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G. WALTERS ET AL

2,664,922

LOOM HARNESS-STRAP

Filed May 16, 1950

2 Sheets-Sheet 1

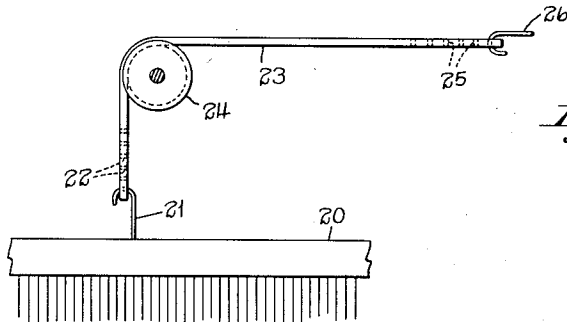


Fig. 1.

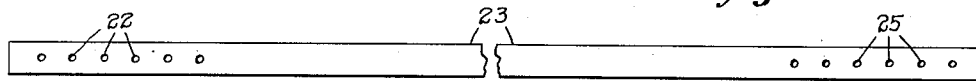


Fig. 2.

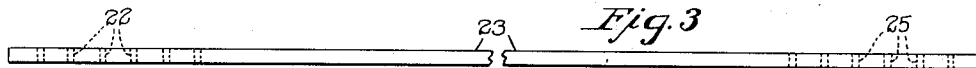


Fig. 3.



Fig. 4.

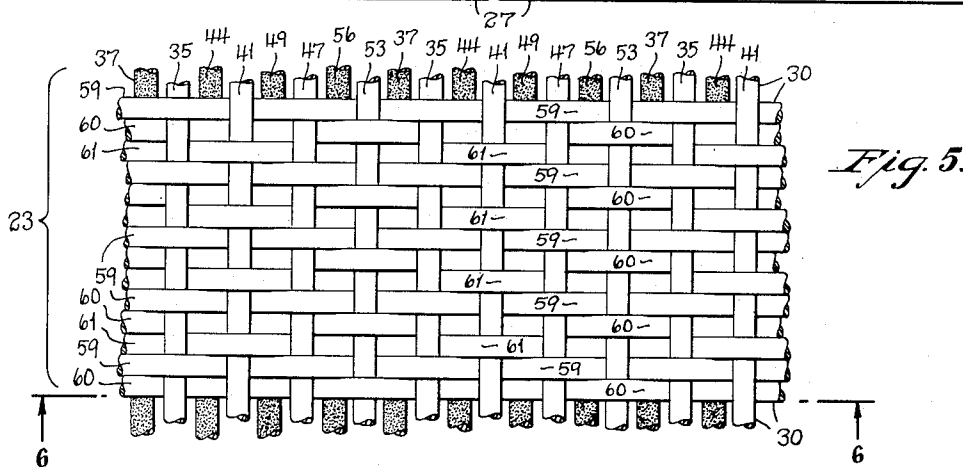


Fig. 5.

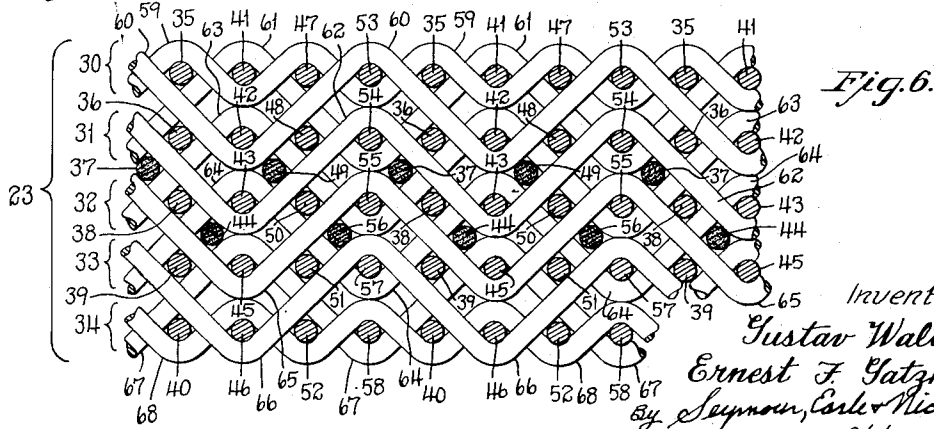


Fig. 6.

