May 23, 1967 YASUSHI KOBAYASHI 3,320,978

SELVAGE BRAIDING MEANS FOR A SHUTTLELESS LOOM

Filed April 27, 1965 2 Sheets-Sheet 1

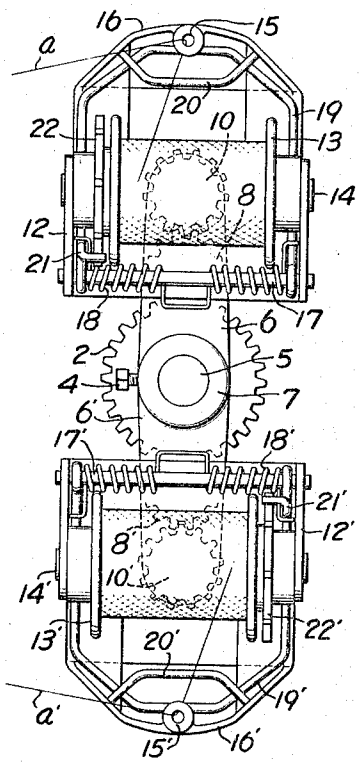


FIG. 1

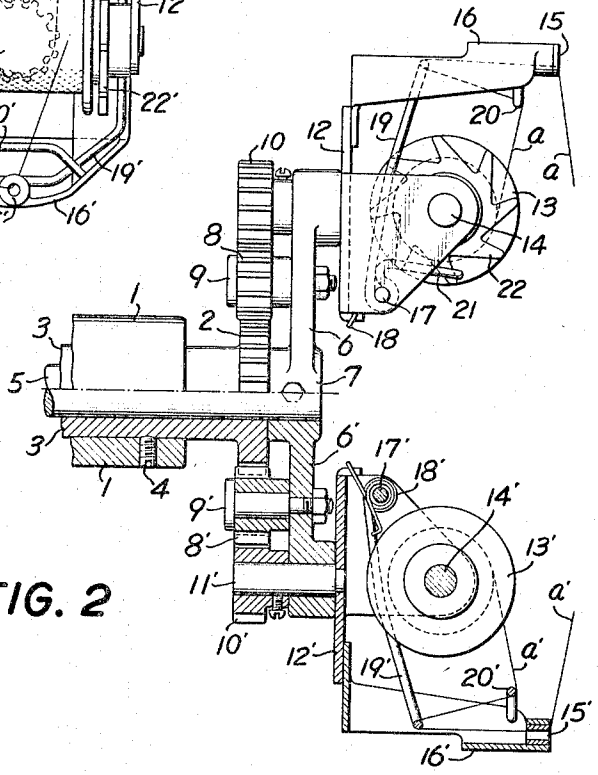


FIG. 2

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SELVAGE BRAIDING MEANS FOR A SHUTTLELESS LOOM

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FIG. 3

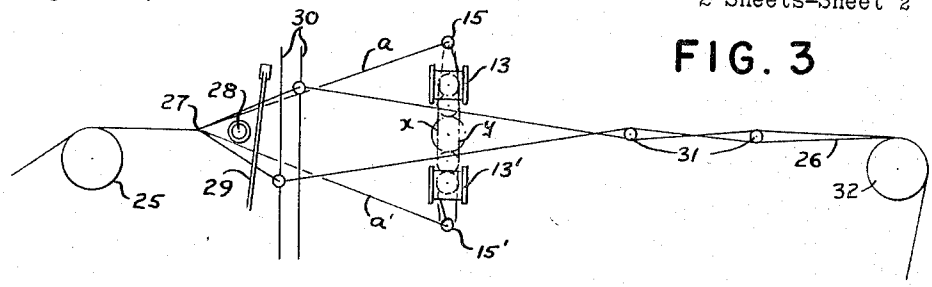


FIG. 4

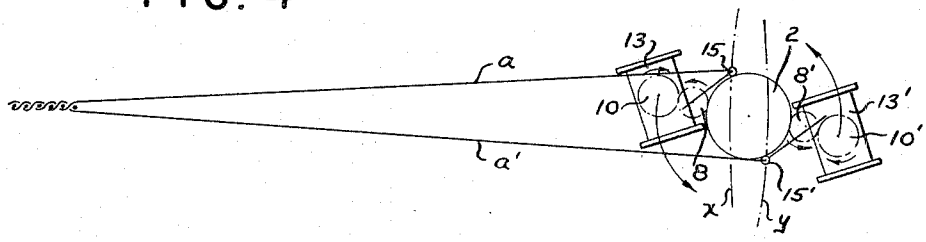
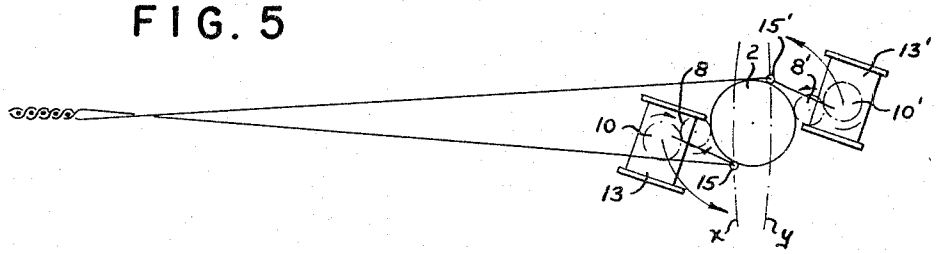


FIG. 5



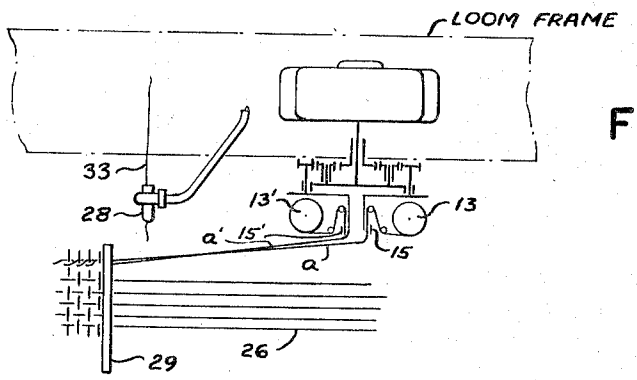


FIG. 6

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United States Patent Office 3,320,978
Patented May 23, 1967

3,320,978

SELVAGE BRAIDING MEANS FOR A SHUTTLELESS LOOM

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Filed Apr. 27, 1965, Ser. No. 451,251
6 Claims. (Cl. 139—54)

The present invention relates to a selvage braiding means in a shuttleless loom, and more particularly to such a means for braiding two threads in individual bobbins on ends of slot weft yarns through compound bobbin movements comprising rotation about its own axis for unwinding the thread contained therein and revolution around the stationary gear axis for twisting the two threads and giving them the shedding movements in accordance with those movements of the warp yarns.

In such a means, it is common practice to arrange the means with its revolutional axis perpendicular to the longitudinal axis of the loom, however, in the ordinary arrangements, the length of the thread between each bobbin and the selvage portion being braided changes remarkably and results in variation of thread tension. Since the speeds of revolution and rotation is substantially high, the above effect is critical.

The present invention has an object to reduce remarkable change in thread length between each bobbin and the selvage portion due to change of bobbin position during revolution thereof in such a selvage braiding means mounted with its revolutional axis perpendicular to the longitudinal axis of the loom. For this end, the present invention comprises a stationary gear fixed with its axis perpendicular to the longitudinal axis of the loom body, and two symmetrically disposed planetary gears each of which having gear ratio of 1:2 relative to said stationary gear and being engaged with said stationary gear so as to rotate about its own axis in reverse direction relative to the direction of revolution, each planetary gear having a bobbin loosely mounted thereon, two guide arms being so secured one on each planetary gear that they move with symmetrical relation about the stationary gear axis but they do not interfere mutually when they come close together.

