Oct. 4, 1966 R. BUCHER 3,276,484

GRIPPER SHUTTLE TYPE LOOMS

Filed Jan. 15, 1965 2 Sheets-Sheet 1

Fig. 1

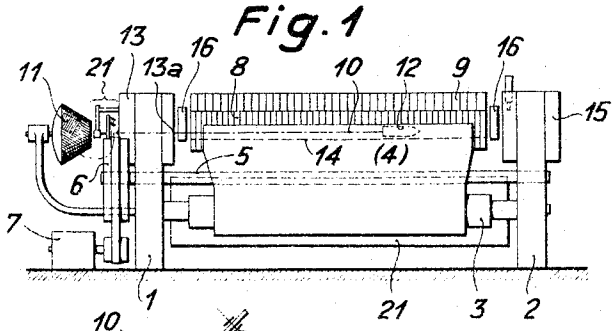


Fig. 3

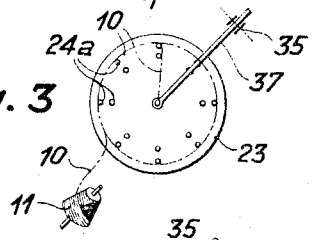


Fig. 7

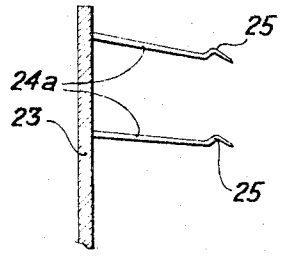


Fig. 4

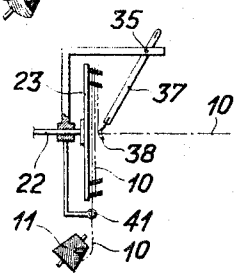


Fig. 5

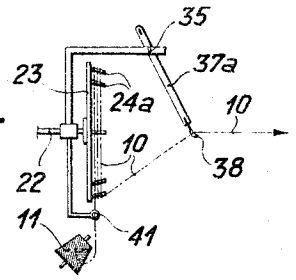


Fig. 8

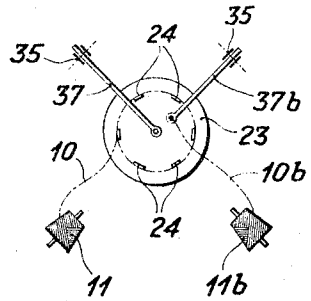
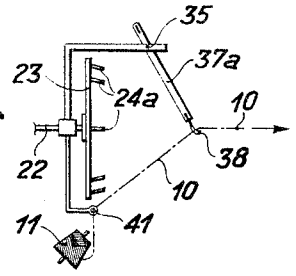


