



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.12.2018 Bulletin 2018/51

(51) Int Cl.:
D03J 5/06 (2006.01)

(21) Application number: **18176734.4**

(22) Date of filing: **08.06.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **15.06.2017 IT 201700066823**

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(54) **IMPROVED SYSTEM FOR GRIPPING/RELEASING THE WEFT THREAD IN A PROJECTILE WEAVING LOOM**

(57) Improved system for gripping/releasing the weft threads in a projectile weaving loom, wherein each of the projectiles (P) comprises, housed therein, a gripping lever (1) and a releasing lever (3) pivoted to the body of the projectile (P) and movable between a weft thread gripping position, a weft thread clamping position and a weft thread releasing position. The rotation movement of

the gripping lever (1) and of the releasing lever (3), against the action of thrust means (M), is caused by the contact between a portion (lps, 8) of said gripping and releasing levers (1, 3) and respective fixed slides (S1, S2) arranged along a portion of the projectile guide track (P), before the inlet and after the outlet of the shed.

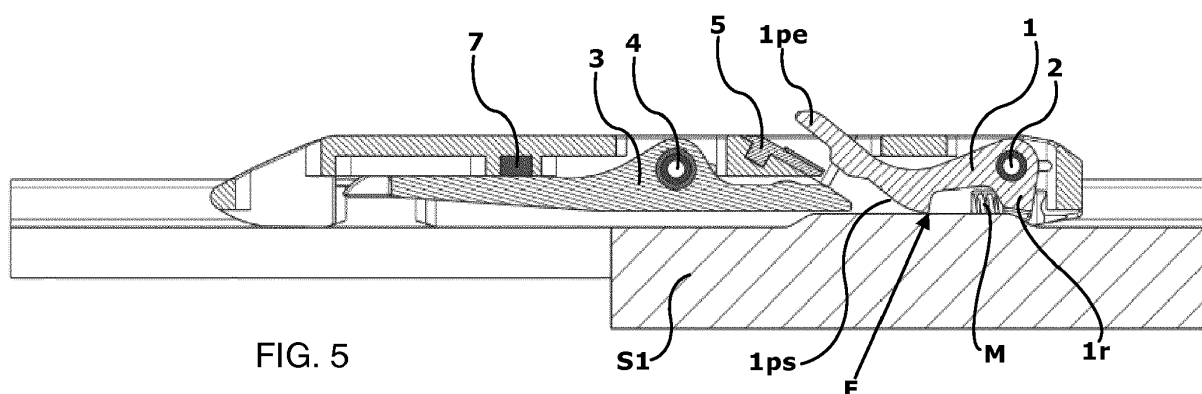


FIG. 5

Description

FIELD OF THE INVENTION

[0001] The present invention relates to an improved system for gripping/releasing the weft thread in a projectile weaving loom.

STATE OF THE ART

[0002] As known, projectile weaving looms differ from other types of looms in that the weft thread is inserted into the shed by the launch of a projectile, i.e. a tapered metal body of appropriate mass and shape, along a guide track. The projectile is loaded into a start station of the guide track, external to the shed, where, before starting the launching operation through any known device, the free end of a weft thread is joined to the projectile while the latter is still stationary in said start station. After the projectile has been launched, the projectile passes through the shed, drawing the weft thread with the same, thus obtaining the desired weft thread insertion.

[0003] When coming out from the shed (usually at the right side of the loom, with reference to the standard working position of the weaver) the projectile is slowed down and halted by a braking device provided in an arrival station of the guide track, external to the shed. Once the projectile halt has been completed, the weft thread is released. The projectile is freed from the weft thread and then is returned to the launching side of the loom (usually the left side thereof) by means of a suitable continuous transport system. On the launching side, the single incoming projectiles are stocked on a loading device which progressively brings them in front of the start station where a respective desired weft thread is joined to each one of them before launching again the projectiles into the shed. Of course, a certain number of projectiles is operative at the same time on a specific loom, which number is determined substantially by the height of the loom and by the speed of the continuous transport system which returns the projectiles from the arrival station to the start station.

[0004] Precisely because the weft thread gripping and releasing operations are carried out only when the projectile is stationary, the insertion cycle of a weft thread in projectile looms has a significantly longer duration than that in rapier looms and therefore the maximum operating frequency of this kind of looms is medium-low, i.e., for example, 300-400 weft insertions per minute. In ordinary weaving applications, therefore, projectile looms have now been completely replaced by rapier, air and water looms; while projectile looms are still competitive today in the weaving of fabrics having a large height (over 3.50 m) or of technical fabrics made with special yarns, wherein they provide higher performance than those of the other kind of looms.

[0005] The problem that the present invention intends to address is therefore that of improving the operating

modes of the current weft thread gripping and releasing systems in projectile looms, in order to reduce the duration of the weft insertion cycle to values comparable with those of rapier looms, without impairing the relevant advantages provided by projectile looms. As already mentioned above, these advantages essentially consist in allowing to weave on large heights - as the projectile looms do not include mechanical members accompanying the projectile along the shed - as well as allowing to weave special yarns that, due to their intrinsic features, cannot be correctly treated in the weft exchange operations of the rapier looms or in the insertion operations with fluid flow under pressure of air and water looms, without causing serious problems such as delamination, loss of the desired orientation, missed or irregular exchange at the centre of the shed, or short wefts.

[0006] US-3.213.892 discloses a projectile loom, wherein the projectile is provided with a clamping lever, pivoted to the body of the projectile, said lever comprising a clamping nose, whose clamping surface cooperates with a corresponding clamping surface formed in the body of the projectile to temporarily retain a weft thread. A spring keeps the clamping nose firmly pushed into a clamping position. The clamping lever comprises a control portion having a cam surface which projects from the projectile body, on the same side of the clamping nose, to cooperate with a fixed cam provided immediately downstream of the projectile start position, such that the clamping nose is in its open position when the projectile passes sideways to a weft thread pneumatically tensioned by a suction tube in a vertical direction perpendicular to the projectile path.

