Jan. 21, 1969 A. MALCHAIR 3,422,858

WEFT NIPPER FOR CIRCULAR LOOMS

Filed Sept. 13, 1966 Sheet 1 of 6

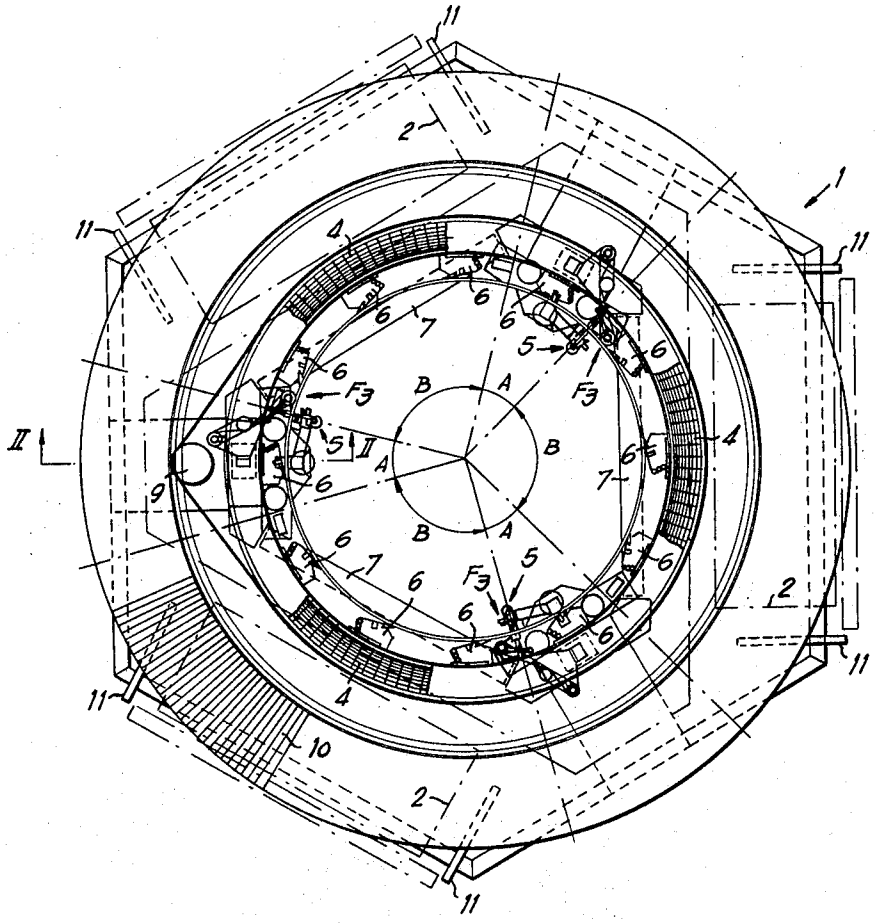

Fig. 1

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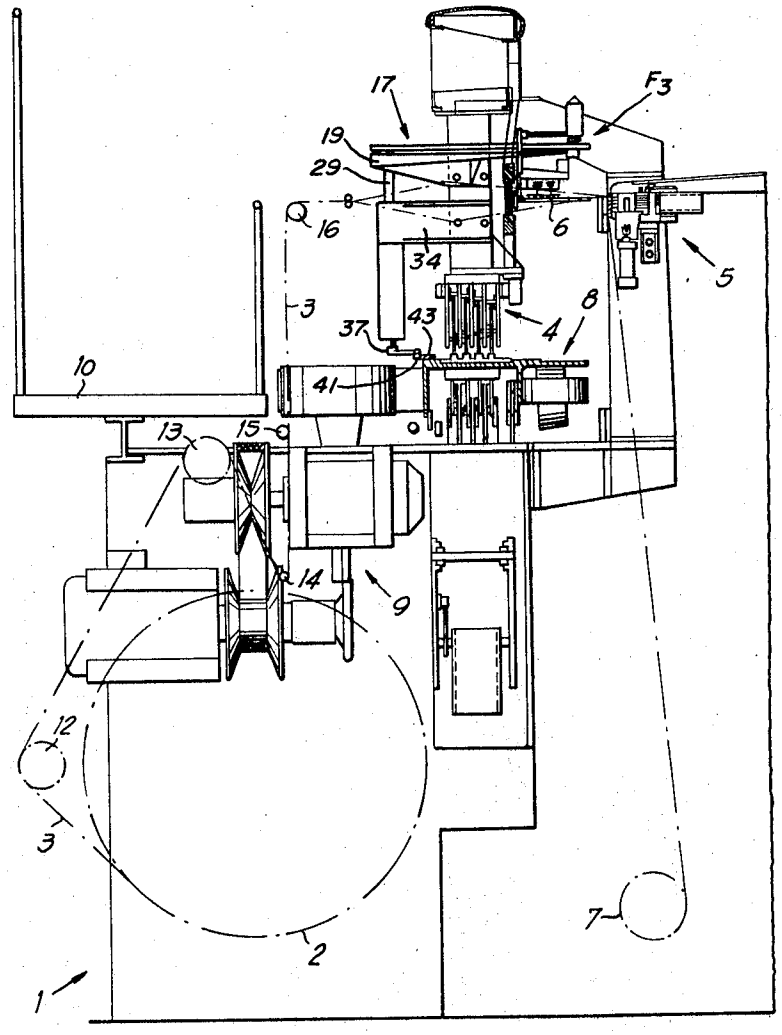

