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(54) **Weft yarn presenting device for gripper looms**

Schussfadenzubringvorrichtung für Greiferwebmaschinen

Dispositif de présentation de fil de trame pour métiers à griffer

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(56) References cited:
EP-A- 347 626
EP-A- 353 005
EP-A- 407 333
EP-A- 0 077 309
EP-A- 0 123 772
CH-A- 418 248
CH-A- 450 315
JP-A-81 166 328
US-A- 3 780 775

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Description

[0001] The present invention concerns a weft yarn presenting device for gripper looms.

[0002] As known, in shuttleless looms of the type with grippers, one or more weft yarns are inserted by a pair of grippers with alternate motion, cooperating at the centre of the shed, into the sequence of the warp yarns forming said shed.

[0003] The proper succession of weft insertions and of the exchanged positions of the warp yarns, by way of the weave devices, determines the formation of the desired fabric. The need hence arises to insert into the warp shed a certain sequence of weft yarns which, according to the fabric having to be produced, can vary in colour, type and size.

[0004] For this reason, it has now become generally widespread to use in gripper looms the so-called presenting devices, i.e. devices performing the function of selecting the weft yarns to be inserted and presenting them to the weft carrying or insertion grippers. Such devices substantially comprise one or more rods having an eyelet into which passes a respective wet yarn to be presented. When one of said eyelets moves, it shifts the respective weft yarn from a rest position far from the gripper trajectory, to another position (called presenting position) wherein the weft yarn can be gripped by the carrying gripper and conveyed towards and into the warp shed.

[0005] At present, in weft presenting devices for gripper looms, use is generally made of mechanical selection units, which can be functionally disassembled in two parts:

a) moving unit: it is a group of mechanical elements apt to perform an alternate rotary and rectilinear motion within the weft presenting members, according to a motion law defined by kinematic mechanisms and/or by suitable cams;
b) selecting unit: it is a group of mechanical and/or electromagnetic hooking elements apt to select which weft or wefts, among those in a rest position, should be presented by the unit a).

[0006] An example of these mechanical presenting devices of the type comprising a plurality of presenting rods having a yarn guiding eyelet, which converge towards the zone in which the weft yarn has to be gripped by the loom carrying gripper and which are each controlled by a flexible cable, is

[0007] described and illustrated by US-A-3780775. The mechanical presenting devices of the known technique have in any case the following inconveniences:

- The motion law for presenting each weft is a fixed law. To change said law it is necessary to replace some mechanical elements or to carry out manual adjustments. It is hence practically impossible, when changing the article having to be produced, to adapt said motion law to the physical-textile features of the different types of wefts having to be presented, or to change the motion laws for the various wefts in order to improve, for instance, the separation of the wefts during the forward and backward movement in the presenting step.
- The unit b) can start selecting the weft only after the previously presented weft has returned to its rest position, whereby it is not possible to overlap the forward movement of a rod to the backward movement of another rod. This overlapping would allow to dispose of more time for said movements and would thus involve less mechanical stresses.
- It is known that, in weaving, to prevent weaving faults when an inserted weft yarn breaks or remains incomplete in the warp shed, the loom has to be stopped in order to remove the broken weft. This stop is usually preceded by a missed insertion - that is, by an inlet and outlet stroke of the grippers into the warp shed, with no weft yarn - so as to prevent weaving problems and position again the loom in correspondence of the weft yarn having to be removed. Hence, in this insertion, the presenting step should not take place.

[0008] On the other hand, weft control ends when the gripper moves out of the warp shed and the selection step requires a certain time for the yarn to be hooked, which depends on the force of the electromagnet and/or on the masses of the mechanical hooking elements having to be shifted. As loom speed increases, said time corresponds to wider rotation angles of the loom for the selection step, hence to the detriment of the angles utilizable for the presenting step, the reduction of which leads to an increase in the mechanical stresses, in the wears and in the vibrations of the presenting device. To avoid these last inconveniences, one is forced to anticipate the start of the selection step before the outlet of the gripper from the warp shed - which outlet determines the final time within which weft control can take place - rather than reducing the times for the presenting step.

