April 18, 1939. F. C. HALE ET AL 2,154,900

SHUTTLE FOR CIRCULAR LOOMS

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FIG. 1

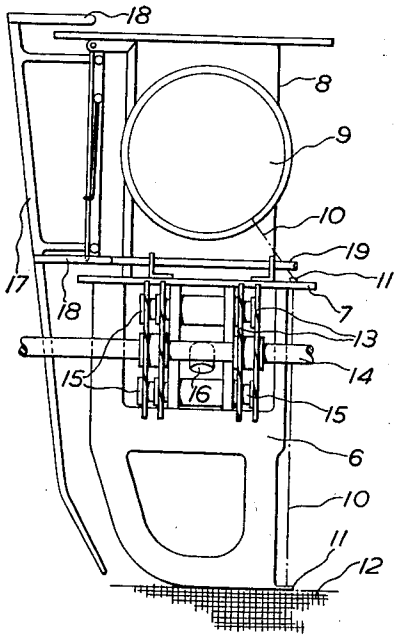


FIG. 2

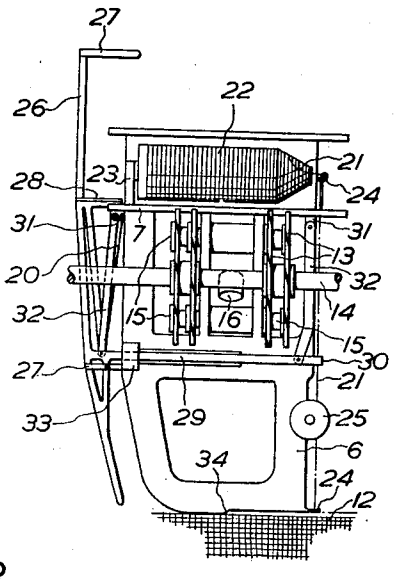


FIG. 3

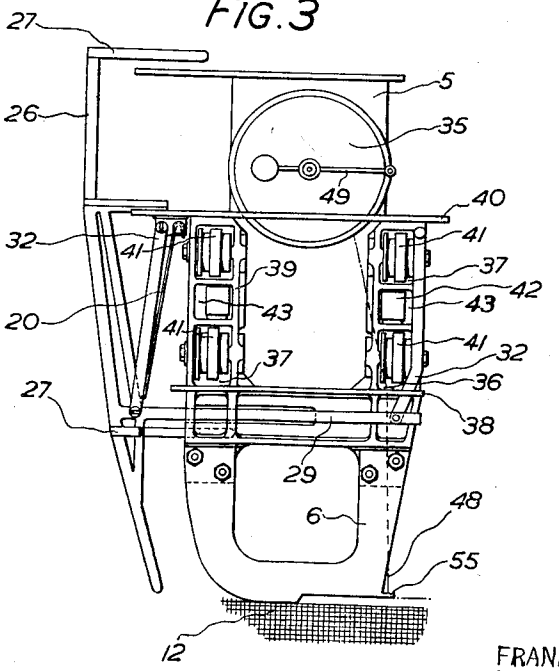


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FIG. 4

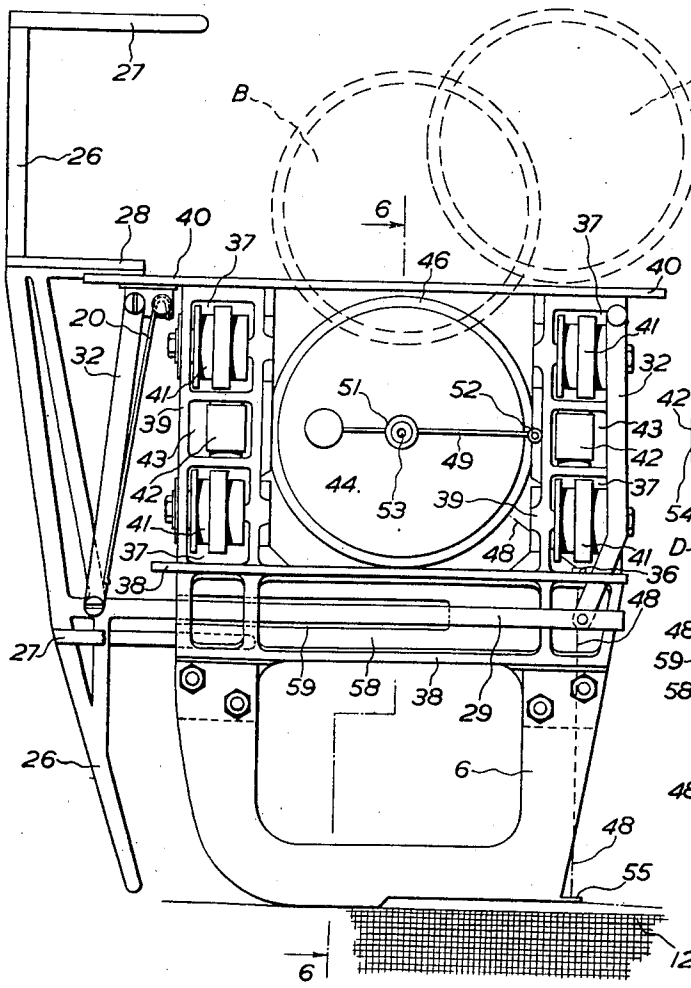



FIG. 6

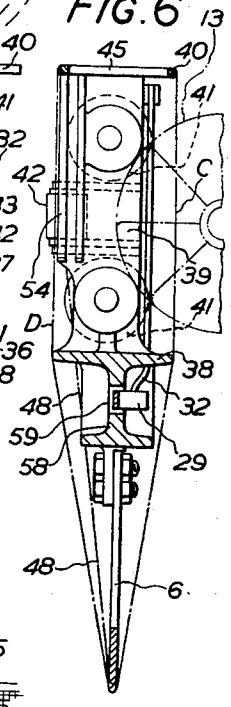
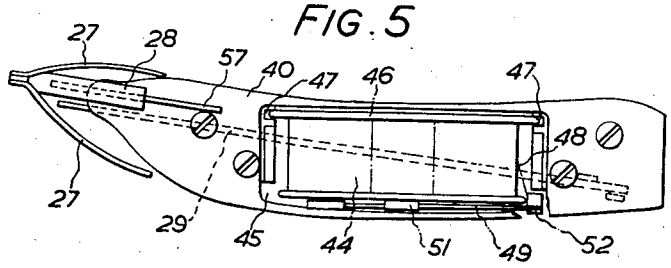



FIG. 5

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Patented Apr. 18, 1939 2,154,900

# UNITED STATES PATENT OFFICE

2,154,900

## SHUTTLE FOR CIRCULAR LOOMS

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Application February 10, 1938, Serial No. 189,790
In Great Britain February 22, 1937

5 Claims. (Cl. 139—13)

This invention relates to circular loom shuttles of the type which are held within the warp shed by means of vane wheels penetrating one sheet of the shed to contact with a shuttle, while allowing the threads of that sheet to pass through the slots in the vane wheels, and by means of a supporting race at the other side of the shuttle against which rolling contact is made through the other sheet of the shed to provide a thrust opposing the thrust of the vane wheels.

The object of the invention is to provide a shuttle capable of accommodating a large supply of weft in relation to the size and weight of the shuttle and to improve the positioning of such shuttle within the shed.

The circular loom shuttle according to the invention comprises means disposed at one side of the shuttle for engaging the vane wheels, rolling means disposed at the opposite side of the shuttle for engaging the support and providing a thrust opposing the thrust of the vane wheels, and means for holding a weft supply package in a position such that the centre of gravity of the shuttle falls substantially at a level near which the supporting thrusts are applied to the shuttle. A further feature of the invention consists in so constructing the shuttle that the thrust between the shuttle and the fell of the cloth results in little or no twisting movement to be overcome by the vane wheels; in this way, damage to the vane wheels is avoided.

In one form of shuttle according to the invention, the supply package takes the form of a thick cop-like body lying paralel to and close alongside the shuttle supporting means. Another form of package comprises a thick flat spool of relatively small diameter, from the periphery of which the yarn is guided by a rotatable member such as an arm or by a circular ring or disc to assist in the unwinding. The yarn may, however, be unwound from the interior of the spool.

