

Description

The present invention relates generally to slide fasteners, and more particularly to a fluid-tight (airtight and watertight) slide fastener suitable for wet suits, life preservers, etc.

U. S. Pat. No. 2,791,017, issued May 7, 1957 to F. Mulka, and U. S. Pat. No. 4,348,789, issued Sep. 14, 1982 to Brown, show a fluid-tight slide fastener of the type in which an inner longitudinal edge portion of each of opposed fluid-tight tapes is folded so as to extend around base portions of successive I-shaped coupling elements and in which successive C-shaped clamping strips surround, in clenched form, the folded edge portion over the base portion of the respective coupling element. The fluid-tight tape is relatively thick and is chiefly composed of rubber or synthetic resin having a certain degree of rigidity which is required for stable attachment of the coupling elements to the tape.

A problem with the known fluid-tight slide fastener is that smooth movement of a slider is difficult to achieve, partly because of such thick and rigid tape, and partly because the folded edge portion of the tape tends to restore its initial unfolded shape due to its own resilience.

Further, because of the rigidity of the tape, intimate contact between the opposed tapes at their contact portions contiguous to the respective folded edge portions can be impaired when lateral pulling forces are exerted on the tapes while the slide fastener is closed.

The present invention seeks to provide a fluid-tight stringer for slide fasteners suitable for wet suits, life preservers and the like.

The present invention further seeks to provide a fluid-tight slide fastener stringer in which a fluid-tight tape has adequate softness and elasticity at least around its inner longitudinal margin including a folded edge portion and contact portions, thus causing not only smooth movement of a slider, but also an improved fluid-tightness between the opposed stringers.

According to the present invention, there is provided a fluid-tight slide fastener stringer comprising: a fluid-tight tape chiefly made of elastic material; a series of discrete coupling elements mounted on said tape along an inner longitudinal margin thereof, each of said coupling elements having a generally I shape having a base portion, a leg portion and a head portion; said inner longitudinal margin of said tape being folded so as to provide therealong first and second contact portions engageable with corresponding first and second portions of a fluid-tight tape of a like companion stringer to effect a fluid-tightness between such two tapes, and a folded edge portion disposed between said first and second contact portions and extending around said base portion of each of said coupling elements; a series of generally C-shaped clamping strips each surrounding in clenched form said folded edge portion of said tape over said base portion of a respective one of said coupling elements; and said tape having a foamed layer of said elastic material extending in and through at least said first and second

contact portions and said folded edge portion.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying drawings in which certain preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.

Figure 1 is a fragmentary plan view, partially in cross section, of a pair of interengaged fluid-tight slide fastener stringers each embodying the present invention;

Figure 2 is a transverse cross-sectional view taken along line II-II of Figure 1;

Figure 3 is a transverse cross-sectional view of one of the stringers of Figure 2, showing the posture of the stringer as the opposed stringers are uncoupled;

Figure 4 is a view similar to Figure 3, showing a modified fluid-tight slide fastener stringer; and

Figures 5A, 5B, 5C and 5D are fragmentary cross-sectional views showing various fluid-tight tapes.

Figure 1 shows a pair of opposed fluid-tight slide fastener stringers 1, 1 each having a fluid-tight tape 3.

As better shown in Figures 2 and 3, the tape 3 has an inner longitudinal margin 4 folded through its entire length so as to provide a folded edge portion 8 and two contact portions (hereinafter referred to as "first and second contact portions") 9a, 9b disposed one of each side of the edge portion 8 and contiguous thereto. The first and second contact portions 9a, 9b are laterally (vertically in Figures 2 and 3) spaced from each other.