Fig. 6



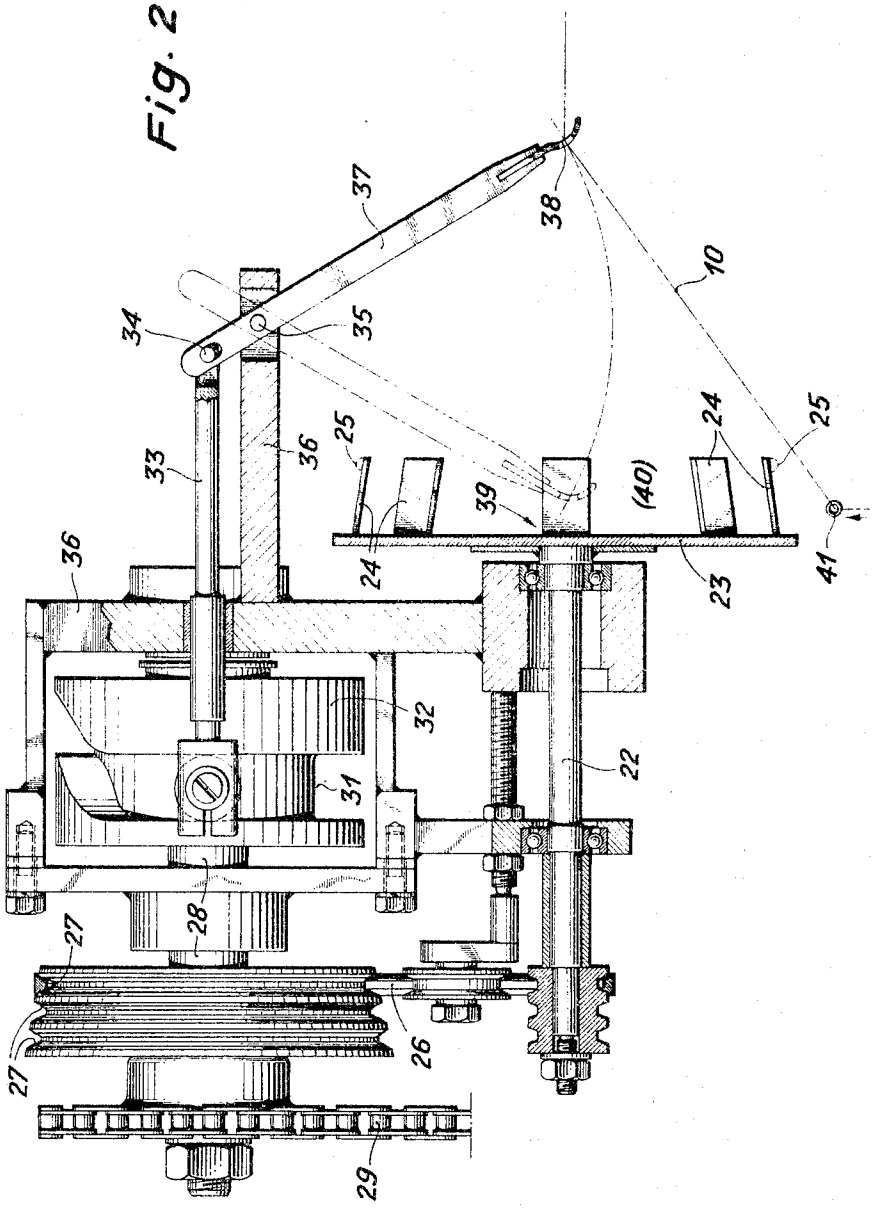
Inventor:
ROBERT BUCHER
By Toulmin & Toulmin
Attorneys

Oct. 4, 1966 R. BUCHER 3,276,484

GRIPPER SHUTTLE TYPE LOOMS

Filed Jan. 15, 1965 2 Sheets-Sheet 2

Fig. 2



Inventor:
ROBERT BUCHER
By Toulmin & Toulmin
Attorneys

United States Patent Office

3,276,484

Patented Oct. 4, 1966

3,276,484

GRIPPER SHUTTLE TYPE LOOMS

Robert Bucher, Winterthur, Switzerland, assignor to Sulzer Brothers Limited, Winterthur, Switzerland

Filed Jan. 15, 1965, Ser. No. 425,743
Claims priority, application Switzerland, Jan. 28, 1964, 815/64
9 Claims. (Cl. 139—122)

This invention relates to looms, and is particularly concerned with a Sulzer or gripper shuttle type loom in which a supply bobbin of weft or fill thread is provided at one side of the loom and which supply remains outside the shed during operation of the loom. More particularly still, this invention relates to an arrangement positioned between the supply bobbin for the weft or fill thread and the point where this thread is attached to the shuttle and operable for withdrawing from the supply bobbin a length of thread sufficient for placing one pick into the fabric being woven, and for supporting this length of thread so that it can easily be withdrawn by the shuttle when the latter is driven across the thread.

Looms of the nature referred to operate by attaching a small missile-like or projectile-like shuttle to the end of the weft or fill thread and then driving the shuttle through the shed at high speed whereupon the thread is detached from the shuttle at the far side of the loom and clipped off on the near side preparatory to adjustment of the shed and the attaching of the weft thread to another shuttle. Looms of this type operate at high speed, readily reaching speeds of 240 picks per minute. With the loom running at a speed of the order of 240 picks per minute, considering the time necessary for adjusting the shed and for beating the weft threads into the fabric, the time available for driving a shuttle through the shed may be as little as about $\frac{1}{10}$ second. It will be evident that the weft thread must thus travel at high speed and that the removing of the thread from the supply bobbin will be intermittent in nature. The supply bobbins are especially formed to permit the thread to be removed therefrom relatively easily, namely by shaping the supply bobbin conically and withdrawing the thread from the small end thereof.

