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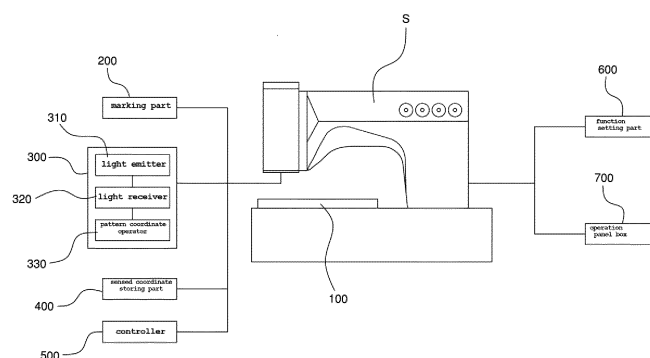
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(54) **ELECTRONICALLY CONTROLLED PATTERN SEWING MACHINE THAT AUTOMATICALLY DETECTS AND PROGRAMS COORDINATE OF SEWING OBJECT AND METHOD FOR CONTROLLING SAME**

(57) The present invention relates to an electronically controlled pattern sewing machine that automatically detects and programs coordinates of a sewing line of a sewing object even if the coordinates of the sewing line are not manually set and programmed, thereby reducing costs and making skilled workers unnecessary. According to the present invention, the electronically controlled pattern sewing machine includes: a jig disposed thereon to support a fabric thereagainst and having a pattern-shaped through hole formed thereon; a sensing part coupled to one side thereof to sense coordinates of a periphery of the pattern-shaped through hole of the jig; a sensed coordinate storing part for storing the coordi-

nates sensed by the sensing part; a controller for automatically converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine; a function setting part for setting sewing functions on the sewing coordinates converted by the controller; and an operation panel box for operating the electronically controlled pattern sewing machine to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.

FIG. 1



Description

[Technical Field]

[0001] The present invention relates to an electronically controlled pattern sewing machine and a method for controlling the same, and more particularly, to an electronically controlled pattern sewing machine that automatically detects and programs coordinates of a sewing line of a sewing object even if the coordinates of the sewing line are not manually set and programmed, thereby reducing costs and making skilled workers unnecessary.

[Background Art]

[0002] As well known, a sewing machine is a machine used to stitch fabric, leather, paper, vinyl, and other materials together with thread to bond the stitched materials to two layers or more, and an electronically controlled pattern sewing machine is a computer sewing machine that replaces hand-powered and foot-powered cranks used in the general sewing machines with a motor and a control technology of an electronic device to thus automatically perform a sewing operation for various patterns through electrical signals.

[0003] An operation panel box is generally disposed on one side of the electronically controlled pattern sewing machine so as to control and monitor the sewing operation of the sewing machine.

[0004] So as to perform the sewing operation through the electronically controlled pattern sewing machine, coordinates X and Y on the position of a sewing line and sewing functions (for example, run, speed, stitch-length, trimmer, jump, and the like) are applied to each portion of a desired design through a CAD program installed on a computer or a punching device as program equipment only for pattern, and thus, coordinate data is generated and converted into pattern data adequate to the electronically controlled pattern sewing machine. After that, the converted data is stored.

[0005] Next, coordinates X, Y and Z for automatically controlling sewing movements of the electronically controlled pattern sewing machine are converted into data adequate to the electronically controlled pattern sewing machine through a program only for the corresponding pattern, and the converted data is stored. The stored data is transferred to the operation panel box through a storage medium like USB or network, and the operation of the electronically controlled pattern sewing machine is controlled by means of the operation panel box.

[0006] Further, a jig, which has a through hole formed to a shape of the pattern, is manufactured and installed to fix a fabric in position, so that at the time of the sewing operation, the fabric is not moved.

