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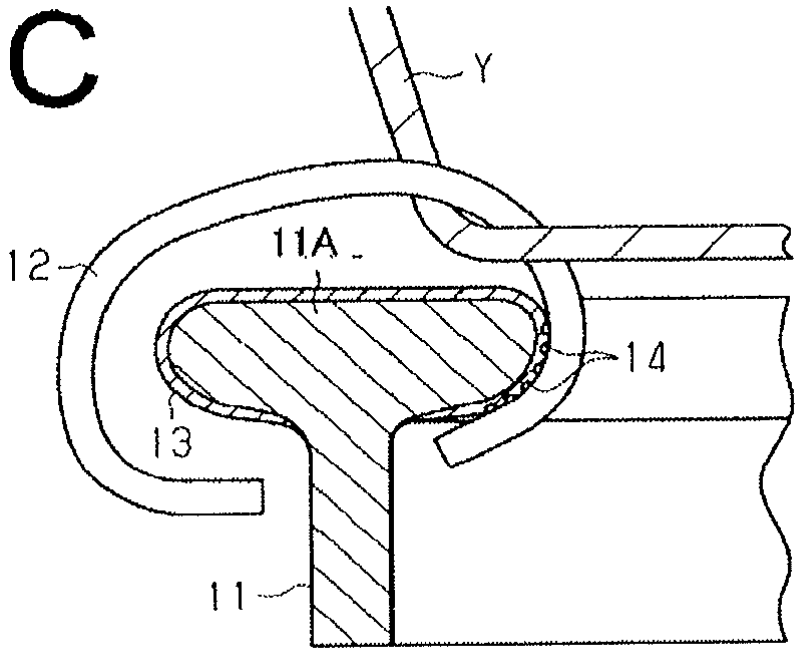
(54) RING-TRAVELER DEVICE OF RING TYPE SPINNING MACHINE

(57) A ring-traveler device of a ring type spinning machine includes a ring 11 and a traveler 12 slidable along the ring. A plurality of dimples 14 is formed in at least one of sliding surfaces of the ring and the traveler. Each dimple is formed by a circular opening edge and a curved inner surface.

FIG. 1C



EP 3 009 542 A1

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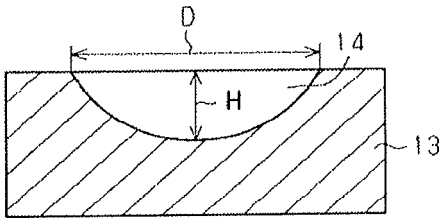
FIG. 2B



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a ring-traveler device in a ring type spinning machine, more specifically, to a ring-traveler device that allows heat generated by sliding of the traveler to be released effectively.

[0002] In a ring-traveler device of a ring type spinning machine, a yarn fed from a draft part is passed through a traveler sliding on a ring and wound on a bobbin that is rotated at high speed. The maximum rotation speed of a spindle exceeds 20,000 rpm during normal spinning operation of the ring type spinning machine and the traveler moves at a high speed in sliding contact with the ring, so that any effective measure needs to be taken in order to protect the traveler from performance deterioration and seizure caused by friction.

[0003] Japanese Utility Model Application Publication No. H06-54776 discloses a ring in a spinning machine that has an inclined flange. The inclined flange of the ring has small holes formed in the inner surface of the flange that is in sliding contact with a traveler of the spinning machine. The small holes are disposed in a spiral manner at an angle between 30 and 90 degree and each small hole has a diameter between 0.8 and 1.2 mm. The small hole may be formed through the inclined flange of the ring or provided in the form of a dent (non-through hole). The heat releasing performance of the ring becomes poor if the diameter of the small hole is less than 0.8 mm and the sliding movement of the traveler becomes unstable if the diameter of the small hole is more than 1.2mm.

[0004] In the conventional ring-traveler device, the small holes are formed by drilling. Referring to Fig. 5, numeral 31 designates a small hole that is formed by drilling, and the small hole 31 includes a vertical wall surface and a conical bottom surface 33. The movement of the traveler in sliding contact with the ring generates heat and the heat is released by forced cooling by an airflow generated by the rotation of the bobbin and the sliding movement of the traveler, as well as by the heat radiation from the surface of the traveler and the ring. In addition, the formation of the small holes 31 increases the surface area of the ring, thus improving the heat releasing performance. In the case of the small holes 31 each having the vertical wall surface 32, however, an airflow 35 that is generated by the rotation of the bobbin and the sliding movement of the traveler along the ring may not pass smoothly through an area of the ring corresponding to the small hole 31, so that a swirl 34 is produced, as shown in Fig. 5, and air in the small hole 31 is not replaced efficiently, with the result that forced cooling is performed less effectively.

