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PATENT SPECIFICATION

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(54) HARNESSING DEVICES

(71) We, DENNISON MANUFACTURING COMPANY, a Corporation organised and existing under the Laws of the State of Nevada, United States of America, of 300 Howard Street, Framingham, Massachusetts, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the harnessing of items, for example to secure a number of items into a bundle.

According to one aspect of the present invention, a harnessing device comprises a strap formed by a ladder structure and connected to a head having a guide channel extending therethrough, one end of the strap being insertible into the guide channel, and the head having a deflectable locking tang within the head which projects into the guide channel and sequentially engages the rungs of the ladder structure when the strap is inserted into the channel.

According to another aspect of the present invention, a harnessing device comprises a head having a guide channel extending therethrough, there being a first auxiliary channel within the head on one side of the guide channel, a locking tang within the head in the first auxiliary channel and extending into the guide channel, a strap connected to the head, having an end insertible in the guide channel and having a set of apertures arranged to be sequentially entered by the locking tang when the end of the strap is inserted in one direction into the guide channel, and there being a second auxiliary channel within the head on the other side of the guide channel from the first auxiliary channel and arranged to receive the extending end of the locking tang when tension is applied to the strap in the opposite direction.

The locking tang may receive some lateral support from the sides of the first and second auxiliary channels. The support by the second auxiliary channel may be

improved without impairing the operation of the device if the walls of the second auxiliary channel converge towards the end of the guide channel opposite to that into which the strap end is inserted since by this means the tang can be caused to wedge tightly in the second auxiliary channel.

The invention may be carried into practice in various ways but a number of harnessing devices embodying the invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a harnessing device being used to harness a bundle of items;

Figure 2 is a perspective view of the head portion of the harnessing device of Figure 1 with the upper part broken away to show the internal construction of the head;

Figure 3A is a cross-sectional view of an alternative harnessing device head;

Figure 3B is a frontal view of the harnessing device head shown in cross-section in Figure 3A;

Figure 4 is a plan view of a harnessing device having an attached strap with a width exceeding that of the guide channel in the head; and

Figure 5 is a cross-sectional view of another alternative head configuration for a harnessing device.

Figure 1 shows a harnessing device 10 formed by a locking head 20 with an attached strap 30. The latter is in the form of a ladder structure that extends perpendicularly with respect to a corresponding guide channel 21 extending longitudinally through the head 20. When a group of items 11 is to be harnessed, they are encircled by the strap 30, and a tab 31 at the free end of the strap is inserted into and through the guide channel 21. The strap 30 is drawn through the locking head 20 by applying a forward thrust to it, and an internal locking tang (not shown in Figure 1) is deflected with respect to associated auxiliary channels 22 and 23. The locking tang successively engages rungs 32 of the strap 30 until the

items 11 are securely harnessed, each ring 32 having a cross-section which is symmetrical about a bisecting plane. Reverse tension produced on the strap 30 by the harnessed items 11 draws the locking tang against an internal stop (not shown in Figure 1) and prevents the items 11 from becoming unbundled. The device 10, including its head 20 and strap 30, is desirably made out of a resilient material, for example a plastics material such as nylon.

The internal structure of the head 20 is shown in Figure 2. The channel 21 serves as a guide for the rails of the strap rungs 32. Extending into the guide channel 21 is a locking tang 25 in the lower auxiliary channel 23. The latter is narrower than the guide channel 21 and receives the locking tang 25 when the strap is moved in the direction indicated by the forward thrust arrow F. The side walls of the lower channel 23 are spaced apart to receive the locking tang 25 without binding effect but are advantageously closely enough spaced to prevent any undesired lateral deflection of the locking tang.

As shown in Figure 2, the locking tang 25 is in its equilibrium position after having been deflected into the lower channel 23 by the forward motion of one of the rungs 32. After the items 11 (Figure 1) have become securely bundled and the forward tension F applied to the strap is terminated, the bundled items apply a reverse tension by which the nearest of the rungs 32 forces the locking tang 25 into the upper channel 22 between side walls, of which one such wall 22w is shown in Figure 2, until the tang 25 comes into contact with an inclined, planar stop 22s that blocks the upper channel 22.