[0007] Before the sewing operation, in conventional practices, a test for the electronically controlled pattern sewing machine is first carried out to check whether a needle of the electronically controlled pattern sewing machine is accurately operated at a position to be sewn on the fabric clamped by the jig. At this time, if the jig is not disposed at an accurate position, the jig itself is made incorrectly, or the coordinates X and Y are erroneously inputted from equipment only for program (for example, CAD or punching device), the needle of the electronically controlled pattern sewing machine hits top of the jig, and otherwise, the fabric fixedly located in the jig becomes sewn wrongly. Accordingly, the test is stopped, and after the jig is re-controlled and installed, the test is carried out again. Through the repetition of the above-mentioned processes over several times, normal sewing is achieved, which undesirably requires lots of time and steps.

[0008] In the conventional practices, accordingly, the electronically controlled pattern sewing machine has to have high-priced program equipment like CAD or punching device so as to design the sewing line and further has to need skilled persons for operating the program equipment. In addition, a lot of time is unnecessarily consumed to repeatedly perform the tests for the accurate installation of the jig and the re-installation of the jig according to the tests, and accordingly, highly-skilled workers should be needed.

[0009] Of course, the coordinates of the sewing object can be directly inputted and stored one by one by means of the operation panel box, not by means of the CAD or the punching device as the program equipment only for pattern, but in this case, it is very hard to input one by one the coordinates of each sewing line through key buttons of the operation panel box. Also, input time is very long. If mistakes happen during the input, on the other hand, the coordinate input has to be performed again from the beginning. Therefore, the coordinate input completion is not easy, and also, long time is needed to gain skill in the manipulation.

[Disclosure]

[Technical Problem]

[0010] Accordingly, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present invention to provide an electronically controlled pattern sewing machine and a method for controlling the same that are capable of accurately performing a sewing operation, without having any CAD or program equipment only for pattern.

[0011] It is another object of the present invention to provide an electronically controlled pattern sewing machine and a method for controlling the same that are capable of sensing coordinates of a pattern to perform a sewing operation, even if a jig is not made or installed correctly, so that the electronically controlled pattern sewing machine can be installed and operated even by means of unskilled workers.

[0012] It is yet another object of the present invention

to provide an electronically controlled pattern sewing machine and a method for controlling the same that are capable of automatically sensing pattern coordinates of a sewing object, converting the coordinates into sewing coordinates adequate thereto, and programs the sewing coordinates, so that even if coordinates for the sewing operation are not inputted one by one, a sewing operation is performed accurately to a shape of the pattern.,

[Technical Solution]

[0013] To accomplish the above-mentioned objects, according to a first aspect of the present invention, there is provided an electronically controlled pattern sewing machine including: a jig disposed thereon to support a fabric thereagainst and having a pattern-shaped through hole formed thereon; a sensing part coupled to one side thereof to sense coordinates of a periphery of the pattern-shaped through hole of the jig; a sensed coordinate storing part for storing the coordinates sensed by the sensing part; a controller for automatically converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine; a function setting part for setting sewing functions on the sewing coordinates converted by the controller; and an operation panel box for operating the electronically controlled pattern sewing machine to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.

[0014] According to the present invention, desirably, the sensing part includes: a light emitter for irradiating light onto the jig; a light receiver for receiving the light irradiated from the light emitter and then reflected; and a pattern coordinate operator for calculating the coordinates of the light reflected on the periphery of the pattern-shaped through hole of the jig from the received light to the light receiver.

[0015] To accomplish the above-mentioned objects, according to a second aspect of the present invention, there is provided an electronically controlled pattern sewing machine including: a jig disposed thereon to support a fabric thereagainst and having a pattern-shaped through hole formed thereon; a marking part for marking a sewing line along a periphery of the pattern-shaped through hole of the jig; a sensing part coupled to one side thereof to sense coordinates of the sewing line marked by the marking part; a sensed coordinate storing part for storing the coordinates sensed by the sensing part; a controller for automatically converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine; a function setting part for setting sewing functions on the sewing coordinates converted by the controller; and an operation panel box for operating the electronically controlled pattern sewing machine to allow the electronically controlled pattern sewing ma-

chine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.

[0016] According to the present invention, desirably, the sensing part includes: a light emitter for irradiating light onto the jig, a light receiver for receiving the light irradiated from the light emitter and then reflected, and a pattern coordinate operator for calculating the coordinates of the light reflected on the sewing line marked by the marking part from the received light to the light receiver.

