Dec. 6, 1960 K. W. BAHLO 2,962,924

ONE PIECE SELF LUBRICATING GUIDE COMB FOR LACE MACHINES

Filed Jan. 12, 1959

FIG. 1

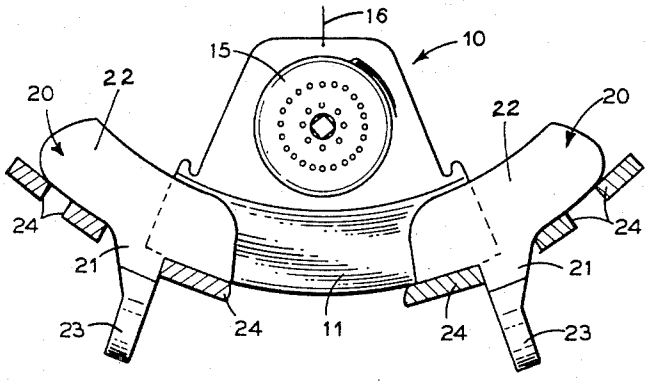


FIG. 2

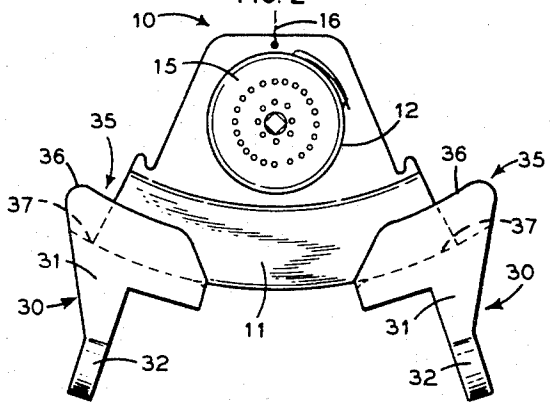


FIG. 2A

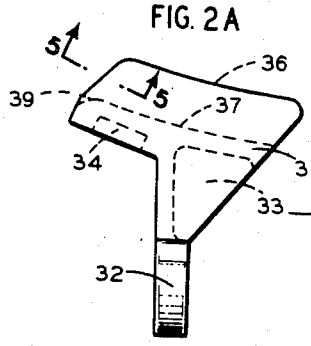


FIG. 3

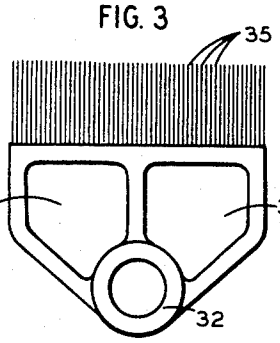


FIG. 4

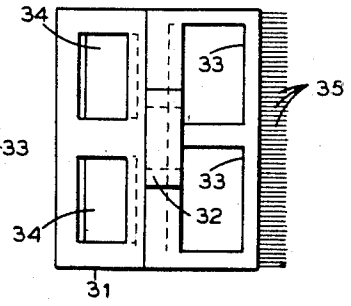
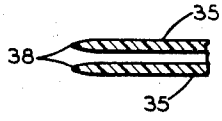


FIG. 5



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ONE PIECE SELF LUBRICATING GUIDE COMB FOR LACE MACHINES

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This invention relates to lace manufacturing apparatus of the "Leavers Lace" type and, more particularly, to an improved carriage guiding comb for such apparatus.

In the manufacture of lace on the Leavers type of machine, the lace is produced by the relative movements and the inter-twisting of two distinct sets of threads known respectively as the bobbin threads and the warp and beam threads. The bobbin threads are wound on thin bobbins each comprising a pair of thin brass disks grooved on their inner surfaces and held together by a circular series of rivets serving as an initial winding surface for the bobbin threads. At present, each bobbin holds from 125–130 yards of thread, such as nylon thread although silk, cotton or metallic threads are sometimes used.

Each wound bobbin is mounted in a carriage comprising a thin steel sector shape plate having a hole rotatable mounting the bobbin which is retained therein by arcuate verge along the lower edge of the hole, the verge acting as a guide rail for the bobbin. The bobbin thread is drawn out through a radial hole at the upper end of the carriage and extending centrally thereof. A fine spring has a free end extending into the bobbin and acting as a brake when the thread is withdrawn.

The lower edge of the carriage is arcuate about a pre-set radius and, below the bobbin hole, the carriage is somewhat thinner to form an arcuate guide blade operating in aligned grooves of a pair of arcuately spaced guide combs. The ends of each carriage have upwardly extending ribs for coaction with catch bars which impart to the carriages a rocking motion.

