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WEAVING FRAME HAVING IMPROVED WEFT TRIMMING MEANS

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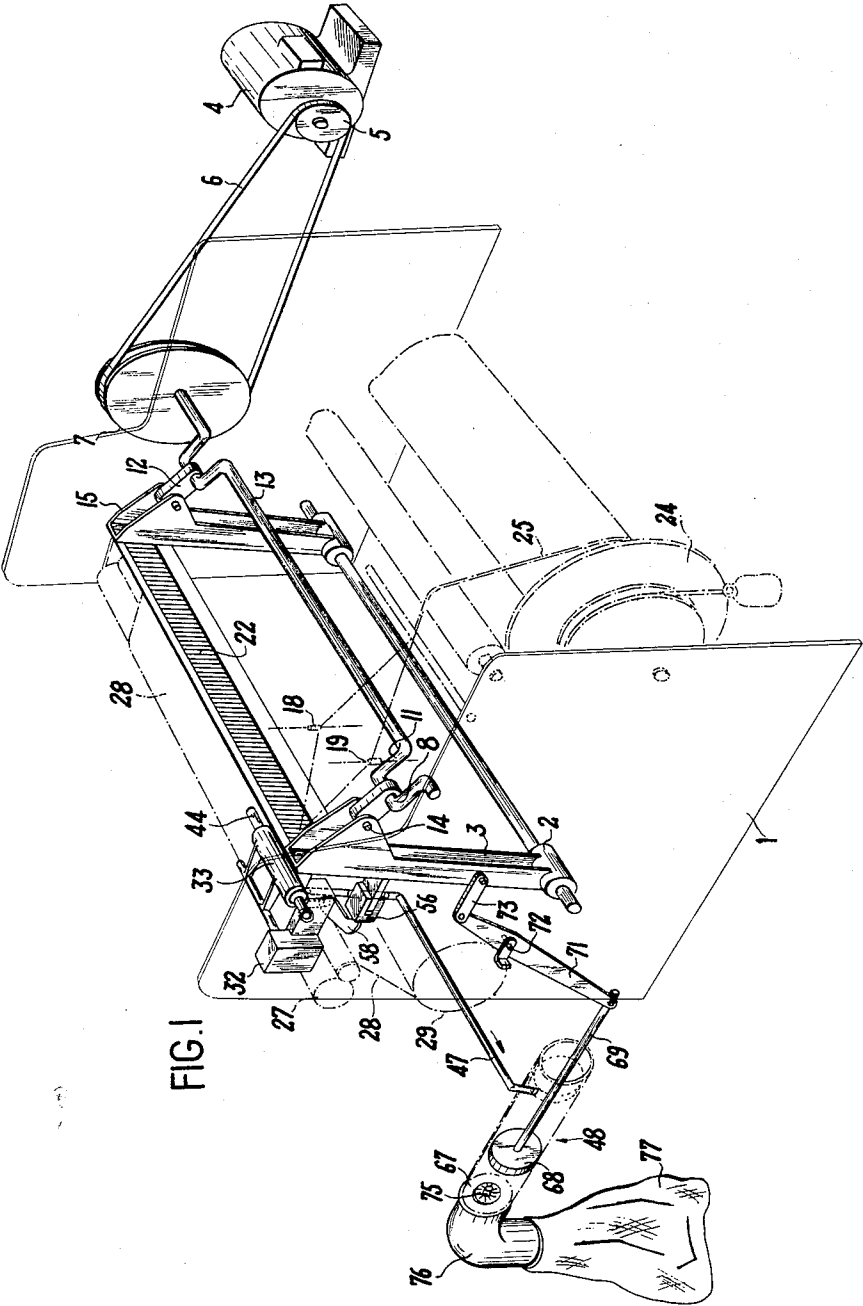


