



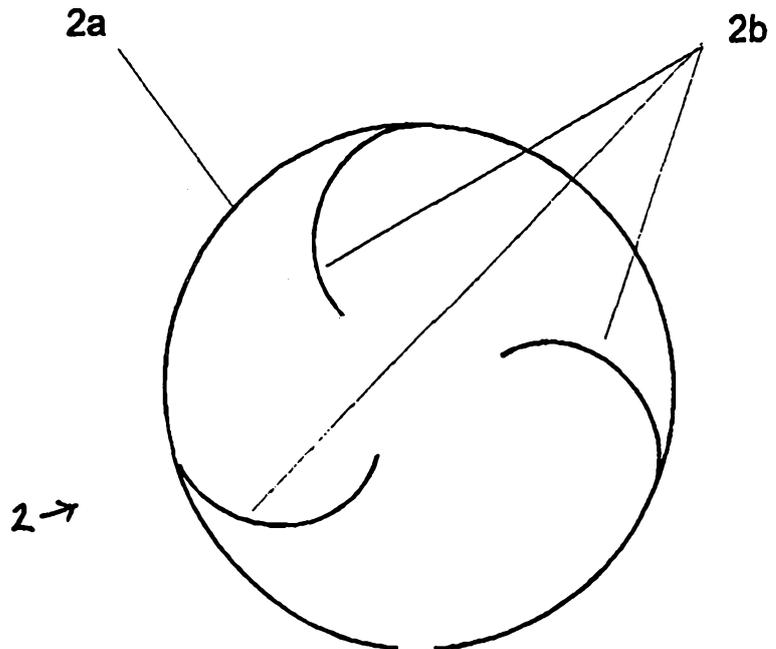
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<p>(21) International Application Number: PCT/GB99/01708</p> <p>(22) International Filing Date: 28 May 1999 (28.05.99)</p> <p>(30) Priority Data: 9812057.9 4 June 1998 (04.06.98) GB</p> <p>(71) Applicant (for all designated States except US): ROLATUBE TECHNOLOGY LIMITED [GB/GB]; 1 Peterborough Road, Harrow, Middlesex HA1 2AZ (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): DATON-LOVETT, Andrew, James [GB/GB]; 166E Ladbroke Grove, London W10 5NA (GB).</p> <p>(74) Agent: FLINT, Adam; W.H. Beck, Greener & Co., 7 Stone Buildings, Lincoln's Inn, London WC2A 3SZ (GB).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: AN EXTENDIBLE, COILABLE MEMBER

(57) Abstract

An extendible, coilable member (2) is reversibly configurable between a coiled form and an extended form (2a). At least one surface of the member (2), typically an inner surface, is provided with resilient protrusions (2b). Upon extension of the member (2) to the extended form, the protrusions (2b) adopt a first state in which they protrude from the surface of the member (2). Upon rolling of the member (2) to the coiled form, the protrusions (2b) flex so as to lie between the turns of the coiled member (2).



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AN EXTENDIBLE, COILABLE MEMBER

The present invention relates to an extendible, coilable member.

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In WO-A-88/08620 and WO-A-97/35706, the entire disclosures of which are incorporated herein by reference, there are disclosed extendible, coilable members which are reversibly configurable between a coiled form and an extended form. A perspective view of an example of such a member 1 is shown in Fig. 1 in part coiled form 1a and part extended form 1b.

According to a first aspect of the present invention, there is provided an extendible, coilable member which is reversibly configurable between a coiled form and an extended form, at least one surface of which is provided with one or more resilient protrusions such that upon extension of the member to the extended form, the or each protrusion adopts a first state in which it protrudes from the surface of the member, and which upon rolling of the member to the coiled form flexes so as to lie between the turns of the coiled member.

The protrusions will typically be in a relaxed state when the member is in its extended form and collapse against said surface when the member is in its coiled form. The member has particular utility in providing a jacket for surrounding another object, such as a pipe, for thermal, sound or electrical insulation for example.

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Said surface may be an inner surface and the or each protrusion may protrude inwardly of the member when said member is in its extended form.

Said surface may be an outer surface and the or each protrusion may protrude outwardly of the member when said member is in its extended form.

Each of inner and outer surfaces of the member may be provided with at least one protrusion, the or each protrusion on the inner surface protruding inwardly of the member and the or each protrusion on the outer surface protruding outwardly of the member when said member is in its extended form.

There may be provided a second extendible, coilable member having a surface attached to the free end of the or at least one of the protrusions of the first member such that said second member can lie between the turns of said first member in its coiled state and is separated from the surface of the first member by the resilient protrusions in the extended state.

