March 13, 1956 E. PFARRWALLER 2,737,981

MECHANICAL LOOM

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Fig. 1.

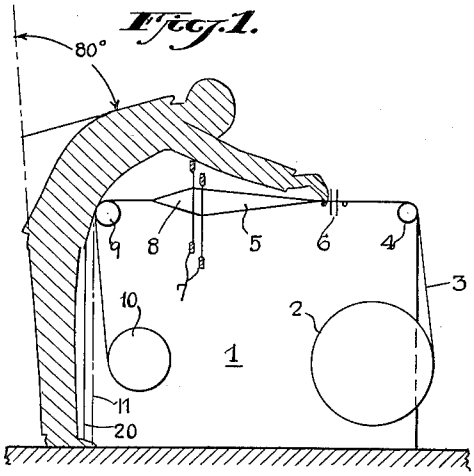


Fig. 2.

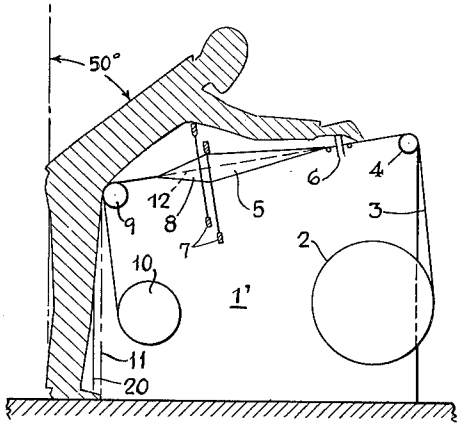
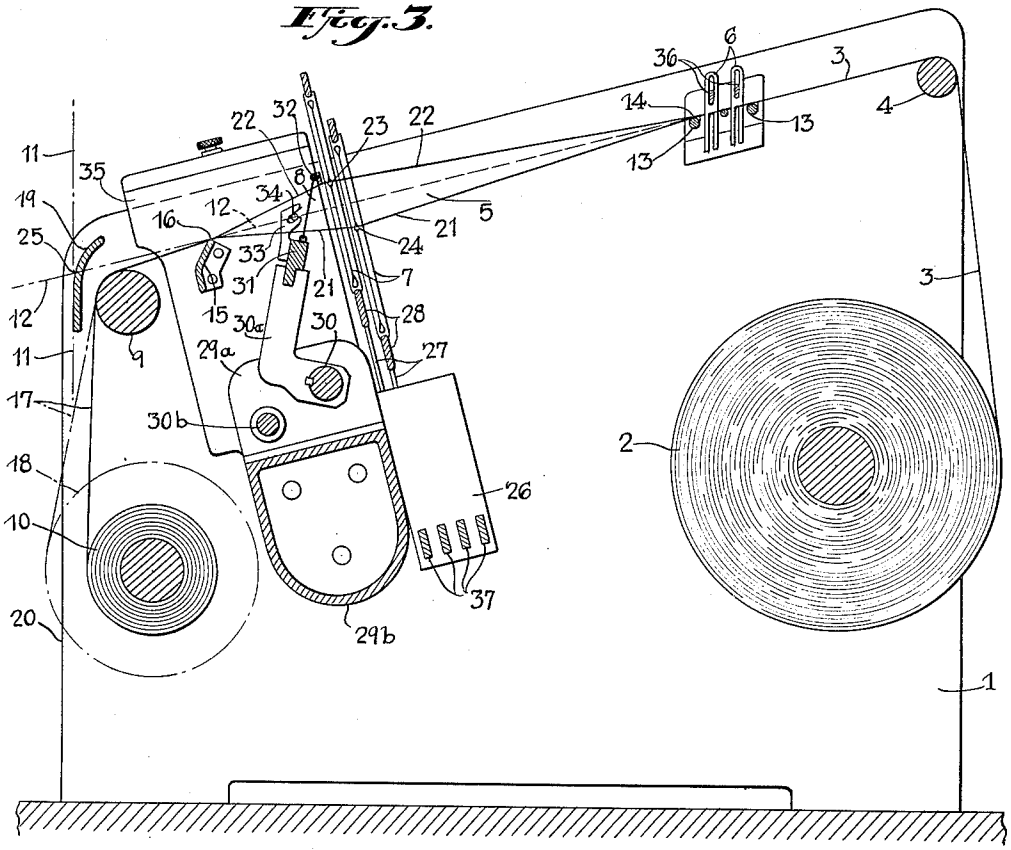


Fig. 3.



