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(54) **CRANKSHAFT AND CONNECTING ROD MECHANISM OF NEEDLE BED OF WARP KNITTING MACHINE WITH SINGLE NEEDLE BED**

(57) The present invention relates to a needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed, which is a connecting rod mechanism composed of a connecting rod frame, a crankshaft, a plurality of connecting rods and pin shafts; the connecting rod mechanism can effectively shorten the stroke of the needle bed connecting rod mechanism, such that its vibration and inertia are low, and the machine can be operated at a higher speed, thereby improving the production efficiency.

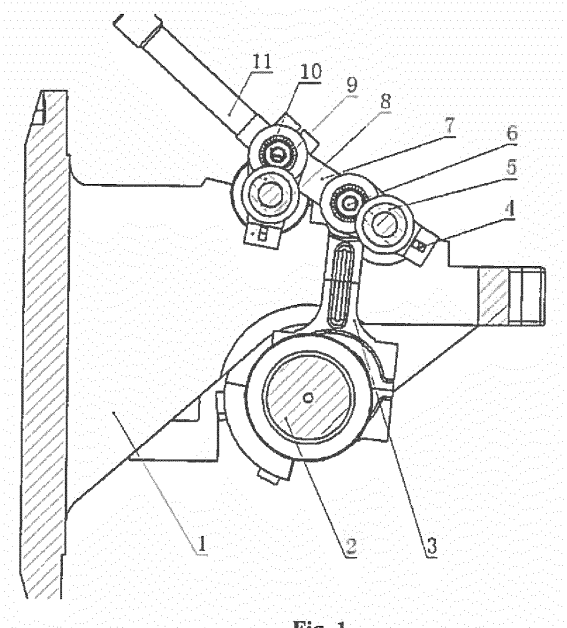

Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to a needle bed transmission mechanism for a warp knitting machine with a single needle bed, and specifically discloses a needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed.

Description of the Related Art

[0002] Warp knitting machine is a knitting machine that uses chemical fibers as the raw material to knit apparel fabrics, underwear fabrics, swimsuit fabrics, curtain fabrics, household fabrics and industrial fabrics. As the warp knitting machine only uses warps to knit fabrics, it has been very popular in the textile industry thanks to the advantages such as short industrial process for production, high production efficiency, a great number of fabric varieties, low investments and low energy consumption.
[0003] The cam-type transmission mechanism has been extensively used as the needle bed transmission mechanism for existing warp knitting machines. Since the cam has relatively high inertia and centrifugal force during rotation, the operating speed of the machine is affected, and the production efficiency of the machine cannot be further improved.

Summary of the Invention

[0004] The object of the present invention is to overcome the problems above by providing a needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed, which can effectively shorten the stroke of the needle bed connecting rod mechanism, such that its vibration and inertia are low, and the machine can be operated at a higher speed, thereby improving the production efficiency.
[0005] The technical solution employed by the present invention as follows:

> A needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed, which is a connecting rod mechanism composed of a connecting rod frame, a crankshaft, a plurality of connecting rods and pin shafts.

[0006] Furthermore, a plurality of grooves is formed on the connecting rod frame, and the crankshaft is fixed in the grooves and can rotate freely.
[0007] Furthermore, one end of the connecting rod a is connected with the crankshaft, and the other end thereof is connected with a pin shaft a and can rotate around the pin shaft a.
[0008] Furthermore, a clamping device is disposed at the connection between the connecting rod a and the crankshaft, and the contact surface of the clamping device with the crankshaft is a circular-arc concave surface with a bearing shell installed thereon.
[0009] Furthermore, the pin shaft a is further connected with the connecting rod b, the connecting rod b is divided into two parts, left and right, which are arranged symmetrically and in parallel on two sides of the pin shaft a and can rotate around the pin shaft a.
[0010] Furthermore, the other end of the connecting rod b is connected with the pin shaft b and can rotate around the pin shaft b.
[0011] Furthermore, two ends of the pin shaft a and the pin shaft b are provided with a connecting rod c and a connecting rod d, respectively, and they can all rotate around the pin shafts.
[0012] Furthermore, the connecting rod c and the connecting rod d are both provided with a plurality of protruding columns a and columns b, the columns are sheathed by steel jackets, and the steel jackets are installed into the grooves of the connecting rod frame.
[0013] Furthermore, a connecting rod e is disposed at the central position of the pin shaft b, the connecting rod e can rotate around the pin shaft b, the connecting rod e is provided with a fastening device thereon for adjusting the tightness between the connecting rod e and the pin shaft b, and the other end of the connecting rod e is connected with the looping part.
[0014] In summary, the application of the above technical solution has the following advantageous effects:

