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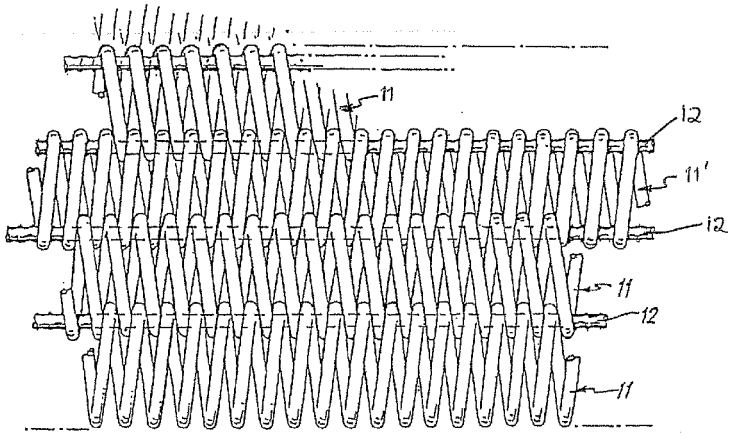
(54) Title: LINK-BELT AND A METHOD OF PRODUCTION THEREOF

FIG. 1



(57) Abstract: A link-belt comprising a multiplicity of helical coils (11) joined in side-by-side disposition by respective hinge wires (12) engaged with the interdigitated turns thereof, the material of at least one of the coils (11) and hinge wires (12) comprising a synthetic thermoplastic material, the material of at least one of the coils (11) comprising a conductive material, and at least one of the coils (11) and hinge wires (12) being deformed from an initial constant transverse cross-section in the regions (13, 15) in which the said coils and hinge wires lie in close disposition thereby to stabilise the said link-belt.

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LINK-BELT AND A METHOD OF PRODUCTION THEREOF

The invention refers to a link-belt comprising a synthetic thermoplastic material and a conductive material, a method of manufacture thereof, and a use thereof to reduce fire risk and/or production of sparks.

It is known to produce a link-belt for use in the context of papermaking machines and/or dewatering processes from a multiplicity of helical coils joined in side-by-side disposition by hinge wires threaded through the interdigitated turns of adjacent such coils. Reference for example is made to WO80/02703. The use of a conductive material in such a link-belt is described in WO96/11051, wherein it is disclosed that conductive material can be inserted into and/or onto a non-conductive base structure to provide conductive/antistatic properties. One specific embodiment of WO96/11051 discloses conductive material being present in the form of stuffer yarns, wherein these stuffer yarns extend in the cross machine direction of the link-belt, are in addition to the hinge wires, and are located within the coils. A second specific embodiment of WO96/11051 discloses conductive material being present as staple fibres needled to one or both sides of the belt. No further options for placement of the conductive material are disclosed.

It has now been discovered that the use of conductive stuffer yarns may result in the stuffer yarns creeping out of the link-belt during use, which results in snagging and consequent damage to the link-belt and items it comes into contact with, possibly resulting in expensive damage to belt-press machinery. In addition, the use of stuffer yarns and conductive staple fibres gives rise to additional belt weight which may give rise to handling and drive difficulties, for example concerning belt tracking.and furthermore affects the filtration characteristics and permeability of the link-belt. Yet further, such stuffer yarns are

typically manually inserted which is a time consuming and consequently costly process. It is therefore desirable to find an alternative manner of placing conductive material into a link-belt, which is cheaper to make and simpler to use, whilst maintaining conductive and antistatic features in order to reduce the fire and/or spark risk, particularly in for example the paper, board and non woven industries.

According to a first aspect of the present invention, there is provided a link-belt comprising a multiplicity of helical coils joined in side-by-side disposition by respective hinge wires engaged with the interdigitated turns thereof, the material of at least one of the coils and hinge wires comprising a synthetic thermoplastic material, the material of at least one of the coils comprising a conductive material, and at least one of the coils and hinge wires being deformed from an initial constant transverse cross-section in the regions in which the said coils and hinge wires lie in close disposition thereby to stabilise the said link-belt.

According to a second aspect of the present invention, there is provided a method for the manufacture of a link-belt defined by a multiplicity of helical coils joined in side-by-side disposition by hinge wires comprising a thermoplastic material threaded through the interdigitated turns of adjacent such coils, including the steps of arranging adjacent coils in interdigitated disposition, threading a respective hinge wire through the interdigitated turns of each pair of adjacent coils, subjecting the resultant link structure to a suitable heat-setting temperature and longitudinal tension to cause the hinge wires to deform and assume a crimped configuration in the plane of the structure, and subsequently reducing the temperature of the structure, wherein at least one helical coil comprises a conductive material.

According to a third aspect of the present invention, there is provided the use of a belt according to the first aspect of the invention, to reduce fire risk and/or production of sparks.

Suitable synthetic thermoplastic materials can comprise polyester, polyamide, polyether ether ketone (PEEK) and polyphenylene sulphide (PPS) and can be monofilament yarns. Preferably all of the coils and hinge wires of the link-belt of the present invention comprise a suitable synthetic thermoplastic material.

