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Fabre

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[54] **WEFT THREAD HOLDING DEVICE IN A LOOM WITH FIXED WEFT FEEDING**

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[52] **U.S. Cl.** **139/125**; 139/370

[51] **Int. Cl.** **D03d 47/24**; D03j 5/06

[58] **Field of Search** ..... 139/122 R, 122 H, 122 W, 139/125, 126, 127, 194, 370

[56] **References Cited**

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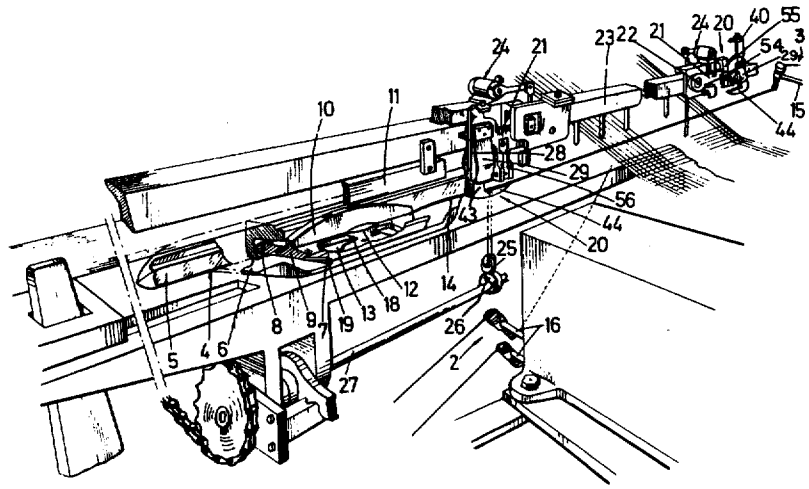
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A weft thread holding device for gripper shuttles in which each holding clamp comprises two clamp halves having each a part receiving the clamp resilient closing reaction, a clamping jaw with an oblong shape in parallel relationship with the movement of the gripper shuttle and a connecting arm joining said part to the one jaw end, in such a way that the jaw mutual application area is displaced in parallel relationship with the gripper shuttle movement relative to the connecting arm.

