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(54) Title: ELASTIC SEALING RING EXPANDING APPARATUS

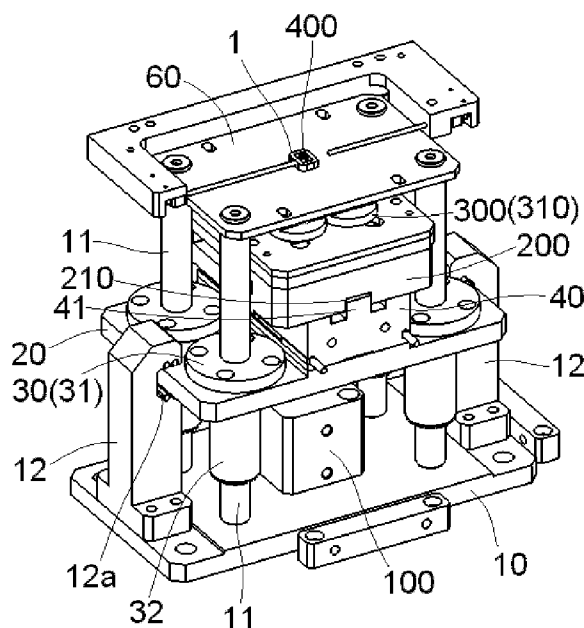


Fig.1

(57) Abstract: An elastic sealing ring (1) expanding apparatus includes: a base (10) on which a plurality of posts (11) are provided; an assembly platform (60) supported on the base (10) by the plurality of posts (11); and four rods (400) movably mounted on the assembly platform (60); a driving device (100) mounted on the base (10) and configured to drive the four rods (400) to move. The four rods (400) are adapted to be driven by the driving device (100) to move from a center of a rectangle (2) toward four corners of the rectangle (2) along respective straight paths, respectively, so as to expand an elastic sealing ring (1) sleeved on the four rods (400) into a rectangular ring with a predetermined length-width ratio. The elastic sealing ring (1) expanding apparatus may efficiently expand an elastic sealing ring (1) into a rectangular ring with a predetermined length-width ratio.

SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
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Elastic Sealing Ring Expanding Apparatus

CROSS-REFERENCE TO RELATED APPLICATION

5

This application claims the benefit of Chinese Patent Application No.201710418172.4 filed on June 6, 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

15 The present invention relates to an elastic sealing ring expanding apparatus adapted to expand an elastic sealing ring into a rectangular ring with a predetermined length-width ratio.

Description of the Related Art

20 In the related art, in order to fit an elastic sealing ring in a rectangular groove in a component to be sealed, it is sometimes necessary to expand the elastic sealing ring into a rectangular ring with a predetermined length-width ratio. In the related art, the elastic sealing ring is generally expanded manually. During installing the elastic sealing ring, a worker needs to pull the elastic sealing ring outward with four fingers to expand the elastic
25 sealing ring. Then, the expanded elastic sealing ring is sleeved onto the component and fit into the rectangular groove. However, an operation of manual expanding of the elastic sealing ring is very time-consuming and inefficient, which increases the assembly cost thereof.

30 SUMMARY OF THE INVENTION

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 elastic sealing ring expanding apparatus adapted to efficiently expand an elastic sealing ring into a rectangular
35 ring with a predetermined length-width ratio.

According to an aspect of the present invention, there is provided an elastic sealing ring expanding apparatus, comprising: a base on which a plurality of posts are provided; an assembly platform supported on the base by the plurality of posts; and four rods movably

mounted on the assembly platform; a driving device mounted on the base and configured to drive the four rods to move. The four rods are adapted to be driven by the driving device to move from a center of a rectangle toward four corners of the rectangle along respective straight paths, respectively, so as to expand an elastic sealing ring sleeved on the four rods into a rectangular ring with a predetermined length-width ratio.

According to an exemplary embodiment of the present invention, four slots are formed in the assembly platform, one end of each of the four slots is pointed to the center of the rectangle, and the other end of each of the four slots is pointed to a corresponding one of the four corners of the rectangle. The four rods are slidably mounted in the four slots, respectively, and the driving device is adapted to drive the four rods to move in the four slots, respectively.