[0007] US-3.213.892 proposed long time ago the idea of using a weft grip system on a running projectile instead than on a stationary projectile, as instead continues to be made in all existing projectile looms. As a matter of fact, whilst the disclosed system would in theory be able to advantageously reduce the dead times for clamping the weft, at the loom insertion side, this system has never been practically implemented on the market due to significant technical problems shown by the same. A first drawback stems from the fact that the weft thread in the clamping area is tensioned in a vertical direction, perpendicular to the trajectory of the projectile clamping nose. A correct clamping of the weft thread into the running projectile is however practically impossible in these conditions, both due to the high impact stress which would definitely impair the weft and due to the fact that the weft thread would remain within the clamping area for too a short time with respect to the time required for performing the closing movement of the clamping lever. A second drawback stems then from the fact that the action of the fixed cam on the control portion of the clamping lever is not sufficiently gradual and, therefore, it would cause an excessively short service life of the projectile. On the other hand, it is not even possible to render this action more gradual by simply modifying the squared shape of the fixed cam, i.e. by providing the same with

an entry ramp, because in this case a mechanical interference between the fixed cam and the clamping nose could easily happen at the initial rotation of the clamping lever.

SUMMARY OF THE INVENTION

[0008] Starting from the above shown prior art state, it is therefore an object of the present invention to provide an improved system for gripping/releasing the weft thread, in a projectile weaving loom, wherein the gripping and releasing operations can effectively be performed on the running projectile, thus removing from the whole period of the weft insertion cycle, the lengths of time relating to the weft gripping/releasing step on a stationary projectile, without incurring in the drawbacks of the prior art solution expounded above.

[0009] Another object of the present invention is to eliminate also the projectile repositioning step which normally occurs in the prior art looms, after the projectile halting step, to bring back the projectile and the weft thread joined thereto in their correct weaving position.

[0010] These objects are achieved by means of a weft gripping/releasing system in a projectile loom having the features defined in claim 1. Further preferred features of said device are defined in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Further features and advantages of the improved system for gripping/releasing the weft thread according to the present invention will anyhow become more evident from the following detailed description of a preferred embodiment of the same, given by mere way of non-limiting example and illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a projectile of the system for gripping/releasing the weft thread of the present invention, while moving along a guide track formed by discrete support and guide elements of the projectile;

Figs. 2A and 2B are respectively side elevation and perspective views of the device of Fig. 1 in a closed position of the gripping means;

Figs. 3A and 3B are respectively side elevation and perspective views, of the projectile of fig. 1 in an open position of the gripping means;

Fig. 4 is a perspective view of the internal elements of the projectile of fig. 1 which perform the weft thread gripping and releasing operations;

Fig. 5 is a longitudinal section view of a projectile according to the invention and of a first fixed slide cooperating with the same, during the gripping step of the weft thread;

Fig. 6 is a front elevation view of a projectile having a widened upper portion and of the first fixed slide, in the position shown in Fig. 5;

Fig. 7 is a longitudinal section view of a projectile according to the invention and of a second fixed slide cooperating with the same, during the releasing step of the weft thread;

Fig. 8 is a front elevation view of a projectile having a widened upper portion and of the second fixed slide, in the position shown in Fig. 7;

Fig. 9 is a cross-section view of a projectile having a widened upper portion in correspondence of a hook of the guide track; and

Fig. 10 is a cross-section view like that of Fig. 9 of a second embodiment of the projectile.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] According to the present invention, in order to solve the above highlighted problem, the projectile P houses therein movable elements which perform the weft thread gripping and releasing operations, while the projectile is moving along the guide track. Said movable elements are moved by fixed slides arranged in a suitable position along the guide track.

[0013] Preferably said guide track is formed by multiple discrete support and guide elements of the projectile P, often indicated in the art simply as hooks G. Hooks G are arranged aligned along the desired trajectory of the projectile P and fixed with their base to the body of the loom, in a *per se* known manner. Therefore, projectile P is provided with suitable sliding surfaces that cooperate with corresponding internal surfaces of the hooks G, arranged in such a way as to provide a bilateral constraint in the two directions perpendicular to the sliding direction of projectile P. Various arrangements of these surfaces may therefore be proposed, with the sole limitation that they are compatible with the other functions of projectile P, which will be described below, according to which the weft thread gripping and releasing operations can be performed on the "running" projectile.

[0014] In all the currently used projectile looms, joining of the weft thread to the projectile takes place by means of a clamp arranged at the rear end of the projectile. Said clamp can be opened from the outside of the projectile, by inserting therein a movable pin which diverges the two arms of the clamp, against spring means which push the clamp arms into their closed position. It is therefore obvious that, with such a construction, the weft thread gripping and releasing operations may take place only when the projectile is stationary and precisely positioned in respect of the aforesaid movable pin. As a matter of fact, the different solution proposed in the prior art document discussed above has never been embodied, due to the heavy inherent drawbacks. Against this state of the prior art, projectile P according to the present invention is provided with movable elements suitable to perform a gripping and a steady clamping of the weft thread and then the quick releasing thereof, while the same projectile P is running.

[0015] This allows to grip the weft thread - which is presented to the projectile by a weft presenting device with appropriate coordination of time and position - and to release the same while the projectile is running, precisely soon after the projectile has been launched and, respectively, when the weft thread insertion in the shed has been completed but the projectile is still moving in the halting device. The improved system for gripping/releasing the weft thread according to the present invention therefore allows to completely eliminate the static weft thread gripping/releasing operations on a stationary projectile before the start of the launching step and after the end of the halting step of the projectile, as happen in the prior art projectile looms, and to perform instead dynamic weft thread gripping/releasing operations at the end of the launching step and at the beginning of the halting step of projectile P.

