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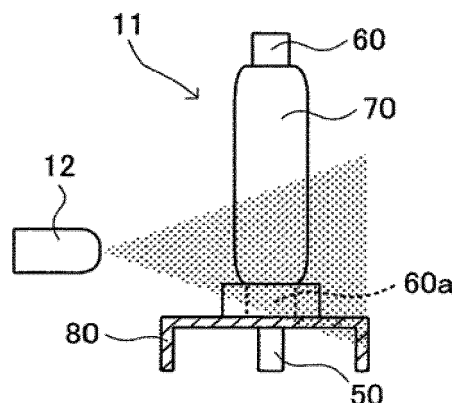
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(54) **RING SPINNING MACHINE COMPRISING A DOFFING FAILURE DETECTION DEVICE**

(57) A ring spinning machine (10) that includes a doffing failure detection device is provided. The ring spinning machine (10) has a plurality of spindle stations (11) and a plurality of yarn break detectors (12) provided for the respective spindle stations (11). Each spindle station (11) has a spindle (50) on which a yarn package (70) including a bobbin (60) and a yarn is to be formed. The doffing failure detection device includes a determiner (21) and

an output (13, 30). The determiner (21) is configured to determine whether there is a doffing failure for each of the spindle stations (11) based on a change in a signal received from the yarn break detectors (12) during a doffing operation. The output (30, 50) is configured to output a position of one of the spindle stations (11) that is determined as having a doffing failure by the determiner (21).

FIG. 3



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a ring spinning machine comprising a doffing failure detection device.

[0002] During a doffing operation of a spinning machine, any failure must be detected and remedied appropriately. Japanese Examined Patent Application Publication No. S48-3339 discloses a configuration for detecting a failure in the removal of a bobbin from a spindle of a ring spinning machine. According to the Publication, when a failure has occurred during a removal of a full bobbin from a spindle, a worker locates the position of the failure and moves to the position to remove the full bobbin from the spindle.

[0003] Doffing failure detection devices of the conventional art have a problem that it takes time to locate the position of a doffing failure. For example, according to the configuration of the above-described Publication No. 48-3339, it is possible to narrow the position of a doffing failure down to a spindle line by using an automated means. However, the worker needs to manually find which one of the spindle stations in the identified spindle line has the doffing failure.

[0004] The present invention has been made to solve the above-described problem and is directed to providing a ring spinning machine comprising a doffing failure detection device that is configured to easily locate a position of a doffing failure that occurs during a doffing operation of the ring spinning machine.

SUMMARY OF THE INVENTION

[0005] In accordance with an aspect of the present invention, there is provided a ring spinning machine that includes a doffing failure detection device for detecting a doffing failure that occurs during a doffing operation. The ring spinning machine includes a plurality of spindle stations and a plurality of yarn break detectors provided for the respective spindle stations. Each of the spindle stations has a spindle on which a yarn package including a bobbin and a yarn is to be formed. The doffing failure detection device includes a determiner and an output. The determiner is configured to determine whether there is a doffing failure or not for each of the spindle stations based on a change in a signal received from the yarn break detectors during the doffing operation. The output is configured to output a position of one of the spindle stations that is determined as having a doffing failure by the determiner.

[0006] Other aspects and advantages of the invention will become apparent from the following description and accompanying drawings that illustrate, by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention together with objects and advantages thereof, may best be understood by reference to the following description of the embodiments together with the accompanying drawings in which:

FIG. 1 shows an example layout of ring spinning machines comprising a doffing failure detection device according to an embodiment of the present invention;

FIG. 2 shows an example structure of each ring spinning machine of FIG. 1;

FIG. 3 shows an example configuration of a spindle station and a yarn break sensor of FIG. 2;

FIG. 4 shows an example configuration of an information processing device of FIG. 1;

FIG. 5A is a view for explaining a determination that is made during a yarn package removal operation;

FIG. 5B is a view for explaining the determination that is made during the yarn package removal operation;

FIG. 5C is a view for explaining the determination that is made during the yarn package removal operation;

FIG. 6A is a view for explaining a determination that is made during a bobbin placement operation;

FIG. 6B is a view for explaining the determination that is made during the bobbin placement operation; and

FIG. 6C is a view for explaining the determination that is made during the bobbin placement operation.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0008] The following will describe an embodiment of the present invention with reference to the accompanying drawings.

