

Warp knitting machine, especially crochet galloon machine

5 Technical field

The invention relates to a warp knitting machine, especially a crochet galloon machine, according to the pre-characterizing clause of Claim 1.

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Prior art

A warp knitting machine of the type mentioned in the introduction is known, for example, from
15 DE-A-27 58 421. In this warp knitting machine, the weft guide bars and the weft guides arranged thereon must be moved not only to and fro along the weft guide bars, but also up and down, in order to underlay a corresponding weft yarn on a knitting needle. In this case,
20 the weft guide bars are exposed to a very high dynamic load, thus resulting in sagging, wear and high noise emission. In order to counteract this, the bars must have a very large cross-section and therefore require a large amount of space. This space requirement, on the
25 one hand, and the only limited free space available on the warp knitting machine, considerably restrict the maximum number of weft guide bars, for example to eight. An improvement to a maximum of sixteen can be achieved by improving the design according to
30 WO 94/23 106. In this case, two weft guide bars are designed so as to be one above the other and so as to engage one into the other. In this design too, there are still the disadvantages that the weft guide bars have to be moved not only to and fro but also up and
35 down, so that high inertia forces, strong vibrations, high noise emission and wear occur. The maximum speed of such warp knitting machines is therefore restricted,

for example to 1200 revolutions/minute. In addition, in view of the fact that an ever smaller needle gauge of four to ten needles per cm is demanded nowadays, the knitting needles have very thin cross-sections, with
5 the result that the needles are highly susceptible to flexions and oscillations. At the present time, it is customary to restrict the maximum free knitting needle length to approximately 50 times the needle thickness in the gauge direction. The warp yarns are inserted
10 into the knitting needle heads when the needles are in the extended position. The distance between the knock-over bar and this extended position is available for the number of racking rows for weft guidance and, at the present time, amounts to a maximum of seven rows.
15 Yarn guides having tips or having small end tubes serve for laying the weft yarns under and between the knitting needles. Furthermore, the tip of the yarn guide may also be provided with a small end tube which, however, takes up a relatively large amount of space.
20 The racking gauge is therefore nowadays, on average, approximately 3 mm. This restricts the number of racking levels to seven, on the assumption of a knitting needle stroke of 25 to 30 mm. Also because up to seven yarn guide tips, which have to engage into a
25 knitting needle gap between the knitting needles, cannot be oriented exactly in one line, there is contact with the knitting needles, and these begin to vibrate or may be damaged, thus impeding insertion of the warp yarns in the knitting needle heads and greatly
30 restricting the rotational speed of warp knitting machines.

Since, on the one hand, the yarn guides for laying the weft yarns under the knitting needles have to penetrate into the knitting needle gaps and since,
35 on the other hand, the guidance of weft yarns over long distances is driven via a crank mechanism, a certain number of knitting needles must be omitted at the reversal point of the yarn guide. This affords the disadvantage that the useful knitting length is reduced

or that weft guidance must be driven via cam mechanisms, thus, in turn, restricting the maximum rotation speed of warp knitting machines.

According to the prior art, the knitting point
5 is designed on the crochet galloon principle, as a result of which it is not possible for the yarns to be beaten up on the selvedge. This affords the disadvantage that it has hitherto been possible to produce only knitted fabrics having a relatively low weft density.
10 The area of use of warp knitting machines is thereby restricted.

Presentation of the invention

15 The object of the invention is to improve a warp knitting machine of the type mentioned in the introduction.

The set object is achieved by means of the characterizing features of Claim 1.

20 Since the weft guides of the weft guide bars do not intersect the knitting needles, they also do not have to be moved up and down, a to-and-fro movement instead being sufficient. The weft yarns are supplied to the knitting needles by the feeders. This results in
25 an appreciable simplification of the weft guide and of the weft guide bars, so that a very large, hitherto impractical number of weft guide bars and weft guides is possible. The number of racking rows is also no longer necessarily restricted, so that the maximum
30 possible number is equal to the number of installed weft guide bars. Furthermore, the knitting needle stroke can be reduced to a minimum size, since there need only be space for a single feeder in a knitting needle gap between the knitting needles. The knitting
35 needle stroke is therefore essentially dependent on the width of the feeder. Since the weft guides no longer enter the knitting needle gaps between the knitting needles, operation is possible with weft guidance of virtually any length, without any loss of knitting

needles. This may be further assisted by using electronically controlled drives for driving the weft guide bars, the said drives allowing smooth motion so as to treat the weft yarns carefully.