[0016] Thanks to this innovative solution for gripping/releasing the weft, the duration of the weft insertion cycle is drastically reduced by the time relating to the static weft thread gripping/releasing steps, while the projectile is stationary. The improved system for gripping/releasing the weft thread of the invention thus allows the manufacture of projectile weaving looms having working speeds much higher than those of a traditional projectile loom.

[0017] In addition to the above, the system of the invention is immediately suitable for using weft thread management techniques like the already widely known and well-tested techniques in use in rapier looms, from which the selection, presenting and cutting devices, the weft management devices and finally also the layout on the loom of said devices can be borrowed.

[0018] Entering now into greater detail of the mechanical construction of the preferred embodiments of the system for gripping/releasing the weft thread of the present invention, it is worth to note that said system consists of two oscillating levers housed inside the projectile P and two respective fixed slides arranged along the guide track suitable for actuating said levers to achieve the gripping of the weft thread, when the projectile is entering the shed, and the release of said weft thread, when the projectile P is coming out from the shed. Two main innovative features clearly distinguish the projectile according to the present invention from the one disclosed by US-3.213.892 and which actually allow the inventive device to be effectively carried out in practice, in contrast to that disclosed in the above prior patent.

[0019] A first important feature relates to the fact that the weft thread gripping lever is arranged in such a way as to project its control cam portion on a side of the projectile different from the side from which the end of the same gripping lever is moved out during the weft thread gripping step. This innovative arrangement makes it possible to design the fixed control cam which drives the clamping lever in such a way that the action of opening and closing the lever is sufficiently gradual so as not to impair the service life of the projectile.

[0020] A second important feature of the projectile of the present invention relates to the way of gripping the waiting presented weft thread, which is not in fact an "active mode" in which the weft thread is directly hooked by the end of the gripping lever projecting from the projectile and then dragged by the same end against the clamping surface, as disclosed in the aforementioned document. Indeed, the inventors of the present invention were well aware of the fact that such a way of gripping the weft thread could cause localized stresses in the weft thread which irreparably impair the structure thereof and do not allow to obtain a high-quality weaving. The weft thread gripping operation in the inventive projectile has therefore been designed according to a "negative mode", i.e. a mode wherein the weft thread is made to slide on the upper surface of the projectile until it falls into a convenient housing cavity in which the weft thread is suitably positioned for the subsequent clamping action by the end of the gripping lever. Therefore, when the end of the gripping lever is in its open position, it just acts as a directing element to facilitate the entry of the weft thread into said housing cavity. After the weft thread has been correctly positioned therein the gripping lever is moved in its closed position, while clamping the weft thread against a fixed abutment surface. The gripping action on the weft thread is therefore very mild and does not entail any possible damage to the same.

[0021] As clearly shown in fig. 4, wherein the above said two oscillating levers are shown in operating position - without representing the body of projectile P housing the same for better clearness - and in fig. 5 (cross-section), a first gripping lever 1 is pivoted in 2, near the rear end of the body of the projectile P, while a second releasing lever 3 is pivoted in 4 in a nearly central position of projectile P. Preferably, both said levers are positioned in order to have their own longitudinal median plane coinciding with the longitudinal median plane of projectile P. The gripping lever 1 performs the operation of gripping the weft thread, while the releasing lever 3 performs the releasing operation of said weft thread from projectile P, as will be better seen in detail below. Both said levers oscillate around axes which are preferably perpendicular to the movement direction of the projectile P and parallel to the sliding plane thereof.

[0022] Gripping lever 1 is a two-arm lever which comprises a longer front gripping arm 1p and a shorter rear return arm 1r, said arms being approximately perpendicular to each other. The lever 1 is kept in closed position, where it performs a clamping action on the weft thread, by a pair of helical springs M arranged within suitable cylindrical housings formed in the body of the projectile P, on the two sides of lever 1. The springs M work with a compression force and act against the free end of the return arm 1r, to push the free end 1pe of the gripping arm 1p against an abutment plate 5, made of a material having a high resistance to wear, said abutment plate 5 being inserted in a suitable seat provided in projectile P or being integral with the same. As clearly shown in Figs.

2, when the gripping lever 1 is in its clamping position, i.e. with the end 1pe of the gripping arm 1p resting against the abutment plate 5, the profile of said gripping arm 1p is completely inside the outline of projectile P. The body of the projectile P and the end 1pe of the gripping arm 1p of the lever 1 are provided with a shape devoid of any possible hooking points, such that the projectile P can freely slide within the shed without causing entangling, drawing and/or breaking of the warp threads coming into contact with the projectile external surface, particularly in the final step of the projectile run while the shed is going to be closed.

[0023] The releasing lever 3 is also a two-arm lever (Fig. 4, 5) which comprises a longer front controlled arm 3c and a shorter rear operating arm 3a, which are mutually nearly aligned. When the gripping lever 1 is open in the gripping position of the weft thread, as shown in Fig. 5, the releasing lever 3 is kept in its non-working position by a permanent magnet 7 arranged inside a respective housing formed in the body of the projectile P; when, instead, the gripping lever 1 is closed in the clamping position of the weft thread, such gripping lever 1 is adjacent with its portion 1p (fig. 7) to the free end of the operating arm 3a, without however interfering with the same. The free end of the controlled arm 3c branches out into two mutually spaced prongs 8, having an arcuate shape, which in the non-working position of the releasing lever 3 project from suitable cut-outs formed in respective shelves 9 of the projectile P (figg. 2B, 3B). Shelves 9 form the upper surface of two lateral expansions 10 which project from the lower half of the projectile P along its whole length.

