

United States Patent

Porter

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[54] **GRIPPER SHUTTLES FOR LOOMS FOR WEAVING**

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[51] Int. Cl.D03d 47/24
[58] Field of Search139/122 R, 125, 126, 122 N

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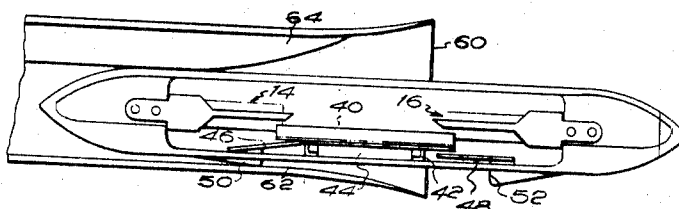
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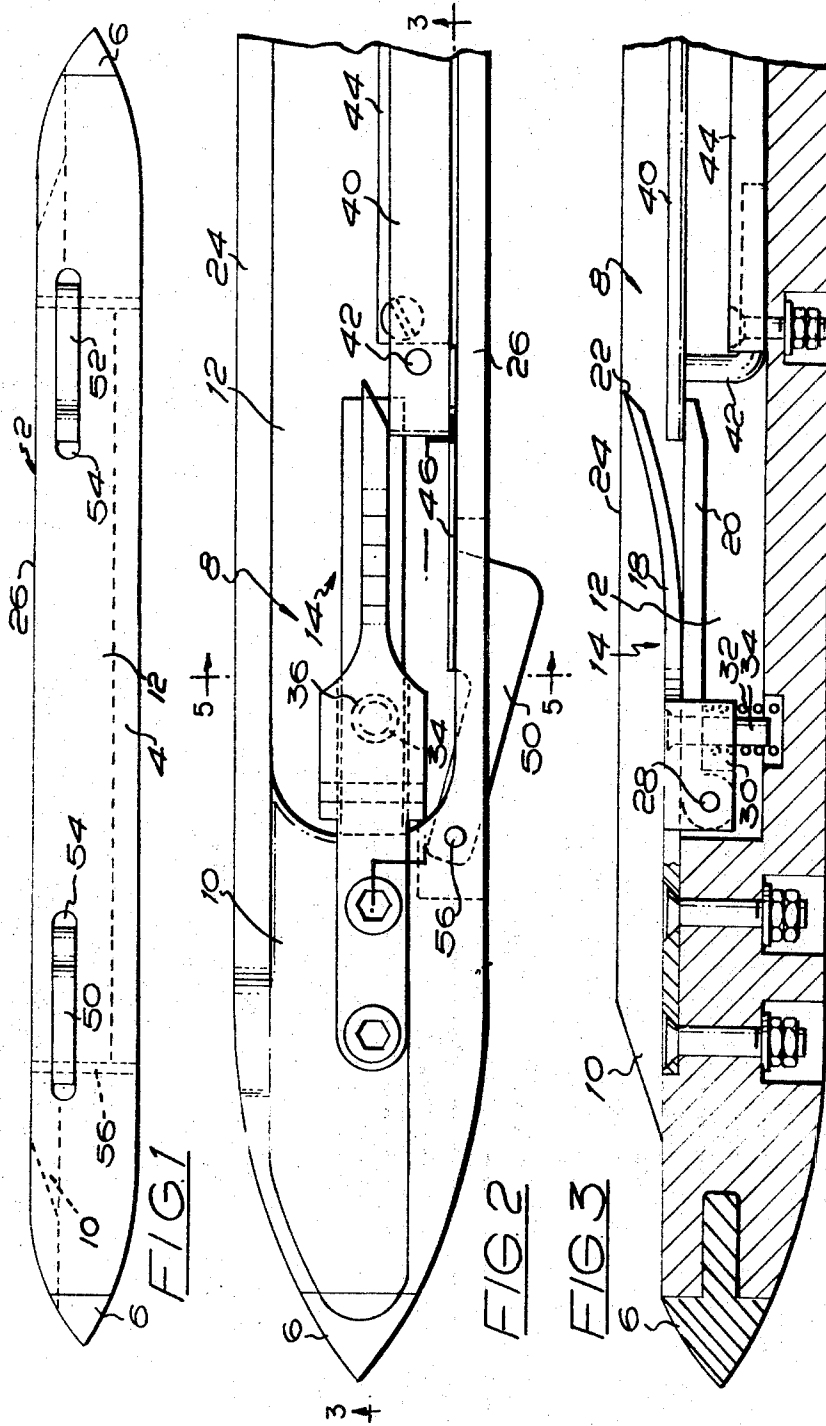
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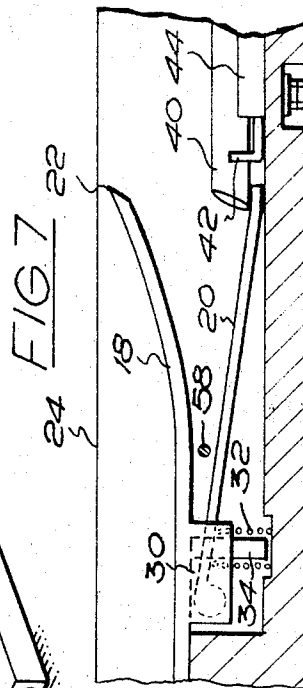
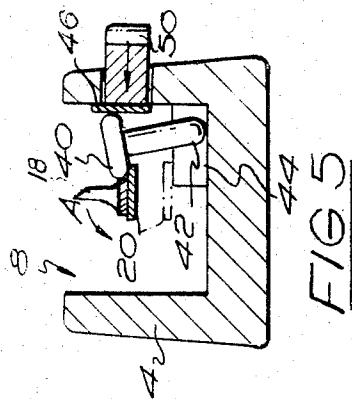
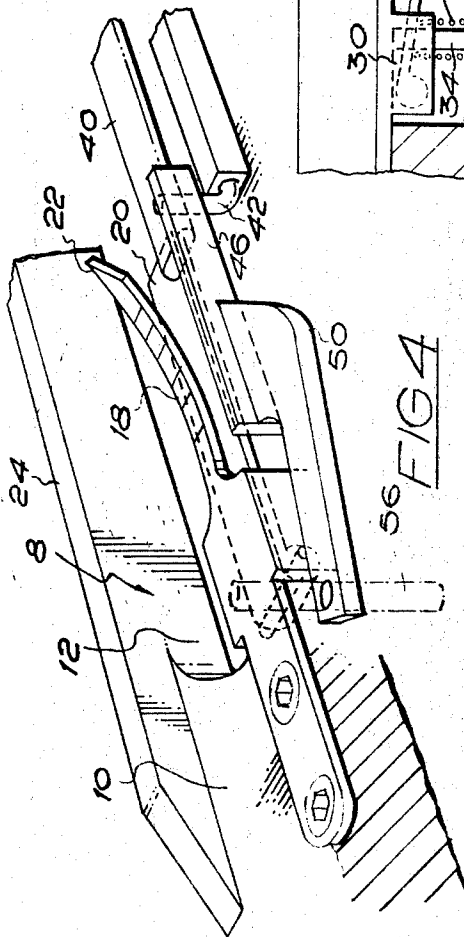
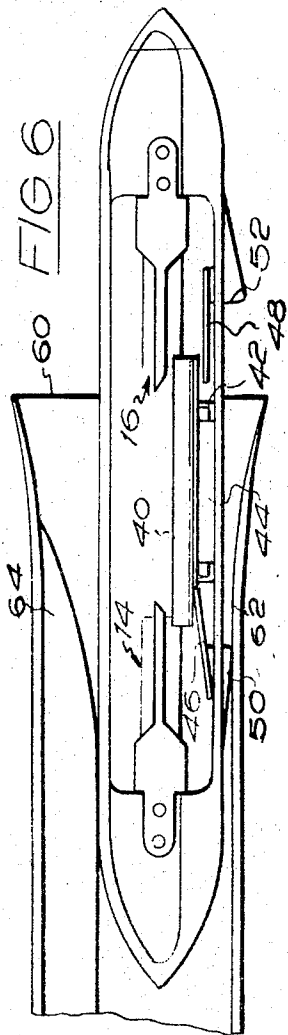
[57] **ABSTRACT**

