

The invention relates to textile lashing straps as well as to textile lifting slings and textile lifting slings designed as endless slings made of a woven webbing strap. The textile lashing straps are used to lash cargo to be stored and transported. The lashing strap here grips partially around the cargo to be stored or transported and is under tension in its lashed state. The tension can be introduced into the lashing strap by means of a tensioning ratchet or a tensioning winch, for example. Lashing straps are used particularly to lash or tie down freight on the loading surfaces of lorries or railway wagons or to lash cargo in transportation holds in such a way that it is secured from sliding about. The textile lifting slings also according to the invention serve to lift loads in general, i.e. goods of all types. The ends of the lifting slings may have attachment means with which they can be attached to the lifting means, on the one hand, and to the load to be lifted, on the other hand. The connection between the lifting means or the load is preferably made releasable, while the connection between the lifting sling and the attachment means is preferably non-releasable. Textile lifting slings, however, can also be used directly as attachment means. Lifting slings of this kind which can be used directly as attachment means are preferably designed as endless slings. The endless sling is itself encased by a woven tubular sheath. The endless sling itself is embedded, so to speak, in the woven tubular sheath. The endless sling is preferably connected to the lifting tool by an attachment means. The endless sling is simply placed around the load to be lifted and at least partially girdles the load to be lifted during the lifting process.

Such lifting slings made of synthetic fibres are the subject of DIN 61360 (March 1986 edition). The concepts, dimensions and types of attachments of such a lifting sling are described in detail in this standard specification so that further comments are not necessary at this point. The

transferability of the concepts mentioned in this standard specification to the lashing straps also according to the invention is evident.

In rough everyday use, lashing straps as well as lifting slings are subject to considerable wear attack, particularly due to abrasion stresses. The object underlying the invention is to improve the wear or abrasion resistance of the above-mentioned lashing straps and lifting slings and also endless slings by simple means which do not adversely affect their application properties. This object is achieved by means of the characterizing clause of claim 1.

The basic concept of this solution is to provide intentional abrasion locations which are subject to wear attack on the outer skin of the lashing strap or lifting sling, namely on a plane side surface particularly subject to wear attack and facing towards the load, and if necessary on both plane side surfaces, these intentional abrasion locations keeping the wear attack away from the essential part of the basic fabric. This succeeds particularly convincingly if there are several spaced, juxtaposed rows of such thickened locations.

Expediently, the thickened locations are formed by woven-in textile threads of a wear-resistant material. Tests have shown that only a slight increase in the overall material used results in a disproportionate improvement of the wear resistance of the lashing straps and lifting slings. The wear-resistant textile threads are here woven into the basic fabric of the lifting sling in the direction of the warp or are woven onto it. The wear-resistant textile threads may be filament yarns or twines made of synthetic fibre materials or also monofilament textile wires.

The thickened locations which extend in the longitudinal direction of the strap in the manner of a longitudinal bead or

a longitudinal rib have the further advantage of increasing the longitudinal stiffness of the lashing strap and of the lifting sling or endless sling, thereby improving their ease of handling. Because of this, the lashing strap and the lifting sling can be pushed through more easily underneath a load. Moreover, the lashing strap can be threaded more easily into the tensioning spindle of a tensioning winch or ratchet. Particularly in the case of lifting slings designed as endless slings, this increased longitudinal stiffness has the advantage of smoothing the corrugations formed in the tube surrounding the supporting skein of threads. In endless slings, the tube necessarily has a greater circumferential length in the unloaded state than the skein of threads it surrounds. The corrugations formed in the tube and caused by this and the resulting risk of it getting caught behind sharp edges of the load are described in detail in the introduction to the specification of EP 0,116,916 B1, where, in order to suppress this corrugation formation, the transverse rigidity of the protective tube in the form of a tubular fabric is increased by monofilament textile wires as the weft threads.

As a result of designing the thickened locations as longitudinally oriented ribs or beads, the lifting sling, in the unloaded state, slides along the cargo due to a greater degree of smoothness effective in the longitudinal direction of the lifting sling. The longitudinally oriented ribs here act to a certain extent like sledge runners with respect to the cargo. When the lashing tension is introduced into the lashing strap, the strap slides more easily along the cargo to be lashed, particularly along its edges. The effectiveness of the introduced lashing tension is enhanced in that the introduced lashing tension is converted directly into lashing force and not into lost friction heat.