15 Claims, 6 Drawing Figures



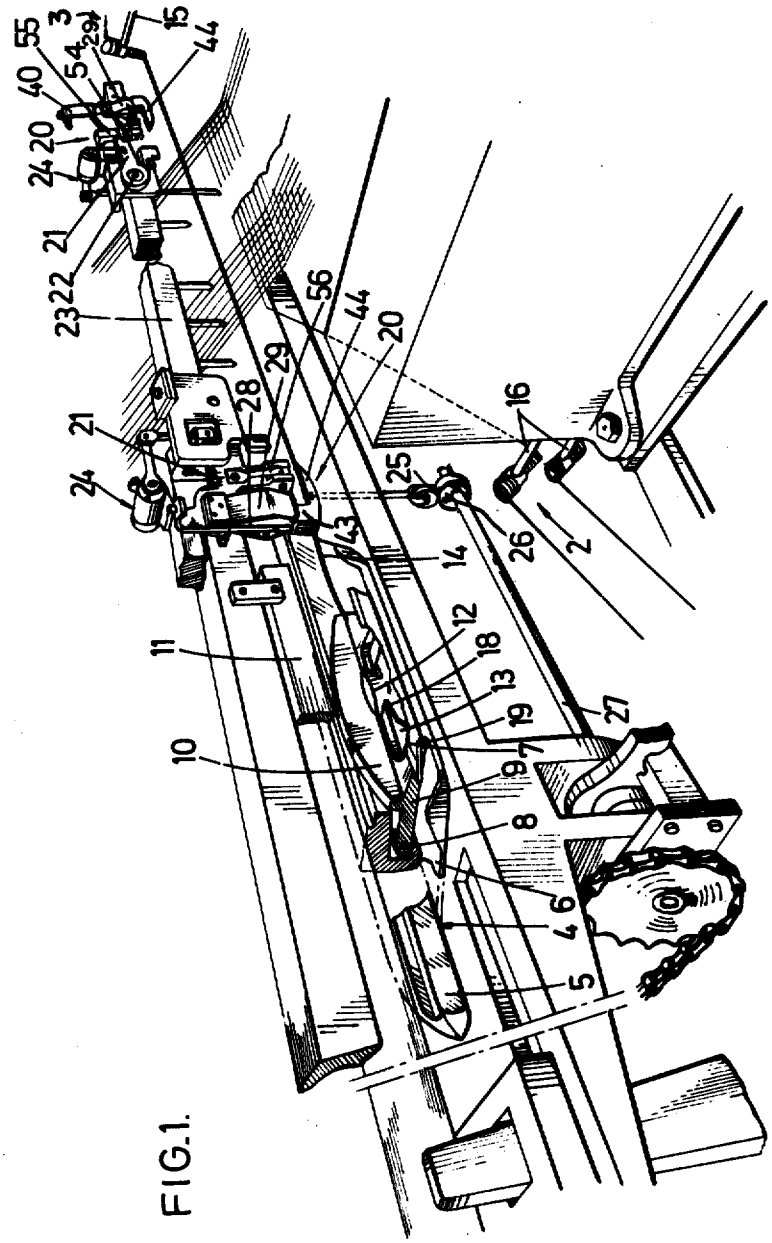

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FIG.1.

FIG. 2

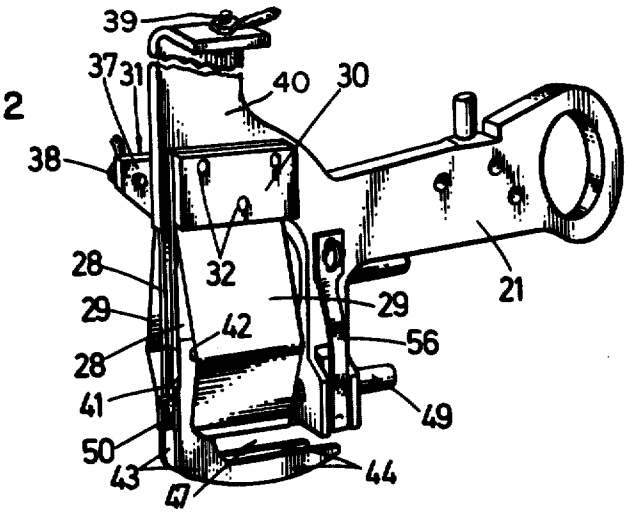
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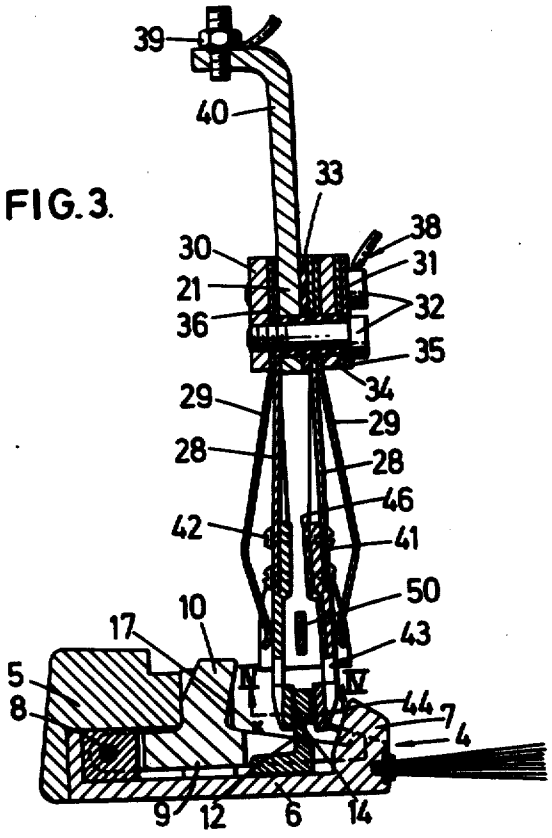
FIG. 3.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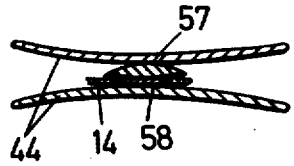

FIG. 4.

