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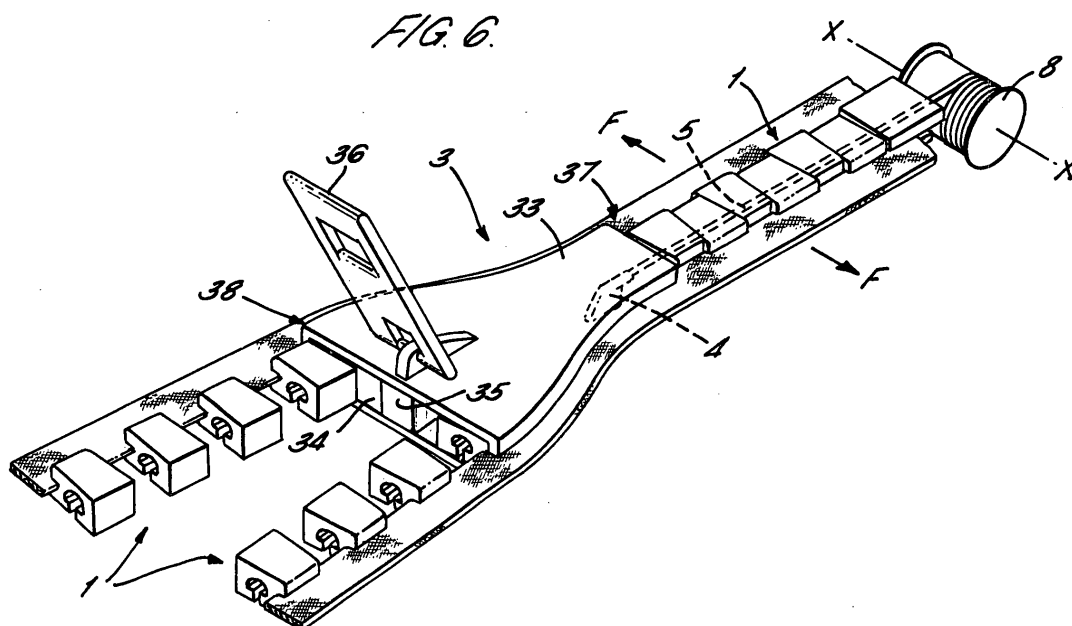
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(54) **A reinforced zip**

(57) The invention is a zip fastener device (1) comprising two sets of opposing teeth (2) and an actuating mechanism (3) operable to bring the opposing teeth (2) into interlocking engagement when moved along the sets of teeth (2) from a first end to a second end and to disengage the interlocked teeth (2) when moved from the second end towards the first end; wherein each tooth is formed with a cavity (7) therethrough located such that when the teeth (2) are interlocked the cavities (7) align

to form a continuous channel through the engaged teeth (2), a flexible line (5) is provided in a storage device (8) at the first end of the device, and the actuating mechanism (3) is arranged to extend the line (5) from the storage device and locate it in the channel as the actuating mechanism is moved from the first end to the second end; and wherein the device (1) is provided with resilient means which holds the flexible line (5) in tension to prevent any slack forming in the line (5). The device (8) may have means to lock if it is subjected to a sudden force.



Description

[0001] The present invention relates to zips suitable for closing apertures on item such as clothing or luggage, and in particular to zips which must withstand forces to keep an aperture sealed.

[0002] Zips, consisting of two sets of individual teeth which can be engaged and disengaged by a slider mechanism are well known in the art. Known zips have the disadvantage that the two sets of teeth can become disengaged accidentally, causing the zip to "pop" open. This can occur because the teeth are damaged or a force is applied to the zip which the teeth are unable to withstand, for example when a zip is used to close a bag or suitcase which has been over-filled. Once the sets of teeth are disengaged in this way, it is difficult to re-engage them.

[0003] Once a few of the teeth have become disengaged, the remaining engaged teeth can be separated relatively easily. Thus once the sets of teeth are separated at any point, it is likely that the entire zip will fail. Since zips are frequently used on items such as luggage, clothing and footwear, a failure of the zip can cause serious problems to the user.

[0004] The slider is only designed to cause engagement of the two sets of teeth when pulled along the zip in one direction. Therefore, it may jam if pulled back down a zip which has "popped" into disengagement. The disadvantage is therefore increased because there is no quick or easy means to reconnect a zip whose teeth are improperly separated.

