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(71) Applicant: **Saurer (Jiangsu) Textile Machinery Co. Ltd.**
Changzhou City, Jiangsu Province 213200 (CN)

(72) Inventors:
- **Kistner, Alexander**
  63179 Obertshausen (DE)
- **Qu, Hongmin**
  Suzhou (CN)

(74) Representative: **Morgenthum-Neurode, Mirko**
Saurer Spinning Solutions GmbH & Co. KG
Patentabteilung
Carlstraße 60
52531 Übach-Palenberg (DE)

(54) ROTOR SPINNING DEVICE SELF-CLEANING STRUCTURE, TEXTILE MACHINERY AND SELF-CLEANING OPERATION METHOD

(57) The invention relates to a rotor spinning device self-cleaning structure and a textile machinery as well as to a self-cleaning operation method, wherein the rotor spinning device self-cleaning structure comprises a spinning device that includes a cup insert for conveying cotton fibers, and a rotor. The rotor includes a condensing groove for forming a yarn, and includes a cleaning rod that can extend into and clean the condensing groove of the rotor when the rotor is in an operating state, and a driving device for driving the cleaning rod to operate. In addition, the rotor self-cleaning method comprises a rotor spinning device self-cleaning structure as described above, when the rotor is to be cleaned, the driving device drives the cleaning rod to move from an initial operating position to a cleaning operating position in which the cleaning rod is in contact with the condensing groove of the rotor in the rotating operating state. The invention can realize the cleaning of the rotor without stopping the machine and has a good cleaning effect, and at the same time can ensure the production efficiency of the textile machinery with the self-cleaning structure and improve the production benefit.

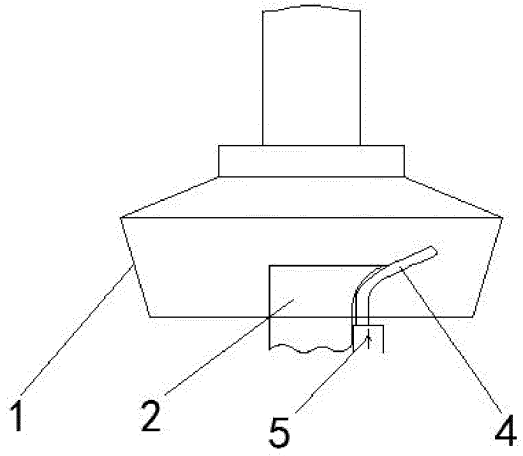

Fig. 2

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Description

Technical Field

[0001] The invention relates to the technical field of textile equipment, and in particular to a rotor spinning device self-cleaning structure, a textile machinery and a self-cleaning operation method.

Background

[0002] Rotor spinning is one of the open-end spinning methods. Rotor spinning is referred to as rotor spinning because of the use of rotor-condensation single fibers. Rotor spinning has a high spinning speed, large winding capacity, and a good ability to spinning low-grade cotton and waste cotton, and labor-intensive environment is, wherein the rotor-spinning device is an important part to realize such process.

[0003] In a rotor spinning machine, a fiber strip is fed and loosened into a single fiber by a rotary carding roller coated with a card clothing, to be transported with the air flow to the inner wall of the high-speed rotating rotor, to form a yarn tail in the condensing groove, and simultaneously to be twisted into yarn to be led out, to be directly wound into a bobbin. The main difference between rotor spinning and other open-end spinning methods is the mechanism and function of condensing and twisting. After the single fiber enters the rotor of the rotor-spinning device, it is first sent to the inclined surface of the inner wall of rotor. Due to the high surface velocity of the inner wall of the rotor, the fibers are arranged in parallel along the circumference of the inner wall, and under the action of centrifugal force, they slide into the condensing groove at the maximum diameter of the inner wall, where they are overlapped and formed into annular fiber strands, which is the process of condensation of fibers. In the condensation process, the fibers are circularly arranged in a circumferential direction to form a wound fiber of the air-flow yarn.

