United States Patent	12391504
Kind Code	B2
Date of Patent	August 19, 2025
Inventor(s)	Sun; Feng-Tso et al.

Motor controlling system for application in apparatus having roll-to-roll mechanism

Abstract

A motor controlling system is disclosed. The motor controlling system is integrated in an apparatus having roll-to-roll mechanism, and comprises a linear light source, at least one camera and a modular electronic device. When a continuous web material is discharged by an unwinding unit of the roll-to-roll mechanism so as to be further transferred to an inspection unit, the at least one camera is controlled by the modular electronic device to capture at least one material image. Subsequently, the modular electronic device conducts a defection inspection for a segment of the continuous web material by applying an image process to the at least one material image. As a result, in case of there being at least one defect found, the modular electronic device stops a plurality of motors of the apparatus from running, thereby making the segment of the continuous web material be positioned on an inspection platform.

Inventors: **Sun; Feng-Tso (Hsinchu, TW), Yeh; Yi-Ting (Hsinchu, TW), Sun; Feng-Yu (Hsinchu, TW), Chou; Po-Han (Hsinchu, TW), Chen; Yun-Yi (Hsinchu, TW), Chang; Hui-Pu (Hsinchu, TW), Huang; Jyun-Tang (Hsinchu, TW)**

Applicant: **KAPITO INC.** (Hsinchu, TW); **Sun; Feng-Tso** (Hsinchu, TW); **Yeh; Yi-Ting** (Hsinchu, TW); **Sun; Feng-Yu** (Hsinchu, TW)

Family ID: **1000008766148**

Assignee: **Kapito Inc. (Hsinchu, TW); Sun; Feng-Tso (Hsinchu, TW); Yeh; Yi-Ting (Hsinchu, TW); Sun; Feng-Yu (Hsinchu, TW)**

Appl. No.: **17/878191**

Filed: **August 01, 2022**

Prior Publication Data

Document Identifier	Publication Date
US 20230061439 A1	Mar. 02, 2023

Foreign Application Priority Data

TW	110131882	Aug. 27, 2021

Publication Classification

Int. Cl.: **B65H26/02** (20060101); **G06T7/00** (20170101); H04N23/56 (20230101); H04N23/90 (20230101)

U.S. Cl.:

CPC **B65H26/02** (20130101); **G06T7/001** (20130101); B65H2513/11 (20130101); B65H2513/50 (20130101); B65H2553/42 (20130101); G06T2207/30124 (20130101); H04N23/56 (20230101); H04N23/90 (20230101)

Field of Classification Search

CPC: B65H (26/00); B65H (26/02); B65H (26/025); B65H (2513/00); B65H (2513/10); B65H (2513/11); B65H (2513/50); B65H (2553/42); B65H (2553/40); G06T (2207/30124); G06T (2207/30108); G06T (2207/30); G06T (7/001); G06T (7/0004); G06T (7/0002); G06T (7/00); H04N (23/56); H04N (23/90); H04N (23/57); H04N (23/60); H04N (23/61); H04N (23/62); G01N (2021/8416); G01N (2021/8411); G01N (21/88); G01N (21/8803); G01N (21/8806); G01N (21/8851); G01N (2021/8854); G01N (2021/8858); G01N (2021/8861); G01N (2021/8864); G01N (2021/8887); G01N (2021/898); G01N (2021/8893); G01N (21/89); G01N (21/8901); G01N (21/8903); G01N (2021/8908); G01N (2021/8909); G01N (21/8915); G01N (21/8914); G01N (21/8916); G01N (21/892); G01N (21/8921); G01N (21/8922); G01N (2021/8924); G01N (2021/8925); G01N (2021/8927); G01N (2021/8928); G01N (21/894); G01N (21/896); G01N (2021/8962); G01N (2021/8965); G01N (2021/8967); G01N (21/898); G01N (21/8983); G01N (33/367); G01N (33/36)

