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Amended claims in accordance with Rule 137(2) EPC.

(54) **WIRE FORMING DEVICE**

(57) A wire forming device, comprising: a base seat and four wire forming units. The base seat is provided with a wire output port at its center. The four wire forming units are disposed respectively on four corners of the base seat, and each provided with a movable plate. A plurality of tool seats are located in parallel and disposed at a front end of the upper plate, while an up-down driver is disposed at a rear end of the upper plate. A left-right driver is disposed on back side of the base seat and on back side of each lower plate. As such, through using the up-down driver and the left-right driver, the movable plate can be made to move upward, downward, left, and right in two dimensions, to bring the forming tool of tool seat at front end of the movable plate into action, to process the wire in the wire output port in two dimensions. Therefore, the wire forming device is able to simplify the forming tool's adjusting, and reduce forming tool's stroke distance. Also, it can act separately, to speed up feed and retraction of the setup tool.

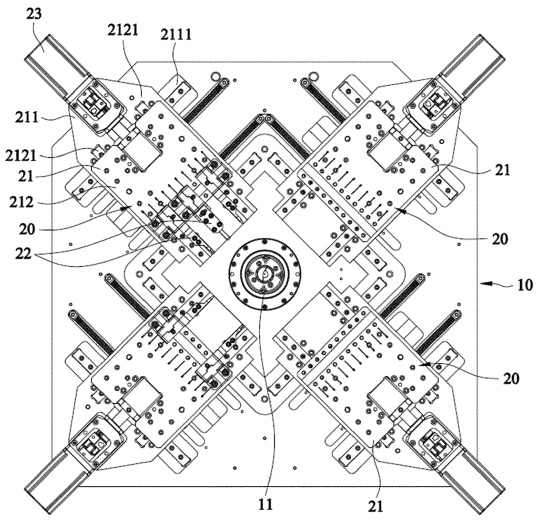


Fig. 1

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a wire forming device, and in particular to a wire forming device, of which the wiring forming units are capable of moving in two dimensions separately, to simplify the forming tool's adjustment and reduce the forming tool's stroke distance, while achieving fast feed and retraction of setup tools independently.

The Prior Arts

[0002] With regard to the conventional wire forming device, Taiwan Patent Number M390828 discloses a "Tool holder rotary type wire forming machine" including: A machine provided with a working platform, on which a rotary disc is arranged; the rotary disc is provided with a plurality of groups of upper and lower push-cutting devices which are separately and oppositely arranged; one end of each push-cutting device is respectively provided with a forming tool; the rotary disc is driven by a driving device to generate rotation motion; and the working platform corresponding to the other ends of the push-cutting devices is annularly provided with drivers with the number the same as the push-cutting devices, so that the drivers can drive the forming tool of the push-cutting devices to conduct the work of bending, winding and cutting off wires. When the tool holder rotary type wire forming machine is used, the rotation of the forming tool of each push-cutting device is continuously carried out at different angles through the rotation of the rotary disc, and the driving of the drivers is utilized to conduct the work of bending, winding and cutting off wires at different angles.

[0003] However, in the Prior Art, the forming tool of a tool holder rotary type wire forming machine is only able to move in linear up and down directions, yet it is not able to move in two dimensions separately, thus it is not capable of simplifying the forming tool's adjustment, reducing the stroke distance, and achieving fast feed and retraction of the setup tools.

[0004] Therefore, presently, the design and performance of the wire forming device is not quite satisfactory, and it leaves much room for improvement.

SUMMARY OF THE INVENTION

[0005] In view of the problems and drawbacks of the prior art, the present invention provides a wire forming device, of which the wiring forming units are capable of moving in two dimensions separately, to simplify the forming tool's adjustment and reduce the forming tool's stroke distance, while achieving fast feed and retraction of setup tools independently.

[0006] The present invention provides a wire forming device, comprising: a base seat and four wire forming units. The base seat is provided with a wire output port at its center, used to output the wire. The four wire forming units are disposed respectively on four corners of the base seat, and each having a movable plate. Each movable plate is provided with a lower plate, that is able to move to left and right on the base seat; and an upper plate disposed on a top surface of the lower plate, and is able to move upward and downward on the top surface of the lower plate. A plurality of tool seats in parallel are disposed at a front end of the upper plate, while an up-down driver is disposed at a rear end of the upper plate, so that up-down driver drives the upper plate to move upward and downward on the lower plate. A left-right driver is disposed on a back side of the base seat and on a back side of each lower plate, so that the left-right driver drives the upper plate and the lower plate to move to left and right at the same time on the base seat. As such, through using the up-down driver and the left-right driver, the upper plate and the lower plate are driven to move separately up and down, left and right in 2-dimensional movements, hereby bringing a forming tool of the tool seat to perform two-dimensional processing on the wire in the wire output port. Therefore, the present invention is capable of simplifying the forming tool's adjustment, reducing the forming tool's stroke distance, while achieving fast feed and retraction of setup tools independently.

