Nov. 26, 1935. W. HOWARTH 2,022,373

TEXTILE MACHINERY

Filed June 27, 1934

FIG. 2

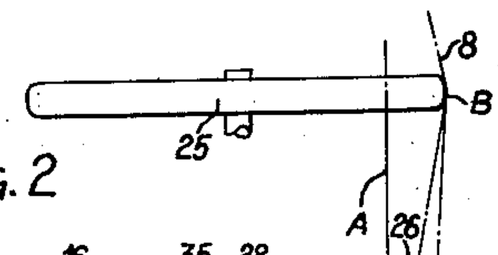


FIG. 1

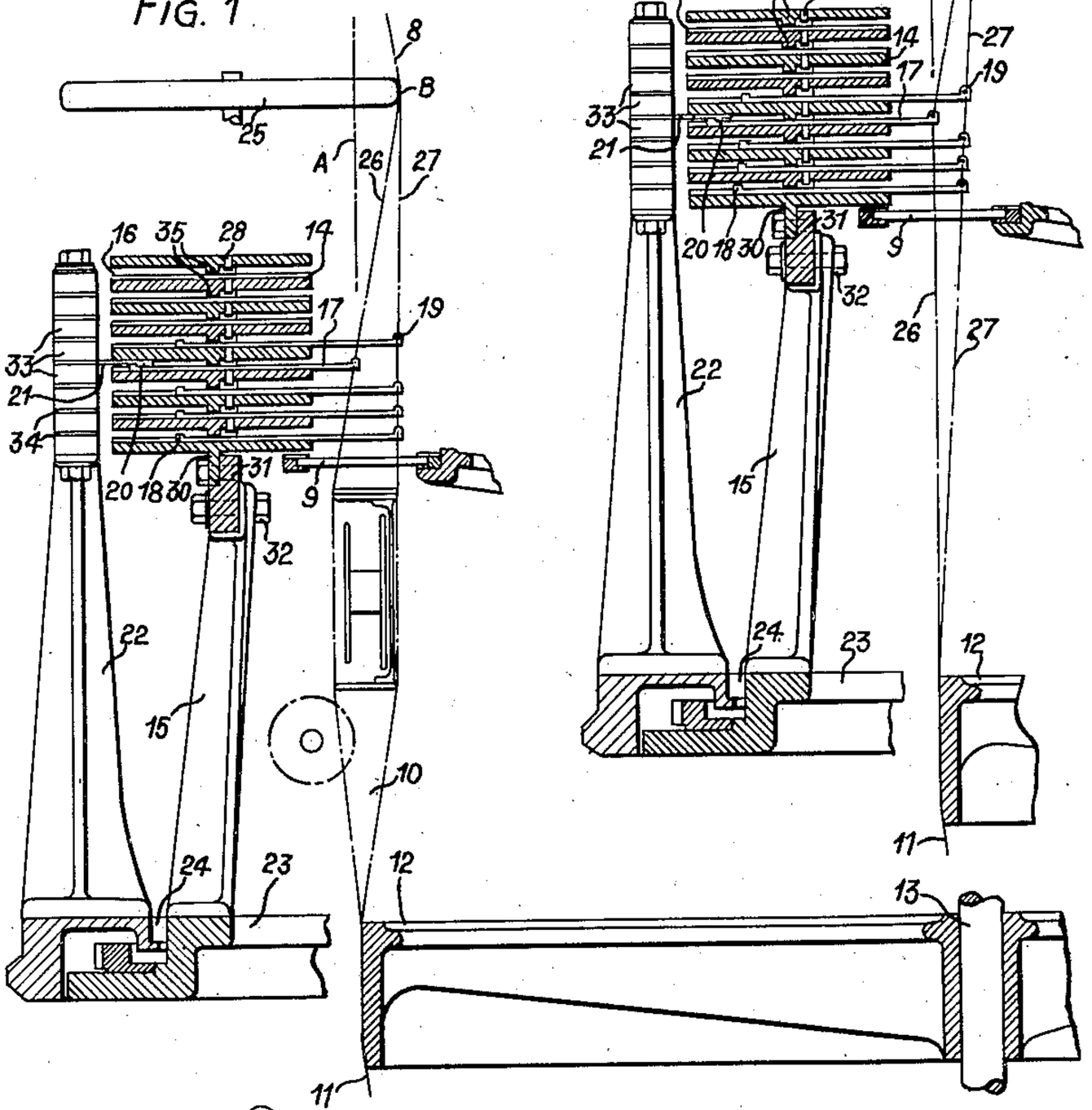


FIG. 3

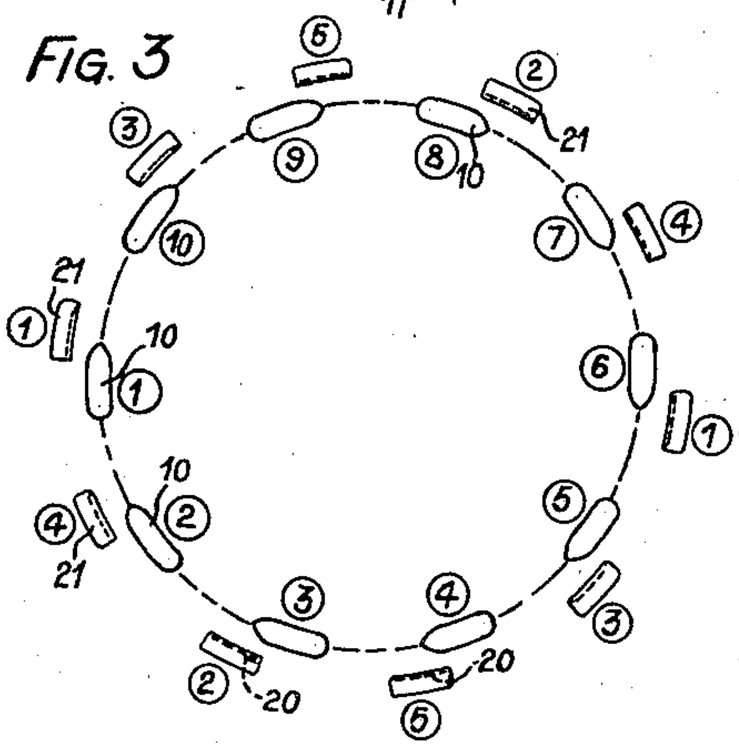


FIG. 4

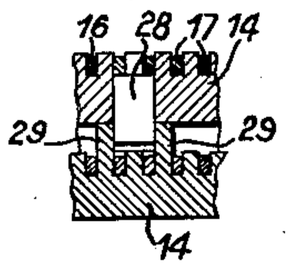


FIG. 5

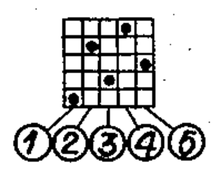


FIG. 6

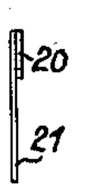
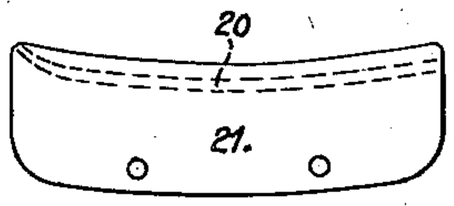


FIG. 7



WILLIAM HOWARTH
INVENTOR

By

J. Selby & A. Levinson

ATTORNEYS

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2,022,373

TEXTILE MACHINERY

William Howarth, Spondon, near Derby, England, assignor to Celanese Corporation of America, a corporation of Delaware

Application June 27, 1934, Serial No. 732,581
In Great Britain July 22, 1933

7 Claims. (Cl. 139—16)

This invention relates to textile machinery, and in particular to shedding mechanism for circular looms, the object of the invention being to provide a shedding mechanism particularly, though not exclusively, adapted for controlling closely spaced warps for the production in a simple manner of a variety of designs.

The invention, like that described in U. S. application S. No. 706,319 filed 12th January, 1934, makes use of means which lock selected warp threads in conjunction with means which press the whole of the warp threads so that the locked threads are separated from the free threads, thereby starting a shed into which the shuttle can enter to complete it by forcing the two sets of threads apart.

According to the invention, the warp threads are controlled by a plurality of banks of fine needles, the needles of each bank being supported in closely spaced slots adapted to permit a sliding movement of the needles. Projections or butts are provided on the ends of the needles remote from the warp threads for engagement at selected points round the loom periphery with restraining means. After selected needles have been engaged by such restraining means, the warp threads are pressed by means such as a rotatable wheel out of their normal line. The threads whose needles remain free are in this way deflected to one side of the shuttle nose, while the threads whose needles have been restrained remain undeflected. The shuttle then enters the space between the separated threads, and completes the shed by pressing the threads apart.

The needle banks are preferably spaced close to each other, especially where a considerable number of banks is provided.