Fig. 2

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WEFT NIPPER FOR CIRCULAR LOOMS

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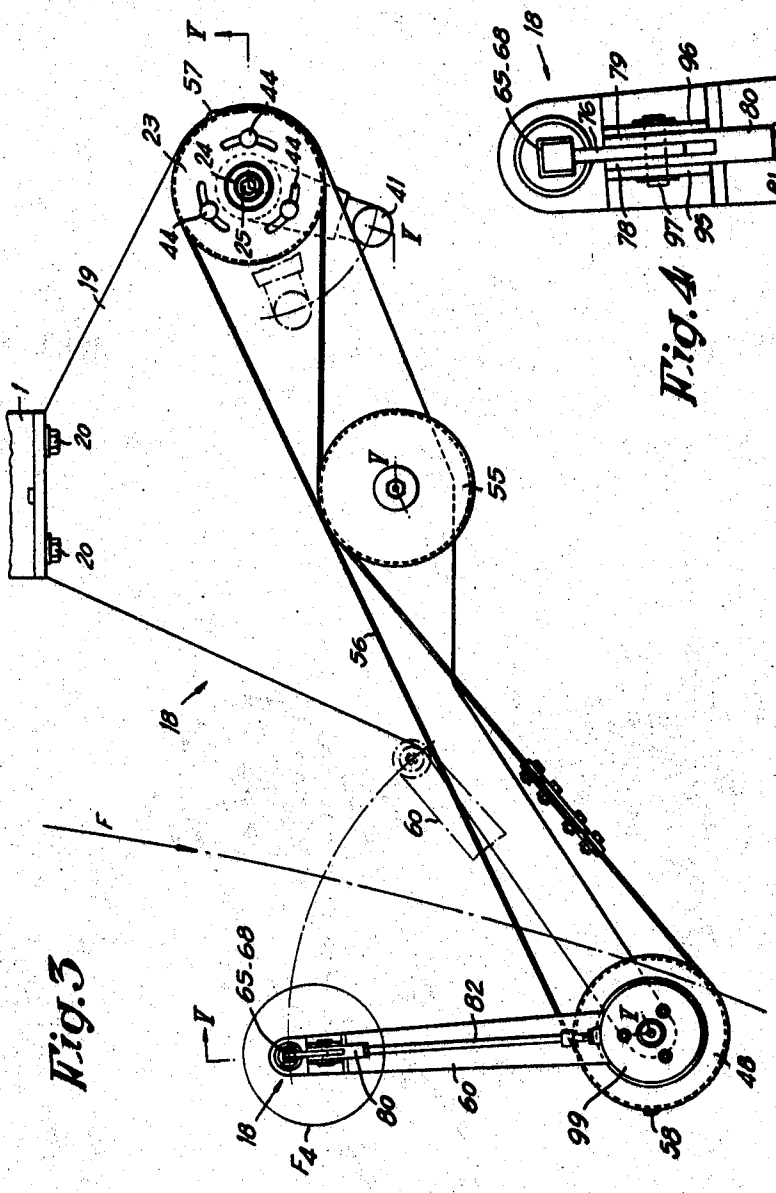

Fig. 3

Fig. 4

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WEFT NIPPER FOR CIRCULAR LOOMS