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Fig. 4.

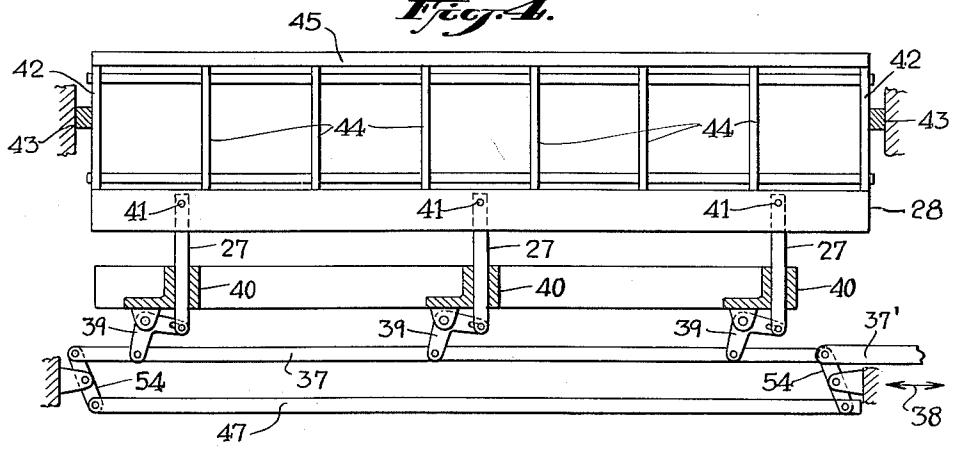
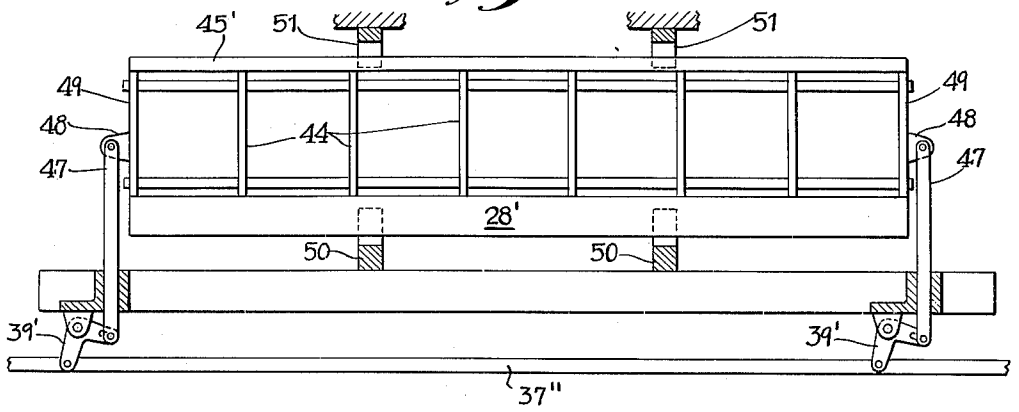


Fig. 6.



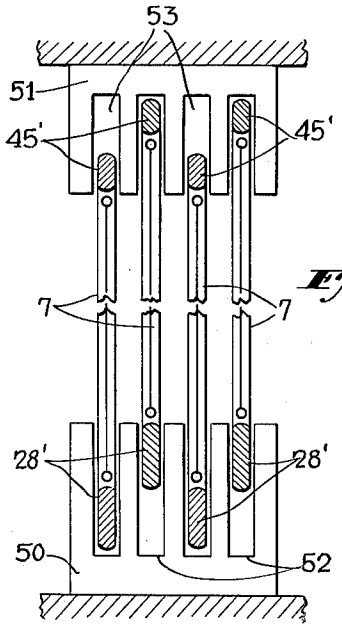
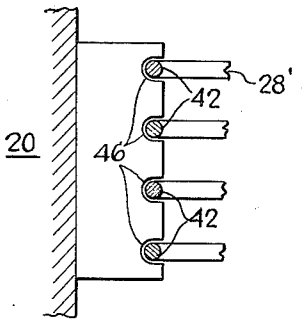


Fig. 7.

Fig. 5.



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United States Patent Office 2,737,981 Patented Mar. 13, 1956

2,737,981

MECHANICAL LOOM

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Application March 1, 1951, Serial No. 213,334

Claims priority, application Switzerland March 3, 1950

6 Claims. (Cl. 139—1)

The present invention relates to mechanical looms, more particularly gripper shuttle looms, in which the shed of the warp threads is formed by up and down moving heddles which are supported and actuated from below the shed, whereby the provision of a superstructure extending above the warp for actuating the heddles is avoided.

