

Oct. 22, 1940.

F. S. HARDY

2,218,608

CIRCULAR LOOM

Filed Oct. 20, 1939

2 Sheets-Sheet 1

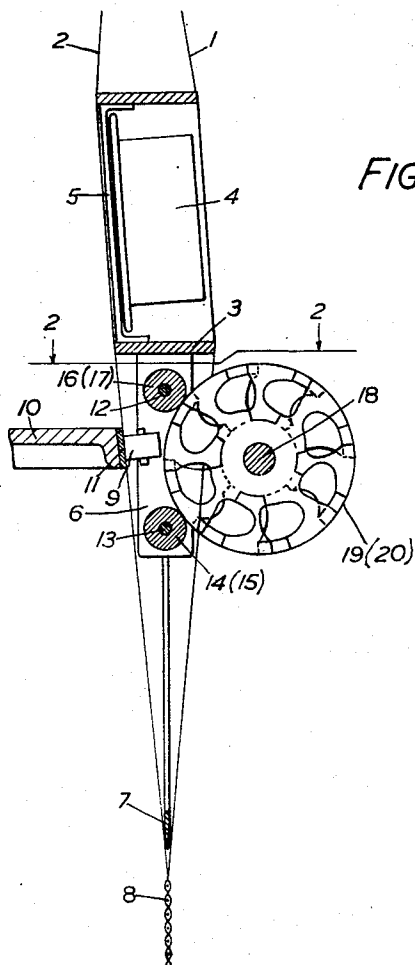


FIG. 1

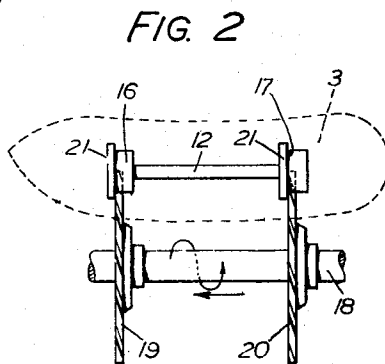


FIG. 2

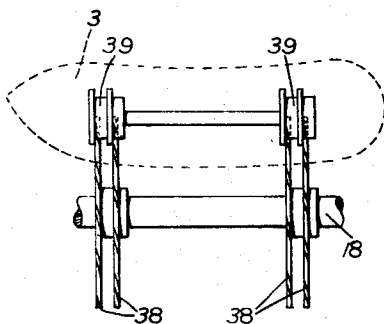


FIG. 3

F. S. HARDY
Inventor

by
[Signature]
Attorneys

Oct. 22, 1940.

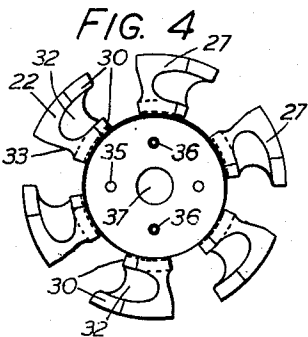
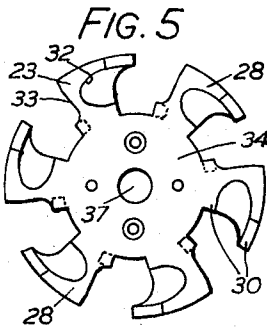
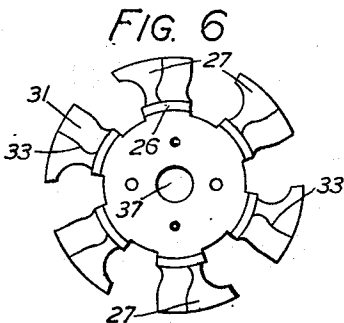
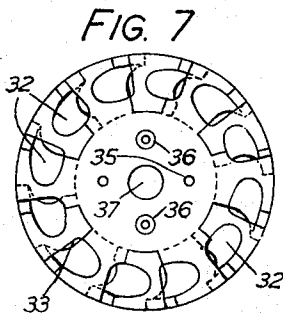
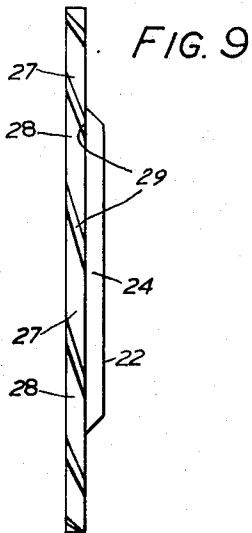
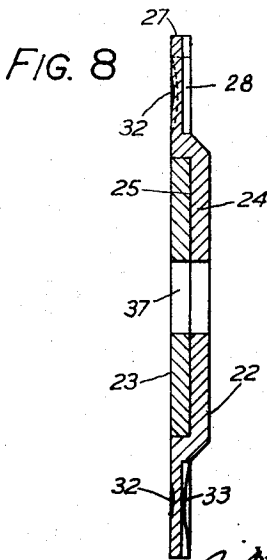
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CIRCULAR LOOM