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
5990468	12/1998	Cornuejols	250/559.46	G06T 7/0004
11100626	12/2020	Roepke	N/A	G05B 19/41805
11203494	12/2020	Sun	N/A	B65G 61/00
11341630	12/2021	Sugihara	N/A	G06T 7/0004
11874232	12/2023	Batista	N/A	G01N 21/8903
11890772	12/2023	Acciari	N/A	B26D 7/27
12111268	12/2023	Sun	N/A	G01N 21/8903
2014/0174127	12/2013	Dalstra	65/29.11	G01N 21/90
2020/0160497	12/2019	Shah	N/A	G06T 7/70
2020/0348242	12/2019	Watanabe	N/A	G01N 23/18
2021/0024297	12/2020	Sun	N/A	B65G 61/00
2021/0079588	12/2020	Mantellassi	N/A	B65H 35/008
2021/0358109	12/2020	Sugihara	N/A	G01N 21/8901
2021/0383530	12/2020	Peleg	N/A	G06T 7/0008

2021/0394387	12/2020	Acciari	N/A	B26D 7/27
2022/0146436	12/2021	Batista	N/A	G01N 21/8422
2023/0061439	12/2022	Sun	N/A	G06T 7/001
2023/0117656	12/2022	Sun	382/149	G01N 21/8851
2023/0168208	12/2022	Sun	348/92	H04N 23/56
2024/0282096	12/2023	Sun	N/A	G06T 7/0004

Primary Examiner: Lee; John R

Attorney, Agent or Firm: ANOVA LAW GROUP, PLLC

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

(1) This application claims the priority of Taiwan Patent Application No. 110131882, filed on Aug. 27, 2021, the content of which is incorporated by reference in its entirety.

TECHNICAL FIELD

(2) The present invention relates to the technology field of apparatuses that all have roll-to-roll unit, and more particularly to a motor controlling system for application in apparatus having roll-to-roll mechanism.

BACKGROUND

(3) It is well known that it is necessary to receive a defect inspection treatment for a woven article like cloth before being packed, and the defect inspection treatment is completed by an inspector through operating a fabric inspection machine (also called perching machine). Cloth manufactures certainly know that, a conventional fabric inspection machine commonly includes: an unwinding unit, a fabric spreading unit and a winding unit, where the fabric spreading unit consists of a first feed roller, an inspection platform and a second feed roller. The first feed roller is disposed between the unwinding unit and the inspection platform, and is adjacent to a top side of the inspection platform. On the other hand, the second feed roller is disposed between the winding unit and the inspection platform, and is adjacent to a bottom side of the inspection platform.

(4) A defect inspection treatment consists of multiple steps. In first step, the inspector stands at the front of an operation table, and then controls the actions of the unwinding unit, the first roller, the second roller, and the winding unit by operating a controller put on the operation table, so as to properly regulate a feeding speed and a winding speed of a fabric that is discharged from the winding unit and rewound by the unwinding unit. At the end of the foregoing first step, there is a segment of the fabric is laid out on the inspection platform. In second step, the inspector checks the appearance of the fabric segment spread on the inspection platform detailedly, and then operates the controller to stop the transmission of the fabric in case of there being at least one defect found. In third step, the inspector judges whether the defects in the fabric segment is repairable or not. If yes, the inspector repairs the defects; otherwise, the inspector patches a label on said defect. Eventually, the inspector restarts the transmission of the fabric by operating the controller, so as to make the fabric segment that has been received the defect inspection treatment be wound by the winding unit.

(5) However, the experienced inspectors have found the conventional fabric inspection machine exhibits many drawbacks when being applied in conducting the defect inspection treatment. The drawbacks are summarized as follows. (1) In the second step of the foregoing defect inspection treatment, the inspector checks the appearance by his eyes, so as to verify whether there are existing any defects in the fabric segment or not. No doubt such way must lead the missed

inspection to occur. (2) During the defect inspection treatment, the inspector manually stops the transmission of the fabric in case of there being defects found, and then manually restarts the transmission of the fabric after repairing the defects and/or patches a label on each of the defects. After repeating several times of the stopping and the restarting of the transmission of the fabric, it is found that two end sides of a fabric roll that is wound on the winding unit both do not have a flat profile.

(6) It is understood that, the unwinding unit and the winding unit constitute a roll-to-roll mechanism, such that the fabric inspection machine is regarded as one kind of apparatus having roll-to-roll mechanism. On the other hand, the roll-to-roll mechanism has been integrated in a variety of article manufacturing systems nowadays, including meal foil manufacturing system, metal thin sheet manufacturing system, touch panel manufacturing system, flexible circuit board manufacturing system, and flexible solar cell manufacturing system. Moreover, according to above descriptions, it is understood that there is still room for improvement in the apparatus having roll-to-roll mechanism. In view of this fact, inventors of the present application have made great efforts to make inventive research and eventually provided a motor controlling system for application in apparatus having roll-to-roll mechanism.