The shedding operation calls for the needles to operate under tension only, the unrestrained needles moving freely under the tension imposed upon them by the deflected warps, while the restrained needles are held under tension to prevent the displacement of the remaining warps. The needles can thus be made very slender and the slots in the trick rings constituting the supporting banks very shallow, while the banks themselves can be placed correspondingly close together, as mentioned above. In this way the large number of controlling needles required in the weaving of fabrics containing up to, say, 150 or more threads per inch may be accommodated in a very small space while still being readily controlled.

The lightness of the needles, moreover, permits them to be easily returned to normal position as the warp threads pass out of contact with the shuttle and return to their normal line. This return of the needles, though accomplished by the warp threads pushing the needles, operates by a smooth sliding action, since the slots in the trick rings can be made long enough to engage the needles over a substantial part of their length.

The needle banks can be closely spaced even where, if it is desirable, restraining means are arranged to engage the needle butts within the length of the controlling slots. It is merely necessary to space the banks by an amount sufficient to permit the entry between the lower side of one bank and the projecting butts of the needles of the lower bank of a thin plate carrying on its underface a projection to engage the butts. This projection extends for a distance sufficient to hold the warp threads controlled by the needles engaged by the projection until separation of those threads from the others has been completed and the shuttle has passed between the separated threads. Conveniently, the needles control the warp threads directly, being formed with eyes through which the warps are threaded. With the warps in their normal line these eyes lie just clear of the slots in the trick rings.

The number of trick rings employed depends upon the spacing of the warp threads; for example for 150 warp threads per inch 5 trick rings may be employed each containing 30 needles per inch. Such an arrangement may readily be used for the production of 5-shaft satin by arranging the needles of any particular trick ring to control the first of every group of five warp threads. Then, by first restraining the warps controlled by such trick ring, these warps will be separated from the remainder while one pick is inserted, and the warps controlled by another trick ring will be restrained for the insertion of a further pick by another shuttle and so on, the fourth, second, fifth and third warps being restrained in turn to effect the usual 5-shaft satin weave.

The assembly of trick rings and associated restraining means is of very compact construction, and though conveniently placed outside the warps for easy assembly and accessibility, does not add materially to the over-all dimensions of the loom.

The arrangement may be used with the shuttles either stationary or rotating. For example, with the shuttles rotating and the warps stationary, the trick rings remain stationary with the warps, while the restraining means provided in

association with each shuttle are connected to a member rotatable with the shuttles so as to effect a restraint of selected warps immediately in advance of each shuttle just before the warp deflecting wheel, also rotatable with the shuttle, commences to form a shed for the entry of the shuttle. It is desirable that a reed be arranged between the shedding needles and the shuttle to control the spacing of the warps and to ensure smooth shedding.

Where, as is most desirable in the weaving of large fabric in relation to the loom diameter, the warp threads proceed in a vertical direction from the beams or bobbins to the fabric, the sliding movement of the needles takes place in a radial or substantially radial direction. The trick rings are placed one upon the other in the form of a flat cylinder surrounding the warps.

One form of apparatus according to the invention will now be described in greater detail with reference to the accompanying drawing in which:—

Fig. 1 illustrates in part cross-sectional elevation warp thread controlling mechanism suitable for the weaving of 5-shaft satin with 150 warp threads per inch, incorporated in a loom of the type described in U. S. application S. No. 655,560, filed February 7, 1933;

Fig. 2 is a similar view showing the formation of a warp shed prior to the entry of the shuttle therein;

Fig. 3 is a diagrammatic plan view of the shuttles of a 10 shuttle loom of the type mentioned above, and also indicates the warp-shed operating sequence in accordance with the 5-shaft satin design shown in Fig. 5;

Fig. 4 is an enlarged section of part of the needle supports, while

Figs. 6 and 7 are end elevation and plan views, respectively, of a detail of Fig. 1.

As shown in Fig. 1 a sheet of warp threads 8 proceeds downwardly in cylindrical form through a circular reed 9, past shuttles 10 (one shown), to the fabric 11 which is maintained in correct position by a spreading ring 12 borne by the central shaft 13 of the loom.

Above the level of the circular reed 9 and outside the cylinder of warps 8 a series of trick rings 14 is mounted on a number of pillars 15 arranged around the loom. The trick rings 14 are provided with radial or substantially radial tricks or slots 16 having a density (in this particular instance) of 30 to the inch, and arranged one above the other in a compact manner, as is apparent from the drawing. Needles 17 consisting of thin steel strips are accommodated within the lengths of the tricks 16 and are thus supported in banks round the loom. Each needle is formed at its outer end with a projection or butt 18, and at its inner end with an eye or "mail" 19 for engagement of the warp threads.

