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METHOD OF MAKING BIFURCATED EDGE NARROW FABRICS

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2 Sheets-Sheet 2

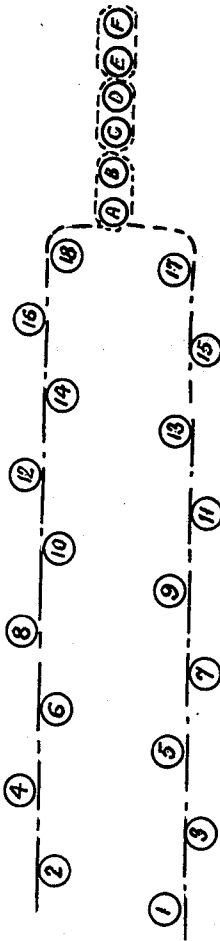


FIG. 3.

FIG. 4.

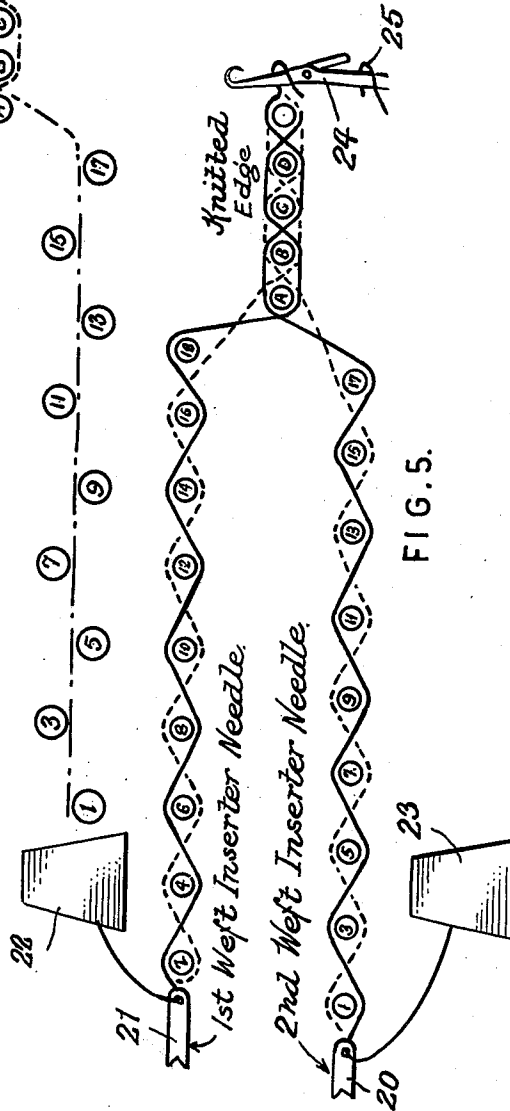
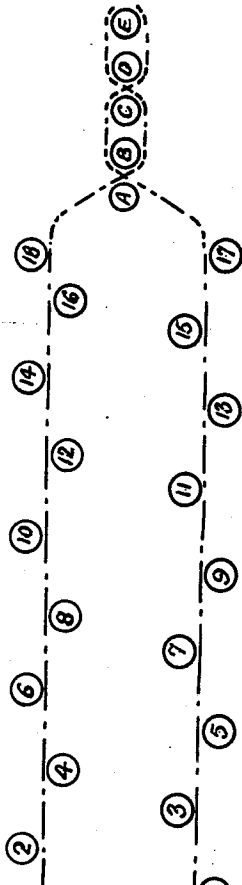


FIG. 5.

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**METHOD OF MAKING BIFURCATED-EDGE
NARROW FABRICS**

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This invention concerns narrow fabrics and is particu-
larly concerned with the method of weaving such a fabric
having a bifurcated or multi-ply edge using a needleloom.

Bifurcated edge fabrics can, of course, be woven upon
shuttle looms but in the past it has been considered un-
likely that such a fabric can be woven upon a needleloom
in view of the fact that it has been the practice to use two
shuttles and there has not in the past, existed a shuttle-
less loom having a plurality of weft layers.

The object of the present invention is to produce a 20
multi-ply edge fabric using a shuttleless loom.

According to the present invention the method of produ-
cing a needleloom fabric having a bifurcated or multi-
ply edge comprises the steps of laying weft loops from
at least two weft packages in such a manner that all the
weft loops are common to the body of the fabric whilst
each weft loop is individual to one ply only of the edge.