1. Kinematic pairs of such a mechanism are all revolute pairs, the connected rods (shafts) are in surface contact, leading to a low pressure, such that wear and tear is insignificant for contact positions of all parts, the impact on motion regularity of looping parts is relatively low, and vibration and inertia are low;

2. The structure has a steady and accurate transmission, such that the machine can be operated at a higher speed of rotation, and the noise is relatively low, thereby improving the operation efficiency;

3. All parts of the structure are easy to be processed, and it is relatively easy to achieve relatively high geometric precision.

Brief Description of the Drawings

[0015]

> Fig. 1 is a schematic diagram of the structure of the present invention;
>
> Fig. 2 is a side view of the present invention.

[0016] Legends in the drawings: 1. connecting rod frame, 2. crankshaft, 3. connecting rod a, 4. connecting rod c, 5. column a, 6. pin shaft a, 7. connecting rod b, 8. connecting rod d, 9. column b, 10. pin shaft b, 11. con-

necting rod e.

Detailed Description of the Specific Embodiments

[0017] The present invention will be further described below with reference to the accompanying drawings.

[0018] As shown in Fig. 1, a needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed is mainly composed of a connecting rod frame 1, a crankshaft 2, a plurality of connecting rods 3, 4, 7, 8, 11 and pin shafts 6, 10.

[0019] A plurality of grooves is formed on the connecting rod frame 1, and the crankshaft 2 is fixed in the grooves and can rotate freely.

[0020] One end of the connecting rod a3 is connected with the crankshaft 2, and the other end thereof runs into a pin shaft a6 and can rotate around the pin shaft a6.

[0021] A clamping device is disposed at the connection between the connecting rod a3 and the crankshaft 2, and the contact surface of the clamping device with the crankshaft 2 is a circular-arc concave surface, the clamping device is divided into two parts with a bearing shell installed in each of the parts, the bearing shell is formed with a small hole thereon, the separated two parts sheathe the crankshaft 2 and are fastened by tightening screws through the threaded holes on two sides of the two parts, a lubrication system injects oil into the small holes, such that a thin oil film is formed between the bearing shell and the crankshaft 2. The advantage of such a practice is that the rotation of the crankshaft 2 becomes smoother, and the friction between the crankshaft 2 and the bearing shell is reduced. As a result, the crankshaft 2 is very well protected, the operating load on the power device and the force applied mutually on the transmission parts are reduced, and the machine operates more steadily and smoothly while electric power is saved.

[0022] The pin shaft a6 is further connected with the connecting rod b7, the connecting rod b7 is divided into two parts, left and right, which are arranged symmetrically and in parallel on two sides of the pin shaft a6 and can rotate around the pin shaft a6.

[0023] The other end of the connecting rod b7 is connected with the pin shaft b10 and can rotate around the pin shaft b10.

[0024] The pin shaft a6 and the pin shaft b10 are parallel to each other, two ends thereof are provided with a connecting rod c4 and a connecting rod d8, respectively, and they can all rotate around the pin shafts.

[0025] The connecting rod c4 and the connecting rod d8 are both provided with a plurality of protruding columns a5 and columns b9, the columns are sheathed by steel jackets, and the steel jackets are installed into the grooves of the connecting rod frame.

[0026] A connecting rod e11 is disposed at the central position of the pin shaft b10, the connecting rod e11 can rotate around the pin shaft b10, the connecting rod e11 is provided with a fastening device thereon for adjusting the tightness between the connecting rod e11 and the pin shaft b10, and the other end of the connecting rod e11 is connected with the looping part. The transmission device drives the crankshaft 2 to rotate, and the crankshaft 2 drives, via the needle bed connection rod, the looping part to make looping motion.

[0027] Only a preferred embodiment of the present invention is described above, which is not used to limit the present invention. Any modification, equivalent substitution and improvement made within the spirit and principle of the present invention shall be encompassed by the scope of the present invention.

Claims

1. A needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed, **characterized in that** it is a connecting rod mechanism composed of a connecting rod frame, a crankshaft, a plurality of connecting rods and pin shafts.

2. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 1, **characterized in that** a plurality of grooves is formed on the connecting rod frame, and the crankshaft is fixed in the grooves and can rotate freely.

3. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 1, **characterized in that** one end of the connecting rod a is connected with the crankshaft, and the other end thereof is connected with a pin shaft a and can rotate around the pin shaft a.

4. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 3, **characterized in that** a clamping device is disposed at the connection between the connecting rod a and the crankshaft, and the contact surface of the clamping device with the crankshaft is a circular-arc concave surface with a bearing shell installed thereon.

5. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 3, **characterized in that** the pin shaft a is further connected with the connecting rod b, the connecting rod b is divided into two parts, left and right, which are arranged symmetrically and in parallel on two sides of the pin shaft a and can rotate around the pin shaft a.

6. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 5, **characterized in that** the other end of the connecting rod b is connected with

the pin shaft b and can rotate around the pin shaft b.

7. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 5 or 6, **characterized in that** two ends of the pin shaft a and the pin shaft b are provided with a connecting rod c and a connecting rod d, respectively, and they can all rotate around the pin shafts.

8. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 7, **characterized in that** the connecting rod c and the connecting rod d are both provided with a plurality of protruding columns a and columns b, the columns are sheathed by steel jackets, and the steel jackets are installed into the grooves of the connecting rod frame.

9. The needle bed crankshaft-connecting rod mechanism for a warp knitting machine with a single needle bed according to claim 7, **characterized in that** a connecting rod e is disposed at the central position of the pin shaft b, the connecting rod e can rotate around the pin shaft b, the connecting rod e is provided with a fasteni ng device thereon for adjusting the tightness between the connecting rod e and the pin shaft b, and the other end of the connecting rod e is connected with the looping part.