[0009] Thus, if weft selection and forward movement are anticipated in respect of gripper outlet from the warp shed, when the loom issues a stop signal establishing the need to exclude weft selection, this latter may have already taken place and the weft may have already been moved into the gripper hooking zone. It is then necessary to use further auxiliary devices to remove the yarn from the gripper trajectories, which devices can however cause various problems, as loosening of the weft and difficulties of adjustment.

[0010] The mechanical presenting devices require furthermore a motion transmission obtained with a mechanical drive by means of belts, chains or gears, which cause problems of alignment on assembly, require maintenance and limit the choice of the most suitable positioning on the loom for a proper weaving operation.

[0011] It is moreover not possible, without further complications, to operate the mechanical presenting device independently from the loom, in order to move the presenting rod from its rest position when the loom is not working, so as to facilitate operations of weft insertion into the eyelet of the presenting rod.

- Finally, the mechanical selection units are relatively large and thus hamper the weaver's work on the machine, as well as weft insertion into the eyelets of the presenting rods.

[0012] These drawbacks still exist in some weft presenting devices - like the one of CH-A-418248 - which use a solenoid as drive mechanism for each presenting rod, as they simply replace a drive mechanical mechanism with a drive electric mechanism, without changing the working concept of the weft presenting device.

[0013] All the above drawbacks are instead fully overcome by the presenting device according to the invention, which not only is electrically operated, but also electronically controlled and which provides many advantages in respect of the known presenting devices.

[0014] Said device is characterized by the combination of features of patent claim 1.

[0015] Furthermore, in the device according to the invention, each of the presenting rods can act so as to regulate the tension of the weft yarn moved by the same.

[0016] Further preferred embodiments are subject of the subclaims.

[0017] The invention is now described in further detail, with reference to the accompanying drawings, which illustrate an embodiment thereof and in which:

Fig. 1 is a general diagrammatic view of a weft presenting device according to the invention, wherein each of the presenting rods is directly operated by the respective linear electric motor;
Fig. 2 is a diagrammatic view, with some constructive details,showing a single presenting rod of the device,
Fig. 3 is a diagram illustrating the working of the device; and
Fig. 4 shows one of the presenting rods of the device acting as weft yarn tension regulator.

[0018] Referring to the first two figures of the drawings, the device according to the invention comprises - in known manner - a plurality of presenting rods 1, ending with an eyelet 2 for the weft yarn f and each controlled by a flexible cable 3 sliding into a sheath 4. Figure 1 shows, by way of exam; ple, a device with eight rods 1, of which only one can be seen in figure 2. Also in known manner the rods 1, which are slidably guided into stiff guides 5 wherein their rotation is prevented, converge into the zone P where the weft yarn has to be gripped by the loom carrying gripper to be drawn into the shed. The most suitable position of the guides 5, and thus of the rods 1 - for an efficient presenting of the various weft yarns - is obtained by acting on adjustable supports 6.

[0019] Instead of being mechanically operated - like the conventional presenting devices - the device according to the invention is electrically operated. More precisely, each of the flexible cables 3 controlling the rods 1 is operated by a linear electric motor.

[0020] According to figure 1, the linear electric motors 7 are positioned radially, each aligned on the common axis of the rod 1, of the flexible cable 3 and of the corresponding guide 5 and sheath 4. These motors act directly on the flexible cables 3, causing short rectilinear alternate movements thereof, of adjustable amplitude. Equal movements are thus imparted on the rods 1.

[0021] According to of figure 2, whose embodiment, as far as the presenting rods are operated by the linear motors through rotary levers, is not within the scope of the invention, the linear electric motors 8 are positioned in block and they operate the flexible cables 3 each through a rotating lever 9, to which the cable 3 is anchored in 10 and which is caused to perform, by the respective motor 8, short angular back and forth movements of adjustable amplitude (to which correspond short rectilinear alternate movements, of adjustable amplitude, of the rods 1).

[0022] The linear electric motors used are of the conventional type and are hence not described in detail; it should simply be remembered that they allow to perform very precise movements, even if of limited amplitude, and to carry out a very precise adjustment of the operating times, of the working speeds, of the length and amplitude of the movements.