According to another exemplary embodiment of the present invention, a frame is mounted on the assembly platform and arranged to define a rectangular space with the predetermined length-width ratio, and the four rods are moved by the driving device from a center of the rectangular space to four corners of the rectangular space along respective straight paths, respectively, and are respectively blocked and stopped at the four corners of the rectangular space.

According to another exemplary embodiment of the present invention, the driving device is configured to drive the four rods to synchronously move.

According to another exemplary embodiment of the present invention, the driving device comprises four cam mechanisms and a driving motor, each cam mechanism being adapted to transfer a driving force from the driving motor to the respective rod, and convert a rotation motion of the driving motor into a linear motion, so as to drive the four rods to move along respective straight paths.

According to another exemplary embodiment of the present invention, the cam mechanism comprises a cam and at least two transmission gears arranged between a drive shaft of the cam and an output shaft of the driving motor.

According to another exemplary embodiment of the present invention, the transmission gears of the four cam mechanisms are received in a gear box, and the cams of the four cam mechanisms are provided outside the gear box.

According to another exemplary embodiment of the present invention, the elastic sealing ring expanding apparatus further comprises a support table supported on the base by a plurality of brackets provided on the base. The support table is located below the assembly platform, and the gear box is mounted on the support table.

According to another exemplary embodiment of the present invention, a seat is provided on the support table, and the gear box is detachably mounted on the seat.

According to another exemplary embodiment of the present invention, a dove-tail slot is formed in one of the gear box and the seat, and a dove-tail bar is formed on the other of

the gear box and the seat. The dove-tail bar is slidably engaged into the dove-tail slot to detachably mount the gear box on the seat.

According to another exemplary embodiment of the present invention, a notch is formed in each bracket, and side edges of the support table are fitted and supported in the notches of the brackets, respectively, so as to support the support table on the brackets.

According to another exemplary embodiment of the present invention, a plurality of flanges are mounted on the support table, and the plurality of posts pass through the plurality of flanges, respectively; and the flange is configured to enhance a structural strength of the post to prevent the post from being bent.

According to another exemplary embodiment of the present invention, the flanges each comprise a disk portion and a cylindrical portion connected to the disk part. The disk part is fixed to the support table, and the post passes through the disk part and the cylindrical portion in an axial direction of the flange.

According to another exemplary embodiment of the present invention, the driving motor is mounted on the base and located below the support table.

In the above various exemplary embodiments of the present invention, the elastic sealing ring expanding apparatus may efficiently expand an elastic sealing ring into a rectangular ring with a predetermined length-width ratio, which improves the elastic sealing ring expanding efficiency, and reduces the assembly cost.

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 elastic sealing ring expanding apparatus according to an exemplary embodiment of the present invention;

Fig.2 is an illustrative plan view of an assembly platform of the elastic sealing ring expanding apparatus of Fig.1;

Fig.3 shows an initial state of an elastic sealing ring when it has not been expanded by the elastic sealing ring expanding apparatus; and

Fig.4 shows an expanded state of the elastic sealing ring when it has been expanded by the elastic sealing ring expanding apparatus.

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 elastic sealing ring expanding apparatus, comprising: a base on which a plurality of posts are provided; an assembly platform supported on the base by the plurality of posts; and four rods movably mounted on the assembly platform; a driving device mounted on the base and configured to drive the four rods to move, the four rods are adapted to be driven by the driving device to move from a center of a rectangle toward four corners of the rectangle along respective straight paths, respectively, so as to expand an elastic sealing ring sleeved on the four rods into a rectangular ring with a predetermined length-width ratio.

Fig.1 is an illustrative perspective view of an elastic sealing ring expanding apparatus according to an exemplary embodiment of the present invention.