Even with the supply bobbin especially shaped problems are encountered, especially in high speed operation, because of the rapidity with which the thread must be withdrawn and carried through the shed by the shuttle and without thread breakage, and without the thread interfering with free movement of the shuttle.

Because of this difficulty, devices have been made which withdraw from the supply bobbin a length of thread equal to what is required for a pick while this thread is supported so that it can easily be pulled off by the shuttle as it passes through the shed. These devices heretofore, however, have been expensive and have not operated in such a manner as to produce the best possible results.

With the foregoing in mind, it is a primary object of the present invention to provide a winding up device for a loom of the Sulzer type which will facilitate rapid free movement of the shuttle and which will inhibit breakage of the weft threads during weaving.

Another object of this invention is the provision of a winding up device of the nature referred to which is relatively inexpensive to construct and easy to maintain.

Still another object is the provision of a winding up device of the nature referred to in which the operation of the device is integrated with the operation of the loom and including means for adjusting the speed of the winding up device to cause it to wind up very nearly exactly the amount of thread required to place a pick in the fabric being woven.

The foregoing objects are realized, in general, by providing a disc having fingers projecting therefrom on one side together with means for rotating the disc at a predetermined speed together with the thread guide which is positionable within the axial range of the fingers on the disc during a winding up operation and which is movable into axially spaced relation with the disc during a shearing off operation.

In one form of the invention the fingers on the disc are inclined somewhat inwardly to form a support that tapers inwardly toward the shearing off direction, whereby the thread can be removed from the fingers very easily.

According to a modification, at least one of the fingers has a raised portion near its outer end which assists in retaining the thread on the winding device before it is pulled therefrom by the shuttle.

The present invention contemplates adjusting the speed of the winding up disc to regulate the amount of thread or yarn stored thereon so as to accommodate the winding up device to different fabric widths. The present invention, in particular, contemplates mechanical actuation of the axially movable guiding eye, but it is furthermore contemplated to actuate this element electrically.

The exact nature of the present invention will be more readily understood upon reference to the following specification taken in connection with the accompanying drawings, in which:

FIGURE 1 is a somewhat diagrammatic end view of a loom according to the present invention when viewed from the ground side thereof;

FIGURE 2 is a view drawn at enlarged scale and partly in section showing the weft storage or winding up device which is located adjacent the supply bobbin of the loom;

FIGURES 3 to 6 are somewhat diagrammatic views drawn at reduced scale showing the manner of operation of the device;

FIGURE 7 is a fragmentary view showing a modification wherein the winding up fingers have protrusions at their outer ends, and

FIGURE 8 is a view like FIGURE 3 but shows a modified structure.

The loom shown in FIGURE 1 comprises two uprights **1**, **2** interconnected by a central cross member. Between the uprights **1**, **2** are a cloth beam **3** for taking up cloth **4**, a warp beam **21**, various guiding and tensioning means (not shown in detail) for the warp threads and the fabric, and a main drive shaft **5**. Adjacent the upright **1** is a clutch and brake device **6** and a driving motor **7**. Alternately, the elements **6**, **7** can be on the right-hand side of FIGURE 1. The loom also comprises a reed **8** for beating up the weft thread **10** and healds **9** for shedding. A number of other drive mechanisms (not shown, but well known) are driven off the main shaft **5**.

The weft thread **10**, which is drawn off a weft bobbin **11**, is secured for picking to a gripper shuttle **12** which is picked up by a picking mechanism **13** in picking station **13***a* along a shuttle guide **14** formed by a number of guide teeth which project between the various warp threads.

A weft-storing unit which will be described in greater detail hereinafter and which has the general reference **21** is disposed between the weft bobbin **11** and the picking station **13***a*. The shuttle runs into a catching mechanism **15**. A selvedge former **16** is disposed at each edge of the warp near the mechanisms **13**, **15** for centering, clamping and—on the picking side—severing the inserted weft thread **10**. The devices **16** also insert the ends of the picked weft thread after shed changing to form a selvedge along the edge of the cloth.

