

[54] **METHOD AND APPARATUS FOR ANCHORING A FLOATING YARN PORTION IN A WOVEN FABRIC**

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**Related U.S. Application Data**

[63] Continuation of Ser. No. 34,475, May 4, 1970, abandoned.

[52] **U.S. Cl.** ..... **139/46**

[51] **Int. Cl.** ..... **D03c 7/06**

[58] **Field of Search** ..... 139/46, 48, 49, 50, 116, 139/117, 124, 391, 419

**References Cited**

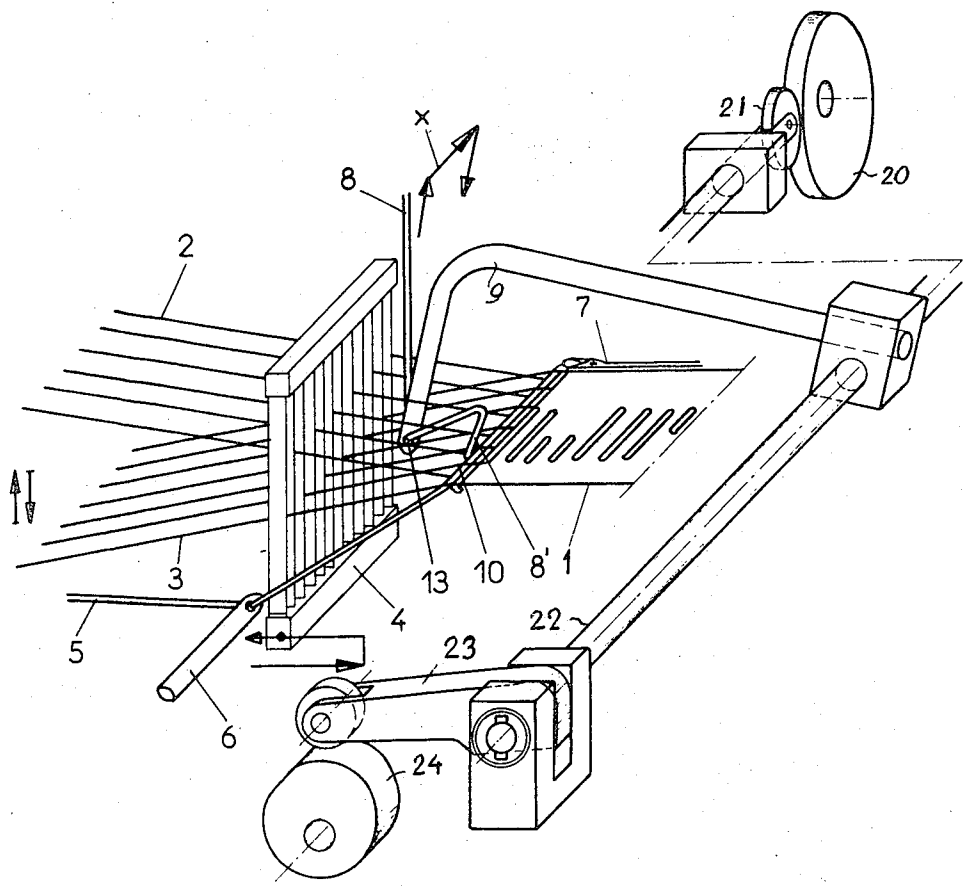
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[57] **ABSTRACT**

In a shuttleless loom, a yarn is inserted into an open warp shed to form a yarn loop which is anchored by a weft thread passing therethrough upon changing of the warp shed. The yarn is laid across a warp part inserted and anchored again by a following weft thread so that a floating yarn portion, anchored at the ends, is formed on the fabric. The yarn may be a fancy yarn having an ornamental effect, or the floating yarn portion may be used for attaching objects to the fabric.