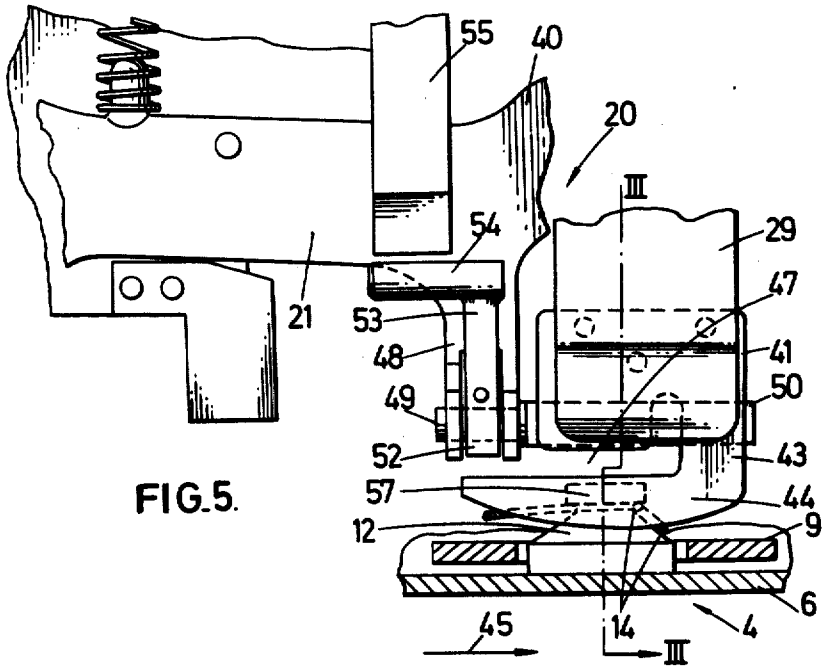

FIG. 5.

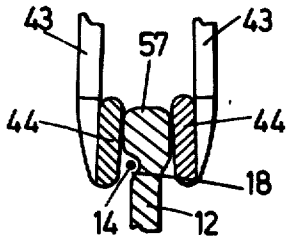

FIG. 6.

WEFT THREAD HOLDING DEVICE IN A LOOM WITH FIXED WEFT FEEDING

This invention pertains to a weft thread holding device in a loom with a stationary supply of weft thread comprising

a. a moving gripper shuttle which comprises

a gripper (with two gripping jaws) for clamping the weft thread;

and an upward-facing detent having a recessed area for locating the weft thread running from the gripper to the stationary supply for the weft thread;

b. means for opening the gripper to release the weft thread;)

c. a pair of stationary holding clamps, one on each side of the loom, each holding clamp comprising two clamp halves between which an end of the weft thread introduced by the detent is clamped after this detent has passed (at the same time that the means for opening the gripper release the weft thread from this gripper).

A device of this kind has been described in U.S. Pat. No. 3,717,181 (British Pat. application No. 18,166/71). In said known device, the stationary holding clamps on either side of the loom comprise two resilient clamping arms which are arranged in the path of the detent which is integral with the gripper shuttle, around which detent the weft thread is returned between the portion thereof pulled from the stationary supply and the end thereof clamped in the weft-thread gripper of the gripper shuttle; said gripper is comprised in said known construction, of a clamp with movable jaws operated by cam members located on either side of the loom. When the gripper shuttle reaches the considered loom side, the detent opens the holding clamp arms which close beyond the detent to trap the weft thread by the time the gripper shuttle is opened by the cam members to release the weft thread end. The holding clamp is then positively opened after the complete closing of the shed, that is when the weft thread does no more have to be held, and said clamp retracts relative to the detent path so as not to hinder the following operating cycle of the loom.

