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(54) LOAD SLING

(71) I, FRANK NATTRASS, of Falloys End, Brearton, Harrogate, Yorkshire, a British Subject, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a load-encircling sling which tightens about a load as the sling is tensioned and remains tight thereabout when the tensioning force is removed.

It is frequently required to handle and lift loads of irregular shape or unbalanced weight or which distort when encompassed by a sling, as for example sacks of powdered or granular material. Expensive equalising slings have been used for handling such loads. Choker slings, formed of a length of rope twisted into a noose, have been used as a cheaper alternative but they suffer from the disadvantage that the standing part is rapidly abraded by the running part which leads to a shortened useful life or constitutes a serious hazard to repeated use. In addition choker slings do not remain tight about a load when the lifting tension is removed which may lead to collapse of the load during handling.

According to the present invention I provide a load encircling sling comprising two parts, one of substantially unvarying length and the other a continuous loop the two parts being secured together by means allowing movement of the loop material in one direction and restricting or preventing movement in the other direction which movement in said one direction in use causes part of the loop in contact with the load to shorten and to tighten about part of the encircled load.

A sling according to this invention may be comprised of any suitable flexible material such as natural or synthetic fibre ropes. Webbing or bands of natural or synthetic materials are particularly suitable by reason of the ease with which they may be secured together with restricted movement in one direction. Synthetic band materials of a most suitable type are described in U.K. patent specifications Nos. 1,272,225 and

1,311,658. The materials described in these specifications are bands or endless bands of parallel continuous synthetic filaments encased in a sheath of thermoplastics organic material, such bands being very strong yet light and flexible.

In a sling according to a preferred embodiment of this invention the part which is of substantially unvarying length may be a suitable length of rope or band material or may be an endless loop. By substantially unvarying length in this context it is meant that the length of this part which contacts a load substantially remains constant apart from any stretch of the material when the sling is tensioned and the load raised. The loop part of a sling according to a preferred embodiment of this invention may be an endless rope or band or a length of rope or a band with the ends secured as for example by sewing, to form a continuous loop. In the latter case it is preferred that the joined ends are positioned so that the joint does not pass through the means used for restricting movement of the loop material during use of a sling.

The tightening effect in use of a sling according to this invention is brought about by attaching a load handling means, as for example a crane hook, to a first limb of the loop which becomes tensioned as the load is taken up. This tension causes the loop material to move in the allowed direction through the restricting means. The other limb of the loop, which contacts that part of the load not contacted by the sling part of substantially unvarying length, is thus drawn tighter about the load. By reason of the restricted movement of the loop material in the opposite direction a load once tightly secured by the sling will remain so when the lifting force is released. Loads may thus be transported from place to place secured in a sling ready for instant handling, the load throughout being maintained securely together as a unit.

As the loop material of a sling is tensioned to tighten one limb of the loop about the upper part of a load the length of the other limb lengthens. It is sometimes desirable to

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limit the amount of lengthening in this way and this may be accomplished by using a discontinuous length of sling material for the loop and forming the loop by joining the free ends in an adjustable manner, as for example by a restricting means as herein described.

When initially selecting or adjusting a sling according to this invention it is preferred that a combination of two parts is chosen so that the restricting means is positioned against a vertical face of a load and remains in this plane when the lifting tension is applied and the tightenable part moves into the fully-tightened position. A single restricting means may be used and positioned at one vertical face of the load, it is however preferred to use a pair of restricting means positioned at opposite faces of the load since if only one is used the upper limb of the tightened part may need to be repositioned in the lifting means after tightening in order that the load will hang vertically.

A restricting means for securing together the two parts of a sling according to this invention may have several forms. Thus such means may comprise two chain links or rings through which one or both sling parts are taken in a sinuous path as more fully described hereinafter. Another form of restricting device comprises a single link or ring and a bar of length greater than the span of the link, and extending across the link. In a further form of restricting device only a single link or ring may be used, the part of a sling which tightens being taken in a particular sinuous path. In yet another arrangement the restricting means comprises a loop in an end of the part of substantially unvarying length, through which the continuous loop is passed in a sinuous path. These and other forms of restricting means are illustrated in the accompanying drawings wherein:—

Figure 1 shows a load encompassed by a sling according to this invention.

Figure 2 is an enlarged view, partly sectioned, of one form of restricting means.

Figure 3 is a partly sectioned view of another form of restricting means.

Figure 4 is an end elevation of a third form of restricting means.

Figure 5 is a partly sectioned view of a fourth arrangement wherein a lifting loop is formed adjacent to a restricting means.

Figures 6 and 7 are side and end views of another form of restricting means wherein only a single link is in a restricting means.

Figure 8 is a side view of an arrangement wherein no separate link is used.

