

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 421 633 B1

(12)

EUROPEAN PATENT SPECIFICATION

(49) Date of publication of patent specification: **20.07.94** (51) Int. Cl.⁵: **D04B 7/00**

(21) Application number: **90310253.1**

(22) Date of filing: **19.09.90**

(54) **Flat knitting machine.**

(30) Priority: **04.10.89 JP 259564/89**

(43) Date of publication of application:
10.04.91 Bulletin 91/15

(45) Publication of the grant of the patent:
20.07.94 Bulletin 94/29

(84) Designated Contracting States:
CH DE ES FR GB IT LI

(56) References cited:
EP-A- 0 277 351
FR-A- 2 227 362
GB-A- 2 136 152

(73) Proprietor: **SHIMA SEIKI MFG., Ltd.**
No. 85, Sakata
Wakayama-shi, Wakayama 641(JP)

(72) Inventor: **Nishibata, Shigeaki**
7, Nakatamachi 3-chome
Wakayama-shi, Wakayama-ken(JP)
Inventor: **Shima, Masahiro**
3-22, Imafuku 1-chome
Wakayama-shi, Wakayama-ken(JP)

(74) Representative: **Thomson, Roger Bruce et al**
W.P. THOMPSON & CO.
Eastcheap House
Central Approach
Letchworth Hertfordshire SG6 3DS (GB)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

EP 0 421 633 B1

Description

The present invention relates to a flat knitting machine having cable support means for supporting a cable or cables for supplying power and electrical signals to the carriage or carriages.

In one known flat knitting machine, such as described in EP-A-0277351, a cable connecting a controller for controlling the flat knitting machine to a terminal unit provided on the flat knitting machine to supply power and/or electrical signals to the carriage is arranged fixedly, while a movable cable connecting the carriage to the terminal unit is supported for movement to allow the movable cable freedom for movement in accordance with the reciprocating motion of the carriage. The movable cable is suspended on a cable suspension device in a zigzag configuration. The cable extends or retracts according to the movement of the carriage. No problem arises with such cable support means as long as the carriage reciprocates at a comparatively low speed. However, it is possible for the movable cable to become damaged due to its inertial movement in the reversing of the carriage when the carriage moves at a comparatively high speed or due to vibrations caused by frequent application of loads to the movable cable when the carriage reciprocates through a short stroke.

A weft knitting machine provided with two carriages on a single needle bed has problems attributable to the interference between movable cables connected to the carriages and the carriages themselves.

It is an object of the present invention to provide a cable system capable of supporting a movable cable or cables for supplying power and electrical signals to one or a plurality of carriages mounted on a single needle bed so that the movable cables, if there is more than one, do not interfere with each other and do not obstruct the individual movements of the carriages even when the carriages reciprocate rapidly.

In accordance with the invention, there is provided a flat knitting machine comprising a needle bed, a frame supporting the needle bed, a carriage, a guide member supporting and guiding the carriage for reciprocation along the needle bed, a terminal unit provided on the frame, and a cable for supplying power and electrical signals to the carriage having one end connected to the terminal unit, characterised in that the terminal unit is positioned at the middle of the stroke of the carriage, and in that the cable is guided to the carriage by a flexible cable support structure, which is supported on a support member.

In accordance with a preferred embodiment of the invention, two carriages are provided, the guide member supports and guides the two carriages for

reciprocation along the needle bed, the terminal unit is positioned at the mid-point of the strokes of the two carriages, one end of each of two cables for supplying power and electrical signals to the two respective carriages is connected to the terminals of the terminal unit, the two cables are guided to the respective carriages by flexible cable support structures, and the flexible cable support structures are each capable of bending at the respective opposite outer sides of the frame.

When the terminal unit is disposed at a position corresponding to the middle of the stroke of the carriage and one end of the cable connected to the carriage is connected at the other end to the terminal unit, the cable is required to move through the minimum distance and to have the minimum length.

With a two carriage machine, since the cables connected to the two carriages are supported respectively on the cable support structures which are capable of bending at the opposite outer sides of the frame of the flat knitting machine, the cables do not interfere with each other and are able to move independently.

A preferred embodiment of flat knitting machine according to the present invention will now be described with reference to the accompanying drawings.

In the drawings:

Figures 1 to 4 are front views of a flat knitting machine in accordance with the present invention, showing the carriages at different positions; and

Figure 5 is a bottom view of a cable support structure.