In order that the present invention may be understood, it will now be described with reference to the accompanying drawings, in which:

FIGS. 1 and 2 are a front view and a partially cut away side elevation of the main portion of an embodiment of the present invention respectively;

FIGS. 3 to 5 are schematic drawings illustrating steps of movements of the means shown in FIGS. 1 and 2; and

FIG. 6 is a schematic plan view of the present invention showing the means of FIGS. 1 and 2 in cross-section.

As shown in the drawings, a sun gear **2** is fixed on the frame **1** at its hollow boss **3** by means of a key screw **4**. A drive shaft **5** extends through said hollow boss **3** and projects from said sun gear **2** so as to receive the mounting frame **7**. The shaft **5** is arranged to be driven in one direction by a suitable means. The mounting frame **7** is provided with two symmetrically extending arms **6** and **6'** and fixedly mounted on the projecting end of the shaft **5** to rotate therewith. Each of the arms **6** and **6'** has a planetary gear **10** or **10'** secured on the rotatable shaft **11** or **11'**. The gears **10** and **10'** each of which has gear ratio of 1:2 relative to the sun gear **2**, are arranged symmetrically about the sun gear axis and engage with the sun gear **2** through intermediate gears **8** and **8'** respectively mounted rotatably on the fixed shaft **9** and **9'** on the arms **6** and **6'**. Each of the rotatable planetary gear shafts **11** and **11'** projects through the arms **6** or **6'** and have at their projecting end a bobbin holder **12** or **12'**

secured thereon. On each bobbin holder **12** or **12'**, a bobbin **13** or **13'** is respectively carried by means of a shaft **14** or **14'**, and further, said bobbin holder **12** or **12'** is provided with a thread guide arm **16** or **16'** having a guide hole **15** or **15'** which serves to guide the thread (*a*) or (*a'*) unwound from the bobbin **13** or **13'**. The guide arms **16** and **16'** are so disposed that they move with symmetrical relation about the sun gear axis but they do not interfere mutually when they come close together.

Each bobbin holder has a tensioning arm **19** or **19'** which is constantly biased to rotate to one direction by means of a spring **18** or **18'** and serves to tension the thread unwound from the bobbin **13** or **13'** and passing through the guide wire **20** or **20'** to the guide hole **15** or **15'**.

Each tensioning arm **19** (or **19'**) is preferably provided with a nail portion **21** (or **21'**) which engages with saw teeth **22** (or **22'**) formed or secured on the bobbin, so that the bobbin is normally restrained from free rotation, but as the unwound thread is gradually consumed and thread tension is increased, the arm **19** (or **19'**) is gradually rotated clockwise (or counter-clockwise) as viewed in FIG. 2 and finally disengaged from the saw tooth permitting counter-clockwise rotation of the bobbin to allow a length of thread to be unwound, after which the arm **19** (or **19'**) is returned to its initial angular position under the influence of the spring **18** (or **18'**) due to decrease in thread tension and again engages with the next saw tooth by its nail portion **21** (or **21'**) to restrain the bobbin against rotation.

Said tensioning arm **19** and/or **19'** may be replaced by a tension spring (not shown) which holds the braiding thread slidably at its one end so as to tension the thread between two guide members. In this case, the nail portion **21** and/or **21'** may be separately provided for engagement with the saw teeth **22** and/or **22'**.

As described above, as the gear ratio of the sun gear **2** to the planetary gear **10** or **10'** is 2:1 and the planetary gear rotates in the reverse direction relative to the direction of revolution due to inter-position of the intermediate gear, each guide hole **15** or **15'** moves along the arcuated path of large diameter of curvature such as shown by letters *x* and *y* in FIGS. 3 to 5. Thus, it becomes possible to effectively reduce the change of thread length between each bobbin and the portion of selvage being braided in response to change of the bobbin position during the revolution thereof.

In FIGURE 3, the bobbins **13**, **13'** are shown in the position when threads *a*, *a'* are most widely separated. During this time the weft and/or fill is inserted. No specific description of either the manner or timing is necessary, in view of the knowledge of those in the art. Actually, these elements of the actual weaving are not germane to the present invention.