**5 Claims, 6 Drawing Figures**



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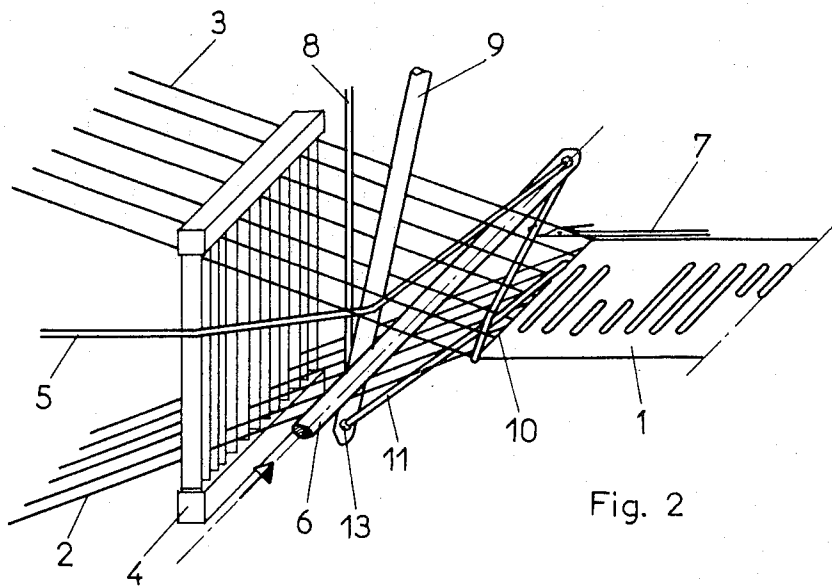
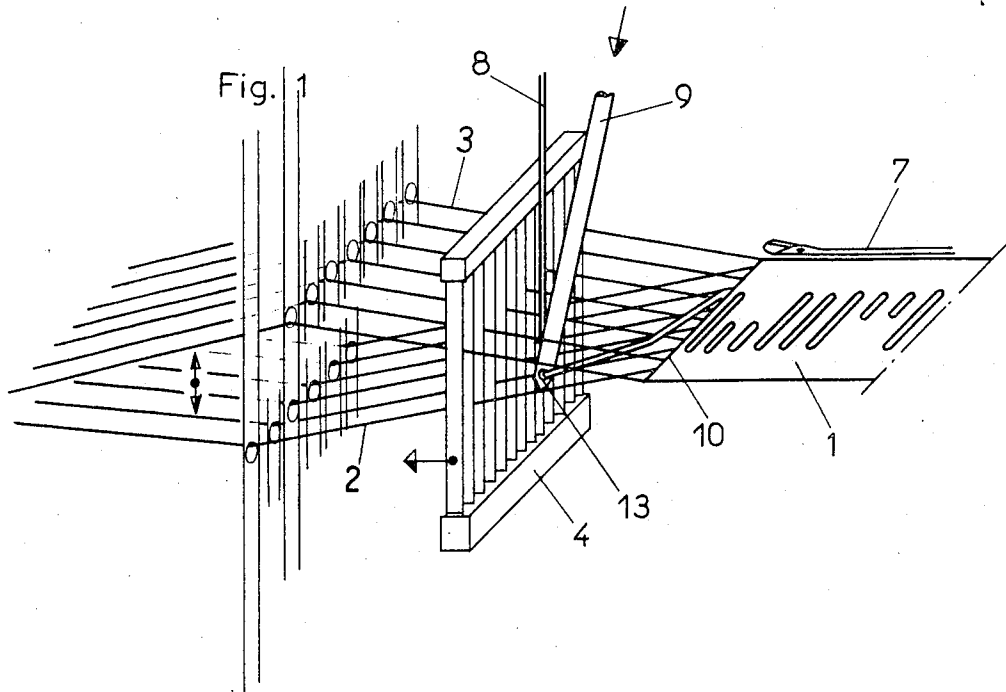