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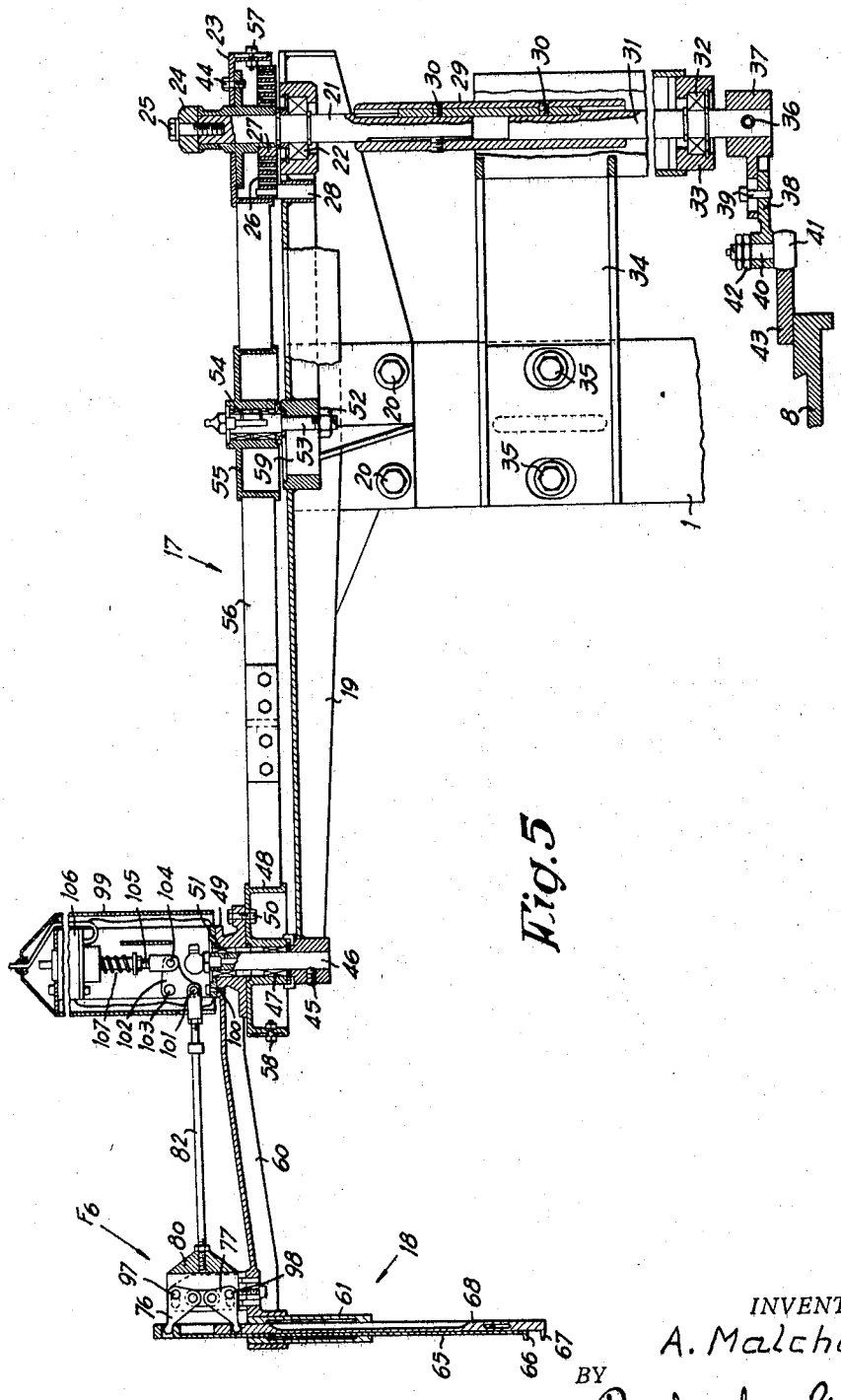

