United States Patent [19]

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[11] **3,724,513**

[45] **Apr. 3, 1973**

[54] **LOOM HAVING A COMMON FRAME FOR THE WARP AND CLOTH BEAMS**

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[22] Filed: **Oct. 29, 1968**

[21] Appl. No.: **771,472**

[30] **Foreign Application Priority Data**

July 19, 1968 Switzerland 10903/68

[52] **U.S. Cl.** **139/1,** 139/97, 139/304

[51] **Int. Cl.** **D03d 49/02,** D03d 49/04

[58] **Field of Search** ..... 139/97, 1, 304, 307, 308; 28/32, 41, 42; 66/86 A; 242/55, 67.3

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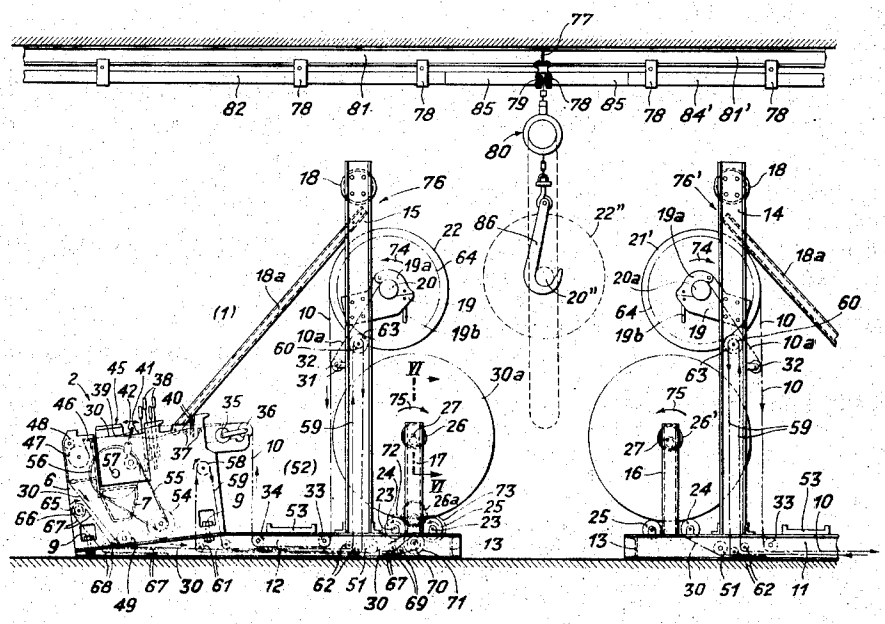
[57] **ABSTRACT**

The warp beam and cloth beam are both mounted at the rear of the loom with the warp beam over the cloth beam. The warp yarn is then led downwardly and across to the loom while the cloth is led downwardly and under the loom for take-up on the cloth beam.

21 Claims, 12 Drawing Figures



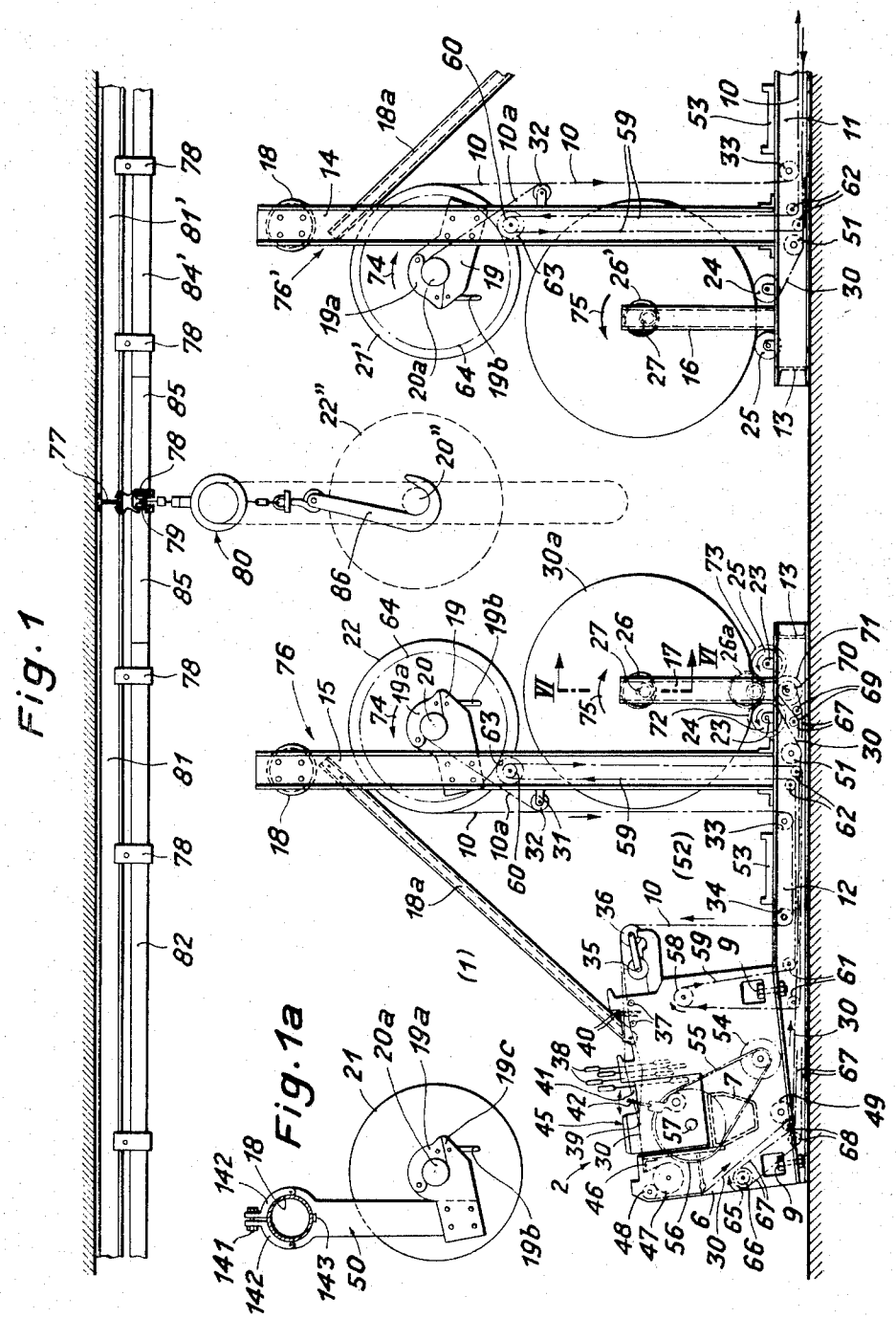


Fig. 1

Fig. 1a

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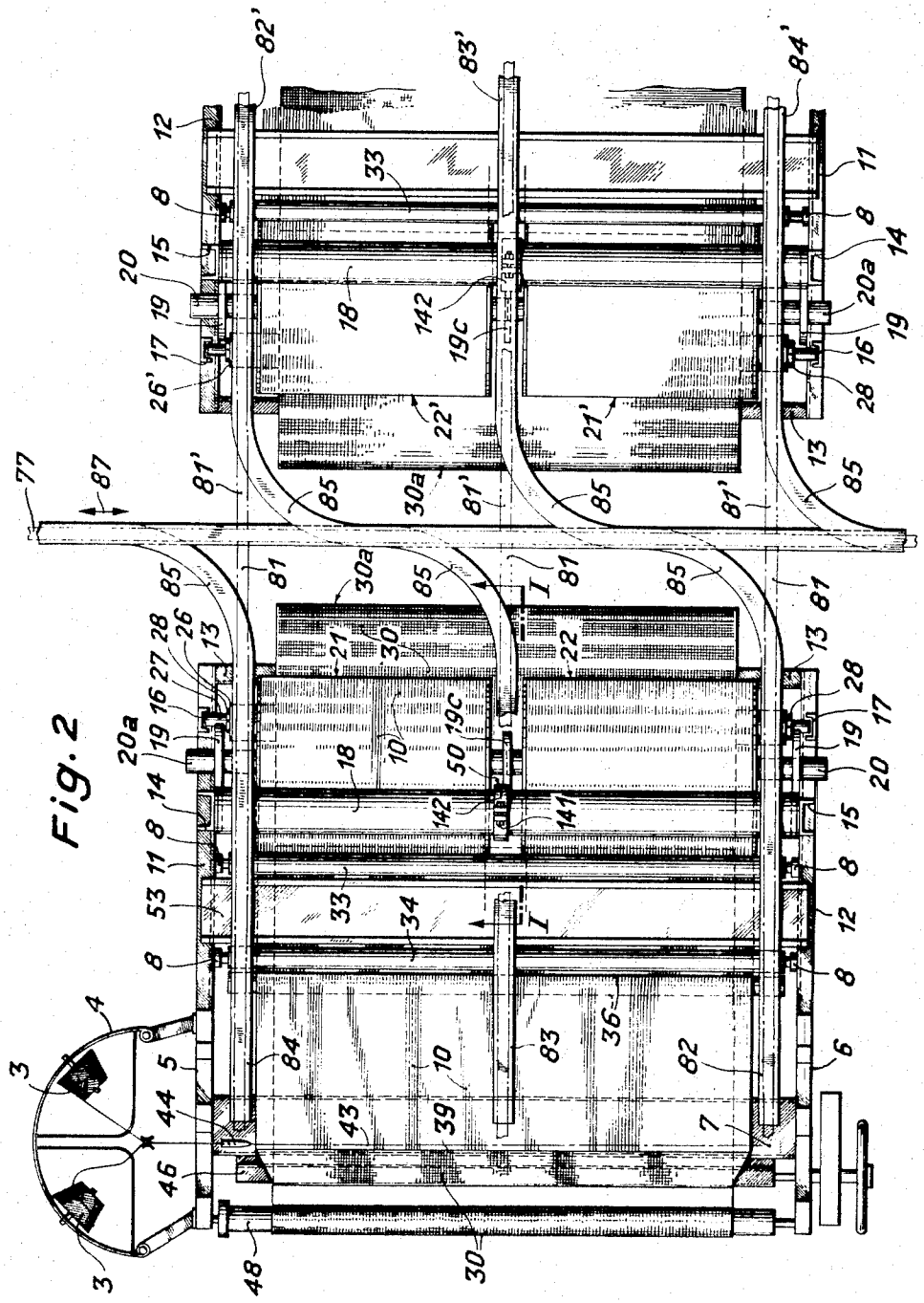