A flat knitting machine 1 has a needle bed 3 supported on a frame 2, and carriages 4 and 5 supported on a guide rail (not shown). The carriages 4 and 5 are moved in a reciprocating manner by a driving belt 6. The rotary force of a driving unit 7 is transmitted to the driving belt 6. Power and/or electrical signals provided by a control unit 8 are transmitted through a fixed cable 9 connected to a terminal block 10 provided on the frame of the weft knitting machine 1. The carriages 4 and 5 are connected to the terminal block 10 by cables 11a and 11b respectively. The cables 11a and 11b are supported on flexible cable support structures 12a and 12b respectively. The flexible cable support structures 12a and 12b are supported on a support member 13. Fig. 5 shows the construction of the flexible cable support structures 12a and 12b, each of the flexible cable support structures 12a and 12b being formed by fitting a projection 15 formed on each of a plurality of small webs 14 in a small bore 16 formed in the adjacent small web 14 to connect the adjacent small webs 14 together. A terminal member 17 connected to

one end of the series of small webs 14 is fastened to the driving belt 6, so that the flexible cable support structure 12a (12b) is unrolled, rolled up or bent according to the turning motion of the driving belt 6, hence according to the reciprocation of the carriage 4 (5). The cables 11a and 11b are supported by the small webs 14.

The flexible cable support structures 12a and 12b connected respectively to the carriages 4 and 5 are bent respectively on the opposite outer sides of the frame, and both of the flexible cable support structures 12a and 12b are supported on the support member 13 for free bending.

The carriages 4 and 5 of the flat knitting machine thus constructed are able to move individually as shown in Figs. 2 to 4. In any of the modes of movement, the flexible cable support structures 12a and 12b, supporting the cables 11a and 11b connected to the carriages 4 and 5 respectively, are able to move individually without interfering with each other.

As is apparent from the foregoing description, in the flat knitting machine according to the present invention, the cable for supplying power and/or electrical signals to a single carriage supported on and guided by the guide member for movement along the needle bed is provided at a position corresponding to the middle of the stroke of the carriage and the cable is then supported by the flexible cable support structure. Accordingly, the length of the cable need only be about half the stroke of the carriage even if the carriage reciprocates over the entire width of the needle bed and the bend in the cable moves within the narrowest range. When the flat knitting machine is provided with two carriages, the cables connected to the carriages are bent respectively at the opposite outer ends of the needle bed, so that the cables and the cable support structures are able to move individually without interfering with each other.

Claims

1. A flat knitting machine (1) comprising a needle bed (3), a frame (2) supporting the needle bed, a carriage (4 or 5), a guide member supporting and guiding the carriage for reciprocation along the needle bed, a terminal unit (10) provided on the frame (2), and a cable (11a or 11b) for supplying power and electrical signals to the carriage having one end connected to the terminal unit (10), characterised in that the terminal unit (10) is positioned at the middle of the stroke of the carriage (4 or 5), and in that the cable is guided to the carriage by a flexible cable support structure (12a or 12b), which is supported on a support member (13).

2. A flat knitting machine (1) as claimed in claim 1, characterised in that two carriages (4,5) are provided, the guide member supports and guides the two carriages for reciprocation along the needle bed, the terminal unit (10) is positioned at the mid-point of the strokes of the two carriages, one end of each of two cables (11a, 11b) for supplying power and electrical signals to the two respective carriages is connected to the terminals of the terminal unit (10), the two cables are guided to the respective carriages by flexible cable support structures (12a, 12b), and the flexible cable support structures (12a, 12b) are each capable of bending at the respective opposite outer sides of the frame (2).

3. A flat knitting machine as claimed in claim 1 or 2, characterised in that the or each said flexible cable support structure (12a, 12b) comprises a plurality of small webs (14), each said small web having a projection and a small bore so that the webs can be connected to each other by fitting each projection into the bore of an adjacent web.

4. A flat knitting machine as claimed in any preceding claim, characterised in that the support member (13) for supporting the flexible cable support structures (12,12b) is provided extending under the needle bed (3).

Patentansprüche

1. Flachstrickmaschine (1), umfassend ein Nadelbett, einen das Nadelbett tragenden Rahmen (2), einen Schlitten (4 oder 5), ein den Schlitten zur Hin- und Herbewegung entlang dem Nadelbett haltendes Führungselement, eine am Rahmen (2) vorgesehene Anschlußeinheit (10) und ein Kabel (11a oder 11b) zur Versorgung des Wagens mit Strom und elektrischen Signalen, dessen eines Ende mit der Anschlußeinheit (10) verbunden ist, dadurch **gekennzeichnet**, daß die Anschlußeinheit (10) in der Mitte des Hubweges des Schlittens (4 oder 5) angeordnet ist, und dadurch, daß das Kabel durch eine flexible Kabeltülle (12a oder 12b) zum Schlitten geführt wird, die von einem Tragelement (13) getragen wird.