An object of the invention resides in the provision of a mechanical loom for weaving of the type set forth above and having warp thread stop-motion feelers disposed in the rear of the heddles, which loom is so constructed that it can be serviced from the front and the operator, standing in front of the loom, can reach the warp a least as far as the stop-motion feelers without uncomfortably bending his body.

Conventional looms have an upper structure supporting a lay and the actuating mechanism for the heddles, particularly in Jacquard looms, or serving for suspending rollers or other means for counterbalancing pairwise cooperating heddle frames. In such looms, the warp shed forward of the heddles is sometimes inclined so that a depending lay can be used which effects beating up of the weft threads by gravity. Because of the support and drive means connected with the superstructure, particularly if a great number of heddles is used, servicing of all parts of the warp disposed in the rear of the heddles is very difficult from the front of the loom, even if the forward shed is inclined. It is considerably more difficult than in conventional looms having no superstructure and a horizontal warp and shed. The latter type of looms are sometimes so constructed that the median plane of the shed is somewhat inclined, about 1° or 2° with respect to the horizontal, for facilitating supervision of fabric and warp. For obtaining a different tension of the upper end lower warp threads forming the shed, it has been proposed to operate the shed forward of the heddles at a slant different from that of the shed in the rear of the heddles. The forward shed declines in some of such cases toward the heddles. The declination or inclination amounts to a few degress only, say 2° to 5°.

Such minor inclinations of the warp facilitate supervision but do not improve accessibility of the shed from the front of the loom. This is particularly true in gripper shuttle looms in which there is frequently quite a length of fabric between the breast beam and the shed due to the provision of boxes containing the mechanisms for picking, forwarding, and receiving the shuttles, as well as for transferring the weft thread ends and cutting the weft threads, especially if such boxes are adapted to be displaced.

The limited accessibility permits servicing of only a part of the rear portion of the warp from the loom front, and the operator must go around the loom to the rear thereof for servicing the otherwise inaccessible part of the warp. This causes delays and longer standstill periods, particularly in looms of great width.

An object of the present invention is to overcome the above described shortcomings of conventional looms by providing increased accessibility through the combination of a mechanically operated weft insertion mechanism, of a positive guide for the weft insertion means during actual weft insertion, and of inclining the median plane of the shed at least forward of the heddles by an angle of 10° to 45° with respect to the horizontal and constructing the loom so that the line of intersection of said plane with the vertical plane confining the front of the loom profile is not more than 35½ inches above the floor.

This results in a low front of the loom according to the invention and reduces the angle, at which the operator must bend his body to lean forward, to an extent that his position is never uncomfortable. Since the loom front is not higher than 35½ inches, even a short person need not bend his back for reaching rear portions of the warp, because the loom front is not higher than the hip of the operator. The operator can reach the warp stop-motion feelers with his hands when standing in front of the loom so comfortably that he can insert broken warp threads from the rear into the feelers and re-tie the threads. The inclination of the shed by 10° to 45° greatly facilitates servicing and reduces straining of the body of the operator when considering that in leaning forward, the strain on the body increases with each degree of bending of the body farther from the upright position.

It is essential that the shuttle be positively guided throughout its movement through the shed if the shed is inclined, particularly when the shuttle is moved by hand, for example, when a weft thread has been broken.

The inclination of the median plane of the shed should preferably not exceed 45° because otherwise the front part of the shed is so low that it can be serviced only by unduly bending the body and the rear part of the warp can be serviced only by standing on an elevated platform which makes supervision of the loom difficult. A greater inclination than 45° also entails difficulties in connection with warp stop-motion feelers acting by gravity and guided vertically by rails.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims, and shown in the drawings which, by way of illustration, show what I now consider to be preferred embodiments of my invention.

In the drawings:

Fig. 1 is a diagrammatic side view of a conventional loom;

Fig. 2 is a diagrammatic side view of a loom according to the invention;

Fig. 3 is a diagrammatic longitudinal sectional view of a loom according to the invention;

Fig. 4 is a diagrammatic part sectional elevation of a guided heddle frame and its drive mechanism according to the invention;

Fig. 5 is a diagrammatic illustration of lateral means for vertically guiding a plurality of heddle frames of the type shown in Fig. 4;

Fig. 6 is a diagrammatic illustration of a modified heddle frame drive and guide mechanism;

Fig. 7 is a diagrammatic showing of means for vertically guiding heddle frames of the type shown in Fig. 6.

