

[72] Inventor **Peter Erich Julius Held**
London, England
 [21] Appl. No. **881,133**
 [22] Filed **Dec. 1, 1969**
 [45] Patented **Dec. 14, 1971**
 [73] Assignee **Alberton Limited**
London, England
 [32] Priority **Dec. 4, 1968**
 [33] **Great Britain**
 [31] **57,561/68**

2,169,886 8/1939 Shaw 139/11 X
 3,336,645 8/1967 Mirsky 139/11 X
 3,503,106 3/1970 Port et al. 139/11 X

FOREIGN PATENTS

180,540 12/1954 Austria 139/11
 1,035,227 7/1966 Great Britain 139/11
 1,151,217 5/1969 Great Britain 139/101
 464,819 12/1968 Switzerland 139/11

OTHER REFERENCES

Textile Month, Film Slitting At The Loom, November 1968
 pgs. 49, 52, 55

Primary Examiner—James Kee Chi
 Attorney—Lawrence E. Laubscher

[54] **WEAVING METHOD AND APPARATUS**
12 Claims, 7 Drawing Figs.

[52] U.S. Cl. **139/11,**
139/97, 139/101

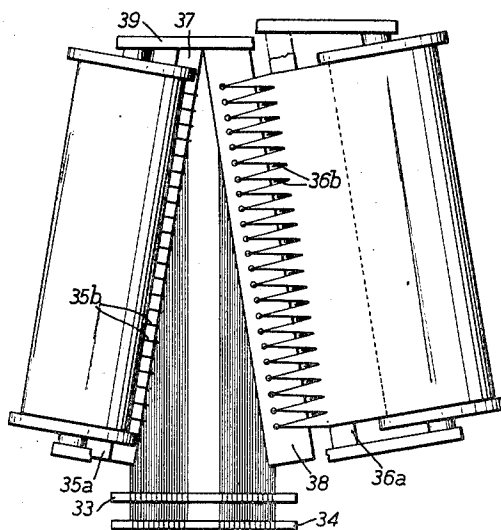
[51] Int. Cl. **D03d 41/00,**
D03d 49/00

[50] Field of Search **139/11,**
197, 101, 420, 353; 28/1 CS, 72 CS

[56] **References Cited**
UNITED STATES PATENTS

2,046,291 6/1936 Harter 139/353

ABSTRACT: Webs including warp elements formed by multiply splitting an elongate sheet or plastics material are woven by disposing a warp beam carrying the unsplit sheet with its axis at an acute angle to the direction of the warp elements in the woven web so that the packing density of the elements in the web exceeds that of the elements as split from the sheet.



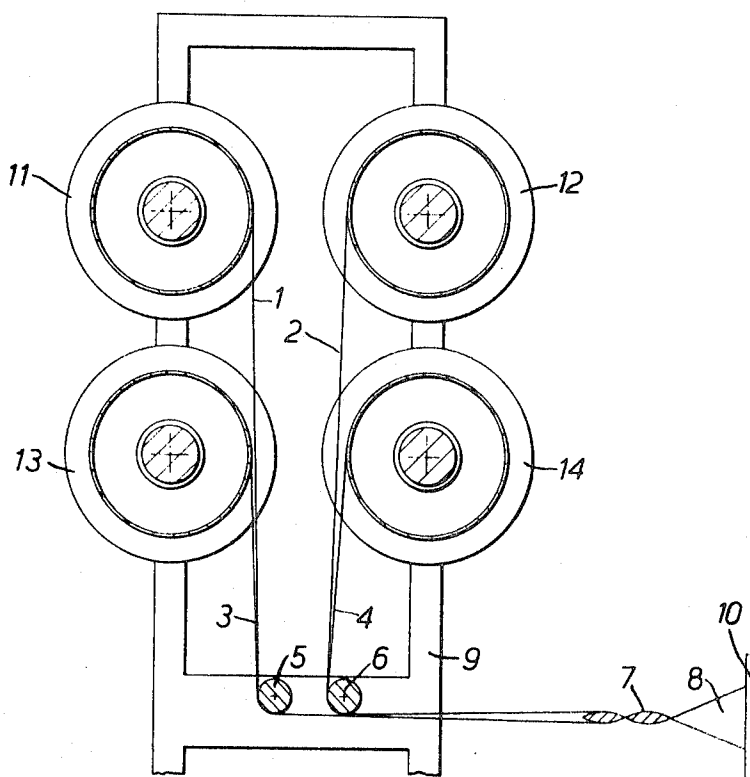


FIG. 1.