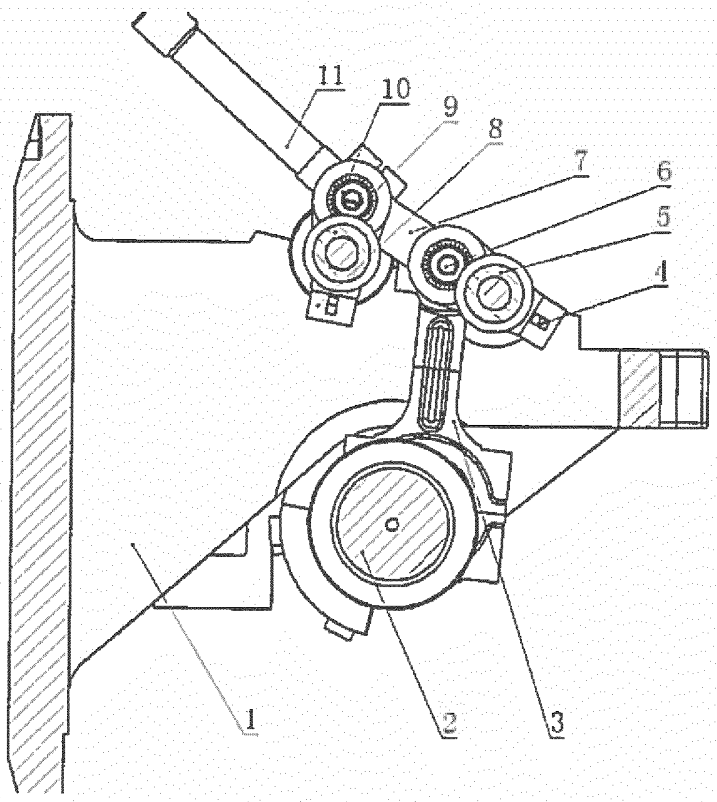

Fig. 1

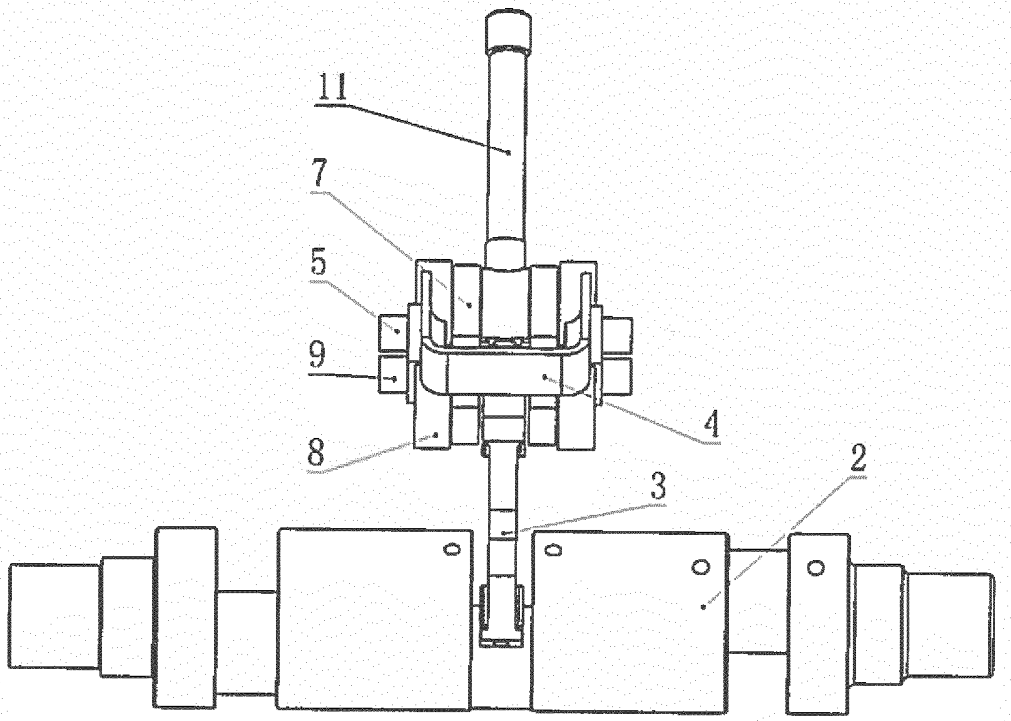

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/076604

A. CLASSIFICATION OF SUBJECT MATTER

D04B 27/08 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, EPODOC, WPI: rod, lever, arm, knitting, bed, bracket, frame, pin, fasten, tighten, crankshaft, bent, connect, link

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 102733065 A (CHANGZHOU WUJIN WUYANG TEXTILE MACHINERY CO., LTD.) 17 October 2012 (17.10.2012) description, paragraphs [0015] and [0016], and figures 2 and 3	1, 3, 4
Y	CN 102733065 A (CHANGZHOU WUJIN WUYANG TEXTILE MACHINERY CO., LTD.) 17 October 2012 (17.10.2012) description, paragraphs [0015] and [0016], and figures 2 and 3	2
Y	CN 102505327 A (WANG, Minqi) 20 June 2012 (20.06.2012) description, paragraphs [0010] and figure 2	2
X	CN 102733067 A (CHANGZHOU WUJIN WUYANG TEXTILE MACHINERY CO., LTD.) 17 October 2012 (17.10.2012) description, paragraph [0032], and figures 3 and 4	1, 3, 4
PX	CN 104452083 A (CHANGZHOU WUJIN WUYANG TEXTILE MACHINERY CO., LTD.) 25 March 2015 (25.03.2015) description, paragraphs [0005] to [0013], and figures 1 and 2	1-9

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 July 2015	22 July 2015
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer LU, Yan Telephone No. (86-10) 82245768

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/076604

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 104480626 A (CHANGZHOU WUJIN WUYANG TEXTILE MACHINERY CO., LTD.) 01 April 2015 (01.04.2015) description, paragraphs [0006] and [0014], and figures 1 and 2	1-9
PX	CN 104452081 A (CHANGZHOU WUJIN WUYANG TEXTILE MACHINERY CO., LTD.) 25 March 2015 (25.03.2015) description, paragraphs [0006] and [0014], and figures 1 and 2	1-9
A	CN 201424554 Y (ZHU, Chao) 17 March 2010 (17.03.2010) the whole document	1-9
A	WO 9802605 A1 (ARTECHNIC S.A. et al.) 22 January 1988 (22.01.1988) the whole document	1-9

Form PCT/ISA /210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/076604

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102733065 A	17 October 2012	None	
CN 102505327 A	20 June 2012	None	
CN 102733067 A	17 October 2012	None	
CN 104452083 A	25 March 2015	None	
CN 104480626 A	01 April 2015	None	
CN 104452081 A	25 March 2015	None	
CN 201424554 Y	17 March 2010	None	
WO 9802605 A1	22 January 1988	FR 2751352 A1	23 January 1988
		AU 3271097 A	09 February 1988
		FR 2751352 B1	16 October 1998

Form PCT/ISA /210 (patent family annex) (July 2009)