Like parts are designated by like numerals in all figures of the drawings.

Referring more particularly to Fig. 1, numeral 1 designates the loom comprising a warp beam 2, a warp 3, a whip roll or warp tensioning beam 4, a back shed 5, warp thread stop-motion feelers 6, heddles 7, a front shed part 8, a fabric guide roll 9, and a cloth beam 10. The warp tensioning beam 4 may be supported and actuated as shown in Patent Nos. 2,375,316 and 2,398,547.

The breast beam in Fig. 1 is at the usual elevation, making it difficult for the attendant to reach the warp thread stop-motion feelers 6.

As obvious from Fig. 2, accessibility of a loom according to the invention is much improved by reducing the height of the front of the loom 1 and by placing the central plane 12 of the front shed 8 in an inclined position. The loom 1' comprises the same parts as that shown in Fig. 1. However, since the fabric guide roll 9 is at a lower elevation than in the loom of Fig. 1, the position of the attendant is not only more comfortable but he can also reach appreciably farther up and beyond the warp thread stop-motion feelers 6 and can fix most warp failures without going to the back of the loom.

In the loom shown in Fig. 1, the attendant must bend the upper part of his body at an angle of about 80° in relation to the lower part, because of the elevation at which the fabric guide roll 9 is located and because of the horizontal shed 5, 8.

In the loom shown in Fig. 2, the breast beam 9 is substantially as high above the floor as the hip of an average person, so that the attendant can bend his body forward by bending it at the hip which is natural. Because of the inclination of the shed 5, 8, the angle at which the body must be bent is only 50° and the upper part of the body can remain extended. The head of the attendant is in a much better position for observing the warp over its whole width than in the conventional loom according to Fig. 1.

Fig. 3 is an illustration on a larger scale of the loom 1' according to the invention. Warp beam 2, whip roll 4, fabric guide roll 9, and cloth beam 10 are as shown in Figs. 1 and 2; the warp 3 is carried by support rails 13 adjacent to the warp thread stop-motion feelers 6, so that the shed is formed at 14 in front of the thread feelers. The fabric 17 is carried by a support bar 15, which is arranged immediately in front of line 16 where the shed is closed. The fabric 17 moves from the support bar 15 over the fabric guide roll 9 and is wound on the cloth beam 10. For the protection of the fabric, a shield 19 is placed in front of and over the roll 9, on which shield the attendant may lean. The front of the loom profile is limited by a plane 11, shown in dot-dash line, which is vertical and tangent to the protecting shield 19. The plane 11 is somewhat in the rear of the front side of the lateral loom shields 20 and of the front of the cloth roll on beam 10, when it is fully wound, as indicated by the dot-dash circle 18 in Fig. 3.

The median plane 12 of the forward shed portion 8 extends through line 16 and also through line 14 unless the inclination of the rearward shed 5 is different from that of the forward shed due to a position of the support rails 13 higher or lower than that shown in Fig. 3 or because of a lower position of the heddles 7 and the bar 15. The imaginary plane 12 usually halves the angle between the lower warp threads 21 and the upper threads 22 of the forward shed 8. There is no such symmetry if the upper warp threads are subjected to greater tension than the lower threads by appropriately positioning the heddles 7. In that case, the plane 12 extends through line 16 and a line between the heald eyes 23 for the upper warp threads and the eyes 24 for the lower threads.

The line of intersection of planes 12 and 11 is not more than 35½ inches above the floor on which the loom stands according to the invention and the inclined plane 12 encloses with the horizontal an angle of between 10° and 45°.

The heddles 7 are actuated by a conventional harness operating mechanism, which is not shown since it does not form part of the present invention. Driving rods 27 are connected with the lower heddle frame beam 28 and connected for actuation with rods 37 by a mechanism contained in boxes 26 supported by a box girder 29*b*. The latter extends between the shields 20 and also supports a plurality of casings 29*a* containing shafts 30 having arms 30*a* for supporting and actuating the lay 31 carrying a reed 32 and a positive guide 33 for the shuttle 34, for example as shown in Patent No. 2,316,703. Shafts 30 are connected with and oscillated by conventional mechanisms inside casings 29*a*, which mechanisms are actuated by a drive shaft 30*b* extending across the loom.