According to a further feature of the invention the
method of producing a bifurcated fabric on a needle-
loom comprises the steps of inserting alternately one of a
pair of weft layers into the shed from the flap side of the
fabric whilst shedding the warp ends in such a manner
that all of the warp ends for one flap and some of the
warp ends of the other flap are above or below the weft
layer and thus the weft loop, knitting the edge of the
fabric remote from the flaps, removing the weft layer
beating up and changing the shed to lock the weft loop
into the one flap of the fabric and to ensure that all the
warp ends for the said flap and some of the warp ends
for the other flap are either above or below a weft loop
inserted with the second weft layer, knitting the loop at
the edge remote from the flaps, removing the weft layer,
beating up, changing the shed and repeating the cycle to
weave the fabric.

Preferably, when manufacturing a zip fastener tape the
warp ends for weaving the flaps are pre-shrunk, or are not
capable of reducing in length with removal of longitudinal
tension, whilst the warp ends for the body of the fabric
are resilient or unshrunk whereby they will reduce in
length when tension is removed, the resultant fabric there-
fore having a body which is shorter than the flaps where-
by on securing zip fastener teeth the extra length of the
flaps is taken up and the lengths of the flaps and the body
becomes identical.

The invention will be described further, by way of ex-
ample with reference to the accompanying drawings in
which:

FIG. 1 is a weaving diagram illustrating the composite
shedding motion for weaving the two flaps of a bifurcated
edge tape, together with one repeat of the weaving dia-
gram.

FIG. 2 is a diagram illustrating the weaving diagram
for the two flaps separately, in this case no part of the
body of the tape is shown.

FIGS. 3 and 4 are diagrams showing the weaving, and
FIG. 5 is a diagram showing the action of the weft
insertion needles and the latch needle.

As can be seen from FIG. 1 there are eighteen warp
ends numbered 1 to 18 inclusive from which the two
flaps are woven and these eighteen warp ends are divided
into two sets of nine warp ends each from which the

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separate flaps are woven. The odd numbered warps are
used for weaving the bottom flap and the even numbered
warps are used for weaving the top flap. The eighteen
warp ends are controlled by four heald frames and the
body warp ends are controlled by a further four heald
frames.

The weft is supplied from two sources and two weft
insertion needles are used, one needle 20 for the lower
flap and one needle 21 for the upper flap. Both weft
layers pass alternatively through the shed for the body of
the fabric and thus there is twice the density of weft in the
body compared with either one of the flaps.

When the weft layer for the bottom flap is inserted all
the warp ends for the top flap are above the weft to-
gether with the warp ends numbered 1, 5, 9, 13 and 17.
The warp ends 3, 7, 11 and 15 are below the weft layer.

After the beat up and change of shed all the nine warp
ends of the lower flap are below the weft layer for the
top flap together with the warp ends numbered 2, 6, 10,
14 and 18. The remaining even numbered warp ends 4,
8, 12, and 16 are above the weft layer.

Again after beat up the shed changes and again the weft
layer for the bottom flap is inserted, in this instance how-
ever the warp ends numbered 3, 7, 11 and 15 are above
the weft with the warp ends for the top flap whilst ends
1, 5, 9, 13 and 17 are below.

For the final change of shed for a repeat of the pat-
tern the warp ends numbered 4, 8, 12 and 16 are below
the weft layer together with the warp ends of the lower
flap whilst warp ends 2, 6, 10, 14 and 18 are above.

As will be appreciated from the weaving plans the
combined shedding motion for both flaps is 3 and 1 whilst
the resultant weave for each flap is 1 and 1.

As heretofore stated, there are eighteen warp ends for
the flap of the fabric which are divided between four
heald frames. In the drawing, these heald frames are
indicated at 1, 2, 3 and 4. In addition to these four
heald frames there are four heald frames for the body,
and the latter heald frames are indicated at 5, 6, 7 and 8.
In order to indicate the four heald frames above men-
tioned diagrammatically, further warp ends have been
added at the body side of the diagrams.

Referring to the diagram shown in FIG. 5, it will be
noted that the two weft-inserting needles 20 and 21 are
indicated and that the two weft packages 22 and 23 are
also shown. As is herein mentioned, the weft-inserting
needles 20 and 21 must enter their respective shed from
the flap side of the fabric if the flaps are to be maintained
as separate entities. The knitted edge which prevents
unraveling of the fabric is fastened along the edge of the
body by means of the latch needle 24 illustrated. Each
successive loop of weft is initially positioned in the eye
of the latch needle, which reciprocates alongside of the
edge of the fabric and each such loop is drawn through
the preceding loop. The preceding loop 25 is illustrated
in FIG. 5 of the drawing as being around the shank of
the latch needle 24 and obviously this loop 25 would in
fact, be attached to the part of the fabric which has just
been formed by the beat-up.