As shown in Fig.1, in an embodiment, the elastic sealing ring expanding apparatus mainly comprises a base 10, an assembly platform 60, four rods 400, and a driving device 100, 200, 300. A plurality of posts 11 are provided on the base 10. The assembly platform 60 is supported on the base 10 by the plurality of posts 11. The four rods 400 are movably mounted on the assembly platform 60. The driving device 100, 200, 300 is mounted on the base 10 and configured to drive the four rods 400 to move.

Fig.2 is an illustrative plan view of an assembly platform 60 of the elastic sealing ring expanding apparatus of Fig.1; Fig.3 shows an initial state of an elastic sealing ring 1 when it has not been expanded by the elastic sealing ring expanding apparatus; and Fig.4 shows an expanded state of the elastic sealing ring 1 when it has been expanded by the elastic sealing ring expanding apparatus.

As shown in Figs.1-4, in an embodiment, the four rods 400 are adapted to be driven by the driving device 100, 200, 300 to move from a center of a rectangle 2 toward four corners of the rectangle 2 along respective straight paths, for example, the four straight paths defined by four slots 61 in Fig.2, respectively, so as to expand the elastic sealing ring 1 sleeved on the four rods 400 into a rectangular ring with a predetermined length-width ratio (see Fig.4).

As shown in Figs.1-2, in an embodiment, four slots 61 are formed in the assembly platform 60, one end of each of the four slots 61 is pointed to the center of the rectangle 2, the other end of each of the four slots 61 is pointed to a corresponding one of four corners of

the rectangle 2. The four rods 400 are slidably mounted in the four slots 61, respectively, and the driving device 100, 200, 300 is adapted to drive the four rods 400 to move in the four slots 61, respectively.

As shown in Figs.3-4, in an embodiment, a frame 62 is mounted on the assembly platform 60. The frame 62 is arranged to define a rectangular space 63 with the predetermined length-width ratio. The four rods 400 are moved by the driving device 100, 200, 300 from a center of the rectangular space 63 to four corners of the rectangular space 63 along respective straight paths, respectively, and are respectively blocked and stopped at the four corners of the rectangular space 63.

As shown in Fig.1, in an embodiment, the driving device 100, 200, 300 is configured to drive the four rods 400 to synchronously move.

As shown in Fig.1, in an embodiment, the driving device 100, 200, 300 mainly comprises four cam mechanisms 300 and a driving motor 100 constructed to drive the four cam mechanisms 300 to rotate. Each cam mechanism 300 is adapted to transfer a driving force from the driving motor 100 to the respective rod 400, and each cam mechanism 300 is adapted to convert a rotation motion of the driving motor 100 into a linear motion, so as to drive the four rods 400 to move along respective straight paths.

As shown in Fig.1, in an embodiment, each cam mechanism 300 comprises a cam 310 and at least two transmission gears (not shown) arranged between a drive shaft of the cam 310 and an output shaft of the driving motor 100.

As shown in Fig.1, in an embodiment, the transmission gears of the four cam mechanisms 300 are received in a gear box 200, and the cams 310 of the four cam mechanisms 300 are provided outside the gear box 200. When the cams 310 of the four cam mechanisms 300 are rotated, the cams 310 may drive the four rods 400 to move along respective straight paths.

As shown in Fig.1, in an embodiment, the elastic sealing ring expanding apparatus further comprises a support table 20. The support table 20 is supported on the base 10 by a plurality of brackets 12 provided on the base 10. The support table 20 is located below the assembly platform 60, and the gear box 200 is mounted on the support table 20.

As shown in Fig.1, in an embodiment, a seat 40 is provided on the support table 20, and the gear box 200 is detachably mounted on the seat 40.

As shown in Fig.1, in an embodiment, a dove-tail slot 210 is formed in one of the gear box 200 and the seat 40, a dove-tail bar 41 is formed on the other of the gear box 200 and the seat 40. The dove-tail bar 41 is slidably engaged into the dove-tail slot 210, so as to detachably mount the gear box 200 on the seat 40.

As shown in Fig.1, in an embodiment, a notch 12a is formed in each bracket 12. Side edges of the support table 20 are fitted and supported in the notches 12a of the brackets 12, so as to support the support table 20 on the brackets 12.