The guide 33 is so constructed that it forms a race which the shuttle 34 cannot leave while being picked through the shed, in spite of the inclination of the shed 5, 8. The guide extends over the whole width of the shed, special guides being provided at the boxes 35 on either side of the loom, one box containing a picking mechanism and the other a shuttle receiving and braking mechanism. These mechanisms are not illustrated as they do not form part of the invention. After picking a weft thread through the shed, shuttles 34 are returned from the receiving box to the shuttle picking box outside the shed in conventional manner.

The heddles 7 extend at a right angle to the central plane 12 of the shed to make the movement of the warp threads 21, 22 in the heald eyes 23 as small as possible when the shed is changed. The heddles 7 are consequently inclined, and, if the loom is very wide, a multiple guide for the heddle frames is desirable to prevent sagging of the frames. The warp stop-motion feelers 6 are guided vertically on the contact bars 36, so that they can freely move up and down without sliding down on the inclined warp threads.

Fig. 4 illustrates a heddle frame actuated from below. Rod 37 is pivoted to a drive rod 37' which is reciprocated (arrow 38) by means of a dobby in box 26, the dobby not being shown as it does not form part of the invention. The heddle frame is carried by rods 27, to the upper ends of which the lower beam 28 of the heddle frame is pivoted by pins 41. Rods 27 reciprocate in substantially vertical guides 40 and have their lower ends pivoted to one arm of bellcrank levers 39, the other arm of which is pivoted to the horizontal rod 37. The upright lateral members 42 of the heddle frames slide reciprocatingly in suitable guides 43. Several stays 44 are provided between the lateral frame members 42 for rigid connection of the horizontal lower frame beam with the upper horizontal frame beam 45.

A guide 43 for four heddle frames is shown in larger scale in Fig. 5. Member 43 is rigidly connected with a stationary part of the loom and has recesses 46 adapted to individually receive the lateral heddle frame member 42.

The up and down movement of the heddle frame shown in Fig. 4 is guided from below as well as at the ends of the frame. Either the lateral guides or the guides below the frame may be omitted, if desired.

All guides 40 are rigidly connected and supported by the bellcrank levers 39 which are fulcrumed thereon. The openings in the arms of the bellcrank levers which are pivoted to the lower ends of rods 27 must be elongated to provide for the necessary freedom of movement. Rod 37 is supported by levers 54 which are fulcrumed to a stationary part of the loom. The levers may be interconnected by a rod 47 to complete a parallelogram system.

In the modified arrangement illustrated in Fig. 6, the heddle frame is supported and actuated at its ends by vertically guided rods 47. The upper ends of rods 47 are pivoted to ears 48 on the lateral frame stays 49. The lower ends are pivoted in elongated apertures of one arm of elbow levers 39', whose other arm is pivoted to the horizontal and reciprocated rod 37. Comb-like members 50 and 51 are provided for guiding the up and down movement of intermediate parts of the lower beams 28' and of the upper beams 45' of the heddle frames, respectively. Guides for four heddle frames are shown in Fig. 7 on a larger scale and in a position at a right

angle to that shown in Fig. 6. They have slots or gaps 52 and 53 individually slidingly receiving the lower heddle frame bars 28' and the upper frame bars 45', respectively. The teeth of the comb-like guides 50 and 51 provide the support necessary for preventing forward sagging of the inclined heddle frames.

While I believe the above described embodiments of my invention to be preferred embodiments, I wish it to be understood that I do not desire to be limited to the exact details of design and construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:

1. A mechanical loom for weaving comprising, in combination, a warp beam in the rear of the loom for unwinding the warp threads, a whip roll, heddles disposed forward of said whip roll for guiding the warp threads to form a shed, frames for said heddles, said frames being supported and actuated from below the shed, means for picking weft threads through the shed forward of said heddles and comprising shuttles and shuttle guide means adapted to positively guide the shuttles during their entire passage through the shed, a fabric guide roll disposed in the front of the loom for receiving and guiding the woven fabric, the median plane of the shed forward of the heddles being inclined toward the rear of the loom, enclosing with the horizontal an angle substantially between 10 and 45 degrees, said heddle frames being inclined with respect to the vertical and guided to move at a right angle to the median plane of the shed forward of the heddles, and means associated with said heddle frames for preventing offset of said heddle frames due to their inclination with respect to the vertical.