[0005] The present invention provides a zip fastener device comprising two sets of opposing teeth and an actuating mechanism operable to bring the opposing teeth into interlocking engagement when moved along the sets of teeth from a first end to a second end and to disengage the interlocked teeth when moved from the second end towards the first end; wherein each tooth is formed with a cavity therethrough located such that when the teeth are interlocked the cavities align to form a continuous channel through the engaged teeth, a flexible line is provided in a storage device at the first end of the device, and the actuating mechanism is arranged to extend the line from the storage device and locate it in the channel as the actuating mechanism is moved from the first end to the second end; characterised in that the device is provided with resilient means which holds the flexible line in tension to prevent any slack forming in the reinforcing line.

[0006] Thus, the line acts as a reinforcement to resist the interlocked teeth from becoming disengaged. It has the extra advantage that even if the sets of teeth accidentally lose engagement with each other, the reinforcing line will ensure that the sets of teeth do not become widely separated. This is of particular advantage for zips which are used to withstand significant forces, and whose failure is especially problematic to a user, e.g. if an item of luggage pops open in transit.

[0007] Preferably, the cavities are shaped such that the channel has a continuous opening along one face of the teeth when interlocked.

[0008] This provides a reliable means for the line to be located in the cavities of the interlocked teeth.

[0009] Advantageously, the actuating mechanism comprises a slider and the line is secured to a pin protruding from the actuating mechanism into the channel through the opening.

[0010] Thus, the line is supported at the correct position to enter the cavity of each interlocked tooth.

[0011] Advantageously, the line has a circular cross-section and the opening has a width slightly smaller than the diameter of the line.

[0012] This has the advantage that the line cannot be removed from the cavity through the opening.

[0013] In one embodiment, an end of the line is retained adjacent to the actuating mechanism by magnetic means.

[0014] This has the advantage that the teeth do not require an opening to allow a physical connection between the line and the actuating mechanism.

[0015] Conveniently, the storage device comprises a rotatable spool around which the line is coiled.

[0016] This allows the line to be stored in a compact manner, whilst being able to be deployed easily.

[0017] Advantageously, the resilient means is provided in the storage device and assists with retraction of the line into the storage device.

[0018] Conveniently, the storage device further comprises locking means operable to prevent further extension of the line if the line is subject to a sudden force.

[0019] A preferred embodiment of the reinforced zip apparatus according to the present invention will now be described, with reference to the accompanying figures, in which:

Figure 1 is a perspective view of a slider according to the present invention;

Figure 2 is a plan view of the zip according to the present invention with one face of the slider removed for clarity;

Figure 3 is a cross section of the slider and zip according to figure 2;

Figure 4 is a perspective view of the teeth of one part of the zip according to the present invention;

Figure 5 is an enlarged perspective view of one tooth;

Figure 6 is a perspective view of a reinforced zip according to the present invention;

[0020] As shown in Figure 6, in common with conventional zips, a zip 1 in accordance with a first embodiment of the present invention comprises two sets of opposing teeth 2 and a slider mechanism 3 which can be drawn along the device. Movement of the slider 3 in one direction brings the two sets together and forces the teeth 2 into interlocking engagement. Movement of the slider 3

in the opposite direction forces the interlocking teeth apart, allowing the two sets to separate.

[0021] As shown in Figure 1, the slider 3 comprises upper and lower plates 33, 34 joined by a wedge shaped bridging member 35. A pivotable tab 36 may be provided to assist with grasping and pulling the slider 3 along the zip 1.

[0022] The slider 3 has a narrower, open end 37 and a wider, open end 38. The wider end 38 is divided into two openings by the bridging member 35.

[0023] In a known manner, to close the zip 1 the slider 3 is drawn along the sets of teeth 2 with the wider end 38 leading such that the narrowing of the slider 3 towards the trailing end 37 forces the teeth 2 together to close the zip. When drawn in the opposite direction, the bridging member 35 of the slider 3 forces the engaged teeth 2 apart to open the zip.

[0024] Thus, the slider 3 is like that of a conventional zip, except that it is also provided with a driving pin 4 extending from the lower plate 34 of the slider 3 adjacent to the narrow end 37. A reinforcing line 5, described further below, is secured to the pin 4.

[0025] Referring to Figures 1 and 6, the reinforcing line 5, which is a thin, flexible but strong line made from, e.g. plastic or wire, is connected at one end to the driving pin 4 of the slider 3, and connected at the other end to a reel 8 located at the base of the zip 1. The reel 8 is preferably a cylindrical body, able to rotate about its longitudinal axis X. When the zip 1 is open, the reinforcing line 5 is wound around the reel 8 for storage. As the slider 3 is pulled up the zip 1 to close it, it pulls line 5 from the reel 8.