The known holding device has proved very efficient and has given very good results with heavy and medium threads. However when trying to apply said device to find threads, there appeared the drawback that the clamping surfaces of the clamp jaws will be damaged by the use, notably under the action of the continuous friction of the detent in such a way that said surfaces no more fit accurately one against the other after some operating time and do not retain well a very small diameter thread. It was tried to obviate said drawback by increasing the resilient clamping force of the clamp arms, so as to crush the slight metal burs that might be present on the surface thereof, and on the other hand it was tried to make said arms from steel which has been suitably treated to have a high surface hardness that might withstand the abrading action of the detent. However experience has shown that such clamps with jaws which are of necessity thick and relatively heavy, did cut through the weft thread by the closing thereof. This phenomenon may be explained by the fact that with the very high travel speed of the detent, the jaws apply against one another with a substantial acceleration in such a way that they work somewhat like a hammer

blow that might crush a light thread up to the destroying thereof.

The invention has for object to provide a holding clamp as defined above which operates perfectly even with very fine threads, without any danger of damaging same and which on the other hand cannot cause the formation of any burs on the useful surface of said jaws.

The invention has moreover for object to provide such a clamp which may comprise simultaneously a device for monitoring weft breakage, that is a weft-protector device, as due to the permanence of the surface condition of said jaws, such jaws remain electrically insulated from one another by the weft thread after the passage of the detent in such a way that the accidental absence of said thread is detected by the direct engagement of said jaws with one another without any danger of false alarm.

According to the invention, each holding clamp comprises two clamp halves having each:

a main part;

a clamping jaw, with an oblong shape in parallel relationship with the movement of the gripper shuttle; and

a connecting arm, joining said main part with said clamping jaw.

In a preferred embodiment, the device comprises a moving gripper shuttle with a gripper and an upward-facing detent, and a pair of stationary holding clamps, each holding clamp comprising two clamp halves, each clamp half comprising an arm for retracting the clamp from the path of the detent of the gripper shuttle, a supporting leaf joined to the arm and a single body in the shape of a shoe, which is attached to the lower end of the supporting leaf and which comprises the main part of the clamp half, the clamping jaw and the connecting arm. In such conditions each clamp half has some resiliency about an axis at right angle to the gripper shuttle path and lying in the middle plane of the half concerned, in such a way that when the clamp closes beyond the gripper shuttle detent, the energy that might cause a hammer-blow action results directly but from a fraction of the mass of both clamp halves, the remainder being absorbed through a momentary resilient distortion of the arms and of the jaws themselves about a vertical axis at right angle to the weft path and lying in a plane passing through the connecting arm center.

In an advantageous embodiment, the jaws of each holding clamp and the gripper shuttle detent are so arranged that the jaw area in which the weft thread is clamped after the detent passage is displaced relative to that jaw area in opening engagement with the gripper shuttle detent when this detent opens the jaws. Consequently, the jaw area in which the thread is clamped after the detent passage is not that area against which said detent rubs for the clamp opening and there results an increased stability of the pinching area for the weft thread.

So as to insure the function of weft protector, both halves of the holding clamp include means for insulating electrically one half from the other to the exception of the jaw engagement area, electric connecting means for connecting to a circuit sending electric pulses for monitoring weft loss being provided on the uninsulated portion of each clamp half.

Other details and features of the invention will stand out from the description given below by way of non

limitative example and with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic view in perspective, with parts broken away, of the essential portions of a loom provided with the weft thread holding device according to the invention.

FIG. 2 is a diagrammatic view in perspective of a weft thread holding clamp which is part of the device according to the invention.

FIG. 3 is an elevation view in section of the device according to the invention by that time where the holding clamp is opened by the gripper shuttle detent along line III—III in FIG. 5.