2. Flachstrickmaschine (1) nach Anspruch 1, dadurch **gekennzeichnet**, daß zwei Schlitten (4, 5) vorgesehen sind, das Führungselement die beiden Schlitten entlang dem Nadelbett hin und her bewegbar trägt und führt, die Anschlußeinheit (10) in der Mitte des Hubweges der beiden Schlitten angeordnet ist, jeweils ein

Ende von zwei Kabeln (11a, 11b) zur jeweiligen Versorgung der beiden Schlitten mit Strom und elektrischen Signalen mit den Anschlüssen der Anschlußeinheit (10) verbunden ist, die beiden Kabel zu den jeweiligen Schlitten durch flexible Kabeltüllen (12a, 12b) geführt sind und die flexiblen Kabeltüllen (12a, 12b) jeweils in der Lage sind, sich an den jeweils entgegengesetzten Außenseiten des Rahmens (2) umzubiegen.

3. Flachstrickmaschine nach Anspruch 1 oder 2, dadurch **gekennzeichnet**, daß die oder jede der beiden Kabeltüllen (12a, 12b) eine Vielzahl von kleinen Bahnen (14) umfaßt, wobei jede der kleinen Bahnen einen Vorsprung und eine kleine Bohrung aufweist, so daß die Bahnen miteinander durch Einsetzen eines jeweiligen Vorsprungs in die Bohrung einer benachbarten Bahn verbindbar sind.
4. Flachstrickmaschine nach einem der vorstehenden Ansprüche, dadurch **gekennzeichnet**, daß das Tragelement (13) zum Tragen der flexiblen Kabeltüllen (12a, 12b) unterhalb des Nadelbettes (3) verlaufend vorgesehen ist.

5

10

15

20

25

des chariots respectifs par des structures flexibles de support de câble (12a, 12b), et les structures flexibles de support de câble (12a, 12b) sont aptes chacune à se courber aux côtés externes respectivement opposés du châssis (2).

3. Machine à tricoter rectiligne selon la revendication 1 ou 2, caractérisée en ce que la ou chacune desdites structures flexibles de support de câble (12a, 12b) comprend une pluralité de petites bandes (14), chacune desdites petites bandes présentant une saillie et un petit perçage de sorte que les bandes peuvent être connectées les unes aux autres en ajustant chaque saillie dans le perçage d'une bande adjacente.
4. Machine à tricoter rectiligne selon l'une des revendications précédentes, caractérisée en ce que l'élément de support (13) pour supporter les structures flexibles de support de câble (12a, 12b) est réalisé de façon à s'étendre sous la barre à aiguilles (3).

Revendications

1. Machine à tricoter rectiligne (1) comprenant une barre à aiguilles (3), un châssis (2) supportant la barre à aiguilles, un chariot (4 ou 5), un élément de guidage supportant et guidant le chariot en vue d'un mouvement de va-et-vient le long de la barre à aiguilles, une unité terminale (10) prévue sur le châssis (2) et un câble (11a ou 11b) pour fournir de l'énergie et des signaux électriques au chariot dont une extrémité est connectée à l'unité terminale (10), caractérisée en ce que l'unité terminale (10) est positionnée au milieu de la course du chariot (4 ou 5), et en ce que le câble est guidé au chariot par une structure flexible de support de câble (12a ou 12b) qui est supportée sur un élément de support 13.
2. Machine à tricoter rectiligne (1) selon la revendication 1 caractérisée en ce que deux chariots (4, 5) sont prévus, l'élément de guidage supporte et guide les deux chariots en vue d'un mouvement de va-et-vient le long de la barre à aiguilles, l'unité terminale (10) est positionnée au point central des courses des deux chariots, une extrémité de chacun des deux câbles (11a, 11b) pour fournir de l'énergie et des signaux électriques aux deux chariots respectifs est connectée aux bornes de l'unité terminale (10), les deux câbles sont guidés à