[0004] Impurities are left in the condensing groove of the rotor in the spinning process, and the condensation and the transmission of twist of the fiber strands may be damaged, so that the spun yarn has periodic unevenness, and the wavelength is about the circumference of rotor, and broken ends will occur in serious cases. Even if fine dust enters the condensing groove, it will gradually accumulate into larger particles, producing the same effect. In various embodiments of the prior art, open spinning machines are known which each comprise a cleaning device for cleaning a spinning rotor. For example, DE 100 231484A1 describes an open-end spinning device wherein a rotor-spinning machine is cleaned by means of a removable maintenance unit. For this purpose, the maintenance unit comprises a cleaning device including a cleaning head including a mechanical cleaning element, such as a scraper, or including a compressed air nozzle. In order to clean the spinning rotor, the maintenance unit is positioned in front of the relevant spinning equipment, the rotor of the spinning device is opened, and the cleaning head is pushed towards the spinning rotor and then cleans the rotor. However, the cleaning device in the prior art must open the rotor of the spinning device to interrupt the spinning, and cannot perform the cleaning under the working condition, which affects the spinning efficiency. Hence, there is a need for an apparatus that is capable of automatically cleaning in the normal operating state of a rotor-spinning device.

Summary of the Invention

[0005] The invention aims to provide a rotor spinning device self-cleaning structure in a textile machinery as well as a self-cleaning operation method, which can realize the cleaning of the rotor without stopping the machine and has a good cleaning effect, and at the same time can ensure the production efficiency of the textile machinery with the self-cleaning structure and improve the production benefit.

[0006] In order to achieve the above object, the present invention adopts a technical solution as below:

The invention provides a rotor spinning device self-cleaning structure, comprising a spinning device that includes a cup insert for conveying cotton fibers, and a rotor. The rotor includes a condensing groove for forming a yarn, and includes a cleaning rod that is designed to extend into and to clean the condensing groove of the rotor when the rotor is in an operating state, and a driving device for driving the cleaning rod to operate.

[0007] Optionally, the cleaning rod is made of a flexible material.

[0008] Optionally, the driving device automatically adjusts the length of the cleaning rod that extends into the condensing groove of the rotor as needed.

[0009] Optionally, the cup insert is provided with a channel to guide the cleaning rod to extend into the rotor groove. The guide channel includes an arc-shaped segment for guiding the cleaning rod to the condensing groove.

[0010] Optionally, the guide channel includes a first end and a second end in the entry direction of the cleaning rod, the second end is provided with a guiding portion that has a guiding arc surface. When the cleaning rod enters from the first end and arrives at the second end, it bends under the guidance of the guiding arc surface and moves towards the condensing groove.

[0011] Optionally, the invention further comprises a control device for controlling the driving device and a detection device for detecting the amount of residue to be cleaned in the condensing groove of the rotor. The control device is designed to control the frequency at which the cleaning rod enters the rotor according to the detection result of the detection device.

[0012] Optionally, the invention further comprises a control device for controlling the driving device. The control device is preset with a preset frequency for cleaning

the rotor. The control device is designed to control the frequency at which the cleaning rod enters the rotor according to the preset frequency.

[0013] In particular, the present application further provides a textile machinery comprising a number of rows of stations arranged side by side, each of the stations comprising a rotor spinning device self-cleaning structure as described above.

[0014] In particular, the present application further provides a rotor self-cleaning operation method, comprising a rotor spinning device self-cleaning structure as described above, when the rotor is to be cleaned, the driving device drives the cleaning rod to move from an initial operating position to a cleaning operating position in which the cleaning rod is in contact with the condensing groove of the rotor in the rotating operating state.

[0015] Optionally, after the cleaning rod completes the cleaning of the rotor, the cleaning rod is moved away from the rotor cleaning operating position and returned to the initial operating position.

