Title: A FASTENER AND A METHOD FOR ITS MANUFACTURE

Abstract: A fastener (F) comprising two tapes (1, 2), made of a flexible fabric. Around a respective longitudinal edge (1a, 2a) of each of said tapes (1, 2) a respective plurality of separate coupling members (3; 3a, 3b) adapted to be engaged with and disengaged from those of the other tape (2, 1) is fixed. The tapes (1, 2) are made of a knitted fabric including a plurality of longitudinal chain threads (C1, C2, ...) interlaced by tricot or welt threads (A1, B1; A2, B2; ...) extending along respective sinuous paths so as to form a corresponding plurality of longitudinal stitch wales (W12, W23, W34, ...). An essentially inextensible anchoring cord (AC) extends and is firmly retained through the first stitch wale (W12) of each tape (1, 2) adjacent the said edge (1a, 2a). The coupling members (3; 3a, 3b) of each tape (1, 2) grips the said anchoring cord (AC).
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European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
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For two-letter codes and other abbreviations, refer to the “Guidance Notes on Codes and Abbreviations” appearing at the beginning of each regular issue of the PCT Gazette.
A fastener and a method for its manufacture

The present invention generally relates to fastener devices, such as so-called zippers and the like.

Fasteners of that kind are widely used for fastening articles, such as for instance bags, rucksacks and articles of clothing.

The present invention is directed in particular to a fastener of the kind comprising
  two tapes made of a flexible fabric and adapted to be attached to respective mating portions of an article;
  around a respective longitudinal edge of each of said tapes there being fixed a respective plurality of separate coupling members, adapted to be engaged with and disengaged from those of the other tape;
  in their engaged condition said coupling members being capable of retaining said tapes in a juxtaposed relationship.

Two different prior art fasteners of that type are (partially) shown in figures 1 and 2, respectively, of the annexed drawings.

The fastener F shown in figure 1 is a quite conventional slide fastener or zipper, including two tapes or stringers 1, 2 made of a woven fabric, adapted to be secured, typically by sewing, to the edges of mating portions of an article. Around a respective edge 1a, 2a of each of said tapes 1, 2 there are secured respective coupling members 3, which are conventional zipper locking teeth, adapted to be selectively engaged and disengaged by means of a per se known slider (not shown). Said locking teeth 3 can be made of
metal and clamped around the edges 1a, 2a of the tapes or stringers 1, 2, or can be made of a plastics material, injection-moulded around said edges of the fastener tapes.

In their engaged condition, the locking teeth 3 retain the tapes 1, 2 of the fastener in a juxtaposed relationship, as shown in the lower portion of figure 1.

Another prior art fastener of the aforedefined type is shown in figure 2. Also the fastener of figure 2 comprises two flexible stringers or tapes 1, 2 made of a woven fabric. Said tapes 1, 2 are provided with respective coupling members 3a, 3b made of a plastics material, overmoulded around the longitudinal edges 1a and 2a of the stringers or tapes 1, 2. In the embodiment shown in figure 2 the coupling members 3a are female members, and are provided with a front aperture 4 and two facing side apertures 5. The coupling members 3b are male members, and are provided with an enlarged distal end or head portion 6 adapted to be manually fitted, with a snap engagement, into a corresponding female member 3a, through the front aperture 4 thereof, in a per se known manner. The coupling members 3a and 3b form sort of snap buttons or snap buckles.

In recent times the use of tapes or stringers made of knitted fabrics has been proposed, particularly for fasteners intended for use in articles of clothing, because of the lightness and the generally better feel of such fabrics.

To the applicant's knowledge, tapes or stringers made of a plain knitted fabric have been so far used only in slide fasteners of the special kind in which the coupling members are formed of continuous spiral coils, made of a plastics material and sewn i.e. stitched on one side of the tapes or
interwoven in said tapes.

Stringers or tapes made of a knitted fabric are generally not suited for use in fasteners of the conventional kinds shown in figures 1 and 2, i.e. in fasteners in which respective pluralities of distinct and separate coupling members are fixedly secured at regular distances around one edge of each tape.

It is therefore an object of the present invention to provide a novel fastener of the initially-defined kind having distinct and separate coupling members fixedly secured to the fastener stringers or tapes.

This and other objects are achieved according to the invention by the fastener defined in claim 1 and the method of manufacture defined in claim 17.