FIG. 1

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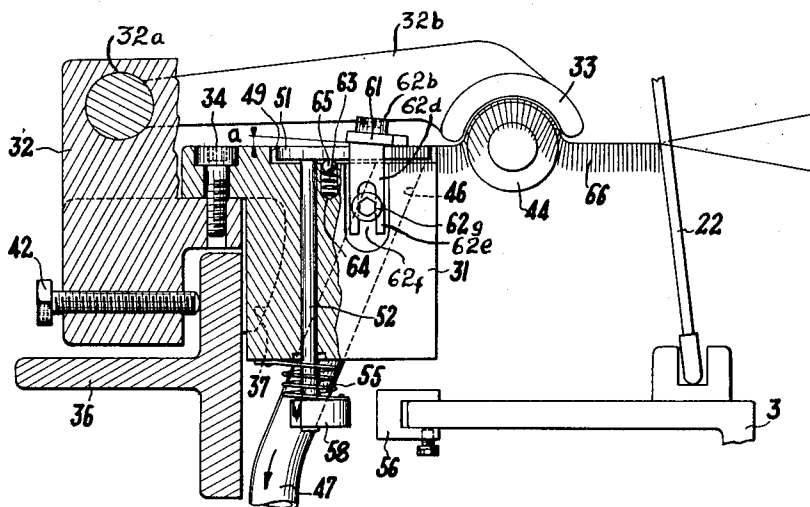
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FIG.2



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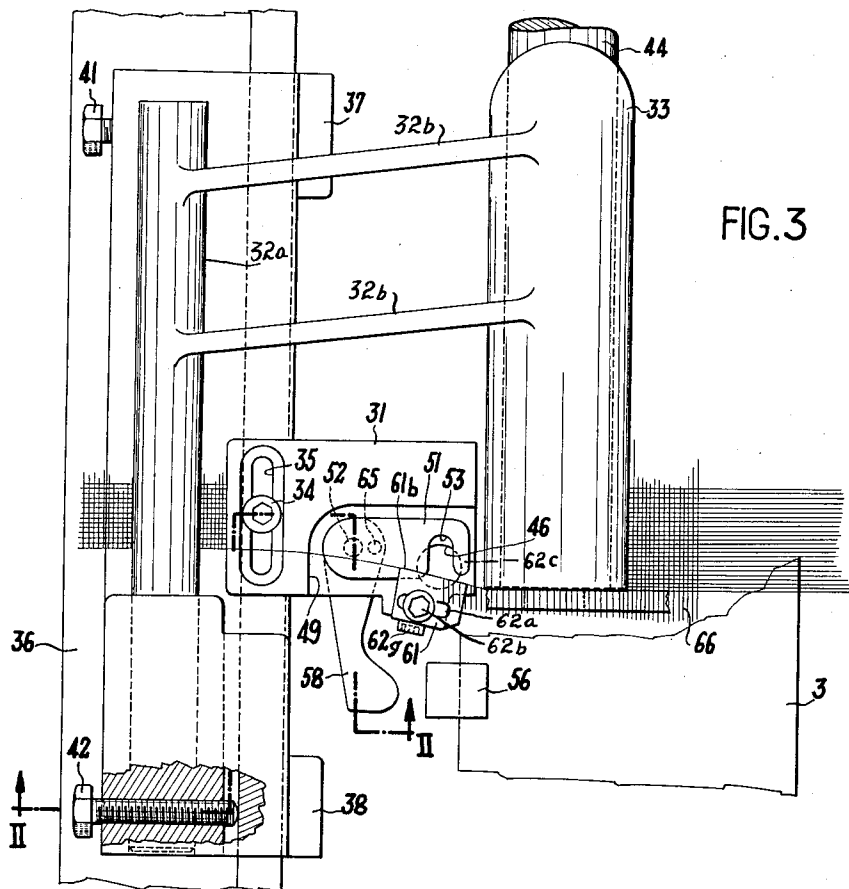
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WEAVING FRAME HAVING IMPROVED WEFT TRIMMING MEANS

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9 Claims. (Cl. 139—266)

This invention relates to textile weaving machinery, and is more particularly concerned with looms of the shuttleless type in which successive picks of weft yarn are shot through the shed formed in the sheet of warp yarn by the combined action of a weft-inserter member or needle which introduces the end of the weft yarn into the shed from one side thereof and brings it approximately as far as the midpoint of the width of said shed, and a weft-withdrawing member which picks up the weft from the inserter member and carries it over the remaining distance and draws it out from the opposite side of the shed.

In looms of this type, the resulting web of woven fabric necessarily has the ends of its weft yarns protruding from one side edge of the web due to the manner of operation just described. These protruding ends must be made quite long in order to avoid displacement of the weft threads during and after the weft shooting process. As a consequence the finished web, as woven, must subsequently be passed through a separate trimming machine in which the excess lengths of weft threads projecting from the side of the web are severed or trimmed. This trimming step entails the need for additional fabric handling steps and trimming machinery. It is a chief object of this invention to eliminate these requirements and to accomplish corresponding savings in time and equipment.