As shown in Fig.1, in an embodiment, a plurality of flanges 30 are mounted on the support table 20, and the plurality of posts 11 pass through the plurality of flanges 30, respectively. The flange 30 is configured to enhance a structural strength of the post 11 to prevent the post 11 from being bent.

5 As shown in Fig.1, in an embodiment, the flanges 30 each comprise a disk portion 31 and a cylindrical portion 32 connected to the disk part 31. The disk part 31 is fixed to the support table 20, and the post 11 passes through the disk part 31 and the cylindrical portion 32 in an axial direction of the flange.

10 As shown in Fig.1, in an embodiment, the driving motor 100 is mounted on the base 10 and located below the support table 20.

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
15 configuration or principle.

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.

20 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
25 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.

What is claimed is,

1. An elastic sealing ring expanding apparatus, comprising:
a base (10) on which a plurality of posts (11) are provided;
5 an assembly platform (60) supported on the base (10) by the plurality of posts (11);
four rods (400) movably mounted on the assembly platform (60); and
a driving device (100, 200, 300) mounted on the base (10) and configured to drive the
four rods (400) to move,
wherein the four rods (400) are adapted to be driven by the driving device (100, 200,
10 300) to move from a center of a rectangle (2) toward four corners of the rectangle (2) along
respective straight paths, respectively, so as to expand an elastic sealing ring (1) sleeved on
the four rods (400) into a rectangular ring with a predetermined length-width ratio.

2. The elastic sealing ring expanding apparatus according to claim 1,
15 wherein four slots (61) are formed in the assembly platform (60), one end of each of
the four slots (61) is pointed to the center of the rectangle (2), and the other end of each of
the four slots (61) is pointed to a corresponding one of the four corners of the rectangle (2);
and
wherein the four rods (400) are slidably mounted in the four slots (61), respectively,
20 and the driving device (100, 200, 300) is adapted to drive the four rods (400) to move in the
four slots (61), respectively.

3. The elastic sealing ring expanding apparatus according to claim 1,
wherein a frame (62) is mounted on the assembly platform (60) and arranged to define
25 a rectangular space (63) with the predetermined length-width ratio, and the four rods (400)
are moved by the driving device (100, 200, 300) from a center of the rectangular space (63)
to four corners of the rectangular space (63) along respective straight paths, respectively,
and are respectively blocked and stopped at the four corners of the rectangular space (63).

30 4. The elastic sealing ring expanding apparatus according to claim 1,
wherein the driving device (100, 200, 300) is configured to drive the four rods (400) to
synchronously move.

5. The elastic sealing ring expanding apparatus according to claim 1,
35 wherein the driving device (100, 200, 300) comprises:
a driving motor (100); and
four cam mechanisms (300) each adapted to transfer a driving force from the driving
motor (100) to the respective rod (400), and convert a rotation motion of the driving motor

(100) into a linear motion, so as to drive the four rods (400) to move along respective straight paths.

5 6. The elastic sealing ring expanding apparatus according to claim 5,
wherein the cam mechanism (300) comprises a cam (310) and at least two transmission
gears arranged between a drive shaft of the cam (310) and an output shaft of the driving
motor (100).

10 7. The elastic sealing ring expanding apparatus according to claim 6,
wherein the transmission gears of the four cam mechanisms (300) are received in a gear
box (200), and the cams (310) of the four cam mechanisms (300) are provided outside the
gear box (200).

15 8. The elastic sealing ring expanding apparatus according to claim 7, further
comprising:

a support table (20) supported on the base (10) by a plurality of brackets (12) provided
on the base (10),

wherein the support table (20) is located below the assembly platform (60), and the
gear box (200) is mounted on the support table (20).

20

9. The elastic sealing ring expanding apparatus according to claim 8,
wherein a seat (40) is provided on the support table (20), and the gear box (200) is
detachably mounted on the seat (40).