In a shuttle comprising rollers for engaging the vane wheels, the rollers may be positioned in a manner such as to allow of a spool or other weft package being supported in the shuttle between the rollers so that the centre of gravity of the package substantially coincides with that of the shuttle as a whole.

By way of example forms of shuttle according to the invention will now be described in greater detail with reference to the accompanying diagrammatic drawings, of which

Fig. 1 is a front elevation of a circular loom shuttle as described in U. S. Patent No. 2,108,120, and is included in the present drawings for purposes of comparison with the shuttles according to the invention:

Figs. 2 to 4 are front elevations of different forms of shuttle according to the invention;

Fig. 5 is a plan of the shuttle shown in Fig. 4; and

Fig. 6 is a part cross-sectional elevation of the same shuttle viewed along the line 6—6 of Fig. 4.

Referring to Fig. 1 the shuttle comprises a base plate 6 and a superstructure 8 which is supported on a plate 7 and carries a weft spool 9 from which weft 10 is fed via guides 11 to the fabric 12, a substantial portion of the length of the base plate 6 pressing on the fell of the fabric 12 to beat up weft laid by the preceding shuttle. The shuttle is positioned in the loom by pairs of vane wheels 13 mounted on and driven by a shaft 14, the vane wheels passing through the warp threads and engaging pairs of flanged rollers 15 mounted for rotation about substantially horizontal axes at two different levels on the plate 6. The shuttle is supported from the side nearest to the loom axis by the edge of a race (not shown) which engages a roller 16 mounted for rotation about a substantially vertical axis on the plate 6 between the levels of the upper and lower rollers 15.

A warp thread jam detector 17 formed with feeler wings 18 is supported by the shuttle so as to project from the front thereof, and on meeting jammed warp threads is pushed rearwardly towards the shuttle, such rearward motion causing a horizontal rod 19 connected to the detector 17 to be propelled rearwardly through a warp sheet to actuate means for bringing to an end relative circular motion between the shuttle and the warp threads.

For more detailed description of the construction and operation of the shuttle reference may be had to the above-mentioned patent.

In the shuttles according to the invention illustrated in Figs. 2 to 6 the vertical overall dimension is considerably reduced, and the weft supply package is so disposed that, as viewed in the front elevations of Figs. 2, 3 and 4, the centre of gravity of the shuttle falls within the rectangle having as its corners the four contact points between the vane wheels and the flanged rollers.

Thus, referring to Fig. 2, weft thread 21 is supplied from a large cop 22 which is supported horizontally close to the plate 7 by a bracket 23 upstanding from the plate, the bracket carrying a spindle (not shown) which enters the bore of the bobbin. The weft thread 21 unwinds from the end of the cop 22 and proceeds to the fabric 12

via guides 24. A tensioning device 25 disposed at the rear of the plate 6 engages the weft thread 21 as it passes to the fabric and subjects the weft to regular tension.

As is apparent from the drawings, the centre of gravity of the bobbin 22 is not far distant from that of the shuttle as a whole, i. e. only a little above the levels at which the supporting thrusts are applied to the shuttle by the vane wheels 13 and the roller 16. The bobbin may be replaced by a cop or like thread package adapted to be supported in a similar manner close to the plate 7. The package may, with advantage, be wound on a flat support so that its thickness is less than its height, or in other words, so that more weft thread can be accommodated than by a cylindrical cop-like package having a diameter limited to the relatively small thickness of the shuttle.

The shuttle supports a warp thread jam detector 26 formed with feeler wings 27, the detector being guided in a straight path towards the shuttle on meeting an obstruction by a projection 28 which is adapted to slide to and fro in a slot formed in the leading end of the plate 7. The detector is formed with an elongated extension 29, the tip 30 of which is propelled through a warp sheet to actuate the means for bringing weaving to an end in the manner described with reference to the rod 19 of Fig. 1.

The detector 26 is supported in the shuttle by links 32 which are pivotally connected at their upper ends to brackets 31 formed on the plate 6, and at their lower ends to the extension 29, so that the detector and associated extension are pivotally hung in the shuttle and thus are very sensitive in operation. A light cantilever spring 20 secured to the leading bracket 31 and bearing at its end on the leading link 32 normally holds the detector 26 in its forwardly extending position and returns the detector to such position after the clearing of a warp jam detected by the member.

