The closing elements 16 and 17 at the end portion at 18 extending along the platform 20 especially at the region of the recessed end thereof are likewise in lip-sealing contact with one another and are so maintained in such closing relation by the clamping coaction of the member 43 and the backing element 46. This construction thus provides continuity of sealing at the overlapping region of the end portions at 18 and 19.

The bracing projections 30 and 31 adjacent the recesses 21 and 22 in cooperation with the bracing tie plate 32 prevent effectively breakage of the lip-seal by separating movement of the lateral portions 33 and 34 in the outward direction with respect to the wall of the fluid conduit under the action of the internal pressure. The runner 27 being positioned in the space defined at 50 and 51 of the platform overlies the lateral portions 33 and 34 at this region and likewise prevents their separation by such outward movement. Thus continual definite substantial sealing by the closing elements at the overlapping end portions at 18 and 19 is assured. The fastener elements 24 and 25 in their engaged relationship overlie the closing elements throughout the remainder of the peripheral extent of the closure and prevent effectively breakage of the seal by such outwardly separating movement of the closing elements. The invention thus makes possible separably closing the adjacent margins 10 and 12 extending peripherally about the structure 13.

If desired, the margins 11 and 12 of the structure 13 may be completely separated by opening the slide fastener closure 10 in the manner described hereinabove and then separating the end portions at 18 and 19. Such separation of the end portions may be accomplished by loosening the nut 47 on the threaded leg 43a of the member 43 to permit the member 43 to be removed from the cup element 45. The bracing tie plate 32 is also removed by unscrewing the screws 52, 52 from engagement with the ferrules 53 and 54. By rotating the member 43 and the backing element 46 to overlie the margin 14, the runner 27 may be manipulated to the stop element 59, thus completely separating the margins and permitting separation of the structure 13 into two parts.

To again join the parts of the structure or fluid conduit 13, the runner is first manipulated away from the stop element 59 along and beyond the end portion at 19 and the end portions at 18 and 19 are again placed in the closed position. The member 43 and the element 46 are rotated and placed in the clamping position with respect to the end portions, and the bracing tie plate 32 is again attached by the screws 52, 52 to the bracing projections 30 and 31, thereby completing the union of such end portions. The runner 27 is then manipulated peripherally along the margins 14 and 15 to the position shown especially in Figs. 1 and 6, effectively closing the closure throughout its peripheral extent.

Variations may be made without departing from the scope of the invention as it is defined in the following claims.

I claim:

1. A closure for adjacent margins extending peripherally about a structure, said closure comprising flexible closing elements for closing said margins along the latter by association of said elements with one another, said elements having opposite pairs of end portions for disposition in overlapping relations of one pair with respect to the other for closing said margins at said end portions, one of said pairs of end portions being recessed at a face thereof and the other pair of said end portions having parts for seating in the recess in said overlapping relation, the first said pair of end portions at the recessed region thereof being adapted for pressing against said parts of the other pair of said end portions, means for retaining said pairs of end portions in said overlapping relation and pressing said pairs of end portions against one another at said recessed region, and means for holding said elements in their closing relation one with the other along said margins.

2. A closure for adjacent margins extending peripherally about a structure, said closure comprising flexible elongated closing elements for closing said margins along the latter by association of said elements with one another, a portion of said elements being outwardly flared providing a platform and having a recess open at a face thereof and another portion of said elements including a zone adapted for seating in said recess in overlapping relation with respect to the first said portion for closing said margins at said portions, means at said platform for separably retaining the overlapping portions in said overlapping relation, and means for separably holding said elements in their closing relation one with the other along said margins.

3. A closure for adjacent margins extending peripherally about a structure, said closure comprising elastic closing elements for closing said margins along the latter by contact of said elements with one another, said elements having end portions for disposition in overlapping relation to one another for closing said margins at said end portions, one of said end portions being outwardly flared providing a platform and terminating in a recess open at a face thereof and the other of said end portions including a zone for seating in said recess in said overlapping relation, said platform including bracing means adjacent said recess and overlying parts of the closing elements along said platform for resisting separating movement of said parts in the direction normal to said platform, means at the recessed region of said platform for separably retaining said end portions in said overlapping relation, and means for separably holding said elements in their contacting relation one with the other along said margins.

4. A closure for adjacent margins extending peripherally about a structure, said closure comprising closing elements of resilient rubber-like material for closing said margins along the latter, said elements comprising lateral portions for positioning in overlapping and contacting relations one with the other at a face of the closure and said elements having end portions for disposition in overlapping relation to one another for closing said margins at said end portions, one of said end portions being outwardly flared and terminating in a recess open at the opposite face of said closure and the other of said end portions including a zone for seating in said recess in said overlapping relation, the first said end portion including bracing means including a projection adjacent said recess for resisting separating movement of said lateral portions along the first said end portion in the direction normal to said margins, means for retaining said end portions in said overlapping relation, and means for separably holding said elements in said overlapping and contacting relation one with the other along said margins.