[0016] Compared with the prior art, the present invention has advantages as follows:

The rotor spinning device self-cleaning structure and the textile machinery as well as the self-cleaning operation method provided by the invention can achieve an efficient cleaning of the condensing groove of the rotor of the rotor spinning device without opening the rotor in the state that the machine is not stopped, can ensure the spinning quality and meanwhile effectively guarantee the production efficiency of the textile machinery having the self-cleaning mechanism described above, such that the production efficiency is always maintained at a high level.

Brief Description of the Drawings

[0017] Hereinafter, some specific embodiments of the present invention will be described in detail by way of example and without limitation with reference to the accompanying drawings. The same reference numerals in the drawings denote the same or similar components or parts. Those skilled in the art will appreciate that these drawings are not necessarily drawn to scale. In the drawings:

FIG. 1 is a schematic diagram of a rotor spinning device self-cleaning structure according to an embodiment of the present invention, wherein the cleaning rod is not activated;

FIG. 2 is a schematic diagram of a rotor spinning device self-cleaning structure according to an embodiment of the present invention, wherein the cleaning rod is activated.

[0018] Description of the reference numerals is as follows:

1. rotor; 2. cup insert; 3. guide channel; 4. cleaning rod; 5. driving device.

Detailed Description of the Preferred Embodiments

[0019] Hereinafter the technical solution of the present invention will be described clearly and completely in combination with the accompanying drawings, and obviously, the described embodiments are part of the embodiments, not all of the embodiments. Based on the embodiments of the present invention, all other embodiments that are obtained by persons skilled in the art without making creative efforts fall within the protection scope of the present invention.

[0020] In the description of the invention, it should be noted that, the terms "center", "upper", "lower", "left", "right", "vertical", "horizontal", "inner", and "outer" and the like indicate an orientation or a positional relationship based on the orientation or positional relationship shown in the drawings. It is merely to facilitate the description of the invention and simplify the description, and not to indicate or imply that the device or element referred to must have a particular orientation, be constructed and operated in a specific orientation, and therefore should not be construed as limiting the invention.

[0021] In addition, the technical features involved in the different embodiments of the present invention described below can be combined with each other as long as they do not constitute a conflict.

The embodiment 1:

[0022] The embodiment describes a rotor spinning device self-cleaning structure, as shown in FIGs. 1 and 2, comprising a spinning device which includes a cup insert 2 for conveying cotton fibers, and a rotor 1. The rotor 1 includes a condensing groove for forming a yarn, and also includes a cleaning rod 4 which can extend into and clean the condensing groove of the rotor 1 when the rotor 1 is in an operating state, and a driving device 5 for driving the cleaning rod 4 to operate. The driving device 5 can automatically adjusts the length of the cleaning rod that extends into the condensing groove of the rotor as actually needed.

[0023] In order to be able to guide the cleaning rod 4 when it extends into the rotor 1 in the operating state, the cup insert 2 is provided with a guide channel 3 for the cleaning rod 4 to extend into the rotor 1. The guide channel 3 includes an arc-shaped segment for guiding the cleaning rod 4 to the condensing groove. Specifically, the guide channel 3 includes a first end and a second end in the entry direction of the cleaning rod 4. The second end is provided with a guiding portion that has a guiding arc surface. When the cleaning rod 4 enters from the first end and arrives at the second end, it bends under the guidance of the guiding arc surface and moves towards the condensing groove. In this way, during the cleaning process, the cleaning rod 4 can be guided quickly and accurately to the condensing groove, so that cleaning of the condensing groove of the rotor spinning device can be achieved quickly and the cleaning beat can be

shortened.

[0024] In addition, in order to be able to ensure that the cleaning rod 4 can extend into the rotor 1 and to facilitate a curved guidance in the guide channel 3, the cleaning rod 4 is preferably made of a flexible material.