Fig. 2

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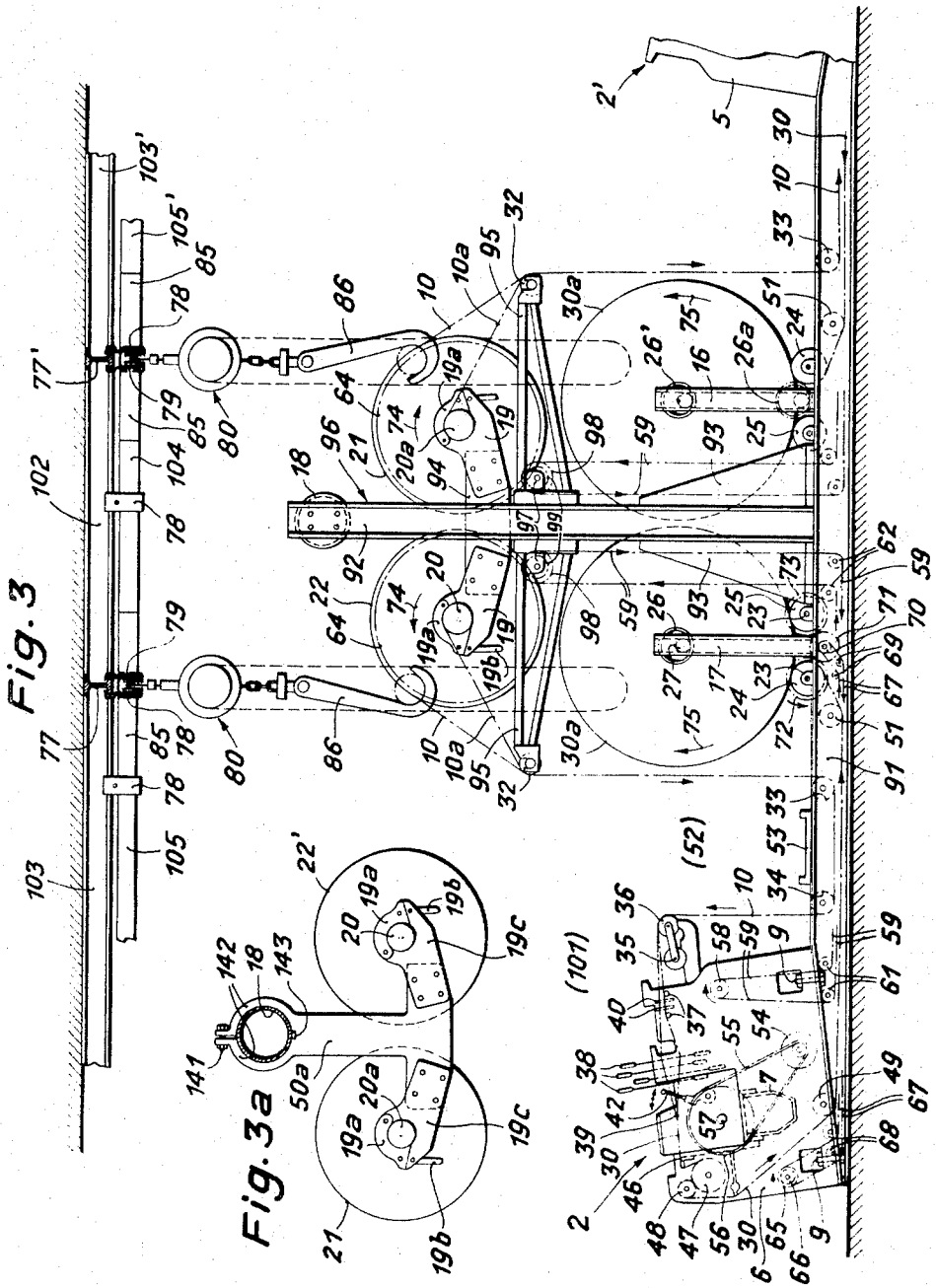

Fig. 3

Fig. 3a

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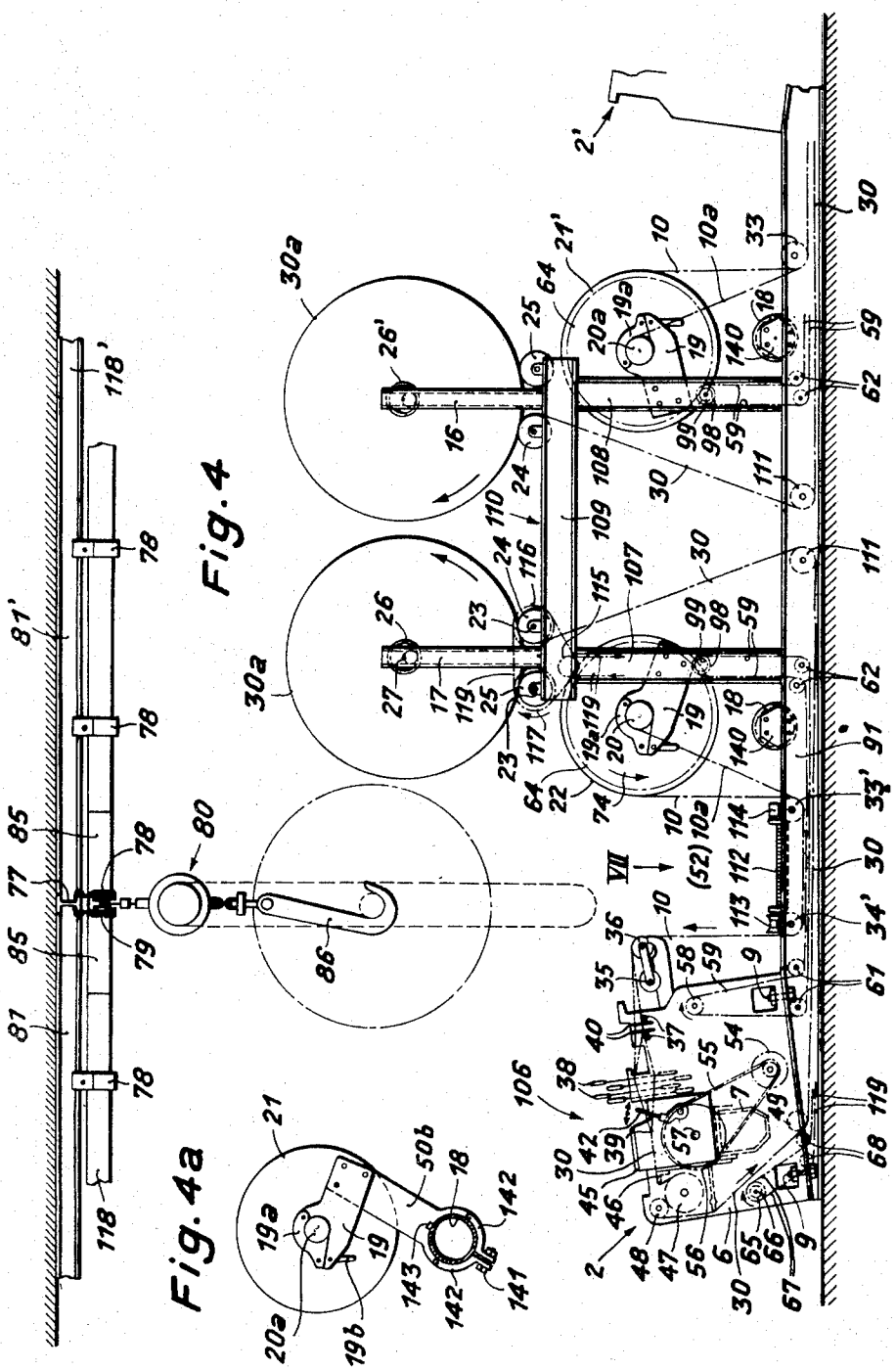