SUMMARY

(7) The primary objective of the present invention is to disclose a motor controlling system for application in an apparatus having roll-to-roll mechanism. The motor controlling system includes a linear light source, at least one camera and a modular electronic device, and the apparatus includes an inspection unit and a roll-to-roll mechanism consisting of an unwinding unit and a winding unit. When a roll of a continuous web material is discharged from the unwinding unit so as to be further transferred to the inspection unit, the at least one camera is controlled by the modular electronic device to acquire at least one image from the continuous web material. Subsequently, the modular electronic device conducts a defection inspection for a segment of the continuous web material by applying an image process to the at least one material image. In case of there being at least one defect found, the modular electronic device stops a plurality of motors of the apparatus from running, thereby making the segment of the continuous web material be positioned on an inspection platform of the inspection unit.

(8) For achieving the primary objective mentioned above, the present invention provides an embodiment of the motor controlling system, which is integrated in apparatus including an inspection unit and a roll-to-roll mechanism consisting of an unwinding unit and a winding unit and includes: a linear light source, being disposed at a first position for facing a first photographing region between the unwinding unit and the inspection unit; at least one first camera, being disposed at a second position for facing the first photographing region; and a modular electronic device, being coupled to the linear light source and the at least one first camera, and including a processor, a memory and a human machine interface (HMI), where the memory stores an application program, and the processor being coupled to the memory and the human machine interface; where the application program includes instructions, such that in case the application program is executed, the processor being configured for: controlling the linear light source to emit a first detection light for irradiating the first photographing region in case of a roll of a continuous web material being discharged by the unwinding unit by a feeding speed; controlling the at least one first camera to acquire at least one material image from a first segment of the continuous web material that is in the first photographing region; applying at least one image process to the at least one material image, so as to generate a first material feature image; extracting a plurality of defect features from the first material feature image, and then determining whether there are existing any defects in the first segment of the continuous web material by matching the plurality of defect features with a plurality of reference defect features; stopping a first motor of the unwinding unit, at least one second motor of the inspection unit, and a third motor of the winding unit from running in case of there being at least one defect detected from the first segment of the continuous web material, so as

to make the first segment of the continuous web material be positioned on an inspection platform of the inspection unit; restarting the first motor, the at least one second motor and the third motor to run after receiving a transmission restarting command transmitted by the human machine interface.
(9) In one embodiment, the motor controlling system further includes: a first rotation speed sensor, being connected to the first motor for monitoring a first rotation speed of the first motor; a second rotation speed sensor, being connected to said second motor for monitoring a second rotation speed of said second motor; a third rotation speed sensor, being connected to the third motor for monitoring a third rotation speed of the third motor.
(10) In one embodiment, after the human machine interface transmits the transmission restarting command to the processor, the processor restarts the first motor, said second motor and the third motor to run by the first rotation speed, the second rotation speed and the third rotation speed, respectively.
(11) In one embodiment, the at least one first camera acquires material image from the first segment of the continuous web material by a shutter speed, and the shutter speed is positively correlated to the feeding speed.
(12) In one embodiment, the application program consists of a plurality of subprograms, and the plurality of subprograms include: a first subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to apply the at least one image process to the at least one material image for generating the first material feature image, and to extract the plurality of defect features from the first material feature image; a second subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to determine whether there are existing any defects in the first segment of the continuous web material by matching the plurality of defect features with the plurality of reference defect features; a third subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to stop the first motor, said second motor and the third motor from running, or restarting the first motor, said second motor and the third motor to run; a fourth subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to control the at least one first camera; and a fifth subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to real-time monitor a movement of the continuous web material.
(13) In one embodiment, the motor controlling system further includes: a light source, being coupled to the modular electronic device, and being disposed at a third position for facing a second photographing region between the inspection unit and the winding unit; a second camera, being coupled to the modular electronic device, and being disposed at a fourth position for facing the second photographing region; where in case the application program is executed, the processor being configured for: controlling the light source to emit a second detection light for irradiating the second photographing region in case of the winding unit running to wind the continuous web material by a material winding speed; controlling the second camera to acquire a second image frame from a second segment of the continuous web material in the second photographing region; and applying at least one image process to the at least one material image, so as to generate a second material feature image.
(14) In one embodiment, the plurality of subprograms further include a sixth subprogram, which is compiled to be integrated in the application program by one type of programming language, and includes instructions for configuring the processor to extract a plurality of material features from the second material feature image, and then to estimate a winding tension of the second segment of the continuous web material based on the plurality of material features.
(15) In one embodiment, the modular electronic device transmits a tension adjustment command to