Simple slings according to this invention, and which consist of a single loop and a single part of substantially unvarying length may generally be used only to encompass loads comprising a limited number of individual

items, as for example, a single stack of sacks or two stacks side-by-side. Larger loads and loads comprising a greater number of individual items may be handled very conveniently by means of the present invention using two continuous loops attached by two pairs of restricting means to the four looped ends of a clover leaf or other multiloop sling which encircles the lower part of the load and provides the part of the combined sling which is of substantially unvarying length. Examples of such multiloop slings and their combination with two continuous loops are illustrated in the further accompanying drawings wherein:—

Figure 9 is a clover leaf sling.

Figure 10 is an alternative multiloop sling comprising two loops joined together at the intersections.

Figure 11 is a second alternative double loop sling.

Figure 12 illustrates a method of using a sling as illustrated in Figure 9-11 in combination with two loops and restricting means.

Referring now to Figure 1 one part of a sling comprises a discontinuous length of material 1, preferably in the form of a band which encloses the lower part of a load of sacks 2. A second part of the sling comprises a continuous loop of material one limb 3 of which encloses the upper portion of the load 2 and to the other limb 4 of which is attached a lifting hook 5. Each end of sling part 1 is taken in a sinuous path (shown to an enlarged scale in Figure 2) around one limb of each of two chain links 6 and 7. The limbs of the loop sling 3/4 are similarly taken about the other limbs of the links 6 and 7. Loop sling 3/4 may be made by joining together, as for example by sewing a suitable discontinuous length of sling material or it may be made as an endless loop in which case provision must be made to attach one limb of each of two links in the process of forming the endless loop.

In operation as limb 4 of the loop sling 3/4 is tensioned by raising the lifting hook 5 the sling material is drawn through links 6 and 7 which are brought together until the whole is locked by friction. At the same time and before the whole is locked by friction, limb 3 is drawn tight about the upper part of the load, thus causing tension in sling part 1 the ends of which are similarly drawn tight in the links 6 and 7. Upon release of the lifting force the material of the two parts of the sling being locked in links 6 and 7 is maintained tightly about the load.

Referring now to Figure 2 an end of sling part 1 is passed through the lower limbs of each of links 6 and 7 then around the outside of the lower limb of link 7 and finally through link 6 under the first part of sling material passed therethrough. Limbs 3 and 4 of the loop sling part are passed through links 6

and 7 and around link 7 in a similar fashion. In Figure 2 the twin-link restricting means is shown in a loosened state and when limb 4 is tensioned the sling material of each part 1 and 3/4 moves around their respective limbs of link 7 in an anti-clockwise direction until the whole is tight and movement (for the applied tension) ceases.

Figure 3 illustrates a restricting means comprising a chain link 8 and a bar 9 of sufficient length to span the link 8 and extend some distance beyond. In this embodiment only the limbs 3 and 4, which are taken through the link 8 and around the bar 9, are movable unidirectionally in use and each end of sling part 1 is merely taken around the lower limb of link 8 and the free end joined to the standing part by suitable means such as sewing.

Figure 4 illustrates a modification of the bar and link restricting means of Figure 3 wherein one limb of the link 8 is split at 10 to allow an end of sling part 1 already formed into a loop to be attached.

In Figure 5 a bar and link restricting means as in Figure 3 or 4 is shown with a different arrangement of the upper sling part 3/4. In this case both limbs 3 and 4 of the upper sling part are taken together through link 8 then under and around bar 9 and back over the top of bar 9 and through link 8 again. In this way a loop 11 is formed near the restricting means a pair of which are used in each complete sling the lifting means being connected to each loop 11. By this means a small distance between the top of the load and the lifting means may be obtained since the movement due to tightening is much reduced. An arrangement of this form may also be used with two chain links in place of a link and a bar.

Referring now to the arrangement illustrated in Figure 6 and 7 an endless loop is used as the upper sling part 3/4 and only a single link 12 is used as the restricting means. In use limbs 3/4 are put together across the top of a load 2 and a small looped portion 11 is taken down one vertical face of the load 2 inwardly through the link 12 and then upward between the link 12 and the vertical face of the load finally passing between spaced apart limbs 3 and 4 to a point centrally above the load 2, the looped end 11 together with a similar looped end from a restricting means on the opposite face of the load 2 then forming the points of attachment of lifting means. The performance of a sling of this arrangement in repeated use may be enhanced by incorporating in sling part 3/4 means to limit the degree of tightening of this part.

In Figure 8 is illustrated an arrangement similar to that of Figure 6 and 7 with the exception that the link 12 is dispensed with and the looped portion 11 is taken through a looped end portion of the lower sling part 1

instead. For very highly compressible loads it may be desirable to take the loop portion 11 twice through the looped end portion of sling part 1 to obtain a secure attachment.