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2 Sheets-Sheet 2



F. S. HARDY
Inventor

by *J. H. Hardy & Co.*
Attorneys

UNITED STATES PATENT OFFICE

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CIRCULAR LOOM

Frederick Sutton Hardy, London, England, assignor to Celanese Corporation of America, a corporation of Delaware

Application October 20, 1939, Serial No. 300,339
In Great Britain November 9, 1938

2 Claims. (Cl. 139—13)

This invention relates to improvements in or relating to circular looms, and in particular to the shuttle-holding means of circular looms.

The invention is particularly concerned with shuttle-holding means of the type comprising a vane wheel with inclined slots between the vanes adapted to be rotated about its axis at one side of a sheet of warps, so that while its contact with flanged rollers in a shuttle at the other side of the sheet serves to position the shuttle in the shed, its rotation permits the threads of the sheet to pass via the slots between the vanes from one side of the vane wheel to the other. Two vane wheels or two pairs of vane wheels of this character may be used to engage one side of the shuttle, their thrust against the barrels of the flanged rollers being opposed by the contact through the warp sheet at the other side of the shuttle of a roller carried by the shuttle body with a circular race concentric with the loom axis. The vane wheels each make contact with two flanged rollers spaced apart in the shuttle body, and with the shuttle thus positioned propulsion of the shuttle relative to the warps is effected by the contact of the faces of the vane wheels with the flanges of the flanged rollers. In cases where the warps remain stationary, the shuttles are caused to revolve round the axis of the loom by carrying the vane wheels bodily round the loom.

According to the invention, a vane wheel of the above character has a built-up construction so that the surfaces of the vanes normally forming the walls of the slot between the vanes are accessible for polishing before the separate elements of the vane-wheel are assembled. Accordingly, a vane-wheel according to the invention comprises a plurality of elements each having a plurality of vanes with inclined edges, the vanes of each element being spaced apart so that the elements may be assembled with the vanes of one element separated from the vanes of another element by narrow slots formed between the inclined edges of the vanes, and means for securing the elements together in such assembled relationship.

Thus, an 8- or 12-bladed vane wheel may be made as two elements each comprising 4 or 6 equally spaced vanes, the spaces between pairs of vanes of one element serving to receive a vane of the other element, so that when the two elements are assembled together by a kind of screwing motion the vanes of the two elements alternate with each other, the whole assembly having a truly circular periphery and a

plane face at least at the side intended to make contact with the flanges of the flanged rollers.

As with a vane wheel made out of the solid, the periphery and the face are interrupted by the slots, the inclination of the slots being such that continuous contact is made between the periphery and the barrel of each flanged roller; again, as regards the face, substantially smooth contact is made with the flanges of the rollers. In addition, smooth running may be obtained by staggering the positions of the slots of one vane wheel with respect to those of any other vane wheel used to support any one shuttle.

A further feature of the invention consists in increasing the thickness of the slots towards the roots of the vanes by hollowing out the faces of the vanes, this being possible because of the built-up construction of the vane wheels. By this opening-up, greater space is left for the warp threads at the farthest point reached by the threads during the penetration of the warp sheet by the vane wheels. The further space thus provided reduces the deflection from the normal line occupied by the warp threads in the loom forced on the threads by the vane wheels as they pass from one side of the vane wheels to the other. In this way the wearing action of the vane wheels on the warp threads is much reduced, which is especially important where the warp threads consist of low twist continuous filament yarns, easily liable to damage. The hollowing out only starts at some distance from the peripheral edge of the vanes, so as to leave plane the portion of the face of the vane-wheel that engages the flange of a flanged roller.