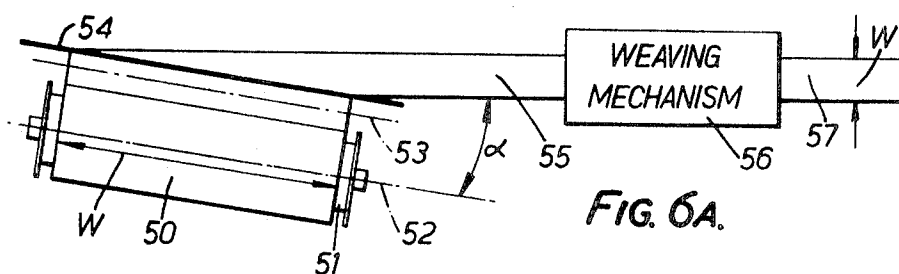


FIG. 6A.

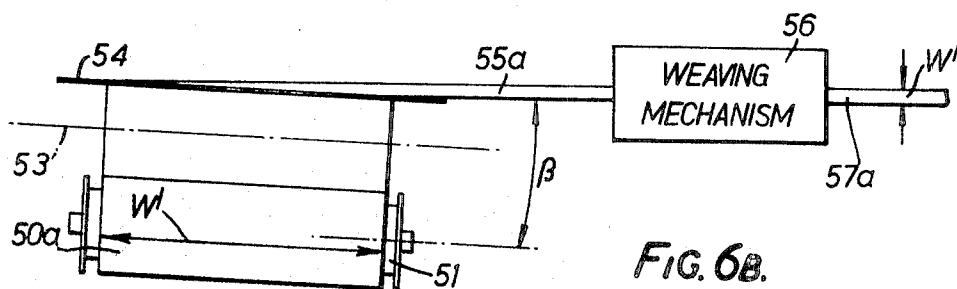


FIG. 6B.

Peter E.J. Held
INVENTOR

BY
Lawrence E. Taubner
ATTORNEY

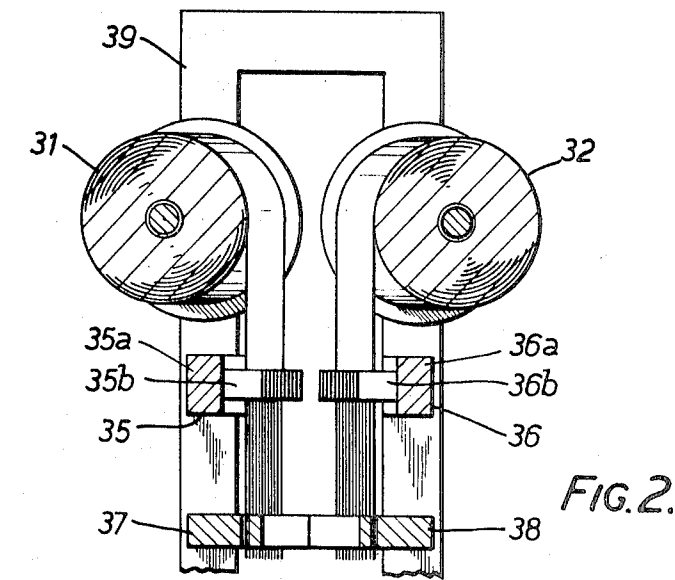
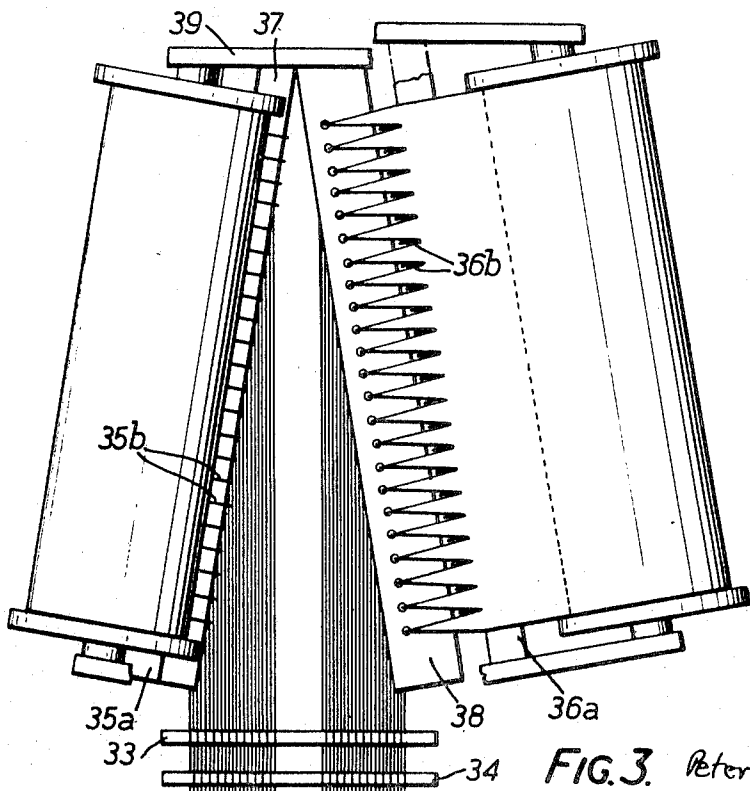