5 Advantageous embodiments of the invention are described in Claims 1 to 16.

 It is possible in principle for the weft guide bars to execute not only a to-and-fro movement, but also a movement transverse to this, provided, however,
10 that the weft guides do not intersect the knitting needles. It is more advantageous, however, if the weft guide bars and therefore also the weft guides execute only a to-and-fro movement in their longitudinal direction, thereby appreciably simplifying the drive
15 and mounting, so that a larger number of weft guide bars and consequently weft guides may be used. It is also advantageous if, according to Claim 3, the knitting needles execute only a to-and-fro movement along their knitting axis.

20 It is possible in principle for not every knitting needle to be assigned a feeder, but the embodiment according to Claim 4 is more advantageous.

 It is conceivable that the feeders do not cross through the weft guides of the weft guide bars and the
25 knitting needles, but run at a distance from these. However, an embodiment according to Claim 5 is especially advantageous, the result of this being that not only is a more compact design achieved, but the operating capacity of the warp knitting machine is also
30 increased.

 The feeders may, if appropriate, be driven individually or in groups, but an embodiment according to Claim 6 on a common feeder bar is more advantageous.

 The feeders may be movable along a straight
35 path and/or along arcuate paths. Especially advantageous is a design according to Claim 7, which makes it possible for the return travel of the feeders to lie outside the weft guides, so that racking of the

weft guide bars can take place as early as during the return travel of the feeders.

As regards the arrangement of the weft guide bars together with the weft guides, various possibilities arise, such as, for example, according to Claim 8 or preferably according to Claim 9.

Claim 10 describes an advantageous arrangement of the weft guide bars.

Various possibilities, that according to Claim 11 being preferred, arise for the design of the feeders. The development according to Claim 12 improves the stability and operating reliability of the feeders. A development according to Claim 13 is also especially advantageous, the result of this being that a close-packed knitted fabric can be produced.

Various possibilities arise as regards the drive of the weft guide bar and/or of the warp guide bar. The possibility according to Claim 14 is especially preferred, since an electronically controlled actuator constitutes, for each guide bar, an effective drive which takes up little space and can be controlled in a simple way, both as regards the timing and as regards the stroke size, according to a pre-determinable pattern for producing the knitted fabric.

The embodiment according to Claim 15 is also especially advantageous, according to this the magnitude of the up-and-down movement of the feeders being adjustable.

Brief description of the drawings

Exemplary embodiments of the invention are described in more detail below with reference to the diagrammatic drawings in which:

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Figure 1 shows a vertical section through a first warp knitting machine, with the feeder raised;

- Figure 2 shows, as a detail, the warp knitting machine of Figure 1, with the feeder in the initial position, in a view towards the weft guide bars;
- 5 Figure 3 shows, as a detail and on a larger scale, the warp knitting machine of Figure 2, with the feeder at the knitting point, in a view towards the weft guide bars;
- 10 Figure 4 shows a vertical section through a further warp knitting machine, with the feeder in the initial position;
- Figure 5 shows, as a detail and on a larger scale, the warp knitting machine of
- 15 Figure 4, with the feeder at the knitting point;
- Figure 6 shows a plan view of the warp knitting machine of Figure 5;
- Figure 7 shows the warp knitting machine of
- 20 Figure 4, with the feeder on its return travel; and
- Figure 8 shows a vertical section through a further warp knitting machine, with the weft guide bar arranged along an arcuate
- 25 surface.

Embodiments of the invention

Figures 1 to 3 show a first exemplary embodiment of a warp knitting machine which has knitting

30 needles 34 which are guided and driven back and forth in their longitudinal direction in a knock-over bar 32 and which are preceded by warp guides 36. The warp guides 36 are fastened to a warp guide bar 38 and

35 execute a movement about the knitting needles 34, in order, in each case, to insert a warp yarn 40 into a knitting needle 34 when the latter is in the foremost position, as indicated by broken lines in Figure 1. In this exemplary embodiment, the knitting needles 34 are

designed as spring-hook needles and are driven in a known way not illustrated in any more detail.