25 10. The elastic sealing ring expanding apparatus according to claim 9,
wherein a dove-tail slot (210) is formed in one of the gear box (200) and the seat (40),
and a dove-tail bar (41) is formed on the other of the gear box (200) and the seat (40), the
dove-tail bar (41) being slidably engaged into the dove-tail slot (210) to detachably mount
the gear box (200) on the seat (40).

30

11. The elastic sealing ring expanding apparatus according to claim 8,
wherein a notch (12a) is formed in each bracket (12), and side edges of the support
table (20) are fitted and supported in the notches (12a) of the brackets (12), respectively, so
as to support the support table (20) on the brackets (12).

35

12. The elastic sealing ring expanding apparatus according to claim 11,
wherein a plurality of flanges (30) are mounted on the support table (20), and the
plurality of posts (11) pass through the plurality of flanges (30), respectively; and

wherein the flange (30) is configured to enhance a structural strength of the post (11) to prevent the post (11) from being bent.

13. The elastic sealing ring expanding apparatus according to claim 12,
5 wherein the flanges (30) each comprise a disk portion (31) and a cylindrical portion (32) connected to the disk part (31), and

wherein the disk part (31) is fixed to the support table (20), and the post (11) passes through the disk part (31) and the cylindrical portion (32) in an axial direction of the flange.

10 14. The elastic sealing ring expanding apparatus according to claim 8,
wherein the driving motor (100) is mounted on the base (10) and located below the support table (20).