FIG. 3. Peter E.S. Held
INVENTOR

BY
Lawrence E. Lautner
ATTORNEY

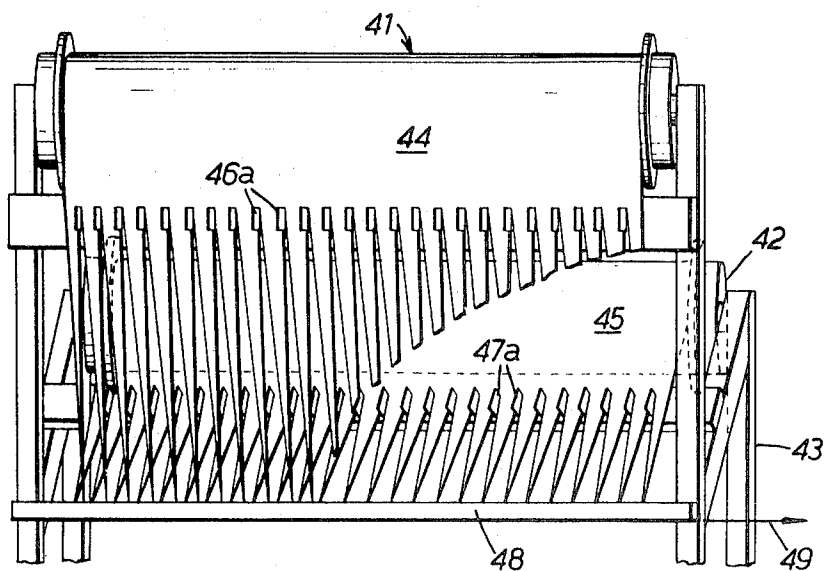


FIG. 4.

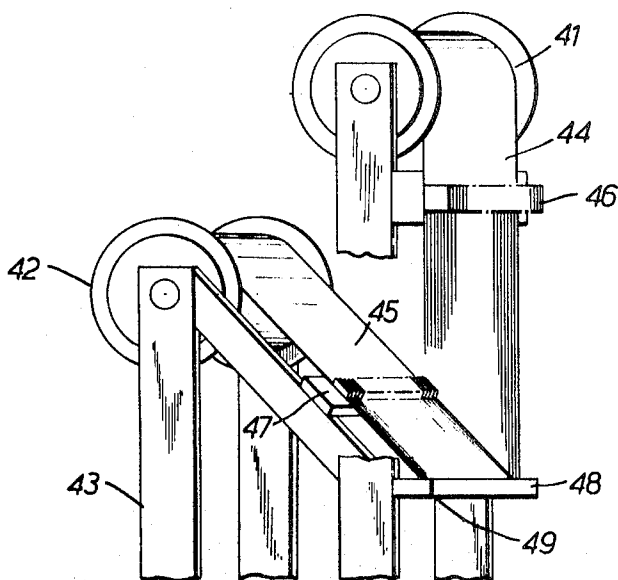


FIG. 5.

Peter E. J. Held

INVENTOR

BY
Lawrence E. Laubscher
ATTORNEY

WEAVING METHOD AND APPARATUS

This invention relates to improvements in warp-feeding arrangements for looms, and is applicable to weaving looms for weaving with a warp formed by multiply splitting a plastics film into narrow strips.

In the weaving of narrow fabrics and webbings it is often desired to feed a large number of warp yarns. When this is done the yarn capacity of the beam becomes severely restricted owing to the necessity for the yarns to be fed into the shed approximately parallel to their direction in the woven web. The arrangement most commonly adopted has been to provide a plurality of beams each carrying a proportionate number of the total yarns required and to lead yarns from all the beams over one or more guide rods to the lease rods and thence to the shed-forming means. Weights up to only some 60 lbs. per yarn have been possible on conventional looms. With this arrangement the down time involved in rethreading the warp yarns is a major cost factor and limits the productive capacity of a given loom.

