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(11) **EP 1 136 610 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**28.07.2004 Bulletin 2004/31**

(51) Int Cl.7: **D05B 11/00**

(21) Application number: **00104573.1**

(22) Date of filing: **14.03.2000**

(54) **Quilting machine with variable-spacing stitchers**

Steppmaschine mit variablen Abständen zwischen den Nähköpfen

Machine à piquer avec têtes de couture à espacement variable

(84) Designated Contracting States:  
**DE ES FR GB**

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(43) Date of publication of application:  
**26.09.2001 Bulletin 2001/39**

(56) References cited:  
**EP-A- 0 931 867**  
**US-A- 5 287 820**

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**GB-A- 2 089 849**

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**EP 1 136 610 B1**

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## Description

**[0001]** The present invention relates to a quilting machine with variable-spacing stitchers.

**[0002]** It is known that a quilting machine comprises a cloth supporting carriage and a plurality of stitchers which quilt the cloth according to a preset pattern.

**[0003]** In quilting machines, the cloth supporting carriage and the stitchers perform relative movements which allow the sewing needle to move on the cloth with two degrees of freedom in order to form a line of stitches that follows the intended path.

**[0004]** In quilting machines, the stitchers are mounted on a frame which comprises a first beam which lies above the cloth and a second beam which is parallel to the first beam and lies below the cloth.

**[0005]** The first beam supports a guide for the sewing head of the stitcher, while the second beam supports a guide for the so-called hook assembly.

**[0006]** In order to allow the sewing needle to act in cooperation with the hook assembly, mechanical transmissions and/or electrical connections are provided so that the sewing needle moves in step, and in perfect vertical alignment, with the hook assembly during its movements over the cloth.

**[0007]** Conventional quilting machines have operating limitations when it is necessary to manage a plurality of stitchers operating independently of each other so that each one follows an individual path. Because of these difficulties, the stitchers are mostly rigidly connected to each other and can follow only parallel paths.

**[0008]** EP-A-0 931867 discloses a quilting machine with a pair of mutually spaced stitchers (12a,12b) supported by respective carriages each actuated individually by their own linear motor controlled by a computerized numeric control.

**[0009]** US-A-5 287 820 discloses a sewing machine with a pair of stitchers mutually spaced from each other by a selectable predetermined distance and supported on a common drive mechanism which simultaneously moves the pair of stitchers together.

**[0010]** The aim of the present invention is therefore to provide a quilting machine without suffering the conventional drawbacks, i.e., which comprises a plurality of stitchers which can be actuated so that they operate independently of each other in order to trace converging and diverging lines of stitches.

**[0011]** In accordance with the invention, there is provided a quilting machine as defined in the appended claims.

**[0012]** Further characteristics and advantages of the present invention will become apparent from the description that follows of a preferred embodiment, illustrated only by way of non-limitative example in the accompanying drawing, wherein the only figure is a perspective view of a supporting frame for two stitchers of a quilting machine.

**[0013]** With reference to the above figure, the refer-

ence numeral 1 designates a frame of a quilting machine, which is composed of two horizontal beams 2 and 3 which are mutually superimposed and are connected, at their opposite ends, by two respective vertical up-

rights 4 and 5.  
**[0014]** The beams 2 and 3 and the uprights 4 and 5 enclose an opening 6 through which a cloth 7 to be quilted is fed. For the sake of clarity in presentation, it is assumed that the cloth 7 is stretched horizontally on a frame (not shown) which is movable in a longitudinal direction A at right angles to the frame 1.

**[0015]** Two mutually parallel cylindrical bars 8 and 9 are fixed to the ends of the upper beam 2 and are spaced from the beam. The bars 8 and 9 form a guide along which carriages 10 and 11 are slideable along a transverse path B which is perpendicular to the path A; such carriages support sewing heads 12 and 13 of two stitchers, generally designated by the reference numerals 14 and 15. The sliding of each carriage on the bars 8 and 9 is performed by two pairs of free rollers, the upper ones being designated by the reference numeral 16 and the lower ones being designated by the reference numeral 17. The rollers 16 and 17 are provided with a groove along their peripheral region and tangentially engage above and below the bars 8 and 9.