Fig. 2

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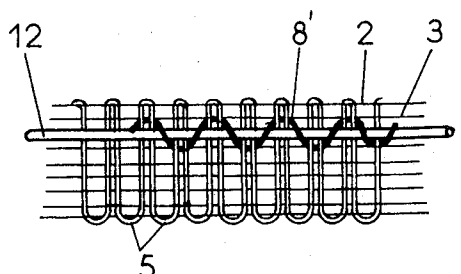
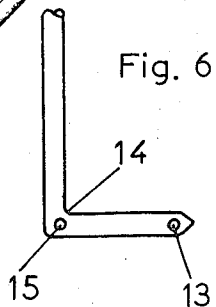
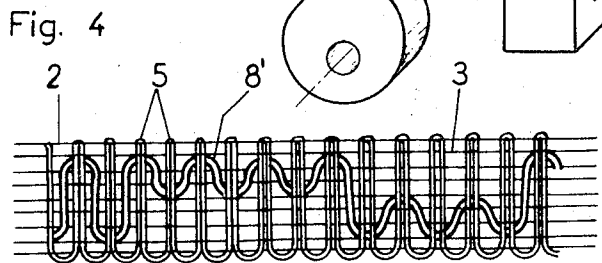
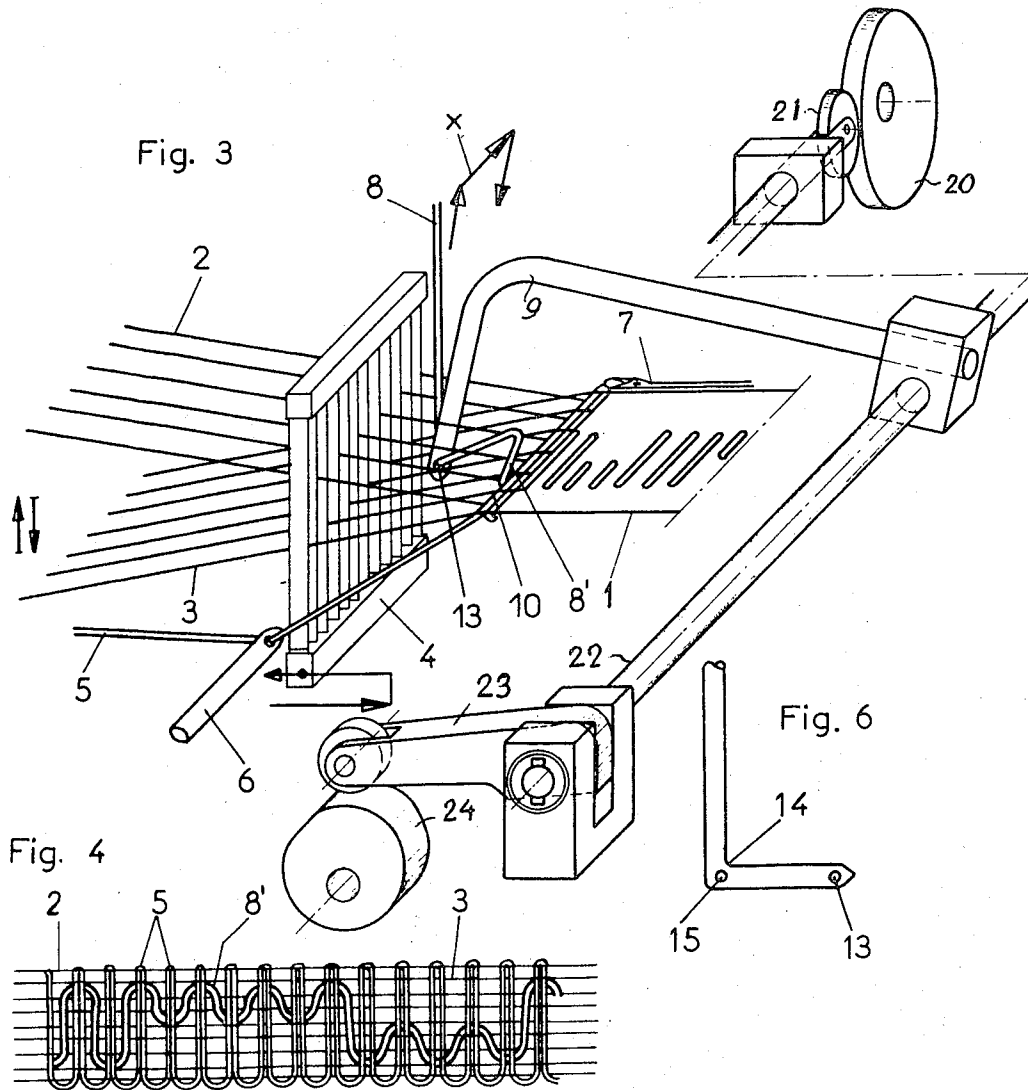