A known method of weaving consists in replacing the warp beam of a conventional loom by a roll of plastics film which is run over an array of razor plates, attached to spacing members, by which the plastics film is split into a multiplicity of narrow tapes which form the warp used in the weaving operation. The width of the warp tapes cannot conveniently be reduced below 2 mm., so that a single roll of plastics film will yield only some 10 ends per inch. If this number of ends is insufficient for a particular weaving operation, then it becomes necessary to use more than one roll of plastics film to supply the necessary number of ends. While this requirement presents no particular difficulty in connection with wide looms, there is considerable difficulty in applying the technique to the weaving of narrow fabrics, where substantially higher numbers of ends per inch are needed than the 20 per inch available for example when two rolls of plastics material are used to supply warp threads.

Thus the invention seeks to provide an improved method of weaving a web in which the warp elements are produced by longitudinally slitting an elongate sheet of plastics material.

The invention also seeks to provide an improved warp-feeding arrangement whereby the weight of warp carried on a beam may be greatly increased, which is very advantageous in weaving operations using warps formed of tapes split from plastics film.

The invention further seeks to provide a woven web having warp elements formed by slitting an elongate sheet of plastics material and having a breaking load of not less than 20 kilograms per gram weight per meter of the woven web.

Objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings, of which:

FIG. 1 is an elevational view showing the warp-yarn-feeding arrangements of a conventional loom for weaving webbing or like narrow fabrics;

FIG. 2 shows a schematic sectional view of a portion of a loom incorporating the present invention using warps split from plastics film;

FIG. 3 shows a schematic plan view, with some parts displaced for ease of illustration, of the portion of the loom shown in FIG. 2;

FIG. 4 shows a front elevation of a portion of another embodiment of loom using warps split from plastics film;

FIG. 5 shows an end elevation of the loom portion shown in FIG. 4;

FIG. 6A shows an elevational view of a warp beam disposed at an angle α with respect to the direction of the warp elements of the woven web; and

FIG. 6B shows an elevational view of the same warp beam shown in FIG. 6A but disposed at an angle β with respect to the warp elements.

In the prior art arrangement shown schematically in FIG. 1, yarns 1, 2, 3 and 4 from warp beams 11, 12, 13 and 14 respectively pass over guide rods 5, 6 by which they are guided from

a generally vertical to a generally horizontal path and then pass by way of lease rods 7 to the shed 8 of a loom. Beams 11-14 and guide rods 5, 6 are carried by a frame 9 generally of the width determined by the requirements of the weaving mechanism proper of the loom. Shed 8 is formed by conventional shed-forming means represented only as a rectangular shape 10. The shed-forming means will in practice comprise a plurality of heald frames arranged for selective upward and downward movement. This arrangement suffers from the disadvantage that the axial length of beam allowable for each yarn is obviously dependent upon the total number of ends being woven, and the total weight of yarn which can be beamed is correspondingly reduced, and more time lost in rethreading.

The expedient of employing longer beams is not feasible because the yarns in the shed must be approximately parallel or at only a very slight angle to each other. Hence wide beams require more floor space.

It will be understood that a loom in accordance with the invention may employ a single beam only and that where the number of beams is two or more the axes of these beams may be parallel with, or may be equally but oppositely inclined to, the direction of the warp elements as shown in the drawings.

It will be seen that the advantage of the invention is that larger weights of warp carried on a long beam may be led into the shed almost parallel to the direction of the warp elements in the finished web and that no increase in the width of the space occupied by the loom is required.

Still greater weights of warp may be beamed by feeding the warp elements from two or even more warp beams disposed with their axes mutually parallel and approximately the same vertical plane. The warp beams can be mounted on the same side of the web plane, feeding through a single eyelet bar, or at least one beam may be above and at least one other below the plane of the web, in which case individual eyelet bars will usually be most convenient.

The portion of a loom according to the invention which is shown in FIGS. 2 and 3 of the drawings is that which provides the warp of the woven web. Two relatively long beams 31, 32, each carrying a roll of plastics film, are disposed, as most clearly seen in FIG. 2, with their axes inclined at an acute angle to the direction of the warp in the woven web, into which the warp passes by way of lease rods 33, 34. The film unwound from a beam passes over a respective one of two razor plate arrays 35, 36 by which it is severed into narrow elements. The number of elements into which the film is slit will usually be greater than that shown, which is chosen merely for simplicity in illustration.