Wherever particularly good flexibility in the longitudinal direction of the lifting sling is desired, it may be advantageous, instead of continuous, longitudinally

oriented ribs or beads, to have an interrupted design thereof in the form of a row of nubs, whereby the increase in wear resistance remains substantially ensured at low material cost, and, if fancy or embroidery threads woven into or onto the fabric in the direction of the warp are used, the sledge-runner-type action which improves the sliding behaviour with respect to the cargo is still obtained. This also applies to the lashing straps according to the invention..

The invention is now described in greater detail with the aid of exemplary embodiments shown in the Figures, in which

- Fig. 1 shows a lifting sling designed as an endless sling.
- Fig. 2 shows an enlarged cross-sectional representation along section line II-II of Fig. 1, with longitudinal ribs extending in the circumferential direction of the endless sling on the exterior side of the protective tube.
- Fig. 3 shows a modified embodiment corresponding to Fig. 2 with thickened locations which extend as rows of nubs in the circumferential direction.
- Fig. 4 shows a cross-section corresponding to Fig. 2 and 3, but through a woven lifting sling or lashing strap.
- Fig. 5 shows a section, extending in the warp direction, through the basic fabric along section line V-V of Fig. 6, with the rib or bead formation being created by fancy threads in the basic fabric.
- Fig. 6 shows a section along section line VI-VI of Fig. 5 through the basic fabric of the upper side of the tube of a lifting sling with the rib or bead formation produced by woven-in fancy threads.
- Fig. 7a shows in plan view and
- Fig. 7b in side view the weave pattern of the fabric of Fig. 5 and 6.
- Fig. 8-10b show sectional representations corresponding

to Fig. 5 to Fig. 7b through a modified form of fabric.

Fig. 11a,b show a section in the warp direction corresponding to Fig. 5 and Fig. 8, but with the fancy threads woven into the basic fabric in a twill weave.

Fig. 12 shows a section, extending in the weft direction, through the fabric according to Fig. 11a,b corresponding to the representations of Fig. 6 and 9.

Fig. 13a,13b show the associated weave pattern for the fabric of Fig. 11a - Fig. 12 in plan view and in side view.

Fig. 14a,14b show a section, extending in the warp direction, through the basic fabric corresponding to section line XIV-XIV in Fig. 15, in which the ribs or beads are formed by embroidery threads.

Fig. 15 shows a section along section line XV-XV of Fig. 14a,b.

Fig. 16a,16b show the weave pattern for the fabric according to Fig. 14a - Fig. 15, in plan view and in side view.

Fig. 17 shows a slight modification of the fabric according to Fig. 14a - Fig. 16b with ribs and beads respectively, which in cross-section as a whole have a semi-circular character.

Fig. 18a,18b show the weave pattern belonging to the fabric structure according to Fig. 17, in plan view and in side view.

Fig. 19 shows a section corresponding to Fig. 15 and Fig. 17 extending in the weft direction XV-XV through the basic fabric with a modified arrangement of the embroidery threads to form a very smooth bead in the longitudinal direction.

Fig. 20a,20b show the weave pattern for the fabric according to Fig. 19 in plan view and in side view.

Fig. 21 shows a section in the weft direction XV-XV of Fig. 14 through a modified fabric design in which the thickened locations are formed by a row of nubs corresponding to Fig. 3.

Fig. 22a, 22b show the weave pattern belonging to Fig. 21 in plan view and in side view (tubular fabric!).

The lifting sling shown in Fig. 1-3 is an endless sling 1 comprising a skein of thread 3 extending in the circumferential direction 2 for load-carrying and a tube 4 enclosing the skein of thread 3 and consisting of a tubular fabric. Technically speaking, a tubular fabric is a double-layer strap fabric with a bond provided at the edge of the fabric between the two fabric layers, but this is not shown here and also has no particular significance for the core of the invention. In DIN 61360, such endless slings 1 are called "lifting sling, applied".

In contrast, Fig. 4 shows a synthetic multifilament fibre webbing strap 5 woven from synthetic multifilament fibres which is primarily designed as a single layer, but which may also be designed in multiple layers, particularly two layers, by being sewn or by means of other equivalent connections. Such webbing straps 5 may also be equipped with fittings to create a ready-for-use lifting sling of the required carrying capacity. This webbing strap 5 is likewise well suited for use as a lashing strap.