A series of discrete coupling elements 5 is mounted on and along the folded edge portion 8 of each tape 3. Each of the coupling elements 5 has a generally horizontal I-shaped cross section having a base portion 6a, a leg portion 6b, and a head portion 6. The folded edge portion 8 of the tape 3 extends around the base portion 6a of each coupling element 5. A series of generally C-shaped clamping strips 7 is also mounted in clenched form on and along the folded edge portion 8 of the tape 3, each clamping strip 7 surrounding the folded edge portion 8 of the tape 3 over the base portion 6a of a respective one of the coupling elements 5. The series of coupling elements 5 of one stringer 1 is engageable with the series of coupling elements 5 of the other stringer 1 by pulling a slider 2 which is mounted on the opposed stringers 1, 1 for movement along the two series of coupling elements 5 to open and close the slide fastener. When the opposed series of coupling elements 5, 5 are coupled together, the first and second contact portions 9a, 9b of one stringer 1 are pressed against the first and second contact portions 9a, 9b, respectively, of the other stringer 1 to effect a fluid-tightness between the opposed stringers 1, 1.

The tape 3 includes a core or ground fabric 10 of textile material, front and rear fluid-tight layers 11,

12 of elastic rubber or synthetic resin wholly covering front and rear surfaces, respectively, of the ground fabric 10. Preferably, the ground fabric 10 is woven or knit of substantially non-stretchable warp threads and stretchable weft threads.

Most important, the tape 3 also includes a spongy or foamed layer 13 of rubber or synthetic resin in the rear fluid-tight layer 12 extending on the fabric 10 along its entire width. Alternatively, the foamed layer 13 may extend through only the first and second contact portions 9a, 9b and the folded edge portion 8.

Figures 5A, 5B, 5C and 5D show various typical structures of the fluid-tight tape 3. In the tape structure of Figure 5A, the foamed layer 13 is disposed in the rear fluid-tight layer 12 in contact with the rear surface of the fabric 10. In the tape structure of Figure 5B, the foamed layer 13 is disposed in both the front and rear fluid-tight layers 11, 12 in contact with both the front and rear surfaces of the fabric 10. In the tape structure of Figure 5C, the foamed layer 13 occupies both the front and rear fluid-tight layers 11, 12. In the tape structure of Figure 5D, the foamed layer 13 occupies only the rear fluid-tight layer 12.

In the examples of Figures 5A and 5B, the foams in the foamed layer 13 may be either continuous or independent. But in the examples of Figures 5C and 5D, in which the foamed layer 13 is exposed to the exterior surface of the tape 3, the foams should be independent so that leakage of water through the foams is prevented.

The material for the front and rear fluid-tight layers 11, 12 and the foamed layer 13 may comprise rubber, or synthetic resin such as polyvinyl chloride and polyurethane.

The fluid-tight slide fastener stringer 1 thus constructed is advantageous in that because of the foamed layer 13, it is possible to increase the softness and elasticity of the contact portions 9a, 9b of the fluid-tight tape 3, thus causing smooth movement of the slider 2 for opening and closing the slide fastener.

Another advantage of the stringer 1 is that since the foamed layer 13 is excellent in ability of restitution, intimate contact between the contact portions of the opposed fluid-tight tapes 3, 3 can be prevented from being impaired when great lateral pulling forces are exerted on the tapes 3, 3 while the slide fastener is closed, thus causing an improved degree of fluid-tightness.

Further, since the foamed layer 13 can be compressed to a relatively large extent in such a manner that the individual clamping strips 7 bite into the fluid-tight tape 3 as they are clenched on the folded edge portion 8 of the tape 3 around the base portions 6a of the coupling elements 5, thus causing firm attachment of the coupling elements 5 to the tape 3.

Claims

1. A fluid-tight slide fastener stringer (1) comprising: a fluid-tight tape (3) chiefly made of elastic ma-

terial; a series of discrete coupling elements (5) mounted on said tape (3) along an inner longitudinal margin (4) thereof, each of said coupling elements (5) having a generally I shape having a base portion (6a), a leg portion (6b) and a head portion (6); said inner longitudinal margin (4) of said tape (3) being folded so as to provide therealong first and second contact portions (9a), (9b) engageable with corresponding first and second portions (9a), (9b) of a fluid-tight tape (3) of a like companion stringer (1) to effect a fluid-tightness between such two tapes (3), (3), and a folded edge portion (8) disposed between said first and second contact portions (9a), (9b) and extending around said base portion (6a) of each of said coupling elements (5); a series of generally C-shaped clamping strips (7) each surrounding in clenched form said folded edge portion (8) of said tape (8) over said base portion (6a) of a respective one of said coupling elements (5); characterized in that said tape (3) has a foamed layer (13) of said elastic material extending in and through at least said first and second contact portions (9a), (9b) and said folded edge portion (8).