Fig. 5

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## METHOD AND APPARATUS FOR ANCHORING A FLOATING YARN PORTION IN A WOVEN FABRIC

This is a continuation, of application Ser. No. 34,475, filed May 4, 1970, now abandoned.

### BACKGROUND OF THE INVENTION

It is known to attach fancy novelty yarns, or attaching yarns for objects, to a fabric during weaving of the same. A fancy yarn or attaching yarn may form part of the warps, or inserted as a filler yarn in weft direction into a warp shed. It is also known to attach fancy yarn or other yarns, to a finished fabric by stitching the yarn to the fabric by a sewing machine. Particularly, the last-mentioned method of attaching yarns is expensive, since it requires a separate operation.

It is one object of the invention to provide a method and apparatus by which a fancy yarn, or an attaching yarn for objects, is anchored in a fabric while the same is being woven, for example on a ribbon or band.

Another object of the invention is to provide a method and apparatus for attaching a fancy yarn or an attaching yarn on a woven fabric, woven in a shuttleless a needle loom.

Another object of the invention is to provide a method and apparatus for attaching a transverse or longitudinal floating yarn portion to a fabric during weaving of the same.

Another object of the invention is to anchor both ends of a floating yarn portion in the fabric to which it is attached during weaving.

### SUMMARY OF THE INVENTION

A preferred method of the invention comprises the steps of inserting a yarn transversely to the weaving plane at a first point through an open warp shed to form a yarn loop in the warp shed; inserting a weft thread portion into the warp shed and through the yarn loop; changing the warp shed so that the weft thread portion anchors the yarn at the first point; inserting the yarn at a second point the into the warp shed to form another yarn loop in the same; inserting another weft thread portion into the warp shed and through the other yarn loop; and changing the warp shed so that the other weft thread portion anchors the yarn at the second point.

In this manner, the yarn portion between the first and second points is anchored at the ends thereof and floats on the surface of the finished fabric. The first and second points may be spaced in the longitudinal direction of the warp so that the float extends in longitudinal direction of the fabric, or may be spaced in the direction of the weft thread portion so that the float extends transversely to the longitudinal direction of the fabric. A plurality of yarns may be simultaneously inserted and retracted to form parallel floats, and a yarn may be repeatedly inserted and retracted so that a plurality of floats is formed.

In this manner, it becomes possible to feed a thin ornamental object under the floating yarn portion during the laying of the same so that the object is located under the float and attached by the same through the fabric.

It is also possible to space the first and second points of successive laid yarn portions different distances so that the floats have different lengths.

Every fancy yarn or attaching yarn is inserted into a warp shed of a fabric being woven, from above, or from

below, and by a yarn inserting needle which enters and leaves the warp shed between the reed and fell of the fabric so that the yarn loop is formed in the warp shed. When the following weft thread is inserted into the warp shed through the yarn loop, and the warp shed changed, the yarn is anchored.