[0023] The presenting device is completed by electronic control means - preferably comprising a microprocessor - which also require no particular description as they are of conventional type. These means, shown by 11 in figure 2, are connected to the electronic control system 12 of the loom - to which the presenting device of the invention is applied - and to the linear electric motors 7 or 8, so as to allow constantly detecting, by way of a position sensor 13, the position taken up by the corresponding presenting rods 1.

[0024] From the above description, it can easily be understood how the presenting device according to the invention is apt to work with the following characteristics:

- The motion law for presenting each weft yarn inserted into the rods 1 and returning it to its rest position, can be optimized for what concerns the forward and backward movements, the speed, the acceleration, the stopping times in the presenting position and in the rest position, which can be programmed according to the physical/textile features of the yarn. Said law can be differentiated according to the weft position at rest in respect of the gripper.
- The control system of the device can actively operate to modify the strokes, speeds, accelerations,

and starting and/or ending moments of the presenting and/or returning law, according to the statistical tendency of the weft stops detected by the loom control system and attributed to the presenting device. It is also apt to signal to the operator any problems by way of a suitable diagnostic program.

- The control system of the device is apt, thanks to the position sensor 13, to control the acceleration and deceleration of the presenting rod 1, and to thus brake the same without having to stop it by means of stops. This determines a regular movement with no impacts and wears.
- As shown in figure 3, it is possible to overlap the forward presenting movement of a rod to the return movement of another rod, so as to prevent the wefts from coming into contact and/or loosening, and reduce the stresses on the yarns and on the mechanical elements, deriving from the presenting laws.
- It is possible to start, if required, the weft presenting step before the gripper has moved out of the warp shed, since at any moment - and particularly when the loom stopping signal due to weft is issued - it is possible to interrupt, by way of the control system, the forward movement for presenting the selected weft and cause the same to return to its rest position, thereby preventing the gripper from hooking said weft and excluding weft selection without having to use any other more complicated systems.
- The selection times are negligible and do not affect the presenting times.
- In any position, and particularly in the presenting position, the linear electric motor reacts - thanks to the control system - to any external force imparted on the selection rod, which would be inclined to shift it from the position detected by the sensor 13, by imparting a proportional opposition force allowing to keep said rod in the required position.

[0025] It is also important to note that, at the moment of weft presenting, the force acting on the eyelet 2 for the weft yarn f, is proportional to the tension of said weft yarn.

[0026] The control system can therefore detect the tension of the weft yarn being inserted by the gripper into the warp shed, by measuring the feed current required by the bobbin to balance the force resulting on the eyelet 2. It ensues that the rod 1 in a presenting position can also act - see figure 4-as tension regulator during insertion, in that, according to the position of the eyelet 2 at the end of the presenting rod 1, in respect of fixed yarnguides 14, 15, weft yarn tension (T) varies to a certain extent during insertion. In fact, the more the eyelet 2 moves down in respect of the yarnguides 14, 15, the wider the winding angles of the weft yarn around said yarnguides.

[0027] The device according to the invention requires no mechanical motion transmissions and can thus be associated to the loom in the most functional area, for instance in a position high above the presenting area, so as not to hamper the intervention of the weaver and the insertion of the wefts.

[0028] It is understood that there can be other practical embodiments of the invention, differing from those described and illustrated, which fully fall within the scope of the present invention.

Claims

1. Weft yarn presenting device for gripper looms, of the type comprising a plurality of presenting rods (1) having a yarn guiding eyelet (2), which converge towards the zone (P) in which the weft yarn has to be gripped by the loom carrying gripper and which are each controlled by a flexible cable (3) sliding into a sheath (4), characterized in that each of the flexible cables controlling said rods is operated by a linear electric motor (7), and in that electronic control means (11) are associated to each linear electric motor (7) aligned on a common axis of said rod (1) and flexible cable (3) and acting directly on the flexible cable (3) and thereby on said rod along said common axis for constantly detecting the position of the presenting rod operated by said motor and for governing the motor, according to said position, to the working of the loom and to the physical,'textile features of the yarn being woven.

2. Device as in claim 1), wherein the running of each motor operating the presenting rods (1), and thus the presenting and return movements of each weft, can be programmed as far as movements, speed, acceleration, stopping times in the presenting position and in the rest position, according to the physical/textile features of the yarn, and with the possibility to take into account the weft position at rest in respect of the gripper.