15

DRAWINGS

1/4

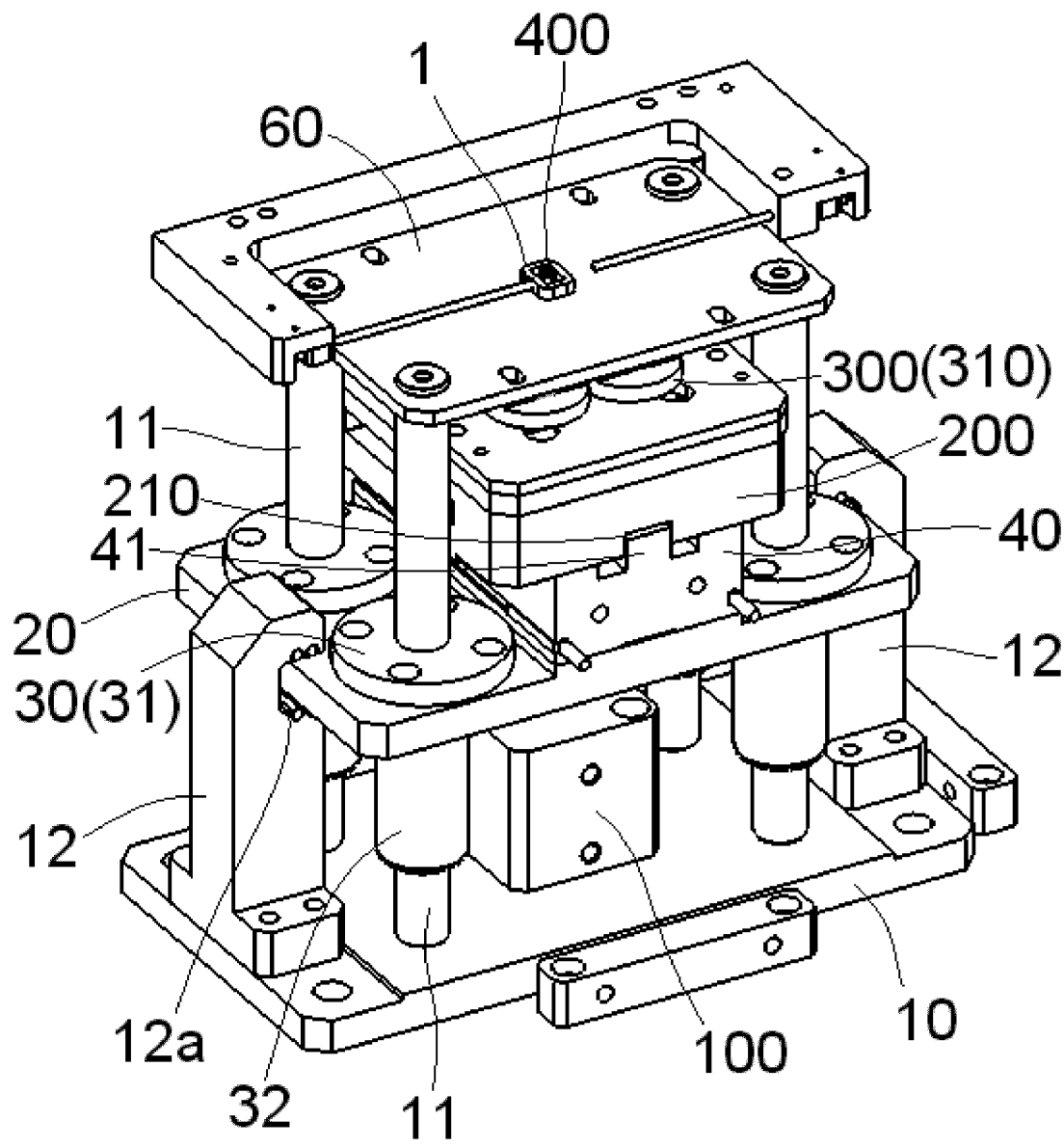


Fig.1

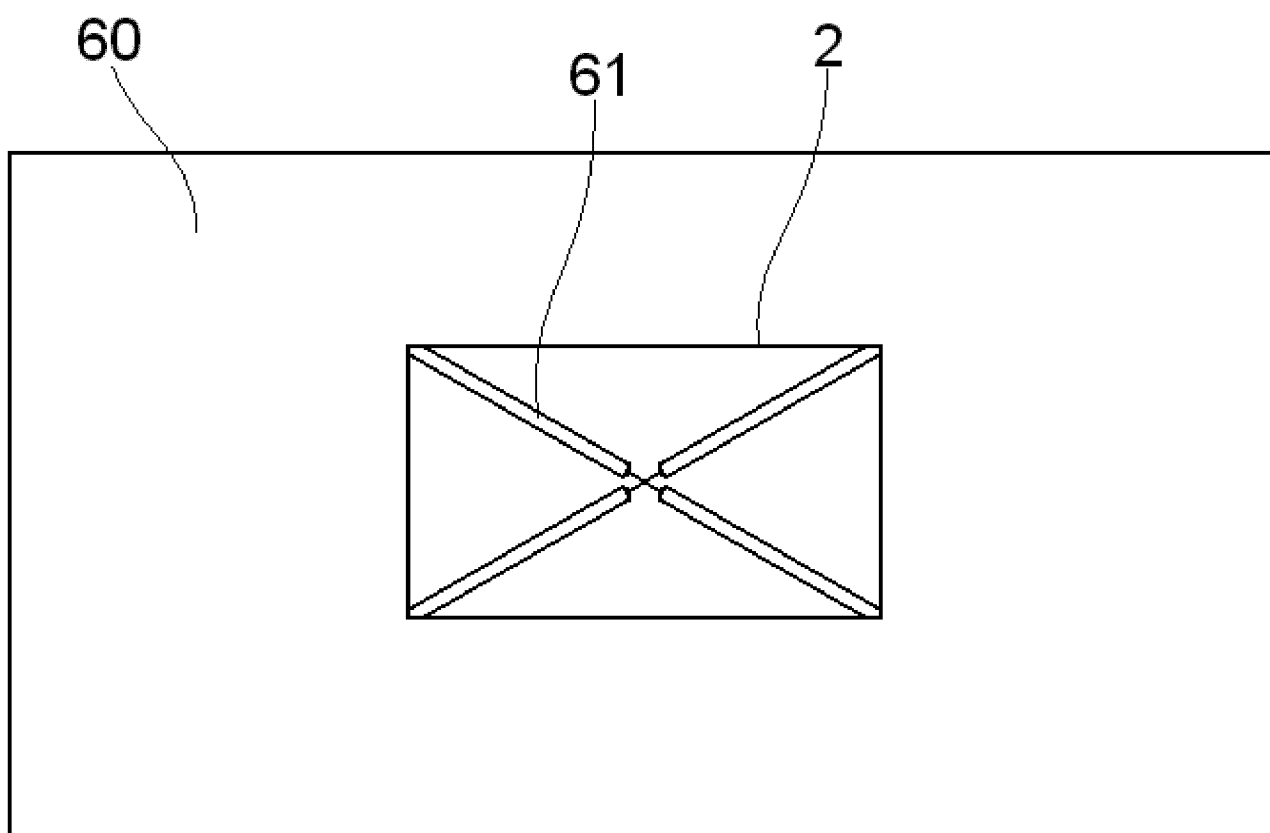


Fig.2

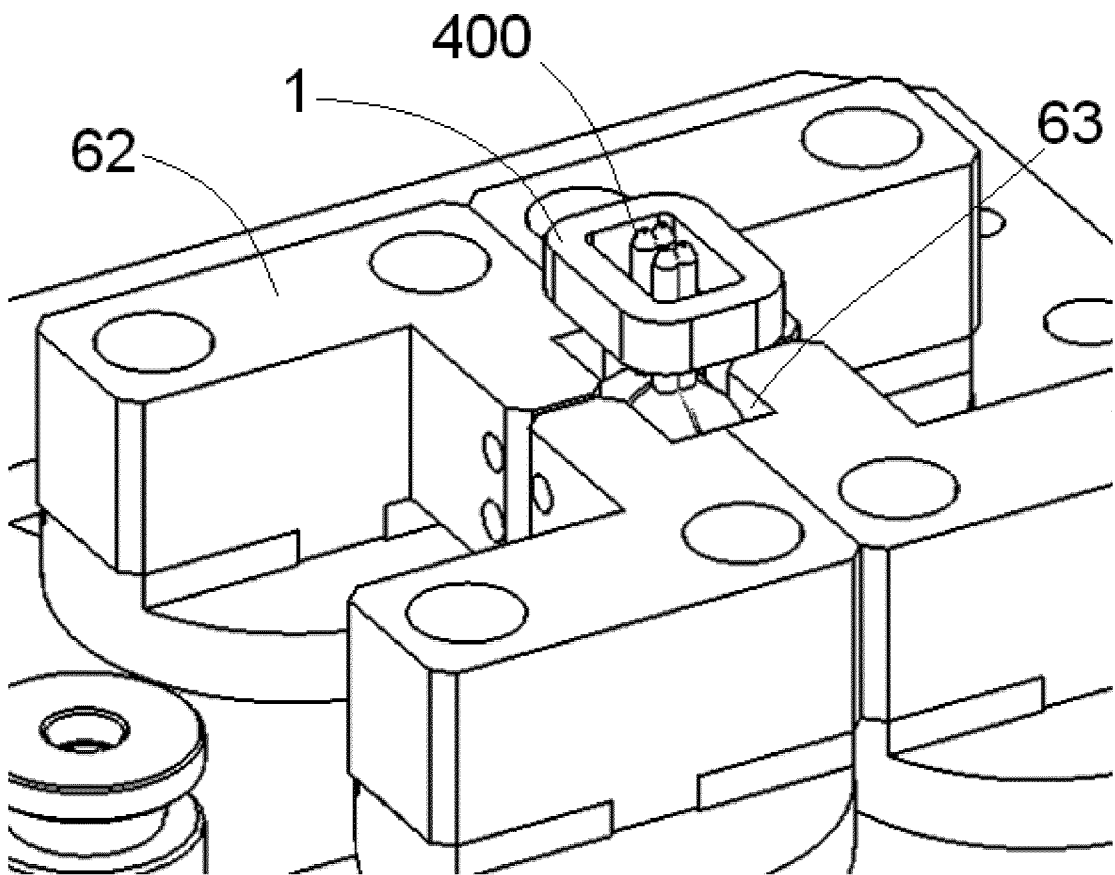


Fig.3

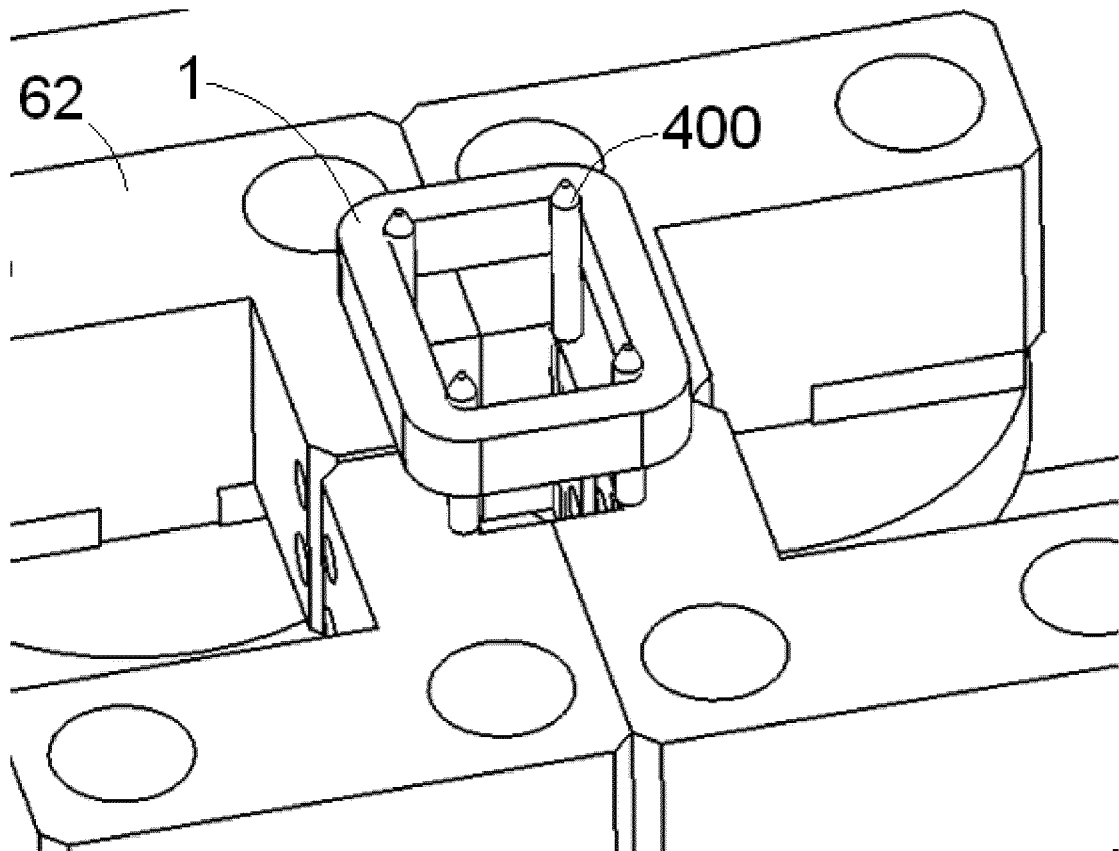


Fig.4

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2018/064872

A. CLASSIFICATION OF SUBJECT MATTER

INV. B25B27/00 B23P19/08
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)

B25B B23P

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	CN 104 162 777 B (KUNSHAN FENGHESHENG PREC MACHINERY CO LTD) 14 September 2016 (2016-09-14)	1-4
A	figures 1,2	5-14
Y	DE 297 07 497 U1 (KLOECKNER MOELLER GMBH [DE]) 20 August 1998 (1998-08-20) page 2, line 15 - page 4, line 16; figures 1-5	1
Y	JP H02 145221 A (FUJII ITSUO) 4 June 1990 (1990-06-04) figures 1-7	1
A	US 2 086 371 A (TEAR HARRY R) 6 July 1937 (1937-07-06) figures 1,4	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/064872

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 104162777	B	14-09-2016	NONE	
DE 29707497	U1	20-08-1998	NONE	
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US 2086371	A	06-07-1937	NONE	