



(51) International Patent Classification:

B23K 1/00 (2006.01)

H05K 3/34 (2006.01)

B23K 3/06 (2006.01)

(21) International Application Number:

PCT/EP2018/056546

(22) International Filing Date:

15 March 2018 (15.03.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

201710160006.9 17 March 2017 (17.03.2017) CN

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(54) Title: AUTOMATIC SOLDER PASTE FEEDING SYSTEM

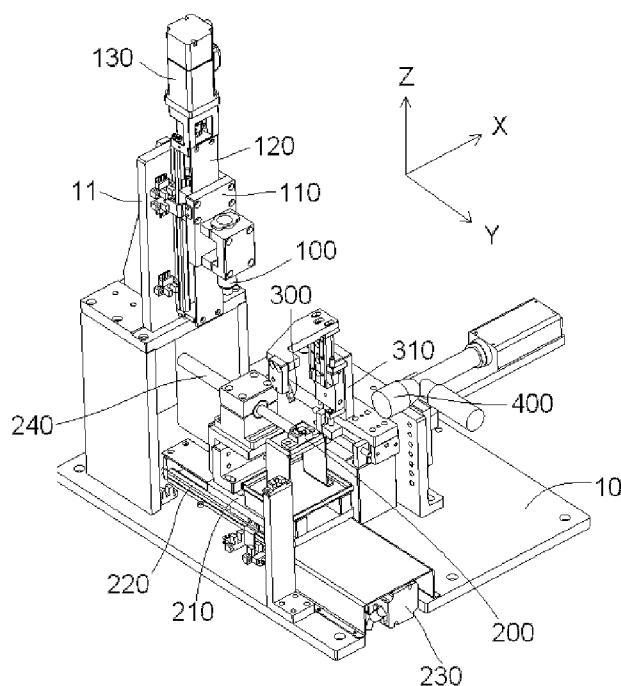


Fig. 1

(57) Abstract: An automatic solder paste feeding system includes: a base (10); a container (200) mounted on the base and configured to contain solder paste therein; a syringe (100) mounted on the base and configured to inject the solder paste into the container; and a heater (240) mounted on the base and configured to heat the solder paste contained in the container, so that the solder paste is melted into liquid state. The solder paste may be automatically fed by the automatic solder paste feeding system, it improves the feeding efficiency of the solder paste.



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(81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

Automatic Solder Paste Feeding System

CROSS-REFERENCE TO RELATED APPLICATION

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This application claims the benefit of Chinese Patent Application No.201710160006.9 filed on March 17, 2017 in the State Intellectual Property Office of China, the whole disclosure of which is incorporated herein by reference.

10 BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an automatic solder paste feeding system.

15

Description of the Related Art

In the field of manufacturing an electrical device, solder paste is often used, for example, to weld a lead or a pin of the electrical device. In the prior art, the solder paste is generally coated on the lead or pin of the electrical device to be welded in advance by manual. Then, the coated solder paste is heated and melted into liquid state by a solder head. After the solder paste is cooled and solidified, the operation of welding the lead or pin of the electrical device is finished.

However, the efficiency of supplying the solder paste by manual is very low, which is only suitable for welding a single electrical product, and not suitable for welding electrical products in mass.

SUMMARY OF THE INVENTION

30 The present invention has been made to overcome or alleviate at least one aspect of the above mentioned disadvantages.

According to an object of the present invention, there is provided an automatic solder paste feeding system that is adapted to automatically feed the solder paste in high efficiency and suitable for welding electrical products in mass.

35 According to an aspect of the present invention, there is provided an automatic solder paste feeding system, comprising: a base; a container mounted on the base and configured to contain solder paste therein; a syringe mounted on the base and configured to inject the solder paste into the container; and a heater mounted on the base and configured to heat the

solder paste contained in the container, so that the solder paste is melted into liquid state.

According to an exemplary embodiment of the present invention, the automatic solder paste feeding system further comprises a first moving mechanism mounted on a support frame of the base and adapted to move the syringe in a vertical direction perpendicular to the base, so as to move the syringe to an injection position; when the syringe is moved to the injection position, an injection port of the syringe is driven to enter into the container.

According to another exemplary embodiment of the present invention, the first moving mechanism comprises: a first rail mounted on the support frame; a first sliding block slidably mounted on the first rail and movable along the first rail in the vertical direction; and a first driving device mounted on the support frame or the first rail. The syringe is mounted on the first sliding block, and the first driving device is adapted to drive the first sliding block and the syringe to slide along the first rail.