the apparatus in case the winding tension is less than a lower threshold value or greater than an upper threshold value, such that the apparatus controls a tension adjusting assembly of the winding unit so as to properly regulate the winding tension.
(16) In one practicable embodiment, the modular electronic device is an electronic device coupled to a control box of the apparatus, and the electronic device is selected from a group consisting of industrial computer, desktop computer, laptop computer, and all-in-one computer.
(17) In another one practicable embodiment, the modular electronic device is integrated in a control box of the apparatus.
(18) In one embodiment, the continuous web material is selected from a group consisting of fabric, meal foil, metal thin sheet, touch panel, flexible circuit board, and flexible solar cell.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The invention as well as a preferred mode of use and advantages thereof will be best understood by referring to the following detailed description of an illustrative embodiment in conjunction with the accompanying drawings, where:
(2) FIG. **1** shows a first stereo diagram of an apparatus including a roll-to-roll mechanism and a motor controlling system according to the present invention;
(3) FIG. **2** shows a second stereo diagram of the apparatus;
(4) FIG. **3** shows a first block diagram of the motor controlling system according to the present invention;
(5) FIG. **4** shows a first side view of an unwinding unit, an inspection unit, a winding unit, and an operation table they are shown in FIG. **1**;
(6) FIG. **5** shows a stereo diagram of a linear light source, at least one first camera, an inspection unit, and a supporting framework they are shown in FIG. **1**;
(7) FIG. **6** shows a second side view of the unwinding unit, the inspection unit, the winding unit, and the operation table they are shown in FIG. **1**; and
(8) FIG. **7** shows a second block diagram of the motor controlling system according to the present invention.
DETAILED DESCRIPTION
(9) To more clearly describe a motor controlling system for application in apparatus having roll-to-roll mechanism according to the present invention, embodiments of the present invention will be described in detail with reference to the attached drawings hereinafter.
First Embodiment
(10) With reference to FIG. **1**, there is shown a first stereo diagram of an apparatus including a roll-to-roll mechanism and a motor controlling system according to the present invention. Moreover, FIG. **2** illustrates a second stereo diagram of the apparatus. As FIG. **1** and FIG. **2** show, the apparatus **2** is a fabric inspection machine (also called perching machine), and includes: a machine chassis **20**, an unwinding unit **21**, an inspection unit **22**, a winding unit **23**, and an operation table **24**. It is understood that, the unwinding unit **21** and the winding unit **23** constitute a roll-to-roll mechanism, such that the fabric inspection machine is regarded as one kind of apparatus having one roll-to-roll mechanism. However, the roll-to-roll mechanism can also be integrated in other kinds of apparatuses, like meal foil manufacturing system, metal thin sheet manufacturing system, touch panel manufacturing system, flexible circuit board manufacturing system, or flexible solar cell manufacturing system. It is worth explaining that, FIG. **1** and FIG. **2** further depict that the inspection unit **22** includes a first roller **221**, an inspection platform **222** and a second roller **222**.
(11) Referring to FIG. **1** and FIG. **2** again, and please simultaneously refer to FIG. **3**, in which a first block diagram of the motor controlling system is shown. On the other hand, FIG. **4** illustrates a

first side view of the unwinding unit **21**, the inspection unit **22**, the winding unit **23**, and the operation table **24** they are shown in FIG. **1**. In the apparatus **2**, the unwinding unit **21** has a first motor **210**, the inspection unit **22** has at least one second motor **220**, and the winding unit **23** has a third motor **230**. As described in more detail below, a roll of a continuous web material **3** (i.e., fabric) is wound on a roller of the winding unit **23**, and driving the first motor **210** to rotate makes the continuous web material **3** be discharged by the unwinding unit **21**, and then be further transferred to the inspection unit **22**.

