UNITED STATES PATENT OFFICE.

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BOBBIN-CARRIAGE AND BOBBIN OF LACE MACHINERY.

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To all whom it may concern:

Be it known that I, William Bruce Mitchell, a citizen of Great Britain, residing at 44 Portland road, Edgbaston, Birmingham, county of Warwick, England, managing director, have invented certain new and useful Improvements in Bobbin-Carriages and Bobbins of Lace Machinery, of which the following is a specification.

This invention comprises improvements in bobbin carriages and bobbins and has particular reference to carriages and bobbins of the kind used in twist lace machines. The carriages vary considerably in shape according to the type of loom on which they are employed, and the bobbins necessarily vary in accordance with the carriages, but their relation to each other, that is to say the working of the bobbin in the carriage, remains in principle the same.

Among the features which the various types of carriages have in common is an opening which is substantially circular but provided at the inner edge of the lower half with a projecting portion or rib known as the "verge." This opening in the carriage is termed the "cage" and the bobbin, which is circular, is loosely retained in this cage by engaging on the verge and by a retaining spring in the upper part engaging the bobbin by means of a shaped projection or nib and pressing it toward the verge.

The bobbins are commonly made with two disk-like sides united by rivets through the center portion called the "middle" and recessed from the periphery of this "middle" to the perimeters of the disks to form an annular space to receive the thread. The perimeters of the sides are cut away sufficiently on the inner side to form lips which do not meet, and thus form an entrance or "open way" to the annular thread space, so that the thread may be wound into the bobbin or removed therefrom. This space or "way" also forms the track portion by which the bobbin engages the "verge" of the carriage.

In all these known constructions the lips of the bobbins have been faced square toward each other and parallel. To accommodate the "verge" of the carriage has necessarily been formed with parallel sides and the carriage has been recessed on each side to form the "verge." The recessing leaves square shoulders at the base of the verge on each side which receives the outer faces of the lips of the bobbin as the latter turns in the "cage," and its "openway" between the lips covers and loosely fits the verge. These well known forms are open to serious objections which the present invention is designed to obviate. Some of these objections are: As the bobbins are wound and filled the sides are forced apart and to bring the same back to their normal position the bobbins are placed under pressure, and in time the lips of the bobbin come in contact one with the other. Such bobbins are then extremely difficult or altogether impossible to wind, as there is no "way" for the thread between the lips. If complete contact of the lips has not taken place but they are partially closed, then, as the bobbin is being unwound in use, the lips press so tightly on the verge and on the nib of the spring that the friction becomes excessive and either causes frequent breakage of the thread or produces bad fabric. The lips of the bobbin become damaged from various causes; and the bobbins are then unserviceable as the slightest damage impedes or completely checks the necessary running on the verge or the passage of the nib of the spring.

The holding capacity of the bobbin depends of course upon the size of the "middle" but in use, as the thread is wound off the bobbin, the speed of the bobbin increases in proportion to the amount of thread removed; at the same time the point where the "thread" leaves the bobbin comes nearer the middle of the bobbin so that the angle of pull or the leverage of the pull is decreased and an increased tension must be put on the thread to overcome the friction. It will thus be seen that the size of the middle must depend in practice on the maximum tension that the thread can withstand. Hitherto there existed no means of accommodating this tension. Bobbins of the ordinary type (due to the fact that the lips are parallel) always present great difficulties in winding; as there is practically no lead or guide to the thread; for these same reasons the placing of the bobbin in position in the cage of the carriage is extremely difficult, and likely to cause the bending of or other damage to the verge. The present
type of verge is necessarily very delicate in formation and easily damaged, and as a
verge cannot be replaced considerable waste
is thereby caused.