The weft-storing unit **21** comprises a weft storage device consisting of a disc **23** mounted on a shaft **22** (FIGURE 2) and eight winding fingers **24** mounted on the disc. The fingers are in the form of small metal plates or rods which are inclined towards the axis of the shaft **22**. They can have returns **25** (shown dotted in FIGURE 2) or similar

forms of projection at their outer ends. The disc 23 is rotated continuously via a belt drive 26. To vary the speed of the disc 23, the belt 26 can be placed in any of various driving pulleys 27 disposed on a shaft 28 driven via a chain drive 29 by the drive for the loom. By this arrangement the winding up device is caused to operate in timed relation to the operation of the loom. The belt drive arrangement may advantageously include a laterally axially adjustable idler pulley at 27*a* for maintaining tension on the drive belt in its several adjusted positions.

A drum 32 formed with a groove 31 is disposed on the shaft 28, and a roller which cannot be seen in FIGURE 2 and which is disposed on a connecting rod 33 engages in the groove 31. The drum 32 reciprocates the rod 33 horizontally as seen in FIGURE 2 so that the rod 33 in turn swings an actuating lever 37 which is connected to the rod 33 by a pivot 34 and which is pivotally mounted at a point 35 on a part 36 of the loom frame. At its free end the lever 37 has a guide eyelet 38 for guiding the weft yarn 10. When in the solid-line position shown in FIGURE 2, the lever 37 is relatively far away from center 39 of the disc 23, and when in the chain-dotted position shown in FIGURE 2, the lever 37 is near the center 39 of the disc.

Operation is as follows:

To store weft yarn 10 on the disc 23 the drum 32 moves the lever 37 clockwise into the storage position which can be seen in FIGURES 3 and 4 and which is the chain-dotted position of the lever 37 in FIGURE 2. The guide 38 is then near the disc center 39, that is, it extends into a circular or approximately cylindrical space 40 bounded by the rotating fingers 24. Due to the clockwise pivoting of the lever 37 around the pivot 35, the weft yarn to be drawn off the bobbin 11 is guided between two rotating fingers 24 (or between the needle-like winding fingers 24*a* of FIGURES 3 to 6), thereafter to be wound around the outside of the fingers 24*a* in FIGURES 3 and 4.

After a few turns of weft yarn are wound onto the fingers 24*a*, the total length of the turns then corresponding to the cloth width and therefore to the length of weft inserted, the lever 37 is pivoted by the drums 32 into the yarn delivery position 37*a* shown in FIGURE 5. The shuttle 12 is now picked by the picking mechanism 13 so that all the stored turns are pulled off the disc 23 substantially without resistance (more weft yarn is wound on to the disc 23 during picking) until the situation shown in FIGURE 6 is reached. The weft thread passes directly from a stationary thread guide eye 41 to the guide 38 of the outwardly swung lever 37 and thence to the shuttle 12. Throughout picking the lever 37 stays in the yarn delivery position 37*a*. The cycle then starts anew; the lever 37 pivots into the yarn-storing position shown in FIGURE 4 so that fresh weft yarn is stored on the disc 23. The transmission ratio of the belt drive 26 ensures that the disc 23 runs at a speed such that the length of weft thread stored on the disc 23 in the time that passes between the lever 37 pivoting towards the disc center 39 and the end of picking is not quite as large as the cloth width. This ensures that picking always empties the disc 23 completely. There is therefore no need to provide special means for controlling the length of thread to be stored by the disc 23, that is, to control the corresponding number of turns or the length of the winding on the disc 23. To adapt the length of yarn stored to a different cloth width, a different disc 23 may be used whose fingers 24*a* lie on a circle of a different diameter. Preferably, the time at which the lever 37 pivots from the position shown in FIGURE 4 into the position 37*a* shown in FIGURE 5 is shortly before the shuttle is picked, that is, the lever 37 reaches the position 37*a* shortly after picking commences.

The needle-like fingers 24*a* used in FIGURES 3 to 6 are shown in detail in FIGURE 7 where only the top part of the disc 23 is shown. The needles 24*a* have external cranked parts 25.

In the construction shown in FIGURE 8, a second actuating lever 37*b* is provided to control a weft thread 10*b* to be drawn off a second weft supply bobbin 11*b* the yarn on which is of a second color, for two-color operation. An appropriate drive moves the levers 37, 37*b* towards the disc center 39 in the correct sequence so that whichever weft yarn 10 or 10*b* is required is stored before being introduced into the shed.

In a similar way, a number of control levers can cooperate with a single storage disc for multi-color working. Clearly, the entire length of yarn stored on the disc 23 must be used up at each pick and the disc must be completely emptied, in order that yarn of some different color can, if required, be stored for the next pick.