[0024] The opening movement of the gripping lever 1 is caused by the contact between a lower portion 1ps of the gripping arm 1p and a first fixed slide S1 (Fig. 5) provided with upward and downward ramps. The first slide S1 is arranged in a suitable position, before the shed inlet, centrally along a portion of the guide track of the projectile P, and is positioned in such a way that, during the passage of projectile P thereon, it enters a convenient central compartment 6 formed in the lower portion of the projectile P (Fig. 6, 9). Inside the compartment 6, also protrudes the lower portion 1ps of the gripping arm 1p of the lever 1, which portion 1ps thus goes into contact with said first slide S1 during the passage of the projectile P on the same. It is worth to note that - differently from the above disclosed prior art - the lower portion 1ps of the gripping lever 1 cooperating with the first slide S1 has been designed to protrude from the lower side of the projectile P, i.e. from a side different from the upper side of said projectile P from which the free end 1pe of the same gripping lever 1 protrudes. This arrangement allows, in fact, to freely design the first slide S1 for giving a rotation movement to the gripping lever 1 as smooth as desired, without causing any possible mechanical interference between said slide S1 and the free end 1pe of the gripping lever. The contact between the rounded lower portion 1ps of the gripping arm 1p and the

upward ramp of the first slide S1, which contact is schematically shown in the drawings by the arrow F in Fig. 5, causes a gradual opening rotation movement of the lever 1 around the axis 2 and against the action of the springs M, until the free end 1pe of the gripping arm 1p of the lever 1 projects from the body of the projectile P, as shown in Figs. 3A, 3B. In this way the free end 1pe of the gripping arm 1p forms a gripping element of the weft thread which, in a *per se* known manner in the field of rapier looms, has been in the meantime lowered by a presenting device into a presentation position at the same level of the upper surface of the projectile P.

[0025] As a matter of fact, as clearly shown in figg. 2 and 3, a conveniently shaped weft thread housing cavity is formed in the body of the projectile P, between the abutment surface 5 and the free end 1pe of the gripping lever 1 in its open position. This weft thread housing cavity is designed in such a way to let the weft thread - sliding onto the projectile P upper surface - fall within the same in the best position for the subsequent clamping action by the free end 1pe of the gripping lever 1. The gripping lever 1, when in its open position, works therefore as a directing element to facilitate the smooth entry of the weft thread into said housing cavity. The shape of the weft thread housing cavity is not particularly limited to the purposes of the invention and is mainly determined by the inclination of the waiting presented weft threads, in respect of the projectile trajectory, and by the weft thread type and count.

[0026] Whilst the projectile P moves ahead, the gripping lever 1 maintains its contact with the first slide S1, through its lower portion 1ps, until the latter arrives at a downward ramp of the first slide S1 which allows the gradual quick closing of the lever 1 against the abutting surface 5. Thanks to the constant compression action by the springs M on the arm 1r of the lever 1, the weft thread is steadily clamped in position between the free end 1pe of the lever 1 and the abutting surface 5. The weft thread is then cut, using techniques and devices already known in the rapier looms, while it is drawn into the warp shed by the projectile P, thus performing the desired weft thread insertion.

[0027] To allow the release of the weft thread when the projectile P has reached the opposite end of the shed, the lever 1 is slightly opened again by the contact between the pair of prongs 8 provided at the free front end of the controlled arm 3a of the releasing lever 3 and a second fixed double slide S2, arranged in an appropriate position outside the shed (Fig. 7). This double slide S2 is arranged in correspondence of the shelves 9 of the projectile P and, specifically, above the projectile P and, symmetrically, on the two sides of said projectile P. This second double slide S2 is also provided with upward and downward ramps which come into gradual contact with the upper arcuate portion of the prongs 8 causing the gradual rotation movement of the releasing lever 3 in both rotation direction.

[0028] In the first "opening" movement, the free end of

the operating arm 3a of the releasing lever contacts the lower portion of the arm 1p of the lever 1 and then causes the end 1pe of said arm 1p to move away from the abutment plate 5, allowing the release of the weft thread (fig 7), against the compression action of the springs M on the arm 1r of the lever 1. The rotation impressed by the releasing lever 3 on the arm 1p of the lever 1 is just sufficient to release the weft thread from the clamping action against the abutment plate 5, but not such to let the free end 1pe of the arm 1p project from the outline of the projectile P, thus avoiding any possible interference of such free end 1pe with the warp threads during the possible early closure of the shed. When the contact between the downward ramp of the second double slide S2 and the prongs 8 of the releasing lever 3 ceases, said lever is recalled in its home position by the attractive force of the magnet 7.

[0029] The general section shape of the projectile P and, consequently, the shape of the inner surface of the hooks G, is studied in such a way to meet the requirements for achieving a stable guide of projectile P and to minimize frictional losses during the projectile P run along the guide track. For example, it is possible to provide projectiles P having lateral sloping contact surfaces converging towards the upper portion of the projectile and devoid of upper contact surfaces, as shown in Figs. 1-3 and 9. Alternatively, projectiles P having lateral vertical contact surfaces and upper horizontal contact surfaces may be used, as illustrated by way of example in Fig. 10. These different shapes of the projectile offer different performances and can be selected according to the needs of the loom for which the projectile itself is intended.

[0030] The shelves 9, together with the upper central surface of the projectile P, also form the braking surfaces of the projectile P when it comes out from the shed, i.e. those on which the pads of a brake device act to halt the projectile at the end of the weft thread insertion in the shed. As far as necessary, in order to limit the wear and overheating of the braking pads and of the same projectile P due to the braking friction within acceptable limits, it is possible to extend the braking surface by widening the upper portion of the projectile P, with respect to that shown in Figs. 1 to 3, providing for lateral overhangs 11 which overlap, at least partly, the shelves 9, as in the embodiments of the projectile P shown in Figs. 6, 8, 9 and 10.

[0031] The special layout of the gripping lever 1 and of the releasing lever 3 of the projectile P allows the lower portion 1ps of the gripping lever 1, cooperating with the first slide S1, to be arranged near the rear portion of the projectile P, and, respectively, allows the prongs 8 of the free end of the releasing lever 3, cooperating with the second slide S2, to be arranged near the front portion of the projectile P. This arrangement enables that the gripping of the weft thread be performed immediately before the shed inlet and that the release of the weft thread again be anticipated in the step in which the projectile P is going across the last warp threads and/or the false selvedge

at the shed outlet; it is thus possible to minimize the waste weft threads ends coming out from the shed, both on the inlet side and on the outlet side of the shed. Moreover, it can be also obtained that the warp and/or false selvedge threads, due to the progressive closing of the shed against the projectile P, duly retain the end of the weft thread while it is released from the projectile, thus assisting the formation of a fabric free from defects.