[0025] The control of the cleaning of the rotor 1 by the cleaning rod 4 can be performed in accordance with the yarn conditions in the condensing groove, or the cleaning frequency can also be controlled by a preset periodic time, as follows:

In one aspect, the self-cleaning mechanism is provided with a control device and a detection device. The control device is used for controlling the operation of the driving device 5. The detection device is used for detecting the amount of residue to be cleaned in the condensing groove of the rotor 1. The residue to be cleaned refers to dust, impurities and short fibers, etc. The control device controls the frequency at which the cleaning rod 4 enters the rotor 1 according to the detection result of the detection device. That is to say, during the operation of the rotor spinning device, the amount of residue to be cleaned in the condensing groove of the rotor 1 is monitored in real time. When the cleanliness of the condensing groove is not high and there are abnormal conditions, there is an abnormal change in the amount of residue to be cleaned in the condensing groove, e.g., it is detected that the accumulated matter to be cleaned in the condensing groove exceeds a certain value. In this way, the condensing groove can be cleaned timely and efficiently.

[0026] In the other aspect, the self-cleaning mechanism is provided with a control device. The control device is preset with a preset frequency for cleaning the rotor 1. That is, the control device controls the frequency at which the cleaning rod 4 enters the rotor 1 according to the preset frequency. For example, if the rotor 1 is set to be cleaned once every ten minutes, then the control device controls the cleaning rod 4 to enter the rotor 1 every ten minutes, to achieve a timed and efficient cleaning of the rotor 1.

The embodiment 2:

[0027] The embodiment provides a textile machinery comprising a number of rows of stations arranged side by side, each of the stations comprising a rotor spinning device self-cleaning structure as described in the embodiment 1.

[0028] With the rotor spinning device self-cleaning structure as described in the embodiment 1, the textile machinery can achieve an efficient cleaning of the rotor 1 in the rotor spinning device without opening the rotor and without the machinery being stopped. This can ensure the spinning quality and meanwhile effectively guarantee the production efficiency of the textile machinery having the self-cleaning mechanism described above, such that the production efficiency is always maintained at a high level.

The embodiment 3:

[0029] The embodiment provides a rotor self-cleaning operation method, comprising a rotor spinning device self-cleaning structure as described in the embodiment 1, wherein the rotor spinning device self-cleaning structure includes a spinning device that includes a cup insert 2 for conveying cotton fibers, and a rotor 1. The rotor 1 includes a condensing groove for forming a yarn, and includes a cleaning rod 4 which can extend into and clean the condensing groove of the rotor 1 when the rotor 1 is in an operating state, and a driving device 5 for driving the cleaning rod 4 to operate. The driving device 5 can automatically adjusts the length of the cleaning rod that extends into the condensing groove of the rotor as actually needed.

[0030] When the rotor 1 is to be cleaned, the driving device 5 drives the cleaning rod 4 to move from an initial operating position to a cleaning operating position in which the cleaning rod 4 is in contact with the condensing groove of the rotor 1 in the rotating operating state. After the cleaning rod 4 completes the cleaning of the rotor 1, the cleaning rod 4 is moved away from the rotor 1 from the cleaning operating position and returned to the initial operating position.

[0031] In the rotor self-cleaning operation method provided in this embodiment, when the rotor 1 is cleaned, the cleaning rod 4 is controlled to extend into the guide channel 3 in the rotor 1. The guide channel 3 includes a first end and a second end in the entry direction of the cleaning rod 4, and the second end is provided with a guiding portion. The guiding portion in the embodiment has a guiding arc surface. The method controls the cleaning rod 4 to enter from the first end and arrive at the second end. The cleaning rod 4, which is made of a flexible material, bends under the guidance of the guiding arc surface and moves towards the condensing groove. During the cleaning process, the cleaning rod 4 can be quickly and accurately guided to and in contact with the inner wall of the condensing groove, thereby quickly achieving effective cleaning of the condensing groove, shortening the cleaning beat, and improving the cleaning efficiency. Of course, the guiding portion in other embodiments may also be a guide groove, a guide hole, or the like, as long as that the cleaning rod 4 is guided to the inner wall of the condensing groove for efficient cleaning of the condensing groove via the rotating of the rotor, which are within the scope of protection of the invention.