Embodiment

[0009] FIG. 1 shows an example layout of ring spinning machines comprising a doffing failure detection device according to an embodiment of the present invention. The doffing failure detection device according to the present embodiment is associated with one or more ring spinning machines 10. It is preferable that plural ring spinning machines 10 are arranged in rows in a factory or a place as illustrated in FIG. 1. It should be noted, however,

that the present invention can be carried out also in the case where the ring spinning machines 10 are not arranged in rows or where there is only a single ring spinning machine 10.

[0010] The doffing failure detection device according to the present embodiment includes an information processing device 20 and a mobile terminal 30. The information processing device 20 includes an arithmetic unit and a memory. The information processing device 20 may be configured by using a known computer. The information processing device 20 further includes a communicator that transmits/receives data or information to/from devices provided in association with the ring spinning machines 10 and also to/from the mobile terminal 30.

[0011] The mobile terminal 30 includes an arithmetic unit and a memory. The mobile terminal 30 may be comprised of a personal mobile computer. The mobile terminal 30 further has a communicator that transmits/receives data or information to/from the information processing device 20. The mobile terminal 30 may be a smart phone or a wearable computer. According to the present embodiment, the mobile terminal 30 corresponds to the output of the present invention that outputs a position of a spindle station at which a doffing failure has occurred.

[0012] FIG. 2 shows an example structure of the ring spinning machine 10 (only one ring spinning machine 10 is shown). The ring spinning machine 10 includes a plurality of spindle stations 11, a plurality of yarn break sensors 12, and a plurality of yarn break indicator lamps 13. The yarn break sensors 12 correspond to the yarn break detectors of the present invention and are provided for the respective spindle stations 11. In the present embodiment, the yarn break indicator lamps 13 are also provided for the respective spindle stations 11.

[0013] FIG. 3 shows an example configuration of the spindle station 11 and the yarn break sensor 12 (only one spindle station 11 and one yarn break sensor 12 are shown). Each yarn break sensor 12 acquires information for determining whether its corresponding spindle station 11 has a yarn break or not. The ring spinning machine 10 includes a support member 80, such as a spindle rail, and a plurality of spindles 50 are fixedly arranged along the support member 80. An empty bobbin 60 is mounted to each spindle 50, so that the bobbin 60 is supported by the spindle 50 and the support member 80. Each bobbin 60 has a metallic seat 60a at the bottom thereof. During the operation of the ring spinning machine 10, a yarn is wound around a part of the bobbin 60 that is located above the metallic seat 60a, so that a yarn package 70 is formed.

[0014] According to the present embodiment, each yarn break sensor 12 includes an optical sensor. Each yarn break sensor 12 has a sensing range that is shown in gray in FIGS. 3, 5A to 5C and 6A to 6C. Each yarn break sensor 12 emits light into the sensing range and determines whether the spindle station 11 has a yarn break or not, based on changes in the amount of light

reflected by the yarn or a traveler. In the present invention, the specific method or configuration for the determination of a yarn break is not particularly described. However, such method or configuration may be provided by a device that detects a traveler, such as the one mentioned in Japanese Unexamined Patent Application Publication No. 2005-535794, or, by a method of detecting a ballooning of a yarn, such as the one mentioned in Japanese Unexamined Patent Application Publication No. H09-188923.

[0015] The behaviors or actions of the ring spinning machine 10 and other related equipment that are to be taken when a yarn break is detected by any of the yarn break sensors 12 may optionally be designed. For example, the yarn break indicator lamps 13 may be configured to be turned on in response to a signal received from their corresponding yarn break sensors 12.