The yarn inserting needle can either reciprocate up and down only, or also perform a movement along a U-shaped path, or along an arc, so that the yarn inserting needle does not enter the warp shed between the same warp threads. In this manner, particular ornamental pattern effects, and also particular possibilities for attaching objects, are obtained. By controlling the movement of the yarn inserting needle, the yarn floats not only be provided in warp direction, but also in weft direction and in oblique position, and form on the front face or back face of the fabric, a zig-zag pattern or serpentine in various combinations.

The apparatus of the invention provides a yarn inserting needle which is reciprocated at an angle to the weaving plane or a fabric, and moved parallel to the weaving plane for laying the yarn float on one side of the fabric. The needle may be provided at its free end with an eye, or with a fork-shaped guide for the yarn, and it is also possible to provide an angular yarn inserting member with two eyes for the yarn so that a large yarn loop is formed in the warp shed through which the weft thread portion can be easily inserted.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

### BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspective view illustrating an apparatus according to an embodiment of the invention in a first operational position in which an operation for attaching a yarn float has started;

FIG. 2 is a fragmentary perspective view corresponding to FIG. 1, but illustrating another operational position in which a yarn loop has been formed in the warp shed;

FIG. 3 is a fragmentary perspective view corresponding to FIGS. 1 and 2 and illustrating an operational position in which the yarn is anchored, and the weft inserting needle retracts the yarn from the warp shed;

FIG. 4 is a plan view illustrating a finished fabric band provided with yarn floats of different length;

FIG. 5 is a plan view of a finished fabric whose yarn floats attach a thin pin to the finished fabric; and

FIG. 6 illustrates a modified construction of a weft inserting member.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1, 2, and 3 illustrate the weaving of a fabric 7 of warp parts 2 and 3 which are operated by heddle frames of a shuttleless loom in a conventional manner to form and change warp sheds. A reed 4 is reciprocated by a slay, not shown, to beat a weft thread into the fell 10 of the fabric 7 which is located in a weaving plane. The apparatus is part of a needle loom in which a weft inserting member 6 is inserted into a warp shed

with a weft thread portion 5, as best seen in FIG. 2 whereupon the weft thread is knitted by a selvedge forming knitting needle 7 so that a portion of the weft thread 5 can be beat into the fell 10 of the fabric 7 by read 4 whereupon the warp shed is changed. Needle band looms of this type are well known, and not an object of the invention.

In accordance with the invention, a yarn inserting means or needle 9 is provided which is reciprocable in longitudinal direction thereof as indicated by an arrow in FIG. 1, but can also be moved parallel to the weaving plane of fabric 1 in the direction of the arrow X, as shown in FIG. 3. The movement of yarn inserting needle 9 is transverse to the weaving plane into the warp shed and through both shed forming warp parts 2 and 3 so that the yarn 8 forms a yarn loop 11, as best seen in FIG. 2, which is located in the warp shed.

In the position of FIG. 1 warp parts 2 and 3 move apart so that the warp shed opens, while reed 4 moves away from the fell 10 of the fabric. The yarn inserting needle 9 moves into the warp shed between two adjacent warp threads, schematically shown to be second and third warp threads of the upper warp part 3, through the warp shed, and between the first and second warp threads of warp part 2, as schematically shown in FIG. 1. Since one end of yarn 8 is already anchored in the fell of the fabric, an additional length of yarn 8 is pulled from a supply means, not shown, so that an open yarn loop 11 is formed in the warp shed, forming an opening bounded by two opposite portions of yarn 8, and by two opposite shed forming portions of warp parts threads of warps 2 and 3.

During the downward movement of yarn inserting needle 9, knitting needle 7 is in the retracted inoperative position shown in FIG. 1. The weft inserting needle 6, not shown in FIG. 1 since it is in a completely retracted position, is now moved forward into the open warp shed. In the position of FIG. 2, the reed 4 has moved farther away from the fell 10, the warp shed is fully opened, and the eye 13 of yarn inserting needle 9 is located under warp 2 so that a large loop 11 is formed of yarn 8. The advancing weft inserting needle 6, moving in the warp shed, passes through the yarn loop 11, and lays a weft thread portion at the fell of the fabric which is caught on the other side of fabric 1 by the advanced selvedge forming knitting needle 7, and knitted by the same, as shown in FIG. 3 so that the yarn 8 is tied and anchored by the weft thread portion. Weft inserting needle 6 is retracted, laying a second portion of the weft thread. The first-laid weft thread portion anchors the yarn 8, yarn inserting needle 9 can be retracted, and reed 4 can beat the weft thread portion and the respective yarn portion against the fell 10, while the warp shed changes so that the weft thread portions anchor the yarn 8 at a first point.