2. A fluid-tight slide fastener stringer according to claim 1, characterized in that said tape (3) includes a ground fabric (10) of textile material, and front and rear fluid-tight layers (11), (12) of said elastic material covering front and rear surfaces of said fabric (10).

3. A fluid-tight slide fastener stringer according to claim 2, characterized in that said foamed layer (13) is disposed in said rear fluid-tight layer (12) in contact with said rear surface of said fabric (10).

4. A fluid-tight slide fastener stringer according to claim 2, characterized in that said foamed layer (13) is disposed in both said front and rear fluid-tight layers (11), (12) in contact with said front and rear surfaces of said fabric (10).

5. A fluid-tight slide fastener stringer according to claim 3, characterized in that said foamed layer (13) occupies said rear fluid-tight layer (12).

6. A fluid-tight slide fastener stringer according to claim 4, characterized in that said foamed layer (13) occupies both said front and rear fluid-tight layers (11), (12).

7. A fluid-tight slide fastener stringer according to claim 5, characterized in that foams in said foamed layer (13) are independent.

8. A fluid-tight slide fastener stringer according to claim 6, characterized in that foams in said foamed layer (13) are independent.

9. A fluid-tight slide fastener stringer according to claim 3, characterized in that foams in said foamed layer (13) are continuous.

10. A fluid-tight slide fastener stringer according to claim 3, characterized in that foams in said foamed layer (13) are independent.

11. A fluid-tight slide fastener stringer according to claim 4, characterized in that foams in said foamed layer (13) are continuous.

12. A fluid-tight slide fastener stringer according to claim 4, characterized in that foams in said foamed layer (13) are independent.

13. A fluid-tight slide fastener stringer according to one of the claims 1 to 12, characterized in that



12 of elastic rubber or synthetic resin wholly covering front and rear surfaces, respectively, of the ground fabric 10. Preferably, the ground fabric 10 is woven or knit of substantially non-stretchable warp threads and stretchable weft threads.

Most important, the tape 3 also includes a spongy or foamed layer 13 of rubber or synthetic resin in the rear fluid-tight layer 12 extending on the fabric 10 along its entire width. Alternatively, the foamed layer 13 may extend through only the first and second contact portions 9a, 9b and the folded edge portion 8.

Figures 5A, 5B, 5C and 5D show various typical structures of the fluid-tight tape 3. In the tape structure of Figure 5A, the foamed layer 13 is disposed in the rear fluid-tight layer 12 in contact with the rear surface of the fabric 10. In the tape structure of Figure 5B, the foamed layer 13 is disposed in both the front and rear fluid-tight layers 11, 12 in contact with both the front and rear surfaces of the fabric 10. In the tape structure of Figure 5C, the foamed layer 13 occupies both the front and rear fluid-tight layers 11, 12. In the tape structure of Figure 5D, the foamed layer 13 occupies only the rear fluid-tight layer 12.

In the examples of Figures 5A and 5B, the foams in the foamed layer 13 may be either continuous or independent. But in the examples of Figures 5C and 5D, in which the foamed layer 13 is exposed to the exterior surface of the tape 3, the foams should be independent so that leakage of water through the foams is prevented.

The material for the front and rear fluid-tight layers 11, 12 and the foamed layer 13 may comprise rubber, or synthetic resin such as polyvinyl chloride and polyurethane.

The fluid-tight slide fastener stringer 1 thus constructed is advantageous in that because of the foamed layer 13, it is possible to increase the softness and elasticity of the contact portions 9a, 9b of the fluid-tight tape 3, thus causing smooth movement of the slider 2 for opening and closing the slide fastener.

Another advantage of the stringer 1 is that since the foamed layer 13 is excellent in ability of restitution, intimate contact between the contact portions of the opposed fluid-tight tapes 3,3 can be prevented from being impaired when great lateral pulling forces are exerted on the tapes 3, 3 while the slide fastener is closed, thus causing an improved degree of fluid-tightness.