[0032] It is understood, however, that the invention is not to be considered as limited to the particular arrangements illustrated above, which represent only exemplary embodiments of the same, but that different variants are possible, all within the reach of a person skilled in the art, without departing from the scope of the invention, which is exclusively defined by the following claims.

Claims

1. Improved system for gripping/releasing the weft threads in a projectile weaving loom, of the type wherein projectiles (P) are successively launched into the open shed of the loom, along a guide track extended upstream and downstream of the shed, for carrying out the insertion of the weft threads joined thereto, **characterised in that** each of said projectiles (P) comprises, housed therein, a gripping lever (1) pivoted (in 2) to the body of the projectile (P) and movable between:

a. a weft thread gripping position, wherein one free end (1pe) of said gripping lever (1) protrudes from the outline of the projectile (P), for gripping a weft thread moved close to the projectile (P) by a weft thread presenting device; and

b. a weft thread clamping position, wherein said free end (1pe) of the lever (1) is fully within the outline of the projectile (P), resting against an abutting surface (5) integral with the body of the projectile (P), for steadily retaining the weft thread during the insertion of the projectile (P) into the shed;

said gripping lever (1) being kept pushed in said weft thread gripping position by thrust means (M),

and in that the opening movement of said gripping lever (1) towards said weft thread gripping position, against the action of said thrust means (M), is caused by the contact between a control portion (1ps) of said gripping lever (1) protruding from a side of the projectile (P) and the upward ramp of a first fixed slide (S1) arranged along a portion of said guide track of the projectile (P), before the shed inlet, said control portion (1ps) of the gripping lever protruding from a side of the projectile (P) different from the side from which the free end (1pe) of said gripping lever (1) protrudes.

2. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 1, wherein each of said projectiles (P) furthermore comprises, housed therein, a releasing lever (3) pivoted (in 4) to the body of the projectile (P) and movable between:

- a. a home position, wherein an operating arm (3a) of said lever (3) is adjacent to a portion of said gripping lever (1); and
- b. a weft thread release position, wherein the free end of said operating arm (3a) of the lever (3) caused the rotation of the gripping lever (1), against the action of said thrust means (M), for moving away the free end (1pe) of said gripping lever (1) from said abutment plate (5), and hence allow the release of the weft thread;

and in that the rotation movement of said releasing lever (3) towards said weft thread release position is caused by the contact between a portion (8) of said releasing lever (3) and the upward ramp of a second fixed slide (S2) arranged along a portion of said guide track of the projectile (P), after the shed outlet.

3. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 1 or 2, wherein said thrust means consist of a pair of helical springs (M) arranged within suitable cylindrical housings formed in the body of projectile P, at both sides of gripping lever 1.
4. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 3, wherein said gripping lever (1) is a two-arm lever and said helical springs (M) act with a compression force against the free end of a return arm (1r) of the gripping lever (1), said return arm (1r) being on the opposite side of the pivoting point (2) of the gripping lever (1) with respect to the gripping arm (1p) of said lever which carries said free end (1pe) of the gripping lever (1).
5. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 2, wherein, in said release position of the weft thread, the profile of the free end (1pe) of said gripping lever (1) is fully within the outline of the projectile (P).
6. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 2, wherein said releasing lever (3) is kept in said home position by return means consisting of a permanent magnet (7) arranged within a housing formed in the body of projectile (P).
7. Improved system for gripping/releasing the weft

threads in a projectile weaving loom as in claim 6, wherein said releasing lever (3) is a two-arm lever and said permanent magnet (7) acts on a control arm (3c) of the releasing lever (3), said control arm (3c) being on the opposite side of the pivoting point (4) of the releasing lever (3) with respect to the operating arm (3a) of said releasing lever contacting said gripping lever (1).

8. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 7, wherein said projectile (P) comprises two lateral expansions which project from the lower half thereof and along the entire length thereof, forming respective shelves (9), and said controlled arm (3c) of the releasing lever (3) branches out at the end thereof into two mutually spaced and arch-shaped prongs (8) which, in said home position of the releasing lever (3), protrude from suitable cut-outs provided in said shelves (9), said prongs (8) making up the contact surface of the releasing lever (3) with said second slide (S2) .
9. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in any one of the preceding claims, wherein the braking surface of the projectile (P) consists of the upper surface thereof and of the surface of said shelves (9).
10. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in claim 9, wherein the upper portion of the projectile (P) is widened by means of lateral overhangs (11) which overlap, at least in part, said shelves (9).
11. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in any one of the preceding claims, wherein the projectiles (P) are provided with lateral contact surfaces cooperating with hooks (G) of the guide track, which lateral contact surfaces are inclined and converging towards the projectile top and are not provided with upper contact surfaces.
12. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in any one of the preceding claims, wherein the projectiles (P) are provided with vertical lateral contact surfaces and with horizontal upper contact surfaces cooperating with the hooks (G) of the guide track.
13. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in any one of the preceding claims, wherein the arms (1p, 1r) of said gripping lever (1) are approximately mutually perpendicular.
14. Improved system for gripping/releasing the weft

threads in a projectile weaving loom as in any one of the preceding claims, wherein the arms (3c, 3a) of said releasing lever (3) are approximately mutually aligned.

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15. Improved system for gripping/releasing the weft threads in a projectile weaving loom as in any one of the preceding claims, wherein said gripping lever (1) is pivoted near the rear end of the projectile (P) and said releasing lever (3) is pivoted in a nearly central position of the projectile (P), so that the lower portion (1ps) of the gripping lever (1), which cooperates with the first slide (S1), and the prongs (8) of the free end of the releasing lever (3), which cooperate with the second slide (S2), are arranged in the proximity of the rear portion and of the front portion of the projectile (P), respectively.