[0017] To accomplish the above-mentioned objects, according to a third aspect of the present invention, there is provided a method for controlling an electronically controlled pattern sewing machine, including the steps of: clamping a jig onto the electronically controlled pattern sewing machine to pressurize a fabric thereagainst; sensing coordinates along a periphery of a pattern formed on the jig by means of a sensing part; storing the sensed coordinates in a sensed coordinate storing part; converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine by means of a controller; setting sewing functions on the converted sewing coordinates by means of a function setting part; and operating the electronically controlled pattern sewing machine by means of an operation panel box to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.

[0018] To accomplish the above-mentioned objects, according to a fourth aspect of the present invention, there is provided a method for controlling an electronically controlled pattern sewing machine, including the steps of: clamping a jig onto the electronically controlled pattern sewing machine to pressurize a fabric thereagainst; marking a sewing line along a periphery of a pattern-shaped through hole formed on the jig; sensing coordinates of the sewing line by means of a sensing part; storing the sensed coordinates in a sensed coordinate storing part; converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine by means of a controller; setting sewing functions on the converted sewing coordinates by means of a function setting part; and operating the electronically controlled pattern sewing machine by means of an operation panel box to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.

[0019] According to the present invention, desirably, the step of sensing the coordinates includes the steps of: irradiating light by means of a light emitter; receiving the light irradiated and then reflected by means of a light receiver; and calculating the coordinates of the light re-

flected along the periphery of the pattern-shaped through hole from the received light by means of a pattern coordinated operator.

[Advantageous Effects]

[0020] According to the present invention, the electronically controlled pattern sewing machine and the method for controlling the same can accurately perform the sewing operation, without having any CAD or program equipment only for pattern.

[0021] In addition, the electronically controlled pattern sewing machine and the method for controlling the same according to the present invention can sense coordinates of the pattern to perform the sewing operation, even if the jig is not made or installed correctly, so that the electronically controlled pattern sewing machine can be installed and operated even by means of unskilled workers.

[0022] Moreover, the electronically controlled pattern sewing machine and the method for controlling the same according to the present invention can automatically sense the pattern coordinates of the sewing object, convert the coordinates into the sewing coordinates adequate thereto, and program the sewing coordinates, so that even if coordinates for the sewing operation are not inputted one by one, the sewing operation is performed accurately to the shape of the pattern.

[Description of Drawings]

[0023]

FIG.1 is a block diagram showing an electronically controlled pattern sewing machine according to the present invention.

FIG.2 is a flowchart showing an operating procedure of the electronically controlled pattern sewing machine according to the present invention.

[Mode for Invention]

[0024] The present invention may be modified in various ways and may have several exemplary embodiments. Specific exemplary embodiments of the present invention are illustrated in the drawings and described in detail in the detailed description. However, this does not limit the invention within specific embodiments and it should be understood that the invention covers all the modifications, equivalents, and replacements within the idea and technical scope of the invention.

[0025] Terms, such as the first, the second, A, and B, may be used to describe various elements, but the elements should not be restricted by the terms. The terms are used to only distinguish one element from the other element. For example, a first element may be named a second element without departing from the scope of the present invention. Likewise, a second element may be named a first element.

[0026] Terms used in this application are used to only describe specific exemplary embodiments and are not intended to restrict the present invention. An expression referencing a singular value additionally refers to a corresponding expression of the plural number, unless explicitly limited otherwise by the context. In this application, terms, such as "comprise", "include", or "have", are intended to designate those characteristics, numbers, steps, operations, elements, or parts which are described in the specification, or any combination of them that exist, and it should be understood that they do not preclude the possibility of the existence or possible addition of one or more additional characteristics, numbers, steps, operations, elements, or parts, or combinations thereof.

[0027] All terms used herein, including technical or scientific terms, unless otherwise defined, have the same meanings which are typically understood by those having ordinary skill in the art.

[0028] The terms, such as ones defined in common dictionaries, should be interpreted as having the same meanings as terms in the context of pertinent technology, and should not be interpreted as having ideal or excessively formal meanings unless clearly defined in the specification.

[0029] Hereinafter, the present invention is in detail disclosed with reference to the attached drawings.