[0007] Further scope of the applicability of the present invention will become apparent from the detailed descriptions given hereinafter. However, it should be understood that the detailed descriptions and specific examples, while indicating preferred embodiments of the present invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the present invention will become apparent to those skilled in the art from the detail descriptions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The related drawings in connection with the detailed descriptions of the present invention to be made later are described briefly as follows, in which:

Fig. 1 is a front schematic diagram of a wire forming device according to an embodiment of the present invention;

Fig. 2 is a back schematic diagram of a wire forming device according to an embodiment of the present invention;

Fig. 3 is a schematic diagram of a wire forming device in operation according to an embodiment of the present invention; and

Figs. 4A,4B,4C,4D,4E,4F are respectively schematic diagrams of a wire forming device in various steps of operations according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] The purpose, construction, features, functions and advantages of the present invention can be appreciated and understood more thoroughly through the following detailed descriptions with reference to the attached drawings.

[0010] Refer to Figs. 1 to 3 respectively for a front schematic diagram of a wire forming device according to an embodiment of the present invention; a back schematic diagram of a wire forming device according to an embodiment of the present invention; and a schematic diagram of a wire forming device in various steps of operation according to an embodiment of the present invention.

[0011] As shown in Figs. 1 to 3, the present invention provides a wire forming device, comprising: a base seat 10 and four wire forming units 20.

[0012] The base seat 10 is provided with a wire output port 11 at its center, used to output the wire.

[0013] The four wire forming units 20 are disposed respectively on four corners of the base seat 10, and each having a movable plate 21. Each movable plate 21 is provided with a lower plate 211, that is able to move to left and right on the base seat 20; and an upper plate 212, that is disposed on a top surface of the lower plate 211, and is able to move upward and downward on the top surface of the lower plate 211. A plurality of tool seats 22 are located in parallel and disposed at a front end of the upper plate 212, while an up-down driver 23 is disposed at a rear end of the upper plate 212, so that up-down driver 23 drives the upper plate 212 to move upward and downward on the lower plate 211. A left-right driver 24 is disposed on a back side of the base seat 10 and on a back side of each lower plate 211, so that the left-right driver 24 drives the upper plate 212 and the lower plate 211 to move to left and right on the base seat 10 at the same time.

[0014] In operation, through driving by the up-down driver 23 and the left-right driver 24, the upper plate 212 and the lower plate 211 are driven to move separately up and down, left and right in 2 dimensions, hereby bringing a forming tool of the tool seats 22 to perform 2-dimensional processing on the wire in the wire output port 11. Therefore, the present invention is capable of simplifying the forming tool's adjustment, reducing the forming tool's stroke distance, while achieving fast feed and retraction of setup tools independently.

[0015] In the following, refer again to Figs. 1,2, and 3. As shown in Figs. 1,2,3, four movable plates 21 are disposed respectively on four corners of the base seat 10, to form angles of 45 degrees, 135 degrees, 225 degrees, and 315 degrees respectively with the base seat 10. For the conventional wire forming machine, movable plates 21 are disposed respectively 0 degree, 45 degrees, 90 degrees, 135 degrees, 180 degrees, 225 degrees, 270 degrees, and 315 degrees relative to the base seats 10. However, through long time observation of the Applicant, it is found that, when the movable plates 21 is located 0 degree to 180 degrees relative to the base seat 10, the force of moving downward the driving device is required to provide is minimal, while the force of moving upward the driving device is required to provide is greater. When the movable plates 21 is located 90 degrees to 270 degrees relative to the base seat 10, the force of moving forward and backward the driving device is required to provide is minimal.

[0016] Therefore, when the movable plates 21 is located 45 degrees, 135 degrees, 225 degrees, and 315 degrees relative to the base seat 10, the up-down driver 23 and the left-right driver 24 may provide the most even driving force, for the left-right and up-down movements.

[0017] A servo motor is each provided on the up-down driver 23 and the left-right driver 24, to drive the movable plates 21.

[0018] The setup tool of the tool seat 22 is a forming tool used to make the spring. The forming tool can be set up to move in two dimensions. The strength of the spring can be controlled. For the spring of stronger strength, the density of the spring is made higher, while for the spring of less strength, the density of the spring is made lower.

[0019] The upper plate 212 is disposed on a sliding rail 2121 on a top surface of the lower plate 211, such that it is able to move upward and downward on the top surface of the lower plate 211.

[0020] The lower plate 211 is disposed on a sliding rail 2111 in the base seat 10, such that it is able to move to the left and to the right on the base seat 10.

[0021] Refer to Figs. 4A,4B,4C,4D,4E,4F respectively for schematic diagrams of a wire forming device in various steps of operation according to an embodiment of the present invention. As shown in Figs. 4A to 4F, through using the up-down driver 23 and the left-right driver 24, the upper plate 212 and the lower plate 211 can be set up to move upward, downward, left, and right in two dimensions, such that two opposite upper plate 212 and the lower plate 211 can be set up to move upward, downward, left, and right in two dimensions, thus the forming tool of different tool seats 22 may perform processing to produce springs (as shown in Figs. 4A,4B,4C). Alternatively, two adjacent upper plate 212 and the lower plate 211 can be made to move upward, downward, left, and right in two dimensions, as such the forming tool of different tool seats 22 may perform processing to produce springs (as shown in Fig. 4D). In addition, three sets of upper plates 212 and the lower plates 211 can be set up to move upward, downward, left, and right in two dimensions, thus the forming tool of different tool seats 22 may perform processing to produce springs (as shown in Fig. 4E). Further, four sets of upper plates 212 and the lower plates 211 can be set up to move upward, downward, left, and right in two dimensions, as such the forming tool of different tool seats 22 may perform processing to produce springs (as shown in Fig. 4F).