A further inconvenience arising out of the presence of the protruding ends of weft yarn is that they tend to produce a thickening at the ends of the roll of woven fabric as taken up on the web take-up beam at the output end of the loom. To obviate this, means are sometimes provided for imparting a continual small-amplitude axial reciprocation to the take-up beam, but this expedient is only partially effective and represents an undesirable additional complication. An object of the invention is to eliminate all the above and any other detrimental effects of the protruding tips of weft yarn in a simple and complete manner.

A related and basic object of the invention is to effect the trimming of the woven web of fabric, i.e. the severing of the laterally protruding tips of weft yarn, within the loom itself, ahead of the means provided at the output end of the loom for taking up the web of fabric.

In accordance with an essential aspect of this invention, there is provided in a loom, reciprocable trimming cutter means supported in the path of the web of fabric adjacent a side edge thereof from which weft threads protrude and ahead of the web take-up means, so as to be engageable with said protruding weft threads, and means for cyclically reciprocating the trimming cutter means in timed relation with the other cyclically-moving parts of the weaving mechanism to cut off said protruding threads.

In a preferred form of the invention, there is provided

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an aperture in a guide surface over which the web of woven fabric is fed towards the take-up means, which aperture is positioned so that said side edge of the web moves substantially across it as it is fed to the take-up means; a conduit connects the aperture with a source of suction whereby to draw the protruding weft threads into the aperture; and the reciprocable trimming cutter means is supported for movement across the aperture so as to cut off the thread portions projecting into the aperture.

Preferably suction is applied to the conduit only intermittently, as a sharp sudden suction pulse occurs only at the instant in the weaving cycle when the trimming cutter is about to be reciprocated in its cutting stroke across the aperture, so as to increase the effectiveness of the suction effect while reducing the power required to create it.

The weft trimmings cut off at each cutting stroke of the trimming cutter are simultaneously aspirated into the conduit and discharged into a receiver.

The objects, features and advantages of the invention will stand out clearly from the ensuing description of a preferred embodiment of the invention selected for purposes of illustration but not of limitation and illustrated in the accompanying drawings wherein:

FIG. 1 is a showing of the trimming mechanism of the present invention, the loom to which it is applied being illustrated in broken lines;

FIG. 2 is an enlarged fragmentary side elevational view of the cutter portion of FIG. 1, partly broken away and shown in section to illustrate details of construction; and

FIG. 3 is an enlarged plan view corresponding to FIG. 2.

Referring first to FIG. 1, a loom of the shuttle-less type is shown which comprises a main frame or stand 1. A horizontal pivot shaft 2 is journaled in the frame 1 near its forward or output end (the left end as here shown). A batten assembly generally designated 3 projects upwardly from shaft 2 and is cyclically pivoted about the axis of shaft 2 by an electric motor 4 through a drive transmission comprising a pulley 5 secured on the shaft of motor 4. The transmission also includes a belt 6 passed round the pulley 5 and around a larger pulley 7 fast on another horizontal shaft 8 parallel to shaft 2 and journaled in the upper portion of frame 1. Two pairs of crankarms 11 are integrally formed in the shaft 8. An integrally formed crankpin 13 interconnects the outer ends of each pair of crankarms 11 and each crankpin 13 passes through one end of a link member 12. The other end of each link member 12 is pivoted by a pin 14 between rearwardly projecting ears 15 of the upper portion of the batten 3. Supported rearwardly of the upper or active part of the batten 3 is a conventional reed 22. A weft inserting needle (not shown) is supported adjacent to the reed for reciprocation across the warp so as to carry the end of a pick of weft half-way through the shed in conventional manner. Heddles 18 and 19 are mounted for reverse vertical reciprocation behind the batten 3, through conventional harness mechanism not shown. A warp beam 24 is journaled across the rear part of frame 1 and carries a roll of warp yarn wound thereon. The front end part of the loom shown includes a temple bar 44, a breast beam 36 (FIGS. 2 and 3), a web feeding roll 27 and a web take-up roll 29 all mounted across the frame 1 as shown.

The operation of a weaving frame as so far briefly described is entirely conventional and may be outlined as follows.

