Aug. 20, 1957 L. W. MACOMBER 2,803,267

METHOD OF AND APPARATUS FOR WEAVING

Filed Feb. 10, 1955 3 Sheets-Sheet 1

Fig. 1

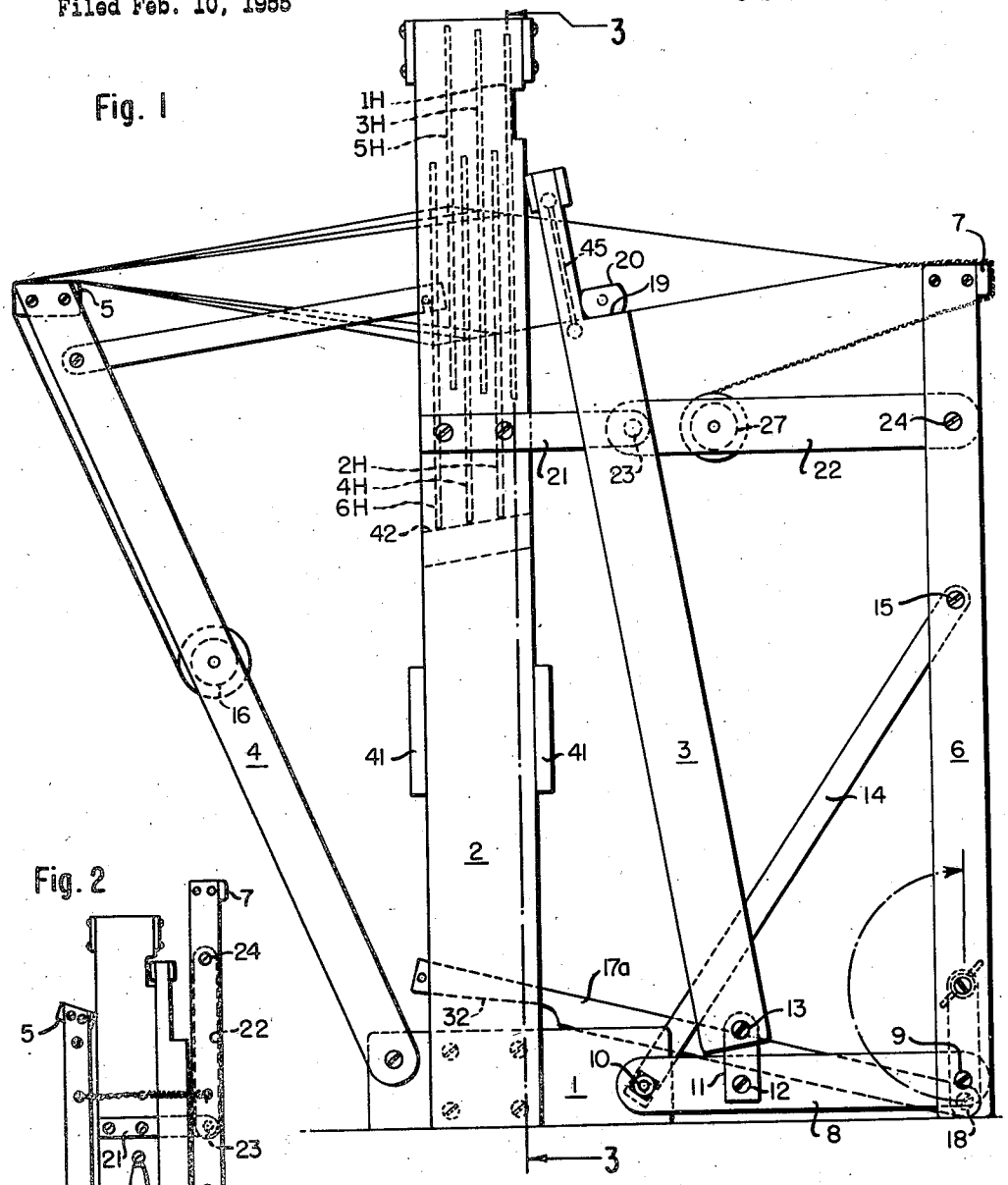


Fig. 2

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Aug. 20, 1957 L. W. MACOMBER 2,803,267