5 A stack of weft guide bars 44 bearing the numbers 1 to 24 is arranged above the knitting needles 34 on a carrier 42 and is held on the topside by a guide 46. Each weft guide bar 44 contains a row of weft guides 48 in the form of small tubes, in order to supply weft yarns 50 to the knitting point 52. For the mutual guidance of the weft guide bars 44, there are, 10 for example, grooves 54, into which tongues 56 of the adjacent components engage. As emerges especially from Figures 3 and 4, the individual weft guide bars 44 are individually driven to and fro, solely in the longitudinal direction, by means of individual actuators 58, 15 for example electrically driven linear motors, via corresponding gears 60. These actuators 58 are connected to an electronic computer-assisted control device 61 which controls the use and/or stroke of the actuators 58 according to the particular pattern.

20 For supplying the individual weft yarns 50 to the knitting point 52, there are feeders 62 arranged on a feeder bar 64 which can be moved, in a way not illustrated in any more detail, up and down out of the initial position A represented by broken lines into the 25 knitting position W represented by unbroken lines. The feeders have a fork-like head 66 and, after the weft guides 48 have been racked, pass through the latter in a finger-like manner, in order to carry the respectively racked weft yarns to the knitting point 52 and lay them under the knitting needles 34, before the 30 latter are moved out of the retracted position into the advanced position (represented by broken lines in Figure 1). During the feed, the feeders 62 move right up to the selvedge 68, with the result that it is 35 possible to produce a very close-packed knitted fabric 70 which is drawn off from the knitting point 52 by a draw-off device 72.

By means of the weft guide bars 44 bearing the numbers 1 to 24 and their weft guides 48, it is

possible to use weft yarns 50 of the most diverse types, such as, for example, having different thickness, twisting, materials (such as rubber yarns), but also different make-up, for example as regards colour, shading and fleeciness. At the same time, such weft yarns may, for example, be laid as a stem S in only one warp K or as a part weft over some of the width or as a long weft LS over the entire width of the knitted fabric 70.

10 Figures 4 to 7 illustrate a further exemplary embodiment of a warp knitting machine which corresponds essentially to that of Figures 1 to 3, so that identical parts are given the same reference symbols, but with the addition of the index a.

15 In contrast to the warp knitting machine of Figures 1 to 3, that in figures 4 to 7 is modified particularly to the effect that the weft guide bars 44a together with the weft guides 48a are arranged in such a way that the weft yarns 50a are supplied to the
20 knitting point 52a by the weft guides 48a essentially in the same direction as the direction of the warp yarns 40a supplied by the warp guides 36a. The feeders 62a on the feeder bar 64a are arranged on a rotating drive device 74, not illustrated in detail, in such a
25 way that they are moved downwards out of the initial position A illustrated in Figure 4, at the same time combing through the weft guides 48a in a finger-like manner, into the knitting position W at the knitting point 52a, as illustrated especially in Figures 5 and
30 6. In this position, they lay the carried-along weft yarns 50a behind the knitting needles 34a which, in the present example, are designed as compound needles. To guide the feeders 62a back out of the knitting position, they are moved forwards out of the region of
35 the weft guides 48a by means of the drive device 74 and pass, free of the weft guides 48a, into the initial position A by way of the return travel 75. As early as during this return movement, the weft guide bars 44a can be racked again according to the particular

pattern, so that the performance of the warp knitting machine can be improved thereby.

As emerges especially from Figures 5 and 6, the feeders 62a have, once again, a fork-shaped head 66a which is provided with guide elevations 78 on the part penetrating into the knitting needle gap 76 between the knitting needles 34a, in order, on the one hand, to make it easier for the feeders 62a to penetrate into the knitting needle gaps 76 and, on the other hand, to keep the knitting needles 34a at a distance from one another.