Warp yarns are fed out from warp beam 24 in a flat sheet of parallel longitudinal yarns 25, and the sheet of warp is guided upward and forward from beam 24 over suitable guide pulleys as shown, then into and through yarn guides carried by the heddles 18 and 19, and thence through the reed 22 to the temple bar 44. When the loom mechanism is in operation, the heddles 18 and 19 are reversely reciprocated in parallel vertical planes, so as to impart to the alternate yarns of the warp sheet 25 passing through the respective heddles 18 and 19 reverse upward and downward movements. The shed is thus formed between the two alternate sets of warp yarns, the apex of the shed being situated at the fell of the fabric before the temple 44. At each cyclic reversal of the shed, the weft inserting needle carries a pick of weft yarn half-way through the shed, and the pick is then immediately transferred to a cooperating weft-withdrawing member or needle (not shown) which carries the pick over the remaining width of the shed and draws it out from the other side of the sheet 25 (the side nearer the viewer in FIG. 1 of the drawing). The active upper part of the batten 3, each time it is moved forward (leftward) in its swinging reciprocation about shaft 2, in synchronism with the other cyclic operations of the loom movement, strikes the newly shot pick of weft home against the fell of the fabric just ahead of temple 44, and simultaneously the reed 22 which is in the nature of a comb, acts to regularize the spacing of the warp yarns. The newly woven fabric thus formed passes through the temple 44 which imparts suitable tension to it, and thence around feeder roll 27 and breast beam 36, and downward therefrom as shown at 28. The fabric is finally taken up as a roll on the take-up beam 29.

The above general description of operation is highly schematic and exemplary only and is entirely conventional. It is given merely as a guide to facilitate the understanding of the invention.

It will be understood from the foregoing that each successive pick of weft shot through the shed by the action of the weft inserting needle and its cooperating weft-picking needle, not shown, necessarily forms a free, loose end beyond the selvage of the sheet of warp 25. These loose ends must be made quite long to hold the weft yarn securely during the weft-shooting process, and produce the undesirable results earlier indicated. In accordance with the invention, means are provided for trimming the weft, i.e. cutting off the excess lengths of weft yarn beyond the side of the woven fabric, at a point positioned beyond the area in which the woven fabric is formed, i.e. beyond temple 44, and ahead of the point where the fabric is taken up, i.e. ahead of take-up beam 29. Specifically, in the embodiment of the invention being described, the trimming mechanism (not shown in FIG. 1) is provided adjacent the breast beam 36. This trimming mechanism will now be described with reference to FIGS. 2 and 3.

As shown in those figures, the breast beam 36 carries a temple cover support 32 secured thereto by means of a horizontally spaced pair of downwardly extending arms 37, 38 of the support 32 which engage the vertical rear surface of breast beam 36 and by clamping screws 41, 42 threaded through support 32. The inner ends of screws 41 and 42 bear against a vertical front surface of the breast beam. A horizontal shaft 32a journaled in the support 32 is connected by arms 32b to a conventional tional cylindrically arcuate temple cover plate 33 the concave under surface of which presses by gravity over the temple 44 previously referred to, so as to tension the newly woven cloth 28 between the mating cylindrical surfaces of temple 44 and temple cover 33, as is conventional.

The horizontal upper surface of temple-cover support 32 has a vertically extending threaded hole 32c formed therein, and supports a block 31, which constitutes a

support for the trimming cutter mechanism of the invention, by means of a clamping screw 34 extending through a horizontally elongated slot 35 in block 31 and threaded into hole 32c. The generally flat horizontal upper surface of block 31 constitutes a guiding surface in the general plane of the web of newly woven fabric 28 issuing from temple 44 to guide said web on its way from the temple 44 to the feed roll 27. Part of the upper surface of block 31 is recessed as at 49, and in the recess is positioned a trimmer blade or cutter 51 having its flat upper surface flush with the general upper surface of block 31. Trimmer member 51 is a flat plate mounted for pivotal movement about a vertical axis, being secured to the upper end of a vertical pivot rod 52 journaled in the block 31. Trimmer blade 51 is formed with a cutout 46 in its outer side near its free end, and the inner end surface 53 of the cutout 46 is sharpened to provide a cutting edge, while the remaining parts of trimmer blade 51 are blunt.

A passage 46 is obliquely bored in a generally downward direction through the block 31. The upper end of the passage opens into the recessed part of the block 31, so as to underlie the path of movement of the cutting edge 53 of the trimmer plate 51 as shown in FIG. 3. The lower end of bore 46 connects with a conduit 47 which leads to a source of suction, generally designated 48 in FIG. 1 and described in greater detail below.