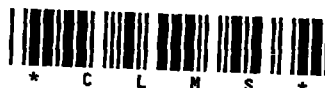
Referring now to Figure 9 a multi-loop sling consists of an endless length of material formed so as to produce a load supporting portion 13 and four looped ends 14, the intersections 15 being sewn or otherwise attached together. In the double loop sling of Figure 10 two endless loops 16 and 17 are laid one on top of the other and at 90° to each other and the intersections sewn or otherwise attached together to produce a load supporting portion 13 and four looped ends 14. Similarly the sling of Figure 11 comprises two endless loops 18 and 19 of figure eight form joined at the central intersection.

In use as illustrated in Figure 12 a multi-loop sling of the kind illustrated in Figures 9-11 is placed on the ground and four stacks of sacks 20 placed on the load supporting part 13. The looped ends are then drawn up at the corners of the load and attached by restricting means to a pair of continuous loops (one only is illustrated) 21. As illustrated the restricting means is of the type illustrated in Figure 8.

In use, particularly with very heavy loads, restricting means of the type illustrated in Figure 1 and Figure 2 may lock so tight that it is difficult to release the load from the encompassing sling without cutting the sling material. This does not matter in cases where the sling is intended for one trip only and to be thereafter disposed of. Slings according to this invention may be cheaply made and used in this disposable fashion. Restricting means according to Figure 3 or Figure 4 is easily releasable from the locked position merely by manually turning bar 9 in a direction opposite to that in which it turns when moving into the locked position. Easier releasability may also be obtained in a device according to Figure 3 or Figure 4 by a modification wherein the relative positions of the upper limb of link 8 and 9 are fixed by rotatably attaching bar 9 to the link 8. In this way a controlled locking effect may be achieved. Any material of sufficient strength may be used to form the links of restricting means, as for example ferrous or non-ferrous metals or plastics materials.

WHAT I CLAIM IS:—

1. A load encircling sling comprising two parts, one of substantially unvarying length and the other a continuous loop the two parts being secured together by means allowing movement of the loop material in one direction and restricting or preventing movement in the other direction which movement in said one direction in use causes part of the loop in contact with the load to shorten and to tighten about part of the encircled load.



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In Figure 5 a bar and link restricting means as in Figure 3 or 4 is shown with a different arrangement of the upper sling part 3/4. In this case both limbs 3 and 4 of the upper sling part are taken together through link 8 then under and around bar 9 and back over the top of bar 9 and through link 8 again. In this way a loop 11 is formed near the restricting means a pair of which are used in each complete sling the lifting means being connected to each loop 11. By this means a small distance between the top of the load and the lifting means may be obtained since the movement due to tightening is much reduced. An arrangement of this form may also be used with two chain links in place of a link and a bar.

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In use as illustrated in Figure 12 a multi-loop sling of the kind illustrated in Figures 9-11 is placed on the ground and four stacks of sacks 20 placed on the load supporting part 13. The looped ends are then drawn up at the corners of the load and attached by restricting means to a pair of continuous loops (one only is illustrated) 21. As illustrated the restricting means is of the type illustrated in Figure 8.

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2. A sling according to claim 1 wherein two restricting means positioned on opposite sides of the load are used.
3. A sling according to claim 1 or claim 2 wherein the or each restricting means respectively comprises two rings or links through which at least the continuous loop is taken in a sinuous path.
4. A sling according to claim 1 or claim 2 wherein the or each restricting means respectively comprises a single link or ring and a bar of length greater than the span of the link or ring and extending across the link or ring, the continuous loop being taken in a sinuous path, through the link or ring, around the bar and back through the link or ring.
5. A sling according to claim 1 or claim 2 wherein the or each restricting means respectively comprises a single link or ring through which the continuous loop is passed in a sinuous path.
6. A sling according to claim 1 or claim 2 wherein the or each restricting means respectively comprises a loop in an end of the part of substantially unvarying length, through which the continuous loop is passed in sinuous path.
7. A sling according to any one of claims 1 and 3 to 6 comprising a multiloop part of substantially unvarying length and presenting four looped ends, and two continuous loops attached by two pairs of restricting means to the four looped ends.
8. A sling according to claims 1 to 6 or claim 7 including in the or each continuous loop respectively means for adjusting the length thereof.
9. A sling according to any one of claims 1-8 wherein one or more of the sling parts is made from a band of parallel continuous synthetic filaments encased in a sheath of thermoplastics organic material.
10. A load encircling sling substantially as hereinbefore described and as illustrated in the accompanying drawings.
11. A load handling method wherein a sling according to any one of claims 1-10 is used.
12. A load encircled by a sling according to any one of claims 1-10.
13. A load according to claim 12 when appendant to claims 1 to 6 or to claim 7 wherein after tensioning the continuous loop or loops respectively the restricting means is positioned close to or at the top edge of the load.

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