[0030] An electronically controlled pattern sewing machine S according to the present invention includes a jig 100 as known, a marking part 200 for marking a sewing line on a fabric, a sensing part 300 for sensing coordinates of the sewing line, a sensed coordinate storing part 400, a controller 500, a function setting part 600, and an operation panel box 700.

[0031] In this case, the jig 100 serves to press the fabric so that the fabric is located at an accurate position, without any movement, during a sewing operation, and further, the jig 100 has a pattern-shaped through hole formed thereon so that a needle of the electronically controlled pattern sewing machine S performs the sewing operation along the sewing line of the fabric, without having any inhibition.

[0032] Further, the marking part 200 serves to mark the sewing line along a periphery of the pattern-shaped through hole formed on the jig 100.

[0033] Also, the sensing part 300 serves to sense the coordinates of the sewing line marked by the marking part 200. At this time, the sensing part 300 is provided to various shapes through various methods.

[0034] For example, the sensing part 300 includes a light emitter 310 for irradiating light on the fabric above the fabric, a light receiver 320 for receiving the light irradiated from the light emitter 310 and then reflected on the fabric, and a pattern coordinate operator 330 for calculating and operating the coordinates of the light reflected on the sewing line or the periphery of the through hole of the jig 100 from the received light to the light receiver 320.

[0035] In this case, the sensed coordinate storing part

400 serves to store the coordinates of each point of the sewing line sensed by the sensing part 300.

[0036] Also, the controller 500 automatically converts the coordinates of each point of the sewing line sensed by the sensing part 300 and then stored in the sensed coordinate storing part 400 into sewing coordinates adequate to the electronically controlled pattern sewing machine S.

[0037] In this case, the function setting part 600 serves to set various sewing functions, such as a run function, a speed function, a stitch-length function, a trimmer function, a jump function, and so on, on a portion to be sewn according to the sewing coordinates converted by the controller 500.

[0038] Further, the operation panel box 700 serves to control the movements of the needle of the electronically controlled pattern sewing machine S according to the sewing coordinates converted adequately to the electronically controlled pattern sewing machine S, so that the needle operates according to the set various functions.

[0039] Under the above-mentioned configuration, now, an explanation on an operating procedure of the electronically controlled pattern sewing machine S according to the present invention will be given.

[0040] First, the jig 100 made separately from the electronically controlled pattern sewing machine S is clamped to allow the fabric to be supported thereagainst (S100). The jig 100 serves to accurately locate the fabric on the electronically controlled pattern sewing machine S, while pressurizing the fabric.

[0041] Next, the coordinates of the sewing line to be sewn on the fabric clamped by the jig 100 are sensed by means of the sensing part 300 (S120). To do this, light is irradiated onto the fabric above the jig 100 through the light emitter 310 of the sensing part 300 (S122), and after that, the light reflected after the irradiation of the light emitter 310 is received by the light receiver 320 of the sensing part 300 (S124).

[0042] In detail, the light irradiated from the light emitter 310 passes through the pattern-shaped through hole formed on the jig 100 and is changed, and the light at the changed position is received by the light receiver 320. Otherwise, light, which is reflected on the line marked (S110) along the through hole of the jig 100 by means of the marking part 200 like a pen, can be received. The received light is operated to coordinates X and Y of each point of the sewing line by means of the pattern coordinate operator 330 of the sensing part 300 (S126), and the coordinates are stored in the sensed coordinate storing part 400 (S130).

[0043] The stored coordinates are automatically converted into the sewing coordinates adequate to the electronically controlled pattern sewing machine S by means of the controller 500 (S140).

[0044] Further, various sewing functions, such as a run function, a speed function, a stitch-length function, a trimmer function, a jump function, and so on, are set by

means of the function setting part 600 on the converted sewing coordinates (S150), and next, the electronically controlled pattern sewing machine S is operated by means of the operation panel box 700 to perform the sewing operation according to the various sewing functions set by the function setting part 600 (S160).