Fig. 5

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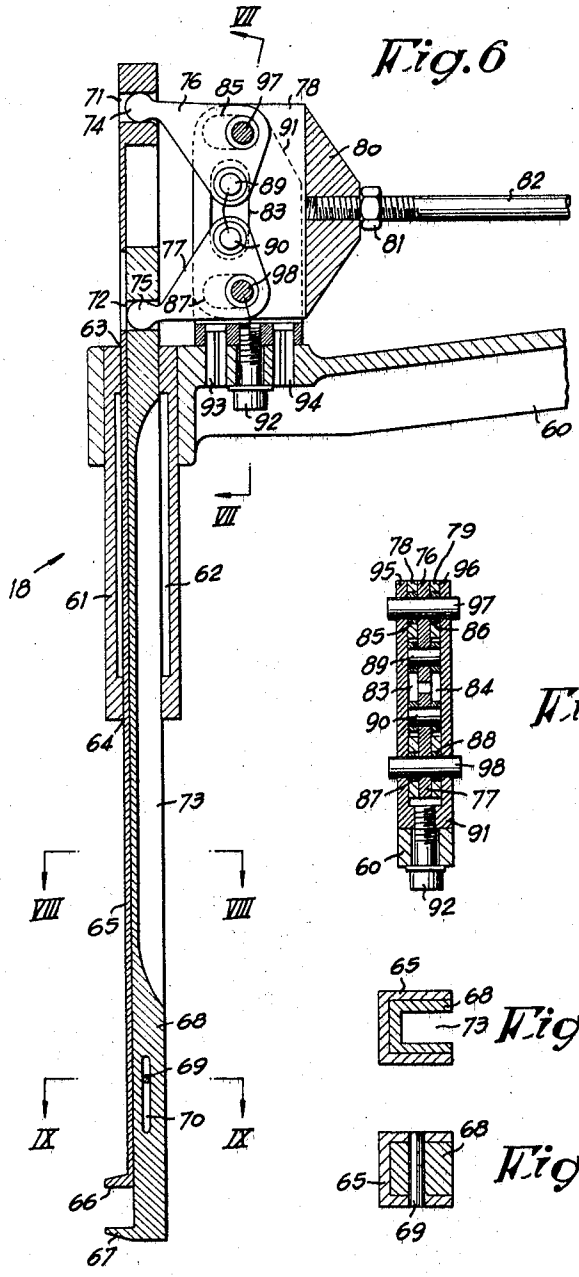

Fig. 6

Fig. 7

Fig. 8

Fig. 9

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WEFT NIPPER FOR CIRCULAR LOOMS

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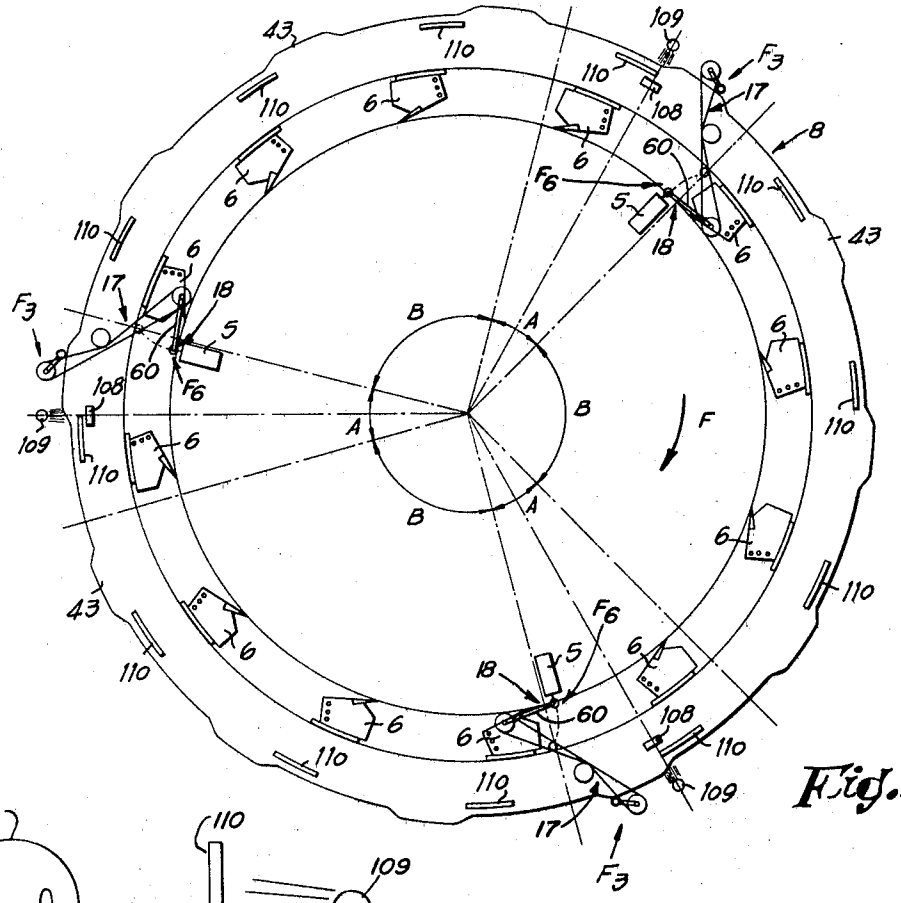
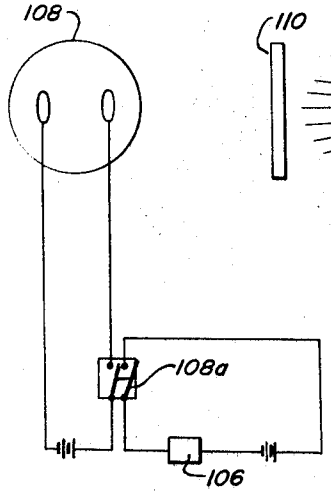