[0005] The present invention, which has been made in light of the above-described problem, is directed to provide a ring-traveler device of a ring type spinning machine that can improve the heat releasing performance with a simple structure by utilizing the rotation of the bobbin and the sliding movement of the traveler.

SUMMARY OF THE INVENTION

[0006] In accordance with an aspect of the present invention, there is provided a ring-traveler device of a ring type spinning machine including a ring and a traveler slidable along the ring. A plurality of dimples is formed in at least one of sliding surfaces of the ring and the traveler. Each dimple is formed by a circular opening edge and a curved inner surface.

[0007] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The invention together with objects and advantages thereof, may best be understood by reference to the following description of the presently preferred embodiments together with the accompanying drawings in which:

Fig. 1A is a perspective view of a ring of a ring-traveler device according to an embodiment of the present invention;

Fig. 1 B is an enlarged fragmentary view of the ring of Fig. 1A;

Fig. 1C is a schematic view showing a relationship between the ring and its associated traveler;

Fig. 2A is a schematic view showing a part of the ring in which dimples are formed;

Fig. 2B is an enlarged cross-sectional view showing one of the dimples of Fig. 2A;

Fig. 3 is a schematic view showing airflow in the dimple;

Fig. 4 is a cross-sectional fragmentary view showing a ring-traveler device according to another embodiment of the present invention;

Fig. 5 is a schematic view showing airflow in a conventional dimple.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0009] The following will described a ring-traveler device of a ring type spinning machine according to the present invention with reference to Figs. 1 to 3. Referring to Figs 1A, 1B and 1C, the ring-traveler device includes a ring 11 and traveler 12 that is slidable along the ring 11. The ring 11 has a flange 11A having a T-shape in

cross-section and the traveler 12 has a C-shape in cross-section. The ring 11 is made of a bearing steel and has a hard chromium plating layer 13 having a thickness of about 10 to 20 μm, as shown in Figs. 1 B and 1C.

[0010] As shown in Fig. 1C, the ring 11 has a plurality of dimples 14 formed at least in the surface thereof along which the traveler 12 is slidable. In the present embodiment, the dimples 14 are formed in the inner surface of the flange 11A of the ring 11.

[0011] As shown in Figs. 2A and 2B, each dimple 14 has an opening end of a circular shape and a spherical concave surface (curved surface). In other words, each dimple is formed by a circular opening edge and a curved inner surface. The circular shape of the opening of the dimple need not be true circular, but it includes variations thereof which may be formed due to errors in the formation of the dimple 14. The dimple 14 is formed such that the radius, or half of the diameter D of the circular opening, is the same as or greater than the depth H of the dimple 14. In the present embodiment, the opening of the dimple 14 is between 10 and 100 μm.

[0012] The dimple 14 may be formed by irradiating a femtosecond pulse laser beam, a high output picosecond pulse laser beam or a nanosecond pulse laser beam to the surface in which the dimples 14 are to be formed.

[0013] The following will describe the operation of the ring-traveler device having the above-described configuration. In spinning operation of the spinning machine, a yarn Y delivered from a draft part (not shown) of the spinning machine and passing though the traveler 12, as shown in Fig. 1C, is wound around a bobbin (not shown) that is rotated at a high speed. The maximum rotation speed of a spindle of the spinning machine is about 25,000 rpm during the normal spinning operation of the ring type spinning machine, and the traveler 12 slides on the flange 11A of the ring 11 while being subjected to the winding tension of the yarn Y. Although the sliding position of the traveler 12 may be slightly varied according to its moving speed, the traveler 12 moves in sliding contact with the inner lower surface of the flange 11 A, as shown in Fig. 1C.

[0014] Because the traveler 12 slides on the flange 11A at a high speed, friction heat is generated on the sliding surfaces of the traveler 12 and the flange 11A. Unless the heat is released efficiently, the traveler 12 is susceptible to premature deterioration and seizure trouble.