FIG. 4 is a section view along the line IV—IV in FIG. 3.

FIG. 5 is a part front elevation view of the device as shown in FIG. 3.

FIG. 6 shows on a larger scale a portion of FIG. 3.

In the various figures, the same reference numerals pertain to similar elements.

In FIG. 1 has been shown a loom with a stationary weft feeding on either side of the loom, in 2 and 3; the gripper shuttle 4 is of the type described in U.S. Pat. No. 3,717,181 (British Pat. application No. 18,166/71) as mentioned above; said gripper shuttle comprises a main body 5 of elongated shape to be guided and forced over the loom guideway; said body 5 is integral with a laterally projecting base plate 6 which has a front rim 7 which slants upwards towards the body 5 so as to form the fixed jaw of the weft thread gripper of the gripper shuttle. Inside the body 5, laterally hollowed out for that purpose, is provided the longitudinal point 8 of a movable jaw 9 which is resiliently applied against the fixed jaw 7 to pinch the weft thread. The movable jaw 9 has a nose 10 facing upwards and which can undergo the action of cam members such as 11, provided on either side of the loom to insure the opening of the gripper at the required times. The base plate 6 bears a vertical detent 12 which rises through an opening 13 in the movable jaw 9.

When the gripper shuttle 4 leaves one loom side, the movable jaw 9 is lowered by that one cam member 11 mounted on said side. The weft thread is brought to the gripper shuttle by a thread presenting member 15, 16 in that gripper shuttle area which is located between the detent 12 and the nose 10; in FIG. 3 cross 17 symbolizes the point where the weft thread is presented. When moving towards and through the shed, the gripper shuttle brings the weft thread between the jaws 7 and 9 while going round the detent 12 the profile of which raises the thread towards a recessed area 18; thus the weft thread forms between jaws 7 and 9 of the gripper shuttle and the stationary supply, a loop over about 90°. The gripper shuttle is further provided with two upstanding cutting edges 19 mounted on each end of the movable jaw 9 with the cutting side thereof at the top. On the shed side after the clamping of the weft thread in the gripper shuttle one of these edges cuts off the weft thread which passes over the edge by the movement of the gripper shuttle.

Immediately adjacent the edge of the warp thread sheet and on each side of the loom lies a fixed holding clamp 20 for the weft thread, which prevents the weft thread end from returning inside the shed when the gripper shuttle releases said thread. The clamps 20 are opened by the passage of the gripper shuttle detent 12 between the arms thereof; the clamps close thereafter on the weft thread to retain same precisely by the time there occurs the opening of the movable jaw 9 of the gripper shuttle 4 under the action of cam member.

Each holding clamp 20 is supported by an arm 21 which is rotatably mounted at 22 on the loom batten 23; the motion of arm 21 is controlled by a crank-shaft device 24. This crank-shaft device comprises a roller 25 rolling on a cam 26 mounted on a shaft 27 mounted in the batten, an upstanding rod having a forkshaped end in which the roller 25 is mounted. A first crank pivotally connected to the other end of said rod and fastened to a shaft mounted in a bearing which is fastened to the batten 23, a second crank fastened to last mentioned shaft, the free end of which is pivotally connected to the upper end of an arm, the lower end of which is pivotally connected to the arm 21. On the drive shaft 27 is mounted a chain wheel over which runs a chain driven by the driving shaft of the batten. To the holding clamps 20 is thus imparted a swinging movement in a vertical plane so as to lie in or out of the path of the detent of the gripper shuttle 4. The shaft 27 makes one-half revolution each picking so that, due to the position and form of the cams 26, alternately each clamp 20 is driven upwards after clamping the weft thread end as described above and after the pick having been beaten by the batten and the shed has closed at least partly, this being when the batten is between the forward position and the backward position. Then going up, the holding clamp 20 is positively opened and releases the weft thread end which can then be cut off by any suitable device. The holding clamp 20 concerned remains in the up position at least until the gripper shuttle has left by the following stroke.

