This invention relates to improvements in lace making machinery and is particularly concerned with machines for making bobbinet. The simplest type of bobbinet is a plain net which is made on a plain net machine. This comprises a warp beam on which are wound the warp threads which pass upwardly from the warp beam and through warp guides which are customarily wire rods having their ends bent into a loop forming an eyelet through which the warp thread passes; the other ends of the rods are cast into a bed of convenient material such as a lead alloy. The warp then passes upwardly from the warp guides to a location where the bobbins pass to and fro from the front to the back and the back to the front of the warps twisting around the warps and making a plain net. After each passage of the bobbins the warps are shotted in a pre-determined direction in unison by movement of the bed containing the thread guides. Conveniently the thread guide for the warps is built up from a plurality of beds each containing a plurality of wires having the warp eyelet holes.

Another lace net is a bobbinet which is a plain net except that a pattern is produced in the net by control of individual warps at predetermined locations. A bobbinet machine makes a background net and by the individual control of the warp threads the pattern is formed on this background net. The individual control of the warp threads is obtained by a manner substantially the same as that used in a Levers lace machine. That is to say the warps pass through steel bars which are spring biased in one direction and are controlled in the other direction by suitable mechanism such as a Jacquard mechanism.

In the application of a Jacquard machine to a bobbinet machine the following arrangement is known. A warp beam having a plurality of warp threads wound thereon is located adjacent the lower end of the machine with the warp threads passing upwardly through apertures in steel bars to provide individual control for each of the warps or alternatively for a group of warps at pre-determined spaced locations along the warp beam. For example the pattern may be repeated every 8" of fabric so that each warp thread spaced 8" from the next adjacent warp thread passes through an aperture in the same steel bar. The warp threads then pass upwardly from the Jacquard controlled steel bars hereinafter referred to as the Jacquard bars through a selected aperture formed in a series of steel bars which are secured to each other in two groups, each group of which is hung in unison to form the background net in a manner similar to the movement of the warp guides in a plain net machine. The apertures in these steel bars hereinafter referred to as the background bars, are formed so that if one of the adjacent warps moves to the left hand side of its aperture and the other warp extends through an aperture to the left of the first mentioned aperture and that warp is moved to the right of its aperture then the warps have been crossed and a bobbin thread may be wrapped around the two warps together. The Jacquard bars control the movement of the warps from one side of the apertures in the background bars to the other and it is by this movement of the warps in said background bars that patterning is obtained. Hitherto the background bars have comprised at least four bars at the front of the machine and two or more at the rear of the machine, said bars being parallel to each other and with their apertures contained in substantially the same horizontal plane.

Spacing of the apertures is conveniently regularly staggered so as to enable the overlap from the left hand edge of one aperture to overlap the right hand edge of the next adjacent aperture on its left. Furthermore four bars are required at the front since brackets or other securing means have to be connected to the bars and to means for sliding the bars in unison. The alignment of these bars causes considerable difficulty and they are not found to be wholly satisfactory.

It will be appreciated that slight lengthwise movement of one of the bars may result in the overlap of the apertures not being sufficient to ensure that a bobbin as it passes is carried from the front to the back or vice versa warps around the crossed warp threads resulting in an incorrect pattern or no pattern at all being formed. For example if the aperture alignment is distorted the bobbin may pass between the crossed warps.

It is one object of the present invention to provide improvements in lace net making machinery and it is one specific object of the invention to provide improvements in background bars of the kind referred to for use in bobbinet machines.

With the above and other objects in view the present invention provides a warp guide section for a lace net machine comprising a member having at least two parallel rows of equally spaced apertures, said rows being staggered relative to each other, and means for securing said member relative to a similar member to form a warp guide. Conveniently the edges of an aperture in one row overlap the edge of an aperture in a next adjacent row. More specifically two rows of apertures are provided and the edges of an aperture in one row is arranged to overlap the edges of the two apertures immediately adjacent in the other row.

In order that the section may be more readily secured relative to each other to form a continuous warp guide one end of the member is conveniently chamfered at an angle substantially equal to the angle formed by an imaginary line joining the centres of an aperture in one row to the centre of an aperture in the next adjacent row and the imaginary line joining all the centres of the aperture in one row. An extension may be provided at the other end having an angle substantially equal to the chamfered end for co-operating therewith.

