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(54) **Sewing machine with new lockstitch**

(57) The invention is a new sewing machine comprising at least one oscillating bar provided with at least one needle (G) and with a device for reversing the oscillation, with at least one lower roller foot (E) positioned under the sewing surface (S), suited to facilitate the movement of the fabric and connected to a device for reversing the rotation of the roller foot itself, and also provided with at least one walking foot (A) positioned over the sewing surface (S) and connected to at least one device for reversing the rotation of the walking foot (A) itself, and wherein said three devices are activated at the same time.

EP 2 078 775 A1

Description

[0001] The present patent relates to the sector of sewing machines and in particular it concerns a new sewing machine equipped with a new lockstitch.

[0002] Sewing machines are known that comprise at least one main shaft that is set rotating by at least one electric motor and is connected to at least one vertical bar by means of a transmission device, the lower end of said bar being made integral with a needle suitable for perforating the fabric and allowing the thread to pass through the fabric itself.

[0003] Said transmission device comprises a cam, in such a way as to generate the alternate upward and downward movement of the needle bar.

[0004] In order to prevent the needle tip from breaking or the fabric from being damaged during the sewing process, said vertical bar moves following an oscillating pattern with variable period according to the fabric advance speed.

[0005] Said main shaft is mechanically connected also to at least one roller foot positioned under the fabric and the sewing surface and suited to facilitate the forward movement of the fabric.

[0006] To further facilitate the forward movement of the fabric, a foot is provided over the fabric to press it against the lower roller foot.

[0007] Walking feet are also known that are positioned over the sewing surface and connected to a forward rotation device to facilitate the forward movement of the fabric.

[0008] To lock the stitches, at the end of the sewing cycle the fabric must be moved backwards; for this purpose the lower roller foot can move both forwards and backwards, while the needle bar is provided with at least one device for reversing the oscillation of the bar, operated by a magnet, that reverses the oscillation of said bar when the fabric is moved backwards, while the rotation device of the walking foot is deactivated, making the foot idle.

[0009] The main drawback posed by the known sewing machines is represented by the fact that if the fabric is too heavy the driving action of the roller foot alone isn't sufficient to allow the fabric to be moved backwards and therefore prevents the correct locking of the stitch.

[0010] To remedy all the above mentioned drawbacks, a sewing machine equipped with a new lockstitch has been designed and constructed.

[0011] The object of the new sewing machine is to improve the backward movement of the fabric for the locking of the stitch.

[0012] These and other direct and complementary objects are achieved by the new sewing machine comprising at least one oscillating bar, provided with at least one needle positioned at its lower end, and with at least one device for reversing the oscillation direction, at least one roller foot positioned under the sewing surface and suited to facilitate the movement of the fabric, provided with at least one device for reversing the rotation direction, and at least one walking foot positioned over the fabric and suited to facilitate the movement of the fabric, provided with at least one device for reversing the rotation of the roller, and wherein said device for reversing the oscillation of the bar, said device for reversing the rotation direction of the roller foot and said device for reversing the rotation of the walking foot are all activated at the same time.

[0013] The characteristics of the new sewing machine will be highlighted in greater detail in the following description, with reference to the drawings attached as non-limiting examples.

[0014] Figure 1 shows a detail of the device for reversing the rotation of the walking foot.

[0015] The new sewing machine comprises, in its main parts" at least one main driving shaft, connected to a cam that in turn is connected to at least one vertical bar through a connecting element, in such a way as to allow the vertical alternate translation of said vertical bar, and wherein said vertical bar comprises at least one needle (G) positioned at its lower end.

[0016] In order to prevent the tip of the needle (G) from breaking during the sewing process, said needle bar moves following also an oscillating pattern with variable period according to the fabric advance speed.

[0017] Furthermore, a device operated by a magnet reverses the oscillation of said bar when the direction of movement of the fabric is reversed.

[0018] Said main shaft is preferably connected to at least one lower shaft with rotation axis parallel to the rotation axis of said main shaft, in such a way as to allow it to rotate around its own axis, said lower shaft being in turn mechanically connected to at least one device for reversing the rotation that is connected to the roller foot (E) positioned under the sewing surface (S) and suited to facilitate the movement of the fabric.