[0022] The above detailed description of the preferred embodiment is intended to describe more clearly the

characteristics and spirit of the present invention. However, the preferred embodiments disclosed above are not intended to be any restrictions to the scope of the present invention. Conversely, its purpose is to include the various changes and equivalent arrangements which are within the scope of the appended claims.

Claims

1. A wire forming device, comprising:

   a base seat (10), provided with a wire output port (11) at its center, used to output a wire; and four wire forming units (20), disposed respectively on four corners of the base seat (10), and each having a movable plate (21), each movable plate (21) having a lower plate (211) being able to move to left and right on the base seat (20), and having an upper plate (212) disposed on a top surface of the lower plate (211), and being able to move upward and downward on the top surface of the lower plate (211), a plurality of tool seats (22) located in parallel and disposed at a front end of the upper plate (212), an up-down driver (23) disposed at a rear end of the upper plate (212), so that up-down driver (23) drives the upper plate (212) to move upward and downward on the lower plate (211), a left-right driver (24) disposed on a back side of the base seat (10) and on a back side of each lower plate (211), so that the left-right driver (24) drives the upper plate (212) and the lower plate (211) to move to left and right at the same time on the base seat (10);
   wherein, through using the up-down driver (23) and the left-right driver (24), the upper plate (212) and the lower plate (211) are driven to move separately up and
   down, left and right in 2-dimensional movements, hereby bringing a forming tool of the tool seat (22) to perform 2-dimensional processing on the wire in the wire output port (11).

2. The wire forming device as claimed in claim 1, wherein
   four movable plates (21) are disposed respectively on four corners of the base seat (10), to form angles of 45 degrees, 135 degrees, 225 degrees, and 315 degrees respectively with the base seat (10).

3. The wire forming device as claimed in claim 1, wherein
   the forming tool of the tool seat (22) is used to make a spring.

Amended claims in accordance with Rule 137(2) EPC.

1. A wire forming device, comprising:

   a base seat (10), provided with a wire output port (11) at its center, used to output a wire; and wire forming units (20), each having a movable plate (21), each movable plate (21) having a lower plate (211) being able to move to left and right on the base seat (20), and having an upper plate (212) disposed on a top surface of the lower plate (211), and being able to move upward and downward on the top surface of the lower plate (211), a plurality of tool seats (22) located in parallel and disposed at a front end of the upper plate (212), an up-down driver (23) disposed at a rear end of the upper plate (212), so that up-down driver (23) drives the upper plate (212) to move upward and downward on the lower plate (211), a left-right driver (24) disposed on a back side of the base seat (10) and on a back side of each lower plate (211), so that the left-right driver (24) drives the upper plate (212) and the lower plate (211) to move to left and right at the same time on the base seat (10);

   wherein, through using the up-down driver (23) and the left-right driver (24), the upper plate (212) and the lower plate (211) are driven to move separately up and down, left and right in 2-dimensional movements, hereby bringing a forming tool of the tool seat (22) to perform 2-dimensional processing on the wire in the wire output port (11);
   the wire forming device being **characterized in that**:
   the wire forming units (20) are four wire forming units (20), disposed respectively on four corners of the base seat (10), so that when the movable plates (21) is located 0 degree to 180 degrees relative to the base seat (10), the force of moving downward the driving device is required to provide is minimal, while the force of moving upward the driving device is required to provide is greater ; when the movable plates (21) is located 90 degrees to 270 degrees relative to the base seat (10), the force of moving forward and backward the driving device is required to provide is minimal.

2. The wire forming device as claimed in claim 1, wherein
   four movable plates (21) are disposed respectively on four corners of the base seat (10), to form angles of 45 degrees, 135 degrees, 225 degrees, and 315 degrees respectively with the base seat (10).

3. The wire forming device as claimed in claim 1, wherein the forming tool of the tool seat (22) is used to make a spring.