[0016] According to the present embodiment, at least a part of the yarn package 70 or a part of the bobbin 60 is located within the sensing range of each yarn break sensor 12. In the example of FIG. 3, a part of the yarn package 70 is located within the sensing range of its corresponding yarn break sensor 12.

[0017] FIG. 4 shows an example configuration of the information processing device 20 according to the present embodiment. The information processing device 20 includes a determiner 21. The configuration of the determiner 21 is built by the arithmetic unit and the memory of the information processing device 20 that work in a cooperative manner in accordance with programs stored in the memory.

[0018] The information processing device 20 controls and monitors operation of each ring spinning machines 10, and determines whether each ring spinning machine 10 is in a doffing time or not in a doffing time (e.g., the ring spinning machine 10 is in a spinning operation). The doffing time herein refers to a time during which the ring spinning machine 10 performs a doffing operation for the respective spindle stations 11 of the ring spinning machine 10. It should be noted that the doffing operation herein refers to an operation in which the yarn packages 70 (full cops or full bobbins) are removed from the spindles 50 of the spindle stations 11 and then the bobbins 60 (i.e., empty bobbins) are placed on the spindles 50. That is, the doffing operation includes the yarn package removal operation and the bobbin placement operation.

[0019] According to the present embodiment of the present invention, detection of a yarn break is not particularly necessary during the doffing time. The yarn break sensors 12 are configured to detect a yarn break at least during a specified period of time in a spinning operation of the ring spinning machine 10. However, in other periods during the operating time of the ring spinning machine 10, such as the doffing time, the yarn break sensors 12 need not detect a yarn break.

[0020] The determiner 21 determines whether there is a doffing failure or not for each of the spindle stations 11, based on a change in a signal received from each yarn

break sensor 12 during a doffing time. According to the present embodiment, the yarn break sensors 12 are configured to output video signals or light quantity signals. The determiner 21 performs determinations based on the signals received from the yarn break sensors 12. According to the present embodiment, the determination by the determiner 21 is performed at a specified time that corresponds to the time during which a certain operation of the ring spinning machines 10 is performed. For example, the determiner 21 makes determinations during a yarn package removal operation and during a bobbin placement operation from/on the spindles 50.

[0021] The following will describe in further detail the determination of the determiner 21 with reference to FIGS. 5A to 5C and 6A to 6C.

[0022] FIGS. 5A to 5C are views for explaining a determination that is made during a yarn package removal operation in a doffing operation. The determination that is made during the yarn package removal operation is concerned with the failure of yarn package removal.

[0023] FIG. 5A illustrates a spindle station 11 and a yarn break sensor 12 before a yarn package removal operation is initiated. Before a yarn package removal operation is started, part of the yarn package 70 of the spindle station 11 is located within the sensing range of the yarn break sensor 12. The yarn break sensor 12 senses the presence of that part of the yarn package 70 within its sensing range and outputs a signal indicating the sensing result to the determiner 21. In response to the signal received from the yarn break sensor 12, the determiner 21 recognizes or determines that the yarn package 70 is present within the sensing range of the yarn break sensor 12.

[0024] It should be noted that the processing of recognition by the determiner 21 may optionally be designed. For example, an image processing may be employed to detect a region in the sensing range of the yarn break sensor 12 where the yarn package 70 is present. Alternatively, a threshold may be provided to determine whether the quantity of the light in the sensing range exceeds the threshold or not. In this case, the color of the region to be detected and the criteria for the comparison of the light quantities may be optionally determined in accordance with the color of the yarn package 70 and the like. This also applies to the recognition processing in general that is performed by the determiner 21.

[0025] FIG. 5B illustrates the spindle station 11 and the yarn break sensor 12 during a yarn package removal operation. A bobbin 60 (and the yarn package 70 that is wound around the bobbin 60) is moved in a direction indicated by an arrow in FIG. 5B. The signal received from the yarn break sensor 12 changes with the movement of the bobbin 60.