[0015] The rotation of the bobbin and the sliding of the traveler 12 along the ring 11 during the spinning operation of the spinning machine generate accompanying airflow 15 (hereinafter simply referred to as airflow) along the inner surface of the flange 11A of the ring 11. Part of the airflow 15 flowing over the surface in which the dimples 14 are formed flows through the dimple 14, as shown in Fig. 3. Unlike the conventional dimple that has a vertical wall surface 32, the inner surface of the dimple 14 that is formed by a curved surface allows the airflow 15 to pass through the dimple 14 smoothly without generating a swirl, so that the air exchange in the dimple 14 takes place efficiently and, accordingly, the heat is released efficiently. Such a simple structure of the ring-traveler device of the present embodiment allows heat releasing effect to be increased by utilizing the rotation of the bobbin and the sliding of the traveler 12.

[0016] The present invention will offer the following effects.

(1) The ring-traveler device of the ring type spinning machine includes a plurality of the dimples 14 formed at least in the surface of the ring 11 that is in sliding contact with the traveler 12 and each having a circular opening and a spherically curved inner surface. Thus the heat releasing effect may be increased with a simple structure by using the rotation of the bobbin and the sliding of the traveler 12.

(2) The formation of the dimple 14 having the radius of the opening of which is the same as or greater than the depth H of the dimple 14 allows the airflow 15 generated by the rotation of the bobbin and the sliding of the traveler 12 to pass through in the dimple 14 smoothly.

(3) The dimple 14 that is formed by a spherical concave surface is easy to be formed and permits smooth airflow 15 through the dimple 14.

(4) The airflow around the ring 11 is not constant due to the position of the traveler 12 and the chasing motion of the bobbin. However, the dimple 14 having a spherical concave inner surface and hence having no directionality allows heat to be released efficiently under any airflow condition.

[0017] The present invention is not limited to the above-described embodiment, but it may be modified in various manners, as exemplified below.

[0018] The dimple 14 may be so configured that the surface thereof is formed by smoothly continuously connected concave surfaces of spheres of different diameters.

[0019] The dimple 14 need not be spherical concave as long as it has a generally curved surface. For example, the dimple 14 may have a shape that is formed by rotating an ellipse or a parabola line.

[0020] The surface of the dimple 14 may not necessarily be smooth, but it may be finely wavy, which may produce more desirable heat releasing effect due to an increased surface area.

[0021] The dimple 14 may not necessarily be formed by a simply recessed curved surface, but it may be formed by a curved surface in which recessed portions and swelled portions are smoothly continuously connected.

[0022] Dimples of various sizes may be formed.

[0023] The dimples 14 may not necessarily be spaced at a regular interval (uniform distance between two ad-

jacent dimples 14), but they may be disposed in a random manner.

[0024] The flange 11A of the ring 11 of the ring-traveler device need not be T-shaped in cross-section. For example, the flange 11A may be formed inclined in cross-section, as shown in Fig. 4. In this case, the traveler 12 should be formed so as to match the inclined flange 11A, as shown in Fig. 4.

[0025] The dimples 14 need not necessarily be formed by the laser, but may be formed by various chemical or physical methods such as micro etching and shot peening.

[0026] The dimple 14 may be formed in the traveler 12 instead of the ring 11 of the ring-traveler device. In this case, however, the number of dimple is significantly decreased. For better airflow effect, the dimples should preferably be formed in the ring 11.

[0027] The ring-traveler device is applicable to any spinning machine having a ring such as a ring twisting machine.

[0028] A ring-traveler device of a ring type spinning machine includes a ring and a traveler slidable along the ring. A plurality of dimples is formed in at least one of sliding surfaces of the ring and the traveler. Each dimple is formed by a circular opening edge and a curved inner surface.

Claims

1. A ring-traveler device of a ring type spinning machine comprising:

   a ring (11); and
   a traveler (12) slidable along the ring (11);
   characterized in that
   a plurality of dimples (14) is formed in at least one of sliding surfaces of the ring (11) and the traveler (12), and each dimple (14) is formed by a circular opening edge and a curved inner surface.

2. The ring-traveler device according to claim 1, **characterized in that** the inner surface of each dimple (14) is a spherical concave surface.

3. The ring-traveler device according to claim 1 or 2, **characterized in that** a radius of the opening of each dimple (14) is the same as or greater than a depth (H) of the dimple (14).

4. A ring (11) of a ring type spinning machine including a traveler (12) slidable along the ring (11), **characterized in that**
   a plurality of dimples (14) is formed in a surface of the ring (11) along which the traveler (12) is slidable, and each dimple (14) is formed by a circular opening edge and a curved inner surface.