Preferably at least one of the coils of the link-belt comprises both a synthetic thermoplastic material and a conductive material, for example a coil could comprise a synthetic thermoplastic core and an outer coating of conductive material. Such an embodiment could be exemplified by a polyester core surrounded by extruded graphite. Alternatively a coil could comprise a dispersion of conductive compound in a thermoplastic polymer. Such dispersions are particularly useful when using polyamide as the synthetic polymeric material since polyamide is unlikely to stick well to outer coatings of conductive material, and shedding could therefore occur.

Suitable conductive materials may be based on thermoplastics such as polyester, polyamide, polyphenylene sulphide, polyether ether ketone and cross-linked polyethylene. In order to make such thermoplastics conductive, materials such as graphite eg as graphite powder, or conductive carbon black may be added. Metallic materials such as bronze, copper and phosphor bronze may also be suitable as conductive materials. Such thermoplastic or metallic materials may take the form of yarns.

Preferably more than one coil comprising both a synthetic thermoplastic material and a conductive material is present, for example every fifth coil could comprise both a synthetic thermoplastic material and a conductive material. Alternatively it could be every

other coil, every tenth coil, every fifteenth coil etc, or in a random arrangement. Adjusting the number of conductive coils correspondingly adjusts conductivity.

Preferably adjacent helical coils are of opposite hand. Preferably the material of both the coils and the hinge wires is deformed in the regions in which the coils and the hinge wires lie in close disposition. Preferably the hinge wires are of crimped form, and the deformation is at least 5% of the initial diameter thereof.

In use, the link-belt of the present invention travels over rollers and therefore can transfer electrical charge to these rollers. It is desirable to earth at least some, preferably all, of the rollers to dissipate this electrical charge. In prior art link-belts, any unearthed, or "isolated", rollers could build up charge until a spark occurs. The link-belt of the present invention, however, allows any built-up charge to be transferred to other, earthed, rollers. In some embodiments, graphite particles can be added to the link-belt, for example in a glue or resin used in an edge reinforcement, in order to aid removal of charge to the rolls (in particular in the case where at least one roll is not earthed).

The invention will now be described further, by way of example only, with reference to the accompanying drawings in which;

Figure 1 is a plan view of a link-belt according to the invention; and

Figure 2 is a cross section of a coil of monofilament polyester fibre coated in graphite, 11', as depicted in Figure 1.

Figure 1 shows a multiplicity of individual coils 11 of monofilament polyester material, and a coil 11' of monofilament polyester fibre coated in graphite, arranged in interdigitated side-by-side disposition, adjacent coils being connected together by respective hinge wires 12 threaded through the tunnels formed by such interdigitated coils 11 and 11'. Adjacent coils 11 and 11' are of the opposite hand. The hinge wires 12 are deformed into a

crimped appearance and the end regions of the individual turns are deformed. The structure is set by subjecting the fabric, when under tension, to a suitable heat setting temperature for the material, thus to impart dimensional stability to the fabric.

Figure 2 shows an outer coating of graphite 20 applied to a core of monofilament polyester fibre 21, to create a conductive coil.

Claims

1. A link-belt comprising a multiplicity of helical coils (11) joined in side-by-side disposition by respective hinge wires (12) engaged with the interdigitated turns thereof, the material of at least one of the coils (11) and hinge wires (12) comprising a synthetic thermoplastic material, the material of at least one of the coils (11) comprising a conductive material, and at least one of the coils (11) and hinge wires (12) being deformed from an initial constant transverse cross-section in the regions (13, 15) in which the said coils and hinge wires lie in close disposition thereby to stabilise the said link-belt.

2. The link-belt of claim 1, wherein the material of each of the coils (11) and the hinge wires (12) comprises a synthetic thermoplastic material.

3. A link-belt of claim 1 or claim 2, wherein at least one of the coils (11) comprises both a synthetic thermoplastic material and a conductive material.

4. The link-belt of any preceding claim, wherein the synthetic thermoplastic material is a monofilament yarn.

5. The link belt of any preceding claim, wherein the synthetic thermoplastic material comprises polyester, polyamide, polyether ether ketone or polyphenylene sulphide.

6. The link belt of any preceding claim, wherein the conductive material comprises bronze, copper, phosphor bronze or graphite.

7. The link belt of any preceding claim, wherein at least one of the coils (11) comprises conductive material which coats the synthetic thermoplastic material.

8. The link-belt of claim 7, wherein the conductive material is graphite and the synthetic thermoplastic material is polyester.

9. The link-belt of any of claims 1-6, wherein at least one of the coils (11) comprises a conductive material which is dispersed within the synthetic thermoplastic material.

10. The link-belt of claim 9, wherein the synthetic thermoplastic material is polyamide.

11. The link-belt of any preceding claim, wherein the material of both the coils (11) and the hinge wires (12) is deformed in the regions in which the coils (11) and hinge wires (12) lie in close disposition.

12. The link-belt of any preceding claim, wherein the hinge wires (12) are of crimped form, and the deformation is at least 5% of the initial diameter thereof.