**[0016]** The stitchers 14 and 15 comprise hook assemblies 18 and 19 which are actuated synchronously with the respective sewing heads 12 and 13. The hook assemblies are mounted on carriages 20 and 21 which, thanks to upper slotted wheel pairs 22 and lower slotted wheel pairs 23, are slideable on two bars 24 and 25 which are fixed, by means of their opposite ends, to the lower beam 3, parallel to the upper parts 8 and 9.

**[0017]** The stitchers 14 and 15 are moved along the transverse path B above the cloth 7 by mechanically connecting the carriages 10 and 20 of the stitcher 14 to the respective carriages 11 and 21 of the stitcher 15 and synchronously actuating such carriages.

**[0018]** The carriages 11 and 21 are actuated by means of a flexible and inextensible belt 26, made for example of steel, whose ends are fixed to two L-shaped elements 27 and 28, the L-shaped element 27 being rigidly fixed to the carriage 11. The other L-shaped element 28 is provided with a threaded stem 29 which protrudes toward the L-shaped element 27 and is guided through two brackets 30 and 31 which are fixed to the carriage 21.

**[0019]** A nut 32 with a respective lock nut are screwed onto the end of the stem 29 that protrudes beyond the bracket 30, so as to provide a screw-type expander which tensions the belt 7 by acting on the L-shaped element 28.

**[0020]** The belt 7 is wound in a closed loop around four guiding pulleys 33, 34, 35 and 36 and a driving pulley 37. The guiding pulleys 33-36 are arranged at the corners of an imaginary rectangle at the opposite ends of the beams 2 and 3. The driving pulley 37 is supported on the upright 3 between the pulleys 34 and 36, so that

the belt 26 runs along a zigzag path with four parallel, superimposed and co-planar portions 38, 39, 40, 41, the portions 38 and 40 thereof moving in the same direction, which is opposite to the direction of the portions 39 and 41.

[0021] The carriage 21 of the stitcher 15 is fixed to the portion 40 by a clamp 42, so that the two carriages 11 and 21 move correspondingly in the direction of actuation of the belt 26.

[0022] For the actuation of the belt 26, the pulley 37 is provided with a ring gear 43 with which there meshes a pinion 44 of an electric motor 45 which is mounted on a bracket (not shown) which cantilevers out from the frame 1.

[0023] Motion is transmitted from the stitcher 15 to the stitcher 14 by two reversible electric motors 46 and 47 which are mounted on the carriages 11 and 21 and whose shafts are constituted by threaded rods 48 and 49 having the same pitch, extending between the portions 38, 39 and 40, 41 of the belt 26, and being parallel to the bars 8, 9 and 24, 25.

[0024] The threaded rods are engaged in female threads 50, 51 which are fixed to the carriages 10, 20 of the stitcher 14. The motors 46, 47 are controlled so as to move with the same angular speed in the same direction.

[0025] The operation of the quilting machine is evident from the above description. When the motors 46 and 47 are not moving, control of the motor 45 allows to move the quilting machine 15 in one direction or the other along the transverse path B and therefore to also move in the same direction, by means of the rods 48 and 49, the quilting machine 14, so as to provide two parallel lines of stitches on the cloth 7.

[0026] However, by actuating the motors 46 and 47 it is possible to simultaneously move the carriages 10, 20 of the stitcher 14 towards or away from the corresponding carriages 11 and 21 of the stitcher 15, keeping the sewing head 12 in perfect vertical alignment with the respective hook assembly 18. Accordingly, the stitchers 14 and 15 can be moved mutually closer or further apart during their relative movement with respect to the cloth and can form two lines of stitches which follow any convergent or divergent path with respect to each other.

[0027] In the practical embodiment of the quilting machine, numerous modifications and variations are possible within the scope of the same inventive concept. For example, it is possible to install a third stitcher on the guides 8, 9, 24, 25 which is controlled like the stitcher 14 by providing on the carriages 11, 21 of the stitcher 15 two additional motors which drive two threaded rods engaging, with a threaded coupling, respective female threads which are fixed on the carriages of the third stitcher. Advantageously, the female thread is of the ballscrew type. Another embodiment uses, instead of the threaded rods 48 and 49, respective racks which have one end fixed to the carriages 10 and 20 and mesh with pinions which are keyed on the output shafts of the

motors 46 and 47.