The butts 18 of the needles 17 are adapted to be engaged by projections 20 which are formed on short segmental plates 21 (see Figs. 6 and 7). A pillar 22 mounted just outside the outer edge of the trick rings 14, is arranged opposite the foremost edge of each shuttle 10 and carries supporting means for at least one of the short segmental plates 21. Each plate extends radially inwards between the upper edge of the butts 18, and the lower face of the trick ring 14 immediately above, so that the projection 20 depends in front of the butts 18 as is shown clearly in Fig. 1. The pillars 15 and 22 are supported on rings 23, 24 respectively, which extend round the loom, and between which there is relative rotary motion. The function of the rings 23, 24 is described in detail in U. S. application S. No. 655,560 filed February 7, 1933. In the case of weaving with rotating warps the ring 23 carrying the trick rings 14 rotates at the same rate as the warps 8, while the ring 24 carrying the plates 21 is maintained stationary. The butts 18 of the needles 17 are thus engaged in turn by the projection 20 situated over the corresponding trick ring, so that each needle is locked in position whilst its butt 18 is passing the projection.

Situated above the level of the trick rings 14 and over each plate 21 is a rotatable warp shedding wheel 25, (one shown), which is so disposed relatively to the warp threads 8 that the threads are pressed out of their normal line A to the deflected position indicated at B in Figs. 1 and 2. The tension thus imparted to the warp threads 8 draws out of the tricks 16 those needles 17 which are not restrained by engagement with a projection 20, and the warp sheet 8 is thus shedded into two sheets 26, 27 in preparation for the reception of the shuttle 10. The length of the projections 20 may be such as to release the needles 17 as the warp shed formed by the sheets 26, 27 reaches the desired width, the shuttle 10 first pressing the two divided sheets apart and then permitting them to move inwardly to their non-shedded or normal line A under the influence of the tension in the warp threads. As is clear from Figs. 1 and 2, five or more banks of needles can be arranged in relatively little height, the needles 17 (and consequently the trick rings 14) being shallow, and the plates 21 which pass between the trick rings being very thin. The trick rings 14 provide for support of the closely spaced needles 17 over a substantial portion of their length, including the portion of each needle which is engaged by the projection 20.

For the weaving of a 5-shaft satin the warp threads 8 are divided amongst five trick rings 14 in the following manner:—

The first of every five warp threads is threaded through the eye 19 of a needle 17 connected to one trick ring 14. Of the four remaining threads of each group of five the fourth threads are threaded through the eyes 19 of the needles 17 of the next trick ring, and every second, fifth and third through the eyes of the needles of the third, fourth and fifth rings.

The plates 21 are disposed on the pillars 22 at heights which enable the projections 20 to restrain in turn the needles 17 of the several trick rings 14. At the second shuttle 10 the warp threads 26 restrained by the needles 17 of the fourth trick ring form the outer sheet of the shed as shown in Figs. 1, 2 and 3, the threads 27 connected to the needles of the remaining four banks being pushed outwardly by the shedding wheel 25; at the third shuttle after the return of the warp threads to the position A every second thread is restrained; at the fourth shuttle every fifth thread is restrained, and so on, according to the design shown in Fig. 5.

It will thus be clear from the foregoing description that five banks of needles are used for weaving a 5-shaft satin fabric in a loom having ten shuttles. Thus with 30 tricks to the inch 5 trick rings accommodate 150 needles per inch so that each warp thread is controlled by one needle. For more shafts a correspondingly greater number of trick rings is brought into use, and different or more intricate designs such as, for example, plain weaves, hopsacks or twills

may be obtained by the use of more trick rings. If desired, the number of tricks per inch may be varied by changing the trick rings for rings of finer or coarser pitch. Figs. 1 and 2 show how further trick rings, for the support of further banks of needles, can be accommodated in accordance with the weave desired.

The trick rings 14 are held in place one above the other by pins 28 (see Fig. 4) which project from the under side of each trick ring and are engaged by extensions 29 of some of the trick walls immediately below. As many securing pins 28 as desired may be arranged at suitable intervals around the trick rings. The lowermost trick ring 14 is provided with a depending lug 30 by which the ring is secured to a further ring 31 which in turn is secured to the supporting pillar 15 by a bolt 32. The uppermost ring 14 has a plane upper surface and merely serves to hold the needles 17 immediately beneath in place in their tricks 16. All but the lowermost trick ring are provided with a depending annular lug 35 which prevents accidental complete withdrawal of the needles from their tricks, by contacting with the inner side of the butts 18.