FIG. 3 illustrates the position directly following these operations. Reed 4 has beaten the weft thread, and is moving away from the fell 10 while the warp parts 2 and 3 are moved apart to wider open the newly formed warp shed, while weft inserting needle 6 is retracted from the fabric and ready for the next weft insertion.

Yarn inserting needle 9 has been operated to move in the direction of the arrow parallel to the weaving plane of the fabric and transverse to the warp direction in a direction X. When the yarn inserting needle 9 is now again moved into the newly opened shed, but at a point spaced from the first point at which the yarn 8

penetrated the warp parts 2 and 3, a portion of yarn 8 is laid on the respective upper warp 2 at the fell 10 of the fabric, so that a floating yarn portion 8' is completed which is anchored at both ends by the respective weft thread portions. Several previously made and anchored yarn float portions of different length are shown on the fabric 1 in FIG. 3.

A driven cam 20 operates a cam follower roller 21 to reciprocate shaft 22 with yarn inserting needle 9 in the axial direction X, while a cam follower 23 is operated by a driven cam 24 to displace shaft 22 angularly so that yarn inserting needle 9 moves into and out of the warp shed. Shaft 22 is axially slidable in cam follower 23.

FIG. 4 also shows floating yarn portions 8' parallel to the weft threads. It will be seen that, by making several yarn floats shorter, then making a longer yarn float, and then making again short yarn floats on the other side of the fabric, an ornamental pattern of the yarn float can be obtained.

In FIG. 5, a plurality of yarn floats 8' having the same length is shown to attach a thin pin 12 which is attached during the weaving to the fabric band 1. It is only necessary to feed the pin or other object 12 directly above or below the weaving plane of the fabric 1, so that the yarn inserting needle 9 stitches through the warp part 2 and 3 alternately on one and the other side of pin 12 whereby the attaching yarn 8 is alternately anchored on one and the other side of the pin 12 by weft thread portions 5 inserted into the warp parts shed between warps 2 and 3.

If the yarn floats 8' are to form an ornamental pattern, a fancy novelty yarn 8 can be used. If the yarn floats are used for attaching an object, the yarn may be plain and little distinguishable from the fabric so that the ornamental effect is obtained by the pin 12.

It is evident that not only a metal pin, but also a string of beads, a zip fastener, or the like, can be attached by an attaching yarn 8. It is only necessary that the yarn inserting needle 9, moving outside of the warp shed in the direction X as shown in FIG. 3, moves the yarn 8 over the respective object, and then penetrates again into the warp shed. The yarn inserting needle is shown in the drawing to be located above the fabric, but it is also possible to mount the yarn inserting needle 9 below the fabric, and to move the yarn inserting needle 9 upward into the warp shed, in which event, the floats are formed on the bottom side of the fabric.

By moving the yarn inserting needle into and out of the fabric without transverse displacement while weaving is continued, longitudinal floats are obtained on the fabric, not shown. It is also possible to move the yarn inserting needle 9 along a slanted path neither in the warp nor the weft direction.

Instead of a single yarn inserting needle 9, or a corresponding weft inserting member having a fork-shaped open end, two or more yarn inserting needles may be simultaneously operated by common operating means to perform parallel motions so that several parallel floating yarn portions are produced. It is also possible to provide a plurality of yarn inserting needles, and to operate each yarn inserting needle separately to move along different paths whereby differently positioned yarn floats are simultaneously obtained in the same region of the fabric.