(12) According to the present invention, the motor controlling system **1** includes a linear light source **11**, at least one first camera **12** and a modular electronic device **13**, where the linear light source **11** is disposed at a first position for facing a first photographing region between the unwinding unit **21** and the inspection unit **22**. Moreover, the at least one first camera **12** are disposed at a second position for facing the first photographing region. On the other hand, the modular electronic device **13** is coupled to the linear light source **11** and the at least one first camera **12**, and includes a processor, a memory and a human machine interface (HMI). In which, the processor is coupled to the human machine interface and the memory, and the memory stores an application program that consists of a plurality of subprograms. By such arrangements, when the motor controlling system **1** is work normally, the processor accesses the memory so as to execute the application program, thereby making the processor be configured for conducting a plurality of functions.

(13) In one practicable embodiment, the modular electronic device **13** is an electronic device coupled to a control box of the apparatus **2**, and the electronic device is selected from a group consisting of industrial computer, desktop computer, laptop computer, and all-in-one computer. In another one practicable embodiment, the modular electronic device **13** can be integrated in a control box of the apparatus **2**.

(14) As FIG. **3** shows, the application program includes a first subprogram **131**, a second subprogram **132**, a third subprogram **133**, a fourth subprogram **134**, and a fifth subprogram **135**, in which the fourth subprogram **134** is compiled to be integrated in the application program by one type of programming language, and includes instructions for configuring the processor to control the linear light source **11** to emit a first detection light for irradiating the first photographing region in case of a roll of a continuous web material **3** being discharged by the unwinding unit **21** by a feeding speed, and to control the at least one first camera **12** to acquire at least one material image from a first segment **31** of the continuous web material **3** that is in the first photographing region. It is worth further explaining that, the at least one first camera **12** acquires at least one material image from the first segment **31** of the continuous web material **3** by a shutter speed, and the shutter speed is positively correlated to the feeding speed. In addition, there is a supporting framework **14** disposed in the first photographing region, which is adapted for supporting the first segment **31** of the continuous web material **3**, thereby making the first segment **31** be laid out in the first photographing region.

(15) It needs to further explain that, the at least one first camera **12** has a total photographic coverage, and the total photographic coverage has a first width greater than a second width of the continuous web material **3**.

(16) According to the present invention, the first subprogram **131** is compiled to be integrated in the application program by one type of programming language, and includes instructions for configuring the processor to apply the at least one image process to the at least one material image for generating a first material feature image, and to extract a plurality of defect features from the first material feature image. On the other hand, the second subprogram **132** is compiled to be integrated in the application program by one type of programming language, and includes instructions for configuring the processor to determine whether there are existing any defects in the first segment **31** of the continuous web material **3** by matching the plurality of defect features with a plurality of reference defect features.

(17) As described in more detail below, the third subprogram **133** is compiled to be integrated in the application program by one type of programming language, and includes instructions for configuring the processor to stop the first motor **210** of the unwinding unit **21**, the at least one second motor **220** of the inspection unit **22**, and the third motor **230** of the winding unit **21** from running in case of there being at least one defect detected from the first segment **31** of the continuous web material **3**, so as to make the first segment **31** of the continuous web material **3** be positioned on an inspection platform **222** of the inspection unit **22**. FIG. **3** also depicts that the motor controlling system **1** of the present invention further includes a first rotation speed sensor S**1**, a second rotation speed sensor S**2** and a third rotation speed sensor S**3**, in which the first rotation speed sensor S**1** is connected to the first motor **210** for monitoring a first rotation speed of the first motor **210**, the second rotation speed sensor S**2** is connected to said second motor **220** for monitoring a second rotation speed of said second motor **220**, and the third rotation speed sensor S**3** is connected to the third motor **230** for monitoring a third rotation speed of the third motor **230**.
(18) Moreover, the fifth subprogram **135** is compiled to be integrated in the application program by one type of programming language, and includes instructions for configuring the processor to real-time monitor a movement of the continuous web material **3**. During real-time monitoring the movement of the continuous web material **3**, the processor calculates a first displacement of the continuous web material **3** based on the first rotation speed of the first motor **210** sensed by the first rotation speed sensor S**1** and the second rotation speed of said second motor **220** sensed by the second rotation speed sensor S**2**, and also calculates a second displacement of the continuous web material **3** based on the second rotation speed and the third rotation speed of the third motor **320** sensed by the third rotation speed sensor S**3**.
(19) Therefore, by properly controlling the rotation of the first motor **210**, the at least one second motor **220** and the third motor **230**, the first segment **31** of the continuous web material **3** is eventually stopped in the inspection platform **222** of the inspection unit **22**. In such case, an inspector standing at the front of the operation table **24** is allowed to judge whether the defects in the first segment **31** is repairable or not. If yes, the inspector repairs the defects; otherwise, the inspector patches a label on said defect. Eventually, the inspector operates the human machine interface of the modular electronic device to transmit a transmission restarting command to the processor, such that the processor restarts the first motor **210**, said second motor **220** and the third motor **230** to run by the first rotation speed, the second rotation speed and the third rotation speed, respectively.