According to a second aspect of the present invention, there is provided an extendible member which is reversibly configurable between a coiled form and an extended form, the inner surface of which is provided with one or more resilient sheet members affixed to, or formed as part of the extendible member, and the resilient nature of which is such that upon extension of the member they adopt a relaxed state in which they protrude inwards from the surface of the member, but upon rolling can flex so as to lie within the interstices of the coil.

According to a third aspect of the present invention there is provided an extendible member which is reversibly configurable between a coiled form and an extended form, the outer surface of which is provided with one or more resilient sheet members affixed to or formed as part of the extendible member, and the resilient nature of which is such that upon extension of the member they adopt a relaxed state in which they protrude outwards from the surface of the member, but upon coiling can flex so as to lie within the interstices of the coil.

According to a fourth aspect of the present invention there is provided an extendible member which is reversibly configurable between a coiled form and an extended form, both surfaces of which are provided with one or more resilient sheet members, affixed to or formed as part of the extendible member, and the resilient nature of which is such that upon extension of the member they adopt a relaxed state in which they protrude inwards and outwards from the surfaces of the member, but upon coiling can flex so as to lie within the interstices of the coil.

According to a fifth aspect of the present invention there is provided an extendible member which is reversibly configurable between a coiled form and an extended form, one or both surfaces of which are provided with one or more resilient sheet members extending from the surface upon extension of the member, the ends of which are further attached to some other member, cable, optical fibre or other device which can lie in the interstices of the coil when the member is in the coiled state, but upon extension will be separated from the surface of the member and held away from the inner or outer surface by means of the resilient extensions to said surface described above.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an example of an extendible, coilable member which is reversibly configurable between a coiled form and an extended form, showing the member in part coiled form and part extended form;

Fig. 2 is an end view of a first example of a member according to the present invention in its extended form;

Fig. 3 is a cross-section through part of the member of

Fig. 2 in its coiled form; and,

Fig. 4 is an end view of a second example of a member according to the present invention having inner and outer
5 skins.

Referring to Figure 2, there is shown an end view of a first example of a member 2 according to the present invention. The member 2 is reversibly configurable between
10 a coiled form and an extended form. The member 2 is shown in its extended form 2a in Fig. 2. The member 2 may be manufactured and constructed in accordance with the teachings of WO-A-88/08620 or WO-A-97/35706 or may be of any other suitable form.

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In the example shown, the inner surface of the member 2 is provided with a plurality of resilient protrusions 2b. The protrusions 2b may be long sheet members which run the whole or substantially the whole or only a part of the
20 length of the extended member 2. For example, there may be three long protrusions 2b of this type arranged at angles of 120° to each other around the inner surface of the member 2. As an alternative, the protrusions 2b may be in the form of groups of short fins 2b, the fins 2b being
25 arranged equiangularly within the group and the groups repeated at intervals along the whole or substantially the whole or only a part of the length of the extended member 2. The groups may be arranged so that the various fins 2b all overly each other when viewed from the end or the
30 groups or some of the groups may be offset from each other to angularly space the or some of the fins 2b down the length of the extended member 2.

The protrusions 2b form spacers along the length of the
35 member 2 such that, for example, if the member 2 is deployed around a pipe or other extended object, the protrusions 2b act to keep the member 2 spaced away from the outer surface of the pipe or other object, the member 2

thereby providing a jacket for said pipe or other object.

When the member 2 is coiled from its extended form 2a to its coiled form, the protrusions 2b flex by virtue of
5 their resilience, and so deform to lie within the turns 3 of the coiled member 2 as shown in Fig. 3. Similarly, when the member 2 is rolled from its coiled form to its extended form 2a, the protrusions 2b flex outwards to their deployed configuration.

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If desired, provision may be made for the protrusions 2b to lie within cavities in the surface of the extendible member 2, such that they make no addition to the thickness of the member 2 in its coiled form.

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The protrusions 2b may be made of the same material as the main body 2a of the extendible member 2 or may be made from a different material. The protrusions 2b may be integrally formed with the main body 2a of the extendible
20 member 2 or may be affixed thereto by any suitable means including, for example, gluing or welding. Preferably, the protrusions 2b subtend an acute angle at their point of contact with the main body 2a to facilitate rolling of the member 2 to its coiled form. Similarly, the protrusions 2b
25 preferably curve away from the surface of the main body 2a as shown.

As shown in Fig. 4, a member 2 of this type may be combined with a further extendible member, either of the
30 type disclosed in WO-A-88/08620 or WO-A-97/35706 or of any other suitable type, to form a member which upon extension forms a double skinned member 4, the inner and outer layers or skins 4a,4b of which are separated by the resilient protrusions 4c. The protrusions 4c may be fixed to or
35 integrally formed with one or both of the inner and outer skins 4a,4b.