As shown in the figures, on each surface of the free end of the arm 21 are mounted one above the other, a supporting resilient leaf 28 and a clamping resilient leaf 29. The attachment of said leaves is insured by means of two anchor-plates 30 and 31 which are tightened against arm 21 by screws such as 32. It will be noted in FIG. 3 that between the supporting leaf 28 located on the side adjacent plate 31 and arm 21 is arranged a layer 33 of insulating material and that the screws 32 are in turn insulated from the anchor-plate 31 by an insulating layer 34 which is reinforced on the outside with a small metal plate 35, and by individual tubular grommets 36 that go through the anchor-plate 31, the corresponding leaves 28 and 29 and the arm 21. To the anchor-plate 31 provided therefor with an extension 37, is associated an electric terminal 38. A second electric terminal 39 is provided on an upward extension 40 of arm 21.

A flat part 41 is attached with screws 42 to the lower end of each supporting leaf 28. Said part 41 in the shape of a shoe, receives the reaction of the adjacent resilient clamping leaf 29. On the one side, the part 41 is extended downwards with an arm 43 for connecting part 41 to a jaw 44, said jaw having a shape extending in parallel relationship with the movement direction of the gripper shuttle 4, as shown by arrow 45 in FIG. 5. It will be noted that to prevent any accidental electric contact between parts 41 of both clamp halves, one of said parts (the right-hand one in FIG. 3) is covered with an insulating layer 46 on the surface thereof facing the other part.

The two jaws 44 have each as considered sidewise, an oblong profile with a straight upper edge and a curved lower edge so as to slide over the weft thread located

between the detent 12 and the gripper 9, 7, when the detent 12 enters the holding clamp 20. The jaw 44 form with the arms 43 a kind of bracket each bracket being integral with a part 41. From another point of view, it might be considered that for forming each jaw there is first made a solid flat plate in one edge of which has been cut out an opening 47 shaped as a bracket which separates the jaw proper from the main part and which bounds the arm 43 at that side (to the right in FIG. 5) along which the detent 12 of the gripper shuttle moves. In horizontal section (FIG. 4), the jaws 44 have a curved diverging profile that forms a lead-in for detent 12. The unit 41–43–44 is made from steel which is so treated as to have a very high surface hardness.

The arm 21 has an extension 48 directed downwards and the free end of which rotatingly bears a small horizontal shaft 49 of insulating material. Said shaft so extends as to pass between both arms 43 and the thin lower portion of both parts 41, but the corresponding portion of said shaft (between said arm and parts 41) has a flattened cross-section as shown in 50.

It is clear that with such an arrangement, if the shaft 49 is rotated over somewhat less than a quarter revolution, the portion 50 thereof forces back both arms 43 and both parts 41 by spreading the jaws 44 away from one another which allows the weft thread 14 to be released from clamp 20. For this purpose, the lower portion of extension 48 is provided by the location of shaft 49, with a fork in which is received the foot 52 of lever 53. Through this foot 52 passes shaft 49 which is attached thereto. The lever 53 ends at the other end thereof in a finger 54 (FIG. 5) that lies in the lowered position of arm 21 at the bottom of an upright cam member 55 which is fixedly mounted on the loom batten in such a way that when the arm 21 swings upwards to retract clamp 20 from the gripper shuttle path, the finger 54 climbs on the cam member and causes the small shaft 49 to swing so as to open the clamp. On that side opposite finger 54, the foot 52 of lever 53 is subjected to the resilient action of a biasing leaf 56 attached to arm 21 (FIG. 2).

The detent 12 of the gripper shuttle has a particular profile, which is most clearly visible in the large scale cross-section shown in FIG. 6. As shown the detent top end has a projecting portion or head 57 which can engage the jaws 44 to spread same away from one another.