[0032] The rotor self-cleaning operation method provided in the embodiment realizes control of the cleaning of the condensing groove of the rotor 1 by the cleaning rod 4, and the control can be performed in accordance with the amount of residue to be cleaned in the condensing groove, or the cleaning frequency can also be controlled by a preset periodic time, as follows:

In one aspect, the operation of the driving device 5 is controlled by detecting the amount of residue to be cleaned in the condensing groove of the rotor 1. The

amount of residue to be cleaned in the condensing groove of the rotor 1 is detected by the detection device, and then the control device controls the frequency at which the cleaning rod 4 enters the rotor 1 according to the detection result of the detection device. That is to say, during the operation of the rotor spinning device, the amount of residue to be cleaned in the condensing groove of the rotor 1 is monitored in real time. When the cleanliness of the condensing groove is not high and there are abnormal conditions, there is an abnormal change in the amount of charge in the condensing groove. In this way, the condensing groove can be cleaned timely and efficiently.

[0033] In the other aspect, the cleaning frequency of rotor 1 is preset, and cleaning is performed regularly. The self-cleaning mechanism is provided with a control device. Control software of the control device is preset with a preset frequency for cleaning the rotor 1. That is, the control device controls the frequency at which the cleaning rod 4 enters the rotor 1 according to the preset frequency. For example, if the rotor 1 is set to be cleaned once every ten minutes, then the control device controls the cleaning rod 4 to enter the rotor 1 every ten minutes, to achieve a timed and efficient cleaning of the rotor 1.

[0034] In addition, as for selection of the material of the cleaning rod 4 in the above embodiment, the cleaning rod 4 used in the present application is a consumable material. The cleaning rod 4 is flexible but has a certain rigidity strength, for example resin materials such as high molecular polyethylene, polypropylene and the like, or rubber materials, nylon materials and the like. In the course of each cleaning process, the cleaning rod 4 can come into contact with the inner wall of the condensing groove and the end portion can be worn away. The cleaning rod 4 is fed after each cleaning, to ensure that the cleaning rod 4 can get into contact with the inner wall of the condensing groove and clean it. Of course, the cleaning rod 4 can also be made of other wear-resistant materials, and can be maintained or replaced after a certain period.

[0035] The above embodiments are only for illustrating the technical concept and features of the present invention, and the purpose thereof is to enable a person skilled in the art to understand the contents of the invention and accordingly carry out the same, but not to limit the scope of protection of the present invention. Any equivalent change or modification made in accordance with the spirit of the present invention should be included in the protection scope of the invention.

Claims

1. A rotor spinning device self-cleaning structure, comprising a spinning device which includes a cup insert for conveying cotton fibers, and a rotor, which includes a condensing groove for forming a yarn and is **characterized in that** the self-cleaning structure further comprises a cleaning rod which is designed to extend into and to clean the condensing groove of the rotor when the rotor is in an operating state, and a driving device for driving the cleaning rod to operate.

2. The rotor spinning device self-cleaning structure according to claim 1, **characterized in that**, the cleaning rod is made of a flexible material.

3. The rotor spinning device self-cleaning structure according to claim 1, **characterized in that**, the driving device automatically adjusts the length of the cleaning rod that extends into the condensing groove of the rotor as needed.

4. The rotor spinning device self-cleaning structure according to claim 2, **characterized in that**, the cup insert is provided with a guide channel for the cleaning rod to extend into the rotor, the guide channel includes an arc-shaped segment for guiding the cleaning rod to the condensing groove.

5. The rotor spinning device self-cleaning structure according to claim 4, **characterized in that**, the guide channel includes a first end and a second end in the entry direction of the cleaning rod, the second end is provided with a guiding portion which has a guiding arc surface, based on which, when the cleaning rod enters from the first end and arrives at the second end, the cleaning rod bends under the guidance of the guiding arc surface to move towards the condensing groove.