The warp knitting machine of Figures 4 to 7 is, further, modified to the effect that the weft guide bars 44a and consequently also the weft guides 48a, together with the carrier 42a and guide 46a, are arranged at an inclination to the horizontal such that the weft yarns 50a make it possible to have as unimpeded a run-through to the knitting point 52a as possible. Moreover, the knock-over bar 32a is assigned a panel holder 80 which forms with the knock-over bar a guide clearance 82 of the knitted fabric 70a which is drawn off by the draw-off device 72a.

Figure 8 shows a further warp knitting machine which corresponds in functional terms to the above warp knitting machines of Figures 1 to 7, so that identical parts are given the same reference symbols, but with the addition of the index b.

The knitting needles 34b arranged in the knock-over bar 32b are preferably designed as spring-hook needles. The knock-over bar 32b is assigned a panel holder 80b which forms with the latter a guide clearance 82b. The knitting needles 34b are preceded by warp guides 36b, arranged on a warp guide bar 38b, for the supply of warp yarns 40b.

The weft guide bars 44b together with the weft guides 48b are arranged above the knitting needles 34b, specifically opposite to the direction in which the warp yarns 40b are supplied to the knitting point 52b. Moreover, the arrangement of the weft guide bars 44b

and of the weft guides 48b is such that they lie along an arcuate path 86, along which the feeders 62b arranged on a feeder bar 64b also travel through the yarn guides 48b in a finger-like manner from the
5 initial position A into the knitting position W.

The drive device 74b for the feeder bar 64b and for the feeders 62b is designed in such a way that the return travel 75b for the fork-shaped head 66b of the feeders 62b lies outside the weft guides 48b. For this
10 purpose, the feeder bar 64b is fastened to a rocker lever 88 which rocks about the axis 90 which itself describes the eccentric travel 94 by means of a driven eccentric 92, with the result that the distance between the arcuate supply path 86 and the return travel 75b
15 remote from this is determined by the weft guides 48b. The up-and-down movement is generated by an eccentric drive 96, the eccentric 98 of which is connected to a connecting rod 100, the other end of which is coupled to the rocker lever 88 via a joint 102.

LIST OF REFERENCE SYMBOLS

A	Initial position	60	Gear
LS	Long weft	61	Control device
K	Warp	62	Feeder
S	Stem	62a	Feeder
W	Knitting position	62b	Feeder
32	Knock-over bar	64	Feeder bar
32a	Knock-over bar	64a	Feeder bar
32b	Knock-over bar	64b	Feeder bar
34	Knitting needle	66	Head, fork-shaped
34a	Knitting needle	66a	Head, fork-shaped
34b	Knitting needle	66b	Head, fork-shaped
36	Warp guide	68	Selvedge
36a	Warp guide	68a	Selvedge
36b	Warp guide	70	Knitted fabric
38	Warp guide bar	70a	Knitted fabric
38a	Warp guide bar	70b	Knitted fabric
38b	Warp guide bar	72	Draw-off device
40	Warp yarn	72a	Draw-off device
40a	Warp yarn	74	Drive device
40b	Warp yarn	74b	Drive device
42	Carrier	75	Return travel
42a	Carrier	75b	Return travel
44	Weft guide bar	76	Knitting needle gap
44a	Weft guide bar	78	Guide elevation
44b	Weft guide bar	80	Panel holder
46	Guide	80b	Panel holder
46a	Guide	82	Guide clearance
48	Weft guide	82b	Guide clearance
48a	Weft guide	86	Path, arcuate
48b	Weft guide	88	Rocker lever
50	Weft yarn	90	Axis
50a	Weft yarn	92	Eccentric
50b	Weft yarn	94	Eccentric travel
52	Knitting point	96	Eccentric drive
52a	Knitting point	98	Eccentric
52b	Knitting point	100	Connecting rod
54	Groove	102	Joint
56	Tongue		
58	Actuator		