When rolled from the extended form to the coiled form,

the two skins 4a,4b roll together, with the resilient protrusions 4c flexing so as to allow them to come into close proximity as they coil. In this case, the tensile and compressive flexibility of the extendible members
5 providing the inner and outer skins 4a,4b are preferably such as to permit them to roll together over the desired length. Any number of further extendible members may be added in this manner to create multiple-skinned members.

10 When deployed over a pipe or other object as a jacket, or in the case of multiple skinned devices such as described above, the cavity or cavities formed between the extendible member 2 and the object over or around which it is placed, or the cavity or some or all of the cavities
15 lying between the skins 4a,4b of the double or multiple skinned member 4, may be filled with foam or other material, such as to provide thermal, sound, and/or electrical insulation, and/or impact resistance and/or increased rigidity.

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Where desirable, the edges of any extendible member may be joined or sealed, temporarily or permanently, by any desired means such as, for example, welding, zip-type fastening, etc.. Where sealing is carried out on the edges
25 of the skins of a multiple skinned device 4, a concentric pipe is created, capable of carrying separated or bi-directional flows.

Where desirable, cables, optical fibres, heating
30 elements or any other device which can accept rolling may be incorporated into one or more of the extendible members.

It is expected that the present invention will prove of particular utility in the provision of insulated or
35 heated jackets for the protection of pipelines, or other structures, where it can be deployed over said pipelines either at the time of laying, or retrofitted to existing installations, providing a protective insulating jacket,

which may also incorporate means for monitoring the condition of said pipeline.

An embodiment of the present invention has been
5 described with particular reference to the examples
illustrated. However, it will be appreciated that
variations and modifications may be made to the examples
described within the scope of the present invention. For
example, the protrusions 2b may be provided on the outer
10 surface of the member 2 to protrude outwardly. Protrusions
2b may be provided on both the outer and inner surfaces of
the member to protrude respectively outwardly and inwardly.

CLAIMS

1. An extendible, coilable member which is reversibly configurable between a coiled form and an extended form, at least one surface of which is provided with one or more resilient protrusions such that upon extension of the member to the extended form, the or each protrusion adopts a first state in which it protrudes from the surface of the member, and which upon rolling of the member to the coiled form flexes so as to lie between the turns of the coiled member.
2. A member according to claim 1, wherein said surface is an inner surface and the or each protrusion protrudes inwardly of the member when said member is in its extended form.
3. A member according to claim 1, wherein said surface is an outer surface and the or each protrusion protrudes outwardly of the member when said member is in its extended form.
4. A member according to claim 1, wherein each of inner and outer surfaces of the member is provided with at least one protrusion, the or each protrusion on the inner surface protruding inwardly of the member and the or each protrusion on the outer surface protruding outwardly of the member when said member is in its extended form.
5. A member according to any of claims 1 to 4, comprising a second extendible, coilable member having a surface attached to the free end of the or at least one of the protrusions of the first member such that said second member can lie between the turns of said first member in its coiled state and is separated from the surface of the first member by the resilient protrusions in the extended state.

6. An extendible member which is reversibly configurable between a coiled form and an extended form, the inner surface of which is provided with one or more resilient sheet members affixed to, or formed as part of the extendible member, and the resilient nature of which is such that upon extension of the member they adopt a relaxed state in which they protrude inwards from the surface of the member, but upon rolling can flex so as to lie within the interstices of the coil.

10

7. An extendible member which is reversibly configurable between a coiled form and an extended form, the outer surface of which is provided with one or more resilient sheet members affixed to or formed as part of the extendible member, and the resilient nature of which is such that upon extension of the member they adopt a relaxed state in which they protrude outwards from the surface of the member, but upon coiling can flex so as to lie within the interstices of the coil.

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8. An extendible member which is reversibly configurable between a coiled form and an extended form, both surfaces of which are provided with one or more resilient sheet members, affixed to or formed as part of the extendible member, and the resilient nature of which is such that upon extension of the member they adopt a relaxed state in which they protrude inwards and outwards from the surfaces of the member, but upon coiling can flex so as to lie within the interstices of the coil.

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9. An extendible member which is reversibly configurable between a coiled form and an extended form, one or both surfaces of which are provided with one or more resilient sheet members extending from the surface upon extension of the member, the ends of which are further attached to some other member, cable, optical fibre or other device which can lie in the interstices of the coil when the member is in the coiled state, but upon extension will be separated

from the surface of the member and held away from the inner or outer surface by means of the resilient extensions to said surface described above.