The relative positioning is such that the centre of the cutting edge 53 of cutter plate 51, during rotation of the plate about its pivot 52, passes substantially through the centre of the upper end of circular passage 46.

A backing plate 61 is secured to block 31 so as to have its under surface in a plane very close to that of the upper surface of trimmer blade 51. The backing plate 61 has an elongated slot 62a formed therein near its outer edge. A screw 62b passes through the slot 62a and is threaded into the upper horizontally extending leg 62c of a bracket member 62d. The vertical leg 62e of bracket member 62d has a vertical open-ended slot 62f formed therein. A screw 62g, threaded into the block 31, extends through the slot 62f and secures the bracket member 62d and backing plate 61 adjustably to the block 31. As shown in FIG. 3, the backing plate 61 has its sharpened inner edge 61b substantially aligned with the path of the edge or selvage of the woven web 28 as the web passes from the temple 44 towards the take-up means, which path in turn extends approximately across a diameter (or a major chord) of the hole 46.

The trimmer blade 51 is urged upwardly towards the under surface of backing plate 61 by means of a presser ball 65 seated in a blind hole 64 formed in the block 31 and pressed by a spring 63 in the bottom of the hole. Trimmer blade 51 is urged counterclockwise, as viewed in FIG. 3, i.e. towards its rest position, by a torsion spring 55 surrounding the lower end of pivot rod 52 and having an end anchored to block 31. For cyclically rotating trimmer blade 51 on its cutting stroke, in the clockwise direction, there is provided an arm 58 projecting from the lower end of pivot rod 52 and positioned to be struck by a lug 56 projecting from the batten 3, every time the batten is reciprocated in the forward direction to strike the weft home as earlier explained. It will be apparent that when this occurs, the trimmer blade 51 is rotated clockwise (FIG. 3) so that its cutting edge 53 sweeps across a centre area of hole 46, sliding past the sharp edge 16b of the under surface of backing blade 61 scissors-fashion. As shown in FIG. 2 the resulting shearing action is further improved if the backing plate 61 is set at a slight angle, as indicated at *a*, with respect to the plane of the trimmer blade 51.

The source of suction 48 preferably comprises, as shown in FIG. 1, an air cylinder 67 supported from the lower part of frame 1 and having a piston 68 reciprocating within it. For reciprocating the piston the piston rod 69 is pivoted to one end of a lever 71 pivoted intermediate its ends at 72 to the frame 1 and having its other end con-

ected by way of a link 73 with the batten 3. It will be clear from FIG. 1 that with the arrangement shown, the piston 68 will be reciprocated in synchronism with the reciprocation of the batten, the piston advancing in the cylinder each time the batten recedes, and vice versa.

The lower end of conduit 47 communicates with the interior of cylinder 67 through a port located just forward of the rearmost position of piston 68, which position is shown dotted. The rear end of cylinder 67 is open, while its front end is connected by way of a check valve 75, which opens in the forward or outward direction only, with a discharge conduit 76 which leads to an air permeable collector bag 77.

The trimming mechanism of the invention as thus described operates as follows.

At that point in the weaving cycle where the batten 3 advances to strike home the newly shot weft into the newly woven fabric, piston 68 recedes in cylinder 67 at the end of its stroke uncovers the lower end of conduit 47. Throughout the rearward stroke of the piston, suction is progressively generated in the front portion of cylinder 67, so that as the piston 68 uncovers the port communicating with conduit 47, a sharp sudden pulse of negative pressure is applied through conduit 47 to hole 46. The marginal portion of the newly woven fabric 28 overlying this hole is sucked into the upper part of the hole in the form of a concave pocket, with the loose ends 66 of the weft threads extending into the hole. At about the same time or just after the suction effect is created, the lug 56 of the advancing batten acts on arm 58 to rotate the trimmer blade 51 away from the rest position shown in FIG. 3. The cutting edge 53 of the blade 51 sweeps across the hole 46 lifting the selvage part of the web 28 which was sucked into the hole 46 back into the general plane of the web, but does not lift the loose protruding weft yarn ends 66, which are concurrently sheared by the action of cutting edge 53 against the cooperating sharp edge 61b of backing plate 61 substantially along the selvage of the cloth.

Moreover, it will be noted that since the shearing action proper is preceded in the process above described, by a stage in which the cutting plate 51 acts to lift the web into the general horizontal plane of the fabric, the shearing process is highly reliable and has the positive result of trimming the web accurately along the selvage line without any risk of scotching the web of fabric.