METHOD OF AND APPARATUS FOR WEAVING

Filed Feb. 10, 1955 3 Sheets-Sheet 2

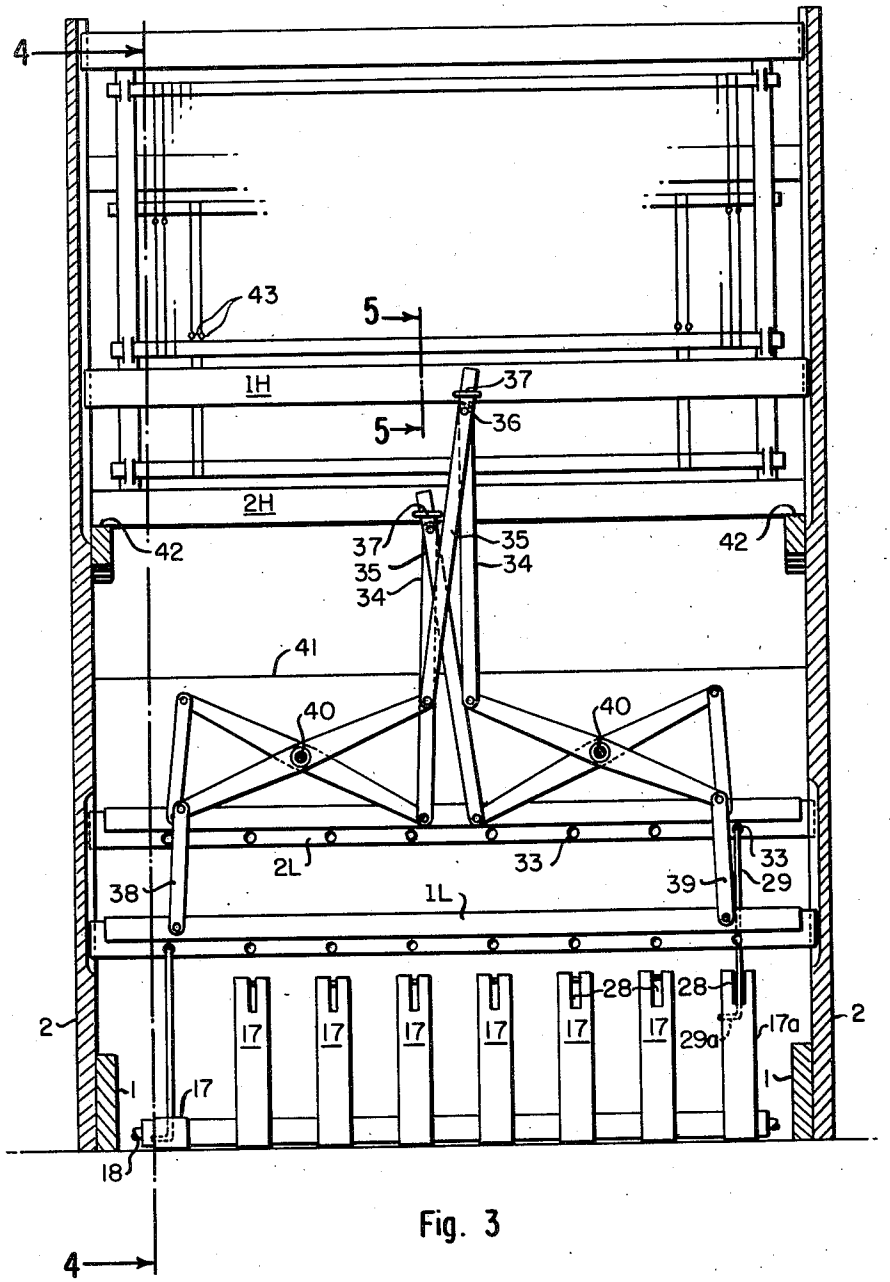


Fig. 3

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Aug. 20, 1957 L. W. MACOMBER 2,803,267