The section may be a member of flat sheet material in which are provided the apertures and said member may conveniently be secured relative to a block member for releasably securing to similar block members. Conveniently the flat sheet material is cast into the block member which may be of lead or lead alloy while the flat sheet material may be of brass.

In order that the invention may be more readily understood reference will now be made to the accompanying drawings in which:

Figure 1 is a cross section through a bobbinet lace machine having a warp guide according to the present invention;

Figure 2 is a perspective view of the operative parts of a bobbinet lace machine;

Figure 3 is a diagrammatic view of a warp guide according to the present invention;
Figures 4 and 5 are an enlargement of part of Figure 3 with the threads in different positions;

Figure 6 is a sectional side elevation of a warp guide according to the present invention.

In the figure a standard 1 for a bobbinet lace machine has a warp beam 2 extending the length of the machine on which are wound a plurality of warp threads 3. The warp threads pass from the beam 2 through a warp thread separator 4 and then upwardly through apertures in one of a plurality of Jacquard bars 5, whence through apertures in a warp guide 6 at the front to the lace making location. The back warp threads pass through loop wire eyes 22. The front warp guides (background bars) comprise slidable bars 18 to which are releasably secured a plurality of blocks 17 having cast therein warp guides 6 provided with a plurality of apertures 19. The back warp guides comprise slidable bars 24 having blocks 23 secured thereto, the said blocks 23 having a plurality of looped wire eyes 22 cast therein.

Bobbin threads 9 are wound on to bobbins 8 located in bobbin carriages 7 and which are rocked from the front to the back of the machine and vice versa by means of rollers 10 and 11. The bobbin carriages 7 slide in carriage guides 16. After a cycle of twisting of bobbin threads around warp threads pickers 12 descend to tighten the twisted threads which result in fabric 14 which is in turn stored on a take-up spool 15. The relative disposition of the parts is more clearly seen in Figure 2. The warp threads 3 which pass through the warp thread separating bar 4 may be selectively passed through apertures 20 in the Jacquard bars 5. For the making of plain net no warp threads pass through apertures 20 in the Jacquard bars 5 or if the threads are passed through the apertures 20 the Jacquard bars are not operated. It is only for producing pattern net and then only selected warp threads at the front are passed through apertures 20 since the warp threads are employed for producing the background net are not controlled by the Jacquard bars. The Jacquard bars are themselves shogged moved to the right by convenience Jacquard mechanism and returned to their original position by a spring, such as for example a Jacquard machine. However, each warp thread passes through an aperture 19 in the warp guides 6 which are all shogged in unison by the bars 18.

The manufacture of net is achieved by passing the bobbin threads through the warp threads, shogging the warp threads in unison in one direction and passing the bobbin threads through the spaces between adjacent warp threads so that the bobbin threads are twisted around the warp threads and then shogging the warp threads back again and passing the bobbin threads between the warp threads again. In order to produce a pattern on a background net it is necessary to twist adjacent warp threads relative to each other. The apertures in the warp guides 6 are so arranged that the edge of one aperture overlaps the edge of the aperture through which the next adjacent warp passes. By reference to Figures 3, 4 and 5 this will be more clearly understood. Consider a thread A which passes through an aperture 20A in a Jacquard bar 5a and then through an aperture 19A in the warp guide 6. A warp thread B passes through an aperture 20B in another Jacquard bar 5b and thence through an aperture 19B in the warp guide 6. It will be observed that both threads are held against their respective left hand edge of the aperture 19A and 19B. If the Jacquard bars containing the aperture 20A is moved to the right the thread A is moved from the left hand edge of the aperture 19A to the right hand edge (Figure 5). The two threads A and B are now treated as one and when a bobbin thread passes through the warps it will wrap around threads A and B together. By suitable selection of the threads which are passed through the apertures 20 of the Jacquard bars 5 and by suitable movement of said Jacquard bars 5 a limitless number of patterns may be produced on a background net.