3. Device as in claim 2), wherein the strokes, speeds, accelerations, and starting and/or ending times of the presenting and/or returning law, are modified according to the statistical tendency of the weft stops detected by the loom control system (12).

4. Device as in claim 2), apt to signal to the operator any problems by way of a suitable diagnostic program.

5. Device as in clam 1), wherein each of the presenting rods (1) can act so as to regulate the tension of the weft yarn moved by the same.

Patentansprüche

1. Schußfadenzubringvorrichtung für Greiferwebma-

schinen von der Art mit einer Mehrzahl von mit einer Garnführungsöse (2) versehenen Zubringstangen (1), die in Richtung auf die Zone (P), in der der Schußfaden von dem Schußfadengreifer ergriffen werden soll, konvergieren, und die jeweils durch einen flexiblen Draht (3), der in eine Aufnahme (4) gleitet, gesteuert werden, dadurch gekennzeichnet, daß jeder der die Stangen steuernden flexiblen Drähte durch einen elektrischen Linearmotor (7) betrieben wird, und dadurch, daß jedem auf einer mit der Stange (1) und dem flexiblen Draht (3) gemeinsamen Achse ausgerichteten und direkt aut den flexiblen Draht (3) und damit auf die Stange entlang der gemeinsamen Achse wirkenden elektrischen Linearmotor (7) elektronische Steuermittel (11) zugehörig sind, um die Position der Zubringstange, die von dem Motor betrieben wird, ständig zu beobachten und um den Motor entsprechend der Position, der Betriebsweise der Webmaschine und den physikalisch/textilen Merkmalen des verwebten Garns zu steuern.

2. Vorrichtung nach Anspruch 1, wobei das Arbeiten jedes der die Zubringstangen (1) betreibenden Motors und damit das Zubringen und die Rückbewegungen jedes Eintrags bezüglich der Bewegungen, der Geschwindigkeit, der Beschleunigung, der Stoppzeitpunkte in der Zubringposition und in der Ruheposition entsprechend den physikalisch/textilen Eigenschaften des Fadens programmiert werden kann, und mit der Möglichkeit, die Eintragposition in der Ruhe bezüglich des Greifers zu berücksichtigen.

3. Vorrichtung nach Anspruch 2, wobei die Hübe, Geschwindigkeiten, Beschleunigungen und Start- und/oder Endzeitpunkte der Zubringregel und/oder der Rückkehrregel entsprechend der statistischen Neigung der Eintragstopps, die von dem Webmaschinensteuersystem (12) erkannt werden, modifiziert werden.

4. Vorrichtung nach Anspruch 2, geeignet, um dem Operator etwaige Probleme mittels eines geeigneten Diagnoseprogramms zu signalisieren.

5. Vorrichtung nach Anspruch 1, wobei jede der Zubringstangen (1) wirken kann, um die Spannung des Schußfadens, die von diesem bewegt wird, zu regulieren.

Revendications

1. Dispositif de présentation de fil de trame pour métiers à pinces, du type comprenant une pluralité de tiges de présentation (1) comportant un oeillet de guidage de fil (2), qui convergent vers la zone (P) dans laquelle le fil de trame doit être saisi par la pince de transport du métier et qui sont chacune commandées par un câble flexible (3) coulissant dans une gaine (4), caractérisé en ce que chacun des câbles flexibles commandant lesdites tiges est actionné par un moteur électrique linéaire (7) et en ce qu'un moyen de commande électronique (11) est associé à chaque moteur électrique linéaire (7) aligné sur un axe commun de ladite tige (1) et dudit câble flexible (3) et agissant directement sur le câble flexible (3) et ainsi sur ladite tige suivant ledit axe commun pour détecter en permanence la position de la tige de présentation actionnée par ledit moteur et pour régler le moteur, en fonction de ladite position, du fonctionnement du métier et des caractéristiques textiles/physiques du fil étant tissé.

2. Dispositif selon la revendication 1, dans lequel le fonctionnement de chaque moteur actionnant les tiges de présentation (1), et donc les mouvements de présentation et de retour de chaque fil de trame, peuvent être programmés ainsi que les mouvements, la vitesses, l'accélération, les temps d'arrêt dans la position de présentation et dans la position de repos, en fonction des caractéristiques textiles/physiques du fil et avec la possibilité de prendre en compte la position de la trame au repos par rapport à la pince.