Each assembly comprises a plurality of slitter plates 35b, 36b spaced along a respective support member 35a, 36a. Each slit warp element passes through a respective eyelet in one of eyelet plates 37, 38 whence it is drawn over the lease rods to form the shed. The beams 31, 32, razor plate assemblies 35, 36 and eyelet bars 37, 38 are all secured to an appropriate framework 39 to retain them in the correct relative positions.

In the loom shown in FIGS. 2 and 3 the warps formed by the slit elements from the two beams are not contiguous, so that two separate narrow webs can be woven by appropriate shuttleless techniques. If it is desired to weave a wider web, then the eyelet bars of the embodiment illustrated by the drawing may be formed so that the web tapes split from the adjacent edges of the films are contiguous in the woven web.

The illustrated embodiment may be modified by positioning one or more rolls of plastics film below the plane of the web in addition to or in substitution for those above the web.

Further warp elements such as binder yarns can be led in either conventionally from a beam disposed with its axis perpendicular to the direction of the warp, if the elements are few in number so that the necessary weight can be carried on a short beam or, if a large number of ends are needed, from a further beam also having its axis inclined at an acute angle to the direction of the warp.

The invention and its advantages will be further apparent from the following examples:

EXAMPLE 1

A sheet of polyethylene having a width of 1 meter and a thickness of 25 microns and weighing 24 grams per square meter, was divided by a slitting bar, spacer discs and cutting knives into an array of 212 strips each approximately 4.7 mm. wide which were used to form the ends of a warp. The split ends were drawn through eyelets which formed the strips into yarns of approximately 1,000 denier. These yarns were woven with a weft of 12 double picks of 770 denier nylon into a webbing having a width of 63 mm. and a thickness of some 1.0 mm. This web has a weight of 28.8 grams per meter, the weight of warp in 1 m. being 24.3 grams and weight of weft in 1 m. being 4.5 grams. It was found to have a breaking load of 612 kilograms and percentage extensions under load as follows:

Load Kilograms	Pounds	% Extension
113	250	4
226	500	8
340	750	12

These figures show that the tenacity of each end after weaving is 2.9 grams per denier and that the strength of each end in the woven warp is 2.9 kilograms.

EXAMPLE 2

A polyethylene sheet as in example 1 was again split into 212 ends. These ends were divided equally and each batch of 106 ends was woven into a 45 mm. wide web having a weight of 16.5 grams per meter and a breaking strength of 344 kilograms.

EXAMPLE 3

A polyethylene sheet as in example 1 was again split into 212 ends and equally divided. Each batch of 106 ends was woven into a web 22.5 mm. wide having a weight of 13.3 grams per meter and a breaking strain of 316 kilograms.

It has also been found that when stitched in layers webs woven in accordance with the invention yield excellent conversion, which is not obtained with webbing woven of conventional textile yarns. Webbing prepared as in example 1 had a break load of 612 kilograms. Two layers of such webbing stitched together gave a breaking load of 1,224 kilograms and three stitched layers gave a breaking load of 1,850 kilograms.

Similarly, while the breaking load of a single layer of 45mm. wide, 106-end web was 344 kilograms, that of two such webs stitched together was 688 kilograms and that of a treble layer of stitched webs was 980 kilograms.

Again, while the breaking load of a single layer of 23 mm., 106-end web was 317 kilograms, that of three such webs stitched together was 871 kilograms.

Single-layer webs woven on a loom in accordance with the invention may thus have a specific breaking load of not less than 15 kilograms per kilograms/meter.

It will thus be seen that by the use of the invention, webs having a breaking load of not less than 20 kilograms per gram weight per meter of the woven web may be produced.

Although the sheet from which the warp elements are split in the examples given above is polyethylene sheet, it is possible and may be advantageous to employ polypropylene sheet which has been hot stretched to enhance its longitudinal strength.

Still greater numbers of ends of plastics tape may be used if two or more rolls of plastics film are disposed with their axes mutually parallel. The rolls may be mounted on the same side of the web plane, feeding through a single eyelet bar, as shown in FIGS. 4 and 5 of the drawings.