Further characteristics and advantages of the present invention will become apparent from the detailed description which follows, with reference with the annexed drawings, in which:

figures 1 and 2 (already described) are partial views of prior art fasteners;
figure 3 is a partial view showing a portion of a first fastener according to the present invention;
figure 4 is a diagram showing the construction of a stringer or tape made of a knitted fabric, for a fastener according to the present invention;
figure 5 is a diagrammatic cross-sectional view, essentially along line V-V of figure 3;
figure 6 is a diagrammatic cross-sectional view similar to that of figure 5, showing in phantom a coupling member secured around one edge of a fastener stringer or tape ac-
cording to the present invention;

figure 7 is perspective view similar to that of figure 2, and shows one portion of a second embodiment of a fastener according to the present invention;

figure 8 is a diagram showing the construction of a stringer or tape made of a knitted fabric for the fastener of figure 7;

figure 9 is a diagrammatic cross-sectional view, essentially along line IX-IX of figure 7, and

figure 10 is a diagrammatic cross-sectional view similar to that of figure 9, showing in phantom one portion of a coupling member fixedly secured around one edge of a stringer or tape of the fastener of figures 7 to 9.

Figure 3-6 of the annexed drawings relate to a first exemplary embodiment of a fastener according to the present invention. In said figures items which have already been described in connection with figures 1 and 2 have been attributed again the same alphabetical/numerical references.

In the fastener F of figure 3 the tapes or stringers 1 and 2 are made of a knitted fabric. Each tape, as shown in figures 4 to 6, includes a set of n longitudinal chain threads C1, C2 ... Cn, interlaced by tricot or weft thread pairs A1-B1, A2-B2, ... An-1, Bn-1.

As it appears in particular in figure 4, the chain threads C form each a plurality of interlaced loops, and the tricot or weft threads A and B extend along respective sinuous paths with alternate loops which are interlaced with adjacent loops of the chain threads C.

Each chain thread A(B) extends along a sinuous path which is essentially "in counterphase" with respect to the sinuous
path followed by the other thread B(A) of the same pair. The successive loops of a same weft thread A or B alternately engage loops formed in two adjacent chain threads.

The construction of the knitted fabric is such as to form, between each pair of adjacent chain threads, a corresponding longitudinal stitch wale W.

In figure 4, the stitch wale formed between chain threads C1 and C2 has been indicated W12. Similarly, the stitch wale comprised between chain threads C2 and C3 has been indicated W23, etc.

Each longitudinal stitch wale W comprises a plurality of stitches. In figure 4 the four stitches shown in stitch wale W12 (which is the first stitch wale adjacent the tape edge 1a or 2a) are indicated S121-S124. Each of said stitches is formed by corresponding portions of the weft threads A1 and B1 of a same weft thread pair.

An essentially inextensible anchoring cord AC extends through the stitches S121, S122, ... of the first stitch wale W12 of each tape 1, 2 adjacent the edge 1a, 2a thereof.

The cord AC of each stringer or tape 1, 2 serves as the anchoring member onto which the coupling members 3 of the slide fastener F are secured. This applies to locking teeth 3 made of metal, clamped around the edges of said stringers or tapes, as well as to locking teeth 3 or the coupling members 3a, 3b of figure 7 made of a plastics material, injection-moulded around the edges 1a, 2a of said stringers or tapes. In both cases, the coupling members or locking teeth 3 firmly grip the anchoring cord AC.
The anchoring cord AC of each stringer or tape must be firmly retained within the first stitch wale W12 of the respective stringer or tape 1, 2. This can be achieved by subjecting the first tricot or weft thread pair A1-B1 to proper tensions during the knitting process, so that the stitches S121, S122, etc. be firmly fastened onto said anchoring cord.

Tests carried out by the applicant have shown that optimum results are obtained when the coupling members are secured to a tape in which the weft threads A1 and B1, which form the stitches of the first stitch wale W12, have been subjected in knitting to respective predetermined different tensions, the tension applied to one of them, for instance the weft thread B1, being greater than that applied to the other, A1, so that the said stitches become strongly asymmetrical, as it can be seen in figures 5 and 6: the portion of each stitch which in the first stitch wale W12 is formed by the much more tensioned weft thread B1 is quite shorter than the portion formed by the other weft thread A1, and the chain thread C1 moves close to the second chain thread C2.

When the coupling members of a fastener according to the present invention are made of a plastics material overmoulded onto the edges of the tapes, it might happen that in the course of the moulding process some of the injected material leaks outside of the moulding equipment, forming so-called flashes onto the tapes, which may adversely affect the aesthetic appearance of the latter.