The latch needle in the position shown is about to be
moved away from the heald frames to thereby draw the
eye through the indicated loop, which letter serves to close
the eye by moving the latch thereby insuring that the
loop located within the eye is in fact, drawn through the
loop through which the latch needle is being moved.
When the latch needle is next moved toward the heald
frames, the loop which has been trapped in the eye by
the latch, initially moves the latch as the needle moves
toward the heald frames and having opened the latch,
travels up the shank of the needle to take up a position
indicated in FIG. 5 of the drawing.

As can be seen from FIG. 1 the body of the fabric is woven 2 and 2 twill.

It will be noted from FIG. 2 that in laying a loop from the first weft package and subsequently laying a loop from the second weft package in a changed shed formed by the warp ends for the body fabric and also in the shed formed by a plurality of warp ends for a different ply, the warp ends for one of the plies are wholly disaligned on one side of the weft loop from the second weft package.

The invention is not restricted to the above details. For example by changing the shedding motion for the flaps a tube-like edge can be woven and of course the body of the fabric may be woven as a broken twill. It is also possible further to modify the weave by using more than eight heald frames.

In one particular use of the fabric, for example, as a zip fastener tape, the body warp ends would be in the form of stretchable yarn which is capable of shrinking when tension is removed whilst the flap warp ends would be in the form of pre-shrunk yarns. The resultant tape is of the usual radiused type, the flaps being longer than the body. In this instance however when the zip fastener teeth are secured to the tape along one of the flaps the extra length is taken up and the resultant tape is straight and of even length of body and flaps.

It is also within the scope of the invention to weave a tape having three flaps using three weft insertion needles and increasing the number of heald frames.

I claim:

1. The process for producing a needleloom fabric having a multi-ply edge comprising the successive steps of laying a loop from a first weft package with a first weft inserting needle in the shed formed by a plurality of longitudinally resilient (for example unshrunk) warp ends for a body fabric and in the shed formed by a plurality of longitudinally non-resilient (for example pre-shrunk) warp ends for one of said plies, and subsequently laying a further weft loop from a further weft package in a changed shed formed by said longitudinally resilient warp ends for said body fabric and also in a shed formed by a plurality of longitudinally non-resilient warp ends for a different ply, said warp ends for said one ply being wholly misaligned on one side of said weft loop from said further weft package when said further loop is being inserted and said warp ends for said different ply being wholly misaligned on one side of said weft loop from said first weft package when said first loop is being inserted.

2. The process for producing a needleloom fabric having a multi-ply edge as set forth in claim 1 in which said resulting fabric initially has a body which is shorter than the plies, said fabric being capable of being used for a zip fastener tape, the extra length of said plies being taken up by the attachment thereto of zip fastener ele-

ments to result finally in a fabric having plies of length identical to said body.

3. The process for producing a needleloom fabric having a multi-ply edge comprising the successive steps of laying a loop from a first weft package with a first weft inserting needle in the shed formed by a plurality of longitudinally resilient warp ends for a body fabric shed by four heald frames in a 2 and 2 manner and in the shed formed by a plurality of longitudinally non-resilient warp ends for said plies, said warp ends being shed in a 3 and 1 manner by four further heald frames to cause the warp ends for a first ply to be shed in a 1 and 1 manner and all the warp ends for a subsequent ply to be misaligned on one side of said weft loop, withdrawing said first weft inserting needle after knitting the end of said loop, changing said shed for said body fabric and said plies to result in a plurality of warp ends for a subsequent ply to be shed in a 1 and 1 manner, said warp ends for said first ply being wholly misaligned on one side of said shed, inserting a subsequent weft loop with a second weft inserting needle, withdrawing said second weft inserting needle after knitting the end of said loop and repeating the steps in sequence.

4. The process for producing a needleloom fabric having a multi-ply edge comprising the successive steps of arranging any required number of longitudinally resilient warp ends in four heald frames for 2 and 2 shedding to provide a body fabric, arranging eighteen longitudinally non-resilient warp ends in four additional heald frames for 3 and 1 shedding to provide two plies each of nine warp ends, laying a loop from a first weft package with a first weft inserting needle in the said 2 and 2 shed of said body fabric and in the resulting 1 and 1 shed formed by the first group of nine warp ends forming said first ply, said nine warp ends for said second ply being wholly displaced on one side of said first loop, knitting the end of said loop, withdrawing said first weft inserting needle, changing said 2 and 2 shed of said body fabric and said 3 and 1 shed of said eighteen ply forming warp ends to result in a 1 and 1 shedding for said nine warp ends of a second ply, inserting a second weft loop with a second weft inserting needle in said so formed shed, said nine warp ends for said first ply being wholly displaced on one side of said second weft loop, knitting the end of said second weft loop, withdrawing said second weft inserting needle and repeating the steps in sequence.

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