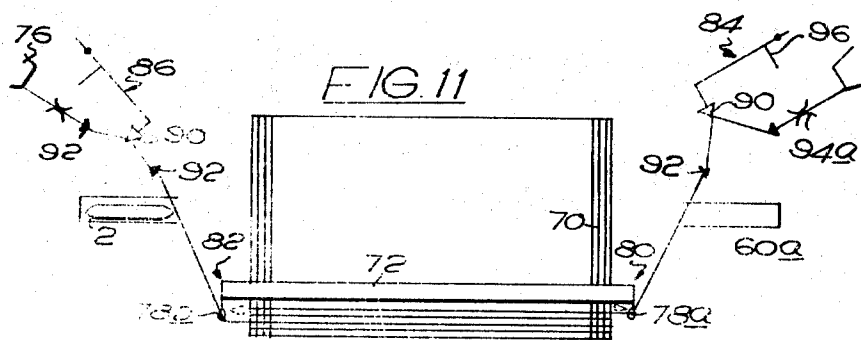
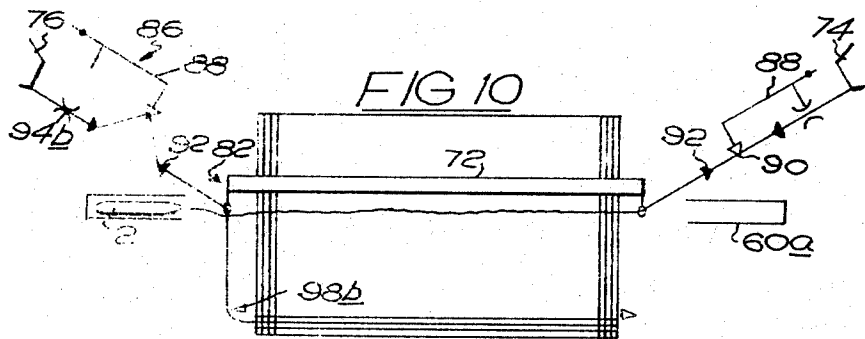
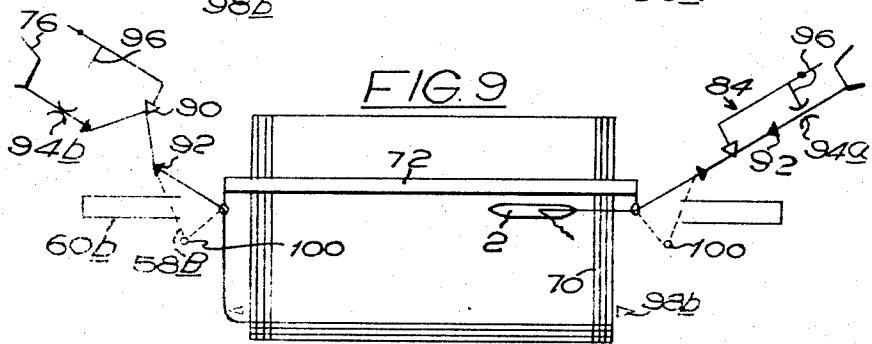
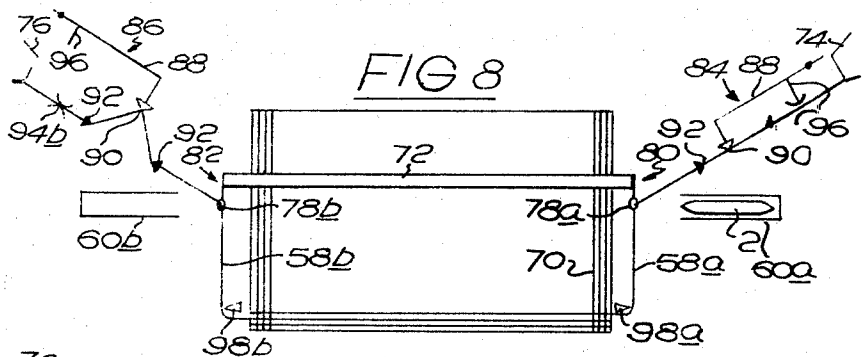
A weaving loom gripper shuttle with an elongated body having a recess in the top containing two pairs of weft gripper jaws. Two pivotable cam levers project outwardly from a side of the body and are moved inwardly to open the jaws when the cams contact a side of a shuttle box.