A modification of the yarn inserting member is shown in FIG. 6. The yarn inserting member 14 can be

made angular and have a supporting portion and a free arm transverse to the supporting portion. A first guide eye 13 is provided at the free end of the arm, and a second guide opening in the region where the support portion and the arm join. The yarn 8, passing through opening 13 and 15, forms a wide yarn loop having substantially U-shape, so that the weft inserting needle 6 is with the weft thread 5 can easily pass through the yarn loop, and faults which may occur if weft inserting needle 6 misses the V-shaped yarn loop described with reference to FIG. 2, are avoided. The yarn inserting member 14 is particularly suited for looms with a reciprocating shuttle since the yarn loop formed by the angular yarn inserting member is wide enough for passage of the shuttle.

In a shuttle loom, in which no knitting needle 7 is provided, and a single weft portion is beat into the fell before the warp shed changes, the yarn is anchored by the inserted weft portion which is held by the changed warp shed.

If longitudinal yarn floats, not shown, are to be made, it is not necessary to move the yarn inserting needle 9 in transverse or longitudinal direction, but the yarn inserting needles 9 is reciprocated once to insert the yarn at one point where it is anchored by the weft thread portion, whereupon the yarn inserting needle 9 is retracted to a position above warp part 2 forming the upper shed portion and one or several weft thread portions are inserted, whereupon the yarn inserting needle 9 is then moved into and out of the warp shed to anchor a second point of the yarn.

The angle at which the yarn inserting needle 9 reciprocates into and out of the warp shed, depends on the type and construction of the loom in which the yarn inserting needle 9 is used in accordance with the invention.

It is a particular advantage of the invention that floating yarn portions, which may be used for ornamental novelty yarns, or for attaching objects can be provided during the weaving operation of the shuttleless loom without requiring a separate operation, or a reduction of the weaving speed.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of arrangements for anchoring floating yarn portions in a woven fabric differing from the types described above.

While the invention has been illustrated and described as embodied in a method and apparatus for anchoring a floating yarn portion in a fabric by reciprocating yarn inserting means during weaving of the fabric, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can

by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A loom for forming floating yarn portions for retaining objects on a fabric woven in a weaving plane, comprising fixed support means; shed forming means connected with two warp parts for opening, closing and changing warp sheds; a reed; yarn inserting means including a yarn inserting needle located directly between said reed and the fell of the fabric, mounting means located forwardly of said fell for mounting said yarn inserting needle movable in a direction parallel to the weft direction of the fabric and pivotable between a position outside said shed and a position projecting into said shed; operating means cooperating with said mounting means for moving said yarn inserting needle into, across and out of open warp sheds and transversely to the weaving plane for forming warp loops in said warp sheds crossing said warp parts; and weft inserting means for inserting weft thread portions through open warp sheds and through said warp loops so that upon changing of said warp sheds and beating of said weft thread portions by said reed, floating portions of said yarn are anchored at the ends thereof by said weft portions and form floats on the finished fabric for retaining an object on the surface of said fabric.

2. Apparatus as claimed in claim 1 wherein said operating means include first means for reciprocating said needle in the longitudinal direction thereof into and out of the warp shed, and second means for reciprocating said needle parallel to the weaving plane of said fabric across said fabric for laying said yarn portion.

3. A loom as defined in claim 1, wherein said weft inserting means is located on one side of said loom movable between a position retracted from said warp sheds and an advanced position for inserting weft thread portions through open warp sheds and through said warp loops.

4. A loom as defined in claim 3, wherein said mounting means comprise a support portion rotatable about an axis extending in the weft direction and an arm projecting transversely from said support portion, said yarn inserting needle being carried by the end of said arm distant from said support portion and said needle extending transversely to said arm and having at the free end thereof yarn guide means for guiding said yarn.

5. A loom as defined in claim 4, wherein said needle has a further yarn guide means at the junction of said needle and said arm.

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