METHOD OF AND APPARATUS FOR WEAVING

Filed Feb. 10, 1955 3 Sheets-Sheet 3

Fig. 4

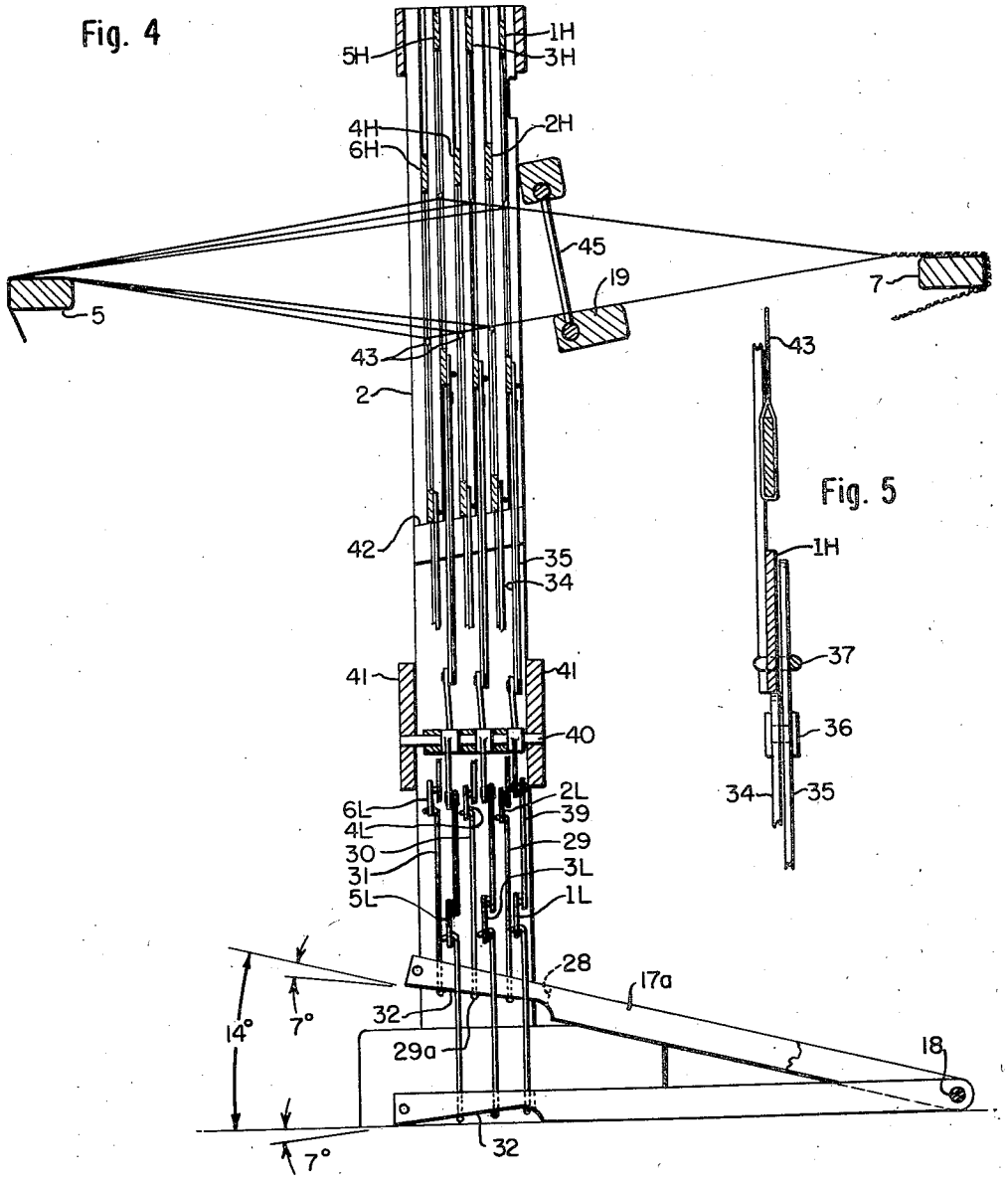


Fig. 5

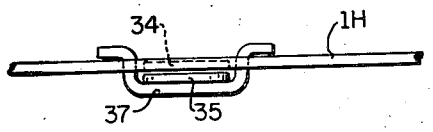


Fig. 6

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2,803,267

METHOD OF AND APPARATUS FOR WEAVING

Leroy W. Macomber, Saugus, Mass.