The forward and reverse movements of a representative locking tang 25 are illustrated in Figure 3A. The tang 25 has a blunt end that is perpendicular to the direction of thrust, by contrast with the blunt end of the tang 25 in Figure 2 which is parallel to the direction of thrust. When forward tension F—1 is applied to the strap in Figure 3A, and one of the rungs 32—1 engages the locking tang 25, there is a component of force F—2 that is perpendicular to the tang and another component of force F—3 along the tang. The forward force F—1 produces a counterclockwise deflection of the tang 25 into the lower channel 23, with the tang ultimately reaching the phantom position 25f. It is to be noted that as the downward deflection of the tang into the channel 23 increases, the perpendicular component of force F—2 decreases until the deflecting rung of the strap occupies the phantom position 32—2, after which the natural resiliency of the tang 25 restores it to its equilibrium position.

When the forward force F—1 on the strap

of Figure 3A is terminated, the reverse force R—1 exerted by the bundled items 11 (Figure 1) causes the rung in the phantom position 32—3 to bear against the tang 25. Ultimately, as a result of the reverse force, the locking tang 25 occupies the phantom position 25r in abutting relationship with the inclined planar stop 22s. In this position, the reverse force R—1 has a component R—2 that is perpendicular to the stop surface 22s and another component R—3 along the surface of the tang. In the rest or locked position of the tang 25, the compression component R—2 is maximum. In addition, as the tang 25 moves to the phantom position 25r, the lever arm decreases so that the resistance of the tang to reverse deflection increases as the deflection increases. Thus the tang tends to resist the reverse force applied by the items that have been harnessed. This is by contrast with conventional harnessing devices in which there is no increase in counter-deflection.

As shown by Figure 3A, the locking tang 25 is positioned within the head 20 to facilitate the forward movement of the strap and at the same time impede reverse movement. Thus, the counter-clockwise deflection of the locking tang into the lower auxiliary channel 23 is facilitated by the position of the tang, while the clockwise deflection from equilibrium caused by reverse movement is resisted. Figure 3A also shows that the height of the guide channel 21 near the output end exceeds the height of the channel near the locking tang 25. This promotes the feed of the strap in the guide channel.

In addition the walls 22w of the upper auxiliary channel 22 can be tapered towards the end of the head containing the inclined planar stop 22s, so that as the locking tang 25 moves upwardly into the channel 22 it becomes wedged between the walls 22w.

A frontal view of the locking head 20 of Figure 3A in Figure 3B shows that when the locking tang 25 is in equilibrium, the guide channel is substantially fully occupied, but the tang does not extend into the upper auxiliary channel (not visible in Figure 3B). The portion of the locking tang 25 in the lower auxiliary channel is flanked by ramp surfaces 23r. These surfaces facilitate the entry of the rails 34—1 and 34—2 of the strap 30 into the guide channel and are of a width determined by an extent to which an inclined ramp effect is desired at the entrance of the locking head 20. It is to be noted that the strap 30 which is attached to the locking head is shown to have a neck 33 that is wider than the remainder of the strap between the rails 34—1 and 34—2. When the harnessing device is of nylon, the strap 30 is deliberately made oversized. It is then stretched, except at the neck 33, to a suit-

able width to permit easy entry into the guide channel of the head 20.

A plan view of a harnessing device with an oversized strap 30 is shown in Figure 4. As noted above, this kind of strap is formed when the harnessing device is fabricated of nylon and the strap is thereafter stretched to produce the desired ladder configuration below the head shown by Figure 3B. Alternatively, the strap 30 of Figure 4 can be used without being pre-stretched when the harnessing device is fabricated of a stretchable elastomeric material. In that event, when the tab 31 is inserted into the guide channel 21, the strap becomes stretched over the items being harnesses by the forward tension applied by the user. When the forward tension is terminated, and the harnesses items exert a reverse tension, there is resistance to that tension by virtue of the action of the locking tang 25, but there is additional resistance to the reverse tension due to interference between the strap and the guide channel. This increases the security of the harnessing device.