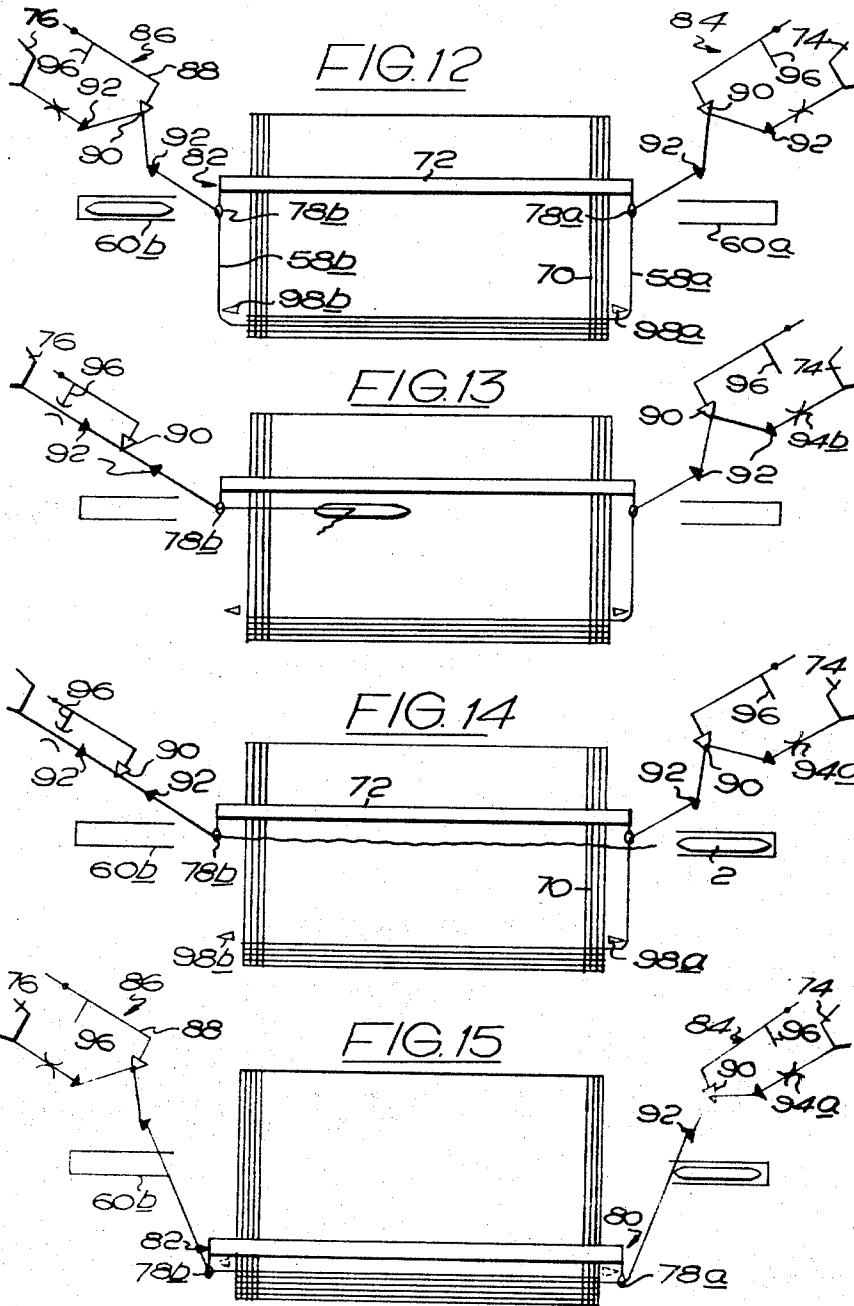
3 Claims, 15 Drawing Figures











GRIPPER SHUTTLES FOR LOOMS FOR WEAVING

This invention relates to improvements in gripper shuttles for weaving looms wherein the shuttle is supplied with weft yarn from a stationary yarn package by a yarn presenter.