In a possible modification an electromagnet guides the lever 37 into one position, for instance the storage position, and a spring moves the lever 37 into the other position, for instance the yarn delivery position 37*a*, when the electromagnet is de-energized.

When an electromagnet of this nature is employed, switch means are provided to control the energization of the electromagnet and the switch means, in turn, are under the control of a cam carried by shaft 28.

The disc 23, instead of being driven via the stepped pulley system 26, can be driven by an infinitely variable transmission so that the length of yarn stored can be steplessly adapted to any cloth width.

With reference to the weft guiding eye 38 and the movement taken thereby, it will be apparent that the movement of this guiding eye is essentially in the axial direction. The pivotally supported lever 37 thus is only one of several means by which this would be employed for effecting movement of the weft guiding eye. Thus, the guiding eye could be supported for straight axial movement from its one position within the axial range of the winding fingers to its second position outwardly from the ends of the fingers as by a rod extending axially through shaft 22 or some like arrangement.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions; and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. A weft thread storage device for a gripper shuttle loom, said loom comprising means for supporting a weft supply bobbin outside the shed; said device comprising a rotary support, fingers carried by said support and circumferentially spaced about the axis of rotation of the support and extending generally parallel with said axis, said fingers having their one ends connected to said support and their other ends free, means for rotating said support continuously during operation of said loom, a first guiding eye located outside the periphery of said rotary support and through which the thread from the weft supply bobbin passes, a second guiding eye located inwardly of the circumferential range of said fingers and through which the said thread passes from the device to the clamping station of said looms and means for moving said second guiding eye in the axial direction of said rotary support so that in one position of said second guiding eye the thread leading between the guiding eyes is at least within the axial range of said fingers so as to be engaged thereby whereas in a second axial position of said second guiding eye, the thread clamped to a shuttle will run freely from the fingers and through said second guiding eye when the shuttle is projected through the shed of the warp threads.

2. A weft thread storage device for a gripper shuttle loom having means for supporting a weft supply bobbin outside the shed, said device comprising a rotary support, a plurality of fingers carried by said support and circumferentially spaced about the axis of rotation of the support and extending generally parallel with said axis, said fingers having their one ends connected to said support and their other ends free, means for rotating said support

in timed relation with the operation of said loom, means to guide thread from the weft supply bobbin to a position which, radially of said axis, is outside said fingers and which, longitudinally of said axis, is between said one ends and said other ends of said fingers, and a weft thread guide through which the weft thread passes, said weft thread guide being movable between first and second positions, said first position being located, radially of said axis, inside said fingers and being located, longitudinally of said axis, between said one ends and said other ends of said fingers, said second position being located, longitudinally of said axis, on the side of said other ends of said fingers remote from said support.

3. A weft thread storage device according to claim 2 wherein said other ends of said fingers are closer to said axis than said one ends thereof.

4. A weft thread storage device according to claim 2 including means for changing the rate of rotation of said support in relation to the operation of said loom.

5. A weft thread storage device according to claim 2 wherein said rotary support is in the form of a disc.

6. A weft thread storage device according to claim 2 including a frame, first and second shafts journaled in the frame for rotation with respect thereto, means to rotate one of said shafts in timed relation with the operation of the loom, means coupling said shafts for rotation together but not necessarily at the same angular velocity, said support being affixed to one of said shafts for rotation therewith, and means driven by the other of said

shafts for effecting movement of said weft thread guide between its said first and second positions.

7. A weft thread storage device according to claim 6 wherein said means to rotate one of said shafts in timed relation with the operation of said loom is coupled to the one of said shafts which drives the means for effecting movement of the weft thread guide between its first and second positions.

8. A weft thread storage device according to claim 6 wherein the means for effecting movement of said weft thread guide comprises a lever pivoted in said frame, said lever supporting said weft thread guide, and cam means driven by the other of said shafts operatively connected with said lever.

9. A weft thread storage device according to claim 6 wherein said means for coupling said shafts for rotation together includes means for varying their relative speeds of rotation.

References Cited by the Examiner

UNITED STATES PATENTS

2,720,223 10/1955 Svaty ---------- 139—127

FOREIGN PATENTS

1,261,463 4/1961 France.

MERVIN STEIN, *Primary Examiner.*

H. S. JAUDON, *Assistant Examiner.*