The severed ends of weft or trimmings are sucked in through hole 46 and conduit 47 by the draft of air drawn into the hole 46 and are thus passed to the cylinder chamber in front of piston 68. When the piston next advances in the cylinder, the air and trimmings are expelled through the check valve 75 and conduit 76 into the collector bag 77.

The particular embodiment of the improved trimming means as herein shown and described has a number of advantages in addition to the broad advantages provided by the invention as earlier indicated. Thus the entire device, including the suction generating means or air pump, is operated from the loom movement and involves only a very small additional consumption of energy. The sharp sudden pulse of negative pressure produced in hole 46 by the suction system described, ensures with high reliability the precise positioning of the loose tips of weft in the hole in optimum position for undergoing shear, while at the same time the selvage of the fabric is positively held in position during the shearing action.

The trimming apparatus can easily be fitted as an attachment to an existing loom, though it is also envisaged that the apparatus may be incorporated in the loom as originally manufactured. The supporting arrangement described assures that the trimming mechanism will be precisely positioned in accordance with the width of fabric being woven, since the mechanism is supported from the temple cover plate support which in turn must necessarily be adjusted in position in accordance with the particular width of fabric. In addition, fine positional adjustment of

the trimming mechanism is made possible by the slot mounting provided for the block 31. Thus, such adjustment will simply require loosening the screw 34, sliding the block 31 along slot 35 with respect to support 32 in one or the other sense until the sharp edge 61b of the backing plate 61 is aligned along the normal path of travel of the web selvage, and tightening the screw 34 in this adjusted position.

It should however be understood that various modifications may be made in the single embodiment illustrated and described without departing from the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. In a loom, in combination with means for feeding a sheet of warp, means for cyclically forming a shed in the warp and alternately reversing said shed, means for shooting picks of weft across the warp through the shed at successive reversals thereof whereby a web of fabric is woven having weft ends protruding from a side edge thereof, batten means cyclically operated to strike home the picks of weft into the fell of said fabric, means for feeding said web over a surface and means for taking up said web; the provision of reciprocable trimming cutter means supported at said surface in the path of said side edge of the web of fabric for engagement with the protruding ends of weft, a shaft pivotally mounted for rotation about a vertical axis and carrying said cutter means on an upper end portion thereof, an arm connected to and projecting from a lower end portion of said shaft, means on said batten means positioned to strike said arm as the batten is advanced to strike the weft home into the fell of the fabric thereby to drive said cutter means through its cutting stroke, a backing plate supported on the other side of the web from said cutter means and extending substantially along the path of said side edge of said fabric to cooperate with said cutter means in shearing said protruding ends of weft, and retractile means biasing said cutter means.

2. The combination claimed in claim 1, wherein the trimming cutter means has a cutout recessed in a side thereof and a cutting edge formed in an end wall of the cutout and positioned to sweep across while cooperating with a cutting edge portion of said backing plate during the cutting reciprocation of the cutter means.

3. The combination claimed in claim 1, wherein said surface is the upper surface of a support removably attachable to the loom frame.

4. The combination claimed in claim 1, wherein the loom includes a temple bar interposed in the path of the web of fabric towards said take-up means, and a temple cover plate overlying the temple bar, and in which said surface is the upper surface of a support removably attached to the temple cover plate.

5. The combination claimed in claim 4, further comprising detachable mounting means for the support on the temple cover plate including means for adjustably positioning said support on said cover plate transversely of the loom frame.

6. The combination claimed in claim 1, further comprising means defining an aperture positioned so that said side edge of the web moves substantially across it within the path of said cutter means, a source of suction, and conduit means connecting the aperture with the suction source whereby to draw said protruding weft ends into the aperture.

7. The combination claimed in claim 6, wherein said suction source comprises a cylinder and a piston reciprocable therein, and means connected for operation by the batten means to reciprocate the piston in a timed relationship such as to apply a suction pulse to the aperture just prior to each cutting reciprocation of the cutter across the aperture.

8. The combination claimed in claim 7, further comprising a receiver connected to a discharge end of said cylinder whereby to receive weft trimmings aspirated into

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said aperture and through said conduit and cylinder by said suction pulse.

9. The combination claimed in claim 6, including means supporting the trimming cutter means for angular reciprocation about an axis normal to said surface.

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