Gripper shuttles for weaving looms have been proposed in which an elongated shuttle body has a recess formed in the top of the body and extends the length thereof. This recess contains two pairs of gripper jaws. In one arrangement the pairs of jaws face in opposite directions. Each upper jaw is pivotable relatively to the lower and each is moved upwardly away from the lower when a roller on an arm mounted on the upper jaw and projecting into a recess in an underside of the shuttle body comes into contact with a vertically movable cam disposed at a side of loom in front of a shuttle box. A mechanism is provided to raise the cam immediately before the shuttle enters the box at the end of a pick so that the leading pair of jaws are opened to receive yarn from a supply ready for the next pick. The raised upper jaw is interconnected by a pair of rods pivotally mounted on one end of a central arm pivotally mounted on the other end of the arm and pivotably mounted on the arm of the other upper jaw, whereby the raising of the leading upper jaw throws the central arm and thereby raises the other or trailing upper jaw which releases grip on the pick of weft last inserted into the shed. When the shuttle has entered the box the jaws close under the action of spring force, and the cam is lowered so as not to open the jaws as the shuttle is picked. A similar cam is provided on the opposite side of the loom. In another arrangement the upper jaws are stationary and face toward one another and the lower jaws are vertically pivotable and face in opposite directions. The lower jaws are pressed against the upper by spring pressure, and a movable actuator is provided at each side of the loom to depress the lower jaw to release gripped yarn after a pick.

An object of the invention is to provide a simple gripper shuttle which is shaped similarly to a conventional yarn carrying shuttle, and which can be actuated to open the jaws by coming into contact with a side of a conventional shuttle box and so obviate the necessity for cams or actuators which are vertically movable by complicated mechanisms in response to motions of the loom.

According to the invention a gripper shuttle for a weaving loom comprises an elongated, horizontal, shuttle body formed with tapering ends, a top of said body having a recess formed therein extending from one end of the body to the other, two pairs of gripper jaws disposed in said recess with one pair of jaws spaced from end facing the other pair, each pair of jaws being formed by a stationary upper jaw and a pivotable lower jaw, spring means in the recess pressing the lower jaws against the upper, a rod extending longitudinally of the recess and constrained therein for up and down arcuate movement, opposite ends of the rod overlying facing ends of the lower jaws, two cam arms each disposed towards an opposite end of the body and projecting from a side thereof, each cam arm being pivotably mounted on the body for movement in and out of said body, and each cam arm being arranged to engage an end of said rod and apply pressure to the rod when either cam is moved inwardly of said body to move the rod downwards whereby downward pressure is applied to the lower jaws to open facing gaps between each pair of upper and lower jaws.

The invention will now be further described with reference to the accompanying drawings in which

FIG. 1 is a side elevation of a gripper shuttle formed according to the invention;

FIG. 2 is a plan view on an enlarged scale of an end portion of the shuttle in FIG. 1;

FIG. 3 is a section on line 3—3 in FIG. 2;

FIG. 4 is a perspective view of a side of the end portion in FIGS. 2 and 3, with the near side wall and nose piece of the shuttle removed;

FIG. 5 is a section on line 5—5 in FIG. 2;

FIG. 6 is a fragmentary plan view on a reduced scale of the shuttle in FIG. 1 entering a shuttle box; and

FIG. 7 is a fragmentary view of the section in FIG. 3 showing the jaws of the gripping device open.

FIGS. 8 to 15 are diagrammatic views of a loom during various stages of a weaving operation using a gripper shuttle formed according to the invention.

Referring to FIGS. 1 to 7 a gripper shuttle 2 has an elongated body 4 with a usual nose tip 6 at each end. A recess 8 formed in a top of the body comprises a groove 10 extending longitudinally from one end of the body to the other, and a cut out or well 12 extending downwardly from other groove and disposed centrally of the body.

Two similar pairs of gripper jaws 14 and 16 are disposed in the recess 8. The two pairs face one another and each pair is mounted adjacent to an opposite end of the well 12. Each pair comprises a stationary upper jaw 18 above a movable lower jaw 20, each jaw being formed by a relatively narrow elongated plate. Jaw 18 is secured at one end to the body 4 and inset into a base of the groove 10 and curves upwardly to a chamfered and pointed tip at the other end 22 which is located above the base of the groove but wholly in the recess 8 below the tops of walls 24 and 26 defining sides of the recess. Jaw 20 is pivoted on a pin 28 mounted in a pair of brackets 30 depending from jaw 18. An helical spring 32 seated in a depression in the floor of the well 12 presses the lower jaw 20 into contact with an underside of the upper jaw 18, this spring being located in position by a stationary peg 34 depending from the upper jaw and freely passing through a hole 36 in the lower.

