Jan. 12, 1943. G. L. BOLDEN ET AL 2,308,430

WARP TENSION BAR FOR TEXTILE MACHINES

Filed May 18, 1942 2 Sheets-Sheet 1

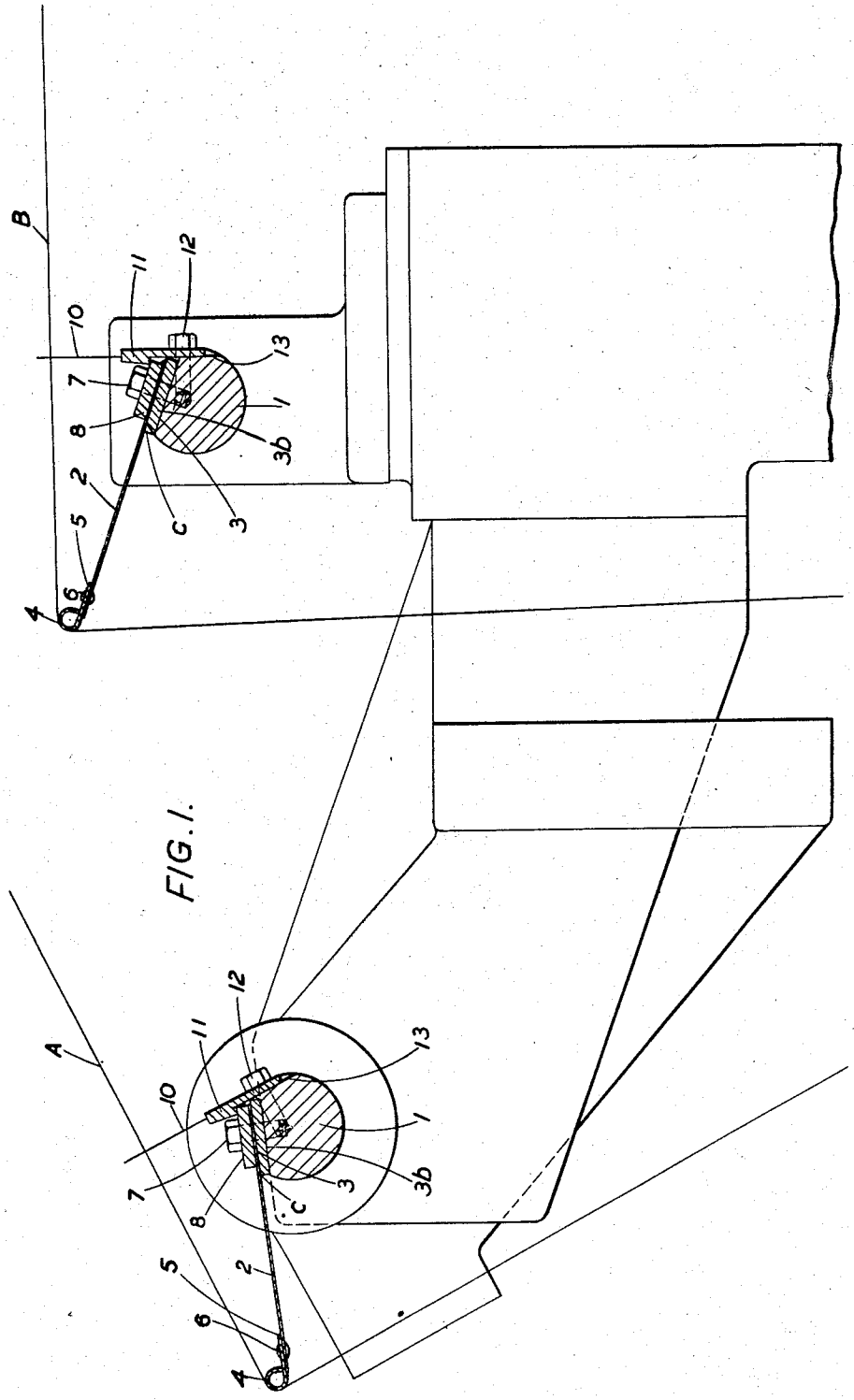


FIG. 1.