Second Embodiment

(20) Referring to FIG. **1** and FIG. **2** again, and please simultaneously refer to FIG. **6**, in which a second side view of the unwinding unit **21**, the inspection unit **22**, the winding unit **23**, and the operation table **24** is provided. On the other hand, FIG. **7** illustrates a second block diagram of the motor controlling system **1**. As FIG. **1**, FIG. **2**, FIG. **6**, and FIG. **7** show, the motor controlling system **1** of the present invention can be designed to further include a light source **16** and a second camera **15**, in which the light source **16** is coupled to the modular electronic device **13**, and is disposed at a third position for facing a second photographing region between the inspection unit **22** and the winding unit **23**. On the other hand, the second camera **15** is coupled to the modular electronic device **13**, and is disposed at a fourth position for facing the second photographing region.
(21) Moreover, because there are the first subprogram **131**, the second subprogram **132**, the third subprogram **133**, and the fourth subprogram **134** stored in the memory of the modular electronic device **13**, the processor is basically configured for: (i) controlling the light source **16** to emit a second detection light for irradiating the second photographing region in case of the winding unit **23** running to wind the continuous web material **3** by a material winding speed; (ii) controlling the second camera **15** to acquire a second image frame from a second segment **32** of the continuous web material **3** in the second photographing region; and (iii) applying at least one image process to

the at least one material image, so as to generate a second material feature image.
(22) It is worth noting that, FIG. **7** further depicts that there is a sixth subprogram **136** compiled to be integrated in the application program by one type of programming language, where the sixth subprogram **136** includes instructions for configuring the processor to extract a plurality of material features from the second material feature image, and then to estimate a winding tension of the second segment **32** of the continuous web material **3** based on the plurality of material features. Therefore, when the winding tension is less than a lower threshold value or greater than an upper threshold value, the modular electronic device **13** transmits a tension adjustment command to the apparatus **2**, such that the apparatus **2** controls a tension adjusting assembly **231** of the winding unit **23** so as to properly regulate the winding tension.
(23) Therefore, through above descriptions, all embodiments and their constituting elements of the motor controlling system **1** proposed by the present invention have been introduced completely and clearly; in summary, the present invention includes the advantages of: (1) When this motor controlling system **1** integrated in a fabric inspection machine works normally, in case of a segment **31** of a fabric (i.e., the continuous web material **3**) is detected to have at least one defect, the motor controlling system **1** controls a plurality of motors of the fabric inspection machine to properly run, thereby transferring the segment **31** to be positioned on an inspection platform, without needing manual controls made by an inspector. (2) after the inspector repairs the defects and/or patches a label on each of the defects, the motor controlling system **1** restarts the transmission of the fabric (i.e., the continuous web material **3**), so as to make the segment **31** be wound by a winding unit **23** of the fabric inspection machine, without needing manual controls made by the inspector. As a result, after repeating several times of the stopping and the restarting of the transmission of the fabric, two end sides of a fabric roll that is wound on the winding unit both have a flat profile.
(24) Therefore, above descriptions have introduced the motor controlling system for application in an apparatus having roll-to-roll mechanism proposed by the present invention completely and clearly. Moreover, the above description is made on embodiments of the present invention. However, the embodiments are not intended to limit the scope of the present invention, and all equivalent implementations or alterations within the spirit of the present invention still fall within the scope of the present invention.