Free ends of the lower jaws 20 are overlapped and engaged by opposite ends of a rod 40 in the recess 8 and mounted on a pair of arms 42 pivotally located in a bar 44 secured to a base of the well 12. Opposite ends are engaged by plates 46 and 48 respectively mounted on cam lever arms 50 and 52 formed, for example, of hard plastics material projecting from a side of the body 4 through slots 54 formed therein. The cam levers are mounted for pivoting movement on pins 56 mounted in the body 4.

When either cam 50 or 52 is pressed inwardly of the body 4, such as when the shuttle enters a shuttle box 60 (see FIG. 6) and the cams engage against an inner face of a wall 62 of the shuttle box which has a swell 64, the plate 46 or 48 swings about the pin 56 and pivots rod 40 downwards in the direction of arrow A in FIG. 5. This movement presses the lower jaws 20 downwards against the action of the springs 32 to open a gap between the upper and lower jaws in each pair 14 and 16 as shown in relation to the pair 14 in FIG. 7. The opening of this gap releases a pick of weft (such as shown at 58 in FIG. 7) previously gripped between a pair of the jaws. When the inward pressure on both cams 50 and 52 is released, such as when the shuttle has left the shuttle box, the springs 32 push the lower jaws upwardly to engage against the upper jaws so enabled weft yarn to be gripped by a pair of jaws. The upward motion of the lower jaws pivots the rod 40 upwardly causing the plates 46 and 48 to be pressed against the inner face of wall 26 to return the cams 50 and 52 to their full outward projecting positions beyond the side of the shuttle.

The shuttle so constructed can be used on a loom to carry out a weaving sequence as shown in FIGS. 8 to 15 which are diagrammatic, and for the sake of clarity the motions of various components are shown as taking place in the same plane though in actual fact various of these motions take place in differing planes. The shuttle is shown at 2 and a pair of shuttle boxes at 60a and 60b from which the shuttle is picked by any suitable means, for example by conventional picking sticks. The shed of warp yarns is indicated at 70 and a reed of any type known per se at 72 moved in known manner to bent up. Weft yarns 58a and 58b are supplied from stationary yarn packages 74 and 76 respectively, mounted at opposite sides of the loom. Each of these yarns passes through an eye 78a and 78b of a respective yarn presenter 80 or 82 mounted on opposite ends of a sley sole (not shown) supporting the reed 72. The eye of each presenter is movable up and down relatively to the sley sole by movement of a respective Bowden cable connected at one end to the presenter and at the other end to a lever pivotably mounted on the loom frame (now shown). The lever being pivoted to move the Bowden cable in response

to rotation of a respective cam (not shown and hereafter referred to as the presenter cam) engaging against a cam follower on the lever. This presenter cam is mounted on the half speed shaft of the loom, which shaft is well known in loom technology. When a presenter is lowered relatively to the sley sole the eye 78a and 78b locates in the groove 10 between walls 24, 26 of the shuttle passing the presenter and the weft yarn passing through the eye is positioned to be gripped by jaws 16 of the shuttle. When the presenter is raised the eye 78a and 78b and weft yarn are lifted clear of the shuttle, and the yarn in the eye avoids the shuttle. By suitably shaping the presenter cams each presenter 80 and 82 is raised and lowered in the sequence described below.