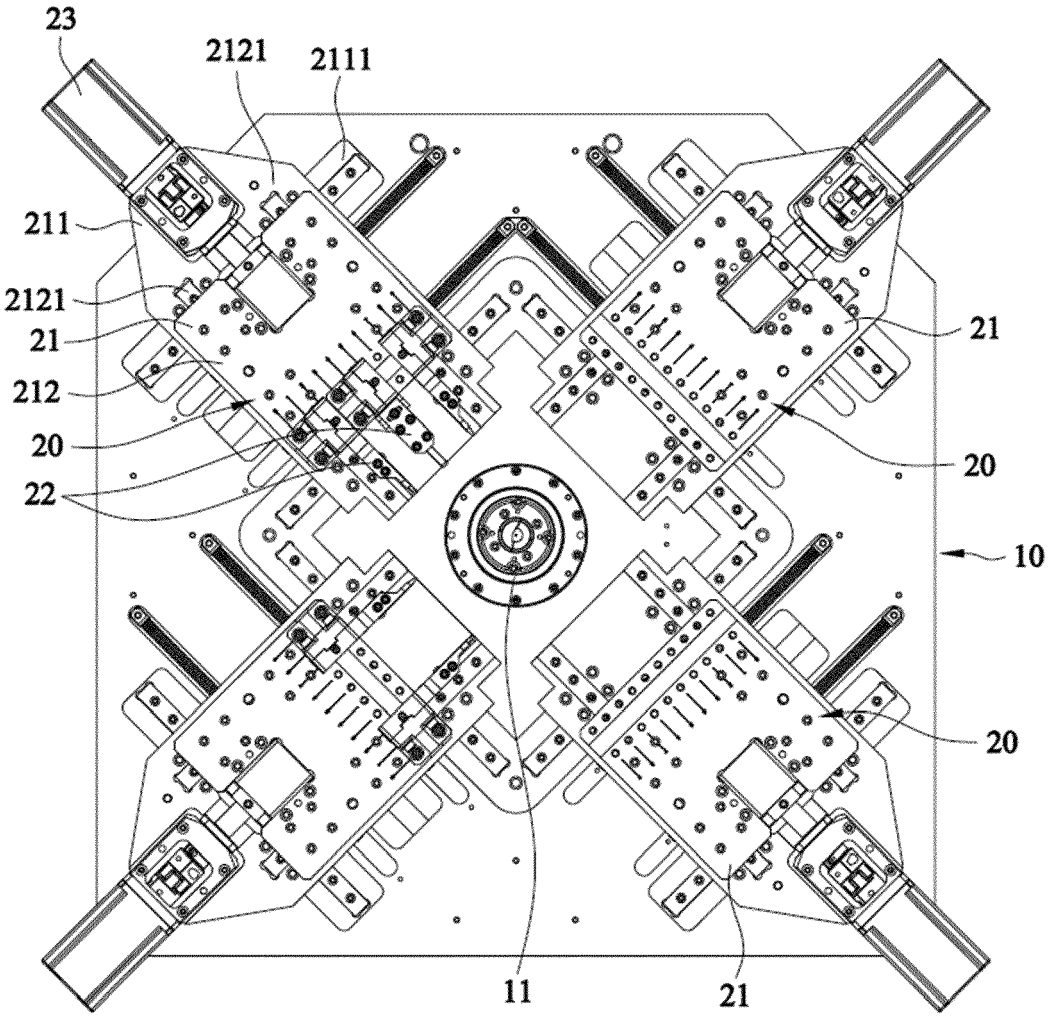


Fig. 1

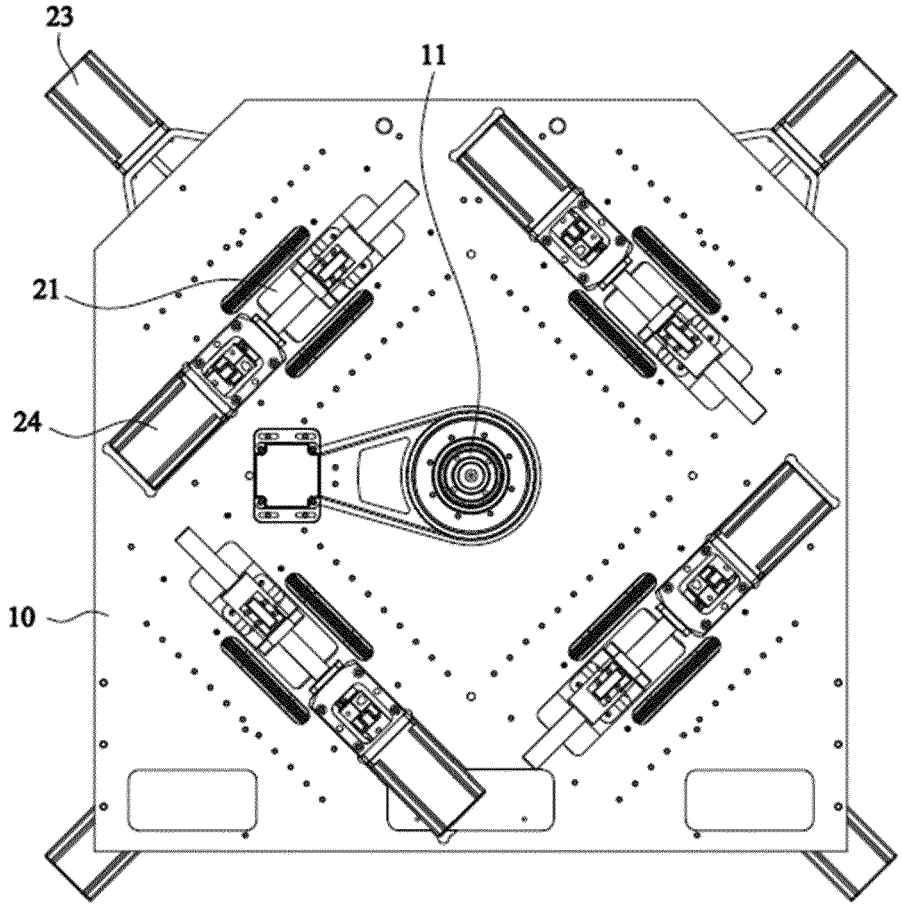


Fig. 2

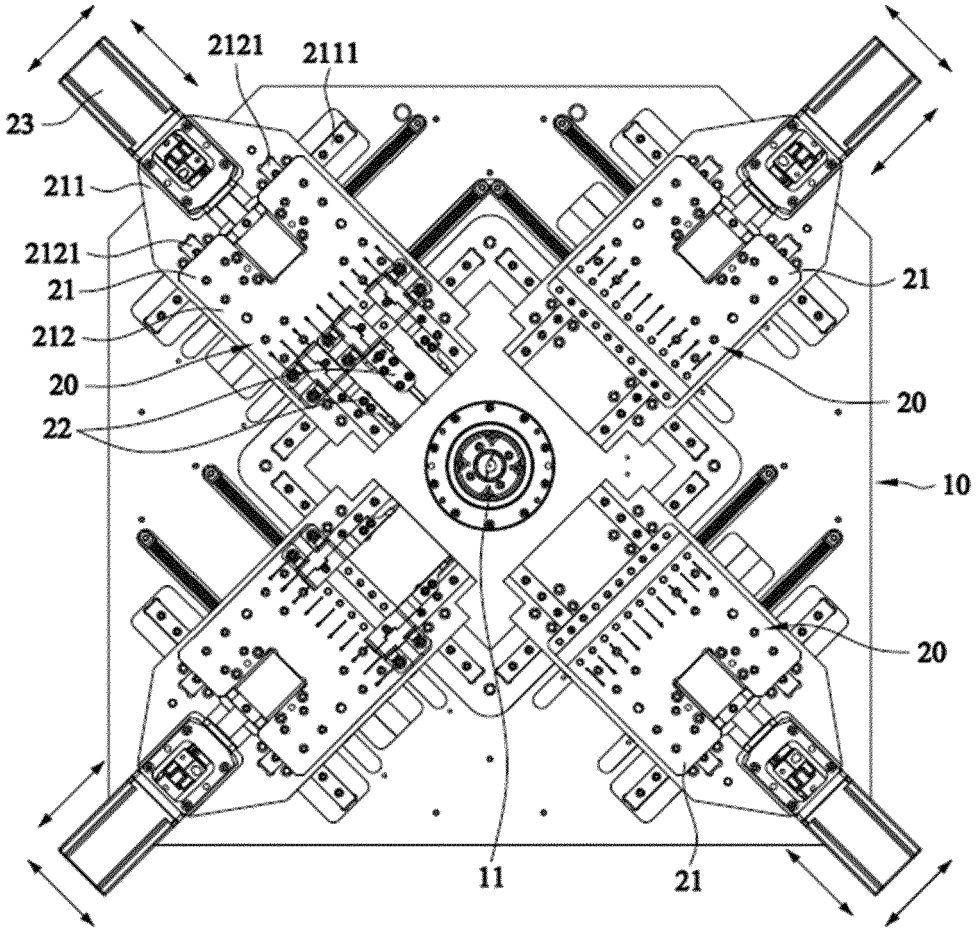


Fig. 3

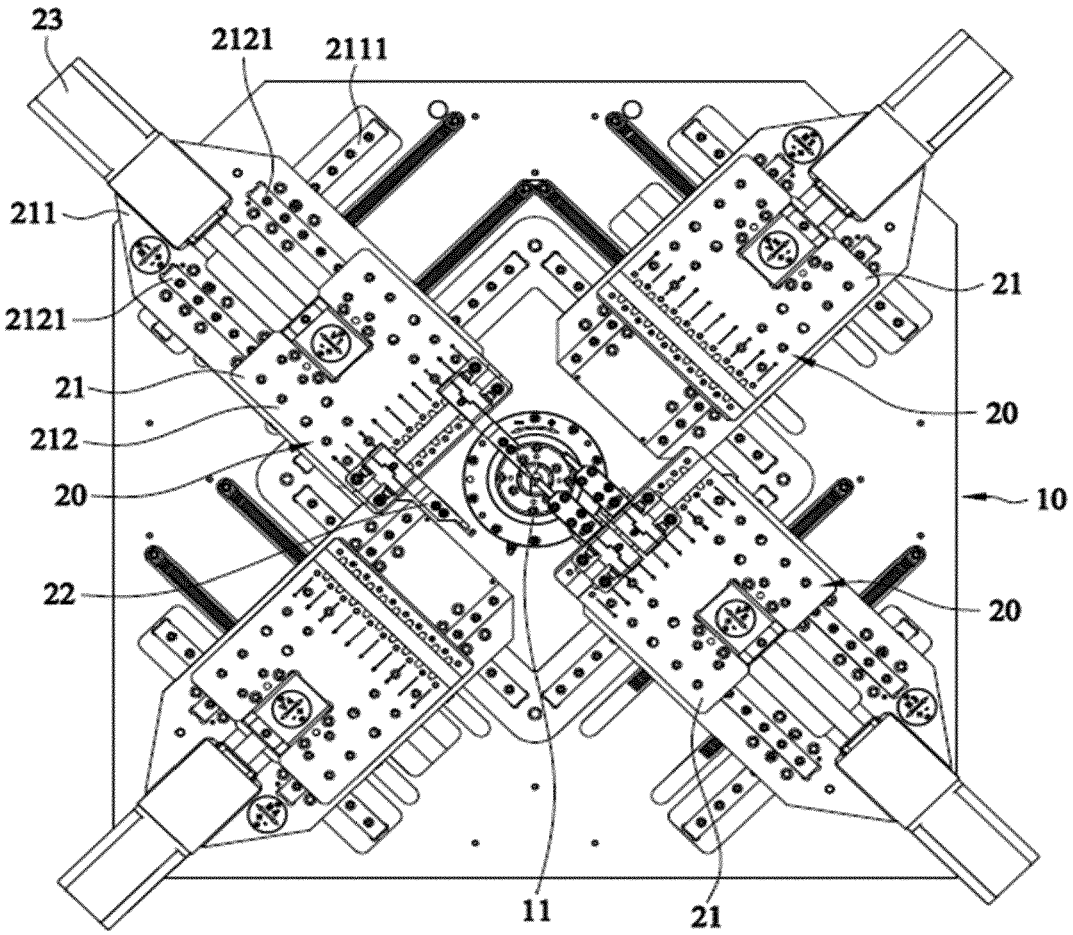


Fig. 4A

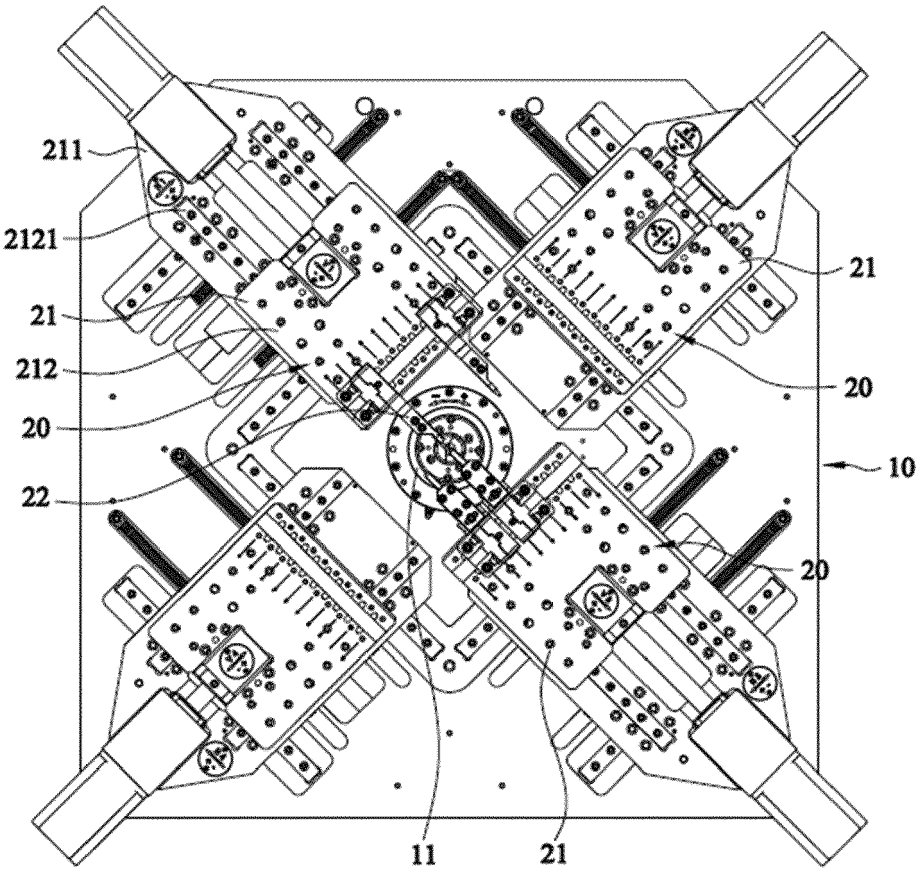


Fig. 4B