[0028] All the details may furthermore be replaced with other technically equivalent elements.

[0029] In practice, the materials employed, as well as the dimensions, may be any according to requirements and the state of the art.

[0030] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

## Claims

1. A quilting machine which comprises a frame (1) composed of a first beam (2) arranged horizontally above a cloth (7) to be quilted and a second beam (3) arranged below said cloth (7), said beams (2,3) being provided with respective guides (8,9;24,25) for carriages (10,11;20,21) for supporting sewing heads (12,13) and, respectively, a hook assembly (18,19) of at least two stitchers (14, 15), one (15) of which being provided with means for moving one of the sewing heads (13) and the hook assembly (19) synchronously and along a same path and with a same orientation, **characterized in that** the carriages (11,21) that support said one of the sewing heads (13) and the hook assembly (19) of a first stitcher (15) support respective motor elements (46,48,50;47,49,51) connected between the carriages (11,21) supporting the first stitcher (15) and the carriages (10,20) that support another one of the sewing heads (12) and the hook assembly (18) of the second stitcher (14) for synchronous movement of the carriages (10,20) supporting the second stitcher (14) towards or away from the corresponding carriages (11,21) supporting the first stitcher (15), and wherein when said motor elements are not moving the first and second stitchers move together.
2. The quilting machine according to claim 1, **characterized in that** said motor elements comprise electric motors (46, 47) which are supported on the supporting carriages (11, 21) of said one of the sewing heads (13) and of the hook assembly (19) of said first stitcher (15) and are adapted to actuate respective threaded rods (48, 49) which are parallel and are rotatably engaged in female threads (50, 51) which are supported on the carriages (10, 20) that support said another one of the sewing heads (12) and the hook assembly (18) of the second stitcher (14).
3. The quilting machine according to claim 1, **charac-**

**terized in that** said motor elements comprise electric motors which are supported on the carriages (11, 21) that support said one of the sewing heads (13) and the hook assembly (19) of said first stitcher (15) and are adapted to actuate respective racks which are parallel and have an end which is fixed to the carriages (10, 20) that support said another one of the sewing heads (12) and the hook assembly (18) of said second stitcher (14).

4. The quilting machine according to claim 2, **characterized in that** for the actuation of said first stitcher (15) there is a flexible and inextensible belt (26) which has a point (27) fixed to a carriage (11) of said first stitcher (15) and wound in a closed loop around four guiding pulleys (33, 34, 35, 36) and a driving pulley (37), said guiding pulleys (33, 34, 35, 36) being arranged on said frame (1) at the corners of an imaginary rectangle and said driving pulley (37) being arranged between two superimposed guiding pulleys (34, 36) so that said belt (26) winds along four parallel, co-planar and superimposed portions (38, 39, 40, 41) which move in a same direction in pairs, the carriages (11, 21) for supporting said one of the sewing heads (13) and, respectively, the hook assembly (19) of said first stitcher (15) being fixed to two (38, 40) of said portions which move in the same direction.
5. The quilting machine according to claim 4, **characterized in that** two electric motors (46, 47) of the reversible type are mounted on said carriages (11, 21), their shafts comprising threaded rods (48, 49) which have the same pitch and are parallel to said portions (38, 39, 40, 41) of the belt (26) and are engaged in female threads (50, 51) which are fixed to the carriages (10, 20) that support said another one of the sewing heads (12) and the hook assembly (18) of said second stitcher (14), said electric motors (46, 47) being controlled so as to move said carriages (10, 20) with the same speed and in the same direction.
6. The quilting machine according to claim 4, **characterized in that** two electric motors (46, 47) of the reversible type are mounted on said carriages (11, 21), their shafts being provided with pinions which mesh with racks which are parallel to said portions (38, 39, 40, 41) of the belt (26) and have ends which are fixed to the carriages (10, 20) that support said another one of the sewing heads (12) and the hook assembly (18) of said second stitcher (14), said electric motors (46, 47) being controlled so as to move said carriages (10, 20) with the same speed in the same direction.
7. The quilting machine according to claim 5, **characterized in that** it comprises a third stitcher which is

controlled by providing, on the carriages (11, 21) of said first stitcher (15), two additional motors for actuating two threaded rods which engage, with a screw coupling, respective female threads which are fixed to the carriages that support the sewing head and the hook assembly of said third stitcher.