Inventors
Gustav Walters
Ernest F. Gatzke
By Seymour, Carter, Nichols
Attorneys

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Fig. 7.

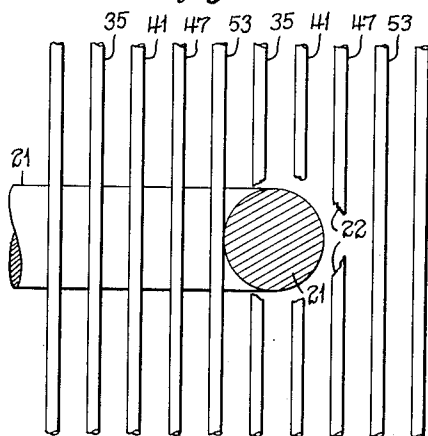


Fig. 8.

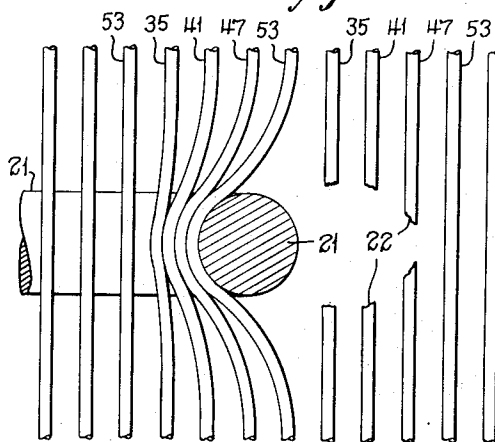


Fig. 9.

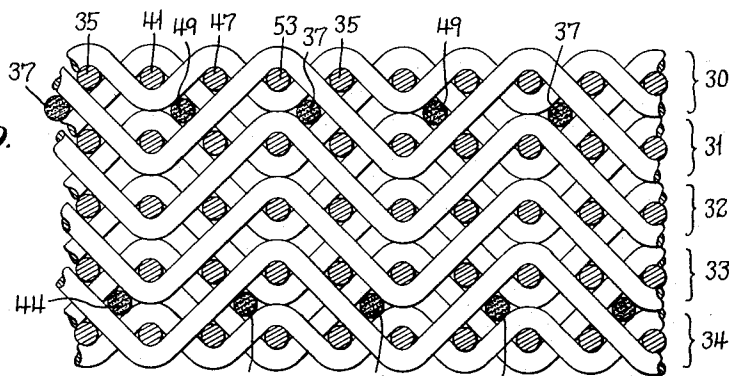


Fig. 10.

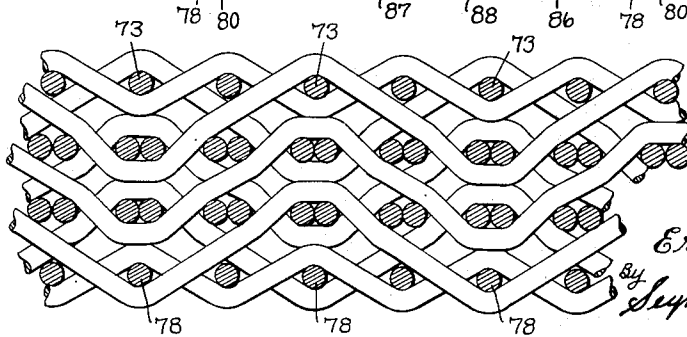
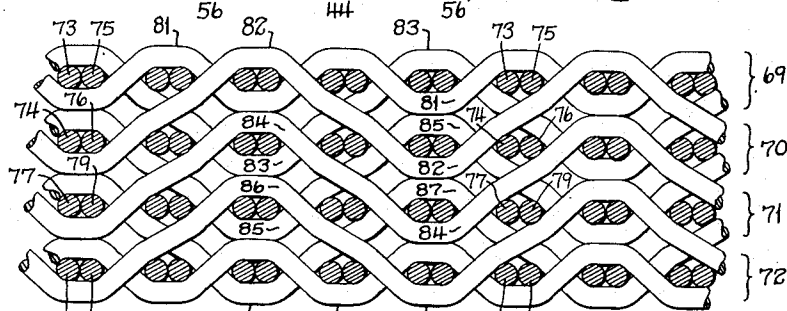


Fig. 11.