The extension 29 is carried below the lower pair of rollers 15 and is guided by a sleeve 33 formed on the plate 6 and through which the extension passes. Such mounting of the extension enables the centre of gravity of the detector member system comprising the member 26, wings 27, links 32 and the extension 29 to be low with respect to the level of the roller 16, and thus assists in maintaining the centre of gravity of the shuttle as a whole substantially at the level at which the supporting thrusts are applied to the shuttle by the vane wheels 13 and roller 16.

The portion of the shuttle carrying the weft supply package 22 may be made in the form of a light moulding, pressing or stamping, e. g. of synthetic resin, aluminium, or other light material. Because of the compactness of the package, this portion of the shuttle body is small in height, with consequent advantage as regards low mass and close positioning of the center of gravity of the mass to that of the shuttle as a whole.

The lower or beat-up edge of the plate 6 is cut away at 34 from a point substantially beneath the roller 16 so that no thrust between the fell of the fabric 12 and the base of the shuttle takes place rearwardly of such point. In this way the tendency for the shuttle to be tilted anti-clockwise is reduced, and in consequence the thrust between the fell of the fabric and the shuttle is taken squarely by the lower pair of flanged rollers 15 and the vane wheels 13. This feature of the cutting away of the base plate from a point substantially beneath the centre of gravity of the shuttle is also shown in Figs. 3 and 4, Figure 4 showing a form of shuttle according to the invention on larger scale.

Referring to Figs. 3 and 4, the shuttles each comprise a base plate 6 of less depth than that described with reference to the shuttle of Fig. 2, the plate being bolted to a stiff supporting member 38 which is formed with upstanding brackets 39 at its ends, the brackets supporting a plate 40. Two pairs of flanged rollers 41, for engagement by the vane wheels (omitted from Figs. 3 and 4 for clarity of illustration), are mounted in openings 37 formed in the brackets 39, and between the flanged rollers in each bracket there is mounted in an opening 43 a race-engaging roller 42, the latter rollers each rotating about a substantially vertical axis.

The shuttle illustrated in Fig. 3 carries a flat weft spool 35, the spool being supported by a vertical plate 5, upstanding from the plate 40, in a manner such that the lowermost point of its edge is not far removed from the axis of the upper rollers 15. Weft thread 48 is unwound from the spool by a balanced rotatable arm 49 (described in greater detail with reference to Fig. 4) and proceeds to a guide eye 55 formed on the rear of the lower edge of the plate 6, where the thread is laid at the fell of the fabric 12 to be beaten up by the base plate 6 of the succeeding shuttle. The shuttle carries a warp thread jam detector 26 generally similar to that described with reference to Fig. 2, and described in greater detail with reference to Fig. 4.

Fig. 4 shows on larger scale another form of shuttle according to the invention in which the weft supply is carried between the flanged rollers 15 which co-operate with the vane wheels.

A weft spool 44 is lowered into the shuttle through an opening 45 formed in the plate 40, and the rear flange 46 of the spool is guided by and gripped in vertical slots 47 formed in the brackets 39. The figure shows in dotted line at A and B the positions occupied by the spool 44 on being placed in or removed from the shuttle. Fig. 6 shows in chain lines C and D the paths followed by the sheets of warp threads, the figure showing how the edge of the top plate 40 and a portion of the member 38 guide the warp threads clear of the mechanism of the shuttle on the right-hand side thereof, and how the pair of rollers 42 protrude through the warp threads D for engagement by the circular race (not shown).

Weft 48 is unwound from the spool 44 by a balanced rotatable arm 49 which is pivoted at 51 in the spool body and carries a guiding eye 52 at the end of the arm. The weft thread passes from the spool to the eye 52 (see Fig. 5), and from the eye to an aperture 53 formed centrally of the pivot 51 and leading to the back of the spool to a point 54 (see Fig. 6). From the point 54 the weft thread proceeds down the back of the shuttle (Figs. 4 and 6) through a guide eye 36 in the member 38 to a guide eye 55 formed at the rear of the lower edge of the plate 6 where the thread is laid at the fell of the fabric 12 to be beaten up by the base plate 6 of the succeeding shuttle. The tension in the weft may be regulated by varying the resistance to rotation of the arm 49.