8. The quilting machine according to claim 2, **characterized in that** said female threads (50, 51) are of the ballscrew type.
9. The quilting machine according to claim 4, **characterized in that** said driving pulley (37) is provided with a ring gear (43) with which the pinion (44) of an actuation motor (45) meshes.

#### Patentansprüche

1. Steppmaschine, die umfasst: einen Rahmen (1) gebildet aus einem ersten Träger (2), der horizontal über einem zu steppenden Tuch (7) angeordnet ist, und einen zweiten Träger (3), der unter dem Tuch (7) angeordnet ist, wobei die Träger (2, 3) mit entsprechenden Führungen (8, 9; 24, 25) für Schlitten (10, 11; 20, 21) zum Tragen von Nähköpfen (12, 13) und, entsprechend, einer Greiferanordnung (18, 19) mindestens zweier Hefter (14, 15) versehen sind, wobei einer (15) davon mit Mitteln zum Bewegen eines der Nähköpfe (13) und der Greiferanordnung (19) synchron und entlang eines selben Weges und mit der selben Orientierung versehen ist, **dadurch gekennzeichnet, dass** die Schlitten (11, 21), die den einen der Nähköpfe (13) und die Greiferanordnung (19) des ersten Hefters (15) tragen, entsprechende Motorelemente (46, 48, 50; 47, 49, 51) tragen, die zwischen den Schlitten (11, 21) verbunden sind, die den ersten Hefter (15) tragen, und die Schlitten (10, 20), die einen weiteren der Nähköpfe (12) und die Greiferanordnung (18) des zweiten Hefters (14) tragen, zur synchronen Bewegung der Schlitten (10, 20), die den zweiten Hefter (14) tragen, zu oder von den entsprechenden Schlitten (11, 21), die den ersten Hefter (15) tragen, und worin, wenn die Motorelemente nicht laufen, der erste und zweite Hefter sich zusammen bewegen.
2. Steppmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Motorelemente Elektromotoren (46, 47) umfassen, die auf den Trägerschlitten (11, 21) des einen der Nähköpfe (13) und der Greiferanordnung (19) des ersten Hefters (15) getragen sind, und geeignet sind, entsprechende Gewindestangen (48, 49) zu betätigen, die parallel und drehbar in Innengewinde (50, 51) eingreifen, die auf den Schlitten (10, 20) getragen sind, die den anderen der Nähköpfe (12) und die Greiferanordnung (18) des zweiten Hefters (14) tragen.

3. Steppmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die Motorelemente Elektromotoren umfassen, die auf den Schlitten (11, 21) getragen sind, die einen der Nähköpfe (13) und die Greiferanordnung (19) des ersten Hefters (15) tragen, und geeignet sind, entsprechende Zahnstangen zu betätigen, die parallel sind und ein Ende aufweisen, das an den Schlitten (10, 20) befestigt ist, die den anderen der Nähköpfe (12) und der Greiferanordnung (18) des zweiten Hefters (14) tragen.
4. Steppmaschine nach Anspruch 2, **dadurch gekennzeichnet, dass** zur Betätigung des ersten Hefters (15) ein flexibler und undehnbare Riemen (26) vorhanden ist, der einen Punkt (27) am Schlitten (11) des ersten Hefters (15) befestigt aufweist und in einer geschlossenen Schlaufe um vier Leitrollen (33, 34, 35, 36) und eine Festscheibe (37) gewunden ist, wobei die Leitrollen (33, 34, 35, 36) auf dem Rahmen (1) an den Ecken eines imaginären Rechtecks angeordnet sind und die Festscheibe (37) zwischen zwei übereinander liegenden Leitrollen (34, 36) angeordnet ist, so dass der Riemen (26) entlang vierer paralleler, koplanarer und übereinander liegender Teile (38, 39, 40, 41) verläuft, die sich paarweise in eine gleiche Richtung bewegen, wobei die Schlitten (11, 21) zum Lagern des einen der Nähköpfe (13) und entsprechend der Greiferanordnung (19) des ersten Hefters (15) auf zwei (38, 40) der Teile befestigt sind, die sich in die selbe Richtung bewegen.
5. Steppmaschine nach Anspruch 4, **dadurch gekennzeichnet, dass** zwei Elektromotoren (46, 47) des reversiblen Typs auf den Schlitten (11, 21) angebracht sind, wobei ihre Wellen Gewindestangen (48, 49) umfassen, die dieselbe Steigung aufweisen und zu den Teilen (38, 39, 40, 41) des Riemens (26) parallel sind und in Innengewinde (50, 51) eingreifen, die auf den Schlitten (10, 20) befestigt sind, die den anderen der Nähköpfe (12) und die Greiferanordnung (18) des zweiten Hefters (14) tragen, wobei die Elektromotoren (46, 47) so gesteuert sind, dass sie die Schlitten (10, 20) mit der selben Geschwindigkeit und in die selbe Richtung bewegen.
6. Steppmaschine nach Anspruch 4, **dadurch gekennzeichnet, dass** zwei Elektromotoren (46, 47) des reversiblen Typs auf den Schlitten (11, 21) angebracht sind, wobei ihre Wellen mit Ritzeln versehen sind, die in Zahnstangen eingreifen, die parallel zu den Teilen (38, 39, 40, 41) des Riemens (26) sind und Enden aufweisen, die an den Schlitten (10, 20) befestigt sind, die den anderen der Nähköpfe (12) und die Greiferanordnung (18) des zweiten Hefters (14) tragen, wobei die Elektromotoren (46, 47) so gesteuert sind, dass sie die Schlitten (10, 20) mit