If desired, the needles 17 of more than one trick ring 14 may be operated at each shuttle 10. The pillars 22 are therefore adapted to carry more than one plate 21 at any one shuttle, and at appropriate heights relatively to the trick rings. If the needles of one trick ring only are to be restrained, (as shown in Fig. 1), it is arranged that each pillar 22 can support a plate 21 at the height of any trick ring so that at any shuttle any particular set of threads can be restrained. Spacing members 33 maintain the plates 21 in correct relation, while packing rings 34 enable the spacing members 33 to be maintained in correctly spaced relation during the absence of a plate 21 from any trick ring.

Means preferably are employed to bring weaving to an end on breakage of warp or weft threads as described, for example, in U. S. applications Serial Nos. 655,560 filed February 7, 1933 and 672,379 filed May 23, 1933. In this way the shedding operation ceases and with the shuttles and warps rotating together, as described in the above mentioned specifications, the mechanism rotates idly until the whole loom is brought to a standstill for rectification of the defect.

What I claim and desire to secure by Letters Patent is:—

1. Shedding mechanism for a circular loom, comprising a plurality of banks of shedding needles adapted to engage the warp threads, the needles in each bank being supported in closely spaced slots adapted to permit sliding of said needles therein, means to engage the warp threads and to deflect them substantially in the direction of the slots, and means to prevent needles in selected banks being moved along their slots by the deflection of the warp threads in engagement with such needles.

2. Shedding mechanism for a circular loom, comprising a plurality of banks of shedding needles adapted to engage the warp threads, the needles in each bank being supported in closely spaced slots adapted to permit sliding of said needles therein, means to engage the warp threads and to deflect them away from the needle banks so that the threads tend to draw said needles along said slots, and means to restrain needles in selected banks against the drawing tension of the threads in engagement with such needles.

3. Shedding mechanism for a circular loom, comprising a plurality of banks of shedding needles adapted to engage the warp threads, the needles in each bank being supported in closely spaced slots adapted to permit sliding of said needles therein, means to engage the warp threads and to deflect them away from the needle banks so that the threads tend to draw said needles along said slots, a butt on each needle, and means disposed around said banks and adapted to engage the butts of needles in a selected bank so as to restrain said needles against the drawing tension of the threads in engagement with such needles.

4. Shedding mechanism for a circular loom, comprising a plurality of banks of shedding needles adapted to engage the warp threads, the needles in each bank being supported in closely spaced slots adapted to permit sliding of said needles therein, warp-shedding wheels disposed around said banks and adapted to deflect the warp threads substantially in the direction of the slots in said banks, and means to restrain needles in selected banks against movement along their slots under the influence of the deflected warp threads in engagement with such needles.

5. Shedding mechanism for a circular loom, comprising a plurality of trick-rings arranged in superposed relation and extending round the loom, a plurality of warp-thread engaging needles slidably housed within the tricks of said trick rings, means adapted to engage the warp threads and to deflect them substantially in the direction of the tricks, and means to restrain needles in selected trick rings against movement along their tricks under the influence of the deflected warp threads in engagement with such needles.

6. Shedding mechanism for a circular loom, comprising a plurality of trick-rings extending round the loom in superposed relation, adjacent rings being spaced apart, a plurality of banks of warp-thread engaging needles slidably housed within the tricks of said trick-rings, a butt on each needle, means to engage the warp threads and to deflect them substantially in the direction of said tricks so that the warp threads tend to draw said needles along said tricks under tension, at least one plate between which and the trick rings there is relative motion, and a projection on said plate, said plate being adapted to extend between adjacent trick rings so that said projection engages the butts of needles in a selected bank and restrains said needles against the drawing tension of the threads in engagement with such needles.

7. Shedding mechanism for a circular loom, comprising a plurality of banks of shedding needles adapted to engage the warp threads and disposed outside the warp circle, the needles in each bank being supported in closely spaced slots adapted to permit sliding of said needles therein, means to engage the warp threads and to deflect them inwardly with respect to the warp circle, and means to prevent needles in selected banks being moved along their slots by the deflection of the warp threads in engagement with such needles.

WILLIAM HOWARTH.