As described with reference to Figs. 2 and 3, the shuttle carries a warp thread jaw detector 26 formed with feeler wings 27 and a guiding projection 28 slidable in a slot 57, the slot being formed in the top plate 40 of the shuttle. The

right-hand supporting link **32** for the extension **29** is cranked inwardly with respect to the shuttle at its lower end (see Fig. 6) to reduce the extent to which the link and the extension project from the web **58** of the member **38**. The web **58** is slotted at **59** to allow of the extension being of straight construction (see Fig. 5) and hence stiff and rigid in operation.

With shuttles constructed as above described, the resultant thrust between the shuttle and the vane wheels is substantially equally distributed between the flanged rollers engaging the vane wheels at two different levels, so that each vane wheel engages the flanges of the rollers smoothly, thus avoiding damage to the vanes such as might lead to the production of sharp edges capable of endangering the warps.

Having described our invention what we desire to secure by Letters Patent is:

1. A circular loom shuttle of the type adapted to be positioned and supported within a warp shed by vane wheels engaging pairs of rotatable rollers disposed in axially aligned relation at two different levels in the shuttle at one side, and rolling means for engaging an annular support at the opposite side to provide a thrust opposing the thrust of the vane wheels, said shuttle comprising means for holding a weft supply package in such a position that the center of gravity of the shuttle and weft package as viewed from the side falls within the polygon having as its corners the four contact points between the vane wheels and the rotatable rollers.

2. A circular loom shuttle of the type adapted to be positioned and supported within a warp shed by vane wheels engaging pairs of rotatable rollers disposed in axially aligned relation at two different levels in the shuttle at one side, and rolling means for engaging an annular support at the opposite side to provide a thrust opposing the thrust of the vane wheels, said shuttles comprising means for holding a cop-like weft supply package above but close to the upper pair of rotatable rollers so that the center of gravity of the shuttle and weft package as viewed from the side falls within the polygon having as its corners the four contact points between the vane wheels and the rotatable rollers.

3. A circular loom shuttle of the type adapted to be positioned and supported within a warp shed by vane wheels engaging pairs of rotatable rollers disposed in axially aligned relation at two different levels in the shuttle at one side, and rolling means for engaging an annular support at the opposite side to provide a thrust opposing the thrust of the vane wheels, said shuttles comprising means for holding a flat weft spool in the plane of the shuttle in a position between the rotatable rollers at the front of the shuttle and those at the rear so that the center of gravity of the shuttle and weft package as viewed from the side falls within the polygon having as its corners the four contact points between the vane wheels and the rotatable rollers.

4. A circular loom shuttle of the type adapted to be positioned and supported within a warp shed by vane wheels engaging pairs of rotatable rollers disposed in axially aligned relation at two different levels in the shuttle at one side, and rolling means for engaging an annular support at the opposite side to provide a thrust opposing the thrust of the vane wheels, said shuttles comprising means for holding a weft supply package in such a position that the center of gravity of the shuttle and weft package as viewed from the side falls within the polygon having as its corners the four contact points between the vane wheels and the rotatable rollers, and a plate for beating-up weft at the fell of the fabric, the beat-up edge of the plate being cut away from a point substantially beneath the center of gravity of the shuttle and extending along the plate to the rear of the shuttle so that no thrust between the fell of the fabric and the shuttle takes place rearwardly of said point.

5. A circular loom shuttle of the type adapted to be positioned and supported within a warp shed by vane wheels engaging pairs of rotatable rollers disposed in axially aligned relation at two different levels in the shuttle at one side, and rolling means for engaging an annular support at the opposite side to provide a thrust opposing the thrust of the vane wheels, said shuttle comprising means for holding a weft supply package in such a position that the center of gravity of the shuttle and weft package as viewed from the side falls within the polygon having as its corners the four contact points between the vane wheels and the rotatable rollers, a warp jam detector, a member controlled thereby and adapted to be propelled by the detector through a sheet of the warp shed to actuate means for bringing weaving to an end on jamming of the warp threads, and means disposed beneath the shuttle-supporting means for carrying said member.

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