Fig. 10



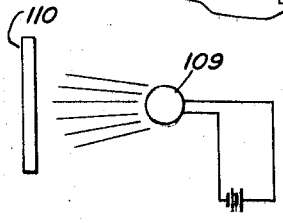


Fig. 11

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United States Patent Office 3,422,858 Patented Jan. 21, 1969

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WEFT NIPPER FOR CIRCULAR LOOMS

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Claims priority, application Belgium, Sept. 17, 1965, 669,742
U.S. Cl. 139—13 5 Claims
Int. Cl. D03d 37/00

ABSTRACT OF THE DISCLOSURE

A weft nipper for circular looms has an oscillating arm carrying jaws actuated by an electromagnet. This arm is angularly displaced by cams carried by the rotating equipment of the loom.

The present application has co-related applications, Ser. Nos. 579,079 and 579,097 filed concurrently therewith by the same applicant.

This invention relates to circular looms capable of producing fabrics having weft threads variable as regards nature, quantity and color. More particularly, this invention has for an object a weft-nipping device capable of bringing the weft threads, at a rate proportional to that at which the fabrics are made, into the trajectory of weft-drawing devices intended to pass the picks in correct lengths and at correct positions into successive sheds. Additionally, this weft-nipping device is capable of cooperating with a selector device able to feed it with weft threads of a nature, quantity and/or color predetermined in accordance with the fabric to be manufactured. This weft nipper also cooperates with the cutting-off device of the selector in such manner that the picks intended to be carried and moved by the weft-drawing device have a properly predetermined length.

An important object of the invention relates to a weft-nipping device of this type which is capable of being readily interposed between a selector device and a weft-drawing device, so that the rapid feeding of the latter is assured irrespective of the pattern and the colours of the fabrics to be woven.

The selector device is preferably of the type described in the co-pending patent application Ser. No. 579,079, while the weft-drawing device is preferably of the type disclosed in the co-pending patent application Ser. No. 579,097.

A suitable selector device is also disclosed in the British patent to Slot, No. 435,061.

The weft-nipping device according to the invention substantially consists in the combination of a support in the form of a crosspiece extended by an oscillating arm overhanging the path of the weft-drawing devices, said oscillating arm carrying, at its end, the gripping means proper normally maintained in the open position by the selector at the point of the feed means for the weft threads.

An embodiment of such a weft nipper is described below, without any limiting character, by reference to the attached drawings, in which:

FIGURE 1 is a schematic plan view of a circular loom using the weft-nipping device forming the object of the invention;

FIGURE 2 is an enlarged schematic section on the line II—II of FIGURE 1;

FIGURE 3 is an enlarged view of the portion indicated at F3 in FIGURE 1;

FIGURE 4 is an enlarged view of the portion indicated at F4 in FIGURE 3;

FIGURE 5 is a section along the lines V—V of FIGURE 3;

FIGURE 6 is an enlarged view of the part indicated at F6 in FIGURE 5;

FIGURES 7, 8 and 9 represent sections respectively along the lines VII—VII, VIII—VIII and IX—IX of FIGURE 6;

FIGURE 10 is a schematic representation of a part of the rotating control equipment;

FIGURE 11 is a diagram of an electrical circuit.

In FIGURES 1 and 2 there are shown, diagrammatically the essential elements of the loom using the weft-nipping device according to the invention, indicated by F3 in FIG. 1, namely, the main frame **1**, the warp beams **2**, the sheets of warp threads **3**, the heald frame units **4**, the selector **5**, the weft drawing devices **6**, the cloth take-up rollers **7**, the rotating equipment **8** and its general driving mechanism **9**.

The main frame **1** is arranged according to the number of sections forming a complete weaving unit, in the present case three, enabling three fabrics to be woven independently of each other, and of a quality and in designs which may be the same or different.

This main frame is arranged so as to be able to carry perfectly all the fixed and moving elements of the loom as well as the beams and the fabric, with their respective mechanisms and their respective unrolling and rolling gear. In the illustrated embodiment, there is also shown, supported upon said main frame **1**, an annular platform **10**, enabling the loom to be permanently overseen and permitting easy access to its principal mechanisms.