Fig. 4

Fig. 4a

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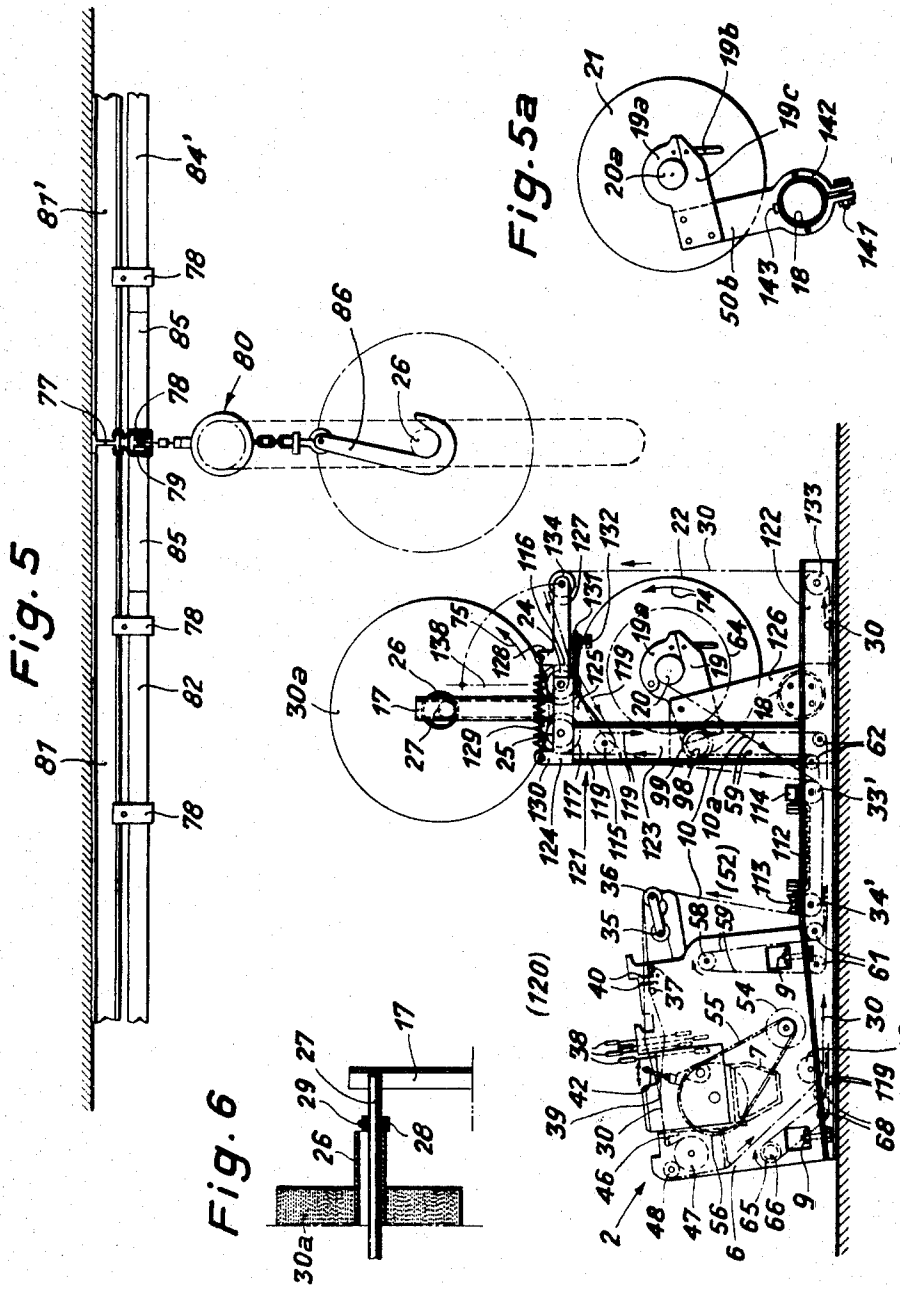

Fig. 5

Fig. 5a

Fig. 6

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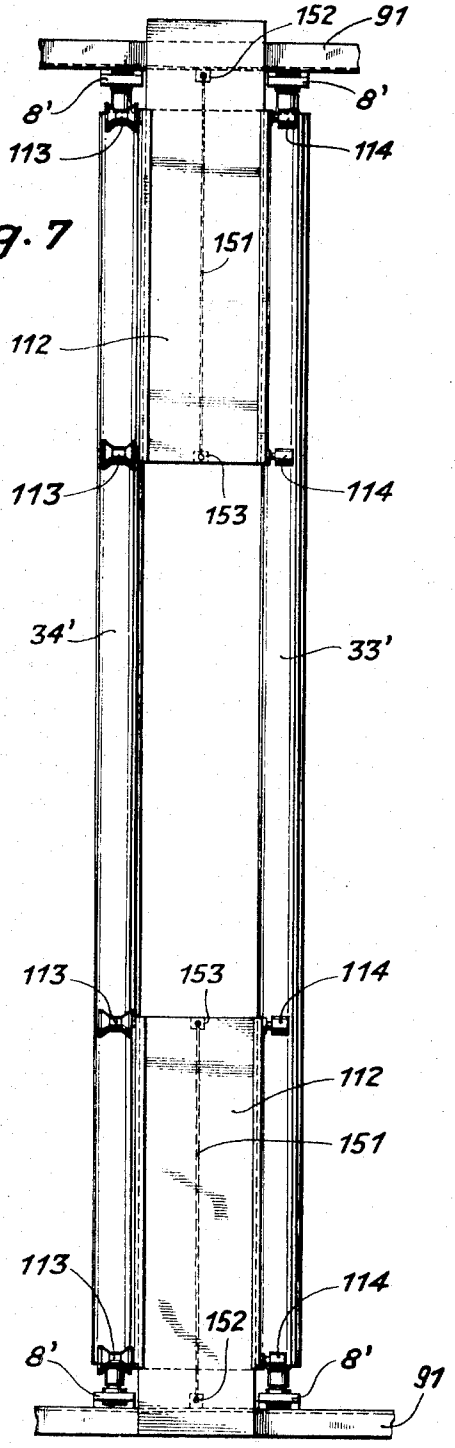

Fig. 7

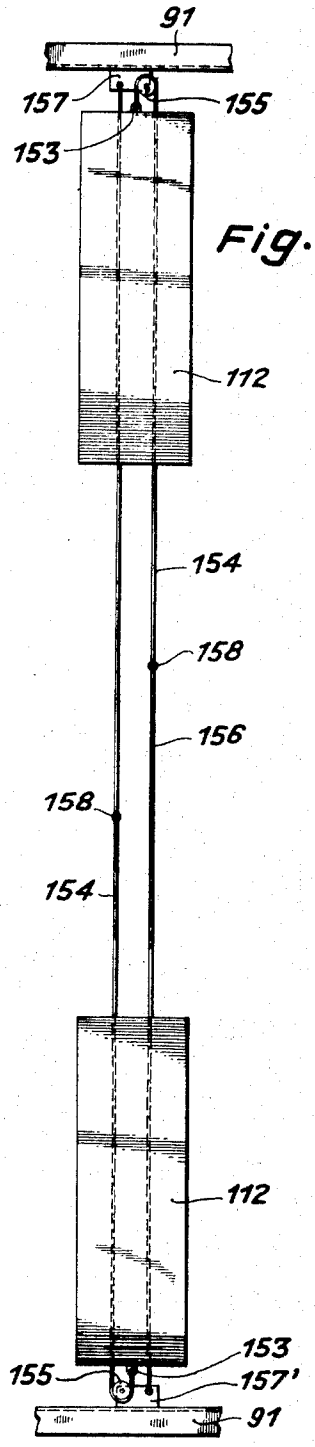

Fig. 8

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LOOM HAVING A COMMON FRAME FOR THE WARP AND CLOTH BEAMS

This invention relates to a loom. More particularly, this invention relates to a loom having a warp beam and a cloth beam.

Heretofore, looms have been known to carry warp and cloth beams at the respective ends of the machine frame of the loom, for example, laterally of the machine frame. Consequently, the beam diameters have been confined to relatively narrow limits, for instance, the warp beams have in many instances been limited to a maximum diameter of 600 millimeters. In order to permit the use of larger warp beams, looms have sometimes been mounted on inclined planes so as to raise the warp beam end. This, however, has permitted the use of warp beams of a diameter only up to about 800 millimeters.