According to another exemplary embodiment of the present invention, the automatic solder paste feeding system further comprises a second moving mechanism mounted on the base and adapted to move the container in a horizontal direction parallel to the base, so as to move the container to an injection station; when the container is moved to the injection station, the syringe is aligned to the container in the vertical direction.

According to another exemplary embodiment of the present invention, the second moving mechanism comprises: a second rail mounted on the base; a second sliding block slidably mounted on the second rail and movable along the second rail in the horizontal direction; and a second driving device mounted on the base. The container is mounted on the second sliding block, and the second driving device is adapted to drive the second sliding block and the container to slide along the second rail.

According to another exemplary embodiment of the present invention, the heater is mounted on the second sliding block, so as to slide along the second rail with the second sliding block.

According to another exemplary embodiment of the present invention, the automatic solder paste feeding system further comprises a cleaning brush mounted on the base and adapted to remove impurities from a top surface of the solder paste contained in the container.

According to another exemplary embodiment of the present invention, the automatic solder paste feeding system further comprises a vision system mounted on the base and configured to detect the impurities on the top surface of the solder paste contained in the container, the cleaning brush is adapted to remove the impurities from the top surface of the solder paste contained in the container in time when the vision system detects the impurities.

According to another exemplary embodiment of the present invention, the automatic solder paste feeding system further comprises a third moving mechanism mounted on the base and adapted to move the cleaning brush in the vertical direction and/or the horizontal

direction, so as to move the cleaning brush to an cleaning position; when the cleaning brush is moved to the cleaning position, the cleaning brush contacts the top surface the solder paste contained in the container.

According to another exemplary embodiment of the present invention, when the vision system detects the impurities on the top surface the solder paste contained in the container, the third moving mechanism moves the cleaning brush to the cleaning position under guidance of the vision system, so as to remove the impurities from the top surface the solder paste contained in the container by the cleaning brush.

According to another exemplary embodiment of the present invention, the syringe comprises an electric control syringe, and is controlled so that the amount of the solder paste injected by the syringe at a single time is just fully filled the container.

In the above various exemplary embodiments of the present invention, the solder paste may be automatically fed by the automatic solder paste feeding system, improving the feeding efficiency of the solder paste. The automatic solder paste feeding system is adapted to perform automatic welding for large quantities of electrical products.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

Fig.1 is an illustrative perspective view of an automatic solder paste feeding system according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Exemplary embodiments of the present disclosure will be described hereinafter in detail with reference to the attached drawings, wherein the like reference numerals refer to the like elements. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiment set forth herein; rather, these embodiments are provided so that the present disclosure will be thorough and complete, and will fully convey the concept of the disclosure to those skilled in the art.

In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

According to a general concept of the present invention, there is provided an automatic solder paste feeding system, comprising: a base; a container mounted on the base and configured to contain solder paste therein; a syringe mounted on the base and configured to inject the solder paste into the container; and a heater mounted on the base and configured to heat the solder paste contained in the container, so that the solder paste is melted into liquid state.

Fig.1 is an illustrative perspective view of an automatic solder paste feeding system according to an exemplary embodiment of the present invention.

As shown in Fig.1, in an embodiment, the automatic solder paste feeding system mainly comprises a base 10, a container 200, a syringe 100, and a heater 240. The container 200 is mounted on the base 10 and configured to contain solder paste therein. The syringe 100 is mounted on the base 10 and configured to inject the solder paste into the container 200. The heater 240 is mounted on the base 10 and configured to heat the solder paste contained in the container 200, so that the solder paste is melted into liquid state. The melted solder paste may be coated on a lead or pin of an electrical device to be welded to another lead, pin or pad. After the solder paste is cooled and solidified, the lead or pin of the electrical device is soldered and electrically connected to the other lead, pin or pad.

As shown in Fig.1, in an embodiment, the automatic solder paste feeding system further comprises a first moving mechanism 110, 120, 130 mounted on a support frame 11 of the base 10 and adapted to move the syringe 100 in a vertical direction Z perpendicular to the base 10, so as to move the syringe 100 to an injection position. When the syringe 100 is moved to the injection position, an injection port (a lower port) of the syringe 100 is driven to enter into the container 200. In this way, the solder paste may be directly injected into the container 200 by the syringe 100.