The beams **2** are arranged in the conventional manner on beams so that they can be readily engaged and disengaged from their support, shown diagrammatically at **11**, these supports as well as the rolling mechanisms (not shown) for the beams being also known per se.

The sheet **3** of warp threads are, in the present case, conveyed and guided by return drums and support elements **12–13–14–15–16**, so that said warp threads always have a practically constant tension. The warp threads then pass into the shed forming device shown schematically at **4**, and operated by a suitable heald frame motion (not shown).

The weft-drawing device is shown schematically at **6**, as being moved in the shed, whereupon the fabric is beaten-up and supplied to the roller **7** in known manner. Such a combination forming, as it were, a loom in itself, is positioned around the longitudinal axis of the loom in a symmetrical manner, and there is maintained between them a gap in which are arranged the mechanisms of the selector, the weft nipper, the selvedge-forming unit and the other auxiliary devices. In the example shown schematically in FIGURES 1 and 2, the circular loom has been divided into six angular zones covering and alternately, arranged in zones of 30° and 90°, indicated at A and B in FIGURE 1. The zones A correspond to the selecting and preparing zones for the weft threads, while the zones B correspond to the weaving zones proper.

The subject of the invention concerns more particularly the weft-nipping device shown schematically at F3 and also being positioned in the zones A.

This weft-nipping device comprises two essential parts, namely, a crosspiece **17** with its mechanism for imparting alternate angular movements and the gripping head **18** mounted at the end of said crosspiece. The crosspiece **17** is, in this case, comprised of a profiled horizontal arm **19** carried by the bolts **20** on the main frame **1** of the loom.

Towards its rear end, this arm is traversed by a vertical shaft **21** supported on roller bearings **22** and extending beyond the upper plane of said arm and carrying on this projecting portion a pulley **23** the hub of which butts against a cap **24** fixed to the shaft **21**, in this instance by a screw **25**. The pulley **23** which is hollow, contains a

spiral return spring **26**, one end of which is fixed at **27** to said pulley, while the other end is fixed to a pin **28** integral with the arm **19**. The shaft **21** is connected by a sleeve **29** and screws **30** to a second lower coaxial shaft **31**. The latter at its lower end is mounted on a roller bearing **32** housed in the corresponding portion of a tubular support **33** fixed by any suitable means, to a small support **34**, which is connected firmly to the main frame **1** of the loom by means of screws **35**. On the lower projecting end of the shaft **31**, there is keyed, by means of a pin **36**, a lever consisting of two parts **37–38** interconnected by a screw **39**, the arrangement being such that the length of this lever can be fully regulated. The free end of this lever serves as a bearing for the shaft **40** of a roller **41**, said shaft being held in position by a screw **42**. This roller is permanently urged by the action of the spiral spring **26** against a cam **43** integral with the rotating equipment **8**. The cam **43** can either extend around the rotating equipment **8**, in the present embodiment in the form of twelve identical and equidistant protuberances, or there can be fitted on the moving equipment **8** twelve separate cams which have the same profile and are equidistant from each other.

The pulley **23** may also for control requirements be formed in two parts joined by screws **44** so that the two parts constituting the pulley can be adjusted angularly.

At the other end of the profiled arm **19** there is fixed by a screw **45** a shaft **46** extending upwardly. On its projecting part there is supported, through the intermediary of roller bearings **47**, a pulley **48** of the same diameter as the pulley **23**. The pulley **48** is surmounted by a base **49**, fixed by bolts **50** and also housing roller bearings **51** upon which is supported the upper portion of the shaft **46**.

Finally, on the same arm **19**, between the pulleys **23–48**, there is secured, by means of a screw **52**, a shaft **53** upon which, through roller bearings **54**, is freely supported a third pulley **55**. An endless metal strip **56** is supported on these three pulleys **23**, **48**, **55** and is fixed to the outer pulleys by the bolts **57–58** respectively. The shaft **53** of the intermediate pulley **55** which forms, in this arrangement, a tensioning device, is engaged in an oblong orifice **59** cut in the arm **19**, which makes it possible for the shaft **53** to be displaced at the appropriate time, for the purpose of controlling and ensuring the required tension in the endless metal strip **56**.

The head **18**, is carried at the end of the arm **19** by the base **49**. This head includes in the illustrated arrangement, an arm **60**, which preferably forms a single piece with the base **49**, or can be fixed thereto. The free end of the arm **60** carries a tubular guide **61**, the bore **62** of which is extended to the two ends of the guide **61** by passages **63–64** respectively, of rectangular cross-section. Engaged in the guide **61** by a light friction fit is a rod **65**, having a section in the form of a U, and having its lower end profiled so as to form one of the jaws **66** of the weft nipper, the second jaw **67** forming the lower part of a second rod **68**, engaging gently by friction in the first rod **65**. These two mutually inter-engaged rods **65**, **68** are simultaneously guided by the tubular element **61**, as well as in their lower projecting parts by the engagement of the two free ends of a peg **69**, integral with the fisrt rod **65**, in an oblong orifice **70** cut for this purpose in the second rod **68**.