6. The rotor spinning device self-cleaning structure according to claim 1, **characterized in that** it further comprises a control device for controlling the driving device and a detection device for detecting the amount of residue to be cleaned in the condensing groove of the rotor. The control device is designed to control the frequency at which the cleaning rod enters the rotor according to the detection result of the detection device.

7. The rotor spinning device self-cleaning structure according to claim 1, **characterized in that** it further comprises a control device for controlling the driving device, the control device is preset with a preset frequency for cleaning the rotor and is designed to control the frequency at which the cleaning rod enters the rotor according to the preset frequency.

8. A textile machinery, comprising a number of rows of stations arranged side by side, **characterized in that**, each of the stations comprises a rotor spinning device self-cleaning structure according to any of claims 1 to 7.

9. A rotor self-cleaning operation method, **characterized in that** the method comprises a rotor spinning device self-cleaning structure according to any of claims 1 to 7, when the rotor is to be cleaned, the driving device drives the cleaning rod to move from an initial operating position to a cleaning operating position in which the cleaning rod is in contact with the condensing groove of the rotor in the rotating operating state.

10. The rotor self-cleaning operation method according to claim 9, **characterized in that**, after the cleaning rod completes the cleaning of the rotor, the cleaning rod is moved away from the rotor from the cleaning operating position and returned to the initial operating position.