[0026] FIG. 5C illustrates the spindle station 11 and the yarn break sensor 12 after the yarn package removal operation has been completed. At this time, the yarn package 70 is no longer present within the sensing range of the yarn break sensor 12. The yarn break sensor 12

senses the absence of the yarn package 70 within its sensing range and outputs a signal indicating the sensing result to the determiner 21. In response to the signal received from the yarn break sensor 12, the determiner 21 recognizes or determines that the yarn package 70 is not present within the sensing range of the yarn break sensor 12.

[0027] In this way, during the yarn package removal operation, when the yarn break sensor 12 senses that the yarn package 70 that was present within the sensing range has disappeared from this range, the determiner 21 determines that the doffing operation has been completed successfully (i.e., no doffing failure has occurred). Specifically, when the indication of the signal that is sent from the yarn break sensor 12 has changed from a presence of (a part of) the yarn package 70 to an absence of (the part of) the yarn package 70, the determiner 21 determines that the doffing operation has been completed successfully (i.e., no doffing failure has occurred).

[0028] If no such change is perceived in the indication of the signals, the determiner 21 determines that the doffing operation is not successfully completed (i.e., a doffing failure has occurred). For example, a detection of the bobbin 60 being not properly removed and remaining on the spindle 50 and part of the yarn package 70 remaining in the sensing range of the yarn break sensor 12 results in a determination of occurrence of a doffing failure.

[0029] FIGS. 6A to 6C are views for explaining a determination that is made during a bobbin placement operation in a doffing operation. The determination that is made during the bobbin placement operation is concerned with the failure of bobbin placement.

[0030] FIG. 6A illustrates the spindle station 11 and the yarn break sensor 12 before a bobbin placement operation is initiated. Before a bobbin placement operation is started, no bobbin 60 is present within the sensing range of the yarn break sensor 12. The yarn break sensor 12 senses the absence of the bobbin 60 and outputs a signal indicating the sensing result to the determiner 21. In response to the signal received from the yarn break sensor 12, the determiner 21 recognizes or determines that no bobbin 60 is present within the sensing range of the yarn break sensor 12.

[0031] FIG. 6B illustrates the spindle station 11 and the yarn break sensor 12 during the bobbin placement operation. The bobbin 60 having the metallic seat 60a at the bottom thereof is moved in a direction indicated by an arrow in FIG. 6B. The indication of the signal received from the yarn break sensor 12 changes with the movement of the bobbin 60.

[0032] FIG. 6C illustrates the spindle station 11 and the yarn break sensor 12 after the bobbin placement operation has been completed. At this time, (a part of) the bobbin 60 is present within the sensing range of the yarn break sensor 12. The yarn break sensor 12 senses the presence of the bobbin 60 within its sensing range and outputs a signal indicating the sensing result to the determiner 21. In response to the signal received from the

yarn break sensor 12, the determiner 21 recognizes or determines that the bobbin 60 is present within the sensing range of the yarn break sensor 12.

[0033] In this way, during the bobbin placement operation, when the yarn break sensor 12 senses that the bobbin 60 that was not present within the sensing range has appeared within this range, the determiner 21 determines that the doffing operation has been completed successfully (i.e., no doffing failure has occurred). Specifically, when the indication of the signals sent from the yarn break sensor 12 has changed from an absence of (a part of) the bobbin 60 to a presence of (the part of) the bobbin 60, the determiner 21 determines that the doffing operation has been completed successfully (i.e., no doffing failure has occurred). If no such change is perceived in the indication of the signals, the determiner 21 determines that the doffing operation is not successfully completed (i.e., a doffing failure has occurred).