The above-mentioned jaws **66–67** are directed forwardly or towards the outside in relation to the overall arrangement of this weft nipper mechanism. In their upper parts each of the rods **65–68** has an orifice **71–72** respectively. Over a large part of its height, the rod **68** can be hollowed out as shown at **73** for the purpose of reducing the dead weight.

In each of the orifices **71–72** there is engaged the profiled end **74–75** forming part of a cranked lever, **76–77** respectively. These two cranked levers are also engaged between the two side-plates **78–79** of a head **80** having a section in the form of a U and secured, by means of a screw **81**, to the end of a rod **82**. The side-plates **78–79** each have a medial oblong opening, **83–84** respectively,

the longitudinal axis of which is vertically disposed, and two outer oblong openings, **85–86** and **87–88** respectively, the longitudinal axis of each of which is horizontally disposed. The levers **76–77** carry near their adjacent parts, the ends of the shafts, **89–90** respectively, engaged by their free end in the medial oblong orifices **83–84**. The head **80** is inserted in a U-shaped support **91** fixed in the underlying part of the arms **60** by means of a screw **92** and of pegs **93–94**. The support **91** has a U section, the two arms **95–96** of which are spaced apart by a distance very slightly in excess of the length of the shafts **89–90**, so that said head **80** may slide therein under gentle friction.

Opposite the outer oblong openings **85–86** and **87–88** the cranked levers **76–77** are each traversed by a shaft **97–98** respectively, which are supported on the limbs **95–96**.

The other end of the control lever **82** traverses the wall of a small case **99** fixed on the base **49** by the screw **100**. Towards this end, the rod **82** is articulated by a shaft **101** at the end of one of the arms of a cranked lever **102**, mounted on a fixed shaft **103** and the other end of which is, through the intermediary of a shaft **104**, articulated on the end of a rod **105** integral with the moving element of an electromagnet **106**, said moving element being urged rearwardly by a spring **107**.

The excitation circuit of this electromagnet **106** can be controlled by any appropriate means known per se, in turn controlled by the rotating equipment shown schematically at **8**. As shown in FIGS. 10 and 11, this equipment is formed by a fixed photo-electric cell **108**, an excitation lamp **109** also fixed and placed opposite said cell and opaque screens **10** carried by the moving equipment **8**, all these parts being placed in suitable positions with regard to the cams or protuberances of the cam **43**.

The weft drawing devices move in the direction of the arrow F shown in FIGURE 3, so that the weft threads must be laid successively across the trajectory F by means of the jaws **66**, **67** of the weft nipper. The weft is presented to the nipper by a device diagrammatically indicated by the numeral **5** in FIGS. 2 and 10. This device does not constitute any part of the present invention and is described, for instance, in applicant's above-mentioned patent application Ser. No. 579,079. The operation of the described device is as follows:

Initially, as shown in FIGURES 3 to 6, the arm **60** is located in the waiting position at the point where the appropriate weft thread is presented by the selector shown schematically at **5**, the jaws **66–67** being in the open position, the screen **110** being interposed between the photo-electric cell **108** and the corresponding lamp **109**, but in the position just preceding the unmasking phase, and a cam or protuberance **43** being located in a position preceding, by a small distance, the release of the roller **41** of the means for moving the arm **60**. In effect, in this position, the electro-magnet **106** is always inactive and, by the action of the return spring **107**, the rod **105** is always urged downwardly, thus pushing back the rod **62** via the cranked lever **102**, which brings about the separation of the free ends **74–75** of the cranked levers **76–77**, and, consequently the open position of the jaws **66–67** of the weft nipper.