Figure 5 shows a head 20' which is very similar to that shown in Figure 3A but has a tang 25' which, when unstressed, is curved along its length and has an end surface which is so inclined to the length of the tang that it can engage the planar stop 22s'. It will be seen that with reverse tension R' applied to the strap, the tang forms an arch to resist the force applied to it by the rung 32'.

WHAT WE CLAIM IS:—

1. A harnessing device comprising a strap formed by a ladder structure and connected to a head having a guide channel extending therethrough, one end of the strap being insertible into the guide channel, and the head having a deflectable locking tang within the head which projects into the guide channel and sequentially engages the rungs of the ladder structure when the strap is inserted into the channel.

2. A harnessing device as claimed in Claim 1 in which an auxiliary channel communicates with the guide channel and is arranged to receive the projecting end of the locking tang during the application of reverse thrust thereto by the strap.

3. A harnessing device as claimed in Claim 2 in which the locking tang is positioned at one end of the head in an auxiliary channel on the opposite side of the guide channel from the auxiliary channel arranged to receive the locking tang.

4. A harnessing device comprising a head having a guide channel extending therethrough, there being a first auxiliary channel within the head on one side of the guide channel, a locking tang within the head in the first auxiliary channel and extending

into the guide channel, a strap connected to the head, having an end insertible in the guide channel and having a set of apertures arranged to be sequentially entered by the locking tang when the end of the strap is inserted in one direction into the guide channel, and there being a second auxiliary channel within the head on the other side of the guide channel from the first auxiliary channel and arranged to receive the extending end of the locking tang when tension is applied to the strap in the opposite direction.

5. A harnessing device as claimed in Claim 4 in which the strap comprises a plurality of rungs extending between a pair of longitudinal rails.

6. A harnessing device as claimed in Claim 5 in which each of the rails is of rounded cross-section.

7. A harnessing device as claimed in Claim 5 or Claim 6 in which a part of each rung which engages the tang is convexly curved in cross-section.

8. A harnessing device as claimed in Claim 5 or Claim 6 in which each rung is of rounded cross-section.

9. A harnessing device as claimed in any of Claims 5 to 8 in which each rung has a cross-section which is symmetrical about a bisecting plane.

10. A harnessing device as claimed in any of the preceding claims in which the strap is of a stretchable material and is prestretched lengthways.

11. A harnessing device as claimed in any of Claims 1 to 9 in which the strap has a width which exceeds that of the guide channel and is stretchable over at least a portion thereof to a width less than that of the guide channel for insertion therinto.

12. A harnessing device as claimed in any of the preceding claims in which one end of the strap is attached to the head at an angle with respect to the axis of insertion of the other end of the strap into the channel.

13. A harnessing device as claimed in any of the preceding claims in which the lateral walls of the guide channel converge towards the end of the guide channel opposite to that into which the strap end is inserted.

14. A harnessing device as claimed in any of the preceding claims in which the locking tang is positioned at one end of the head.

15. A harnessing device as claimed in any of Claims 2 to 14 in which the locking tang is engageable with a stop member which blocks the auxiliary channel arranged to receive the said end of the locking tang.

16. A harnessing device as claimed in any of Claims 2 to 15 in which the lateral walls of the auxiliary channel arranged to receive the locking tang converge towards one end of the head.

17. A harnessing device substantially as

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able width to permit easy entry into the guide channel of the head 20.

A plan view of a harnessing device with an oversized strap 30 is shown in Figure 4. As noted above, this kind of strap is formed when the harnessing device is fabricated of nylon and the strap is thereafter stretched to produce the desired ladder configuration below the head shown by Figure 3B.