30

35

40

45

50

55

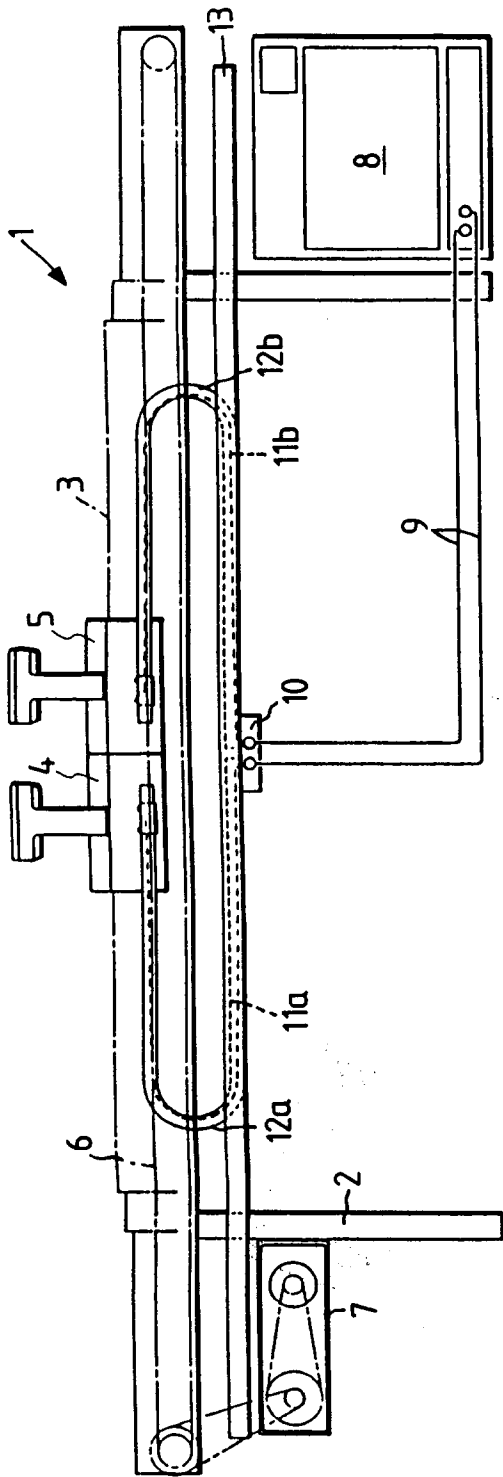


FIG. 1

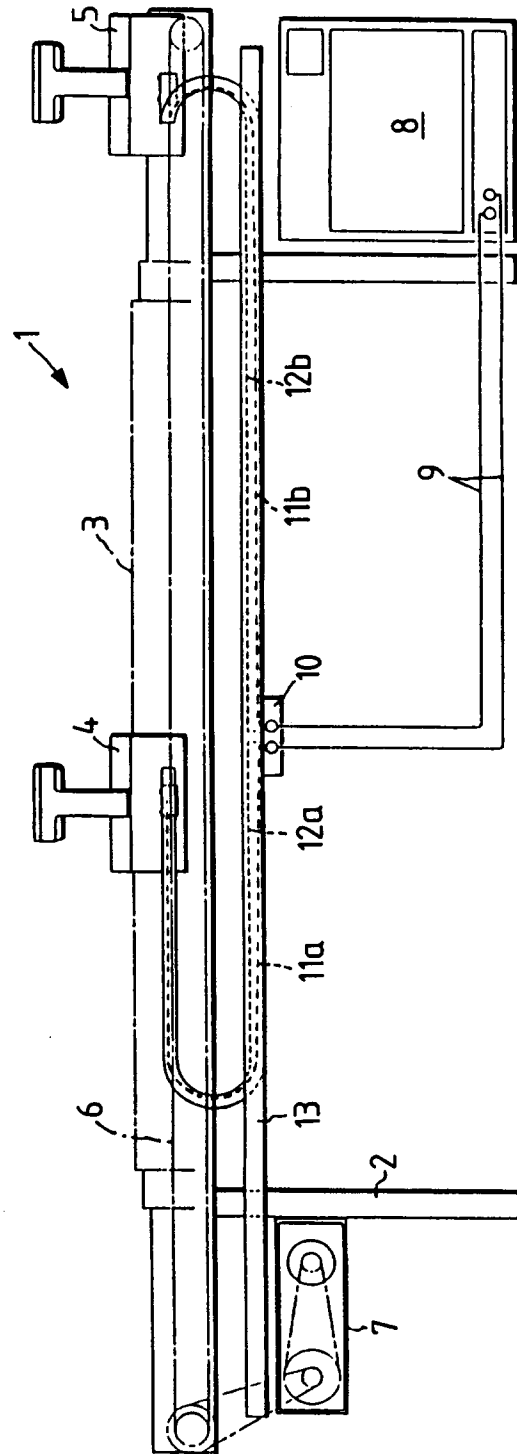