Further, since the foamed layer 13 can be compressed to a relatively large extent in such a manner that the individual clamping strips 7 bite into the fluid-tight tape 3 as they are clenched on the folded edge portion 8 of the tape 3 around the base portions 6a of the coupling elements 5, thus causing firm attachment of the coupling elements 5 to the tape 3.

Claims

1. A fluid-tight slide fastener stringer (1) comprising: a fluid-tight tape (3) chiefly made of elastic ma-

terial; a series of discrete coupling elements (5) mounted on said tape (3) along an inner longitudinal margin (4) thereof, each of said coupling elements (5) having a generally I shape having a base portion (6a), a leg portion (6b) and a head portion (6); said inner longitudinal margin (4) of said tape (3) being folded so as to provide therealong first and second contact portions (9a), (9b) engageable with corresponding first and second portions (9a), (9b) of a fluid-tight tape (3) of a like companion stringer (1) to effect a fluid-tightness between such two tapes (3), (3), and a folded edge portion (8) disposed between said first and second contact portions (9a), (9b) and extending around said base portion (6a) of each of said coupling elements (5); a series of generally C-shaped clamping strips (7) each surrounding in clenched form said folded edge portion (8) of said tape (8) over said base portion (6a) of a respective one of said coupling elements (5); characterized in that said tape (3) has a foamed layer (13) of said elastic material extending in and through at least said first and second contact portions (9a), (9b) and said folded edge portion (8).

2. A fluid-tight slide fastener stringer according to claim 1, characterized in that said tape (3) includes a ground fabric (10) of textile material, and front and rear fluid-tight layers (11), (12) of said elastic material covering front and rear surfaces of said fabric (10).

3. A fluid-tight slide fastener stringer according to claim 2, characterized in that said foamed layer (13) is disposed in said rear fluid-tight layer (12) in contact with said rear surface of said fabric (10).

4. A fluid-tight slide fastener stringer according to claim 2, characterized in that said foamed layer (13) is disposed in both said front and rear fluid-tight layers (11), (12) in contact with said front and rear surfaces of said fabric (10).

5. A fluid-tight slide fastener stringer according to claim 3, characterized in that said foamed layer (13) occupies said rear fluid-tight layer (12).

6. A fluid-tight slide fastener stringer according to claim 4, characterized in that said foamed layer (13) occupies both said front and rear fluid-tight layers (11), (12).

7. A fluid-tight slide fastener stringer according to claim 5, characterized in that foams in said foamed layer (13) are independent.

8. A fluid-tight slide fastener stringer according to claim 6, characterized in that foams in said foamed layer (13) are independent.

9. A fluid-tight slide fastener stringer according to claim 3, characterized in that foams in said foamed layer (13) are continuous.

10. A fluid-tight slide fastener stringer according to claim 3, characterized in that foams in said foamed layer (13) are independent.

11. A fluid-tight slide fastener stringer according to claim 4, characterized in that foams in said foamed layer (13) are continuous.

12. A fluid-tight slide fastener stringer according to claim 4, characterized in that foams in said foamed layer (13) are independent.

13. A fluid-tight slide fastener stringer according to one of the claims 1 to 12, characterized in that



said elastic material of said tape (3) comprises rubber.

14. A fluid-tight slide fastener stringer according to one of the claims 1 to 12, characterized in that said elastic material of said tape (3) comprises polyvinyl chloride.

15. A fluid-tight slide fastener stringer according to one of the claims 1 to 12, characterized in that said elastic material of said tape (3) comprises polyurethane.