Alternatively, the strap 30 of Figure 4 can be used without being pre-stretched when the harnessing device is fabricated of a stretchable elastomeric material. In that event, when the tab 31 is inserted into the guide channel 21, the strap becomes stretched over the items being harnessed by the forward tension applied by the user. When the forward tension is terminated, and the harnessed items exert a reverse tension, there is resistance to that tension by virtue of the action of the locking tang 25, but there is additional resistance to the reverse tension due to interference between the strap and the guide channel. This increases the security of the harnessing device.

Figure 5 shows a head 20' which is very similar to that shown in Figure 3A but has a tang 25' which, when unstressed, is curved along its length and has an end surface which is so inclined to the length of the tang that it can engage the planar stop 22s'. It will be seen that with reverse tension R' applied to the strap, the tang forms an arch to resist the force applied to it by the rung 32'.

WHAT WE CLAIM IS:—

1. A harnessing device comprising a strap formed by a ladder structure and connected to a head having a guide channel extending therethrough, one end of the strap being insertible into the guide channel, and the head having a deflectable locking tang within the head which projects into the guide channel and sequentially engages the rungs of the ladder structure when the strap is inserted into the channel.

2. A harnessing device as claimed in Claim 1 in which an auxiliary channel communicates with the guide channel and is arranged to receive the projecting end of the locking tang during the application of reverse thrust thereto by the strap.

3. A harnessing device as claimed in Claim 2 in which the locking tang is positioned at one end of the head in an auxiliary channel on the opposite side of the guide channel from the auxiliary channel arranged to receive the locking tang.

4. A harnessing device comprising a head having a guide channel extending therethrough, there being a first auxiliary channel within the head on one side of the guide channel, a locking tang within the head in the first auxiliary channel and extending

into the guide channel, a strap connected to the head, having an end insertible in the guide channel and having a set of apertures arranged to be sequentially entered by the locking tang when the end of the strap is inserted in one direction into the guide channel, and there being a second auxiliary channel within the head on the other side of the guide channel from the first auxiliary channel and arranged to receive the extending end of the locking tang when tension is applied to the strap in the opposite direction.

5. A harnessing device as claimed in Claim 4 in which the strap comprises a plurality of rungs extending between a pair of longitudinal rails.

6. A harnessing device as claimed in Claim 5 in which each of the rails is of rounded cross-section.

7. A harnessing device as claimed in Claim 5 or Claim 6 in which a part of each rung which engages the tang is convexly curved in cross-section.

8. A harnessing device as claimed in Claim 5 or Claim 6 in which each rung is of rounded cross-section.

9. A harnessing device as claimed in any of Claims 5 to 8 in which each rung has a cross-section which is symmetrical about a bisecting plane.

10. A harnessing device as claimed in any of the preceding claims in which the strap is of a stretchable material and is prestretched lengthways.

11. A harnessing device as claimed in any of Claims 1 to 9 in which the strap has a width which exceeds that of the guide channel and is stretchable over at least a portion thereof to a width less than that of the guide channel for insertion therein.

12. A harnessing device as claimed in any of the preceding claims in which one end of the strap is attached to the head at an angle with respect to the axis of insertion of the other end of the strap into the channel.

13. A harnessing device as claimed in any of the preceding claims in which the lateral walls of the guide channel converge towards the end of the guide channel opposite to that into which the strap end is inserted.

14. A harnessing device as claimed in any of the preceding claims in which the locking tang is positioned at one end of the head.

15. A harnessing device as claimed in any of Claims 2 to 14 in which the locking tang is engageable with a stop member which blocks the auxiliary channel arranged to receive the said end of the locking tang.

16. A harnessing device as claimed in any of Claims 2 to 15 in which the lateral walls of the auxiliary channel arranged to receive the locking tang converge towards one end of the head.

17. A harnessing device substantially as



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described herein with reference to and as illustrated in Figures 1 and 2 or Figures 3A and 3B or Figure 4 or Figure 5 of the accompanying drawings.

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