Underneath head 57 is provided with a recess 58 for locating the weft thread on that detent side along which the weft thread is pulled from the stationary supply and which lies opposite the gripper 9, 7. This design of the top portion of detent 12 of the gripper shuttle has two results, namely on the one hand that by the opening of holding clamp 20 by detent 12, there is no danger of thread 14 rubbing against jaws 44, and on the other hand that the area of said jaws 44 which might be scored by the detent lies above the clamping area for said thread 14 which thus cannot be damaged by such scoring.

The operation of the system comprised of the holding clamp and the opening detent according to the invention remains the same for the main features as the one described in the above-mentioned patent: when the gripper shuttle with a weft thread clamped between its jaws 7 and 9 reaches that loom side provided with the holding clamp, the detent 12 is engaged between the jaws 44 thereof and opens same as shown in FIGS. 3 and 5. As soon as the detent has moved beyond the jaws, said jaws close down to retain therebetween the weft thread 14 at the same moment that the stationary cam member 11 engages the weft-nose is to lower the movable jaw 9 and release the thread which thus is taken over by the clamp. Said thread insulates electrically the jaws 44 from one another, in such a way that if by the time concerned, a voltage pulse is sent across terminals 38 and 39, such pulse is stopped and will not cause any current flow.

When the shed has closed, the clamp arm 21 is raised and simultaneously the lever 53 rotates over about 60° the small shaft 49 to open the jaws 44 and release thread 14.

As the jaws 44 are made of treated steel with a very high surface hardness, there is substantially no danger of scoring said jaws. However even if there should be some local abrading this will have no action on thread 14 which as clearly shown in FIG. 8, is clamped below head portion 57 of the detent. On the other hand, making the clamp jaws 44 of special treated steel requires having such jaws with a substantial thickness, much thicker than the one of the simple leaves used actually for making the previously-known clamp. Each clamp half thus has a relatively large mass which by the sudden closing of jaws 44 behind detent 12, causes a substantial energy output. However due to the particular construction with which the jaws 44 are only connected to the corresponding parts 41 through a connecting arm 43 which is relatively thin and displaced sidewise relative to the pinching area of jaws 44, each jaw half has a substantial resiliency about a clamp vertical axis. There results that when both jaws 44 engage with a high acceleration the thread to clamp same, the resulting impact is caused but by the mass of those portions immediately adjacent to the clamping point, the energy from the more distant portions being as it were spent by the resilient distortion of both clamp halves about said vertical axis. This avoids untimely breaks due to crushing of particularly fine and delicate weft threads.

Finally, due to the facing surfaces of jaws 44 undergoing substantially no abrading by the detent 12, a thread 14, even a very fine one, is able to insulate said jaws from one another when said thread is clamped therebetween, which would not be the case if said surfaces had burs. This insures that a voltage pulse applied to terminals 38, 39 as the clamp closes will allow to sense positively and without any danger of an error, the presence or the absence of the weft thread (which is considered as insulating). The clamp thus acts as a perfectly efficient weft protector.

It must be understood that the invention is in no way limited to the above embodiments and that many changes may be brought therein without departing from the scope of the invention as defined by the appended claims.

For instance, even if the invention is particulary suitable for looms with thrown gripper shuttles, it could also advantageously be used with gripper shuttle comprised of bars moving across the loom.

I claim:

1. Weft thread holding device in a loom with stationary supply of weft thread, comprising:

a. a moving gripper shuttle which comprises:

a gripper having two gripping jaws for clamping the weft thread;

and an upwardly extending detent having a recessed area for positioning the weft thread running from the gripper to the stationary supply to the weft thread;

b. means for opening the gripper to release the weft thread; and

c. a pair of stationary holding clamps, one on each side of the loom, each holding clamp comprising two clamp halves between which an end of the weft thread introduced by the detent is clamped after the detent has passed, each clamp half comprising:

a main part;

a clamping jaw, with an oblong shape in parallel relationship with the movement of the gripper shuttle; and

a connecting arm, joining said main part with said clamping jaw.