The warp guide 6 is conveniently in the form of flat sheet material having two rows of apertures 19 formed therein. The flat sheet material may conveniently be of brass and the apertures may be hardened by suitable means to prevent wear as the threads pass therethrough. The two rows of apertures 19 are conveniently located in a block 17 by casting therein. The block 17 may be of lead or an alloy of lead and prior to casting the block around the flat sheet material 6, the said sheet material may be suitably tinned to assist bonding between the molten metal and the material 6. An aperture may be cast into the block 17 or may be formed after casting by suitable means such as for example drilling to enable a bolt 21 to extend therethrough and to secure the block relative to the sliding bar 18. Each of the warp guides 6 is provided with a chamfered end 25 and with an expansion at the other end 26. The angle of the chamfer is conveniently equal to the angle formed by the line adjoining the centre of one aperture to the next adjacent aperture in the other row and the line joining all the centres of the apertures in one row. Thus, a continuous warp guide bar may be built up by placing end to end a plurality of sections each constituting a warp guide of flat sheet material with a plurality of apertures formed therein. Each of the sections is secured to the sliding bar 18 by a bolt 21. The manufacture of warp guide sections according to the present invention is comparatively simple and the setting up of a warp guide bar (background bar) for use with a bobbinet machine is considerably simpler than a plurality of staggered steel bars having formed therein a plurality of apertures.

Furthermore since it is required to move all the warp threads in unison with each other it will be appreciated that provision of a warp guide of continuous form is more easy to thread up and to arrange for all the warp threads to be moved the same amount in unison than with the previously known arrangements.

By the employment of warp guides according to the present invention it is possible to manufacture bobbinet lace machines of widths beyond 120°. Hitherto the width of the bobbinet lace machine has been limited by the provision of front and back warp guide steel bars which are not satisfactory in length over 120°. Furthermore it is not possible to provide sufficient strengthening of the steel warp guides which are subjected to intermittent forces as the warps pass through apertures provided therein. These intermittent forces result in bowing and whipping of the steel bars which turn result in incorrect or no pattern being formed in the fabric.

What we claim is:

1. A warp guide section for a lace net machine comprising a member having at least two parallel rows of equally spaced apertures, said rows being staggered relative to each other, the edges of each aperture in one row overlapping the edge of an aperture in another row; a supporting member, and means for securing said member to said supporting member to form a warp guide bar.

2. A warp guide section according to claim 1 wherein said member has one end chamfered at an angle substantially equal to the angle formed by an imaginary line joining the centre of an aperture in one row to the centre of the next adjacent aperture in another row and the imaginary line joining the centres of all the apertures in one row.

3. A warp guide section according to claim 2 wherein said member has an extension at the end remote from the chamfered end of substantially the same angle for cooperation with said chamfered end to form two continuous rows of apertures staggered with respect to each other when the two sections are placed end to end.

4. A warp guide section for a lace net machine comprising a member having two parallel rows of equally spaced apertures, said rows being staggered relative to
each other, the edges of each aperture in one row overlapping the edges of the two apertures immediately adjacent in the other row, a supporting member, and means for securing said member to said supporting member to form a warp guide bar.

5. In a continuous guide bar of a lace net machine, a first warp guide section comprising a member having at least two parallel rows of equally spaced apertures, said rows being staggered relative to each other, the edges of each aperture in one row overlapping the edge of an aperture in another row, said member being formed of flat sheet material, said first warp guide section further comprising a first block for securing said member therein; in combination with at least one further warp guide section of similar construction as said first warp guide section and also comprising a block and a member, and in combination with means associated with said first block for securing the same relative to the block of said further warp guide section.

6. A warp guide section of the type described in claim 5 wherein the flat sheet material is cast into the block pertaining to said warp guide section.

7. A warp guide section of the type described in claim 5 wherein the flat sheet material is brass.

8. A warp guide section of the type described in claim 5 wherein the block pertaining to said warp guide section is of lead or a lead alloy.

References Cited in the file of this patent

UNITED STATES PATENTS

69,471 Nichols Oct. 1, 1867
1,112,996 Forigoule Oct. 6, 1914

FOREIGN PATENTS

379,531 Germany Aug. 27, 1923
632,431 Great Britain Nov. 28, 1949