[0034] When a doffing failure has occurred at any one of the spindle stations 11, the information processing device 20 identifies the spindle station 11 that is associated with the yarn break sensor 12 sending a signal indicating the occurrence of the doffing failure, and sends information indicating the position of the spindle station 11 which has the doffing failure to the mobile terminal 30. The mobile terminal 30 receives the positional information of the spindle station 11 from the information processing device 20 and outputs the received positional information to the worker W. The form or type of the information indicating the position of the respective spindle stations 11 may optionally be designed. For example, a set of information that includes a machine identification information, a spindle line identification information, and a spindle station identification information, may be prepared to represent a position of a certain spindle station 11. The machine identification information herein refers to the information for identifying a ring spinning machine 10. For example, the machine identification information indicates which one of the ring spinning machines 10, shown in FIG. 1, the spindle station 11 belongs to. The spindle line identification information herein refers to the information for identifying a spindle line of a ring spinning machine 10 in which the spindle station 11 is disposed. For example, the spindle line identification information indicates which one of the two spindle lines, shown in FIG. 2, the spindle station 11 belongs to. The spindle station identification information herein refers to the information for locating the position of the spindle station 11 in a spindle line. For example, the spindle station identification information is represented by a position of the spindle station 11 in the longitudinal direction of the ring spinning machine 10. Alternatively, a number is allocated to each of the spindle stations 11 that are arranged in the longitudinal direction of the ring spinning machine 10 so that each spindle station 11 is represented by its own number.

[0035] The worker W moves to the position of the spindle station 11 having the doffing failure based on or in accordance with the information that is output by means

of the mobile terminal 30.

[0036] As described above, the doffing failure detection device according to the present embodiment utilizes the detection results of the yarn break sensors 12 in order to output information that indicates the position of the spindle station 11 having the doffing failure. Specifically, the mobile terminal 30 outputs a position of a spindle station 11 that is determined as having a doffing failure by the determiner 21. With this configuration, the worker W can locate the doffing failure more quickly and easily.

[0037] Since the above-described locating of the doffing failure utilizes the existing yarn break sensors 12, no additional sensors are required for detecting a doffing failure.

[0038] The present embodiment of the present invention may be modified as described below. According to the present embodiment, each yarn break sensor 12 includes an optical sensor. However, the specific configuration of the yarn break sensors 12 may optionally be modified by those skilled in the art. For example, magnetic type sensors may be employed. In such case, the determination of a doffing failure may be based on whether the metallic seat 60a is present or not in the sensing range of the sensor. An example of the yarn break sensor of the magnetic type is mentioned in Japanese Unexamined Patent Application Publication No. 2014-169511.

[0039] According to the present embodiment, the determination of a yarn package removal failure is made based on the presence of the yarn package 70 in the sensing range of the yarn break sensor 12. However, the determination may be based on the presence of the bobbin 60 or any other components, or otherwise, any other criteria may be employed for the determination. The determination of a bobbin placement failure is made based on the presence of the bobbin 60 in the sensing range of the yarn break sensor 12. However, the determination may be based on the presence of any other components, or otherwise, any other criteria may be employed for the determination.

[0040] It should be noted that "*a doffing failure*" may optionally be defined. According to the present embodiment, the doffing failure includes both the yarn package removal failure and the bobbin placement failure, and determinations are made both during a yarn package removal operation and during a bobbin placement operation. However, the present embodiment may be modified to perform the determination for either one of the failures. Further, a failure that occurs during a process associated with the doffing may be employed as a criterion that constitutes a doffing failure.

[0041] The output (corresponding to the mobile terminal 30 in the present embodiment) may also output information indicating a position of a spindle station 11 which has a yarn break detected by its corresponding yarn break sensor 12. In this case, the mobile terminal 30 is configured to output the position of the spindle station 11 having a doffing failure while the ring spinning machine 10 is in the doffing time (or in the doffing oper-

ation), and to output the position of the spindle station 11 having a yarn break while the ring spinning machine 10 is not in the doffing time (or not in the doffing operation). According to the configuration, the existing components of the ring spinning machine 10, in addition to the existing yarn break sensors 12, can be utilized as the output for outputting a position of the spindle station 11 having a yarn break in the case that, for example, the mobile terminals 30 are the existing components.