FIG. 1A

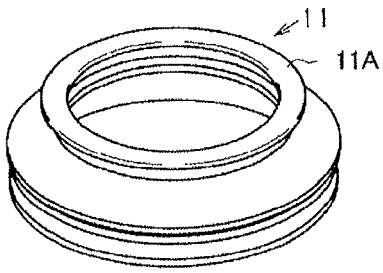


FIG. 1B

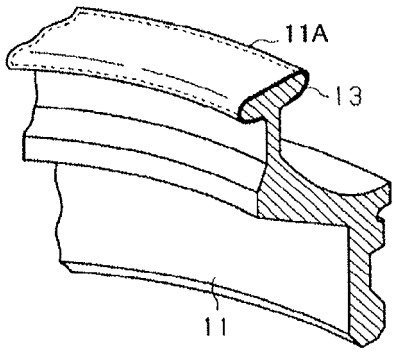


FIG. 1C

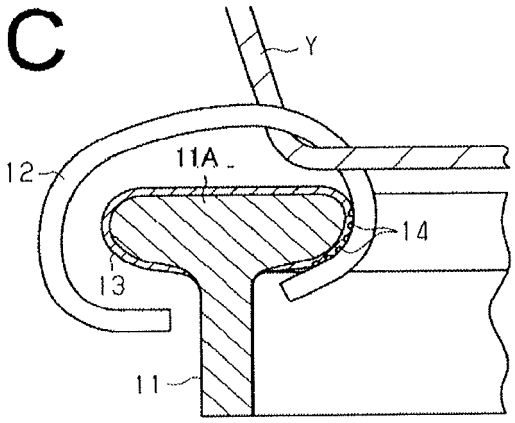


FIG. 2A

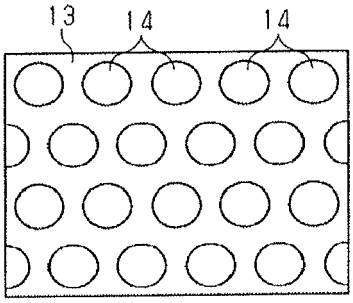


FIG. 2B

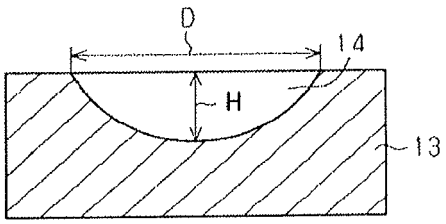


FIG. 3

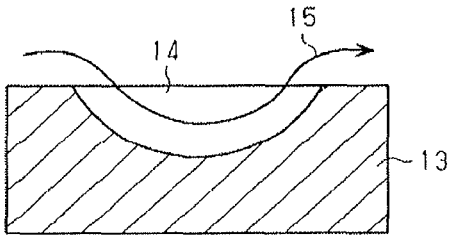


FIG. 4

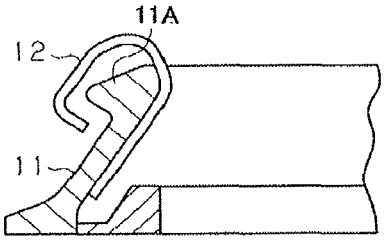
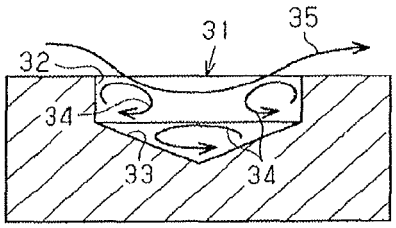


FIG. 5 (BACKGROUND ART)



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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 8501

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 682 508 A2 (TOYOTA JIDOSHOKKI KK [JP]) 8 January 2014 (2014-01-08) * paragraph [0025] - paragraph [0026] * * paragraph [0037] * * figures 1c,7 *	1-4	INV. D01H7/60
X	GB 1 212 067 A (MAREMONT CORP [US]) 11 November 1970 (1970-11-11) * page 1, line 67 - line 71 * * page 2, line 4 - line 14 * * page 2, line 25 - line 32 * * page 2, line 45 - line 66 * * page 2, line 103 - line 109 * * figures 1-5 *	1,2,4	
X	GB 1 577 151 A (YARN AID ENGS LTD) 22 October 1980 (1980-10-22) * page 1, line 62 - line 65 * * page 2, line 46 - line 70 * * figures 3,4 *	1,4	
			TECHNICAL FIELDS SEARCHED (IPC) D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 February 2016	Humbert, Thomas

CATEGORY OF CITED DOCUMENTS

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REFERENCES CITED IN THE DESCRIPTION

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