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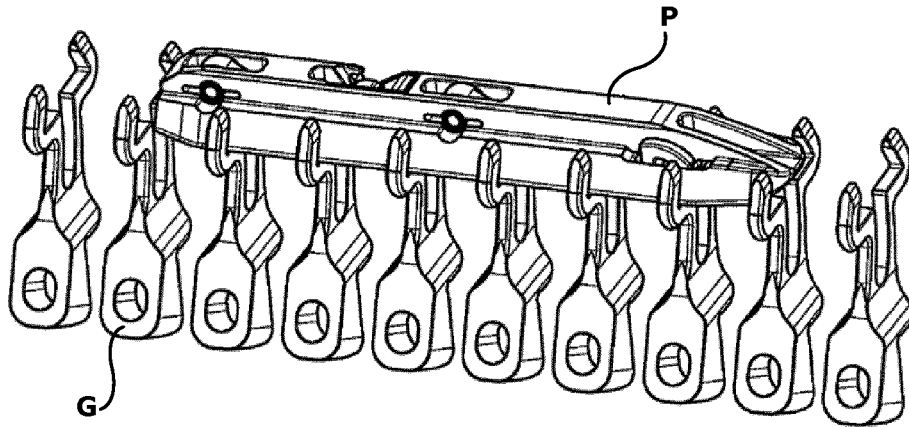