[0042] The output of the present embodiment that outputs the position of the spindle station 11 which has a doffing failure need not necessarily be provided by the mobile terminal 30. For example, the yarn break indicator lamp 13 that is associated with the spindle station 11 which has a yarn break may be turned on to indicate the position of the spindle station 11. Alternatively, the output may be provided by an output device that is associated with the ring spinning machines 10. Specifically, the output may comprise a plurality of displays or computers having a display that are arranged at specified intervals.

[0043] In the case that the doffing failure detection device has a configuration of detecting the location of the worker W, the worker W may be guided to the position of the spindle station 11 which has a doffing failure from the detected location of the worker W. For example, the yarn break indicator lamps 13 may be caused to blink sequentially in the direction from the detected location of the worker W toward the position of the spindle station 11 having a doffing failure, as described, for example, in paragraph [0026] of the Japanese Unexamined Patent Application Publication No. 2015-227520. Alternatively, a path or a route from the detected location of the worker W to the position of the spindle station 11 having a doffing failure may be determined and an information of the determined path may be output by means of the output.

[0044] The information processing device 20 and the mobile terminal 30 may be configured by a single computer. For example, the mobile terminal 30 includes a determiner 21, and the ring spinning machine 10 includes a wireless transmitter that is configured to transmit detection results of the yarn break sensors 12 to the mobile terminal 30. The mobile terminal 30 determines a doffing failure based on the detection results of the yarn break sensors 12 received from the wireless transmitter.

[0045] In the present embodiment, the outputting of the position of the spindle station 11 which has a doffing failure is provided by visual presentation shown on a display. However, the outputting of the information is not limited thereto, and an audio presentation, such as voice, may be used for the outputting of information. In the present embodiment, a voice information may be output by the mobile terminal 30 or by any other device, such as a speaker associated with the aisles, the ring spinning machines 10, or the information processing device 20.

[0046] In the present embodiment, a single mobile terminal 30 is used. However, two or more mobile terminals 30 may be used. For example, the mobile terminals 30 that are identifiable from each other may be allocated to

the workers. In this case, the method of identifying the mobile terminal 30 to which the information processing device 20 sends information may optionally be designed. For example, each worker may enter identification information of the mobile terminal 30 of the worker into the information processing device 20 prior to operation start so that the information processing device 20 can send information based on the identification information of the mobile terminals 30.

[0047] A ring spinning machine (10) that includes a doffing failure detection device is provided. The ring spinning machine (10) has a plurality of spindle stations (11) and a plurality of yarn break detectors (12) provided for the respective spindle stations (11). Each spindle station (11) has a spindle (50) on which a yarn package (70) including a bobbin (60) and a yarn is to be formed. The doffing failure detection device includes a determiner (21) and an output (13, 30). The determiner (21) is configured to determine whether there is a doffing failure for each of the spindle stations (11) based on a change in a signal received from the yarn break detectors (12) during a doffing operation. The output (30, 50) is configured to output a position of one of the spindle stations (11) that is determined as having a doffing failure by the determiner (21).

Claims

1. A ring spinning machine (10) comprising a doffing failure detection device for detecting a doffing failure during a doffing operation, the ring spinning machine (10) having a plurality of spindle stations (11) each having a spindle (50) on which a yarn package (70) comprising a bobbin (60) and a yarn is to be formed, and a plurality of yarn break detectors (12) provided for the respective spindle stations (11), **characterized in that** the doffing failure detection device includes:

a determiner (21) configured to determine whether there is a doffing failure or not for each of the spindle stations (11) based on a change in a signal received from the yarn break detectors (12) during a doffing operation; and an output (13, 30) configured to output a position of one of the spindle stations (11) that is determined as having a doffing failure by the determiner (21).