Between the weft package and presenter eye, weft yarns 58a and 58b pass through yarn tensioners indicated at 84 and 86 respectively similar to those described in our co-pending U.S. application Ser. No. 11,797, filed on Feb. 16, 1970. Each tensioner comprises a tensioner arm 88 pivotably mounted on the loom adjacent to a shuttle box 60a or 60b. Tensioner 88 carries a triangular shaped guide eye 90 through which the weft yarn passes. Each arm 88 is pivotably raised and lowered relative to the loom by motion of a respective Bowden cable connected at one end to the arm and at the other end to a lever pivotably mounted on the loom frame. This lever is pivoted to move the Bowden cable in response to rotation of a respective cam (hereinafter referred to as the tensioner cam) mounted on the half speed shaft and engaging a cam follower on the lever. The weft yarn passes through stationary hollow cone shaped yarn guides 92 located at opposite sides of the eye 90. The weft yarn also passes between a pair of yarn guiding cymbals 94a or 94b facing one another and mounted at their centers on a common stationary pin. The cymbals are pressed together by a spring of such force that the cymbals grip the yarn and prevent it passing therethrough until they are prised apart by a peg 96 inserted between them. The peg is mounted on the tensioner arm and is inserted between the cymbals by the lowering of the arm, and removed from the cymbals when the arm is raised. The tensioner arms are raised and lowered in the manner described below by suitably shaping the tensioner cam.

Substantially vertical weft cutter knives 98a and 98b are mounted on the loom towards the front thereof adjacent to a breast plate and alongside the selvages of the fabric being woven. Each knife has a cutting edge facing sideways of the loom outwardly from the fabric. The knives are raisable (as indicated by their representation by dotted lines in FIGS. 10 and 15) during beating up to permit a pick of weft being beaten up to pass under the blades, but the blades are lowered again after beating up to project in part below the level of the portion of weft yarn which extends from the selvage to the presenter eye. The raising and lowering of the knives in the sequence described below can be by any suitable means. The knives are mounted on pivotable supports which can be raised and lowered relative to the loom by Bowden cables actuated by pivoting levers moved by rotating cams mounted on the half speed shaft or the pivotable knife supports can be raised by being struck by projections mounted on the sley to engage against the supports when the reed moves forward during beating up, the projection releasing the supports when the reed moves back so that the knives are returned to the lowered position.

In FIG. 8 the reed 72 is in the back position. Presenter eye 78a is lowered and eye 78b is raised. The arm of tensioner 86 is fully raised so cymbals 94b grip the weft yarn 58b. The arm of tensioner 84 is fully lowered and weft yarn 58a freely passes through prised apart cymbals 94a. Yarns 58a and 58b extend across the knife edges of lowered blades 98a and 98b. When the shuttle is picked and leaves box 60a, the pairs of jaws 14 and 16 close. The yarn 58a positioned by the eye 78a engages under the upwardly curved portion of the upper jaw 18 of the right hand pair 16 (right hand in respect to the drawings) and becomes wedges in the closed jaw pair 16 as the shuttle passes the presenter 80.

The yarn 58a so gripped is carried by the shuttle into the shed (FIG. 9) and is also pulled firmly against the edge of the blade 98a, thereby severing the yarn from the right hand selvage of the fabric.

On reaching the other side the shuttle enters the shuttle box 60b effecting an opening of jaws to release the pick 58a (FIG. 10).

Now the reed moves forwardly (FIG. 11) propelling the pick 58a to the fell. During this forward movement the arm of tensioner 86 lowers slightly to slacken the yarn 58b to prevent it being snapped by the reed movement carrying the presenter eye 78b forward. Simultaneously the arm of tensioner 84 is raised. This releases cymbals 96 which grip the yarn 58a so that the raising of the eye 90 of tensioner 84 exerts a pull on the pick 58a moving and straightening the latter substantially longitudinally in the shed to give the fabric being woven a neat, firm appearance and shortening the loose tail of the pick projecting beyond the left hand selvage. As the reed beats up, knives 98a and 98b are raised for the beaten up pick 58a to pass beneath.

As the reed moves back to position shown in FIG. 12 the knives are lowered and the arm of tensioner 86 returns to fully raised.

Immediately prior to picking the shuttle 2 from the box 60b in FIG. 13, the presenter eye 78b is lowered and the eye 78a raised. The arm of tensioner 86 is fully lowered relaxing the yarn 58b and opening the cymbals 94b. As the picked shuttle passes the eye 78b the yarn 58b is wedged in the closed left hand jaw pair 14 and gripped thereby. The yarn is then carried through the shed and pulled against the blade 98b to sever the pick from the left hand selvage.

The jaws release the pick 58b when the shuttle enters the box 60a as shown in FIG. 14.