In their swinging movement, the carriages pass between laterally spaced warp and beam threads drawn upwardly with the bobbin threads, these warp and beam threads being fed through holes in spaced substantially parallel steel bars reciprocable at right angles to the plane of swinging of the carriages. The warp and beam threads are disposed between the inner ends of the carriage guiding combs and, by selective longitudinal shifting of the steel bars each time the carriages have swung past the mid-point of their oscillations, a selected intertwisting of the bobbin threads with the warp and beam threads is effected. Shifting of the steel bars is selectively effected by a Jacquard mechanism. Other elements, known as point bars, compress the twists formed during oscillation of the carriages.

Each guide comb for the carriages comprises a number of thin arcuate metal blades held in closely spaced parallel relation by lead cast around stems extending from the lower edges of the blades, and includes brass bearing strips extending across the lower edges of the comb blades both inwardly and outwardly of the stems. The comb blades have arcuate edges formed about a radius equal to the radius of curvature of the carriage lower edges, and the spacing between the comb blades is only slightly greater than the thickness of the carriage blades. The inner ends of the pairs of combs are spaced apart a distance somewhat less than the arcuate length of the carriage blades so that the carriages are always guided positively in their swinging movement. The comb blades guide the carriages, restraining the latter against lateral displacement.

When the bobbins are full, with the yarn thereon wound to a large diameter, the carriages ride on and frictionally engage the brass strips. As the yarn is unwound from the bobbins, the tension conditions change particularly with nylon yarn, and the carriages are lifted out of engagement with the brass strips. At such time, the carriages swing like pendulums, being suspended by the drawn yarn.

It is important that the carriages move as freely as possible during their swinging movement and, for this purpose, the combs, particularly the brass strips frictionally engaged by the carriage, as well as the comb blades, are lubricated with a solid lubricant such as graphite. During the machine operation, the formed lace is somewhat smeared with graphite, as it is not possible to maintain the warp and beam threads, for example, completely out of contact with carriage blades which have the graphite lubricant thereon. Consequently, extensive and prolonged cleaning operations are required for the finished product, which increases the cost of the lace.

The casting of lead or other relatively heavy metal around the comb blade stems is necessary to assure maintenance of the proper spacing of these blades. Additionally, the comb blades have a substantial radial extent to assure their stability, and the lubricated brass strips are necessary to support the carriages when the bobbins are full. All of these factors not only increase the cost of the guide combs but makes their installations and replacement in the machine difficult and expensive. Such replacement is necessary whenever a comb needs repair.

In accordance with the present invention, it has been found that cleaning of the formed lace can be substantially or completely eliminated, the cost of the combs can be substantially reduced, and the labor and expense involved in installing and replacing combs be cut to a fraction of their present values by molding or casting the combs as integral units from a lightweight material having high impact strength, good wear resistance, and self lubricating characteristics. A suitable material is nylon or any other synthetic resinous material possessing equivalent properties.

The self lubricating characteristics of the material eliminate the necessity for use of a solid lubricant such as graphite, and the brass strips are eliminated as the carriage blades are supported on the surfaces between the comb blades when the bobbins are full. These arcuate surfaces provide a length of bearing surface much greater than that provided by the brass strips. With the comb formed as an integral member of one-piece construction, the depth of the comb blades can be reduced and the whole member very substantially lightened in weight without loss of rigidity of the comb blades. The reduced blade depth permits enlargement of the bobbin holes in the carriages, thus allowing use of larger, higher capacity bobbins in turn, this reducing the frequency of bobbin replacement. The reduced weight also results in less manual labor being required for comb replacement, as well as a reduction in material cost in making the comb.

For an understanding of the invention principles, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing:

Fig. 1 is an elevation view of a carriage and bobbin together with the associated guide combs, and illustrates the guide combs presently used;

Fig. 2 is a similar view illustrating the improved guide combs embodying the present invention;

Fig. 2A is a side elevation view of the guide comb embodying the invention;

Fig. 3 is an end elevation view thereof from the outer side;

Fig. 4 is a bottom plan view thereof; and

Fig. 5 is an enlarged sectional view of the end of one of the comb blades.

As the operation of a Leavers Lace machine, insofar as the bobbins, carriages, and guide combs are concerned, has already been generally described above, it will not be repeated hereinafter except insofar as necessary for an understanding of the invention. For a detailed description of such a machine and its operation, reference is made to the publication "Leavers Lace" published in January 1949 by American Lace Manufacturers Association, Inc., of Providence, Rhode Island.