Application February 10, 1955, Serial No. 487,388

7 Claims. (Cl. 139—30)

The present invention relates to method of and apparatus for weaving, and particularly to weaving with looms adapted for operation by hand.

The principal object of my invention is to provide a method and means for weaving which will be conducive to decreasing the shed-angle and consequently the over-all length of the loom from front to back thereof, relative to the overall length of a loom using conventional method and means.

Another object of my invention is to secure greater accuracy and non-variability in alignment of the strands or threads of the shed, and, as a consequence thereof, secure more even tension on the warp, and non-interference of the threads with the passing of the shuttle through the shed.

A further object of my invention is to provide an improved treadle or pedal for actuating the lams and harnesses of the loom within predetermined limited movements thereof.

Another object of my invention is to provide a special arrangement for collapsing the loom for transport by nesting or folding the sleigh or beater more compactly than heretofore.

Another object of my invention is to provide means on the harnesses adapting the latter to relatively close spacing, one from another, without interference of the harness-actuating guiding-means.

The above and further objects of my invention will be more clearly understood by reference to the accompanying specification and drawings, wherein Figure 1 of the latter is a side elevation of a loom according to my invention, the loom being unfolded into operative position; Fig. 2 is a side elevation thereof in the folded position; Fig. 3 is a sectional front elevation thereof on the line 3—3 of Fig. 1, harnesses Nos. 3, 4, 5 and 6 being omitted for clarity; Fig. 4 is a sectional side elevation taken on line 4—4 of Fig. 3; Fig. 5 is a sectional elevation taken on line 5—5 of Fig. 3, and Fig. 6 is a plan view of the parts shown in Fig. 5.

Referring more specifically to the specification, whenever a harness is referred to, the terminology is meant to include the identification "heddle-frame" as well. Where the word "thin" is used with reference to the harnesses or heddle-frames, it is meant to differentiate between a wooden harness and a metal one, a wooden harness being required necessarily to be thicker than a metal harness, because it is hygroscopic and has a tendency to warp.

Referring to the drawing, Fig. 1, 1 represents a base upon which the loom rests. Center uprights 2, are firmly secured to the base, as by suitable bolts. Pivotally secured to the loom structure are beater 3, and supports 4, for cane-beam 5; and supports 6, for front-beam 7. Between base 1, and supports 6, is a link 8, fulcrumed around pivot 9, on support 6, and around pivot 10, on base 1. A short link 11, is clamped to link 8, at 12, and is pivotally secured to beater 3, at 13, by means of which arrangement the beater 3, may be compactly folded for transportation of the loom, as shown in Fig. 2, and may be adjusted at

this point for misalignment. Braces 14, pivoted at 10 and clamped at 15, to support 6, serve to maintain rigidity of the parts when the loom is in unfolded position for use. Between the supports 4, for the cane-beam is mounted the usual warp-roll 16 (shown in dotted lines, Fig. 1).

One of my improved treadles or pedals is shown at 17_a, Figs. 1 and 4. A multiplicity of these pedals is shown in Fig. 3, pivotally mounted on pintle 18. On the beater 3, is provided a shuttle-race 19, in which the shuttle 20, is located for the purpose of being projected through the shed in order to form the weft of the cloth being woven.