Since the warp yarns usually require ready access at least along the length between the warp beam and the edge of the cloth, i.e., at the reed, it has not been possible to have the loom exceed a certain structural elevation. Thus, in order to place a warp beam of a diameter greater than 800 millimeters into the frame, the loom would require lifting to such an extent as to impede the operators in the handling of the warp yarns, for example, during repair of any warp yarn breaks or during work on the shafts or other surrounding mechanism in the loom. Further, as a rule, it has also not been appropriate to raise the loom machine frame at the cloth side since access has been required from this side, for instance, for the repair of weft yarn breaks and in view of the fact that the various shafts should be readily accessible over the entire width of the machine.

It has hitherto been customary to wind material on a cloth beam up to a diameter of approximately 500 mm in each case, whereupon the cloth is cut off, the full cloth beam is removed, and another, empty cloth beam is inserted. This process must be repeated several times until the entire warp has been woven off. Depending on the operating conditions or the type of the fabric to be manufactured, for instance in cotton mills for staple goods, in the processing of continuous filaments as well as in the manufacture of ground weaves of the carpet or tire industry, it has however been desired to have available for further processing, e.g. for printing or dyeing of the cloth or for the application of the carpet pile, on account of economy considerations, a maximum possible one-piece length of the cloth.

A further requirement with regard to efficient weaving mill operation has been the reduction of the downtime of the machine resulting from the replacing of the warp beams, or from the preparation of the warp, respectively. The objective in these cases has, therefore, been to obtain cloth beams as well as warp beams with maximum possible lap diameters. However, warp and cloth beams of this size cannot be mounted on the heretofore known looms because such would impede the ease of operation of the looms.

It has also been known to arrange the warp beam above the healds or heddles of a loom on a supporting frame borne by the machine frame. In this arrangement, it has indeed been possible to use a large warp beam, however, a cloth beam of corresponding size cannot be used. Furthermore, the nap and the size which become detached from the warp upon unwinding may sometimes fall on the warp threads situated beneath the warp beam and enter the shed thereby creating faults in the weaving. In addition, access to the warp thread stop-motion mechanism and the heddles from the rear side (warp beam side) of the machine has been blocked by the warp threads fed in from above. Furthermore, this arrangement has been attended by the risk that the vibrations of the loom machine frame can be transmitted to the relatively heavy warp beam supporting frame borne on the machine frame.

Accordingly, it is an object of the invention to equip a loom with relatively large warp beams.

It is another object of the invention to provide a loom with relatively large warp and cloth beams without elevating the loom machine frame.

It is another object of the invention to select a warp-beam diameter independently of the elevation of the loom machine frame.

It is another object of the invention to permit ready access to the warp yarns in a loom.

It is another object of the invention to provide a loom with enlarged diameter warp and cloth beams within a limited floor space.

It is another object of the invention to reduce the downtime required to change the warp beams of a loom.

Briefly, the invention provides a loom wherein a warp beam and a cloth beam are mounted in substantially superpositioned bearings on a support frame outside the machine frame of the loom. Preferably, this support frame is formed as a structural unit.

The installation and removal of the warp and cloth beams in this arrangement is extremely simple as compared to previously used techniques. Further, the warp and cloth beams can be of a diameter of 1,200 millimeters or more thus making possible long running times of the loom with long piece lengths of the finished cloth. Still further, replacement of the respective beams and any required machine overhaul, such as cleaning, lubricating, and the like, can occur simultaneously.

In order to permit access to the loom from all sides, the warp yarns are guided from the warp beam first downwardly and around a guide situated close to the mill floor, thence along the floor to another guide, and next upwardly to a guide situated at the warp side of the machine frame. Similarly, the cloth is guided over a guide situated on the cloth side of the machine frame downwardly and over a guide situated close to the mill floor, thence along the mill floor to another guide, and next upwardly to a guide positioned adjacent the cloth beam. The warp and cloth beams are also spaced from the loom a sufficient distance as to provide an access space between the loom and beams for the loom operators.

In order to permit the warp yarns to be controlled over their lengths, the support frame is preferably arranged on the warp side of the loom with the access space between the loom and beams being defined by the U-shaped path of the warp yarns let-off from the warp beam. In this manner, all the warp yarns are accessible so as to permit the performance of any work by the operator required during loom operation, such as, the checking of the stop-motion mechanism or the repair of warp yarn breaks.

In order to minimize the load of the loom construction, a supporting link is used between the machine

frame and the beam support structure so that at least a part of the forces generated by weaving on the beam support can be transmitted to the machine frame for balancing with the forces that are generated at that point.

The support structure of the beams further includes girders which carry the machine frame thereon. As a result, the weight of the machine frame is capable of substantially counteracting a moment exerted on the support structure. In addition, the position of the beams or of the guides for the warp and the cloth as well as the position of drive means for the beams can be precisely maintained with respect to the machine frame. Also, a brace can be connected between the support structure and machine frame to improve the stability of the support structure.

For the purpose of optimum utilization of the available weaving mill floorspace, as a further improvement, the support structure of the invention contains bearing and related supporting devices for supporting the warp and cloth beams of an adjacent loom. As a result, the spacing between the machines can be kept at a minimum despite the use of large size beams.

In one embodiment, a platform is movably mounted in the access space between the machine frame and the support structure. This allows access to the space between the beams and machine frame while avoiding damage to the sections of warp yarn and cloth running along the mill floor beneath this space. In one instance, the platform is supported by pivotal guide rollers on two guides disposed on the support frame across the access space. Preferably, the platform is provided with four guide rollers with at least two of the guide rollers having a rolling surface shaped correspondingly to the profile of the respective guide. The length of the platform is also smaller than half the width of the woven material so that, by a corresponding displacement of the platform, the warp and the cloth are accessible across their entire width.

These and other objects and advantages of the invention will become more apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a vertical sectional view through a weaving mill incorporating a loom of the invention;

FIG. 1*a* illustrates a view taken on line I—I of FIG. 2;

FIG. 2 illustrates a top view of the loom of FIG. 1;

FIG. 3 illustrates a view similar to FIG. 1 of a common beam support structure for a pair of adjacent loom machine frames according to the invention;

FIG. 4 illustrates a view similar to FIG. 1 of a pair of adjacent looms connected together according to a modification of the invention;

FIG. 5 illustrates a view similar to FIG. 1 of a modified loom according to the invention;

FIGS. 3*a*, 4*a* and 5*a*, respectively illustrate views similar to FIG. 1a of respective bearing supports for the warp beams according to the invention;

FIG. 6 illustrates a view taken on line VI—VI of FIG. 1;

FIG. 7 illustrates a top view of a platform taken in the direction of arrow VII of FIG. 4; and

FIG. 8 illustrates a view similar to FIG. 7 of a modified platform assembly according to the invention.

Referring to FIG. 1, the weaving mill includes a weaving shed 1 in which a large number of looms 2 are installed; however, for purposes of clarity only one loom 2 is illustrated and only those parts necessary to describe the mode of operation of the loom 2 are shown. The loom 2 is, for example, a gripper shuttle loom with weft winder reserve cheeses 3 (FIG. 2) mounted on a bobbin frame 4 secured to the machine frame.

Referring to FIGS. 1 and 2, the loom machine frame comprises two side supports 5,6 which are jointed by a cross-beam 7 (FIG. 2). The side walls 5,6 are spaced apart a distance somewhat greater than the maximum weaving width in order to accommodate the various drive means of the loom 2. In addition, the side supports 5,6 are attached by means of bolts 8 to two channel shaped girders 11,12 which are disposed horizontally along the floor of the mill and which are of a length greater than that of the side supports 5,6. The girders 11,12 are disposed on the warp side of the loom 2 and are connected at their free ends by means of a horizontal girder 13 to a frame situated on the floor of the weaving shed 1. The girders 11,12 are arranged with their legs facing inwardly, i.e., towards one another, and, in the area of the machine frame, have a shape which tapers downwardly toward the cloth end of the loom 2. In addition, the upper flanges of the girders 11,12 in the tapered region each forms a bearing surface for the side supports 5,6 which is sloped with respect to the horizontal in such a way that the loom 2 is inclined (FIG. 1) in a direction from the warp side to the cloth side.

In addition, two vertical channel shaped girders 14,15 are mounted on the horizontal girders 11, 12 equidistant from the machine frame, with their legs facing inwardly and at a greater distance from the machine frame, two additional vertical channel shaped girders 16,17 are mounted near the ends of the horizontal girders 11, 12 with their legs facing outwardly. The girders 14,15 are each connected by a brace 18*a* with the machine frame and are interconnected at their upper ends by means of a cross beam 18 fashioned from a pipe. The girders 11–15 and cross beam 18 form a support structure 76 for a warp beam consisting of two partial warp beams 21,22 and a cloth beam 26 (FIG. 1).