Such an inconvenience can be eliminated or at least appreciably reduced by using tapes or stringers made of a knitted fabric of the kind which will be now described with reference to figures 8 and the following, in particular in con-
nection with the fastener shown in figure 7. It will however readily appear to those skilled in this art that the solution which is going to be disclosed herebelow is not limited for the application to fasteners having the coupling members shown in figure 7, but is instead generally applicable whenever the coupling members secured to the fastener tapes are provided by an injection-moulding process.

In figures 7-10 items which have already been described in connection with the preceding figures have been attributed again the same alphabetical/numerical references.

The stringers or tapes 1, 2 of figures 7-10 have a construction quite similar to that of the tapes previously disclosed with reference to figure 4.

The knitted fabric forming each tape 1 or 2 of figures 7-10 also includes at least one additional cord means, generally indicated BC, extending through the first longitudinal stitch wale left uncovered by the overmoulded material forming the coupling members 3a, 3b (or 3). In the exemplary embodiment shown in particular in figure 10, the said first stitch wale left uncovered by the overmoulded material is stitch wale W23.

Preferably, the said additional cord means BC includes a plurality of single parallel cords, not interlaced with one another. In the exemplary embodiment of figures 9 and 10 the additional cord means BC comprise four such cords.

The said additional cord means BC advantageously form a sort of barrier which hinders possible leaks of injected material between the half-moulds clamped onto the opposite sides of a fastener tape.
When the coupling members overmoulded onto the fastener tapes extend transversely over more than one longitudinal stitch wale, then it may be useful to include further barrier cord means in each longitudinal stitch wale covered by the overmoulded material, of course except the first one which retains the anchoring cord AC.

But for the provision of the additional barrier cord means, the construction of the knitted fabric of figure 8 essentially corresponds in all respects to that which has been previously described in connection with figure 4.

In general, in a knitted tape according to the invention the chain threads C are preferably textured polyester or polyamide yarns.

The anchoring cord AC is conveniently formed of a plurality of twisted strands made of a polyester or a polyamide. Also the barrier cord(s) is(are) conveniently made of a polyester or a polyamide.

The weft threads A1 and B1, forming the said first stitch wale W12 adjacent the edge (1a or 2a) of each tape 1 or 2, are conveniently polyester or polyamide parallel filament yarns and the weft threads A2, B2, A3, B3, ... which form the other stitch wales W23, W34, ... are conveniently textured polyester or polyamide yarns.

Alternatively, the chain threats, the weft threats, the anchoring cord and the barrier cord or cords may be made of cotton or other natural fiber.

Advantageously, the weft threads or yarns A1 and B1 forming
the first stitch wale W12 of each tape 1 or 2 have a mass per unit length which is smaller than that of the weft yarns A2, B2, A3, B3, ... forming the other stitch wales W23, W34, ...

The anchoring cord AC has a mass per unit length which is greater than that of the chain threads and the weft threads. Conveniently, said anchoring cord AC has a mass value per unit length which is at least 10 times greater than the maximum value of the mass per unit length of the chain threads and the weft threads.

The barrier cord or cords BC extending in the first stitch wale left uncovered by the overmoulded plastics material forming the coupling members has a total mass per unit length which is greater than the maximum value of the mass per unit length of the chain threads and the weft threads, but is smaller than that of the anchoring cord AC.

Advantageously, the total mass per unit length of the barrier cord or cords BC extending in said first uncovered stitch wale is at least 2 times greater than the maximum mass per unit length of the chain threads and the weft threads.

Naturally, the principle of the invention remaining the same, the forms of embodiment and the details of construction may be varied widely with respect to those described and illustrated purely by way of non-limiting example, without thereby departing from the scope of the invention as defined in the appended claims.
CLAIMS

1. A fastener (F) comprising two tapes (1, 2), made of a flexible fabric and adapted to the attached to respective mating portions of an article; around a respective longitudinal edge (1a, 2a) of each of said tapes (1, 2) there being fixed a respective plurality of separate coupling members (3; 3a, 3b) adapted to be engaged with and disengaged from those of the other tape (2, 1); in their engaged condition said coupling members (3; 3a, 3b) being capable of retaining said tapes (1, 2) in a juxtaposed relationship; the fastener (F) being characterised in that said tapes (1, 2) are made of a knitted fabric including a plurality of longitudinal chain threads (C1, C2, ...) interlaced by tricot or weft thread pairs (A1, B1; A2, B2; ...) extending along respective sinuous paths so as to form a corresponding plurality of longitudinal stitch wales (W12, W34, ...); an essentially inextensible anchoring cord (AC) extending and being firmly retained through the first stitch wale (W12) of each tape (1, 2) adjacent the said edge (1a, 2a); the coupling members (3; 3a, 3b) of each tape (1, 2) gripping the said anchoring cord (AC).