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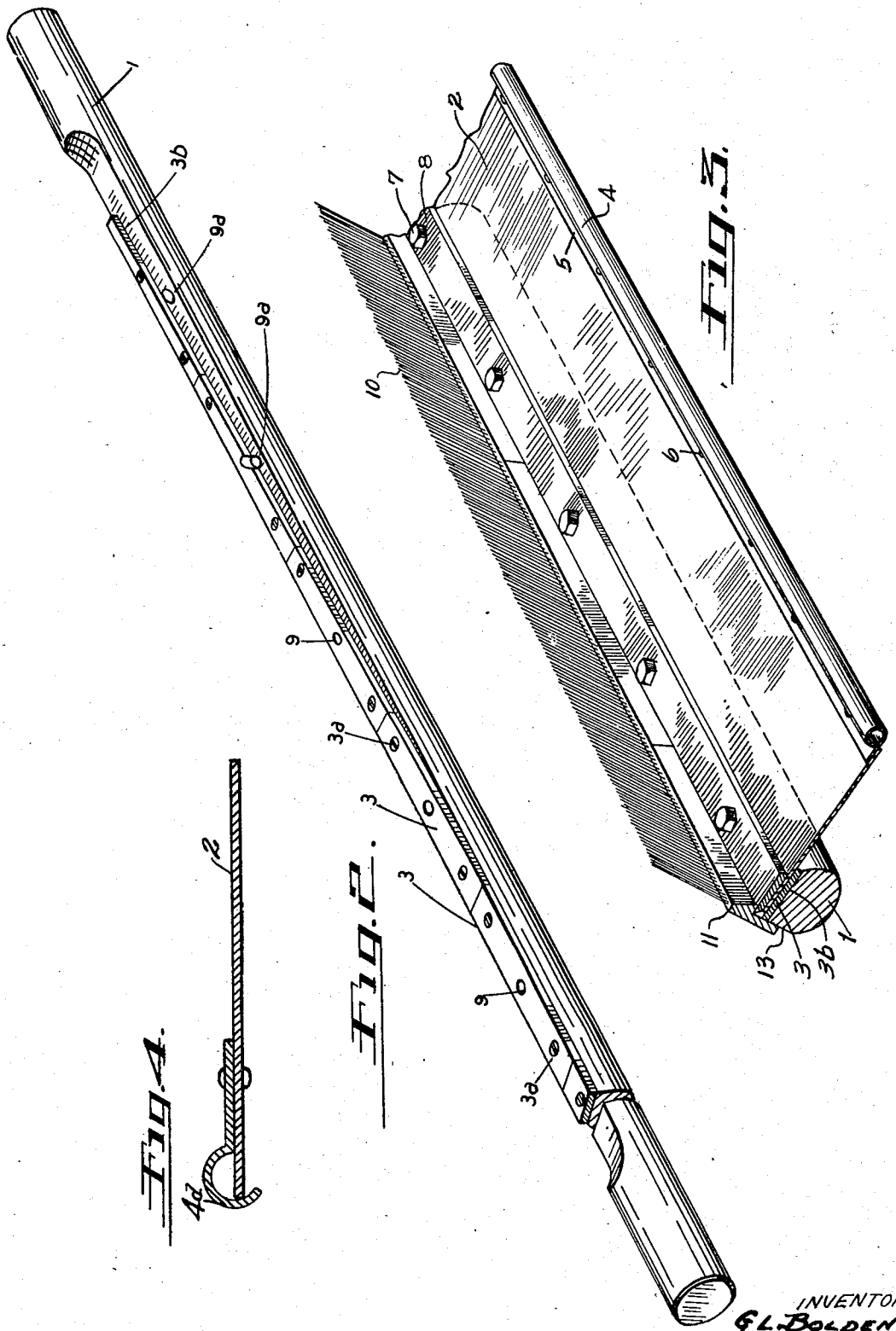


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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WARP TENSION BAR FOR TEXTILE MACHINES

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8 Claims. (Cl. 66—86)

This invention relates to tension bars for warp threads in textile machines and the invention is particularly applicable to warp knitting machines.

Owing to the motion of the various knitting elements of a warp knitting machine, particularly the eyes of the warp guides and the needle hooks, during the formation of loops, and owing to the fact that the beam or beams from which the warp threads are supplied cannot in practice be so controlled as to deliver during each part of the knitting cycle the exact length of yarn required, the total length of yarn between beam and needle changes and, unless some compensating means is provided, the yarn is subjected to such variations in tension that it becomes too tight at some points in the cycle and too slack at others. When too tight, an undue strain is put upon it, and when too slack, it cannot be guided with certainty. The purpose of an effective tension bar arrangement is, therefore, to maintain the tension as uniform as possible during the whole of each knitting cycle.