In addition to the support structure 76 an additional support structure 76′ of identical design is disposed in spaced relation thereto for corresponding beams 21′, 22′, 26′ of an adjacent loom (not shown), the warp side of which faces the warp side of the loom 2. The partial warp beams 21,22 on which the warp yarns 10 are wound are borne by shafts 20*a*, 20 respectively. The two shafts 20*a*, 20 are pivotally positioned in two external bearings 19 affixed to the girders 14,15 and in a central common intermediate bearing 19*c*. The intermediate bearing 19*c* is secured to a supporting means 50 (FIGS. 1*a*, 2) adjustably attached to the cross beam 18 in depending manner. The supporting means 50 comprises two yokes 142 which are clamped to the cross beam 18 by means of a screw connection 141. In order to secure the supporting means 50 against rotation around the cross-beam 18, a key 143 is formed on the cross beam 18 and positioned in slots in the supporting means (FIG. 1*a*). If partial warp beams of dif-

ferent lengths are used, the supporting means **50** and the bearing **19***c* can be displaced axially with respect to the cross beam **18** and be fastened at any desired distance from the vertical girders **14,15**.

A yoke **19***a* is articulated to each bearing **19**, **19***c* over the shafts **20**, **20***a* with the free end attached to the respective bearings **19**, **19***c* by means of a hook-type closure **19***b* in order to lock the shafts **20**, **20***a* in place. Additionally, bearings **31** are affixed beneath the shaft bearings **19** on the girder flanges facing the loom **2** to support a guide or deviating roller **32** in a pivotal manner.

Referring to FIG. **2**, a pair of bearings **23** are fixed on the upper flanges of the horizontal girders **11**, **12** symmetrically with respect to the vertical girders **16,17** to pivotally support two guide rolls **24,25**. These guide rolls **24,25** are provided, respectively, in gritty beam fashion, with a roughened surface in the weaving width area.

The two girders **16,17** serve to support the cloth beam **26** that takes up the finished cloth **30** and which is constituted by a tube open on either side. A guide tube **27** of smaller diameter than the cloth beam **26** is movably mounted in the ends of the cloth beam **26** to project between the flanges of the two vertical girders **16,17** so as to guide the cloth beam **26** vertically therealong.

Referring to FIG. **6**, the length of the guide tube **27** is dimensioned in such a way that there is a minimum possible clearance between its ends and the flanges of the girders **16,17**. In order to secure the cloth beam **26** against axial displacement, the two ends of the beam **26** are guided between two locking rings **28** which are displaceably arranged and fastened by means of a respective screw **29** on the guide tube **27**. The guide rollers **24,25** are spaced at such a distance from one another that the cloth beam **26** bears against them in its lowermost position **26***a*, i.e., at the beginning of the winding process to be described below.

During operation, the warp yarns **10** (or **10***a* in the case of the woven off warp beam) are guided from the warp beams **21,22** via the guide roller **32** and two guide rollers **33,34** pivotally positioned in bearings **8** (FIG. **2**) on the webs of the girders **11,12** to a tensioning beam **36** pivoted around a fulcrum **35** and from there via guide rolls **37** and subsequently through a number of heddles **38** up to the reed abutment **39** where the cloth begins. A stop-motion mechanism **40** is disposed between the guide rollers **37** in order to produce a signal for the disconnecting of the loom drive in the case of a break of a warp yarn.

In order to place the warp yarns **10** on the loom **2**, the guide rollers **33,34** are removed from the bearings **8** which are suitably designed for such, an adequate length of warp yarn is wound off from the warp beams **21,22** and the heddles **38** with the warp yarns inserted therein are installed in the loom **2**. Thereupon, the warp yarns **10** are guided toward the floor between the guide roller **32** and the tensioning beam **36**. Subsequently, the deviating rollers **33,34** are reinserted into their bearings **8** over the parts of the warp yarns **10** running along the floor.

The heddles **38**, as is known, serve to form a shed **41** into which a weft yarn **43** drawn from a cross-wound bobbin **3** (FIG. **2**) is fed between the cloth edge **39** and a reciprocating reed **42** supported in the loom by means of a gripper shuttle **44** and by a weft mechanism (not shown) arranged at the side frame **5**. The gripper shuttle **44** is braked by means of a gripping mechanism **45** arranged at the side frame **6** whereupon it releases the inserted weft yarn **43**. The weft yarn **43** then is cut off at the weft side of the loom and subsequently struck by the reed **42** in the end of the shed **41**, i.e., against the cloth edge **39** thereby forming the cloth **30**. Thereupon, the shed is alternated by the heddles **38** and another weft yarn fed into the newly formed shed.

The finished cloth **30** is guided at the cloth side of the machine over a breast beam **46** as well as a cloth delivery roller (gritty beam) **47** provided with a roughened surface and subsequently over a guide roller **48** downwardly to another guide roller **49** borne by the girders **11,12** in the loom frame zone and from there along the floor to another guide roller **51** borne by the girders **11,12** and, by partial looping of the guide roller **24**, upwardly to the cloth beam **26** arranged at the warp side of the loom **2**.

The warp yarns **10** run substantially vertically between the guide roller **32** and the deflecting roller **33** as well as between the deflecting roller **34** and the tensioning beam **36** and substantially horizontally between the deflecting rollers **33,34**. Between the guide rollers **49,51**, the cloth **30** is likewise guided in a substantially horizontal path running between the horizontal section of the warp yarns **10** and the floor of the weaving shed **1**. The distance between the loom **2** and the girders **14,15** is selected in such a way that a space **52** accessible to the operating staff, which is laterally defined by the vertically running parts of the warp yarns **10**, is created from which the different parts of the loom, e.g. the stop-motion mechanism **40** and the heddles **38**, are accessible over the entire width of the machine. The spacing of the guide rollers **24,25** from the girders **14,15** is controlled by the maximum lap diameter of the cloth beam **26**, in such a way that a pre-determined minimum spacing exists between its outermost lap layer and the vertical section of the warp yarns **10** running to the deflecting roller **33**.

In order to prevent damage to the sections of the warp yarns **10** or of the cloth **30** running above the floor upon entry into the space, a movable platform **53** is arranged on the girders **11,12**. The width of the platform **53** is less than the spacing between the guide rollers **33,34** by an amount sufficient to form a gap between one of the platform edges and the adjacent vertical section of the warp yarn **10** and the adjacent guide roller **33,34** so as to permit repair of yarn breaks likely to occur in the horizontally running sections of the warp yarns.

Referring to FIG. **1**, the loom **2** is actuated by an electric motor **54** via a belt drive **55** and a flywheel **56** fitted onto a main shaft **57** which transmits movement to all the mechanical elements belonging to the loom, e.g., the heddles **38** and the reed **42**, as well as the warp beams **21,22** and the cloth beam **26**.

The warp beams **21,22** are actuated by two sprocket wheels **58** respectively arranged at the inner sides of the lateral frame side supports **5,6** and which are connected ear-wise with one another by means of a differential gear (not shown) and with the main shaft **57** (see FIG. **1**, in which the drives of the warp beam **22** of

the loom 2 as well as the warp beam 21' of the adjacent loom are shown). An endless drive chain 59 passes from each of the two sprocket wheels 58 over two pairs of deflecting rollers 61,62 mounted in the webs of the girders 11,12 to a chain wheel 60 mounted in the girders 15,14, via a pinion 63. The pair of deflecting rollers 61 is disposed beneath the loom 2 and the pair of deflecting rollers 62 is disposed under the girders 15,14, respectively, in such a way that the two stringers of the drive chain 59 are conducted along a substantially U-shaped path.

The cloth beam 26 is actuated by a sprocket wheel 65, arranged at the lateral frame side support 6 on the cloth side of the loom 2, which is driven from the main shaft 57 via a slip clutch 66. An endless chain 67 runs from the chain wheel 65 over two pairs of deflecting rollers 68,69, mounted in the vertical leg of the girder 12, under the loom 2 and to a chain wheel 70 situated at the vertical leg of the girder 12 on an axis running between the cloth beam guide rollers 24,25. The chain wheel 70 is connected to a pinion 71 engaging two gears 72,73 of identical size which are respectively connected with the guide rollers 24 and 25. The driving forces of the guide rollers 24,25 are transmitted by friction to the cloth beam 26 (in the position 26*a*) and to the cloth lap 30*a*. The cloth beam 26' is driven in identical manner, however, the corresponding driving chain runs along the girder 12 (FIG. 2) not visible in FIG. 1.