As shown in Fig.1, in an embodiment, the first moving mechanism 110, 120, 130 mainly comprises a first rail 120, a first sliding block 110, and a first driving device 130. The first rail 120 is mounted on the support frame 11. The first sliding block 110 is slidably mounted on the first rail 120 and movable along the first rail 120 in the vertical direction Z. The first driving device 130 is mounted on the support frame 11 or the first rail 120.

As shown in Fig.1, in an embodiment, the syringe 100 is mounted on the first sliding block 110, and the first driving device 130 is adapted to drive the first sliding block 110 and the syringe 100 to slide along the first rail 120.

As shown in Fig.1, in an embodiment, the automatic solder paste feeding system further comprises a second moving mechanism 210, 220, 230. The second moving mechanism 210, 220, 230 is mounted on the base 10 and adapted to move the container 200 in a horizontal direction Y parallel to the base 10, so as to move the container 200 to an injection station. When the container 200 is moved to the injection station, the syringe 100 is aligned to the container 200 in the vertical direction Z.

As shown in Fig.1, in an embodiment, the second moving mechanism 210, 220, 230 mainly comprises a second rail 220, a second sliding block 210, and a second driving device 230. The second rail 220 is mounted on the base 10. The second sliding block 210 is slidably mounted on the second rail 220 and movable along the second rail 220 in the horizontal direction Y. The second driving device 230 is mounted on the base 10.

As shown in Fig.1, in an embodiment, the container 200 is mounted on the second sliding block 210, and the second driving device 230 is adapted to drive the second sliding block 210 and the container 200 to slide along the second rail 220 in the horizontal direction Y.

As shown in Fig.1, in an embodiment, the heater 240 is mounted on the second sliding block 210, so as to slide along the second rail 220 with the second sliding block 210.

As shown in Fig.1, in an embodiment, the automatic solder paste feeding system further comprises a cleaning brush 300. The cleaning brush 300 is mounted on the base 10 and adapted to remove impurities from a top surface of the solder paste contained in the container 200.

As shown in Fig.1, in an embodiment, the automatic solder paste feeding system further comprises a vision system 400 mounted on the base 10 and configured to detect the impurities on the top surface of the solder paste contained in the container 200. The cleaning brush 300 is adapted to remove the impurities from the top surface of the solder paste contained in the container 200 in time when the vision system 400 detects the impurities. Thus, it may improve the welding quality.

As shown in Fig.1, in an embodiment, the automatic solder paste feeding system further comprises a third moving mechanism 310 mounted on the base 10 and adapted to move the cleaning brush 300 in the vertical direction Z and/or the horizontal direction Y, so as to move the cleaning brush 300 to a cleaning position. When the cleaning brush 300 is moved to the cleaning position, the cleaning brush 300 contacts the top surface the solder paste contained in the container 200. In this way, the impurities on the top surface of the solder paste in the container 200 may be removed by the cleaning brush 300.

As shown in Fig.1, in an embodiment, when the vision system 400 detects the impurities on the top surface the solder paste contained in the container 200, the third moving mechanism 310 moves the cleaning brush 300 to the cleaning position under guidance of the vision system 400, so as to remove the impurities from the top surface the solder paste contained in the container 200 by the cleaning brush 300.

As shown in Fig.1, in an embodiment, the syringe 100 is an electric control syringe, and is controlled so that the amount of the solder paste injected by the syringe 100 at a single time is just fully filled the container 200. In this way, the amount of solder paste injected into the container 200 may be accurately controlled, thereby avoiding the waste of solder paste.

In an embodiment, the first driving device 130 and the second driving device 230 may be a hydraulic cylinder, a gas cylinder or a motor drive mechanism. The vision system 400 may comprise one or more camera.

5 It should be appreciated for those skilled in this art that the above embodiments are intended to be illustrated, and not restrictive. For example, many modifications may be made to the above embodiments by those skilled in this art, and various features described in different embodiments may be freely combined with each other without conflicting in configuration or principle.

10 Although several exemplary embodiments have been shown and described, it would be appreciated by those skilled in the art that various changes or modifications may be made in these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

15 As used herein, an element recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural of said elements or steps, unless such exclusion is explicitly stated. Furthermore, references to "one embodiment" of the present invention are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features. Moreover, unless explicitly stated to the contrary, embodiments "comprising" or "having" an element or a plurality of elements having a particular property may include additional such elements not having that property.

20

What is claimed is,

1. An automatic solder paste feeding system, characterized in that comprises:
a base (10);
5 a container (200) mounted on the base (10) and configured to contain solder paste therein;
a syringe (100) mounted on the base (10) and configured to inject the solder paste into the container (200); and
a heater (240) mounted on the base (10) and configured to heat the solder paste
10 contained in the container (200), so that the solder paste is melted into liquid state.

