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(54) HIGH-SPEED INTELLIGENT NUMERICAL CONTROL HYDRAULIC CUTTING MACHINE

(57) The present invention relates to a high-speed smart numerical control hydraulic cutting machine, which includes a die cutter fixing plate and a die cutter for cutting an object. A die cutter clamping and limiting device is disposed on the die cutter fixing plate to clamp the die cutter. The die cutter clamping and limiting device includes a clamping assembly and a limiting assembly which are mounted on the die cutter fixing plate of the cutting machine. The clamping assembly includes a left die pressing plate, a right die pressing plate, and pressing cylinders. The left die pressing plate and the right die pressing plate are disposed on the left and right side edges of a lower surface of the die cutter fixing plate respectively. The pressing cylinders are disposed inside the die cutter fixing plate and drive the left die pressing plate and the right die pressing plate respectively to press the die cutter closely against the lower surface of the die cutter fixing plate. The limiting assembly includes front limiting components and rear limiting components located at front and rear side surfaces of the die cutter fixing plate, where the front limiting components perform limiting for the front and rear side surfaces of the die cutter in linkage with the left die pressing plate or the right die pressing plate. The present invention improves the position repeatability and the positioning accuracy for changing die cutter.

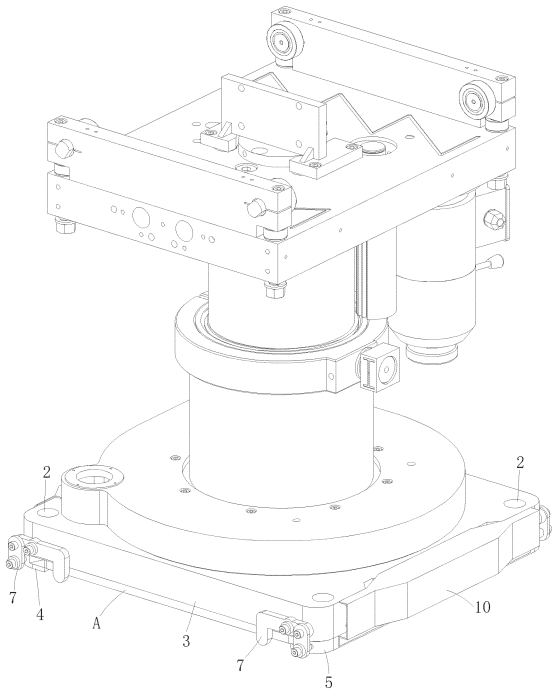

FIG.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to the technical field of cutting machines and in particular to a high-speed smart numerical control hydraulic cutting machine.

BACKGROUND

[0002] The cutting machines requires frequency change of die cutters based on cutting patterns, and the die cutters are usually placed on die cutter plates. For the existing cutting machines, the die cutters are mostly changed manually, which leads to long change time and low efficiency. Furthermore, the position of the changed die cutters has poor repeatability and the size of the cut products is low in accuracy. Although some cutting machines adopt a mechanical device for automatic die cutter change, the mechanical device is complex in structure and the size accuracy of the cut products is still unsatisfactory.

SUMMARY

TECHNICAL PROBLEM

[0003] In order to address the above technical problems, the present invention provides a high-speed smart numerical control hydraulic cutting machine to achieve clamping on a die cutter automatically and change the die cutter automatically. It is simple in structure and can shorten the time for changing the die cutter and noticeably improve the use rate of the cutting machine. Further, the position repeatability and the positioning accuracy of the die cutter are improved, and the size accuracy and stability of the cut products are also increased, so as to satisfy the users.

SOLUTIONS TO THE PROBLEMS AND TECHNICAL SOLUTIONS

[0004] The present invention is achieved by providing a high-speed smart numerical control hydraulic cutting machine, which includes a die cutter fixing plate and a die cutterfor cutting an object. A die cutter clamping and limiting device is disposed on the die cutter fixing plate to clamp the die cutter. The die cutter clamping and limiting device includes a clamping assembly and a limiting assembly which are mounted on the die cutter fixing plate. The clamping assembly includes a left die pressing plate, a right die pressing plate, and pressing cylinders. The left die pressing plate and the right die pressing plate are disposed on the left and right side edges of a lower surface of the die cutter fixing plate respectively. The pressing cylinders are disposed inside the die cutter fixing plate and drive the left die pressing plate and the right die pressing plate respectively to press the die cutter closely against the lower surface of the die cutter fixing plate. The limiting assembly includes front limiting components and rear limiting components located at front and rear side surfaces of the die cutter fixing plate. The front limiting components perform limiting or unlocking for the front and rear side surfaces of the die cutter in linkage with the left die pressing plate or the right die pressing plate. Two pressing cylinders are disposed at the right and left sides of the die cutter fixing plate respectively. The two pressing cylinders act simultaneously to press or release the die cutter. Limiting screws are disposed between the left die pressing plate /the right die pressing plate and the die cutter fixing plate. The limiting screws 2 are used to limit a maximum distance between the left die pressing plate/the right die pressing plate and the die cutter fixing plate.