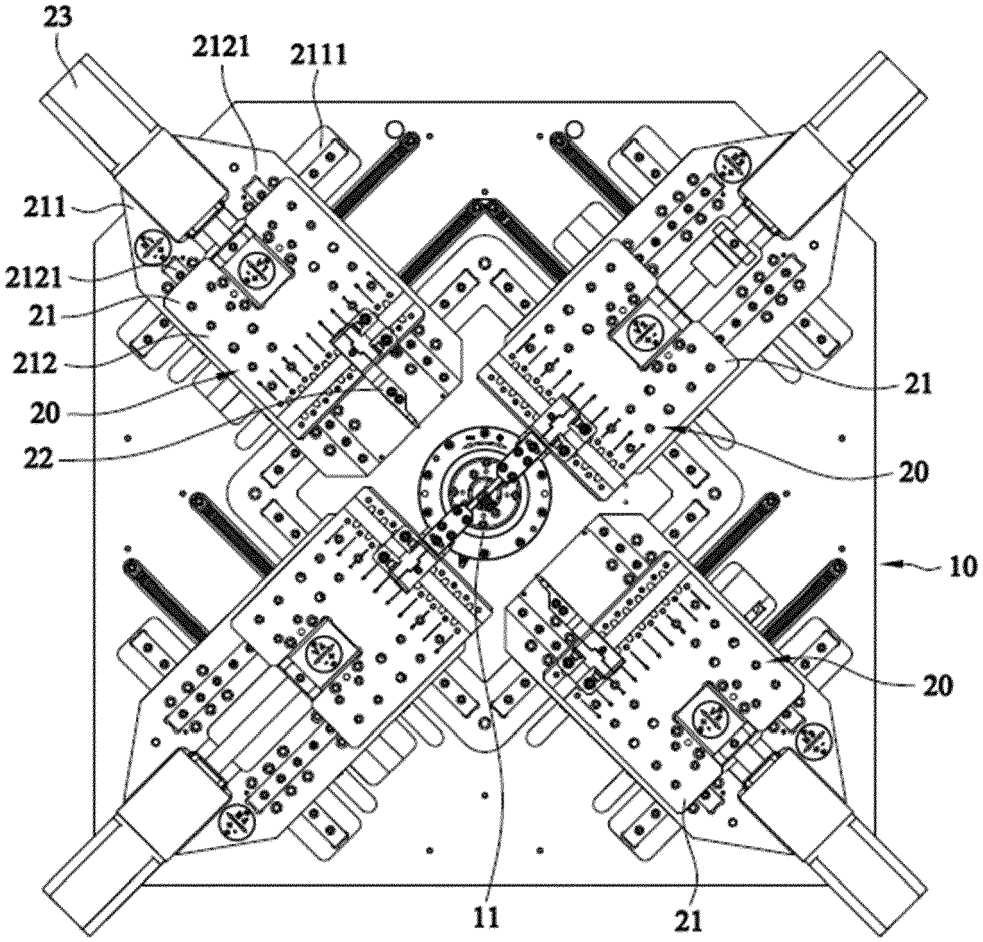


Fig. 4C

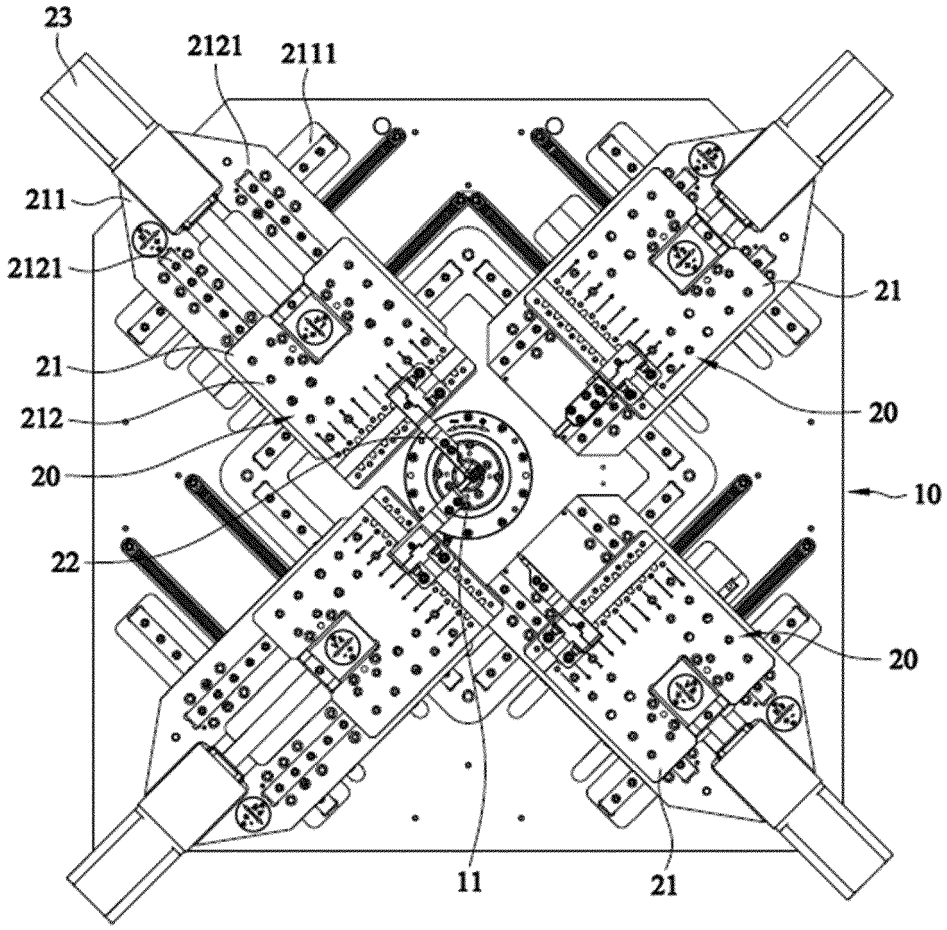


Fig. 4D

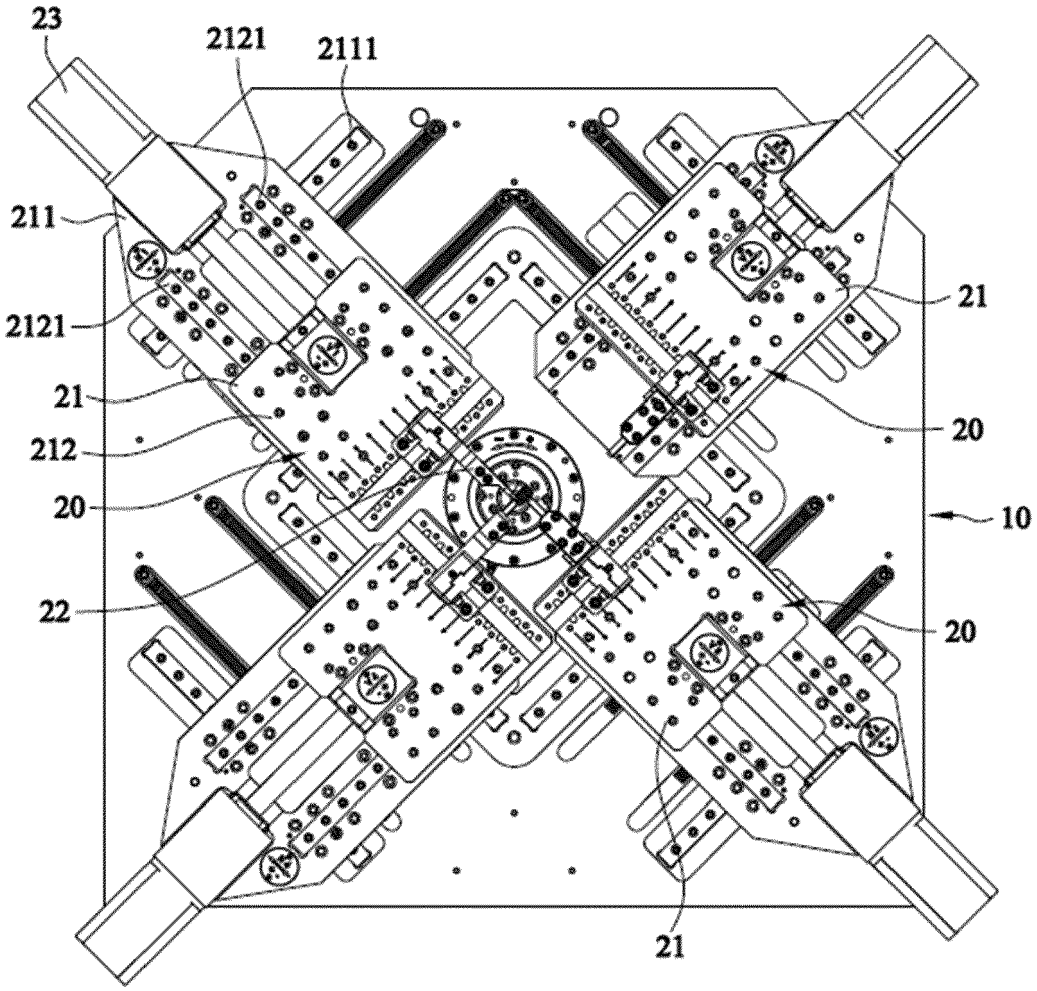


Fig. 4E

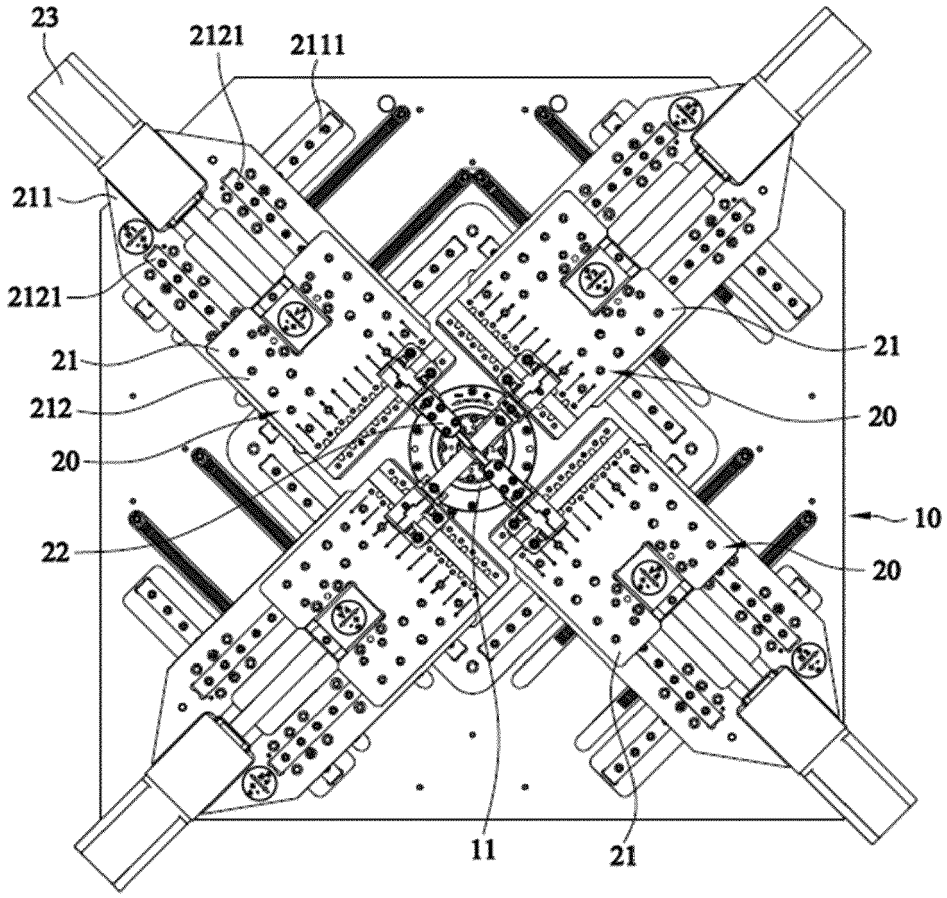


Fig. 4F

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EUROPEAN SEARCH REPORT

Application Number
EP 16 20 1592

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2016/332212 A1 (YANG CHING-FA [TW]) 17 November 2016 (2016-11-17) * paragraphs [0018] - [0021]; figures *	1-3	INV. B21F1/00 B21F3/02 B21F35/00
Y	US 2009/007619 A1 (SPECK NORBERT [DE]) 8 January 2009 (2009-01-08) * paragraphs [0014], [0040], [0049]; figures *	1-3	
Y	US 2011/114217 A1 (WU DAVID [TW]) 19 May 2011 (2011-05-19) * paragraphs [0026] - [0029]; figures *	1-3	

TECHNICAL FIELDS SEARCHED (IPC)

B21F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 June 2017	Charvet, Pierre

CATEGORY OF CITED DOCUMENTS

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01-06-2017

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