2. The automatic solder paste feeding system according to claim 1, further comprising:
a first moving mechanism (110, 120, 130) mounted on a support frame (11) of the base
(10) and adapted to move the syringe (100) in a vertical direction (Z) perpendicular to the
15 base (10), so as to move the syringe (100) to an injection position,
wherein when the syringe (100) is moved to the injection position, an injection port of the syringe (100) is driven to enter into the container (200).

3. The automatic solder paste feeding system according to claim 2, wherein the first
20 moving mechanism (110, 120, 130) comprises:
a first rail (120) mounted on the support frame (11);
a first sliding block (110) slidably mounted on the first rail (120) and movable along the first rail (120) in the vertical direction (Z); and
a first driving device (130) mounted on the support frame (11) or the first rail (120),
25 and
wherein the syringe (100) is mounted on the first sliding block (110), and the first driving device (130) is adapted to drive the first sliding block (110) and the syringe (100) to slide along the first rail (120).

- 30 4. The automatic solder paste feeding system according to claim 3, further comprising:
a second moving mechanism (210, 220, 230) mounted on the base (10) and adapted to move the container (200) in a horizontal direction (Y) parallel to the base (10), so as to move the container (200) to an injection station,
wherein when the container (200) is moved to the injection station, the syringe (100) is
35 aligned to the container (200) in the vertical direction (Z).

5. The automatic solder paste feeding system according to claim 4, wherein the second moving mechanism (210, 220, 230) comprises:

a second rail (220) mounted on the base (10);

a second sliding block (210) slidably mounted on the second rail (220) and movable along the second rail (220) in the horizontal direction (Y); and

a second driving device (230) mounted on the base (10), and

5 wherein the container (200) is mounted on the second sliding block (210), and the second driving device (230) is adapted to drive the second sliding block (210) and the container (200) to slide along the second rail (220).

6. The automatic solder paste feeding system according to claim 5,

10 wherein the heater (240) is mounted on the second sliding block (210) to slide along the second rail (220) with the second sliding block (210).

7. The automatic solder paste feeding system according to any one of claims 1-6, further comprising:

15 a cleaning brush (300) mounted on the base (10) and adapted to remove impurities from a top surface of the solder paste contained in the container (200).

8. The automatic solder paste feeding system according to claim 7, further comprising:

20 a vision system (400) mounted on the base (10) and configured to detect the impurities on the top surface of the solder paste contained in the container (200),

wherein the cleaning brush (300) is adapted to remove the impurities from the top surface of the solder paste contained in the container (200) in time when the vision system (400) detects the impurities.

25 9. The automatic solder paste feeding system according to claim 8, further comprising:

a third moving mechanism (310) mounted on the base (10) and adapted to move the cleaning brush (300) in the vertical direction (Z) and/or the horizontal direction (Y), so as to move the cleaning brush (300) to a cleaning position,

30 wherein when the cleaning brush (300) is moved to the cleaning position, the cleaning brush (300) brings into contact with the top surface the solder paste contained in the container (200).

10. The automatic solder paste feeding system according to claim 9,

35 wherein when the vision system (400) detects the impurities on the top surface the solder paste contained in the container (200), the third moving mechanism (310) moves the cleaning brush (300) to the cleaning position under guidance of the vision system (400), so as to remove the impurities from the top surface the solder paste contained in the container (200) by the cleaning brush (300).

11. The automatic solder paste feeding system according to any one of claims 1-10,
wherein the syringe (100) comprises an electric control syringe and is controlled so that
the amount of the solder paste injected by the syringe (100) at a single time is just fully
5 filled the container (200).