It is usual in present types of warp knitting machines to employ a tension bar arrangement which consists of a light steel tube, constituting a rail, over which the yarn passes on its way from a beam to the eyes in a row of warp guides. The rail is carried by a lever system incorporating coil springs that are intended to yield as the tension in the warp threads increases and to relax when the tension in the warp threads relaxes. Such an arrangement, however, is not found to be satisfactory when knitting at a speed greater than 400 to 500 courses per minute, because the effect of the inertia of the moving parts increases at a very high rate with increases of speed, and even if the weight of the parts is reduced, a speed is soon reached at which the vibration of the tension bar under the influence of the tension in the yarn and of the coil springs reaches such an amplitude that sufficiently precise control of the warp threads is no longer possible.

The aim of the present invention is to provide a satisfactory tension bar arrangement that can be used on warp knitting machines operated at speeds of 1000 courses per minute or higher; at the same time the invention aims at producing a tension bar suitable for any textile machines in which low and uniform tension is to be maintained in the yarn under conditions of rapid fluctuation.

With these aims in view, a tension bar is so constructed, according to the invention, as to include a resilient cantilever portion extending between a comparatively rigid support and a light smooth rail over which the threads pass. The cantilever portion may consist of elastic sheet metal having the smooth rail extending along one edge, and the rail conveniently may consist of beading formed on the sheet metal or on a separate strip secured to the sheet metal. Alternatively, the rail may be carried by a row of separate cantilever springs.

In warp knitting there is a marked difference in tension between those threads which go to the middle of the fabric being knitted and those that form the selvedges, the tension being progressively less towards the selvedges. A particular advantage of the invention, therefore, lies in the possibility of constructing the resilient cantilever portion of the tension bar so that it is progressively more flexible towards the points over which the threads pass to the selvedges than at the centre. In practice it has been found unnecessary to make provision for every degree of variation from the centre to each side, but it has been found beneficial to make the cantilever portion progressively more flexible for about 10 to 20 inches on each side of the cloth towards the selvedge. This may be effected, when a number of cantilver springs are employed, by making those towards the sides of the fabric progressively weaker as they approach the selvedges. If metal sheet is employed, either the support can be so modified towards the selvedges as to increase, in effect, the distance between the support and the rail, or sheets of lighter section can be used towards the selvedges than at the centre.

In order that the invention may be clearly understood and readily carried into effect, tension bars in accordance therewith will now be described, by way of example, with reference to the accompanying drawings, in which

Figure 1 is a vertical transverse section through part of a warp knitting machine;

Figure 2 is a perspective view of a member appearing in Figure 1;

Figure 3 is a perspective view of part of an assembly appearing in Figure 1; and

Figure 4 shows a modification of an element appearing in Figures 1 and 3.

Figure 1 shows the manner in which a pair of tension bars are mounted in a warp knitting machine. Each such bar comprises a fixed rod 1 and a narrow cantilever sheet 2 of thin gauge steel secured along one edge upon strip sections 3 secured by screws 3a (Figure 2) to a flat surface 3b on the rod 1. These tension bars, of course, extend along the machine parallel to the warp beams (not shown) and to the rows of knitting elements (not shown). Warp threads A from one warp beam pass over the tension bar on the left, as viewed in Figure 1, to one row of warp guides, and warp threads B pass from a second warp beam over the other tension bar to a second row of warp guides. To provide a smooth surface in contact with the warp threads, each sheet 2 is provided along its free edge with beading 4. This beading could, of course, be formed directly on the resilient sheet 2, but, as shown in Figures 1

and 3, it is formed by rolling over one edge of a narrow strip 5 secured by rivets 6 to the resilient sheet 2. In Figures 1 and 3 the beading 4 is constituted by a turned-up edge of the strip 5, but it can be formed by bending the edge downwards as shown at 4a in Figure 4.

The rear edge of the resilient sheet 2 is secured upon the line of strip sections 3 on the rod 1 by bolts 7 and a clamping member 8 which may consist of a number of sections similar to the sections 3. The bolts 7 pass through holes in the clamping member 8, through holes in the sheet 2 and through holes 9 in the strip sections 3 to tapped holes 9a in the rod 1. The holes 9a appear in Figure 2 where the line of sections 3 is shown tapered for the reason described below.