[0026] The reel 8 is preferably connected to resilient means (not shown) which exerts a torque on the reel 8. This torque acts to hold the reinforcing line 5 in tension between the reel 8 and the slider 3. The tension is sufficiently low that the slider 3 will not be moved by the force exerted through the reinforcing line 5. However, the tension in the reinforcing line 5 will be enough to ensure that when the slider 3 is moved towards the reel 8, the reel 8 rotates to prevent any slack forming in the reinforcing line 5.

[0027] The reel 8 is preferably located inside a substantially enclosed container (not shown). This container protects the reel 8, stored reinforcing line 5 and the resilient means from being damaged, and aims to prevent them becoming clogged with dirt. The reinforcing line 5 passes out of the container through an aperture.

[0028] In a zip with a permanently closed end, the two halves of the zip are conventionally held together by a clamp. When the zip 1 has one permanently closed end, the container preferably also has the function of connecting the two opposing sets of teeth 2 together at the closed end of the zip 1. This obviates the need for a separate clamp to secure the closed end.

[0029] The reel 8 is preferably able to move laterally along the axis X. The movement allows the reinforcing line 5 stored on the reel 8 to be aligned with the rein-

forcing line 5 in the cavity 7, whichever part of the reel 8 the reinforcing line 5 is stored on. This ensures that the reinforcing line 5 can move smoothly from the reel 8 into the cavity 7, without being forced to bend.

[0030] Referring to Figure 4, there is shown part of the two sets of opposed teeth 2. Each set comprises a series of spaced individual teeth 2 having the same orientation and arranged in a plane. Each tooth 2 is shaped so as to engage between two teeth of the opposing set. As best seen in Figure 5, each tooth 2 has an aperture 6 on an outer surface of the tooth 2. The aperture 6 is preferably formed in a surface of the tooth facing perpendicular to the plane of engagement of the teeth 2 when the zip 1 is closed. Preferably, the aperture 6 is on the side of the zip which will be out of sight when in use. Thus, on luggage, clothing and footwear, the aperture 6 will preferably be on the side facing the interior of the item or garment. This ensures that the aperture 6 and reinforcing line 5 are not visible in normal use.

[0031] Referring to Figure 5, the aperture 6 opens into a cavity 7 in each tooth 2. The aperture 6 and cavity 7 together form a longitudinal channel through each tooth 2. The aperture 6 and cavity 7 are both open at the longitudinally forward and rearward facing surfaces of each tooth 2. The cavity 7 has a cross-section which is preferably larger than that of the aperture 6. The cross sectional area of the cavity 7 is preferably only slightly greater than that of the reinforcing line 5. The aperture 6 and cavity 7 are located in each tooth 2 such that when the two sets of teeth 2 are engaged, the apertures 6 and cavities 7 of each tooth 2 are aligned to create a continuous channel along the zip 1.

[0032] Referring to Figure 5, as in a conventional zip one side of each tooth 2 is secured onto material of the item, in order to connect the teeth 2 with the item the zip is used to close. The securing means requires a certain portion of one side of each tooth 2, and so the aperture 6 and cavity 7 are not located in the centre of each tooth 2, but are located on the side away from the securing material. This off-set of the apertures 6 and cavities 7 is necessary to form a continuous channel along the zip 1, in which the reinforcing line 5 is located in the centre of the zip 1.

[0033] As mentioned above, the zip 1 is closed by the slider 3 engaging teeth 2 from the two sets of teeth in a conventional manner. As the slider 3 is pulled, the driving pin 4 runs along the channel formed by the aligned cavities 7 and the reinforcing line 5 is pulled with it. This ensures that the reinforcing line 5 runs through the engaged portion of the zip 1, whilst not obstructing the open portion of the zip 1. When the slider 3 is pulled down the zip, to open engaged teeth 2, the driving pin 4 pushes the reinforcing line 5 back towards the closed end of the zip 1 and the storage reel 8. The reinforcing line 5 is thus not present at the point in the slider 3 where the teeth 2 are disengaged from one another.

[0034] The slider 3 can thus perform its function of engaging and disengaging the teeth 2 without interference

from the reinforcing line 5.

[0035] The cavity 7 is formed such that when the reinforcing line 5 is inserted into the cavity 7, its chance of accidental departure from the cavity 7 through the aperture 6 is minimised. The aperture 6 is preferably very slightly smaller in width than the diameter of the reinforcing line 5. The reinforcing line 5 therefore cannot easily leave the cavity 7 through the aperture 6. The reinforcing line 5 is sufficiently long such that when the zip 1 is closed along its entire length the reinforcing line 5 is present in the cavity 7 of every tooth 2. The driving pin 4 is located such that the end of the reinforcing line 5 is held inside the cavity 7 of the teeth 2 which are fully engaged with the opposite set of teeth 2.