[0045] As described above, the electronically controlled pattern sewing machine according to the present invention can automatically detect and program the coordinates of the sewing line of the fabric even if the coordinates of the sewing line is not set manually one by one or even if they are not programmed by the CAD or punching device, so that there is no high-priced program, time and cost are drastically reduced, and the operation is performed by the manipulation of even unskilled workers.

Claims

1. An electronically controlled pattern sewing machine comprising:

a jig disposed thereon to support a fabric thereagainst and having a pattern-shaped through hole formed thereon;

a sensing part coupled to one side thereof to sense coordinates of a periphery of the pattern-shaped through hole of the jig;

a sensed coordinate storing part for storing the coordinates sensed by the sensing part;

a controller for automatically converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine;

a function setting part for setting sewing functions on the sewing coordinates converted by the controller; and

an operation panel box for operating the electronically controlled pattern sewing machine to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.

2. The electronically controlled pattern sewing machine according to claim 1, wherein the sensing part comprises: a light emitter for irradiating light onto the jig; a light receiver for receiving the light irradiated from the light emitter and then reflected; and a pattern coordinate operator for calculating the coordinates of the light reflected on the periphery of the pattern-shaped through hole of the jig from the received light to the light receiver.

3. An electronically controlled pattern sewing machine comprising:

- a jig disposed thereon to support a fabric thereagainst and having a pattern-shaped through hole formed thereon;
 a marking part for marking a sewing line along a periphery of the pattern-shaped through hole of the jig;
 a sensing part coupled to one side thereof to sense coordinates of the sewing line marked by the marking part;
 a sensed coordinate storing part for storing the coordinates sensed by the sensing part;
 a controller for automatically converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine;
 a function setting part for setting sewing functions on the sewing coordinates converted by the controller; and
 an operation panel box for operating the electronically controlled pattern sewing machine to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.
4. The electronically controlled pattern sewing machine according to claim 3, wherein the sensing part comprises: a light emitter for irradiating light onto the jig, a light receiver for receiving the light irradiated from the light emitter and then reflected, and a pattern coordinate operator for calculating the coordinates of the light reflected on the sewing line marked by the marking part from the received light to the light receiver.
5. A method for controlling an electronically controlled pattern sewing machine, comprising the steps of:
- clamping a jig onto the electronically controlled pattern sewing machine to pressurize a fabric thereagainst;
 sensing coordinates along a periphery of a pattern formed on the jig by means of a sensing part;
 storing the sensed coordinates in a sensed coordinate storing part;
 converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine by means of a controller;
 setting sewing functions on the converted sewing coordinates by means of a function setting part; and
 operating the electronically controlled pattern sewing machine by means of an operation panel box to allow the electronically controlled pattern sewing machine to perform a sewing operation
- according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.
6. A method for controlling an electronically controlled pattern sewing machine, comprising the steps of:
- clamping a jig onto the electronically controlled pattern sewing machine to pressurize a fabric thereagainst;
 marking a sewing line along a periphery of a pattern-shaped through hole formed on the jig;
 sensing coordinates of the sewing line by means of a sensing part;
 storing the sensed coordinates in a sensed coordinate storing part;
 converting the coordinates stored in the sensed coordinate storing part into sewing coordinates adequate to the electronically controlled pattern sewing machine by means of a controller;
 setting sewing functions on the converted sewing coordinates by means of a function setting part; and
 operating the electronically controlled pattern sewing machine by means of an operation panel box to allow the electronically controlled pattern sewing machine to perform a sewing operation according to the sewing coordinates converted by the controller and the sewing functions set by the function setting part.
7. The method according to claim 5 or 6, wherein the step of sensing the coordinates comprises the steps of: irradiating light by means of a light emitter; receiving the light irradiated and then reflected by means of a light receiver; and calculating the coordinates of the light reflected along the periphery of the pattern-shaped through hole from the received light by means of a pattern coordinated operator.