[0005] Furthermore, the pressing cylinder includes a cylindrical hole, a valve core shaft, an upper piston, a lower piston, an upper air chamber and a lower air chamber, where the cylindrical hole is disposed inside the die cutter fixing plate, and the valve core shaft, the upper piston, the lower piston, the upper air chamber and the lower air chamber are disposed inside the cylindrical hole. The upper piston and the lower piston are disposed on the valve core shaft respectively. The upper air chamber is disposed between the upper piston and the top wall of the cylindrical hole. The lower air chamber is disposed between the upper piston and the lower piston. An upper air pipe connector and a lower air pipe connector are disposed on the die cutter fixing plate respectively. The upper air pipe connector and the lower air pipe connector are in communication with the upper air chamber and the lower air chamber through an upper channel and a lower channel disposed in the die cutter fixing plate.

[0006] Furthermore, a stop washer is disposed on an inner wall of the cylindrical hole to limit a movement position of the lower piston.

[0007] Furthermore, side covers 10 are also disposed on the die cutter fixing plate.

[0008] Furthermore, the rear limiting component includes a limiting block and a fastening bolt. The limiting block limits the movement position of the die cutter, and the fastening bolt fixes the limiting block on a side surface of the die cutter fixing plate.

[0009] Furthermore, the front limiting component includes a first connection bar, a second connection bar, a first rotary shaft, a second rotary shaft, and a third rotary shaft. The first rotary shaft is fixed on the die cutter fixing plate, and the third rotary shaft is fixed on the left die pressing plate or the right die pressing plate. The first rotary shaft is movable disposed in the middle of the first connection bar, and the second rotary shaft movably connects an end of the first connection bar to an end of the second connection bar. A blocking portion is disposed on the other end of the first connection bar to limit the die cutter, and the other end of the second connection bar is movably connected with the third rotary shaft.

[0010] Furthermore, one segment of inclined surface

or arc-shaped surface is disposed on the blocking portion of the first connection bar.

BENEFICIAL EFFECTS OF THE PRESENT INVENTION

[0011] Compared with the prior arts, the high-speed smart numerical control hydraulic cutting machine provided by the present invention includes the die cutter fixing plate and the die cutter for cutting an object. A die cutter clamping and limiting device is disposed on the die cutter fixing plate to clamp the die cutter. The die cutter clamping and limiting device includes the clamping assembly and the limiting assembly which are mounted on the die cutter fixing plate. The clamping assembly presses the die cutter closely against the lower surface of the die cutter fixing plate, and the limiting assembly limits the front and rear side surfaces of the die cutter. Thus, clamping on the die cutter and the change on the die cutter can be automatically achieved. The present invention is simple in structure and can shorten the time for changing the die cutter and noticeably improve the use rate of the cutting machine. Further, the position repeatability and the positioning accuracy of changing the die cutter are improved, and the size accuracy and stability of the cut products are also increased.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a stereoscopic schematic diagram of a die cutter fixing plate and a die cutter clamping and limiting device in an assembled state in a high speed smart numerical control hydraulic cutting machine according to the present invention.

FIG. 2 is a stereoscopic schematic diagram of the die cutter clamping and limiting device in FIG. 1.

FIG. 3 is a stereoscopic schematic diagram of the die cutter clamping and limiting device in FIG. 2 from another perspective, showing M-M section.

FIG. 4 is a stereoscopic schematic diagram of a first connection bar in FIG. 2.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0013] In order to make the technical problems, the technical solutions and the beneficial effects of the present invention clearer and more intelligible, the present invention will be further elaborated in combination with accompanying drawings and specific embodiments. It should be understood that the specific embodiments described herein are used only to explain the present invention rather than limit the present invention.