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Fig. 1

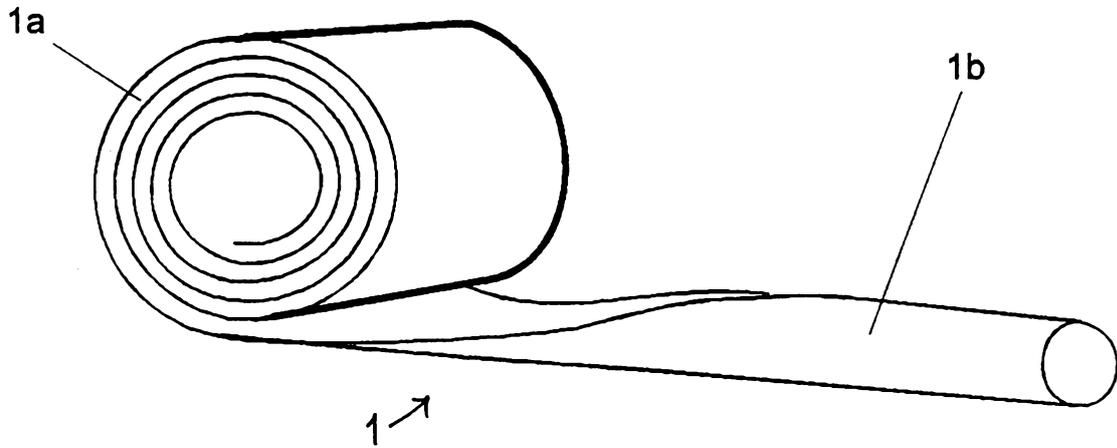
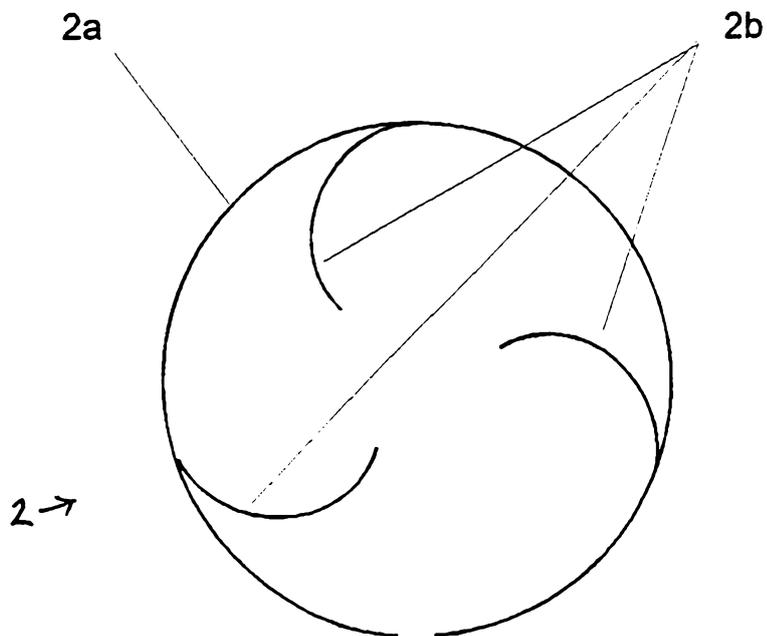


Fig. 2



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Fig. 3

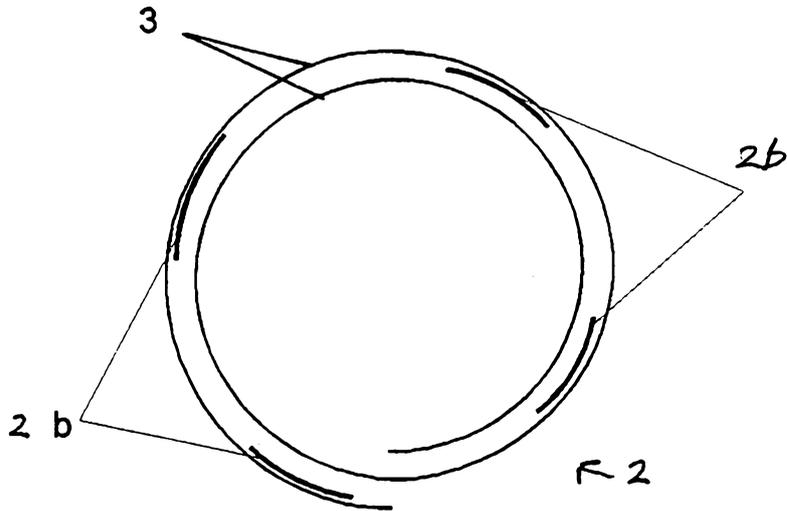


Fig. 4