So that the warp threads will pass substantially parallel to each other over the beading 4, each tension bar carries a comb comprising parallel wires 10 projecting upwardly from blocks 11 secured by bolts 12 against a flat surface 13 formed at the rear of the rod 1. Each warp thread is allocated to one pair of wires 10 between which it passes.

The warp knitting machine being considered by way of example has a gauge of 28 needles to the inch and accommodates rows of knitting elements approximately seven feet long. The resilient sheet 2 is 0.014 inch in thickness, and along the major portion of its length its width, as represented in Figure 1 by the distance between the edge C of the line of strip sections 3 and the outward extremity of the beading 4, is $2\frac{9}{16}$ inches. Thus, along the major portion of its width the sheet 2 provides a cantilever spring extending $2\frac{9}{16}$ inches from its support.

So as to provide weaker spring control of the warp threads towards and at the selvedges of the fabric being knitted, the extent of the cantilever spring constituted by the resilient sheet 2 is increased towards the selvedges from points about 20 inches within the width of the fabric. This is achieved by making the front edge of the line of strip sections 3 progressively recede towards the ends of the rod 1, as shown in Figure 2, and has the effect of increasing the extent of the cantilever spring from $2\frac{9}{16}$ inches to $3\frac{9}{16}$ inches so that it is more flexible at its ends. So that the resilient sheet 2 may be free to bend, the holes therein through which the bolts 7 pass must provide adequate clearance and the strip sections 3 must be sufficiently deep to enable the sheet to bend without touching the edge of the flat surface 3b on the rod. The arrangement of the strip sections 3 on the rod 1 may be varied prior to the knitting operation to suit different widths of fabric to be knitted and variations in the position over the tension bar that the threads pass.

The effective part of the mass of the spring is that near its free edge, and there, particularly at the two ends of the machine, the strip 5 may be of aluminum, secured by aluminum rivets, the beading 4 being protected by a chromium matt finish. An alternative material for the strip 5 is sheet iron. When the beading is of aluminum at the ends and of sheet iron at the centre, the subsidiary strip 5 is, of course, made in sections secured end to end along the resilient sheet 2. The latter also may, if desired, be made in sections secured end to end along the rod 1, and such an arrangement provides a convenient alternative method of providing a weaker spring effect at the ends of the effective part of the tension bar. Then, instead of providing the tapering strip sections 3, a sheet 2 of heavier section is used at the centre and sheets of lighter section at the ends. The distance apart at which the sheets of lighter section are secured to the rod depends on the width of the material being knitted. Accordingly, a selection of centre sheets of different lengths may be provided, and a sheet of appropriate length chosen from the selection and put into position after the distance apart of the end sheets has been settled.

In summary, it may be said that the tension bar includes a resilient cantilever portion, exemplified by the sheet 2, extending between a rigid support constituted by the rod 1 and a light, smooth rail, exemplified by the beading 4 over which the warp threads pass. The bar is so constructed that its natural frequency, when acted on by the yarn, is substantially above the frequency of the changes in yarn tension.

We claim:

1. In a textile machine, a warp tension bar comprising a light smooth rail over which the warp threads are to pass, a support, and a resilient cantilever portion anchored to said support and carrying said rail.

2. In a textile machine, a warp tension bar comprising a light smooth rail over which the warp threads are to pass, a support, and an elastic sheet metal portion fixed to said support and carrying said rail along one edge of said sheet metal substantially parallel to said support.

3. In a textile machine, a warp tension bar comprising, in combination, a support and a resilient portion fixed to said support to act as a cantilever over the free edge of which the warp threads are to pass.

4. In a textile machine, a warp tension bar comprising a support, a rail over which the warp threads are to pass, and resilient cantilever means fixed to said support and carrying said rail substantially parallel to said support.

5. In a textile machine, a warp tension bar comprising a stationary rod, cantilever, spring means secured along the length of said rod, and a rail, over which the warp threads are to pass, carried by said spring means.

6. In a textile machine, a warp tension bar comprising a light smooth rail over which the warp threads are to pass, a resilient cantilever portion anchored to said support and carrying said rail, and a comb secured to said support and operative to keep individual warp threads separated from each other.

7. In a warp knitting machine, a warp tension bar comprising a support, cantilever spring means secured along and varying in strength along said support, and a rail on said spring means, said rail being substantially parallel to said support and serving as the part of the bar over which the warp threads are to pass.

8. In a warp knitting machine, a warp tension bar comprising a straight rail over which the warp threads are to pass, cantilever spring means supporting said rail and a support for said spring means engaging same at points varying in distance from said rail.

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