[0014] By referring to FIGS. 1, 2 and 3, a high-speed smart numerical control hydraulic cutting machine provided by the present invention includes a die cutter fixing plate and a die cutter A for cutting an object. A die cutter clamping and limiting device is disposed on the die cutter fixing plate 3 to clamp the die cutter. The die cutter clamping and limiting device includes a clamping assembly 1 and a limiting assembly which are mounted on the die cutter fixing plate 3.

[0015] The clamping assembly 1 includes a left die pressing plate 4, a right die pressing plate 5, and pressing cylinders 6. The left die pressing plate 4 and the right die pressing plate 5 are disposed on the left and right side edges of a lower surface of the die cutter fixing plate 3 respectively. The pressing cylinders 6 are disposed inside the die cutter fixing plate 3 and located at four corners of the die cutter fixing plate 3 in a manner of left-right and back-front symmetry. The pressing cylinders 6 drive the left die pressing plate 4 and the right die pressing plate 5 respectively to press the die cutter A closely against the lower surface of the die cutter fixing plate 3.

[0016] The limiting assembly includes front limiting components and rear limiting components located at front and rear side surfaces of the die cutter fixing plate 3, where the front limiting components 7 are movable limiting components and the rear limiting components are fixed limiting components. The front limiting components 7 perform limiting or unlocking for the front and rear side surfaces of the die cutter A in linkage with the left die pressing plate 4 or the right die pressing plate 5. As shown in FIGS. 1, 2, and 3, the front limiting components 7 are respectively disposed at the front and rear side surfaces of the die cutter fixing plate 3.

[0017] When the die cutter A is in a clamped state, the left die pressing plate 4 and the right die pressing plate 5 press the die cutter A closely against the lower surface of the die cutter fixing plate 3 along an up-down direction under the drive of the pressing cylinders 6. At this time, the limiting assembly performs limiting for the front and rear side surfaces of the die cutter A. In this way, the position repeatability and positioning accuracy of the die cutter is improved and the size accuracy of the cut products is also improved.

[0018] The limiting assembly acts in the following process: when the left die pressing plate 4 and the right die pressing plate 5 of the clamping assembly 1 press the die cutter A closely against the lower surface of the die cutter fixing plate 3, the front limiting components 7 perform limiting for the front side surface and/or rear side surface of the die cutter A immediately. On the contrary, when the left die pressing plate 4 and the right die pressing plate 5 of the clamping assembly 1 release the up-down press on the die cutter A, the front limiting components 7 release limitation for the front side surface and/or the rear side surface of the die cutter A immediately.

[0019] Two pressing cylinders 6 are disposed at the right and left sides of the die cutter fixing plate 3 respectively. The two pressing cylinders 6 act simultaneously to press or release the die cutter A.

[0020] The pressing cylinder 6 includes a cylindrical hole 61, a valve core shaft 62, an upper piston 63, a lower piston 64, an upper air chamber 65 and a lower air chamber 66, where the cylindrical hole 61 is disposed inside the die cutter fixing plate 3 and the valve core shaft 62, the upper piston 63, the lower piston 64, the upper air chamber 65 and the lower air chamber 66 are disposed inside the cylindrical hole 61. The upper piston 63 and the lower piston 64 are disposed on the valve core shaft 62 respectively. The upper air chamber 65 is disposed between the upper piston 63 and the top wall of the cylindrical hole 61. The lower air chamber 66 is disposed between the upper piston 63 and the lower piston 64. An upper air pipe connector 8 and a lower air pipe connector 9 are disposed on the die cutter fixing plate 3 respectively. The upper air pipe connector 8 and the lower air pipe connector 9 are in communication with the upper air chamber 65 and the lower air chamber 66 through an upper channel 67 and a lower channel 68 disposed in the die cutter fixing plate 3.

[0021] In the present invention, the pressing cylinders 6 are directly made inside the die cutter fixing plate 3, which simplifies the structure of the die cutter clamping and limiting device, reduces the weight of the die cutter fixing plate 3 and improves its stability.

[0022] The pressing cylinders 6 act in the following process: when high pressure air is introduced into the upper air chamber 65 via the upper air pipe connector 8, the lower air chamber 66 recovers air via the lower air pipe connector 9, and then the valve core shaft 62 is driven to move down together with the upper piston 63 and the lower piston 64 disposed thereon, and then the valve core shaft 62 pushes open the left die pressing plate 4 or the right die pressing plate 5, thereby unlocking the die cutter A. When high pressure air is introduced into the lower air chamber 66 via the lower air pipe connector 9, the upper air chamber 65 recovers air via the upper air pipe connector 8, and then the valve core shaft 62 is driven to move up for resetting together with the upper piston 63 and the lower piston 64 disposed thereon, and then the valve core shaft 62 drives the left die pressing plate 4 or the right die pressing plate 5 closely against the die cutter A.