When the design of the surface of the woven lifting sling is mentioned in quite general terms, it relates equally to the fabric design of the tube 4 (Fig. 1-3) of an endless sling 1 as well as to the design of a webbing strap 5 for lifting slings and lashing straps according to Fig. 4, corresponding to the identical treatment of the two lifting sling designs in DIN 61360 and their evident suitability for lashing straps.

The lifting slings and lashing straps shown in Fig. 2 and

4 - 20 have on at least one surface thickened locations designed as ribs or beads 6 extending in the longitudinal and circumferential direction 2 respectively, raised and projecting from their remaining outer surface 7. Such ribs or beads 6 are disposed next to one another at regular intervals 8 on at least one side of the surface. In the lifting sling according to Fig. 3, however, rows of nubs 10 oriented in the longitudinal direction 2 project instead as thickened locations from the outer surface 7 of the lifting sling.

The ribs 6 and nubs 10 projecting as thickened locations are formed by textile yarns or wires worked into the fabric of the lifting slings. These may be filament yarns, twines or monofilament textile wires of the same or different material from the yarn of the basic fabric. Possible options for forming the basic fabric are textile threads in all known basic weaves, such as linen weave, twill weave and satin weave. In the Figures, the basic fabric is usually shown as a linen fabric. In these Figures, particularly in the sectional representations of Fig. 6, 9, 12, 15, 17, 19 and 21 which are oriented in the weft direction, only two ribs 6, bead-forming threads or nubs 10 (Fig. 21, 22) are shown in each case. However, the number of ribs 6 or rows of nubs 9 running parallel to one another at identical intervals 8 apart can be selected as desired according to the particular requirements and the width of the tube or strap.

The individual fabric representations in the aforementioned Figures 6, 9, 12, 15, 17, 19 and 21 each show the fabric of the tube 4 of an endless sling 1. However, they apply analogously to the fabric type of a webbing strap 5 which can be further processed into lifting slings or lashing straps.

Two methods, for implementation using fabric technology, are basically shown in these examples, namely the forming of ribs or nubs by fancy threads in the basic fabric (Fig. 5-13)

or by embroidery threads on the basic fabric (Fig. 14-22).

In Fig. 5 to 22, the weft threads of the basic fabric are denoted 11 and the warp threads of the basic fabric are denoted 12. The ribs 6 are produced by means of fancy threads 13 in the basic fabric. In this case, one or several juxtaposed warp threads 12 of the basic fabric, that is foundation threads, are exchanged for fancy threads 13. The different nature of the fancy threads 13 compared with the foundation threads or warp threads 12 in the present case primarily lies in the greater thickness of the threads, so that in the fabric the fancy threads project more protrudingly from the basic fabric formed by the weft threads 11 and the warp threads 12 as basic fabric threads. Fig. 5, 6 show in a linen weave the replacement of two adjacent foundation threads, here warp threads 12, by thicker fancy threads 13 per bead 6.

Fig. 9 is an example of the formation of nubs 10 in the tube 4. The nub formation may be accomplished by single, double, or multiple passes or by means of longitudinal or transverse rib weaves. In any case, two juxtaposed fancy threads 13 passing the weft threads 11 on the same side are present in this embodiment. Fig. 11-13 show a slight modification from the fabric structure shown in Fig. 5 and 6, in which, with respect to the weave technique used, the fancy threads 13 are interlaced in a twill weave. This produces a better smoothness of the rib 6 in the longitudinal direction 2.

The embroidery threads used in the fabric structure of Fig. 14 to 22 are denoted 14. Fig. 14 to 16 show a simple example of the use of embroidery threads 14 on the basic fabric (warp threads 12 and weft threads 11) with twill as the type of weave. Here embroidery threads 14 in each case skip two juxtaposed weft threads 11 on the outer surface 7 of the fabric before they pass the next weft thread 11 on the inner

surface of the fabric. The two embroidery threads 14 running next to one another to form a rib 6 are in this case basically not woven into the weft threads 11 in the same manner. Rather they are guided in such a way that the one embroidery thread 14 bridges two juxtaposed weft threads 11 on the outer surface 7 (Fig. 14a), and the other, adjacent embroidery thread 14 bridges two juxtaposed weft threads 11 on the inner side 15 before it passes the next weft thread on the other side of the fabric.