[0036] In the event that the teeth 2 experience a force F as shown in Figure 6 acting laterally so as to disengage the two sets of teeth 2, the reinforcing line 5 running through the channel in the teeth 2, will act to restrain lateral movement of the teeth 2 to discourage their separation. Even if some separation does occur in extreme circumstances, the two sets of teeth 2 will not separate fully from each other, due to the presence of the line 5, and the zip will remain substantially closed despite the teeth not being engaged.

[0037] The reel 8 may be provided with a locking mechanism (not shown) to prevent rotation when a large or sudden force is applied, similar to that on a vehicle seat belt for example. In the case of an accidental separating of the teeth 2, there will be some force on the reinforcing line in the longitudinal direction. This force will act to pull any excess line 5 from the reel 8, which would allow the two sets of teeth 2 to separate. The reel locking mechanism will prevent further reinforcing line 5 from leaving the reel 8, and so prevent separation of the sets of teeth 2. The slider 3 could also be fitted with a locking mechanism to lock it in place if accidental separation of the teeth is detected.

[0038] Although the driving pin 4 is illustrated as an elongate member, it could also be a flat plate extending outwardly from the slider 3, or any other shape suitable for linking the reinforcing line 5 to the slider 3. In an alternative embodiment, the reinforcing line 5 may not be connected to the slider 3 by means of a driving pin 4. The reinforcing line 5 may be moved by means of magnets on the slider 3 and reinforcing line 5. This has the advantage that the aperture 6 in the teeth would not be required. The reinforcing line 5 would still be located in the cavity 7 in this embodiment.

[0039] Although the driving pin 4 is preferably adjacent to the narrow end 37 of the slider 3, the driving pin 4 may be located at any point between the bridging member 35 and the narrow end 37. Particularly if the driving pin 4 is located more closely adjacent to the bridging member 35, then guide rails (not shown) may be provided within the slider 3, e.g. extending upwardly from the lower plate 34. As each tooth 2 passes through the slider 3, the aperture 6 receives a guide rail. The guide rails thus accurately guide each tooth 2 as it

moves through the slider 3, such that each tooth 2 is in the exact position necessary for the aperture 6 to receive the driving pin 4.

[0040] Although the aperture 6 in the teeth 2 is preferably smaller in width than the cavity 7, it is not necessary for this to be the case. If the aperture 6 is the same width or larger than the cavity 7, the invention will still work well if the aperture 6 does not permit the reinforcing line 5 to leave the cavity in the event that the teeth 2 lose engagement with each other. In this case, the force on the sets of teeth 2 will be mainly acting to separate them in the plane of the zip 1. The reinforcing line 5 will be retained in the cavity 7 if the aperture 6 is not aligned with the side of the cavity 7 nearest to the opposing set of teeth 2. Similarly, the reinforcing line 5 will be retained in the cavity 7 if the aperture 6 leads from the cavity 7 in a direction at least partially away from the opposing set of teeth 2.

[0041] In another embodiment, the cavity 7 is of a size substantially greater than the reinforcing line 5. In the event that the teeth 2 lose engagement with each other, the force will cause the reinforcing line 5 to move within the cavity 7 to one side of the cavity 7. The cavity 7 can be shaped to hold the line 5 securely at this point, and not allow the line 5 to escape through the aperture 6.

[0042] The reinforcing line 5 is preferably formed of steel wire, although materials such as plastics, fabrics or other suitable materials can be used. The line 5 may have a circular cross-section, rectangular cross-section, or be formed as a flat tape or any other suitable shape. The teeth, slider, driving pin and reel may be formed of plastic, metal or any suitable material.

[0043] The teeth 2 have been shown as being tapered in shape, to allow them to interlock and engage securely. However, any suitable shape of teeth 2 can be used.

[0044] Thus, the present invention provides an improved zip fastener device in which a reinforcing line helps to retain the teeth in interlocking engagement and resists accidental disengagement and "popping" of the zip in use. Thus a more secure fastening device is provided. It will be appreciated that many modifications and variations to the precise details described may be made without departing from the scope of the claims.