Rolls 41, 42 of plastics sheet are supported on a framework 43. Sheets 44, 45 are drawn from the respective rolls and pass over respective razor plate assemblies 46 and 47 by the blades

46a, 47 a of which each sheet is split into an appropriate plurality of narrow strips. Each set of strips passes through holes in a single eyelet plate 48 whence a warp composed of the rolled strips split from each sheet is drawn as indicated by heavy line 49. Preferably, as shown in FIG. 4, strips split from each of the two sheets pass through alternate eyelets of the eyelet plate.

A preferred method of weaving a web in accordance with the invention is illustrated in FIGS. 6A and 6B. FIG. 6A illustrates the method applied to the weaving of a web having a width of not more than one-tenth that of the sheet of material which forms the warp. The sheet material 50 of width W is wound upon a beam 51 which is mounted by conventional means, not shown, for rotation about its axis 52 and is drawn from the beam over a splitter device, not shown in detail but of which the position is indicated by a chain line 53, to an eyelet bar of which the position is indicated by solid line 54. The warp elements 55 split from sheet 50 are led from the eyelet bar 54 into a weaving mechanism 56 in a direction to which the axis 52 of beam 51 is inclined at an acute angle α . This angle is so chosen that the width W of the woven web 57 is not greater than one-tenth of the width W of the sheet which forms the warp elements. Specifically, and as shown in example 1 above, a plastics sheet having a width of 33 inches (1.0 meters) may be condensed into a web having a width of 2% inches (63 mm.) which is less than one hundredth of the width of the unsplit sheet of warp material.

FIG. 6A shows an arrangement similar to that of FIG. 6B and corresponding parts are therefore denoted by the same reference numerals. Here, however, beam axis 52 is inclined to the direction of warp elements 55a at an acute angle β such that the width W' of the woven web 57a is not greater than one-twentieth the width W' of the unsplit sheet 50a from which the warp elements are split. Specifically, a warp sheet 50a 54 inches (1,370 cm.) wide may be condensed into a web 1-inch (2.54 cm.) wide, which is less than one two-hundredth that of the unsplit sheet of warp material.

I claim:

1. A weaving loom for transforming sheet material into a woven web, comprising

a. a warp beam for carrying a roll of sheet material, said warp beam being mounted for rotation about an axis;

b. dividing means for dividing the sheet material into a plurality of strips; and

c. forming means for forming said strips into a plurality of warp ends for the web, said warp ends all extending in a single predetermined direction inclined at an acute angle with the rotational axis of the warp beam, whereby the packing density of the ends in said predetermined direction exceeds the packing density of the strips as they are divided from the sheet.

2. The weaving loom claimed in claim 1, characterized by said sheet material being drawn from a plurality of warp beams of which the axes of rotation are inclined at acute angles to said predetermined direction.

3. The weaving loom claimed in claim 1, characterized in that the axis of said warp beam lies in a plane parallel to but displaced from that of said web.

4. The weaving loom claimed in claim 2, characterized in that the axis of each said beam lies in a different plane parallel to that of said web.

5. The weaving loom claimed in claim 2, characterized by including two said beams of which the axes are inclined at equal but opposite angles to said predetermined direction.

6. A weaving loom as claimed in claim 2, characterized by including a plurality of said warp beams disposed with their axes mutually parallel and in the same vertical plane.

7. A weaving loom as claimed in claim 1, wherein the forming means includes an eyelet bar pierced by a multiplicity of apertures and disposed in the plane of the web and at said acute angle to said predetermined direction, in that said warp material passes from said beam to said web through individual eyelets in said eyelet bar.

5

8. A weaving loom in accordance with claim 1 characterized by a further beam disposed with its axis perpendicular to said predetermined direction, and in that further warp filaments are led into said web from said further warp beam.

9. The method of weaving a web including warp elements 5 formed by splitting sheet material, said warp elements extending generally in a predetermined direction in said woven web, which comprises the steps of:

a. disposing said sheet material in a roll mounted for rotation about an axis inclined at an acute angle to said 10 predetermined direction;

b. leading said sheet material from said roll to divider means whereby said sheet is longitudinally divided into a multiplicity of said warp elements; and

6

c. leading said warp elements through individual apertures in an eyelet bar into said web.

10. The web weaving method of claim 9 wherein the sheet material is made of polyethylene film having a width of approximately 1 meter and a thickness of approximately 25 microns.

11. The web-weaving method of claim 9 wherein the width of the woven web is not greater than one-hundredth that of the sheet material forming the warp.

12. The web-weaving method of claim 9 wherein the width of the woven web is not greater than one two-hundredth that of the sheet material forming the warp.

* * * * *

15

20

25

30

35

40

45

50

55

60

65

70

75