Patentansprüche

1. Luft- und wasserdichtes Reißverschlußband (1), umfassend: ein luft- und wasserdichtes Tragband (3), das überwiegend aus einem elastischen Material hergestellt ist; eine Reihe einzelner Kuppelglieder (5), die an dem Tragband (3) entlang einem inneren Längsrand (4) desselben angebracht sind, wobei jedes dieser Kuppelglieder (5) einen im allgemeinen I-förmigen Querschnitt mit einem Basisbereich (6a), einem Schenkelbereich (6b) und einem Kopfbereich (6) hat; wobei der besagte innere Längsrand (4) des Tragbandes (3) umgefaltet ist, um längs desselben erste und zweite Berührungsbereiche (9a, 9b) zu bilden, die mit entsprechenden ersten und zweiten Bereichen (9a, 9b) eines luft- und wasserdichten Tragbandes (3) eines ähnlichen zugehörigen Reißverschlußbandes (1) in Eingriff bringbar sind, um zwischen diesen beiden Tragbändern (3, 3) eine luft- und wasserdichte Abdichtung zu bewirken, und um einen umgefalteten Randbereich (8) zu schaffen, der zwischen dem ersten und dem zweiten Berührungsbereich (9a, 9b) angeordnet ist und sich um den Basisbereich (6a) eines jeden Kuppelglieds herum erstreckt; eine Reihe im allgemeinen C-förmiger Klemmstreifen (7), die jeweils den umgefalteten Randbereich (8) des Tragbandes (3) über dem Basisbereich (6a) eines zugeordneten Kuppelglieds (5) mit Klemmwirkung umgeben, dadurch gekennzeichnet, daß das Tragband (3) eine geschäumte Schicht (13) aus dem besagten elastischen Material aufweist, die sich in und durch mindestens einen der ersten und zweiten Berührungsbereiche (9a, 9b) und den umgefalteten Randbereich (8) erstreckt.

2. Luft- und wasserdichtes Reißverschlußband nach Anspruch 1, dadurch gekennzeichnet, daß das Tragband ein Grundgewebe (10) aus Textilmaterial und eine vordere und eine hintere luft- und wasserdichte Schicht (11, 12) aus dem besagten elastischen Material umfaßt, die die Vorder- und Rückseite des Gewebes (10) bedeckt.

3. Luft- und wasserdichtes Reißverschlußband nach Anspruch 2, dadurch gekennzeichnet, daß die geschäumte Schicht (13) in der hinteren luft- und wasserdichten Schicht (12) angeordnet ist und mit der Rückseite des Gewebes (10) in Berührung steht.

4. Luft- und wasserdichtes Reißverschlußband nach Anspruch 2, dadurch gekennzeichnet, daß die geschäumte Schicht (13) sowohl in der vorderen als auch in der hinteren luft- und wasserdichten Schicht (11, 12) angeordnet ist und mit der Vorder- und Rückseite des Gewebes (10) in Verbindung steht.

5. Luft- und wasserdichtes Reißverschlußband nach Anspruch 3, dadurch gekennzeichnet, daß die geschäumte Schicht (13) die hintere luft- und wasserdichte Schicht (12) umfaßt.

6. Luft- und wasserdichtes Reißverschlußband nach Anspruch 4, dadurch gekennzeichnet, daß die geschäumte Schicht (13) sowohl die vordere als auch die hintere luft- und wasserdichte Schicht (11 und 12) umfaßt.

7. Luft- und wasserdichtes Reißverschlußband nach Anspruch 5, dadurch gekennzeichnet, daß die Schäume in der geschäumten Schicht (13) selbständig sind.

8. Luft- und wasserdichtes Reißverschlußband nach Anspruch 6, dadurch gekennzeichnet, daß die Schäume in der geschäumten Schicht (13) selbständig sind.

9. Luft- und wasserdichtes Reißverschlußband nach Anspruch 3, dadurch gekennzeichnet, daß die Schäume in der geschäumten Schicht (13) durchgehend sind.

10. Luft- und wasserdichtes Reißverschlußband nach Anspruch 3, dadurch gekennzeichnet, daß die Schäume in der geschäumten Schicht (13) durchgehend sind.

11. Luft- und wasserdichtes Reißverschlußband nach Anspruch 4, dadurch gekennzeichnet, daß die Schäume in der geschäumten Schicht (13) durchgehend sind.

12. Luft- und wasserdichtes Reißverschlußband nach Anspruch 4, dadurch gekennzeichnet, daß die Schäume in der geschäumten Schicht (13) selbständig sind.

13. Luft- und wasserdichtes Reißverschlußband nach einem der Ansprüche 1 bis 12, dadurch gekennzeichnet, daß das elastische Material des Tragbandes (3) Gummi umfaßt.