However, in the type of fabric shown in Fig. 17, there are also thinner embroidery threads 16 [sic, recte 18] next to the two outer embroidery threads 14 which form a bead and these are guided in such a way that the beads 6 as a whole have a semi-circular cross-sectional character.

Fig. 19, 20 show a rib weave with rearrangement of the threads with the object of avoiding contact between the necessary regular interlacings of the embroidery threads, producing a very smooth bead 6 in the longitudinal direction 2.

Fig. 21, 22 show the formation of nubs 10 by the embroidery threads 14.

The amount by which the ribs 6 or the nubs 10 project beyond the outer surface 7 of the lifting sling or lashing strap is denoted 16. The projection height of the ribs 6 or the nubs 10 beyond the outer surface of the lifting sling or lashing strap is at least 20% of the fabric thickness of the basic fabric.

The thread thickness 17, namely the diameter of the fancy threads 13, is expediently at least double the thread thickness and the diameter of the warp threads 11 and the weft threads 12 respectively.



Claims

1. A textile lashing strap for lashing loads or
 - a textile lifting sling for lifting loads or
 - a textile lifting sling designed as an endless sling(1) with a woven tubular sheath (4) as attachment means for lifting loads,
made of a woven webbing strap (5),
characterized by thickened locations projecting at least on one side of the strap in the longitudinal direction (2) of the strap in the manner of a longitudinal bead (6), a longitudinal rib (6) or a row of nubs (9) beyond the exterior surface of the basic fabric consisting of weft threads (11), warp threads (12) of the webbing strap (5) or of the tubular sheath (4), in order to increase the resistance to abrasion.
2. A lashing strap or lifting sling according to claim 1, characterized by several rows (6,9) of thickened locations disposed next to one another at specifically identical intervals (8).
3. A lashing strap or lifting sling according to claim 1 or 2, characterized in that the thickened locations are created by woven-in textile threads of a wear-resistant material.
4. A lashing strap or lifting sling according to claim 3, characterized in that the textile threads are woven into the basic fabric of the lifting sling in the direction of the run of the warp threads (12).
5. A lashing strap or lifting sling according to one or more of the preceding claims, characterized in that the textile threads are filament yarns or twines made of synthetic fibre materials or monofilament textile wires.
6. A lashing strap or lifting sling according to one or more



of the preceding claims, characterized in that the thickened locations are created by fancy threads (13) in the basic fabric (weft threads 11, warp threads 12).

7. A lashing strap or lifting sling according to one or more of the preceding claims, characterized in that the thread thickness of the fancy threads (13) is greater than the thread thickness (17) of weft threads (11) or warp threads (12) of the basic fabric.

8. A lashing strap or lifting sling according to claim 6 or 7, characterized in that the thread thickness (17) of the fancy threads (13) is at least double the thread thickness of weft threads (11) or warp threads (12) of the basic fabric.

9. A lashing strap or lifting sling according to one of claims 1 to 5, characterized in that the thickened locations are created by embroidery threads (14) on the basic fabric.

10. A lashing strap or lifting sling according to claim 9, characterized in that embroidery threads (14) of differing thread thickness are present in each row (6,9) of thickened locations.

11. A lashing strap or lifting sling according to claim 13, characterized in that the embroidery threads of differing thickness are guided in such a way that the rows (6,9) of thickened locations created by them have a semi-circular cross-sectional character in the cross-section projecting beyond the exterior surface (7) (Fig.17).

12. A lashing strap or lifting sling according to one or more of the preceding claims, characterized in that the rows (6,9) of thickened locations extend over the entire length of the lifting sling.

13. A lashing strap or lifting sling according to one or more



of the preceding claims, characterized in that the rows (6,9) of thickened locations extend over the entire width of at least one side of the strap.

14. A lashing strap or lifting sling according to one of claims 6 to 12, characterized in that each thickened location is created by at least two juxtaposed fancy threads (13) or embroidery threads (14) of identical thread thickness.

15. A lashing strap or lifting sling according to one or more of the preceding claims, characterized in that the projection height (16) of the fancy threads (13) or the embroidery threads (14) is at least 20% of the fabric thickness of the basic fabric.