Referring to Fig. 1, a carriage **10** is illustrated as containing a loaded bobbin **15** from which a bobbin thread **16** extends upwardly and centrally of the carriage to suspend the latter for pendulous oscillation from left to right when the bobbins are only partly full. In such oscillation, the blade **11** of carriage **10** has lateral guiding relation in the spaces between the blades of a pair of arcuately spaced guide combs **20** having lugs **21** by means of which the combs are mounted on the comb support bars of the Leavers Lace machine. When the bobbins **15** are full, the lower edges of carriage blades **11** frictionally engage relatively narrow brass strips **24** extending across the under surfaces of comb blades **22** on each side of stems **23**.

It will be noted from Fig. 1 that both the carriage blade **11** and the comb blades **22** have substantial and substantially equal radial depths. Also combs **20** are relatively massive and heavy structures comprises the blades **22** having stems **23** set into a casting of lead or the like. For a given mass of carriage **10**, the substantial radial width of blade **11** restricts the size of the bobbin opening **12** and thus the size of bobbin useable in the carriage.

Referring to Figs. 2, 3 and 4, the comb **30** of the invention is molded as a single piece from nlyon or other synthetic resinous material having good impact strength and wear resistance, and self-lubricating characteristics. Comb **30** includes a body **31** formed with an apertured mounting lug **32**, and is molded with grooves forming closely spaced parallel arcuate guide blades **35**.

Guide blades **35** have arcuate upper edges **36** and arcuate lower or inner edges **37** formed about radii equal to the radius of curvature of the lower edges of the carriage blades **11**, and it will be noted that the radial depth of these comb blades **35** is very substantially less than that of the blades **22** of the present comb as shown in Fig. 1. In addition, the inner edges of blades **35**, that is, the edges at the inner ends of the combs as mounted in the machine, are tapered as shown at **38** in Fig. 5. The arcuate length of blades **35** is also substantially shorter than that of blades **22** of Fig. 1.

To decrease even further the weight of comb **30**, body **31** has recesses **33** and **34** therein, strengthening ribs separating the recesses of each pair from each other. In effect, the comb portions not carrying any weight are reduced in area and volume.

The comb **30** may have the standard 2" width of present combs, or may have a different width to accommodate a particular installation. The number of blades 35 per inch of width corresponds to the desired gauge of the lace machine, there being **19** blades to the inch for a 9½ gauge machine.

In the comb **35**, the concave surface between adjacent blades self-lubricated acts as a supporting guide for the carriage blades **11** when bobbins **15** are filled, being tapered at its inner end as indicated at **39**. This not only eliminates the need for the narrow brass bearing strips **24** but also provides a carriage blade bearing surface having a length very substantially in excess of that provided by such brass strips.

The most important characteristic of comb **35** is its self-lubricating property, as this eliminates the use of a solid lubricant such as graphite, as well as eliminating the necessity for the brass bearing strips **24**. Consequently, the cleaning operations on the lace are substantially eliminated insofar as lubricant removal is concerned.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Guiding means for the pendulously oscillatable carriages of Leavers Lace machines comprising an integral comb member consisting of a single piece of self-lubricating material, said member having an arcuately elongated concave edge facing the carriages and said concave edge being formed with a plurality of spaced, parallel grooves defining guide blades for the blades of the carriages.

2. Guiding means for the pendulously oscillatable carriages of Leavers Lace machines comprising an integral comb member consisting of a single piece of a synthetic resin having self-lubricating characteristics, said member having an arcuately elongated concave edge facing the carriages and said concave edge being formed with a plurality of spaced, parallel grooves having inner edges parallel to said concave edge and defining guide blades for the blades of the carriages; the arcuate surfaces of the grooves providing elongated bearing surfaces for the carriage blades.

3. Guiding means for the pendulously oscillatable carriages of Leavers Lace machines comprising an integral comb member consisting of a single piece of a synthetic resin having self-lubricating characteristics, said member having an arcuately elongated concave edge facing the carriages and said concave edge being formed with a plurality of spaced, parallel grooves having inner edges parallel to said concave edge and defining guide blades for the blades of the carriages; the arcuate surfaces of the grooves providing elongated bearing surfaces for the carriage blades; the radial extent of said guide blades being substantially less than that of the blades of the associated carriages.

4. Guiding means for the pendulously oscillatable carriages of Leavers Lace machines comprising an integral comb member consisting of a single piece of a synthetic resin having self-lubricating characteristics, said member having an arcuately elongated concave edge facing the carriages and said concave edge being formed with a plurality of spaced, parallel grooves having inner edges parallel to said concave edge and defining guide blades for the blades of the carriages; the arcuate surfaces of the grooves providing elongated bearing surfaces for the carriage blades; the radial extent of said guide blades being substantially less than that of the blades of the associated carriages, and the length of the guide blades being substantially less than that of the metal blades of the relatively massive metal combs normally used in such machine.

5. A carriage guiding comb member as claimed in claim 4, in which said synthetic resin is nylon.

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