In the course of the rotary movement **4** moving equipment the screen **110** uncovers the cell **108**; the cell **108** is then energized by the lamp **109** and it will close the switch **108***a* (FIG. 11) so that the excitation circuit of the electromagnet **106** closes immediately, which brings about the almost instant closing of the jaws **66–67** on the weft thread. The rod **105** in its upward axial movement angularly displaces the cranked lever **102** about its shaft **103**, which causes a retracting action of the rod **82**. This movement applies a pull on the head **80**, and consequently on the shafts **89–90** as well, which ipso facto brings together the free ends of the cranked levers **76–77** and, as the result, causes the closing of the jaws

66–67. Almost instantaneously the cam 43 permits the roller 41 to move, thus causing the positive movement of the pulley 23 and, consequently, also the displacement of the endless strip 56 and the rotation of the pulley 48 as well as of all the elements connected thereto, more particularly the arm 60 with the jaws 66–67. The result of this is that the angular movement of the roller 41 is followed precisely by the jaws 66–67 and also by the end of the weft thread which they carry. The equipment is then positioned in the loom in such a way that the weft thread so moved is positioned across the trajectory of the weft-drawing device shown schematically at 6. The cam 43 is so shaped that this end position of the movement of said jaws 66–67 is maintained until the weft-drawing device 6 has drawn up a sufficient quantity of thread from the weft supply and through the selector 5 to form a pick. As shown in FIG. 2, the weft nipper 18 brings the weft thread from the selector 5 into the path of the weft-drawing device 6. At that time, the screen 110 is interposed again between a cell 108 and its exciting lamp 109, while a protuberance on the cam brings the roller 41 into the initial position, which also brings back the arm 60 with the jaws 66–67 into the initial waiting position.

This operational cycle will be repeated for each weft-drawing device.

Obviously, the loom is so arranged that the weft thread can be cut off at the proper time. The weft is cut at the selector side after the weft-drawing device 6 has drawn a sufficient length of weft to lay a pick. After the passage of the weft-drawing device 6 through the shed, the cut-off end of the pick will be located at the exit side of the shed while the other end which has been held by the jaws 66, 67 is located at the other side, namely, the entry side of the shed. Preferably, this operation will be carried out by the selector, and at the moment when the jaws 66–67 are opened following the passage of a weft-drawing device.

It is apparent that the means described above have been indicated solely by way of illustration and that it is possible to use the essential characteristics of the weft-drawing devices in essentially variable forms, particularly by replacing the described means by any technically equivalent means or functional equivalent. In the embodiment described, three such weft-drawing devices are arranged equidistantly on the circular loom, comprising one selector per weft nipper and twelve weft-drawing devices, thereby providing a loom of very high performance.

What I claim is:

1. In a circular loom having a rotary equipment, a selector and weft-drawing devices movable along a trajectory, a weft nipper interposed between said selector and said weft-drawing devices and comprising a support having the shape of a cross-piece, an oscillating arm connected to said support and overhanging the trajectory of the weft-drawing devices, gripping means carried by an end of said arm, said gripping means being normally open, means angularly displacing said arm depending upon the movement of the weft-drawing devices, and means temporarily closing said gripping means whereby weft yarn is gripped at said selector and drawn across the path of the weft drawing device.

2. A weft nipper in accordance with claim 1, wherein the means angularly displacing said arm comprise a plurality of rollers, an endless belt carried by said rollers, a separate shaft carrying each roller, said shafts being supported by said support, one of said shafts being extended, a crank carried by an end of said extended shaft, a roller carried by said crank, a resilient return member engaging the last-mentioned roller, and at least one cam integral with said rotary equipment, said resilient return member maintaining the last-mentioned roller in engagement with said cam, one of the first-mentioned rollers being integral with said arm, whereby angular movements of said crank controlled by said cam are transmitted to said arm.

3. A weft nipper in accordance with claim 2, wherein the plurality of rollers includes a front roller, a rear roller and an intermediate tensioner roller, said endless belt being attached to said font and rear rollers, the shaft of said front roller being fixed, the shaft of said rear roller constituting a driving shaft, the shaft of said intermediate tensioner roller being adjustable.

4. A weft nipper in accordance with claim 1, wherein said gripping means comprise a vertical tubular guide carried by one end of said arm, two telescoping rods extending through said guide and having lower and upper ends, and jaws carried by lower ends of said rods; an electromagnet carried by said support, a linkage actuated by said electromagnet and a scissor device engaging the upper ends of said rods and actuated by said linkage.

5. A weft nipper in accordance with claim 4, wherein said scissor device comprises two cranked levers, a rod, said two cranked levers oscillating relatively to the last-mentioned rod, a third cranked lever, the last-mentioned rod being articulated upon the last-mentioned cranked lever, and an electromagnetic core controlling the last-mentioned cranked lever.

References Cited

UNITED STATES PATENTS

2,594,398	4/1952	Cooper	139—13

FOREIGN PATENTS

435,061	9/1935	Great Britain.
644,301	10/1950	Great Britain.
295,628	3/1954	Switzerland.

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