[0019] Furthermore, said main shaft is mechanically connected also to a device for reversing the rotation of the walking foot (A) that is positioned over the sewing surface (S) and is suited to facilitate the movement of the fabric.

[0020] Said walking foot (A) comprises a driving roller that rotates around its own axis, provided with a series of teeth positioned on its external perimeter.

[0021] The device for reversing the rotation of the walking foot comprises at least one rotary shaft (D) directly or indirectly connected to said main shaft, provided with two opposing bevel gears (D1, D2) with straight teeth, and at least one auxiliary shaft (B1) perpendicular to said rotary shaft (D), connected to said walking foot (A); said auxiliary shaft (B1) is provided at its upper end with a bevel gear (B11) with straight teeth, suited to mesh alternately with the teeth of one of the two bevel gears (D1, D2).

[0022] Said opposing bevel gears (D1, D2) are spaced from each other, so that said bevel gear (B11) is positioned between the two bevel gears (D1, D2) but meshes

alternately only with one of them.

[0023] Furthermore, said device for reversing the rotation of the walking foot (A) comprises at least one translation member, in this case consisting of a magnet-operated actuator (P) suited to translate said rotary shaft (D) and said bevel gears (D1, D2) along their rotation axis by means of a chain (E) counteracted by a spring (M), so that the bevel gear (B11) meshes alternately with one of the two bevel gears (D1, D2), thus reversing the rotation direction of the auxiliary shaft (B1).

[0024] Said auxiliary shaft (B1) is connected through a cardan joint (B12) to a telescopic bushing (B2) and to a spindle (B3) that translates with respect to the bushing (B2) according to the thickness of the fabric; said spindle (B3) is set rotating by the bushing (B2) and in turn is mechanically connected to said walking foot (A), thus setting it rotating around its horizontal axis. The rotary shaft (D) is provided with two opposing free wheels (R1, R2) that are alternately activated by the translation of the key (C) in order to move said two bevel gears (D1, D2) to the right or to the left.

[0025] According to the invention, a device for constraining and releasing (F1, F2) the supporting block of the walking foot (A) is also provided, in order to allow the walking foot or upper rotary and driving unit (A) to be lifted.

[0026] Said device for reversing the oscillation of the bar, said device for reversing the rotation of the lower roller foot and said device for reversing the rotation of the walking foot are connected to an electric circuit that activates the three devices at the same time, thus reversing the direction of movement of the fabric.

[0027] Therefore, with reference to the above description and the attached drawings, the following claims are expressed.

Claims

1. Sewing machine, comprising

   • at least one oscillating bar equipped with at least one needle (G) and with one device for reversing the oscillation,
   • at least one lower roller foot (E) positioned under the sewing surface (S), suited to facilitate the movement of the fabric and connected to a device for reversing the rotation of the lower roller foot itself,

   characterized in that it comprises at least one walking foot (A) positioned over the sewing surface (S) and suited to facilitate the movement of the fabric, connected to at least one device for reversing the rotation of the walking foot (A), and wherein said device for reversing the oscillation of the needle bar (G), said device for reversing the rotation of the lower roller foot (E) and said device for reversing the rotation of the walking foot (A) are activated at the same time.

2. Sewing machine according to claim 1, **characterized in that** said device for reversing the rotation of the walking foot comprises

   • at least one rotary shaft (D) provided with two or more opposing bevel gears (D1, D2) with straight teeth,
   • at least one auxiliary shaft (B1) perpendicular to said rotary shaft (D), provided at one end with at least one bevel gear (B11) with straight teeth positioned between said two bevel gears (D1, D2) and suited to mesh with one or the other bevel gear,
   • at least one device (P) for translating said bevel gears (D1, D2) along the rotation axis of the rotary shaft (D), in such a way as to alternately mesh one or the other bevel gear (D1, D2) with the bevel gear (B11).

3. Sewing machine according to claims 1, 2, **characterized in that** said translation device (P) is operated by at least one magnet.

4. Sewing machine according to claims 1, 2, 3, **characterized in that** said translation device (P) is operated by a compressed air cylinder.