5. A closure for adjacent margins extending peripherally about a structure, said closure comprising closing elements of resilient rubber-like material for closing said margins along the latter said elements comprising lateral portions for positioning in overlapping and contacting relation one with the other at a face of the closure and said elements having end portions for disposition in overlapping relation to one another for closing said margins at said end portions, slide fastener means including a runner at said margins for separably holding said elements in said overlapping and contacting relation, one of said end portions being flared outwardly providing a platform and terminating in a recess open at the opposite face of said closure, said platform having an opening at said opposite face and spaced-apart from said recess for receiving said runner in overlying relation with said lateral portions along said platform and having a bracing projection interconnecting said recess and said opening and overlying the latter said lateral portions, said runner and said bracing projection coacting to resist separating movement of the latter said lateral portions in the direction normal to said margins, the other of said end portions including a zone for seating in said recess in said overlapping relation, and clamping means at the recessed region of said platform for retaining said end portions in said overlapping relation.

6. A closure for separably joining adjacent margins extending peripherally about an inflat-

able structure, said closure comprising a pair of flexible stringers attached to and extending along said margins and including cooperating fastener elements at the adjacent edges of said stringers, a runner for engaging and disengaging said fastener elements, a pair of closing elements of resilient rubber-like material extending along said stringers and mounted thereon at the inner face of the closure in overlapping and contacting relation one with the other for closing said stringers along the latter, said stringers and said closing elements having end portions in overlapping relation to one another for closing said margins at said end portions, and means for separably retaining said end portions in said overlapping relation providing continuity of closing said margins at said end portions, said means including a divided platform along one of said end portions adapted for positioning said closing elements in a zone thereof in overlapping engagement one with the other and pressing said closing elements against one another.

7. A sealing slide fastener closure comprising a pair of flexible margins for the periphery of a structure, said margins comprising cooperating fastener elements at the adjacent edges of said margins and a runner for engaging and disengaging said fastener elements, a pair of closing elements of resilient rubber-like material extending along said margins at a face of said closure, said closing elements being generally L-shaped in section providing base portions at said fastener elements and lateral portions extending from said base portions for overlapping relation and tapering to edges for sealing by lip-action of one of the latter said edges against the other closing element, said closing elements having end portions one of which is outwardly flared providing a platform and terminating in an elongated recess open at the opposite face of said closure for receiving therein a part of the other of said end portions in overlapping relation therewith, said platform including bracing projections overlying the tapered lateral portions adjacent said recess for resisting separating movement of said closing elements at the first said end portion in the direction normal to said margins, and means at the recessed end of said platform for holding the end portions of said closing elements in overlapping engagement and pressingg said closing elements against one another.

8. A closure for adjacent margins extending peripherally about a structure, said closure comprising closing elements of resilient rubber-like material at said margins extending peripherally thereof for closing the same by resilient sealing contact of said elements with one another continuously along said margins, said elements in the closed condition of the closure having end portions disposed in overlapping contacting relation to one another in the peripheral direction of the closure for closing said margins at said end portions, means for separably retaining said end portions in said overlapping contacting relation, and means including a plurality of separable fastener elements in series peripherally on said margins for separably holding said closing elements in their sealing relation with one another along said margins.

9. A closure for adjacent margins extending peripherally about a structure, said closure comprising closing elements of elastic material at said margins extending peripherally thereof for closing the same by resilient sealing contact of said elements with one another continuously along said margins, said closing elements having opposite pairs of end portions disposed in the closed condition of the closure in overlapping contacting relation of one pair with respect the other pair in the peripheral direction of the closure for closing said margins at the overlapping end portions of said elements, a pair of said end portions having a recess in a face thereof and the other pair of said end portions having parts thereof for seating in said recess in said overlapping contacting relation, means for retaining said pairs of end portions in said overlapping contacting relation, and means including separable fastener elements at said margins for separately holding said closing elements in their sealing relation one with the other along said margins.

10. A closure for adjacent margins extending peripherally about a structure, said closure comprising closing elements of elastic material at said margins extending peripherally thereof for closing the same by resilient sealing contact of said elements with one another continuously along said margins, said elements having end portions disposed in the closed condition of the closure in overlapping contacting relation to one another in the peripheral direction of the closure for closing said margins at said end portions, means for engaging said end portions and separably retaining the same in said overlapping contacting relation, and slide fastener means including cooperating fastener elements at said margins for separably holding said closing elements in their sealing relation one with the other along said margins.

11. A closure for adjacent margins extending peripherally about a structure, said closure comprising a pair of closing elements of resilient rubber-like material at said margins extending peripherally thereof for closing the same by resilient sealing contact of said elements one to the other continuously along said margins, each element of said pair having peripheral portions disposed in overlapping contacting relation one to the other in the peripheral direction of the closure in the closed condition thereof and each element of said pair having at one of said peripheral portions thereof a laterally-extending enlargement for backing such peripheral portion, said peripheral portions being disposed in overlapping contacting relation one to the other in the axial direction of the closure in the closed condition thereof, means including a plurality of separable fastener elements in series peripherally on said margins for holding said pair of closing elements in their sealing relation one to the other, and clamping means at the enlargements of said closing elements for holding said peripheral portions of said closing elements in their overlapping contacting relation.

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