der selben Geschwindigkeit in die selbe Richtung bewegen.

7. Steppmaschine nach Anspruch 5, **dadurch gekennzeichnet, dass** sie einen dritten Hefter aufweist, der gesteuert wird, indem auf den Schlitten (11, 21) des ersten Hefters (15) zwei zusätzliche Motoren vorgesehen sind, die zwei Gewindestangen antreiben, die mit einer Gewindekupplung in entsprechende Innengewinde eingreifen, die auf den Schlitten befestigt sind, die den Nähkopf und die Greiferanordnung des dritten Hefters tragen.
8. Steppmaschine nach Anspruch 2, **dadurch gekennzeichnet, dass** die Innengewinde (50, 51) vom Kugelumlauftyp sind.
9. Steppmaschine nach Anspruch 4, **dadurch gekennzeichnet, dass** die Festscheibe (37) mit einem Tellerrad (43) versehen ist, das in ein Ritzel (44) auf einem Antriebsmotor (45) eingreift.

#### Revendications

1. Machine à piquer qui comprend un châssis (1) composé d'une première ensouple (2) agencée horizontalement au-dessus d'une étoffe (7) à piquer et d'une seconde ensouple (3) agencée au-dessous de ladite étoffe (7), lesdites ensouples (2, 3) étant pourvues de guides (8, 9 ; 24, 25) respectifs pour des chariots (10, 11 ; 20, 21) afin de supporter des têtes de couture (12, 13) et, respectivement, un ensemble de crochet (18, 19) d'au moins deux têtes de piqûre (14, 15), dont l'une (15) est pourvue de moyens pour déplacer l'une des têtes de couture (13) et l'ensemble de crochet (19) de manière synchrone et le long d'un même trajet et avec une même orientation, **caractérisée en ce que** les chariots (11, 21) qui supportent ladite une des têtes de couture (13) et l'ensemble de crochet (19) d'une première tête de piqûre (15) supportent des éléments de moteur (46, 48, 50 ; 47, 49, 51) respectifs raccordés entre les chariots (11, 21) qui supportent la première tête de piqûre (15) et les chariots (10, 20) qui supportent l'autre des têtes de couture (12) et l'ensemble de crochet (18) de la seconde tête de piqûre (14) pour le mouvement synchrone des chariots (10, 20) supportant la seconde tête de piqûre (14) vers ou à l'opposé des chariots (11, 21) correspondants qui supportent la première tête de piqûre (15), et dans laquelle, lorsque lesdits éléments de moteur ne se déplacent pas, les première et seconde têtes de piqûre se déplacent ensemble.
2. Machine à piquer selon la revendication 1, **caractérisée en ce que** lesdits éléments de moteur comprennent des moteurs électriques (46, 47) qui sont

