The invention relates to a method for producing a woven belt strap, particularly an automobile safety belt strap, which is characterized in that the weft threads are alternately inserted from one belt strap side and then from the other belt strap side, during which at least the first of both warp threads remain on the respective weft entry side without being woven, and a catch thread, which loops the weft on the weft exit side, is drawn into the weave until the warp threads, which remained unwoven with the preceding weft, are woven by the catch thread loop.
METHOD OF PRODUCING A WOVEN WEBBING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of Application No. PCT/EP03/06388, filed Jun. 17, 2003, which claims priority to German Application No. 102 28 066.5, filed Jan. 17, 2002; both of which are incorporated by reference herein.

BACKGROUND AND SUMMARY OF THE INVENTION

[0002] The invention relates to a method of producing a woven webbing, particularly a vehicle occupant restraint belt.

[0003] In the production of transverse stiff webbing, particularly vehicle occupant restraint belts on narrow fabric needle looms it is known to employ a rigid web yarn, particularly monofil yarn. This hard web yarn has the disadvantage that at the edges where the web returns, it projects from the belt in forming a hard sawtooth-like woven edge. Various attempts have been made to overcome the negative aspects of the hard web material.

[0004] Known from EP 0 021 104 A is a two-needle technique with a knitted course at the web exit side which solves the problem by including a rounded edge in the weave. DE 33 45 508 C2 discloses a two-needle technique with a knitted course at the web exit side which includes a 2:2 edge. Disclosed in conclusion by PCT/EP/48285 is a single-needle technique with two knitting needles in which crochet edges are formed at the web exit side and at the web entry side. DE 40 09 455 by the same applicant as of the present application, discloses a method of weaving a webbing of monofil web threads on a narrow fabric needle loom with two weft needles working in opposition, wherein the web threads are picked alternatingly from both sides of the webbing.

[0005] All of these known techniques have the disadvantage that although the edges of the webbing produced thereby all look substantially the same, because of the weaving system they result differently. When these webbings are put to use, especially in technical applications, such as, for example, as vehicle occupant restraint belts, the webbing is continually abraded in running over pulley locations (buckles, deflectors, and the like), resulting in the edges being heavily flexed and tending to deform. Because of the weaving technique differing in producing the right-hand and left-hand edge of the webbing, this deformation is uneven, resulting worst-possible in the webbing becoming saber-curved. When the webbing becomes as distorted as this, it can no longer be neatly coiled, which, as with vehicle occupant restraint belts, becomes not only uncomfortable but also hazardous (no restraint) for the vehicle occupant.

[0006] Ideal webbing should have the following properties: soft edges when hard web material is employed. Both edges should be 100% identical not only in appearance but also technically in weave. Even in a high web set no thread entanglement must materialize. The weaving method needs to be simple and thus operator-friendly. This resulted in the object of proposing a method of producing a woven webbing, particularly a vehicle occupant restraint belt which avoids, or at least greatly diminishes, the disadvantages known from prior art.

[0007] This object is achieved by a method as set forth in claim 1 by making use of a webbing weaving machine comprising web needles working alternately in opposition with the effect that webbing having soft, exactly identical edges is created.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention will now be briefly explained in the following with reference to the drawing in which:

[0009] FIG. 1 is a view from above of the components of a webbing weaving machine as substantial to discussing the invention in an illustration greatly simplified diagrammatically.

[0010] FIG. 2 is an illustration again greatly simplified diagrammatically and not to scale of a webbing showing how the web reversals are included in the weave in making use of knitting needles.

DETAILED DESCRIPTION

[0011] The sequence in the method in accordance with the invention is, for example, as follows:

[0012] First Pick:

[0013] picking a web thread 9 with a web needle 5 from left to right in a shed formed by warp threads 2 and looping it (in this particularly case as described) to the right-hand edge of the webbing by a right-hand knitting needle 6 by means of a tuck thread (not shown),

[0014] after return of the web thread to the left, attaching the picked web thread by a reed 3 to the finished fabric 1, on change of shed the left-hand web needle and the right-hand knitting needle remain parked during one rotation of the machine

[0015] Second Pick:

[0016] picking a web thread 8 with a right-hand web needle 4 coming from the right in the shed and looping it by means of a tuck thread by a left-hand knitting needle 7, after return of the web thread to the right-hand end position, attaching the picked web thread by the reed 3,

[0017] the right-hand web needle and the left-hand knitting needle remain parked in this position during one rotation of the machine

[0018] Third Pick:

[0019] implementing the third pick as a repeat of the first pick Fourth pick:

[0020] implementing the fourth pick as a repeat of the second pick

[0021] When using hard, especially monofil, web material relatively thick tuck threads are employed at both sides to cover the hard reversals of the web thread. In addition, since in this technique only every second pick is crocheted to the edge of the webbing, very high web sets are achievable (high web set webbing having enhanced abrasion resistance).