The invention is also important in that it enables the whole surface of the vane wheels making contact with the warp threads to be highly polished, it being possible to obtain access to both faces of each slot, since the faces are formed on the separate elements from which the vane wheel is built up. It is therefore possible to machine and polish the slot faces before the vane wheels are hardened. Likewise, the hollowing out of the slots near the roots of the blades is rendered more simple, since there is available the whole of the gap later to be occupied by a blade of the other element of the vane wheel. Thus, the faces of the slots may be shaped by hobbing.

Hardening of the vane wheels is advisable to enable the loom to run for long periods without attention, it being important to avoid any wearing of the vane wheels or flanged rollers such

as might lead to cutting of the warp threads. Preferably, however, the hardening operation is of the type that leads to no distortion of the vane wheels, so that the whole of the machining, grinding and preliminary polishing, and, if desired, preliminary running-in, may be performed before hardening, leaving only final polishing to be performed afterwards. The nitriding process is particularly suitable for hardening the vane wheels without material distortion. A similar process may be used for hardening the flanged rollers.

The invention will now be described in greater detail with reference to the accompanying drawings, in which—

Fig. 1 is a diagrammatic vertical section of a shuttle and its supporting means;

Fig. 2 is a diagrammatic plan view taken on the line 2—2 of Fig. 1;

Fig. 3 is similar to Fig. 2, but shows a slight modification;

Figs. 4 and 5 are side elevations of two elements of a vane wheel;

Fig. 6 shows the reverse side of the element shown in Fig. 4;

Fig. 7 shows the elements of Figs. 4 and 5 when assembled; and

Figs. 8 and 9 are sectional and end elevations respectively of the assembly shown in Fig. 7.

Referring to Figs. 1 and 2, 1 is an exterior sheet of warp threads, and 2 an interior sheet between which the shuttle 3 is caused to pass to lay weft for the spool 4. The shuttle comprises an upper part 5 carrying a spool 4, an intermediate body portion 6 and a beat-up edge 7 extending to the fell of the fabric 8. In the body portion 6, a roller 9 is mounted for free rotation about a slightly inclined axis so as to bear against a circular race 10 having a rubber cover 11. On horizontal axes 12, 13 are mounted flanged rollers 14, 15 and 16, 17 respectively. Outside the shuttle is arranged a horizontal shaft 18 arranged to be rotated in an anti-clockwise direction as viewed in Fig. 1 and also to be driven round the loom in the direction of the arrow shown in Fig. 2, these rotations being effected by means with which the present invention is not concerned. On the shaft 18 are mounted vane wheels 19, 20 for engagement respectively with the flanged rollers 14, 16 and 15, 17. By the engagement of each vane wheel 19, 20 with the body portions of a pair of flanged rollers and by the thrust of the roller 9 against the circular race 10 the shuttle 3 is held in position between the warp sheets 1, 2. By the engagement of the left-hand faces of the vane wheels, as viewed in Fig. 2, with the right-hand faces of the flanges 21 of the four flanged rollers the shuttle 3 is propelled round the loom at the same speed as the shaft 18 about the axis of the loom.

As the shuttle rotates the threads of the inner warp sheet 2 pass between the roller 9 and the rubber race 11. The threads of the outer sheet 1 have to pass from the left-hand to the right-hand side of each vane wheel. For this purpose the vane wheels are slotted, the nature of the slots being more clearly shown in Figs. 4-9. Each vane wheel is made as two elements 22, 23 shown in Figs. 4 and 5 respectively. The element 22 comprises a central boss 24 recessed at 25 to provide a narrow rim 26 from which project vanes 27. The vanes are six in number and are spaced apart to accommodate the corresponding vanes 28 of the element 23 as will appear later.

The circumferential length of the vanes 27, 28 is such that when the elements 22, 23 are assembled there exists between the vanes a slot 29 (Fig. 9) making an acute angle with the faces of the vane wheel. The faces 30, 31 of the slots are indicated in Figs. 4 and 5, from which it will be seen that the faces are readily accessible for initial machining and final polishing, because of the wide gap existing between adjacent vanes 27 or 28 of the separate elements 22, 23.