14. Luft- und wasserdichtes Reißverschlußband nach einem der Ansprüche 1 bis 12, dadurch gekennzeichnet, daß das elastische Material des Tragbandes (3) Polyvinylchlorid umfaßt.

15. Luft- und wasserdichtes Reißverschlußband nach einem der Ansprüche 1 bis 12, dadurch gekennzeichnet, daß das elastische Material des Tragbandes (3) Polyurethan umfaßt.

Revendications

1. Bande d'accrochage (1) de fermeture à glissière étanche aux fluides comprenant: un ruban (3) étanche aux fluides, formé principalement d'une matière élastique; une série d'éléments d'accouplement séparés (5) montés sur ledit ruban (3) le long d'un bord longitudinal intérieur (4) de ce dernier, chacun desdits éléments d'accouplement (5) ayant une forme globalement en I comportant une partie base (6a), une partie jambe (6b) et une partie tête (6); ledit bord longitudinal intérieur (4) du ruban (3) étant plié de manière à former le long de ce dernier des première et seconde parties de contact (9a), (9b) pouvant venir en contact avec des première et seconde parties correspondantes (9a), (9b) d'un ruban (3) étanche aux fluides d'une bande-support associée analogue (1) pour assurer une étanchéité vis-à-vis des fluides entre les deux rubans (3), (3), et une



partie marginale pliée (8) disposée entre les première et seconde parties de contact (9a), (9b) et s'étendant autour de ladite partie base (6a) de chacun des éléments d'accouplement (5); une série de bandes de serrage (7) en forme de C entourant chacun sous une forme serrée la partie marginale pliée (8) du ruban (3) sur la partie base (6a) de celui correspondant desdits éléments d'accouplement (5); caractérisée en ce que le ruban (3) comporte une couche expansée (13) de ladite matière élastique s'étendant dans au moins les première et seconde parties de contact (9a), (9b) et la partie marginale pliée (8) et d'un côté à l'autre de ces première et seconde parties de contact et cette partie marginale.

2. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 1, caractérisée en ce que le ruban (3) comprend un tissu de fond () en matière textile et des couches avant et arrière (11), (12) étanches aux fluides, de ladite matière élastique, recouvrant les surfaces avant et arrière du tissu (10).

3. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 2, caractérisée en ce que la couche expansée (13) est disposée dans la couche arrière (12) étanche aux fluides, en contact avec ladite surface arrière du tissu (10).

4. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 2, caractérisée en ce que la couche expansée (13) est disposée dans les deux couches avant et arrière (11), (12), étanches aux fluides, en contact avec lesdites surfaces avant et arrière du tissu (10).

5. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 3, caractérisée en ce que la couche expansée (13) occupe la couche arrière (12) étanche aux fluides.

6. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 4, caractérisée en ce que la couche expansée (13) occupe les deux couches avant et arrière (11), (12) étanches aux fluides.

7. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 5, caractérisée en ce que les cellules de la couche expansée (13) sont indépendantes.

8. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 6, caractérisée en ce que les cellules de la couche expansée (13) sont indépendantes.

9. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 3, caractérisée en ce que les cellules de la couche expansée (13) sont continues.

10. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 3, caractérisée en ce que les cellules de la couche expansée (13) sont indépendantes.

11. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 4, caractérisée en ce que les cellules de la couche expansée (13) sont continues.

12. Bande d'accrochage de fermeture à glissière étanche aux fluides selon la revendication 4, caractérisée en ce que les cellules de la couche expansée (13) sont indépendantes.

13. Bande d'accrochage de fermeture à glissière étanche aux fluides selon l'une quelconque des revendications 1 à

5 12, caractérisée en ce que ladite matière élastique du ruban (3) est constituée par du caoutchouc.

10 14. Bande d'accrochage de fermeture à glissière étanche aux fluides selon l'une quelconque des revendications 1 à 12, caractérisée en ce que ladite matière élastique du ruban (3) est constituée par du chlorure de polyvinyle.

15 15. Bande d'accrochage de fermeture à glissière étanche aux fluides selon l'une quelconque des revendications 1 à 12, caractérisée en ce que ladite matière élastique du ruban (3) est constituée par du polyuréthane.