3. Dispositif selon la revendication 2, dans lequel les courses, les vitesses, les accélérations, et les moments de début et/ou de fin de la loi de présentation et/ou de retour, sont modifiés en fonction de la tendance statistique des arrêts de trame détectés par le système de commande du métier (12).

4. Dispositif selon la revendication 2, adapté à signaler au technicien toute anomalie au moyen d'un programme de diagnostic approprié.

5. Dispositif selon la revendication 1, dans lequel chacune des tiges de présentation (1) peut servir à ajuster la tension du fil de trame qu'elle déplace.

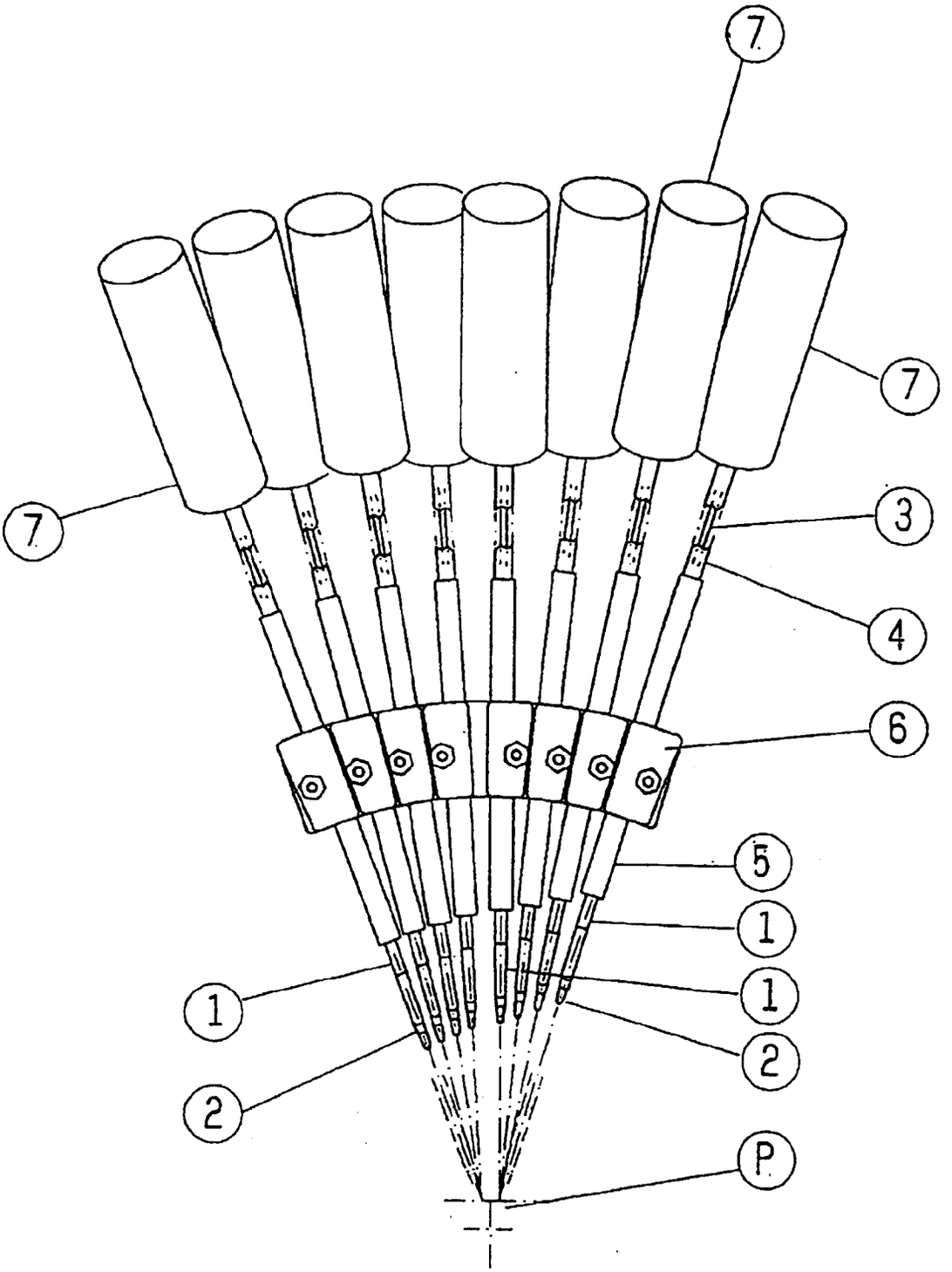
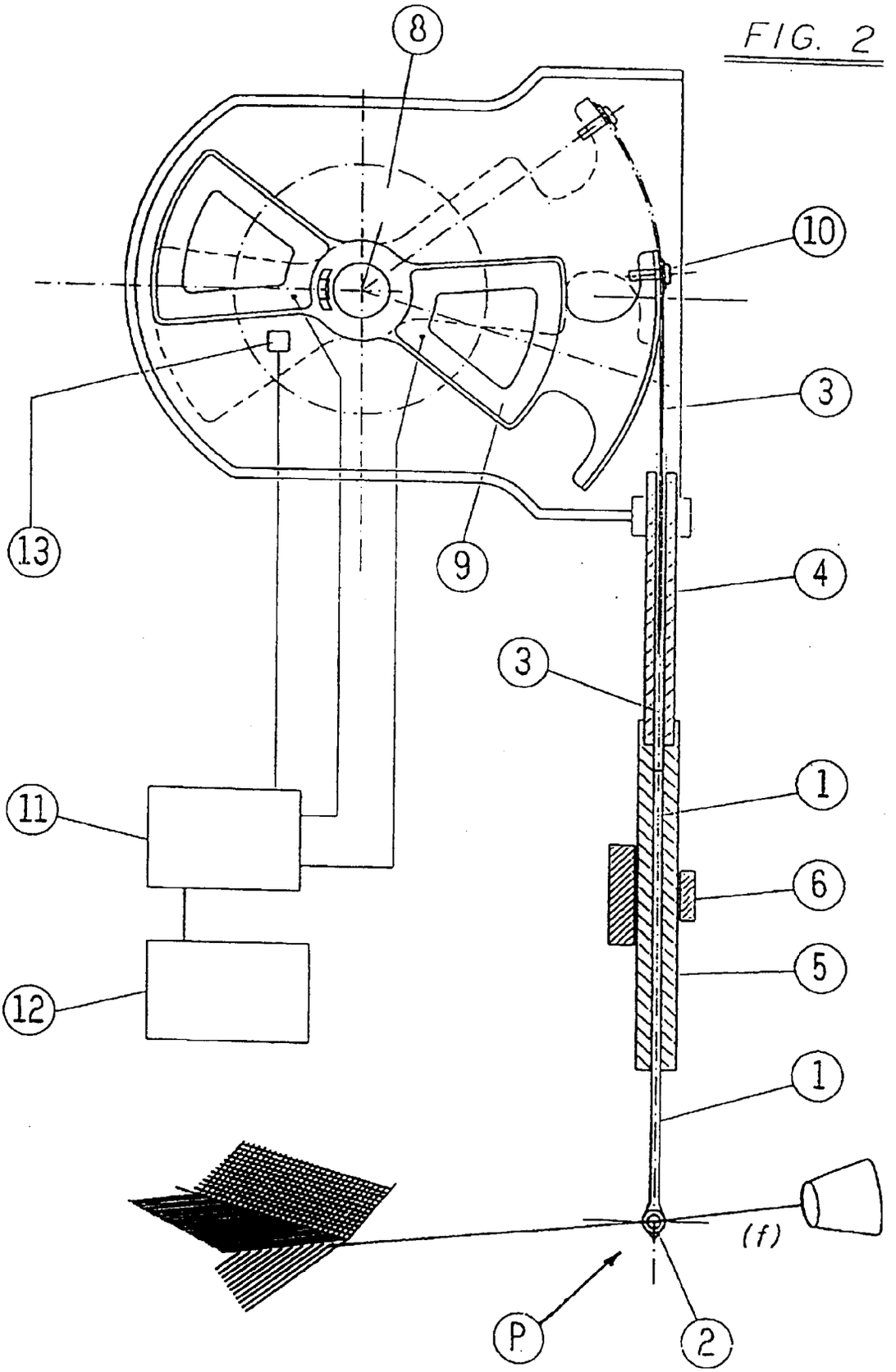