Reed 72 moves forward again, as shown in FIG. 15, to beat up the pick 58b and the knives 98a, 98b are raised. At the same time the arm of tensioner 84 is lowered slightly to relax the yarn 58a and the arm of tensioner 86 is fully raised to straighten the pick 58b and shorten the loose tail thereof.

As the reed returns to the rear position, tensioner 84 returns to the fully raised position. The presenter eye 78a is lowered, and the eye 78b is raised.

Now tensioner 84 is fully lowered to relax yarn 58a and open the cymbals 94a as shown in FIG. 8, and the above weaving sequence is repeated.

In an alternative modification, a stationary eye 100 (shown in FIG. 9) can be mounted at each side of the loom for weft yarn (such as shown in dotted lines at 58B) to pass therethrough from the tensioner eye 90 to the adjacent presenter eye which in the case of weft 58B is the presenter eye 78b. Each eye 100 is mounted on the loom between the rear position of the reed and the fell of the fabric, and is located outside the path of the reed. The motions of tensioner arms 88 are modified such that after an arm is fully raised to pull on a pick of weft in the shed during beating up, the arm is fully lowered again on the sley returning to the back of the loom after beating up, and before the next pick is inserted by the shuttle. The arm 88 of tensioner 86 is fully lowered during weaving stages corresponding with those in FIGS. 8 to 12, 14 and 15. Consequently weft 58B is sufficiently slackened to avoid snapping thereof during forward beat up movement of the sley. On the sley returning to the back position, the provision of the eye 100 ensures that the portion of weft yarn 58B extending from the selvage to the presenter eye 78b becomes drawn sufficiently taut for the lowered knife 98b to hook over this portion to ensure cutting when the weft 58B is carried into the shed by the shuttle in a weaving stage corresponding with that in FIG. 13. Similarly on the other side of the loom, the arm 88 in tensioner 84 is fully lowered on the sley returning to the rear position in a weaving stage corresponding with that in FIG. 12 and remains fully lowered during weaving stages corresponding with those in FIGS. 13, 14, 15, 8, 9 and 10.

The cone shaped guides 92 and triangular shaped eyes 90 have diverging sides to reduce the chance of weft becoming

tangled around these guides and eyes should the yarn whip when pulled by the arms of the tensioners 84 and 86.

If desired the presenters 80 and 82 can be taken off the sley sole and mounted on or adjacent to the shuttle boxes, and can be arranged to insert weft yarn into a pair of gripper jaws whilst the jaws are still held open by the cam lever engaging the side of the box.

One advantage of the gripper shuttle described above in that the body thereof is substantially similar in shape to the body of a conventional pirn carrying shuttle. Consequently the gripper shuttle can be readily used in combination with conventional shuttle boxes, picking systems reeds and sleys, and shedding systems.

What I claim is:

1. A gripper shuttle for a loom for weaving comprising an elongated, horizontal, shuttle body formed with tapering ends, the top of said body having a recess formed therein extending from one end to the other end of said body, two pairs of gripper jaws disposed in said recess with one pair of jaws spaced from and facing the other pair, each pair of jaws being formed by a stationary upper jaw and a pivotable lower jaw, spring means in said recess pressing the lower jaw against the

upper jaw, a rod extending longitudinally of the recess and constrained therein for up and down arcuate movement, opposite ends of the rod overlying facing ends of the lower jaws, two cam arms disposed towards opposite ends of the body and projecting from a side thereof, each cam arm being pivotably mounted on the body for movement in and out of said body, and each cam arm being arranged to engage an end of said rod and apply pressure to the rod when either cam arm is moved inwardly of said body into said recess to move the rod downwards whereby downward pressure is applied to the lower jaws to open facing gaps between each pair of upper and lower jaws.

2. A gripper shuttle as in claim 1, wherein each upper jaw is formed of strip material and a portion of said upper jaw is bent upwardly from the corresponding lower jaw to leave a permanent gap for receiving weft yarn between said portion of said upper jaw and said lower jaw.

3. A gripper shuttle as in claim 1, wherein the rod is mounted on one end of at least one support arm which is pivotably mounted at its other end in the recess for pivoting movement of the arm in a vertical plane.

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