Claims

1. A zip fastener device (1) comprising two sets of opposing teeth (2) and an actuating mechanism (3) operable to bring the opposing teeth (2) into interlocking engagement when moved along the sets of teeth from a first end to a second end and to disengage the interlocked teeth (2) when moved from the second end towards the first end; wherein each tooth is formed with a cavity (7) therethrough located such that when the teeth (2) are interlocked the cavities (7) align to form a continuous channel through the engaged teeth (2), a flexible line (5) is

provided in a storage device at the first end of the device, and the actuating mechanism (3) is arranged to extend the line (5) from the storage device and locate it in the channel as the actuating mechanism (3) is moved from the first end to the second end; 5

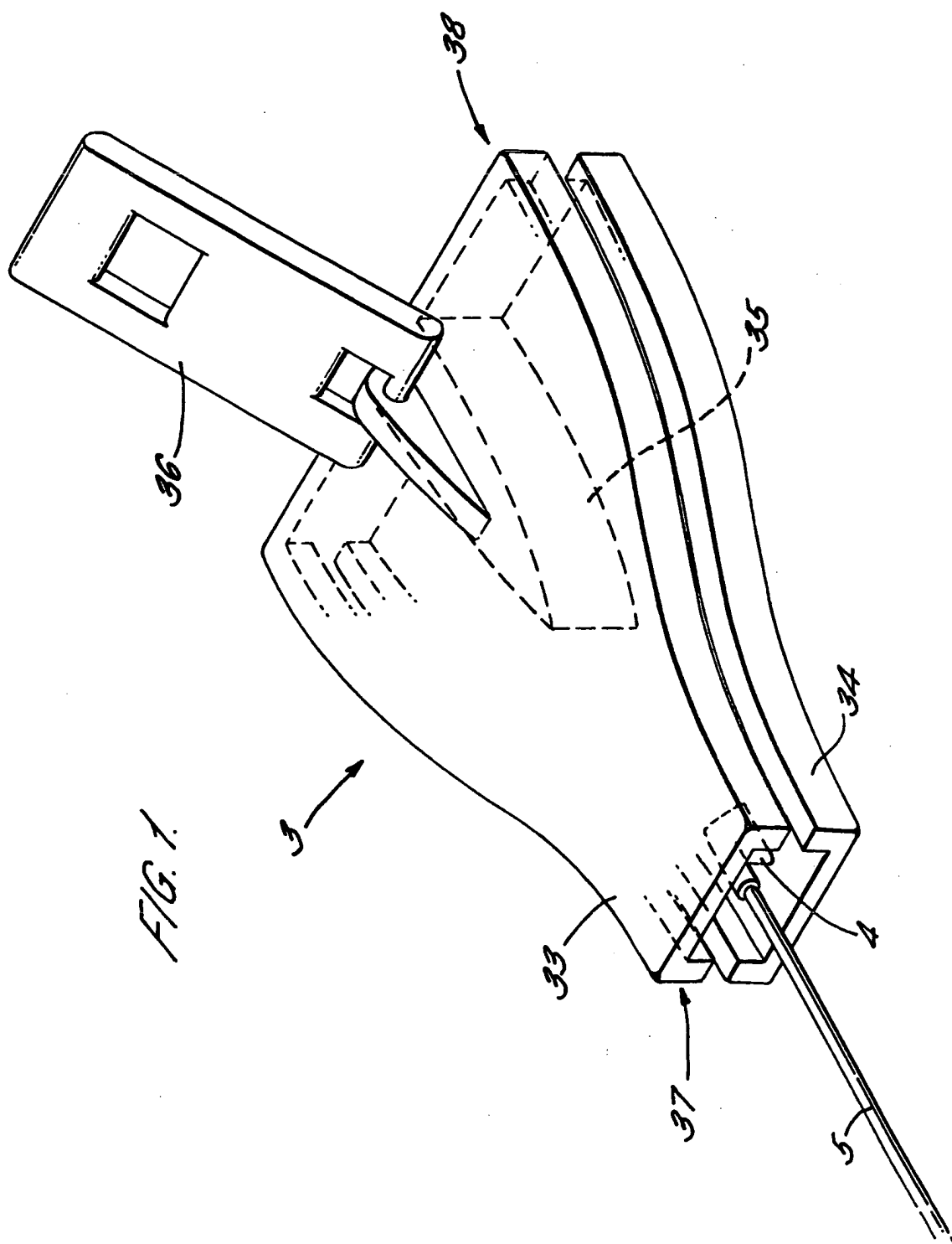
characterised in that:

the device (1) is provided with resilient means which holds the flexible line (5) in tension to prevent any slack forming in the line (5). 10