5 In accordance with the present invention
I form the "open way" of the bobbin and
the verge of the carriage and also preferably
the nib of the spring so that the engaging
portions of each are coacting inclines or
curves, so arranged that upon closing or
partial closing of the lips of the bobbin,
these surfaces may still satisfactorily en-

gage by automatically altering their rela-
tive position. I may employ various sec-
tions for the verge of the carriages and for
the lips of the bobbin to present these
automatically adjusting inclines or curves,
such as a conical section for the verge with

corresponding inclines to ride on the sides of the
verge; or I may make the verge with con-
vex sides in cross section or with concave
sides, correspondingly curving the surfaces
of the lips so that they will coact with the
verge. It is preferred that the nib of the
spring should correspond in form to the
verge. I may in some instances remove the
verge altogether and groove the carriage
shaping the groove wedge like in cross sec-
tion or with convex or concave sides; in
these cases the lips of the bobbins are faced on
their outer sides with inclines, convex
or concave surfaces so as to work in the
before mentioned relation with the surfaces
of the groove in the carriage. In some
cases by using bobbins with their "open
ways" formed in accordance with my in-
vention I may, by beveling the "verge"
fit up old types of carriages with my in-
vention.

On the drawings: Figure 1 is an eleva-
tion showing one type of carriage with a
bobbin in place therein and with my inven-
tion applied. Fig. 2, is a section of the
same on line 2—2. Fig. 3, is an enlarged
section showing one example of the con-
struction of the verge and the bobbin which
is to ride upon it. Fig. 4, is a section of
this construction but showing a different
working relation between the two parts.
Fig. 5, shows a modified construction in
which coacting curves are used. Figs. 6 and
7 show further modifications but in these
one of the advantages aimed at by my in-
vention is not obtained. Fig. 8 shows my
invention as it may be applied to old car-
riages by beveling the sides of the parallel
"verge" and providing bobbins made in
accordance with the invention.

On these drawings in the general views
Figs. 1 and 2, a is a carriage of one particu-
lar type which is well known and serves
here simply as an example. The bobbin
is represented by b and the opening or cage
in the carriage by the letter c. The bobbin
is made up of two disks riveted together
at their center which forms the "middle"
d and cut away beyond that to leave the
lips e. The verge of the carriage is referred
to by f and the well known retaining spring
which retains the bobbin in the verge is
represented at g, Figs. 1 and 2. As pre-
viously set forth it is with the bobbin in
its relation to the verge and the nib of the
retaining spring that my invention is con-
cerned and I accordingly show these parts
on a larger scale at Fig. 3. The verge f
is formed as a cone in vertical section, its
sides presenting inclines h, h. The lips e
of the bobbin are shaped so that the open
"way" or track of the bobbin presents in-
clines i, i, which correspond to those h, h
of the verge. The nib j of the retaining spring
which projects into the "way" or track of
the bobbin so as to retain the latter properly
on the verge is similarly shaped in cross
section as will be seen from Figs. 2 and 3 so
that the bobbin and the nib may smoothly
cooperate even if the bobbin way or track
is partially closed.

As shown at Figs. 2 and 3 the verge is so
formed that the bobbin takes its bearing
on the inclined sides thereof; but as shown
at Fig. 4 the verge is shorter and the per-
ipheries of the lips f of the bobbin may
then rest upon the shoulders k at each side.

At Fig. 5 the verge and the bobbin track
are formed of corresponding curves for the
engaging surfaces in place of inclines. The
nib of the retaining spring will correspond
in cross section.

At Fig. 6 the verge as a projection is dis-
pensed with and a recess is formed in its
place in the carriage. The sides of this re-
cess provide the inclines and the bobbin is
provided with surfaces on its sides to corre-
spond therewith. The accommodating re-
lationship between the bobbin and its car-
riage is thus obtained.

Fig. 7 shows an arrangement similar to
Fig. 6 but with coacting curves instead of
inclines.

With both the forms seen at Figs. 6 and 7
only part of the advantages which are ob-
tainable by my invention are secured.