FIG. 1

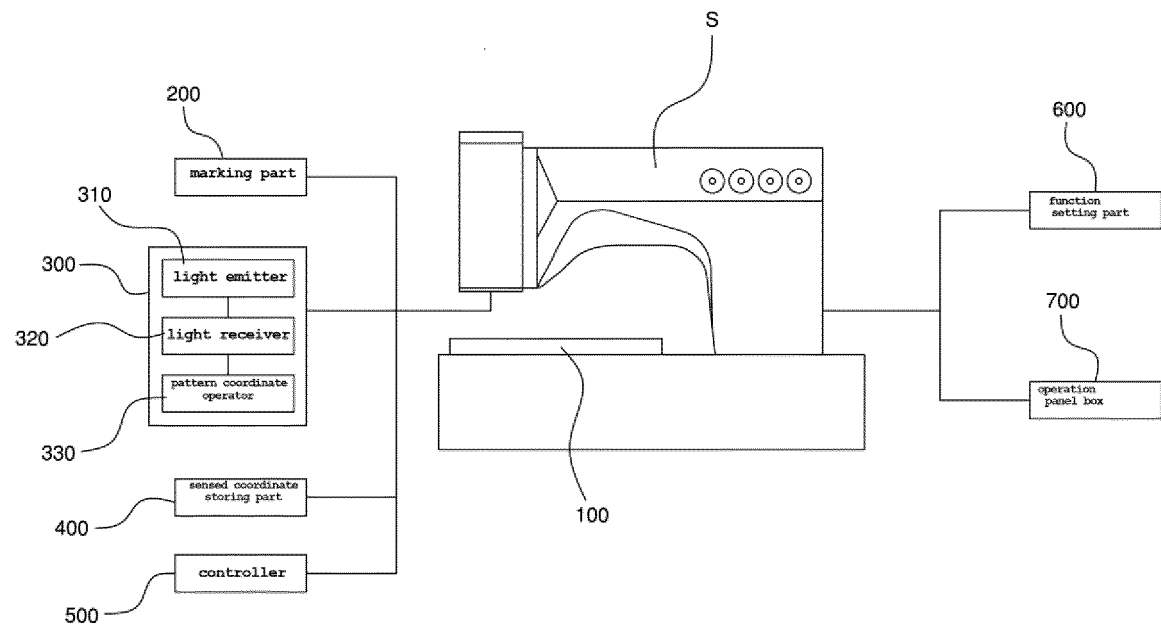
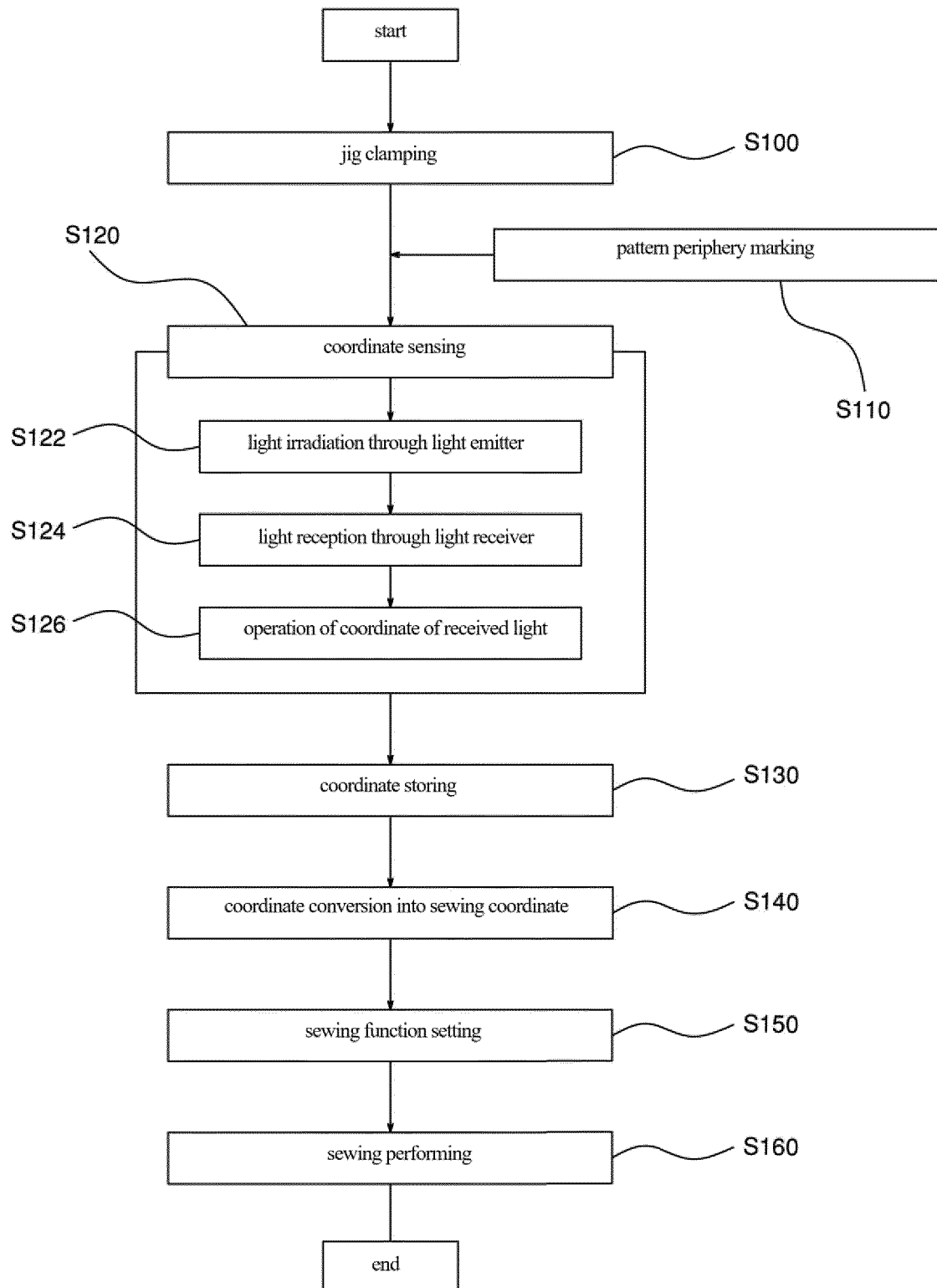