2. A mechanical loom for weaving comprising, in combination, a warp beam in the rear of the loom for unwinding the warp threads, a whip roll, heddles disposed forward of said whip roll for guiding the warp threads to form a shed, means for picking weft threads through the shed forward of said heddles and comprising shuttles and shuttle guide means adapted to positively guide the shuttles during their entire passage through the shed, a fabric guide roll disposed in the front of the loom for receiving and guiding the woven fabric, the median plane of the shed forward of the heddles being inclined toward the rear of the loom, enclosing with the horizontal an angle substantially between 10 and 45 degrees, frames for said heddles, at least three support and actuating means connected with each of said frames for supporting and actuating said heddle frames from below, and guide means for said heddle frames for guiding the up and down movement of said frames and being adapted to maintain said frames in a position which is inclined with respect to the vertical and at a right angle to the median plane of the shed forward of the heddles.

3. A mechanical loom for weaving comprising, in combination, a warp beam in the rear of the loom for unwinding the warp threads, a whip roll, heddles disposed forward of said whip roll for guiding the warp threads to form a shed, frames for said heddles, said frames being supported and actuated from below the shed, means for picking weft threads through the shed forward of said heddles and comprising shuttles and shuttle guide means adapted to positively guide the shuttles during their entire passage through the shed, and a fabric guide roll disposed in the front of the loom for receiving and guiding the woven fabric, the median plane of the shed forward of the heddles being inclined toward the rear of the loom, enclosing with the horizontal an angle substantially between 10 and 45 degrees, said heddle frames being inclined with respect to the vertical and guided to move at a right angle to the median plane of the shed forward of the heddles, each of said heddle frames including a horizontal lower beam, a horizontal upper beam, and at least three stay members connecting said beams.

4. A mechanical loom for weaving comprising, in combination, a warp beam in the rear of the loom for unwinding the warp threads, a whip roll, heddles disposed forward of said whip roll for guiding the warp threads to form a shed, means for picking weft threads through the shed forward of said heddles and comprising shuttles and shuttle guide means adapted to positively guide the shuttles during their entire passage through the shed, a fabric guide roll disposed in the front of the loom for receiving and guiding the woven fabric, the median plane of the shed forward of the heddles being inclined toward the rear of the loom, enclosing with the horizontal an angle substantially between 10 and 45 degrees, frames for said heddles, each of said frames including a horizontal lower beam, a horizontal upper beam, and stay members rigidly connecting said beams, actuating means connected with said stay members between said beams for actuating said frames from below, and guide means connected with said actuating means and with said heddle frames for guiding the up and down movement of said frames and being adapted to maintain said frames in a position which is inclined with respect to the vertical and at a right angle to the median plane of the shed forward of the heddles.

5. A mechanical loom for weaving comprising, in combination, a warp beam in the rear of the loom for unwinding the warp threads, a whip roll, heddles disposed forward of said whip roll for guiding the warp threads to form a shed, means for picking weft threads through the shed forward of said heddles and comprising shuttles and shuttle guide means adapted to positively guide the shuttles during their entire passage through the shed, a fabric guide roll disposed in the front of the loom for receiving and guiding the woven fabric, the median plane of the shed forward of the heddles being inclined toward the rear of the loom, enclosing with the horizontal an angle substantially between 10 and 45 degrees, frames for said heddles, each of said frames including a horizontal lower beam, a horizontal upper beam, at least three stay members rigidly connecting said beams, support and actuating means connected with said frames for supporting and actuating said frames from below, comblike guide means disposed substantially at a right angle to and adapted to slidably receive said upper beams in the gaps between the teeth of the comblike guide means, and comblike guide means disposed substantially at a right angle to and adapted to slidably receive said lower beams in the gaps between the teeth of the comblike guide means, said guide means being placed in spaced relation to the ends of the heddle frames and adapted to guide the up and down movement of said frames and to maintain said frames in a position which is inclined with respect to the vertical and at a right angle to the median plane of the shed forward of the heddles.

6. A mechanical loom for weaving comprising, in combination, a warp beam in the rear of the loom for unwinding the warp threads, a whip roll, heddles disposed forward of said whip roll for guiding the warp threads to form a shed, frames for said heddles, said frames being supported and actuated from below the shed, means for picking weft threads through the shed forward of said heddles and comprising shuttles and shuttle guide means extending across the shed and being adapted to positively guide the shuttles during their entire passage through the shed, a fabric guide roll disposed in the front of the loom for receiving and guiding the woven fabric, and a stationary support means for the fabric arranged immediately in front of the line where the shed is closed, said heddle frames being placed at an elevation relative to the elevation of said support means so that the median plane of the shed forward of the heddles is inclined toward the rear of the loom, enclosing with the horizontal an angle substantially between 10 and 45 degrees, said fabric guide roll being at an elevation below the elevation of said support.

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