[0022] Although there is no need in this weaving method for preventing runs (laddering) by additional, further tuck threads, or so-called locking threads, since web entry and crocheting exists at each edge of the webbing, resulting in the fabric remaining stable even when subjected to wear and
tear of the tuck threads, if additional run prevention is desired the following procedure is of advantage: For run prevention an additional bracket with a thread eyelet is secured to each tucker so that a locking thread drawn through the eyelet is located on upwards movement of the tucker above the pick, the tuck thread advanced from below first being taken by a knitting needle in crocheting the tuck thread. On lowering of the tucker the advancing knitting needle takes the lock thread coming from above and twines the tuck thread resulting in the lock thread becoming intertwined with the tuck thread in not being drawn into the selvedge but nevertheless preventing any pull-up of the tuck thread.

[0023] To further enhance covering the pick reversals the procedure in accordance with the invention is as follows: as evident from FIG. 2 the first two warp threads 11, 15, 11', 15' remain unknitted at each pick side 10 and 10', i.e. they always either being over or under stitched at each pick, resulting in the weft reversal becoming displaced further away from the edge of the webbing. In other words, the higher the number of unknitted threads selected, the more the reversal becomes displaced in the direction of the middle 12 of the fabric, represented in this case by six threads.

[0024] The warp threads 11, 11', 13 and 13' not picked in the weave are included in the weave at each weft exit side by the (soft) tuck threads 14 and 14' intertwined by the weft threads being drawn into the fabric sufficiently so that the tuck threads replace the missing pick. This is achieved by increasing the positive tuck thread transport and correspondingly reducing the positive weft thread transport. This results in the weft set in the region of the edges being half that in the remaining fabric. Compensating this situation is done as follows: in the region of the edges a weave is selected which is shorter than that in the remaining fabric, for instance K 2:2 in the latter and L:1:1 at the edges. Moreover it may prove advantageous to employ a thicker thread for the usual half titer of the weft thread.

[0025] The intention of the present invention is to produce a webbing fabric, particularly vehicle occupant restraint belts on narrow fabric needle looms which even when employing hard weft material features right-hand and left-hand edges 100% identical not only in appearance but also technically in weave. This was hitherto possible in prior art only with webbing produced with shuttles. The great advantage of webbing having identical edges in technical applications, particularly in vehicle occupant restraint belts subject to continual movement in the vehicle (friction), is that because of the edges being totally identical there is no longer any one-sided deformation (sabre-curving) of the webbing in thus eliminating problems in automatic coiling of the webbing in the vehicle in avoiding slack, i.e. the webbing failing to provide snug vehicle occupant retention with the hazard of the occupant being catapulted forwards in a crash situation with an enormous added risk of injury.

List of Reference Numerals

- 0026 1 finished webbing
- 0027 2 warp thread
- 0028 3 reed
- 0029 4 right-hand weft needle
- 0030 5 left-hand weft needle
- 0031 6 right-hand knitting needle
- 0032 7 left-hand knitting needle
- 0033 8 right-hand weft thread
- 0034 9 left-hand weft thread
- 0035 10 and 10' pick side
- 0036 11 and 11' second warp thread
- 0037 12 webbing middle portion
- 0038 13 and 13' third and fourth warp
- 0039 14 and 14' tuck thread
- 0040 15 and 15' first warp thread

The invention claimed is:

1. A method of producing a woven webbing, particularly a vehicle occupant restraint belt, comprising the steps:

   a) picking the weft threads alternatingly from one side of the webbing and then from the other so that at least the first two warp threads at each pick side remain out of the weave, and
   b) drawing in a thread tucking the pick at the pick exit side sufficiently so that said warp threads remaining out of the weave in the previous pick are now included in the weave by the looping of the tuck thread.

2. The method as set forth in claim 1 for producing a tubular edge, comprising the steps:

   a) employing at least four edge threads on each side, remaining out of the weave at the picking side and always becoming included in the weave from the subsequent pick at the pick exit side by it drawing in the tuck thread on return of the weft needle up to the basic warp threads, and
   b) employing on each side a lacing thread running warwise and located in front of the first warp thread and outside of the first weft thread respectively, said lacing thread working like an edge thread but being lifted on at least every second pick, resulting in the edge fabric formed by the tuck threads being drawn around from the pick up to the basic fabric.

3. The method as set forth in claim 1 wherein:

   a) for run prevention an additional bracket with a thread eyelet is secured to each tucker so that a locking thread drawn through the eyelet is located on upwards movement of the tucker above the pick, the tuck thread advanced from below first being taken by a knitting needle in crocheting the tuck thread and
   b) on lowering of the tucker the advancing knitting needle takes the lock thread coming from above and twines the tuck thread resulting in the lock thread becoming intertwined with the tuck thread in not being drawn into the edge of the fabric but nevertheless preventing any pull-up of the tuck thread.

4. The method as set forth in claim 1 wherein a rigid thread, particularly a monofilament yarn, is employed as the weft and a soft thread, particularly a multifilament yarn is employed as the tuck thread.

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