2. The ring spinning machine (10) comprising the doffing failure detection device according to claim 1, **characterized in that** the doffing operation includes a yarn package removal operation in which the yarn packages (70) are removed from the spindles (50), and the determiner (21) determines whether there is a doffing failure or not for each of the spindle stations

(11) during the yarn package removal operation.

3. The ring spinning machine (10) comprising the doffing failure detection device according to claim 1 or 2, **characterized in that** 5
the doffing operation includes a bobbin placement operation in which the bobbins (60) that are empty are placed on the spindles (50), and
the determiner (21) determines whether there is a doffing failure or not for each of the spindle stations (11) during the bobbin placement operation. 10
4. The ring spinning machine (10) comprising the doffing failure detection device according to any one of claims 1 to 3, **characterized in that** each yarn break detector (12) includes an optical sensor. 15

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FIG. 1

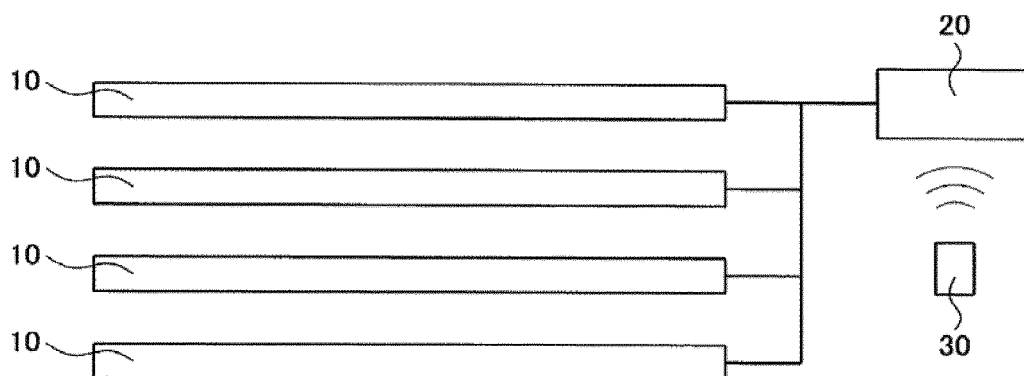


FIG. 2

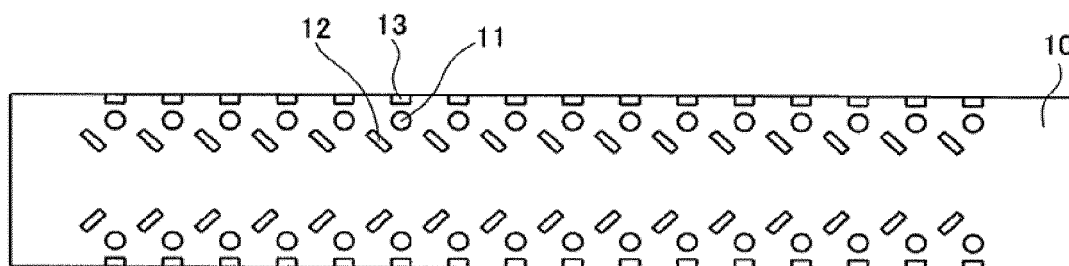


FIG. 3

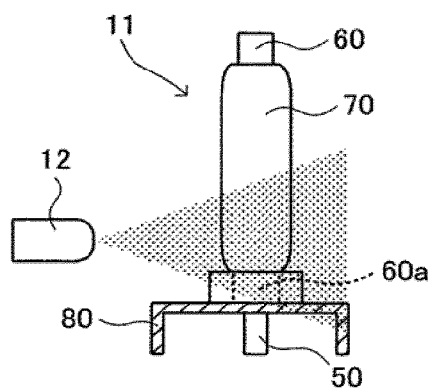
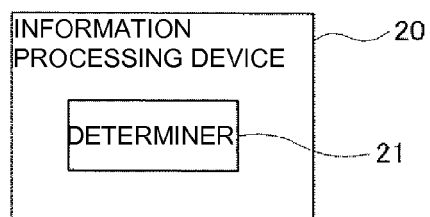