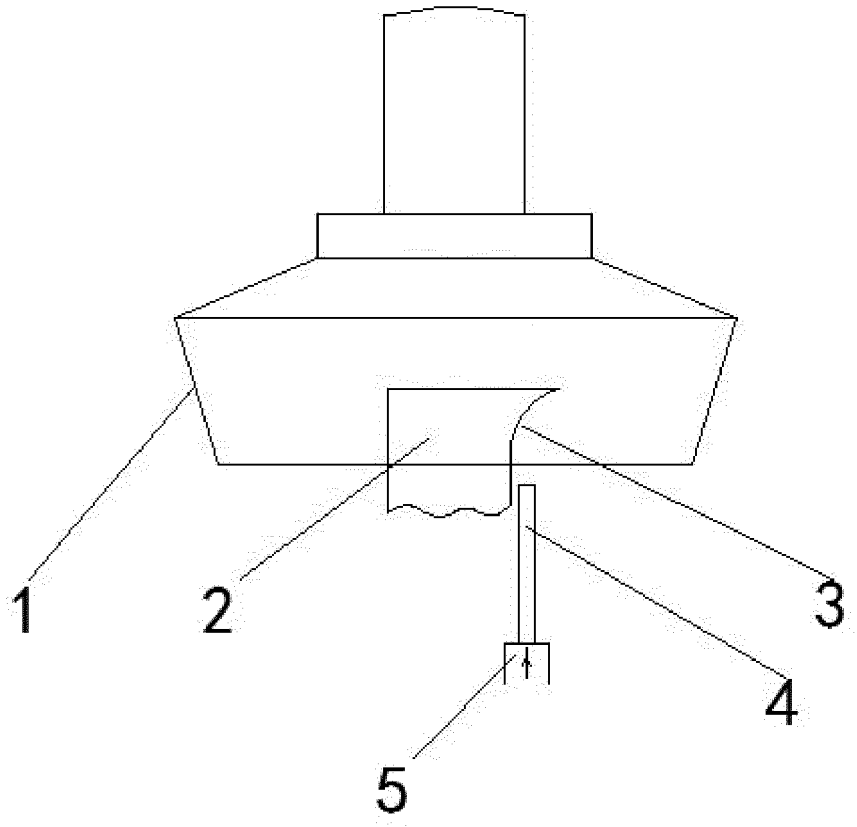

Fig.1

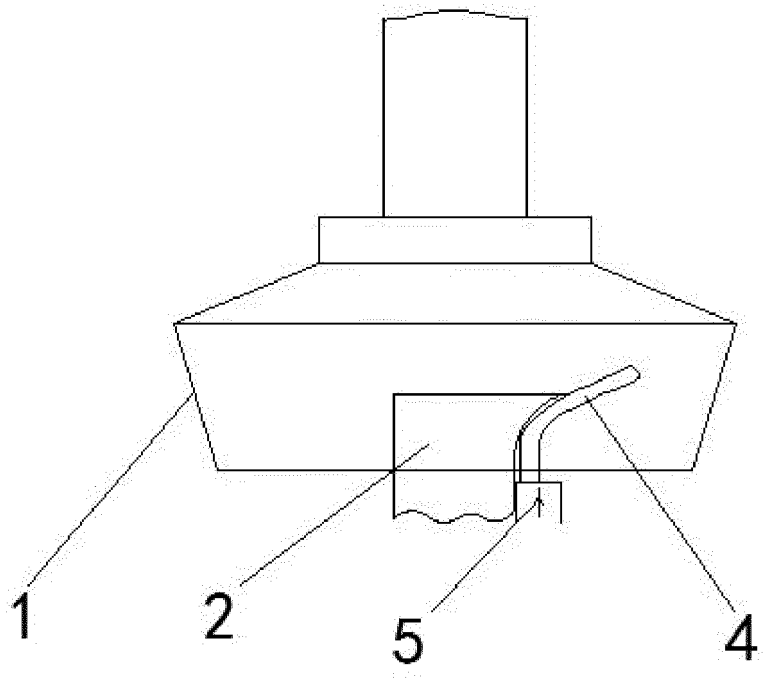

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 0970

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	GB 1 142 923 A (SCHUBERT & SALZER MASCHINEN) 12 February 1969 (1969-02-12) * page 1, lines 32-78; figures 1-5 * * page 2, lines 1-109 * * page 3, lines 19-35 *	1,6-10 2,3 4,5	INV. D01H4/08 D01H4/24
Y	US 5 609 015 A (RAASCH HANS [DE] ET AL) 11 March 1997 (1997-03-11) * column 2, line 12 - column 3, line 11; figures 1-3 * * column 3, line 64 - column 4, line 47 * * column 5, lines 1-34 *	2,3	
A	DE 10 2016 009278 A1 (SAURER GERMANY GMBH & CO KG [DE]) 1 February 2018 (2018-02-01) * paragraphs [0040], [0047] - paragraph [0050]; figures 1,2 *	1-10	
A	US 2020/199789 A1 (KUEBLER MARKUS [DE] ET AL) 25 June 2020 (2020-06-25) * paragraphs [0001], [0004], [0009], [0011], [0016] - [0017], [0022], [0025], [0027], [0029], [0036] - [0039], [0044] - [0046], [0059] - [0061]; figures 1-3 *	1-10	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	13 May 2022	Wendl, Helen

CATEGORY OF CITED DOCUMENTS

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& : member of the same patent family, corresponding document

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13-05-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1142923 A	12-02-1969	BE 702525 A	15-01-1968
		CH 451767 A	15-05-1968
		CS 158206 B2	15-10-1974
		DE 1560301 A1	06-04-1972
		ES 343054 A1	16-08-1968
		GB 1142923 A	12-02-1969
		JP S524656 B1	05-02-1977
		US 3524312 A	18-08-1970
US 5609015 A	11-03-1997	DE 4411343 A1	05-10-1995
		EP 0675217 A1	04-10-1995
		US 5609015 A	11-03-1997
DE 102016009278 A1	01-02-2018	NONE	
US 2020199789 A1	25-06-2020	CN 111349988 A	30-06-2020
		DE 102018133367 A1	25-06-2020
		EP 3670717 A1	24-06-2020
		US 2020199789 A1	25-06-2020

EPO FORM P0459

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 100231484 A1 **[0004]**