FIG. 2

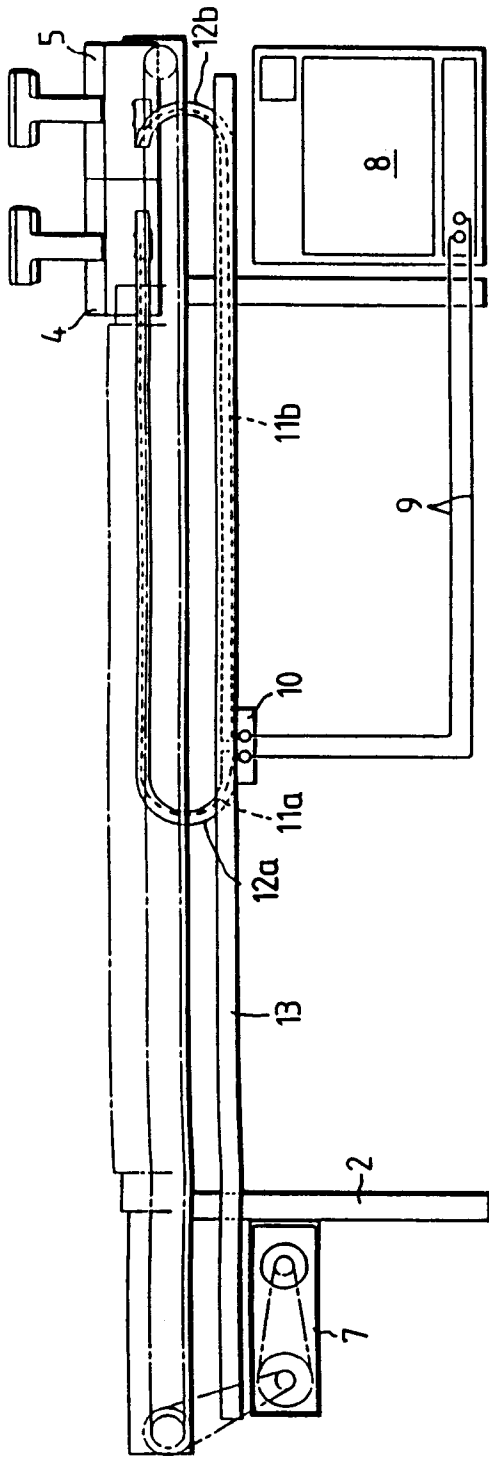


FIG. 3

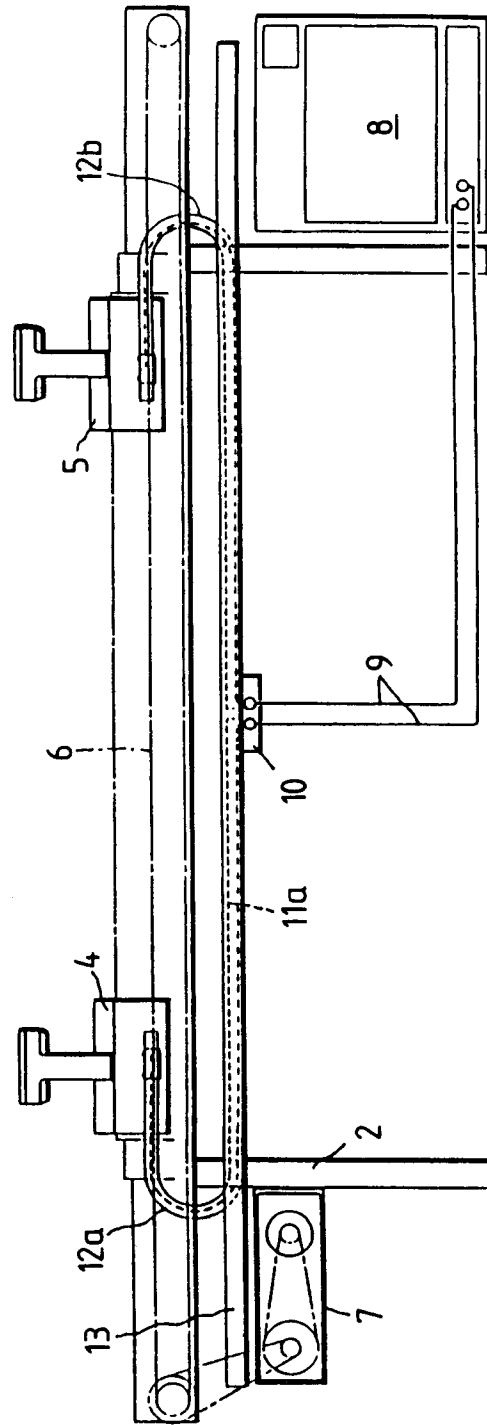


FIG. 4

FIG. 5