To uprights 2, are fixedly secured members 21, pivoted to links 22, by pivots 23. The links 22, also are pivoted to front beam-supports 6, at 24, and between the pivoted links 22, is mounted cloth-roll 27, which receives the woven cloth from front-beam 7. Treadle 17_a, Fig. 1, is connected to lams 2L, 4L and 6L for operating harnesses 2H, 4H and 6H, respectively. This treadle is also identified as 17_a in Fig. 3. The treadle is in the upward position, Figs. 1 and 4. To illustrate the arrangement more clearly, by referring to Fig. 3, it will be seen that the treadles 17, have slots 28, extending therethrough, and inserted through these slots are hooks 29, 30 and 31, best shown in Figure 4. The bottom hook-members, such as 29_a, Fig. 3, are turned under and adapted to embrace the under-surface 32, of the recessed portion of the treadles (Fig. 4), and the upper hook-members extend through suitable holes 33 (Fig. 3) in the respective lams, which they actuate upon depression of the treadles. As above stated, for example, depression of treadle 17_a by the foot of the operator will pull down lams 2L, 4L and 6L (Fig. 4) and raise harnesses 2H, 4H and 6H, from shelf 42. While the treadles are in the upward position, as 17_a, Fig. 4, the harnesses operated thereby rest on shelf 42. The harnesses, of course, carry the heddles 43, having the usual heddle-eyes, Fig. 5, through which eyes the threads pass from warp-beam 5, to cloth-beam 7, and, as is well known in the art, the reed 45, is mounted in the top of the beater 3. The harnesses are raised by means of push-rods 34 and 35, which are pivotally rivetted together at 36, and which are free to slide in guiding-hooks 37 (Fig. 3) fastened to the lower cross-frame member of each harness.

By referring to the drawing, Fig. 3, it will be seen that the guiding-hooks 37, are staggered in relation to each other, and in order that the push-rods will not interfere with the upward and downward movements of the harnesses. Also, this arrangement renders it possible to space the harnesses more closely together, and this contributes another factor to the reduction of the over-all length of the loom.

The members which actuate the push-rods, such as push-rods 34 and 35, are comprised of suitable pivoted links, and which are attached to the lams in balanced relationship, as by the members 38 and 39, Fig. 3. Thus, the lams are moved uniformly because of the equal distribution of leverage due to the arrangement of pivoted parts of the linkages. It will be understood that there is a multiplicity of these harness-actuating linkage devices, one for operating each harness, as best illustrated in Fig. 4, wherein 40, represents one of the fulcrum shafts extending through frame-box 41, of center upright 2. The harnesses normally all rest on shelf 42, which shelf, also, has a slope corresponding to the predetermined shed-angle to be effected.

Referring again to Fig. 4, it will be seen that a number of hooks are arranged in the slots 28, of the treadles, each hook being in substantially vertical alignment with the lam and harness which it is designed to actuate, either upwardly or downwardly. Thus, one treadle may actuate as many lams and harnesses as there are hooks extending through its slot. The respective positions of the harnesses depends upon several factors, viz. whether

the treadle shown in the upward position operates harnesses Nos. 2H, 4H and 6H, or is in the downward position, and operates harnesses 1H, 3H and 5H. Also, the relative heights of the harnesses with respect to each other will depend upon the respective positions of the bottoms of the hooks on the inclined surface or recessed under-surface **32**, of the treadle. The particular position of the lam-operating hooks on the inclined surface **32**, of the treadle will determine the height of the harness controlled thereby. For example, if it is predetermined that a shed-angle of the warp is to be substantially seven degrees above and below the longitudinal axis of the shed adjacent the beaters, the lam-operating hooks will be so located along the inclined surface of the treadle and in the slots that the tops and bottoms of the harnesses respectively, will slope seven degrees from back to front harnesses. The same relationship will be true of the harnesses which form the shed-angle below the longitudinal axis of the shed. This part of the shed will be formed when the treadles which operate these particular harnesses are in the upward position, and the harnesses are resting on shelf **42**, shown in Fig. 4.

Of course, there can be as many harnesses and treadles as desired, within the dimensions of the loom. In the present instance there are seven treadles shown, and eight may be supplied. It will thus be seen that the predetermined shed-angle between the upper and lower threads of the warp will correspond with the slope of the harnesses and the eyes of the heddles therein, and the angular slope of the under-surface **32**, of the recessed portion of the treadles. By these arrangements, the shed-angle of the warp can be definitely fixed, and the provision of the rigid harness-actuating mechanism eliminates the variables due to the use of harness-ropes or other flexible harness-actuating means. There is also obtained an even tension on the warp-roll and warp-threads, as well as reduction of the lifting moment on the harnesses. Further, there is assured a substantially accurate alignment of the upper and lower threads, respectively, of the warp, leaving an unobstructed passage for the projection of the shuttle through the shed.