Inventors
Gustav Walters
Ernest F. Gatzke
By Seymour, Carle & Nichols
Attorneys

UNITED STATES PATENT OFFICE

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LOOM HARNESS-STRAP

Gustav Walters and Ernest F. Gatzke, Middletown, Conn., assignors to The Russell Manufacturing Company, Middletown, Conn., a corporation of Connecticut

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8 Claims. (Cl. 139—408)

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This invention relates to an improved harness-strap for actuating the harness-frames of weaving looms.

One object of this invention is to provide an improved loom harness-strap which will have higher resistance to ripping by the harness-hook or jackwire or other member which engages in a hole in the harness-strap for operating the harness-frame.

Another object of this invention is to provide an improved harness-strap which shall have greater flexibility or freedom of bending.

Other objects and advantages will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings.

In the description and claims, the various parts and steps are identified by specific terms for convenience, but they are intended to be as generic in their application as the prior art will permit.

In the accompanying drawings forming part of the present disclosure, in which certain ways of carrying out the invention are shown for illustrative purposes:

Fig. 1 is a front elevation of a fragment of a loom showing a harness-strap in operating relation with certain parts of the loom;

Fig. 2 is a broken top plan view of the harness-strap shown in Fig. 1, and which is made in accordance with the present invention;

Fig. 3 is an edge elevation of the harness-strap shown in Fig. 2;

Fig. 4 is a broken top plan view similar to Fig. 2 of a modified form of harness-strap made in accordance with the present invention;

Fig. 5 is a schematic top plan view of a fragmental portion of the harness-strap illustrated in Fig. 2, illustrating the weave thereof;

Fig. 6 is a schematic sectional view on line 6—6 of Fig. 5;

Fig. 7 is a schematic top plan view illustrating a harness-hook engaged in a hole of the harness-strap;

Fig. 8 is a schematic view similar to Fig. 7, but illustrating in exaggerated form, what takes place in the strap when the harness-hook is put under stress, such as periodically occurs during normal operation;

Fig. 9 is a schematic sectional view similar to Fig. 6 of a modified form of weave;

Fig. 10 is a schematic sectional view similar to Fig. 6 of another modified form of weave; and

Fig. 11 is a schematic sectional view similar to Fig. 10 of still another modified form of weave.

Referring to Figs. 1 to 8 of the drawings, Fig. 55

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1 illustrates a fragment of a harness-frame 20 having a harness-hook 21 engaged through one of the group or set of holes 22 in one end of the harness-strap 23, which strap extends over a sheave 24 and has one of the set of holes 25 in the other end of the strap engaged by a hook 26 known as a jackwire. As is well understood by those skilled in the art, the jackwire 26 is actuated by suitable mechanism to pull the end of the strap 23 to which it is connected, toward the right of Fig. 1 to thereby cause the central portion of the strap 23 to ride up and over the sheave 24 and thus cause the lower end of the strap 23 to lift the hook 21 and the harness-frame 20. Upon the jackwire 26 being permitted to move to the left, the harness-frame 20 pulls the strap 23 to its original position shown in Fig. 1, all as is well known by those skilled in the art. The sets of holes 22 and 25 permit of adjusting the hooks 21 and 26, so as to engage in one or another of the sets of holes, as usage of the strap tends to elongate it.

In the modified form of strap 27 illustrated in Fig. 4, a set of holes 28 is illustrated at one end, and only one hole 29 at the other end. This strap 27 could be employed in the construction illustrated in Fig. 1, but is commonly employed in a way well known to those skilled in the art in connection with what is known as a two-harness loom, as is well understood by those skilled in the art and is, therefore, unnecessary to illustrate.

Figs. 5 and 6 illustrate the preferred form of weave which is employed in making the straps 23 and 27. This weave employs five plies 30, 31, 32, 33 and 34. The two opposite outside plies 30 and 34, may be referred to as the face plies of the strap. The weft picks or filling picks numbered 35, 36, 37, 38, 39 and 40 form one bank of picks which, in a one-shuttle loom, for example, are formed in the weaving operation in the order in which they are numbered. That is, pick 35 is formed by the shuttle passing across in one direction, then pick 36 is formed by the shuttle passing back again, and so on. Each of the picks 35, 36, 38, 39 and 40 lies in one of the five plies respectively numbered 30, 31, 32, 33 and 34, and may be termed a "ply pick," and it will be noted that the pick 37 does not lie in any of the five plies, but is what may be termed a "float pick." All float picks are shown as stippled for clearness. Similarly, picks 41, 42, 43, 44, 45 and 46 form the next bank of picks, of which the pick 44 is a float pick. Similarly, picks 47, 48, 49, 50, 51 and 52 form the next bank of picks, of which pick 49 is a float pick. And similarly,

picks 53 to 58 form the next bank of picks of which pick 56 is a float pick. The four banks of picks just described, will presently be seen to constitute the picks of one complete repeat of the weave.