PATENT CLAIMS

1. Warp knitting machine, especially a crochet
galloon machine, with knitting needles (34, 34a, 34b)
5 which are guided on a knock-over bar (32, 32a, 32b) and
which are preceded by warp guide bars (38, 38a, 38b)
with warp guides (36, 36a, 36b) and are assigned weft
guide bars (44, 44a, 44b) with weft guides (48, 48a,
48b), characterized in that the weft guides (48, 48a,
10 48b) of the weft guide bars (44, 44a, 44b) do not cross
through the knitting needles (34, 34a, 34b), and in
that the weft guides (48, 48a, 48b) of the weft guide
bars (44, 44a, 44b) are assigned feeders (62, 62a, 62b)
to the knitting needles (34, 34a, 34b), which feeders
15 are guided and can be driven up and down, transversely
to the racking direction of the weft guide bars (44,
44a, 44b), between the weft guides (48, 48a, 48b) and
the knitting needles (34, 34a, 34b), in such a way that
the feeders (62, 62a, 62b) lay racked weft yarns (50,
20 50a, 50b) under the associated knitting needles (34,
34a, 3b).
2. Warp knitting machine according to Claim 1,
characterized in that the weft guide bars (44, 44a,
44b) together with the weft guides (48, 48a, 48b) can
25 be moved to and fro only in their racking direction.
3. Warp knitting machine according to Claim 1 or
2, characterized in that the knitting needle (34, 34a,
34b) is designed so as to be capable of being moved
only along its knitting axis.
- 30 4. Warp knitting machine according to one of
Claims 1 to 3, characterized in that each knitting
needle (34, 34a, 34b) is assigned a feeder (62, 62a,
62b).
5. Warp knitting machine according to one of
35 Claims 1 to 4, characterized in that the feeders (62,
62a, 62b) cross through the weft guides (48, 48a, 48b)



of the weft guide bars (44, 44a, 44b) and the knitting needles (34, 34a, 34b) in a finger-like manner.

6. Warp knitting machine according to one of Claims 1 to 5, characterized in that the feeders (62, 62a, 62b) are arranged on a common, drivable feeder bar (64, 64a, 64b).

7. Warp knitting machine according to one of Claims 1 to 6, characterized in that the return travel (75, 75b) of the feeder (62a, 62b) from the knitting point is arranged at a distance from the weft guides (48a, 48b).

8. Warp knitting machine according to one of Claims 1 to 7, characterized in that the weft guide bars (44a) together with weft guides (48a) are arranged in such a way that the weft yarns (50a) are supplied to the knitting point (52a) by the weft guides (48a) essentially in the same direction as the warp yarns (40a).

9. Warp knitting machine according to one of Claims 1 to 7, characterized in that the weft guide bars (44, 44b) together with the weft guides (48, 48b) are arranged in such a way that the weft yarns (50, 50b) are supplied to the knitting point (52, 52b) by the weft guides (48, 48b) in the opposite direction to the warp yarns (40, 40b).

10. Warp knitting machine according to one of Claims 1 to 9, characterized in that the weft guide bars (44, 44a, 44b) are arranged in such a way that the mouths of the weft guides (48, 48a, 48b) are arranged along a straight or arcuate surface relative to the knitting point (52, 52a, 52b).

11. Warp knitting machine according to one of Claims 1 to 10, characterized in that the feeders (62, 62a, 62b) have a downwardly open fork-shaped head (66, 66a, 66b) for grasping the weft yarns (50, 50a, 50b).

12. Warp knitting machine according to one of Claims 1 to 11, characterized in that the feeders (62a) have guide elevations (78) on each of the two sides on



a head (66a) engaging into the knitting needle gap (76) between the knitting needles (34a).

13. Warp knitting machine according to one of Claims 1 to 12, characterized in that the feeders (62, 62a, 62b) are designed in such a way that, after crossing through the knitting needles (34, 34a, 34b), they press or beat up the weft yarns (50, 50a, 50b) onto the selvedge (68, 68a) of the knitted fabric (70, 70a).
- 10 14. Warp knitting machine according to one of Claims 1 to 13, characterized in that the weft guide bars (44, 44a, 44b) can each be driven by means of an electrical actuator (58) which can preferably be controlled by means of an electronic control device
- 15 (61).
15. Warp knitting machine according to one of Claims 1 to 14, characterized in that the magnitude of the up-and-down movement of the feeders (62, 62a) is adjustable.