Claims

1. A motor controlling system, being integrated in apparatus comprising an inspection unit and a roll-to-roll mechanism consisting of an unwinding unit and a winding unit, and comprising: a linear light source, being disposed at a first position for facing a first photographing region between the unwinding unit and the inspection unit; at least one first camera, being disposed at a second position for facing the first photographing region; and a modular electronic device, being coupled to the linear light source and the at least one first camera, and comprising a processor, a memory and a human machine interface (HMI), wherein the memory stores an application program, and the processor being coupled to the memory and the human machine interface; wherein the application program includes instructions, such that in case the application program is executed, the processor being configured for: controlling the linear light source to emit a first detection light for irradiating the first photographing region in case of a roll of a continuous web material being discharged by the unwinding unit by a feeding speed; controlling the at least one first camera to acquire at one material image frames from a first segment of the continuous web material that is in the first photographing region; applying at least one image process to the at least one material image, so as to generate a first material feature image; extracting a plurality of defect features from the first material feature image, and then determining whether there are existing any defects in the first segment of the continuous web material by matching the plurality of defect features with a plurality of reference defect features; stopping a first motor of the unwinding unit, at least one second motor

of the inspection unit, and a third motor of the winding unit from running in case of there being at least one defect detected from the first segment of the continuous web material, so as to make the first segment of the continuous web material be positioned on an inspection platform of the inspection unit; restarting the first motor, the at least one second motor and the third motor to run after receiving a transmission restarting command transmitted by the human machine interface.

2. The motor controlling system of claim 1, wherein the continuous web material is selected from a group consisting of fabric, meal foil, metal thin sheet, touch panel, flexible circuit board, and flexible solar cell.

3. The motor controlling system of claim 1, further comprising: a first rotation speed sensor, being connected to the first motor for monitoring a first rotation speed of the first motor; a second rotation speed sensor, being connected to said second motor for monitoring a second rotation speed of said second motor; a third rotation speed sensor, being connected to the third motor for monitoring a third rotation speed of the third motor.

4. The motor controlling system of claim 3, wherein after the human machine interface transmits the transmission restarting command to the processor, the processor restarting the first motor, said second motor and the third motor to run by the first rotation speed, the second rotation speed and the third rotation speed, respectively.

5. The motor controlling system of claim 4, wherein the at least one first camera acquires the at least one material image from the first segment of the continuous web material by a shutter speed, and the shutter speed being positively correlated to the feeding speed.

6. The motor controlling system of claim 4, wherein the application program consists of a plurality of subprograms, and the plurality of subprograms comprising: a first subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to apply the at least one image process to the at least one material image for generating the first material feature image, and to extract the plurality of defect features from the first material feature image; a second subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to determine whether there are existing any defects in the first segment of the continuous web material by matching the plurality of defect features with the plurality of reference defect features; a third subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to stop the first motor, said second motor and the third motor from running, or restarting the first motor, said second motor and the third motor to run; a fourth subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to control the at least one first camera; and a fifth subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to real-time monitor a movement of the continuous web material.

7. The motor controlling system of claim 1, further comprising: a supporting framework, being disposed in the first photographing region, and being adapted for supporting the first segment of the continuous web material, thereby making the first segment be laid out in the first photographing region.

8. The motor controlling system of claim 1, wherein the at least one camera has a total photographic coverage, and the total photographic coverage having a first width greater than a second width of the continuous web material.

9. The motor controlling system of claim 1, wherein the modular electronic device is integrated in a control box of the apparatus.

10. The motor controlling system of claim 1, wherein the modular electronic device is an electronic device coupled to a control box of the apparatus, and the electronic device is selected from a group consisting of industrial computer, desktop computer, laptop computer, and all-in-one computer.

11. The motor controlling system of claim 6, further comprising: a light source, being coupled to the modular electronic device, and being disposed at a third position for facing a second photographing region between the inspection unit and the winding unit; a second camera, being coupled to the modular electronic device, and being disposed at a fourth position for facing the second photographing region; wherein in case the application program is executed, the processor being configured for: controlling the light source to emit a second detection light for irradiating the second photographing region in case of the winding unit running to wind the continuous web material by a material winding speed; controlling the second camera to acquire a second image frame from a second segment of the continuous web material in the second photographing region; and applying at least one image process to the plurality of time-consecutive material image frames, so as to generate a second material feature image.

12. The motor controlling system of claim 11, wherein the plurality of subprograms further comprising a sixth subprogram, being compiled to be integrated in the application program by one type of programming language, and including instructions for configuring the processor to extract a plurality of material features from the second material feature image, and then to estimate a winding tension of the second segment of the continuous web material based on the plurality of material features.

13. The motor controlling system of claim 12, wherein the modular electronic device transmits a tension adjustment command to the apparatus in case the winding tension is less than a lower threshold value or greater than an upper threshold value, such that the apparatus controls a tension adjusting assembly of the winding unit so as to properly regulate the winding tension.