13. The link-belt of any preceding claim, wherein the deformation of the material of the coils (11) is equal to approximately 10% of the initial diameter of such material.

14. A method for the manufacture of a link-belt defined by a multiplicity of helical coils (11) joined in side-by-side disposition by hinge wires (12) comprising a synthetic thermoplastic material threaded through the interdigitated turns of adjacent such coils, including the steps of arranging adjacent coils in interdigitated disposition, threading a respective hinge wire through the interdigitated turns of each pair of adjacent coils, subjecting the resultant link structure to a suitable heat-setting temperature and longitudinal tension to cause the hinge wires to deform and assume a crimped configuration in the plane of the structure, and subsequently reducing the temperature of the structure, wherein at least one helical coil (11) comprises a conductive material.

15. The method of claim 14, wherein the helical coils comprises a synthetic thermoplastic material.

16. The method of either of claims 14 or 15, wherein the synthetic thermoplastic material is a monofilament yarn.

17. The method of any of claims 14-16, wherein the synthetic thermoplastic material comprises polyester, polyamide, polyether ether ketone or polyphenylene sulphide.

18. The method of any of claims 14-17, wherein the conductive material comprises bronze, copper, phosphor bronze or graphite.

19. The method of any of claims 14-18, wherein at least one of the coils (11) comprises both a synthetic thermoplastic material and a conductive material.

20. The method of any of claims 14-19, wherein at least one of the coils (11) comprises a conductive material which coats the synthetic thermoplastic material.

21. The method of claim 20, wherein the conductive material is graphite and the synthetic thermoplastic material is polyester.

22. The method of any of claims 14-19, wherein at least one of the coils (11) comprises a conductive material which is dispersed within the synthetic thermoplastic material.

23. The method of claim 22, wherein the synthetic thermoplastic material is polyamide.

24. Use of a belt according to any of claims 1-13, to reduce fire risk and/or production of sparks.

FIG. 1

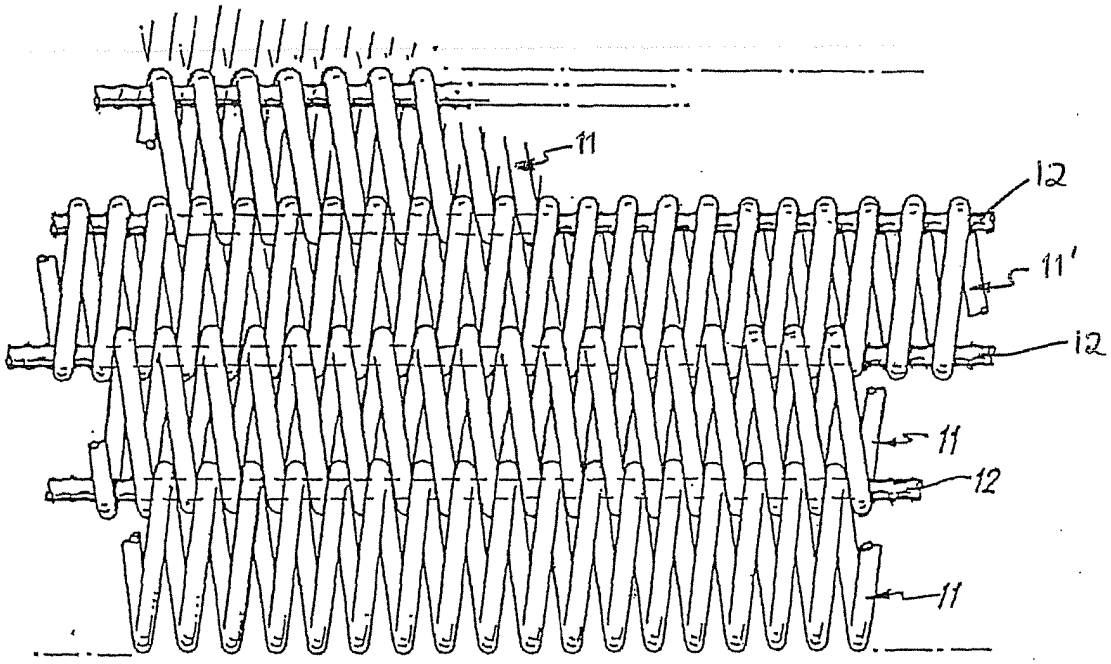
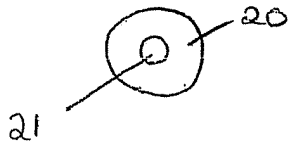


Fig 2



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

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)
D21F

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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	EP 0 266 786 A2 (SITEG SIEBTECH GMBH [DE]) 11 May 1988 (1988-05-11) the whole document -----	1-5,7, 11, 14-17, 19,20
X	WO 96/11051 A2 (SCAPA GROUP PLC [GB]; TEN TIJE ALFONS GERARDUS MARIA [NL] SCAPA GROUP) 18 April 1996 (1996-04-18) cited in the application the whole document ----- -/--	1-6,11, 14-19

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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