The operation of my invention is as follows: In order to construct a hand-loom which will occupy a minimum of floor space, and which will be easily portable, and, assuming that the harnesses are at their bottom positions on shelf **42**, the bottom portion of the shed and the angular slope thereof with reference to the longitudinal axis of said shed will determine the slope of the heddle-eyes in the bottom harnesses. Now, in order to establish the corresponding shed-angle of the top, the pedals, such as pedal 17a, for example, Fig. 4, will be depressed by the foot of the operator until it reaches the floor. This act will pull down the selected lams attached to the pedal or pedals, and raise the corresponding harnesses off shelf **42**, to their uppermost positions in order to effect the corresponding shed-angle of the warp with reference to the longitudinal axis of the shed.

As to the further operation of shuttle, beater, reed, etc. this procedure is so well known in the art of weaving that it is deemed unnecessary to repeat them here. However, it will be seen that the novel features of my invention, including my new design of treadle, have resulted in a decided advance in hand-loom construction and method of operation thereof.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a loom for weaving, adapted to produce a warp shed-angle of from four to eight degrees, the combination of thin harnesses, heddles mounted in the harnesses, treadles for operating the harnesses, the said treadles having reentrant portions recessed at an angle of from four to eight degrees with respect to the lower main surface line of the treadles, lams for the loom, hooks connected at one end thereof with the lams and the other end adapted to embrace the lower surface of the reentrant inclined under-surface of the treadles, and pivoted rigid harness-actuating linkages connecting the lams and harnesses for actuating the latter.

2. A hand loom for weaving comprising lams, harnesses and treadles operatively connected together, the said treadles each having a portion recessed from the bottom surface-line of the treadles sloping at an angle of substantially seven degrees with respect to said bottom surface-line, and each treadle having a slot with hooks inserted therethrough and the latter operatively connected to the lams.

3. A hand loom for weaving comprising lams, harnesses and treadles operatively connected together to provide a warp shed-angle of from four to eight degrees above and below the horizontal longitudinal axis of the shed respectively, the treadles each having a portion recessed from the bottom surface-line of the same, and sloping at an angle of between four and eight degrees with respect to said bottom surface-line, a slot in each treadle extending through the recessed portion, and hooks in the slot operatively connected to the respective lams as desired, to selectively actuate particular harnesses.

4. As an article of manufacture, a treadle for a hand loom having a portion of the under-surface of said treadle recessed and sloping at an angle of between four and eight degrees from the main under surface-line of the treadle.

5. A hand loom comprising the usual lams, harnesses and treadles operatively connected together, the treadles having recessed portions in their under surfaces sloping at a predetermined angle, rigid hooks connecting the treadles and lams for operating the latter, and pivoted rigid linkages connecting the lams and their respective harnesses and adapted to actuate the harnesses to occupy positions determined by the hereinabove-mentioned structural design of the treadles.

6. A hand loom comprising the usual lams, harnesses and treadles operatively connected together, the treadles having recessed portions in their under-surfaces and sloping at a predetermined angle from the latter, slots in the treadles having hooks extending therethrough and connecting with the lams at one end and adapted to embrace the bottoms of the treadles at the other, guiding-hooks in each of the lower cross-frame members of the harnesses, and pivoted rigid linkages mounted in the loom structure, the said linkages comprising push-rods extending through the guiding-hooks.

7. A hand loom comprising center uprights and the usual lams, harnesses and treadles operatively connected together, the treadles having recessed portions in their under surfaces sloping at an angle of substantially seven degrees from the latter, shelves in the center-uprights upon which the harnesses normally rest, the said shelves extending transversely of the height of the center-uprights and sloping at an angle of substantially seven degrees from one end to the other of the respective shelves, and pivoted rigid means comprising linkages and push-rods connecting the treadles, lams and harnesses for operating the latter.

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