The ply 30 is formed by weft strands or picks 35, 41, 47, 53, etc., the set or group of warp strands or warps or ply-warps 59, and the two sets or groups of binder-warp strands or binder-warps 60 and 61. The next ply 31 is formed by picks 36, 42, 48, 54, etc., and four sets or groups of binder-warps 60, 61, 62 and 63. The next ply 32 is formed by picks 38, 43, 50, 55, etc., and by four sets or groups of binder-warps 62, 63, 64 and 65. The next ply 33 is formed by picks 39, 45, 51, 57, etc., and by four sets or groups of binder-warps 64, 65, 66 and 67. And the next or last ply 34 is formed by picks 40, 46, 52, 58, etc., the two sets or groups of binder-warps 65 and 67, and the set or group of warps or ply-warps 68. Thus the sets of binder-warps 60 and 61 bind the plies 30 and 31 together, the sets of binder-warps 62 and 63 bind the plies 31 and 32 together, and so on through the thickness of the strap, so that the binder-warps are arranged in overlapping layers thicknesswise of the strap. The construction just described, forms one complete repeat of the fabric.

The weave construction illustrated in Figs. 5 and 6, while it only has five plies, has the number of warps which would normally occur in a six-ply fabric. In other words, the picks 37 and 49 are float picks which lie between the middle ply 32 and the ply 31, and the picks 44 and 56 are also float picks which lie between the middle ply 32 and the ply 33. This brings about two important results. It produces a more flexible strap, which increases the life of the strap which is subject to the continual flexing as it passes back and forth in its movement over the sheave 24 (Fig. 1). And it also provides increased resistance when the hooks 21 and 26 (Fig. 1) bring about a pulling action against the edges of holes of the strap, with consequent increase in length of life of the strap.

Due both to the larger number of picks that will be engaged by a hook 21, and due to the greater flexibility of the strap, and consequently greater freedom of distortion of the picks within the strap, the hook will pull the picks back from the position schematically illustrated in Fig. 7, as schematically illustrated in Fig. 8, whereby, before the hook can break the first pick, say 53, with which it engages, that pick has been backed up by a second pick 47 and the second pick by the third pick 41, and so on. The picks just mentioned are in the top ply of the strap (Fig. 6), but of course the hook also engages against picks in the rest of the five plies of the strap, and may also engage against one or more of the float picks; and other ply-picks and float picks in and near such other plies also take part in the backing-up action, so that a large number of picks are in backing-up supporting-engagement with the first bank of picks with which the hook engages to thus give a great resistance to rip or tear at the hole.

The modified weave construction illustrated in Fig. 9 is very similar to the weave construction illustrated in Fig. 6, with the exception that the float picks 37 and 44 respectively are located between the plies 30 and 31 and in the first and third banks of picks, and the float picks 49 and 56 respectively are located between plies 33 and 34, and in the second and fourth banks of picks. Although the remaining parts of the construction

shown in Figs. 6 and 9 are identical with one another, the remaining reference numerals applied to Fig. 6, are not repeated in Fig. 9 since it is unnecessary to refer to them in connection with Fig. 9.

The weave construction illustrated in Fig. 10 is formed of four plies 69, 70, 71 and 72. All the picks employed in this construction are ply-picks, there being no float picks. But by having at least two ply-picks in each bank of picks arranged as a pair, a larger number of picks than the number of plies, is obtained in the strap, than if all the ply-picks were arranged as singles. The picks 73, 74, 75, 76, 77, 78, 79 and 80 are arranged in pairs to form one bank of picks. Picks 73 and 75 form one pair of picks in the ply 69, picks 74 and 76 form a pair in the ply 70, picks 77 and 79 form a pair in the ply 71 and picks 78 and 80 form a pair in the ply 72, and the other banks of picks shown in Fig. 10 are similarly arranged in pairs, but reference numerals are not applied to them as not being needed. The ply 69 is formed by the pairs of picks illustrated in this ply woven with a set of ply-warps 81 and two sets of binder-warps 82 and 83. The second ply 70 is formed by the pairs of picks shown in this ply being woven with four sets of binder-warps 82, 83, 84 and 85. The third ply 71 is formed by the pairs of picks shown in this ply being woven with four sets of binder-warps 84, 85, 86 and 87. And the fourth ply 72 is formed of the pairs of picks shown in this ply being woven with two sets of binder-warps 86 and 87, and the set of ply-warps 88. Thus, it will be seen that the form of weave illustrated in Fig. 10, while it only has four plies, has twice as many picks in each bank of picks as there are plies in the fabric, thus giving greatly increased strength against rip or tear, in a strap made in accordance with this weave, by the action of a hook pulling against the wall of a hole in the strap.