FIG.2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2017/005330

A. CLASSIFICATION OF SUBJECT MATTER

D05B 19/00(2006.01)i, D05B 19/12(2006.01)i, D05C 5/02(2006.01)i, D05C 11/00(2006.01)i, D05C 13/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D05B 19/00; D05B 35/12; D05B 19/12; D05B 21/00; D05B 39/00; D05B 35/06; D05B 3/02; D05B 19/02; D05C 5/02; D05C 11/00; D05C 13/02

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: sewing machine, embroidery machine, pattern, coordinates, sensing, light emission, light reception, reflection, storage, conversion, control unit, marking

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2014-091008 A (JUKI CORPORATION) 19 May 2014 See paragraphs [0030]-[0038]; and figures 4-6,8.	1,5
Y		2-4,6,7
Y	JP 01-086982 U (IZUMI FIBER CO., LTD.) 08 June 1989 See page 191; and figures 1-5.	2,4,7
Y	JP 2012-170470 A (BROTHER IND. LTD.) 10 September 2012 See claim 1.	3,4,6
Y	JP 2015-070891 A (BROTHER IND. LTD.) 16 April 2015 See claim 8; paragraphs [0077], [0078]; and figures 14, 15.	2,4,7
A	KR 10-2012-0066864 A (SPACE SOLUTION CO., LTD.) 25 June 2012 See the entire document.	1-7

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

* Special categories of cited documents:

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Date of the actual completion of the international search

24 AUGUST 2017 (24.08.2017)

Date of mailing of the international search report

28 AUGUST 2017 (28.08.2017)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2017/005330

Patent document cited in search report	Publication date	Patent family member	Publication date
JP 2014-091008 A	19/05/2014	CN 103806225 A JP 5993283 B2	21/05/2014 14/09/2016
JP 01-086982 U	08/06/1989	NONE	
JP 2012-170470 A	10/09/2012	US 2012-0210925 A1 US 8607721 B2	23/08/2012 17/12/2013
JP 2015-070891 A	16/04/2015	US 2015-0094842 A1 US 9127386 B2	02/04/2015 08/09/2015
KR 10-2012-0066864 A	25/06/2012	KR 10-1423190 B1	29/07/2014