FIG. 1

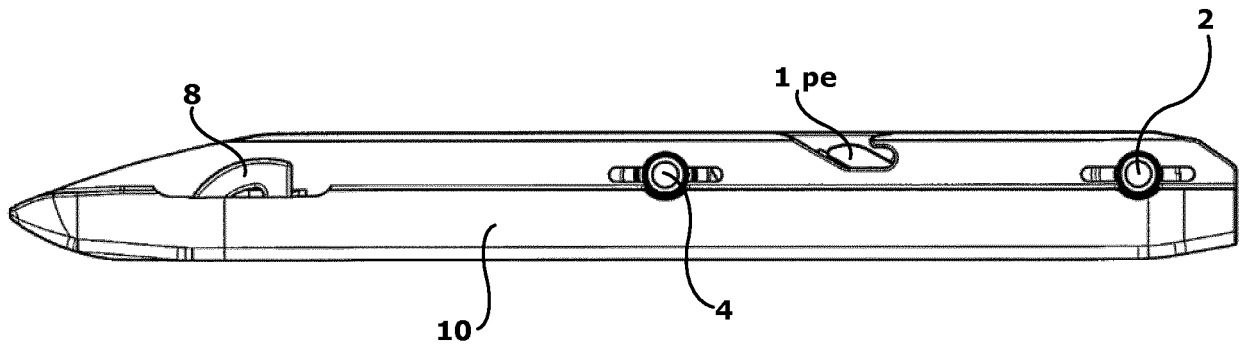


FIG. 2A

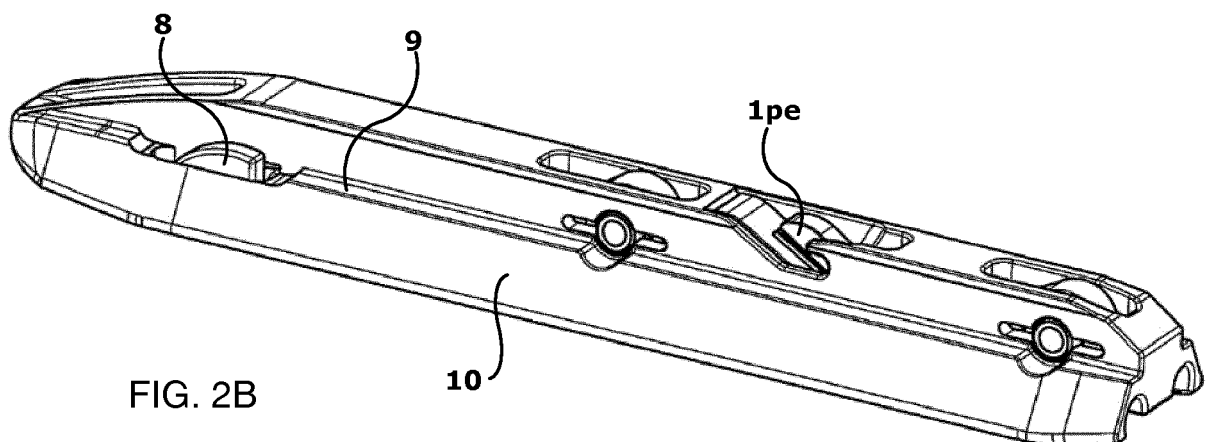


FIG. 2B

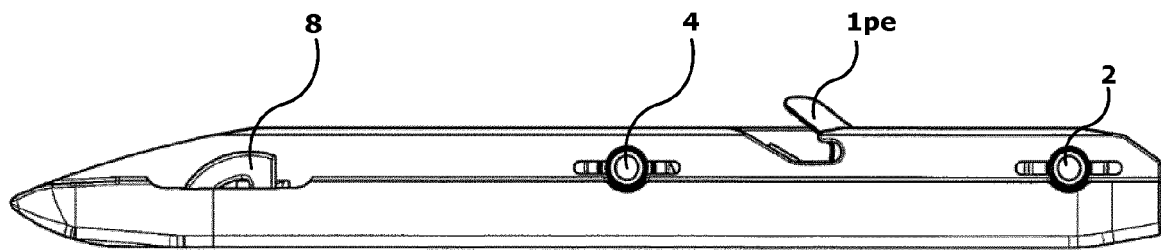


FIG. 3A

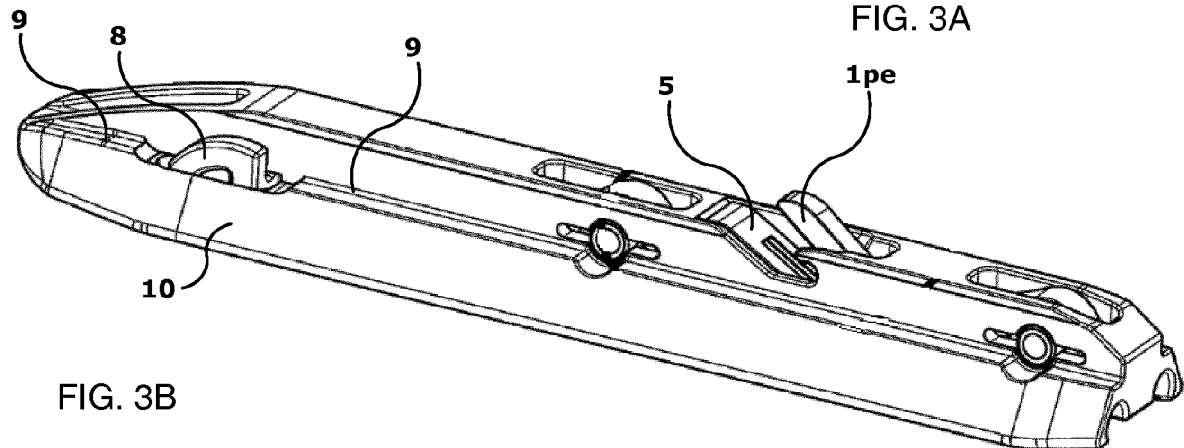


FIG. 3B

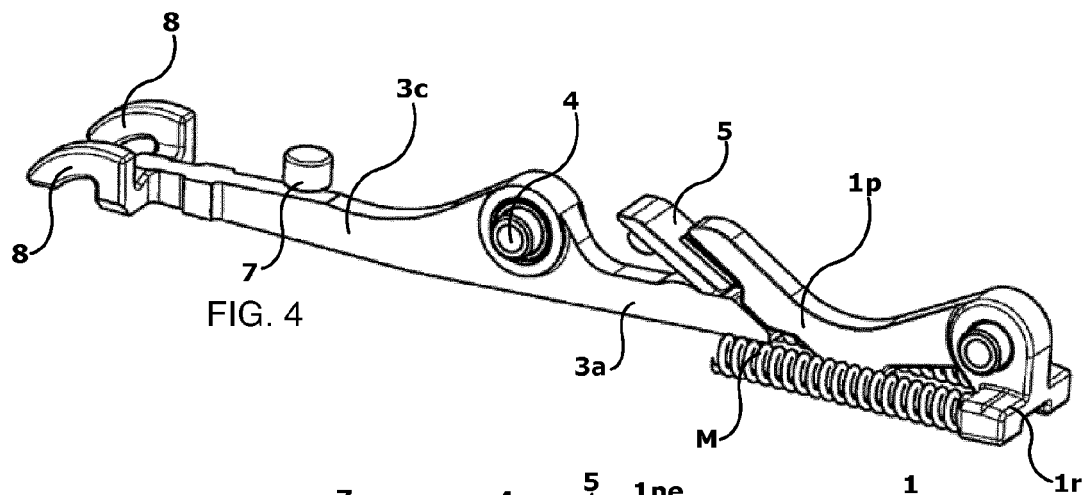


FIG. 4

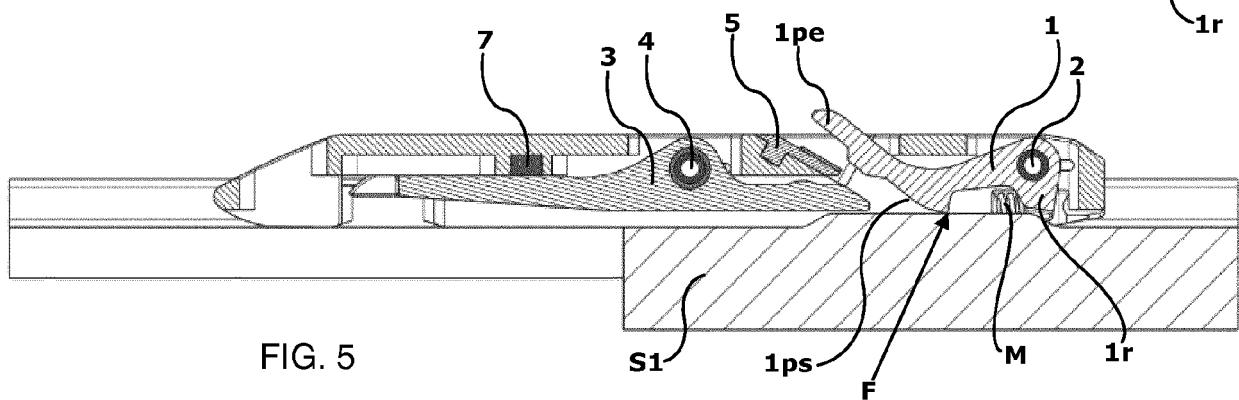
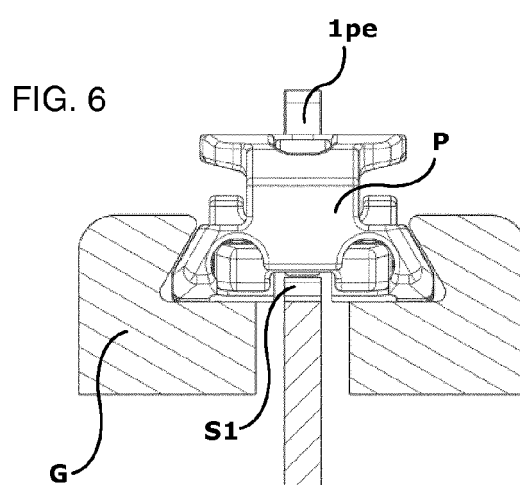
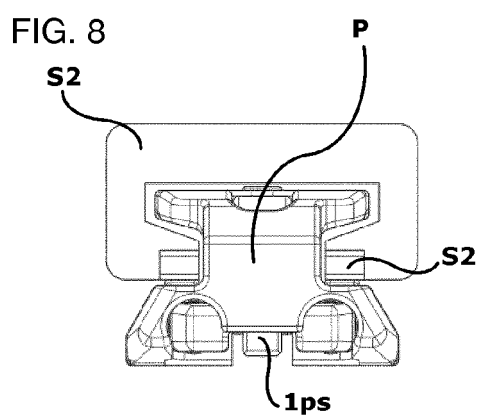
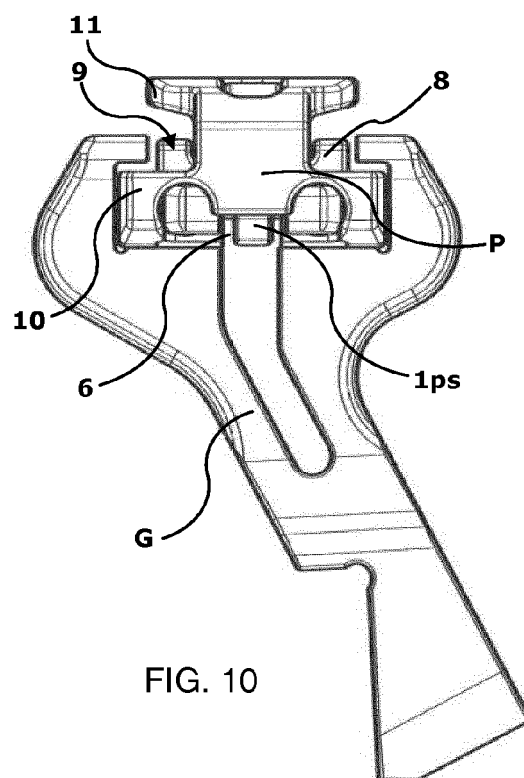
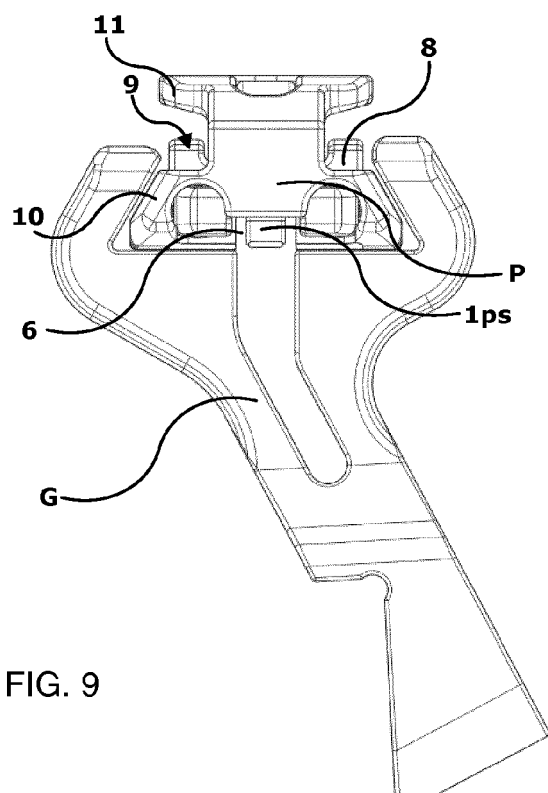
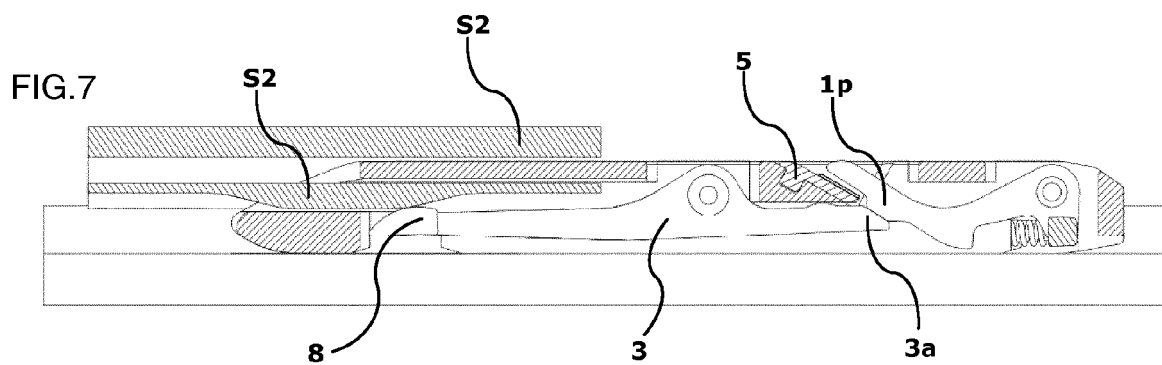


FIG. 5





EUROPEAN SEARCH REPORT

Application Number
EP 18 17 6734

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A,D	US 3 213 892 A (HEINRICH FLUHMAN) 26 October 1965 (1965-10-26) * column 2, lines 32-68; figures 1-6 *	1-15	INV. D03J5/06
A	FR 2 392 150 A2 (MINTISS [FR]) 22 December 1978 (1978-12-22) * page 2, line 18 - page 3, line 12; figures 1-7 *	1-15	
A	DE 25 21 431 A1 (VER SEIDENWEBEREIEN AG) 25 November 1976 (1976-11-25) * page 3, paragraph 4 - page 5, paragraph 4; figures 1-10 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			D03J D03D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 October 2018	Examiner Louter, Petrus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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The members are as contained in the European Patent Office EDP file on
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04-10-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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