2. A fastener according to claim 1, characterised in that the tricot or weft threads (A1, B1) forming said first stitch wale (W12) are subjected in knitting to respective predetermined different tensions, the tension applied to a first one (B1) of said weft threads (A1, B1) being greater than that applied to the second one (A1), so that said first weft thread (B1) is shorter than the second (A1), and the portion of each stitch (S121, S122, ...) formed by said first weft thread (B1) is shorter than the portion formed by said second weft thread (A1).
3. A fastener according to claim 1 or 2, wherein said coupling members (3; 3a, 3b) of each tape (1, 2) are made of a plastics material injection-moulded around a longitudinal edge (1a, 2a) of the tape (1, 2); the fastener (F) being characterised in that the knitted fabric of each tape (1, 2) also includes at least one barrier cord member (BC) extending through the first longitudinal stitch wale (W23) left uncovered by the overmoulded material forming said coupling members (3; 3a, 3b), said at least one barrier cord member (BC) being adapted to eliminate or at least reduce the leak of injected material from a moulding equipment used for moulding said coupling members (3; 3a, 3b).

4. A fastener according to claim 3, characterised in that the knitted fabric of each tape (1, 2) further includes at least one plurality of barrier cords (BC), preferably not interlaced with one another, extending through said first uncovered stitch wale (W23).

5. A fastener according to claim 3 or 4, wherein the coupling means (3; 3a; 3b) extend in a transverse direction on more than two longitudinal stitch wales (W12, W23, W34...) of the respective tape (1, 2) and said barrier means (BC) comprise cord means in each longitudinal stitch wale covered by the overmoulded material, except the first one (W12) which retains the anchoring cord (AC).

6. A fastener according to any of the preceding claims, characterised in that the chain threads (C) are textured polyester or polyamide yarns.

7. A fastener according to claim 6, characterised in that the weft threads (A1, B1) forming the said first stitch wale (W12) adjacent the edge (1a, 2a) of each tape (1, 2) are
polyester or polyamide parallel filament yarns, and the weft threads (A2, B2; A3, B3; ...) forming the other stitch wales (W23, ...) are textured polyester or polyamide yarns.

8. A fastener according to claim 6 or 7, characterised in that said anchoring cord (AC) is formed by a plurality of twisted strands, preferably made of a polyester or a polyamide.

9. A fastener according to any of claims 6 to 8, wherein the barrier cord member(s) is(are) made of a polyester or a polyamide.

10. A fastener according to any of the preceding claims, wherein the mass per unit length of the anchoring cord (AC) has a value which is at least 10 times greater than the maximum value of the chain threads (C) and the weft threads (A, B).

11. A fastener according to any of the preceding claims, wherein the weft yarns (A1, B1) forming the said first stitch wale (W12) adjacent the edge (1a, 2a) of each tape (1, 2) have a mass per unit length smaller than that of the weft yarns (A2, B2; A3, B3, ...) forming the other stitch wales (W23, ...).

12. A fastener according to any of claims 3 to 11, wherein the total mass per unit length of the barrier cord or cords (BC) extending in said first uncovered stitch wale (W23) has a value which is greater than the maximum value of the chain threads (C) and the weft threads (A, B) and smaller than the value of the anchoring cord (AC).

13. A fastener according to claims 10 and 12, wherein the
total mass per unit length of the barrier cord or cords (BC) extending in said first uncovered stitch wale (W23) is at least 2 times greater than the maximum mass per unit length of the chain threads (C) and the weft threads (A, B).

14. A slide fastener according to any of the preceding claims, wherein said coupling members (3) are metal locking teeth (3) clamped around said longitudinal edges (1a, 2a) of said tapes (1, 2).

15. A slide fastener according to any of claims 1 to 13, wherein said coupling members (3) are plastics locking teeth overmoulded around said longitudinal edges (1a, 2a) of said tapes (1, 2).