2. A zip fastener device as claimed in claim 1, wherein the resilient means is provided in the storage device and assists retraction of the line (5) into the storage device. 15
3. A zip fastener device as claimed in claim 2, wherein the storage device comprises a rotatable spool (8) around which the line is coiled and the resilient means exerts a torque on the spool (8). 20
4. A zip fastener device as claimed in any one of the preceding claims, wherein the cavities (7) are shaped such that the channel has a continuous opening (6) along one face of the teeth when interlocked. 25
5. A zip fastener device as claimed in claim 4, wherein the actuating mechanism (3) comprises a slider and the line (5) is secured to a pin (4) protruding from the slider into the channel through the opening (6). 30
6. A zip fastener device as claimed in claim 4, wherein an end of the line (5) is retained adjacent to the actuating mechanism (3) by magnetic means. 35
7. A zip fastener device as claimed in any one of claims 5 or 6, wherein the line (5) has a circular cross-section and the opening (6) is slightly smaller than the diameter of the line (5). 40
8. A zip fastener device as claimed in any one of the preceding claims, wherein the storage device further comprises locking means operable to prevent further extension of the line (5) if the line (5) is subject to a sudden force. 45

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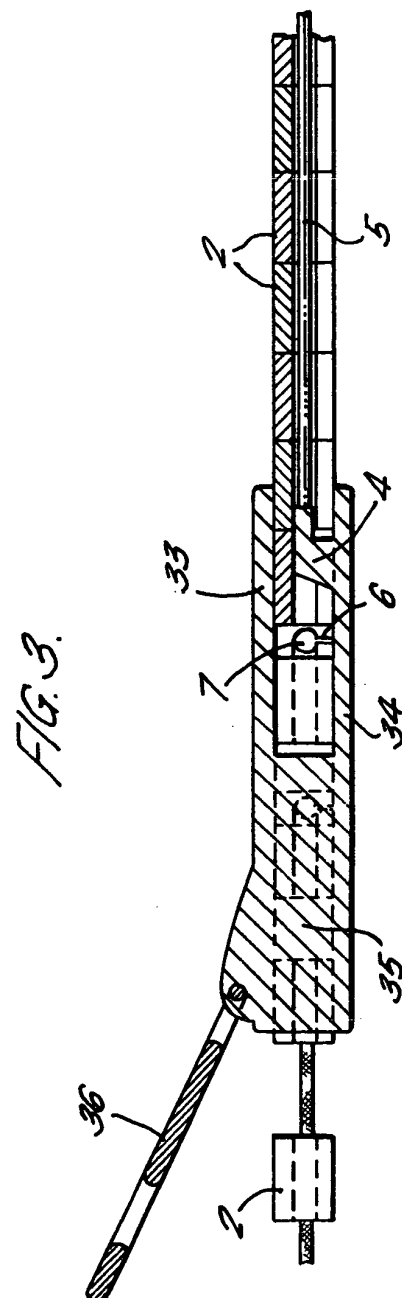
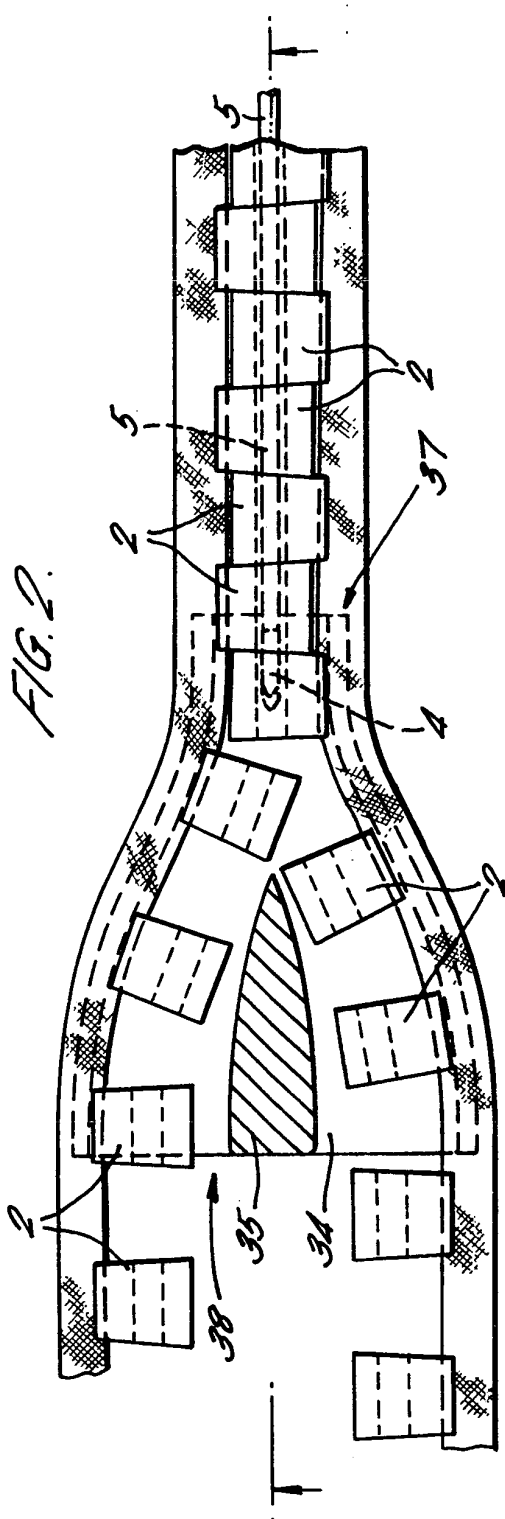


FIG. 4.