FIGURE 3 also schematically illustrates the relationship between the selvage braiding means of the invention and a loom. As illustrated, the warp yarn **26** is fed from a yarn beam (not shown) over a back rest **32** to lease rod **31**, and heddle **30**, to be woven with the weft yarn **33** at the fell line **27**. Nozzle **28**, reed **29** and heddle **30** are schematically presented to suggest the relative position of these components. After weaving the cloth is passed over a breast beam **25** to press rollers and a cloth beam (not shown).

FIGURE 4 illustrates the position of the mechanism of this invention, when the planetary gears have made slightly less than 90 degrees of revolution about the sun gear **2**. As illustrated in this figure, guide holes **15**, **15'** direct threads *a*, *a'* from less widely separated origins. Nevertheless, the total length between the weft and guide holes **15**, **15'** is still substantially similar to that shown in FIG-

URE 3. It should be appreciated that each of FIGURES 3, 4 and 5 have been distorted in order to illustrate the invention most graphically. In fact, the paths *x* and *y* traversed by guide holes **15** and **16** cover a thread payout from a substantially constant distance away from the most recently inserted weft.

FIGURE 5 illustrates the position of the bobbins **13**, **13'** when the planetary gears have rotated slightly more than 90 degrees about sun gear **2**. As illustrated, this position is substantially the mirror image of that depicted in FIGURE 4.

In the illustrated embodiment, the gear mechanism comprises a stationary sun gear, a pair of intermediate gears and a pair of planetary gears engaging said sun gear through said intermediate gears, but said gear mechanism may comprise an internally toothed stationary ring gear and a pair of planetary gears engaged with said ring gear and arranged symmetrically about the revolutional axis, each of said planetary gears having gear ratio of 1:2 relative to said ring gear and being revolutionary driven by a suitable source.

The details of the structure may be modified substantially without departing from the spirit of the invention and exclusive use of such modification as come within the scope of appended claims is contemplated.

What I claim is:

1. A selvage braiding means for a loom wherein the warp extends along the longitudinal axis of the loom, comprising a stationary sun gear, two planetary gears, each having a gear ratio of 2:1 with respect to said sun gear, and means for revolving the axes of said planetary gears about the axis of said sun gear; said sun gear being mounted with its axis perpendicular to the longitudinal axis of said loom, and said planetary gears being coupled to said sun gear to rotate about their individual axes in reverse direction relative to the direction of revolution about the axis of said sun gear; bobbin holders for supporting bobbins of thread mounted to be rotatably driven by each of said planetary gears; and thread guide means affixed to each said bobbin holder; whereby each said thread guide means moves with symmetrical relation in non-interfering paths about the axis of said sun gear.

2. A selvage braiding means in accordance with claim **1**, wherein said planetary gears are coupled to said sun gear via a pinion.

3. A selvage braiding means in accordance with claim **1**, wherein each planetary gear is secured to a shaft, each shaft is journaled in said means for revolving the axis of said planetary gears about the axis of said sun gear, each said bobbin holder is secured to one of said shafts, and each said bobbin holder has a pivot arm which is spring biased to rotate in one direction and serves to apply tension to the thread between the bobbin and the thread guide means.

4. A selvage braiding means according to claim **3**, including bobbins having a saw-toothed gear means in one end thereof, said pivot arm having a nail portion engaged with the saw-toothed gear means and restraining the bobbin against rotation, said pivot arm being operative when the tension on the thread exceeds a predetermined limit to disengage said nail portion and allow unrestrained rotation of said bobbin until the tension decreases below a particular limit, whereupon the nail portion is reengaged.

5. A selvage braiding means according to claim **1**, wherein an individual bobbin of thread is rotatably mounted on each bobbin holder, and said bobbin holders have a spring biased tensioning means which holds the braiding thread slideably and applies tension to the thread between the bobbin and said guide means.

6. A selvage braiding means according to claim **5**, wherein said spring biased tensioning means is coupled to the bobbin by means operative selectively to exert a braking force on the rotation of said bobbin in accordance with the tension on said thread relative to a predetermined value.

References Cited by the Examiner

UNITED STATES PATENTS

727,751	5/1903	Coriasco	57—65 X
2,319,827	5/1943	Reardon	57—65
2,710,631	6/1955	Flamand	139—54

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