16. A fastener according to any of claims 1 to 13, wherein the coupling members (3a, 3b) are male members (3b) and female members (3a) made of a plastics material, overmoulded around said longitudinal edges (1a, 2a) of one and the other tape (1, 2), said male members (3b) and female members (3a) being manually engageable and disengageable with each other like snap buttons or snap buckles.

17. A method of manufacturing a fastener (F), comprising the steps of:
- preparing two tapes (1, 2) of a flexible fabric, and
- fixing around one respective longitudinal edge (1a, 2a) of each tape (1, 2) a respective plurality of separate coupling members (3; 3a, 3b) adapted to be engaged with and disengaged from those of the other tape (2, 1);

the method being characterised in that said tapes (1, 2) are made as a knitted fabric, including a plurality of chain threads (C) interlaced by tricot or weft thread pairs (A, B) extending along respective sinuous
paths so as to form a corresponding plurality of longitudinal stitch wales (W12, W23, ...); and in that

an essential inextensible anchoring cord (AC) is inserted through the first stitch wale (W12) of each tape (1, 2) adjacent the said edge (1a, 2a), so that said cord (AC) is firmly retained therein;

the coupling members (3; 3a, 3b) being secured to the respective tape (1, 2) so that they grip the corresponding anchoring cord (AC).

18. A method according to claim 17, wherein the tricot or weft threads (A1, B1) forming said first stitch wale (W12) are subjected in knitting to respective predetermined different tensions, the tension applied to a first one (B1) of said weft threads (A1, B1) being greater than that applied to the second one (A1), so that said first weft thread (B1) is shorter than the second (A1), and the portion of each stitch (S121, S122, ...) formed by said first weft thread (B1) is shorter than the portion formed by said second weft thread (A1).

19. A method according to claim 17 or 18, characterised in that in each tape (1, 2) at least one barrier cord member (BC) is inserted through the first longitudinal stitch wale (W23) to be left uncovered by the overmoulded material intended to form the said coupling members (3; 3a, 3b), said at least one barrier cord member (BC) being adapted to eliminate or at least reduce the leak of injected material from a moulding equipment used for moulding said coupling members.

20. A method according to claim 19, characterised in that the knitted fabric of each tape (1, 2) further includes at least one plurality of barrier cords (BC), preferably not
interlaced with one another, extending through said first stitch wale (W23) left uncovered.

21. A method according to claim 19 or 20, wherein the coupling means (3; 3a; 3b) extend in a transverse direction on more than two longitudinal stitch wales (W12, W23, W34...) of the respective tape (1, 2) and said barrier means (BC) comprise cord means in each longitudinal stitch wale covered by the overmoulded material, except the first one (W12) which retains the anchoring cord (AC).

22. A method according to any of claims 17 to 21 characterised in that the chain or warp threads (C) are textured polyester or polyamide yarns.

23. A method according to claim 22, characterised in that the weft threads (A1, B1) forming the said first stitch wale (W12) adjacent the edge (1a, 2a) of each tape (1, 2) are polyester or polyamide parallel filament yarns, and the weft threads (A2, B2; A3, B3; ...) forming the other stitch wales (W23, ...) are textured polyester or polyamide yarns.

24. A method according to claim 22 or 23, characterised in that said anchoring cord (AC) is formed by a plurality of twisted strands, preferably made of a polyester or a polyamide.

25. A method according to any of claims 22 to 24, characterised in that the barrier cord member(s) is(are) made of a polyester or a polyamide.

26. A method according to any of claims 17 to 25, wherein the mass per unit length of the anchoring cord (AC) has a value which is at least 10 times greater than the maximum
value of the chain threads (C) and the weft threads (A, B).

27. A method according to any of claims 17 to 25, wherein the weft yarns (A1, B1) forming the said first stitch wale (W12) adjacent the edge (1a, 2a) of each tape (1, 2) have a mass per unit length smaller than that of the weft yarns (A2, B2; A3, B3, ...) forming the other stitch wales (W23, ...).

28. A method according to any of claims 19 to 27, wherein the total mass per unit length of the barrier cord or cords (BC) extending in said first stitch wale (W23) left uncovered has a value which is greater than the maximum value of the chain threads (C) and the weft threads (A, B) and smaller than the value of the anchoring cord (AC).

29. A method according to claims 26 and 28, wherein the total mass per unit length of the barrier cord or cords (BC) extending in said first uncovered stitch wale (W23) is at least 2 times greater than the maximum mass per unit length of the chain threads (C) and the weft threads (A, B).
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A44B19/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A44B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.  
X Patent family members are listed in annex.

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