FIG. 1

FIG. 2



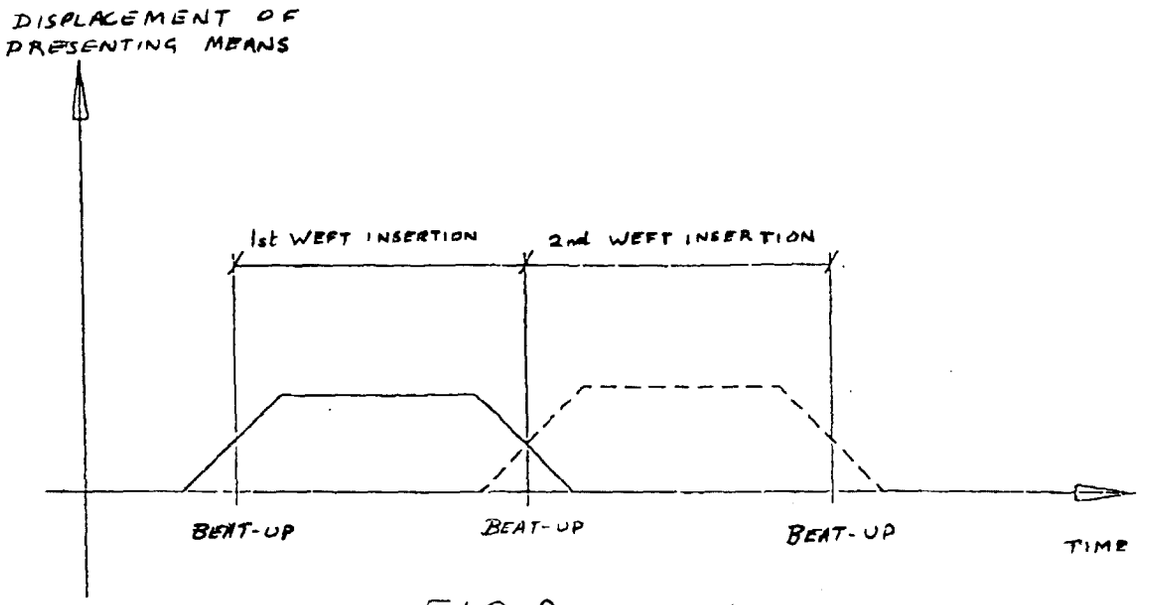

DISPLACEMENT OF PRESENTING MEANS
1st WEFT INSERTION
2nd WEFT INSERTION
BEAT-UP
BEAT-UP
BEAT-UP
TIME

FIG. 3

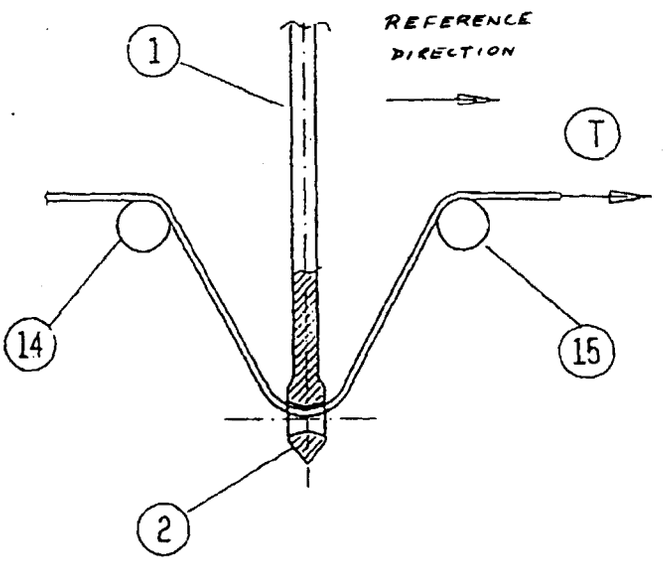

REFERENCE DIRECTION
1
T
14
15
2

FIG. 4