During the weaving operation, the warp beams 21,22 are caused to rotate in steps in the direction indicated by the arrow 74 (FIG. 1) thereby feeding a warp length corresponding to that of the delivered cloth. The tensioning beam 36 generates the required tension in the warp yarns. The drive of the warp beams 21,22 is also controlled according to the respective position of the tensioning beam 36 in per se known manner. For instance, if a warp length is drawn off that is too small by comparison with the cloth delivered, the tensioning beam 36 that holds the tension of the warp 10 constant is moved slightly downward around the fulcrum 35 (FIG. 1). As a result, by means of a control mechanism (not shown) a slip clutch, constituting a part of the warp beam drive is influenced in such a way that the sprocket wheels 58 are actuated for a longer period thereby letting off a correspondingly greater warp length from the warp beams 21,22. If, conversely, a warp length is drawn off that is too great by comparison with the delivery of the cloth, the tensioning beam 36 moves upward and, as a result, the sprocket wheels 58 are actuated for a shorter interval so that a correspondingly shorter warp length is let off. By means of the differential gearing connecting the two sprocket wheels 58, tensioning differences between the sets of warp threads running off from the two beams 21,22 are eliminated.

The finished cloth 30 fed from the cloth side of the loom 2 beneath the machine is taken up on the cloth beam 26 which rotates in steps in the direction indicated by the arrow 75 under the influence of the guide rollers 24,25. Upon starting of the weaving operation, the cloth beam 26 is in the lowermost position 26a in contact, for instance, with the guide roller 25 while a layer of cloth is situated between the cloth beam and the guide roller 24. With the advance of the take-up process, this first fabric layer attains the position between the cloth beam 26 and the guide roller 25 and subsequently a position under the second cloth layer introduced in the meantime so that the cloth beam 26 becomes raised permitting the friction forces of the guide rollers 24,25 to act on the resulting fabric lap 30*a*. With increasing lap diameter, the cloth beam 26 (as well as the movably inserted guide tube 27) is raised until reaching the position illustrated in FIG. 1. The guide tube 27 (FIG. 6) arranged between the girders 16,17 guarantees that the cloth beam 26 will at all times assume a center position above the guide rollers 24,25, in which the lap bears on both guide rollers 24,25.

A horizontal girder 77 is mounted at the ceiling of the weaving shed 1 along an axis running between the supporting structures 76, 76' parallel to the axes of the beams 21,22,26. This girder 77 carries, by means of fixtures 78, a track 79 which serves as an overhead track for hoisting equipment 80. The girder 77 is attached in the area of the two supporting structures 76,76' to three girders 81 and81' (FIG. 2) likewise mounted at the ceiling and at right angles thereto and which are arranged parallel to the girders 11,12 above the looms facing one another. These girders 81, 81' in turn carry likewise by means of holding devices 78, tracks 82, 83, 84, respectively 82', 83', 84', which are connected with the track 79 in known manner through an intermediate element 85 provided with a switch means.

The two external girders 81 and 81' with the tracks 82, 84 and 82', 84' respectively, are arranged above a line running between the girders 11,12 and the outermost yarns of the warp yarns 10, whereas the central girder 81 and 81' is arranged with the track 83 and 83' above the axes of the loom 2 running between the two warp beams 21,22. By means of the track 79, a plurality of looms arranged, for instance, in two rows parallel with respect to one another can be charged with beams. The track 79 connects the weaving shed 1 with a room (not shown) in which the warp beams are prepared and the cloth beams processed.

If the entire warp 10 has been unwound from the warp beams 21,22, then, if the new warp beam to be inserted contains the identical warp yarns, the warp yarn ends are prepared for joining to the new warp. Thereupon, the finished cloth is cut off, for instance, at the cloth beam.

In order to remove the warp beams 21,22, two hoisting devices 80 are run over the track 79 and the correspondingly set switches, one to each of the tracks 83,84. After the yokes 19*a* of the bearings 19, 19*c* have been untightened and moved back, the hooks 86 of the hoisting equipment 80 are moved under the two ends of the shaft 20*a* and raised simultaneously. Thereupon, the two hoisting devices 80 are brought to the track 79 and moved away laterally (arrow 87). In the same manner, the warp beam 22 is taken off by means of two hoisting devices 80 running over the tracks 82,83 and carried away.

In similar manner, the fully wound cloth beam 26 is taken off by two hoisting devices 80 which are run on the tracks 82,84 whereupon the hooks 86 are brought beneath the two ends of the cloth beam 26 and lifted up to a point where the cloth beam 26 and the guide tube 27, is situated above the girders 16,17. Thereupon, the

hoisting devices **80** are brought to the track **79** and likewise carried away laterally (arrow **87**).

In the next phase, another empty cloth beam with a guide tube **27** inserted therein is brought in by the hoisting devices **80**, introduced between the girders **16,17**, and placed onto the guide rollers **24,25**. Finally, in corresponding fashion, another two fully wound warp beams **22''** fitted on a shaft **20''** are inserted into the corresponding bearings **19,19***c*.

The yarns of the new warp are joined to the appropriately prepared yarns of the preceding warp and the cut-off fabric end is attached to the new cloth beam. Thereupon weaving operations can resume.

Referring to FIG. **3**, wherein like parts are designated with identical references, the weaving mill also houses a plurality of looms **2** in a weaving shed **101** in two rows with their warp sides facing one another and designed identically to those shown in FIG. **1**. The loom **2'** is merely suggested by an outline. The side frame supports **5,6** of the loom **2,2'** are mounted on two continuous channel-shaped girders **91**, only one of which is shown for clarity. The girders **91** are arranged with their flanges facing inside and, in the area of the two loom frames, are respectively provided with a tapered girder end.

The warp beams **21,22** and **21'**, **22'** seated on the shafts **20,20***a*, respectively and belonging to the looms **2,2'**, of which only the front beams can be seen, are arranged in the center between the two machines **2,2'** on a free-standing frame joined to one of the beams **91**. This frame consists of two channel-shaped girders **92** which are provided with lateral reinforcing ribs **93** and a cross beam **18** joining their free ends. The girders **91,92** constitute with the beam **18** a supporting structure **96** for the beams **21, 22,26** or **21', 22', 26'** belonging to the two looms **2,2'**.

A plate **94** is mounted on the mutually facing flanges of the girders **92** beneath the cross beam **18** while projecting to either side and supporting at its free ends the outer bearings **19**, symmetrically arranged with respect to the longitudinal axis of the girder **92**, for the shafts **20***a*, **20** of the warp beams **21, 22,21',22'**. The intermediate bearings **19***c* for the shafts **20***a*,**20** are attached to a T-shaped suspension means **50***a* (FIG. **3***a*) which is suspended from the cross beam **18** at identical spacings from the two girders **92**.

The guide rollers **24,25**, as well as the guide carriers **16, 17** of the cloth beams **26,26'** are arranged on the girders **91** likewise symmetrically with respect to the longitudinal axis of the girders **92**. The spacings of the girders **16,17** and the bearings **19**, from the girder **92** are determined by the maximum diameter of the warp and cloth beams to be used.

Brackets **95** are mounted on the flanges of the girder **92** beneath the bearings **19** to carry the guide rollers **32** for the warp yarns **10** and **10***a*. The length of each bracket **95** is dimensioned in such a way that the part of the warp yarns **10** running between the guide rollers **32,33** passes the fully wound cloth beam **26,26'** at a predetermined minimum distance. Furthermore, a bearing **97** is secured on the bracket **95** to carry a chain wheel **98** via a pinion **99**. The pinion **99** engages the gears **64** of the warp beams **21** and **22**, respectively.

The warp yarns **10** and the finished fabrics **30** are guided according to the example illustrated in FIG. **1**. The driving chains **59** for the warp beams **21,22** and **21',22'** are brought to the chain wheel **58** via the pairs of deflection rollers **61,62** borne at the girders **91**. The cloth beams **26,26'**, and the guide rollers **24,25** are actuated by the respective driving chains **67** running over the deflecting rollers **68,69** borne in the beam **91**, and the chain wheel **70**. The driving chain for the cloth beam **26'** runs along the rear girder **91** that cannot be seen in FIG. **3**.

As above, girders **77, 77'** are mounted on the ceiling of the weaving shed **101** above the beams **21,22,26** and **21',22'LP'**, belonging to the looms **2** and **2'** in parallel to their axes. Both girders **77,77'** are provided with tracks **79** and are connected in the area of the supporting structure **96** with cross beams **102, 103, 103'** with respect to the supporting structure **96** as the girders **81,81'** described above (FIG. **2**) with respect to the supporting structure **76,76'**. Tracks **104,105,105'** are attached to the girders **102,103,103'** via an intermediary element **85** with the track **79**.

In the case of this arrangement, the inserting and removing of the warp and cloth beams at the two looms **2,2'**, i.e. at two rows of looms, can occur completely independently of one another or simultaneously. The sequence of the various operational phases corresponds to that described above with regard to FIG. **1**.