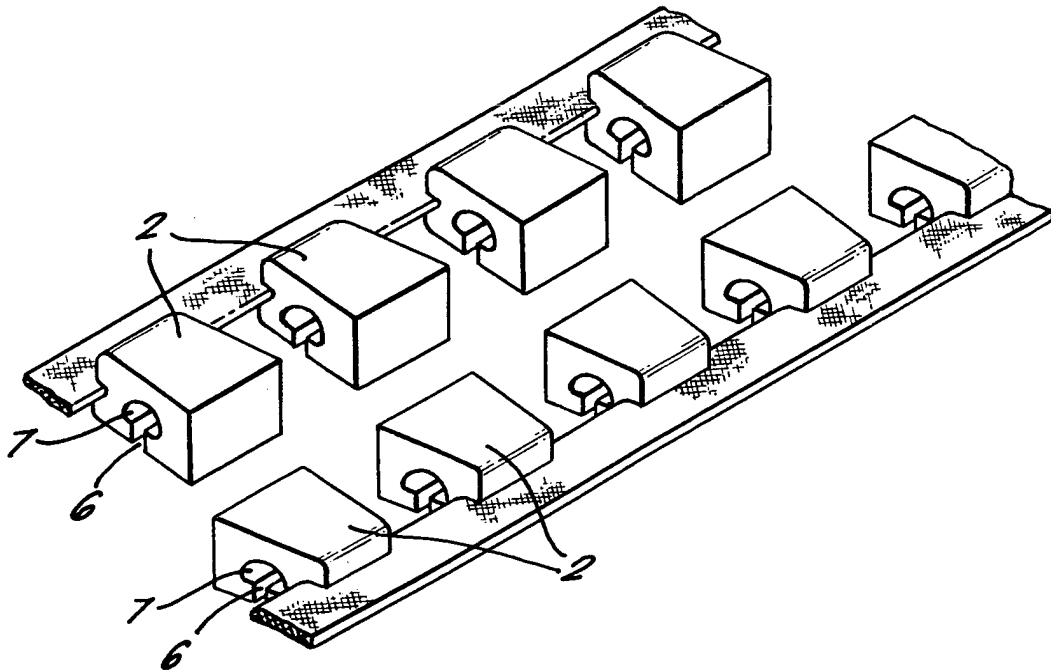
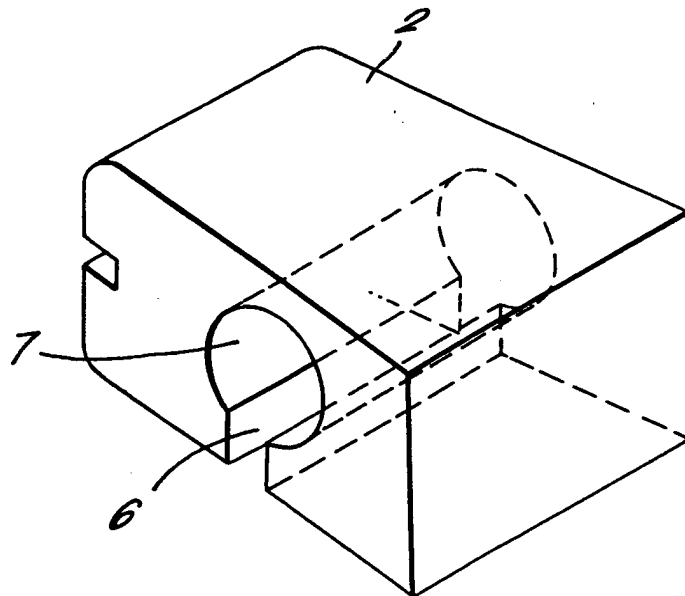
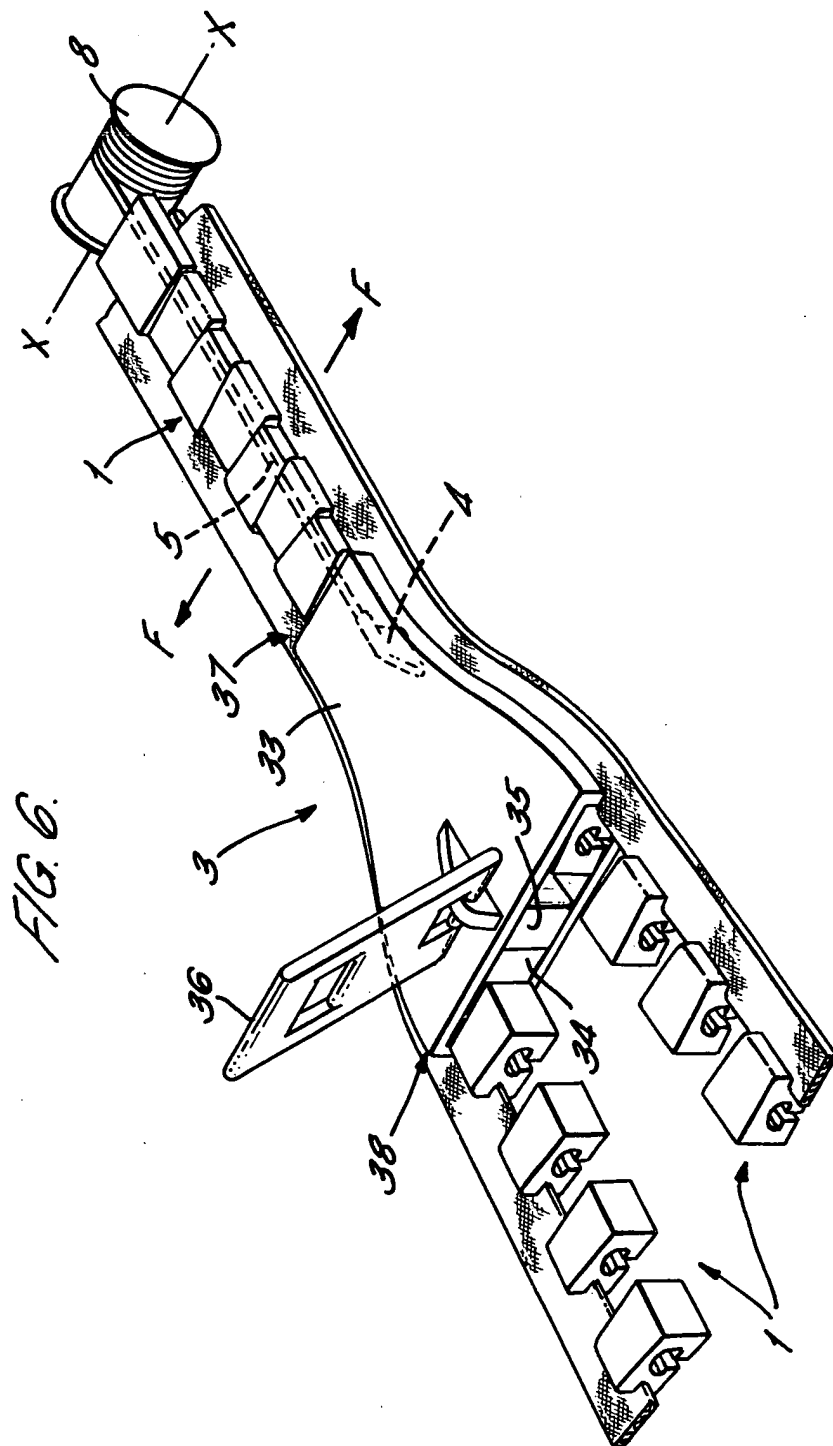


FIG. 5.







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EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3410

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 1 980 955 A (NORTON SAMUEL H) 13 November 1934 (1934-11-13) * page 1, line 32 - line 87; figures 1-6 *	1-5,7,8	A44B19/18
X	CH 272 230 A (INDRAK OTTO) 15 December 1950 (1950-12-15) * page 2, line 25 - page 3, line 20; figures 1-4 *	1-5,7,8	
A	GB 658 595 A (RAMON DE TORRE ISUNZA; DIEZ Y CIA S A) 10 October 1951 (1951-10-10) * page 1, line 43 - line 90; figures 1-4 *	1	
A	US 2 564 742 A (WAHL NICHOLAS A) 21 August 1951 (1951-08-21) * column 2, line 32 - column 3, line 47; figures 1-4 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A44B
Place of search		Date of completion of the search	Examiner
Munich		26 August 2004	Horubala, T
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 25 3410

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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26-08-2004

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