FIG. 4



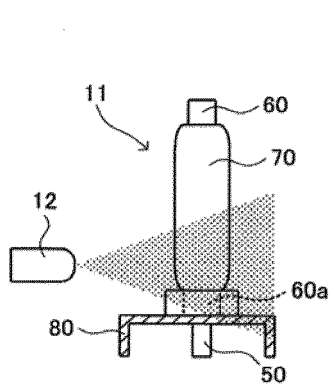


FIG. 5A

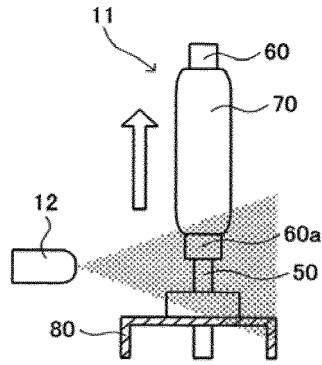


FIG. 5B

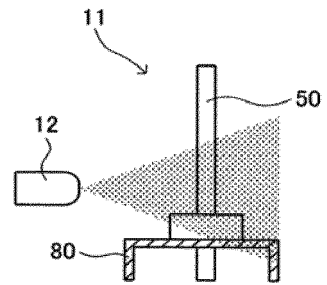


FIG. 5C

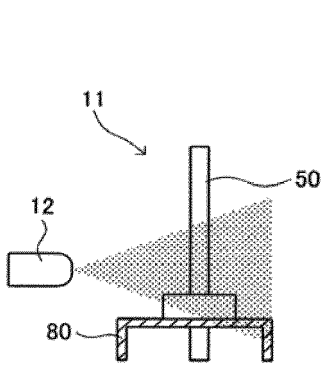


FIG. 6A

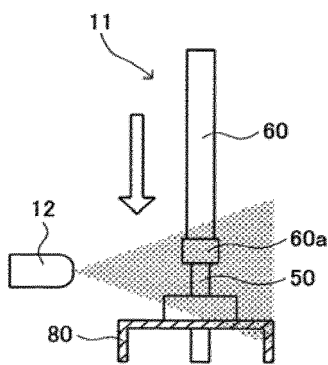


FIG. 6B

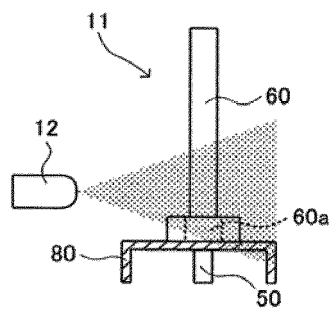


FIG. 6C



EUROPEAN SEARCH REPORT

Application Number
EP 18 16 5711

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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	JP 2004 332141 A (MURATA MACHINERY LTD) 25 November 2004 (2004-11-25)	1	INV. D01H15/013 D01H13/14 D01H15/00 D01H9/02 B65H67/00
Y	* paragraph [0025] * * paragraph [0038] * * paragraph [0043] * * paragraph [0049] * * figures 1-3,5 *	2-4	
Y	----- EP 0 486 780 A1 (ZINSEK TEXTILMASCHINEN GMBH [DE]) 27 May 1992 (1992-05-27) * claims 1-10 * * figures 1-5 *	2-4	
A	----- EP 3 031 761 A1 (SAURER GERMANY GMBH & CO KG [DE]) 15 June 2016 (2016-06-15) * paragraph [0008] * * claims 1-6 * * figure 4 *	1	
A	----- EP 2 433 889 A1 (MURATA MACHINERY LTD [JP]) 28 March 2012 (2012-03-28) * paragraph [0121] * -----	1	TECHNICAL FIELDS SEARCHED (IPC) D01H B65H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 August 2018	Examiner Humbert, Thomas
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