Referring to FIG. **4**, the weaving shed **106** comprises two looms **2,2'** arranged on two girders **91**, as in FIG. **3**. Each one of the girders **91** carries a frame in the center between the two looms **2**, which is formed by two vertically arranged channel shaped sections **107,108** and a crossbeam **109** joining their upper ends and arranged parallel to the girder **91**. The two girders **91** are interconnected by means of two cross beams **18**, the ends of which are connected to the respective vertical legs of the girders as well as to a connection plate **140** arranged on the upper girder flange.

The support structure **110** constituted by the girders **91, 107, 108, 109** supports the beams **21,22,26** and **21',22'LP'** corresponding to the looms **2,2'**. The cloth beams **26,26'** are supported above the warp beams **21,22**, and **21',22'** on their guide rollers **24,25**, the bearings **23** of which are connected to the girder **109** together with the guide carriers **16,17**. The outer bearings **19** for the shafts **20***a*,**20** of the warp beams **21,22; 21',22'** are respectively attached to the inwardly facing legs of the sections **107, 108**, with their free ends projecting toward the corresponding loom. The intermediate bearings **19***c* for the inner ends of the shafts **20***a*, **20** are respectively arranged on a support means **50***b* (FIG. **4***a*) attached between the girders **92** on the cross beams **18**.

The warp yarns **10** run in a preferably short path from the warp beams **21,22; 21',22'** to the deflecting roller **33** and from there, as in the case of the other examples, to the loom **2,2'**.The finished cloth **30** is guided over the deflecting roller **49** and a deflecting roller **111** situated between the sections **107,108** at the legs of the girders **91** to the guide rollers **24** and the cloth beam **26,26'**. The spacing of the deflecting rollers **111** from the sections **107** and **108** is selected in such a way that the cloth **30** travelling toward the guide rollers **24** cannot touch the fully wound warp beams **21,22** and **21',22'**

Referring to FIGS. 4 and 7, two movable platforms 112 are mounted in the area of the space 52 between the girders 91. Each platform 112 is provided with four pivotally arranged guide rollers 113,114 and is carried by a respective pair thereof on the deflecting rollers 34',35' for the warp yarns 10. The deflecting rollers 34',35' are supported in bearings 8' (FIG. 7) mounted on the girders 91 and secured against rotation. The two guide rollers 114 supported on the deflecting roller 33' are provided with cylindrical bearing surfaces, whereas the bearing surfaces of the two guide rollers 113 are shaped to correspond to the surface of the deflecting roller 34', by means of which the platform 112 is laterally guided. The length of each platform 112 is slightly smaller than one third of the spacing between the girders 91 so that, through selective displacement of the platforms 112 in the direction of the longitudinal axes of the deflecting rollers 33',34' a little more than one third of the width of the weave is accessible at all times and, hence, the horizontal sections of the warp yarns 10.

Each one of the two platforms 112 is tensioned with respect to the adjacent girder 91 by means of an elastic cord 151 made, for instance of rubber. The ends of the cord 151 are attached to holding means 152 and 153 respectively attached to the girder 91 and the platform 112. By means of the two cords 151, the two platforms 112 are each held in the respective area of the girders 91 thereby permitting access to the operator from either side at any time.

In order to reach the center area of the space 52, the operator standing on the platform 112 can support himself against the tensioning beam 36, for instance, in such a way that the platform 112 is moved toward the inside away from the girder 91. In this process, the cord 151 is tensioned in such a way that the platform 112, if the operator leaves the space 52 via the other platform 112, is pulled back into its initial position. The length and the strength of the cable 151 are dimensioned in such a way that its elasticity is inadequate to retract the platform 112 out of the central position if an operator is standing thereon.

Alternatively, referring to FIG. 8, a substantially nonelastic cable 154 made, for instance, of nylon fiber (Perlon) or the like, can be secured to the platforms 112 at 153 and guided over a guide roller 155 mounted to a holding means 157 on the adjoining girder 91 and connected at 158 with an elastic cord 156 made, for instance, of rubber and being of substantially identical length. The elastic cord 156 is connected to the opposite girder 91 at the holding means 157' for the guide roller 155 of the other platform 112. In this embodiment, the length of the elastic cord 156 can, for instance, be selected to be twice that indicated in accordance with the example of FIG. 7. As a result, upon the displacement of the platform 112, the elastic cord 156 is tensioned with respect to its length by an amount considerably less than that of the cord 151 (FIG. 7) so that the return force exerted on the platform 112 with each occurring expansion of the cord by positioning of the platform remains substantially constant.

Referring to FIG. 4, the drive chains 59 for the warp beams 21,22,21',22' are guided over the deflecting roller pairs 61,62 to the chain wheels 98 situated on the girders 107,108 and which are connected with the pinions 99 engaging the gears 64. Each one of the cloth beams 26,26' is actuated by two endless chains 119,119 . One chain 119 is guided from the chain wheel 65 over the pairs of deflecting rollers 68 and another pair of deflecting rollers (not shown in FIG. 4) arranged behind the deflecting rollers 62 to a chain wheel 115 borne at the girder 109. This chain wheel 115 is connected to a second chain wheel arranged on the same axis, from which the other drive chain 119 is guided to the two chain wheels 116,117, respectively connected with the guide rollers 24,25. The driving chain for the cloth beam 26' cannot be seen in FIG. 4 in view of the fact that it runs along the rear girders of the supporting structure 110.

The transporting means for the replacement of the beams 21,22,26; 21',22',26' is designed similarly to that shown in the examples according to FIGS. 1 and 2, with the difference that the girder 77 for the track 79 running parallel to the axes of the beams is arranged along a line running between the loom 2 and its corresponding beams 21,22,26. The girders 81 and 81' carry respective runway rails 118 and 118' linked to the guide track 79, which are arranged above the loom 2, respectively, above the supporting structure 110 and the loom 2'. The arrangement of the tracks 118,118' with respect to the supporting structure 110 corresponds to that of the tracks 82,83,84, 82',83',84' with respect to the supporting structures 76,76' described above (FIG. 2).

Referring to FIG. 5 the weaving mill has looms 2 similar to the arrangement of FIG. 1, which are each provided with its own support structure 121 for the corresponding beams 21,22,26. Likewise, the weaving shed 120 is provided with two rows of looms which face one another with their warp sides (only one of which is illustrated). The loom 2 is arranged on two channel-shaped girders 122, the legs of which face inwardly and on which, at identical spacing from the loom side supports 5,6, a vertically arranged channel shaped section 123 is mounted. The girder 123 is provided at the upper free end with a girder 124 projecting like a bracket toward the right and being parallel to the girder 122. The corners of this structure are reinforced by ribs 125 and by plates 126 covering the legs of the two support girders 122,123. A cross beam 18 is secured to the plates 126 to join the two girders 122. The girders 122,123,124, and beam 18 constitute the support structure 121 for the beams 21,22,26.

The outer bearings 19 for the shafts 20*a*,20 of the warp beams 21,22 are mounted on the plates 126 substantially at half elevation of the girders 123. The intermediate bearings 19c for the inner ends of the shafts 20*a*, 20 are, as in the example in accordance with FIG. 4, mounted on a supporting means 50*b* attached to the cross beam 18. The length of the girder 124 is dimensioned in such a way as to project to the right as viewed in FIG. 5 a distance somewhat shorter than the spacing between the shafts 20*a*,20, situated therebeneath, and the adjoining flange of the girder 123. The girder 124 carries the guide rollers 24,25 for the cloth beam 26 with the guide tubes 27 thereof guided between the two channel shaped beams 16,17 carried between the two girders 124.

An arm 127 is hingedly connected on each girder 124 around the axis of the guide roller 24 and is pro-

vided at the upper side with a lug **128**. A tension spring **129** is attached at one end to the lug **128** and at the opposite end to a lug **130** on the girder **124** to balance the weight of the arm **127**. The lower part of the girder **124** carries a stop element **131** which projects toward the right as viewed in FIG. **5** under the arm **127** and which carries a set screw **132** adjustable with respect to the arm **127**. A deflecting roller **134** is arranged at the free ends of the arms **127**.

The warp **10** is guided in a manner identical to that of the preceding examples from the warp beams **21,22** over the deflecting rollers **33,34** to the loom **2**.

The finished fabric **30** is guided via the deflecting rollers **49** and a deflecting roller **133** carried on the free ends of the girders **122** on the side of the warp beams **21,22** facing away from the loom **2** along a vertical path to the deflecting roller **134** and from there to the cloth beam **26** by partially looping the guide roller **24**. Under the effect of the fabric tension, the arm **127** carrying the deflecting roller is pressed downwardly. The lowermost position of the arm **127** is determined by the position of the setscrew **132**. The spacing of the deflecting rollers **133,134** from the girder **123** is selected in such a way that the fabric **30** cannot touch the fully wound warp beams **21,22**.