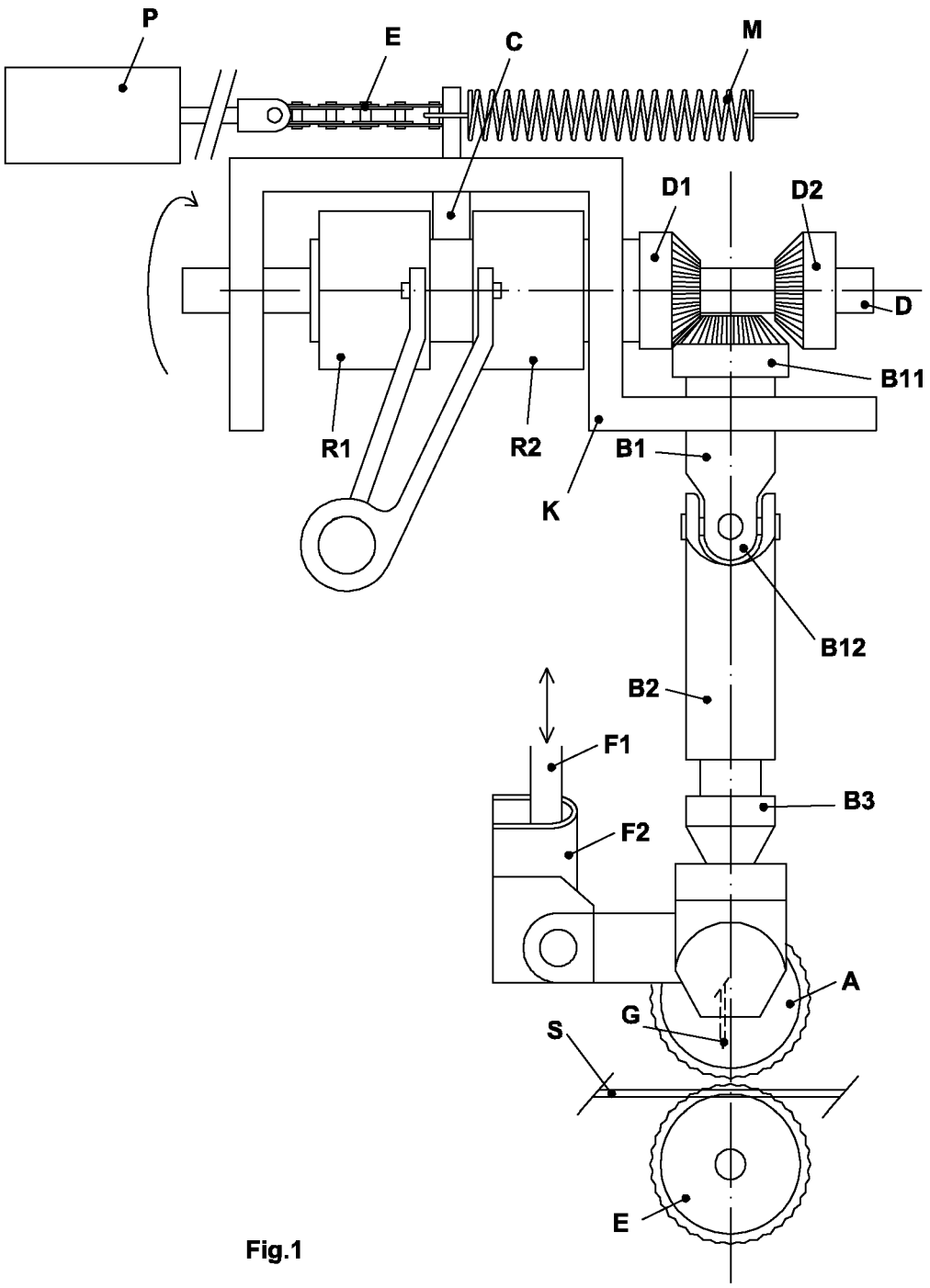

Fig.1

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EUROPEAN SEARCH REPORT

Application Number
EP 08 10 3680

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 May 2009	Herry-Martin, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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1

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 10 3680

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