In the modified form of the invention illustrated in Fig. 11, the weave construction is the same as that shown in Fig. 10, with the exception that in each of the top and bottom plies, instead of pairs of picks, only a single pick is employed in each bank of picks, similar to the picks 73 and 78 illustrated in the first bank of picks. It will be seen, however, that although the construction shown in Fig. 11 contains only the same number of four plies as the construction illustrated in Fig. 10, that the number of picks in each bank of picks is six, thus giving a larger number of picks in each bank than the number of plies, for increased resistance to tear of a strap made in accordance with this construction, where a hook engages in a hole in it.

The weave construction illustrated in Figs. 5 and 6 has the preferred construction of an odd number of plies with the float picks arranged on either side of and closely adjacent the central ply. But the constructions illustrated in Figs. 9 to 11 inclusive also give improved characteristics to a harness-strap made in accordance with this invention. Other forms of weaves embodying this invention can be employed, and a different number of plies can be employed from those illustrated.

It will be observed that in each of the weave constructions illustrated in Figs. 5, 6 and 9, each ply-pick of each ply is located as a single or individual pick in a shed. And in the construction illustrated in Fig. 10, all the picks are ply-picks, and are arranged in pairs with each pair

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located in a shed. And in the weave construction illustrated in Fig. 11, all the picks are ply-picks, and as concerns the two central plies, the picks in each ply are arranged in pairs with each pair of picks in a shed, while in the first and fourth plies, the picks in each ply are arranged as single or individual picks with one pick in each shed. For convenience of terminology, whether there be one pick or more than one pick in a shed, such picks may be referred to as shed-picks.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

We claim:

1. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies.

2. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies and being looped over shed-picks of each of only certain banks of picks each two nearest together of which are separated from one another by an intermediate bank of picks.

3. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one-face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies, and with each of certain of the picks of substantially all the banks of picks, located between two plies.

4. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than

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two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies, and with each of certain of the picks of certain of the banks of picks located adjacent one side of an interior ply and between said interior ply and an adjacent ply, and with each of certain of the picks of certain others of the banks of picks located adjacent the other side of said interior ply and an adjacent ply.

5. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies and being looped over shed-picks of each of only certain banks of picks each two nearest together of which are separated from one another by an intermediate bank of picks, and with each of certain of the picks of substantially all the banks of picks, located between two plies.

6. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies and being looped over shed-picks of each of only certain banks of picks each two nearest together of which are separated from one another by an intermediate bank of picks, and with each of certain of the picks of certain of the banks of picks located adjacent one side of an interior ply and between said interior ply and an adjacent ply, and with each of certain of the picks of certain others of the banks of picks located adjacent the other side of said interior ply and an adjacent ply.

7. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of

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ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending through two adjacent plies but not through all of the plies, and with a plurality of the picks in each of substantially all the banks of picks, located in each of one or more sheds. 10

8. A woven, loom harness-strap construction having: ply-warp strands and binder-warp strands woven with weft picks to form more than two woven plies woven together; the average number of picks per bank of picks, being greater than the number of plies; a plurality of ply-warp strands being woven in only one ply which is one face-ply, and another plurality of ply-warp strands being woven in only another one ply which is the other face-ply; and substantially all the binder-warp strands being arranged in overlapping layers throughout the thickness of the strap, and the binder-warp strands of each layer of binder-warp strands extending

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through two adjacent plies but not through all of the plies and being looped over shed-picks of each of only certain banks of picks each two nearest together of which are separated from one another by an intermediate bank of picks, and with a plurality of the picks in each of substantially all the banks of picks, located in each of one or more sheds.

GUSTAV WALTERS.
ERNEST F. GATZKE.

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