DRAWINGS

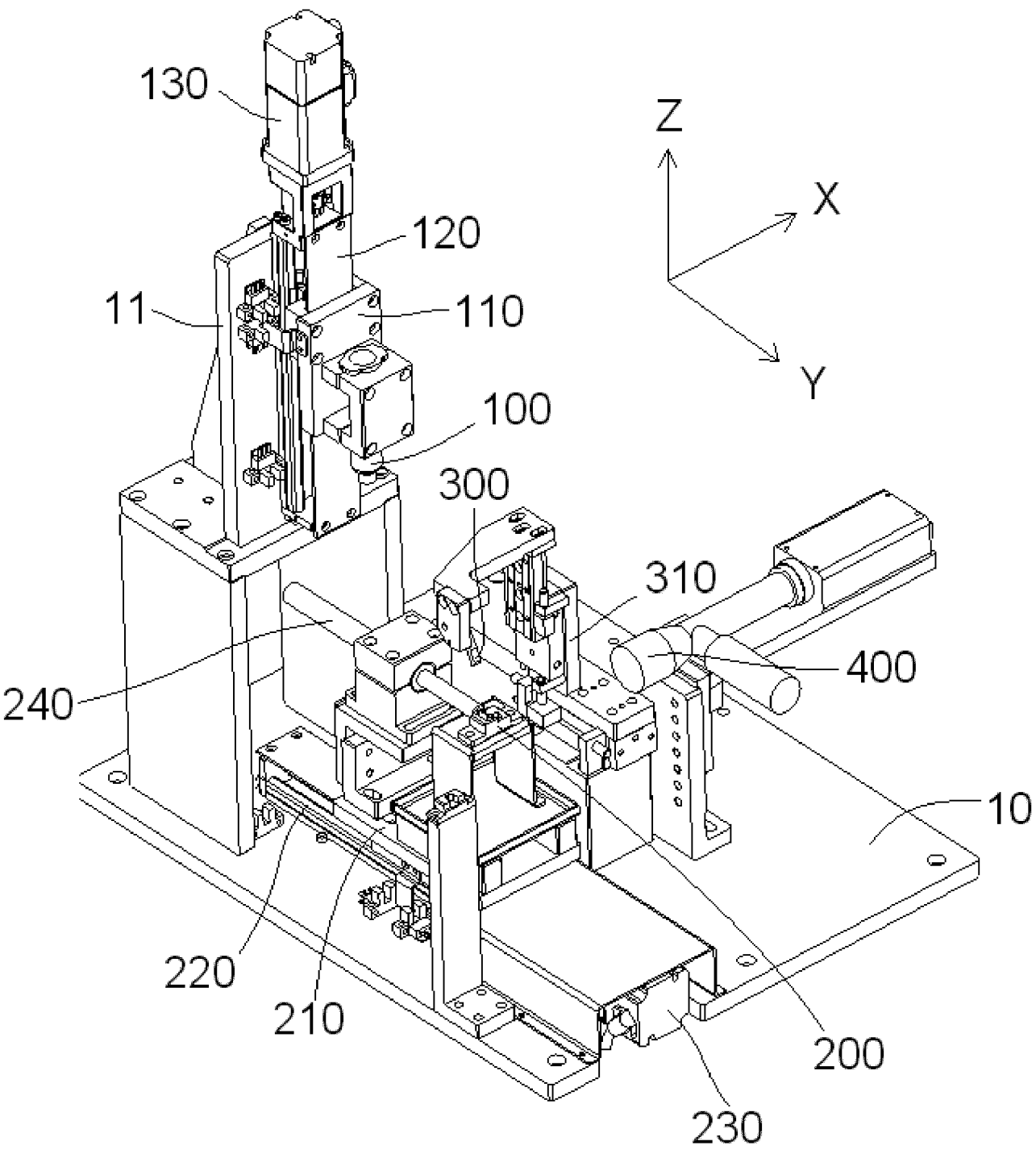


Fig.1

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2018/056546

A. CLASSIFICATION OF SUBJECT MATTER

INV. B23K1/00 B23K3/06 H05K3/34
ADD.

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)

B23K H05K

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 815 806 A (PAXTON R) 11 June 1974 (1974-06-11)	1-6,11
Y	column 1, lines 4-7 column 1, line 67 - column 2, line 3 column 2, lines 12-13 column 3, line 17 - line 18 figure 1	7
A	----- US 4 396 140 A (JAFJE DONALD ET AL) 2 August 1983 (1983-08-02) column 2, line 51 - line 54 column 3, lines 2-5 figures 1-3	1-11
A	----- JP H01 122127 A (TOSHIBA SEIKI KK) 15 May 1989 (1989-05-15) see also unofficial translation; figure 3 ----- -/-	2-6



Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

22 August 2018

Date of mailing of the international search report

30/08/2018

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2018/056546

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP S58 74274 A (NIPPON ELECTRIC CO) 4 May 1983 (1983-05-04) see also inofficial translation; figure 3 -----	7
A	US 5 829 668 A (GEORGE REED A [US] ET AL) 3 November 1998 (1998-11-03) column 1, lines 65-66 column 2, lines 22-28 figure 1 -----	11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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