The faces 30 are also cut away as shown at 32 to reduce the thickness of the vanes 27, 28 towards their roots. Though the cutting-away of the faces 30 extends into the face of the element itself, it starts some distance from the periphery of the element so as to leave a plane face for engagement with the flange of a flanged roller. A similar, but slighter hollowing of the reverse faces 31 of the slots is also effected as indicated at 33 of Fig. 6 and also apparent in Figs. 4 and 5. By this cutting away of the faces, the slots are widened at the part where the deepest penetration of the warp threads into the slots takes place (see Figs. 1, 4 and 5), and, instead of being sharply bent in their passage through the slots from one side of the vane-wheel to the other, the warp threads make this necessary passage with relatively slight deflection from their normal line.

The element 23 is placed against the element 22 and is assembled therewith by a screwing motion that brings the vanes 28 between the vanes 27, the central annulus 34 of the element 23 then occupying the recess 25 in the boss 24 of the element 22. The two elements are located by dowel pins inserted at 35 and secured together by screws inserted at 36. In this way, the two elements 22, 23 are held concentric with one another and their vanes are accurately spaced to give uniform widths to the slots between the vanes. The central holes 37 fit the shaft 18, to which the assembly is secured in any convenient way.

Because of the space between the vanes 27 or 28 of each elements 22 or 24, machining of the faces 30, 31 to the inclination required in the slots in the assembled vane wheel is readily effected, e. g., by milling. The hollow portions 32, 33 of the faces can also be readily produced, e. g., by filing or by mechanical means such as hobbing. After machining, all faces can be highly polished preparatory to hardening. Again, after hardening, final polishing can be effected before assembly of the two elements. It has been found desirable to pay particular attention to polishing after hardening, since the hardening process itself may result in some minute modification of the metal surface which would be harmful to delicate textile threads. Yet, notwithstanding the difficulty of polishing highly hardened surfaces, the accessibility of the disassembled elements makes it possible to apply materials capable of achieving a high polish, whereas with vane wheels cut in a single solid element, polishing of this character is virtually impossible.

The nitriding process is particularly suitable for hardening the vane wheels, because it produces negligible distortion. It is thus possible for the built-up vane wheel when assembled to have substantially the same accuracy as one cut from a single piece of steel, with the added advantage that all its surfaces may be highly polished, and, moreover, provided with the cut-away portions 31, 33, neither of which features is readily obtainable in a solid vane wheel.

The angle of the slots is such that the front end of one vane 27 overlaps the rear end of the next vane 28, and so on, as is indicated in Figs. 2 and 9. This enables continuous peripheral contact to be maintained between the vane wheel and the flanged rollers. Advantageously, however, the vane wheel 20 is so positioned on the vane 18 that its slots are staggered with respect to those of the vane wheel 19, so as to minimise the effect on the accurate positioning of the shuttle 3 of the interrupted peripheries of the vane wheels. The distance between the vane wheels 19, 20 on the shaft 18 exactly equals that between the pairs of flanged rollers 14, 15 and 16, 17, so that the circumferential thrust of the shaft 18 is distributed as equally as possible between the four flanged rollers. In spite of the interruption of the front faces of the vane wheels by the slots, substantially continuous contact is maintained between these faces and the right-hand flanges of the wheels and the staggering of the slots already referred to minimises the effect of these interruptions.

Fig. 3 shows two pairs 38 of vane wheels making contact respectively with rollers 39, each having two flanges. Where such extra number of vane wheels is necessary, the precautions indicated above regarding staggering of the slots should be observed.

The number of vanes in each vane wheel is as large as the periphery of the wheel permits, the greater the number of slots, the less the number of warp threads that have to pass simultaneously through each slot. Fig. 1 shows an 8-bladed vane-wheel; the 12-bladed wheel shown in Figs. 4-9 calls for a rather larger diameter, in order to maintain adequate thickness at the root of the vanes.

Having described my invention, what I desire to secure by Letters Patent is:

1. A vane-wheel for holding the shuttle of a circular loom, said vane-wheel comprising a plurality of elements each having a plurality of vanes with inclined edges, the vanes of each element being spaced apart so that the elements may be assembled with the vanes of one element separated from the vanes of another element by narrow slots formed between the inclined edges of the vanes, and means for securing the elements together in such assembled relationship.

2. A vane-wheel according to claim 1, wherein the faces of the vanes are hollowed out, so as to increase the thickness of the slots towards the roots of the vanes.

FREDERICK SUTTON HARDY.