As represented at Fig. 8 it is possible to
adapt a carriage having an ordinary verge
for use with my invention by beveling the
top of the verge at each side. This will then
accommodate a bobbin of my improved type
but will not be so satisfactory an arrange-
ment as a carriage constructed fully in ac-
cordance with this invention.

From the construction shown at Figs. 1, 2,
and 3, which is preferred and the examples
of modifications given in the latter figures
the invention will be clearly comprehended.
Now with the improved construction, sup-
pose the bobbin lips to be closed or partially
closed, the bobbin may still work in the cage
without undue friction, as owing to the formation of the engaging surfaces as co-acting inclines, or curves, the bobbin automatically adjusts itself to the verge by rising slightly and the working relation is not disturbed. This is also the case with the nib of the spring as the "way" of the bobbin and the "nib" may change their relative position and still be in working relation and the nib does not present abrupt shoulders or angles that would check the running of the bobbin. This is also the case if the lips of the bobbin are slightly damaged as the bobbin adjusts itself to the verge, or the groove in the carriage, as the damaged part comes into contact therewith and no undue friction is caused. As the bobbin is unwound the thread circle reduces in diameter and the speed of the bobbin and tension on the thread increases; with my construction the bobbin accommodates the increased tension by easing itself on the verge and reducing friction, thus the tension is reduced to a normal strain, and breakage of the thread prevented; also this enables smaller middles to be used and consequently increases the holding capacity of the bobbin. Owing to this improved construction the verge is stronger as it is thicker at the base; it may in fact gradually taper into the actual thickness of the carriage; thus the present danger of damage to the verge either while in actual use, or when the bobbin is separated from its carriage, or when they are being assembled again, is eliminated. Further the improved construction gives greater durability to the engaging parts of a bobbin carriage and its bobbin. In the cases where the bobbin lips are shaped with conical or curved "ways" the outer portion is always wider than the inner part and consequently if by pressure the lips are closed, it is the inner parts which meet and the outer are left open, thus always leaving a guide or way for the thread. It is thus always possible to wind the bobbin and moreover owing to this guiding provision for the thread, winding is much more easily and quickly performed. Further, owing to this construction, bobbins are more easily mounted in the carriage so that, apart from the verge being stronger to resist damage, the latter is less likely to accrue to it owing to this greater ease of insertion. I may with my improved construction of the verge, open part of the cage a lead onto the verge is provided and all shoulders are avoided.

With this invention carried out as set forth at Figs. 1, 2, and 3, I find the carriage is less costly in manufacture as there is no need to recess out the carriage to sharp square angles at the sides of the verge as is done with the sd parallel construction so that the tools used in the manufacture last many times as long as hitherto.

What I claim and desire to secure by Letters Patent then is:

1. In bobbin carriages and bobbins, a carriage having a cage in which the bobbin runs, a "verge" within said cage, a bobbin having a thread slot between peripheral lips, said bobbin engaging said verge by means of said lips, and a retaining spring holding said bobbin in proper working position on said verge, the engaging portions of said bobbin and said verge being co-acting inclines which upon partial closing of the lips of said bobbin automatically alter their relative position so that a satisfactory engagement still takes place.

2. In bobbin carriages and bobbins a carriage having a cage in which the bobbin runs, a verge within said cage, a bobbin having a thread slot between peripheral lips, said bobbin engaging said verge by means of said lips, and a retaining spring holding said bobbin in proper working position on said verge by means of a nib, the engaging portions of said bobbin and said verge and said nib of the retaining spring being co-acting inclines as set forth.

3. In bobbin carriages and bobbins a carriage having a cage in which the bobbin runs, a recess in said cage for a portion of the extent of said cage, a bobbin having a thread slot and inturned lips, said bobbin working in the recess in said cage, the outer sides of its lips engaging the walls thereof, the engaging surfaces of said carriage and said bobbin being formed as co-acting inclines, and retaining means for holding said bobbin in place, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM BRUCE MITCHELL.

Witnesses:
F. GILBERT BRETTELL,
E. SIMS BRETTELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."