- supportés sur les chariots de support (11, 21) de ladite une des têtes de couture (13) et de l'ensemble de crochet (19) de ladite première tête de piqûre (15) et sont adaptés pour actionner des tiges filetées (48, 49) respectives qui sont parallèles et sont mises en prise de manière rotative dans des filetages femelles (50, 51) qui sont supportés sur les chariots (10, 20) qui supportent l'autre des têtes de couture (12) et l'ensemble de crochet (18) de la seconde tête de piqûre (14).
3. Machine à piquer selon la revendication 1, **caractérisée en ce que** lesdits éléments de moteur comprennent des moteurs électriques qui sont supportés sur les chariots (11, 21) qui supportent ladite une des têtes de couture (13) et l'ensemble de crochet (19) de ladite première tête de piqûre (15) et sont adaptés pour actionner des rangées respectives qui sont parallèles et ont une extrémité qui est fixée aux chariots (10, 20) qui supportent ladite autre des têtes de couture (12) et l'ensemble de crochet (18) de ladite seconde tête de piqûre (14).
4. Machine à piquer selon la revendication 2, **caractérisée en ce que** pour l'actionnement de ladite première tête de piqûre (15), il est prévu une courroie (26) flexible et inextensible qui a un point (27) fixé sur un chariot (11) de ladite première tête de piqûre (15) et enroulée dans une boucle fermée autour de quatre poulies de guidage (33, 34, 35, 36) et une poulie d'entraînement (37), lesdites poulies de guidage (33, 34, 35, 36) étant agencées sur ledit châssis (1) au niveau des coins d'un rectangle imaginaire et ladite poulie d'entraînement (37) étant agencée entre deux poulies de guidage (34, 36) superposées, de sorte que ladite courroie (26) s'enroule le long de quatre parties (38, 39, 40, 41) parallèles, coplanaires et superposées qui se déplacent dans une même direction par paires, les chariots (11, 21) supportant ladite une des têtes de couture (13) et, respectivement, l'ensemble de crochet (19) de ladite première tête de piqûre (15) étant fixés à deux (38, 40) desdites parties qui se déplacent dans la même direction.
5. Machine à piquer selon la revendication 4, **caractérisée en ce que** deux moteurs électriques (46, 47) de type réversible sont montés sur lesdits chariots (11, 21), leurs arbres comprenant des tiges filetées (48, 49) qui ont le même pas et sont parallèles auxdites parties (38, 39, 40, 41) de la courroie (26) et sont mises en prise dans des filetages femelles (50, 51) qui sont fixés sur les chariots (10, 20) qui supportent ladite autre des têtes de couture (12) et l'ensemble de crochet (18) de ladite seconde tête de piqûre (14), lesdits moteurs électriques (46, 47) étant commandés afin de déplacer lesdits chariots (10, 20) avec la même vitesse et dans la même direction.
6. Machine à piquer selon la revendication 4, **caractérisée en ce que** deux moteurs électriques (46, 47) de type réversible sont montés sur lesdits chariots (11, 21), leurs arbres étant pourvus de pignons qui s'engrènent avec des rangées qui sont parallèles auxdites parties (38, 39, 40, 41) de la courroie (26) et ont des extrémités qui sont fixées aux chariots (10, 20) qui supportent ladite autre des têtes de couture (12) et l'ensemble de crochet (18) de ladite seconde tête de piqûre (14), lesdits moteurs électriques (46, 47) étant commandés afin de déplacer lesdits chariots (10, 20) avec la même vitesse dans la même direction.
7. Machine à piquer selon la revendication 5, **caractérisée en ce qu'elle** comprend une troisième tête de piqûre qui est commandée en prévoyant, sur les chariots (11, 21) de ladite première tête de piqûre (15), deux moteurs supplémentaires pour actionner deux tiges filetées qui mettent en prise, avec un couplage par vis, des filetages femelles respectifs qui sont fixés sur les chariots qui supportent la tête de couture et l'ensemble de crochet de ladite troisième tête de piqûre.
8. Machine à piquer selon la revendication 2, **caractérisée en ce que** lesdits filetages femelles (50, 51) sont du type à vis sphérique.
9. Machine à piquer selon la revendication 4, **caractérisée en ce que** ladite poulie d'entraînement (37) est pourvue d'une couronne (43) avec laquelle le pignon (44) d'un moteur (45) d'actionnement s'engrène.