The drive of the warp beams **21,22** occurs by means of the drive chain **59** guided as in the case of the other examples. As in the case of the example in accordance with FIG. **4**, the cloth beam **26** is actuated by two endless drive chains **119,119**. One drive chain **119** is guided over a pair of deflecting rollers (not shown), as in FIG. **5** behind the deflecting rollers **62**, to the chain wheel **115**, and the other driving chain **119** by a second chain wheel connected thereto to the two chain wheels **116,117** connected with the guide rollers **24,25**.

The transport means for the warp and cloth beams is designed identically to the corresponding transport means in accordance with FIGS. **1** and **2** above.

During weaving operation, the arm **127** assumes the position shown in the drawing. The moment the warp beams **21,22** have been woven off, the fabric is cut off and the cloth end that is now loose is wound up on the cloth beam **26** and the latter is carried away by the hoisting equipment **80**. Then, the arm **127** is moved upward until reaching the position **138** and maintained by the spring **129**.

With the arm in upright position, the bearings **19,19*c*** are readily accessible for the removal of the warp beams **21,22** so that the hoisting hooks **86**, following moving back of the yokes **19*a***, can readily be placed under the ends of the shafts **20*a*,20**. By means of a light lifting off by the hooks **86**, the shafts **20*a***, **20** are detached from the bearings **19,19*c*** and subsequently laterally removed (toward the right in the case of FIG. **5**) and taken away over the guide tracks **82,79**. Thereupon, first, the new warp beams and then the new cloth beam are inserted.

The transport equipment for the warp and cloth beams can, for instance, be designed in such a way that the girders for the hoisting equipment guide tracks are supported on the support structure for the beams.

Various modified embodiments of the invention are possible. For instance, the support structure pertaining to the loom may comprise a warp beam consisting of segmented sections of different width or else two tiered warp beams. The support structure for the beams may also be arranged at the cloth side of the machine frame. Furthermore, a loom designed in accordance with the invention may comprise separating devices for the breaking up of the fabric web into several, for instance three, partial webs. Such partial webs can be taken up on individual segmented cloth beams of corresponding length which are situated next to one another on the guide rollers **24,25** and which are guided for instance by a guide rod **27** continuous over the entire width of the machine between two respective locking rings **28**.

In one embodiment of the invention, the warp and/or cloth beam made of a single piece of consisting of several elements may be provided with a drive means separate from the drive of the loom. The warp can also be provided with only a single braking device.

An embodiment is likewise conceivable in which the support structure for the beams is not situated on the floor of the weaving shed but is mounted, for instance, to girders on the ceiling structure of the building or possibly to supports thereof.

The platform accessible in the space **52** can likewise be designed differently. For instance, the platform situated on the girders **11,12,91** may cover substantially the entire horizontal section of the warp yarns **10**. The platform can be designed for lifting substantially along an axis running crosswise to the direction of travel of the warp, by means of which in each case one-half section of the horizontal part of the warp yarns **10** is accessible.

Instead of being supported on guide rollers, the platforms arranged between the machine frame and the supporting structure may also be supported directly on the deflecting rollers for the warp and fabric, or on corresponding elements and may be guided, for instance, by means of lateral guides. In addition, to elastic tensioning means, the platforms can, for instance, be maintained in their rest positions at the side supports of the loom by means of correspondingly arranged and possibly weighted tensioning means.

An embodiment is also possible wherein only one platform is movable crosswise to the direction of travel of the warp yarns or the fabric. In this embodiment, the platform is of a length which is preferably smaller than one-half the width of the weave and is held at one side of the loom. Furthermore, an endless tensioning means can be attached to the platform, which does not exert any return force on the platform but which is guided, for instance, over one guide roller arranged at the respective side girders of the loom or the support structure. In this instance, the platform can be moved to each one of the lateral girders by means of pulling of one stringer or by rotating of one of the guide rollers.

The invention thus provides a loom which can be equipped with substantially larger beams than before possible, the diameter of which can be selected independently of the elevation of the machine in accordance with the respective operation conditions.

What is claimed is:

1. A loom having a machine frame for forming a cloth; a support structure spaced from said machine frame, said support structure including a plurality of superpositioned bearings; a warp beam journalled in one of said bearings in said support structure; a cloth beam journalled in another of said bearings in said support

structure in vertical disposition relative to said warp beam; said support structure mounting said warp beam and said cloth beam thereon being spaced from said machine frame to define an access space therebetween for a loom operator; first guide means for directing the warp yarns on said warp beam in a first substantially U-shaped path between said warp beam and said machine frame, said first path having a substantially horizontal portion disposed above the floor supporting said loom; and second guide means for directing the cloth on said machine frame in a second substantially U-shaped path between said machine frame and said cloth beam and having a substantially horizontal portion disposed above the floor.

2. A loom as set forth in claim 1 wherein said support structure is a structural unit.

3. A loom as set forth in claim 1 which further includes a moveable platform between said beams and said machine frame in said access space over said horizontal portions of said first and second paths.

4. A loom as set forth in claim 3 wherein said first guide means includes a pair of guides disposed across said access space and wherein said platform includes a plurality of rotatably mounted guide rollers rollably mounted on said guides for longitudinal movement thereon.

5. A loom as set forth in claim 4 wherein said platform includes four of said guide rollers at least two of said guide rollers having a bearing surface thereon in mating relation with the respective one of said guides.

6. A loom as set forth in claim 3 further comprising a holder mounted between said support structure and said machine frame; and an elastic cord connected to said holder and said platform to bias said platform towards said holder.

7. A loom as set forth in claim 1 wherein said support structure is disposed on the warp side of said machine frame and said first U-shaped path for the warp yarns defines said access space with said second path disposed beneath said first path.

8. A loom as set forth in claim 7 further including a laterally displaceable moveable platform within said access space over said horizontal portion of said first path.

9. A loom as set forth in claim 8 wherein said guide means includes a pair of guides disposed transversely of said first path in said access space, and wherein said platform includes a plurality of rotatable guide rollers mounted on said guides for longitudinal movement thereon.

10. A loom as set forth in claim 9 wherein at least two of said guide rollers have a bearing surface thereon complementary to said guides.

11. A loom as set forth in claim 1 further including a support connection supporting said machine frame and connected to said machine frame and said support structure, said support connection having a connecting brace above said access space.

12. A loom as set forth in claim 1 further including a support connection between said machine frame and said support structure connecting said support structure to said machine frame.

13. A loom as set forth in claim 12 wherein said support connection includes a plurality of interconnected girders, and wherein said machine frame is supported on said girders.

14. A loom as set forth in claim 13 wherein said machine frame is supported on an inclined plane on said girders.

15. A loom as set forth in claim 12 wherein said support connection supports said support structure and said machine frame thereon and further supports a second support structure and a second loom machine frame thereon in spaced relation, said machine frames being disposed on opposite ends of said support connection.

16. A loom as set forth in claim 1 wherein said support structure is common to an adjacent loom, and includes a pair of warp beams journalled in a respective pair of said bearings and a pair of cloth beams journalled in another respective pair of said bearings.

17. A loom as set forth in claim 16 further including a pair of drive means, each drive means being operatively connected to a respective one of said warp beams and a respective one of said cloth beams.

18. A loom as set forth in claim 17 wherein each said drive means is driven from the drive of a respective loom.

19. A loom as set forth in claim 1 wherein said support structure further includes a pivotally mounted arm over said warp beam, said arm having a guide at one end for guiding the cloth from said machine frame onto said cloth beam and a spring connected to said arm biasing said arm away from said warp beam.

20. A loom having a machine frame for forming a cloth; a support structure spaced from said machine frame, said support structure including a plurality of bearings; a warp beam journalled in one of said bearings in said support structure; a cloth beam journalled in another of said bearings in said support structure in vertical disposition relative to said warp beam; said support structure mounting said warp beam and said cloth beam thereon being spaced from said machine frame to define an access space therebetween for a loom operator; first guide means for directing the warp yarns on said warp beam in a first substantially U-shaped path between said warp beam and said machine frame, said first path having a substantially horizontal portion disposed above the floor supporting said loom; and second guide means for directing the cloth on said machine frame in a second substantially U-shaped path between said machine frame and said cloth beam and having a substantially horizontal portion disposed above the floor.

21. A loom having a machine frame for forming a cloth; a support structure spaced from said machine frame; a warp beam; means journalling said warp beam in said support structure; a cloth beam; means journalling said cloth beam in said support structure in vertical disposition relative to said warp beam; said support structure mounting said warp beam and said cloth beam being spaced from said machine frame to define an access space therebetween for a loom operator; first guide means for directing the warp yarns on said warp beam in a first substantially U-shaped path between said warp beam and said machine frame, said first path having a substantially horizontal portion disposed above the floor supporting said loom; and second guide means for directing the cloth on said machine frame in a second substantially U-shaped path between said machine frame and said cloth beam and having a substantially horizontal portion disposed below said horizontal portion of said first path.

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