2. A device as claimed in claim **1**, wherein each holding clamp comprises an arm for retracting the clamp from the path of the detent of the gripper shuttle and a pair of supporting leaves joined to the arm, said two clamp halves each being secured to a respective leaf.

3. A device as claimed in claim **1**, wherein the end portions of said jaws diverge from one another at least on the detent entry side, said connecting arms being located at the end portions of the clamp halves opposite the detent entry portion.

4. A device as claimed in claim **3**, in which at least that jaw end portions that lie on the side of the detent entry have a lower edge curving upwards relative to the lower edge of that area where the jaws are applied one against the other.

5. A device as claimed in claim **1**, in which said main part, said connecting arm and said jaw are integral and made from treated steel with a high surface hardness.

6. A device as claimed in claim **1**, in which each holding clamp half further comprises a vertical supporting leaf, connected to said main part and a resilient clamping leaf secured to said supporting leaf which also extends vertically with the lower end bearing against said main part, the upper ends of the resilient supporting leaves and of the resilient clamping leaves of both clamp halves being attached to means for alternatively moving the clamp in and out of the gripper shuttle path.

7. A device as claimed in claim **1**, in which the jaws of each holding clamp and the gripper shuttle detent are so arranged that the jaw area in which the weft thread is clamped after the detent passage is displaced relative to that area of said jaws in engagement with the gripper shuttle detent when this detent opens the jaws.

8. A device as claimed in claim **7**, in which the detent is provided with a head for opening the holding clamp jaws, said head being situated above the weft-thread positioning area.

9. A device as claimed in claim **1**, in which both halves of each holding clamp comprise means for insulating electrically one half from the other with the exception of the jaw engagement area, electric connecting means for connecting said halves to a circuit sending electric pulses for monitoring weft loss which would allow the jaws to engage each other and complete the circuit.

10. In a loom with a gripper shuttle, comprising a stationary weft thread supply, a gripper shuttle having a gripper for clamping the weft thread, detent means arranged on the gripper shuttle and extending upwards relatve to the gripper, means for feeding the weft thread from the stationary supply to the gripper crosswise to the detent means, means for releasing the weft thread from said gripper, said loom further comprising a pair of fixed clamps, one on either side of the loom between which an end of the weft thread introduced by the detent is clamped after this detent has passed at the same time that the means for opening the gripper release the weft thread from this gripper and means to bring each holding clamp in and out of the path of the gripper shuttle detent, the improvement comprising each holding clamp having two halves each comprising a shoe-like main part, a weft thread clamping jaw with an oblong shape in parallel relationship with the gripper shuttle movement, arranged underneath the shoe-like main part, and a connecting arm between said main part and one jaw end.

11. In a loom as claimed in claim **10**, the improvement comprising said holding clamp jaws having end portions diverging from one another on the side of the gripper shuttle detent entry, the connecting arm being arranged adjacent the detent outlet end portion of the holding clamp.

12. In a loom as claimed in claim **10**, the improvement comprising said main part, said connecting arm and said jaw of each clamp half being integral and made from treated steel with a high surface hardness.

13. In a loom as claimed in claim **10**, the improvement comprising each clamp half having a vertical supporting leaf connected to said main part and a resilient clamping leaf secured to said supporting leaf which also extends vertically with the lower end bearing against said main part, the upper ends of the resilient supporting leaves and of the resilient clamping leaves of both clamp halves being attached to means for alternatively moving the clamp in and out of the gripper shuttle path.

14. In a loom as claimed in claim **10**, the improvement comprising the gripper shuttle detent having a head for opening the holding clamp jaws, said detent being provided with a recessed area situated underneath the head, for positioning the weft thread running from the gripper to the stationary supply for the weft thread.

15. In a loom as claimed in claim **10**, the improvement comprising each holding clamp having electric insulating means between both clamp halves with the exception of the jaw engagement area, electric connecting means for connecting said halves in a circuit for sending weft-loss monitoring pulses.

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