[0023] A stop washer 69 is disposed on an inner wall of the cylindrical hole 61 to limit a movement position of the lower piston 64, so as to limit a movement position of the valve core shaft 62, thereby limiting a telescoping height of the pressing cylinder 6.

[0024] The rear limiting component includes a limiting block and a fastening bolt (not shown). The limiting block limits the movement position of the die cutter A, and the fastening bolt fixes the limiting block on a side surface of the die cutter fixing plate 3.

[0025] The front limiting component 7 includes a first connection bar71, a second connection bar 72, a first rotary shaft 73, a second rotary shaft 74, and a third rotary shaft 75. The first rotary shaft 73 is fixed on the die cutter fixing plate 3, and the third rotary shaft 75 is fixed on the left die pressing plate 4 or the right die pressing plate 5. The first rotary shaft 73 is movable disposed in the middle of the first connection bar 71, and the second rotary shaft 74 movably connects an end of the first connection bar 71 to an end of the second connection bar 72. A blocking portion 76 is disposed on the other end of the first connection bar 71 to limit the die cutter A, and the other end of the second connection bar 72 is movably connected with the third rotary shaft 75.

[0026] As shown in FIG. 4, one segment of inclined surface or arc-shaped surface 77 is disposed on the blocking portion 76 of the first connection bar 71 , and thus it is convenient to push the die cutter A back to a correct limiting position when the first connection bar 71 performs limiting for the die cutter A.

[0027] The front limiting component 7 acts in the following process: when the pressing cylinders 6 drive the left die pressing plate 4 or the right die pressing plate 5 to move down, the third rotary shaft 75 and the second connection bar 72 move down accordingly, and the second connection bar 72 also drives, via the second rotary shaft 74, an end of the first connection bar 71 to move down. Thus, the first connection bar 71 rotates around the first rotary shaft 73, so as to lift up the other end of the first connection bar 71, thus releasing the limited die cutter A. When the pressing cylinders 6 drive the left die pressing plate 4 or the right die pressing plate 5 to move up, the third rotary shaft 75 and the second connection bar 72 move up accordingly, and the second connection bar 72 drives, via the second rotary shaft 74, an end of the first connection bar 71 to move up. Thus, the first connection bar 71 rotates around the first rotary shaft 73, so as to lower the other end of the first connection bar 71, thus limiting the die cutter A.

[0028] Limiting screws 2 are disposed between the left die pressing plate 4/the right die pressing plate 5 and the die cutter fixing plate 3. The limiting screws 2 are used to adjust and limit a maximum distance between the left die pressing plate 4/the right die pressing plate 5 and the die cutter fixing plate 3.

[0029] With the clamping and limiting device of the present invention, the die cutter A can be quickly limited and clamped, thus achieving quick change of the die cutter A. Further, good position repeatability and high positioning accuracy are ensured.

[0030] Side covers 10 are also disposed on the die cutter fixing plate 3 to cover the upper air pipe connector 8 and the lower air pipe connector 9.

[0031] The above descriptions are made only to preferred embodiments of the present invention rather than limit the present invention. Any modifications, equivalent substitutions and improvements etc. made within the spirit and principle of the present invention all shall be incorporated into the scope of protection of the present invention.

Claims

1. A high-speed smart numerical control hydraulic cutting machine, comprising a die cutter fixing plate and a die cutterfor cutting an object, wherein a die cutter clamping and limiting device is disposed on the die cutter fixing plate to clamp the die cutter, the die cutter clamping and limiting device comprises a clamping assembly and a limiting assembly which are mounted on the die cutter fixing plate, the clamping assembly comprises a left die pressing plate, a right die pressing plate, and pressing cylinders, the left die pressing plate and the right die pressing plate are disposed on the left and right side edges of a lower surface of the die cutter fixing plate respectively, the pressing cylinders are disposed inside the die cutter fixing plate and drive the left die pressing plate and the right die pressing plate respectively to press the die cutter closely against the lower surface of the die cutter fixing plate, the limiting assembly comprises front limiting components and rear limiting components located at front and rear side surfaces of the die cutter fixing plate, the front limiting components perform limiting or unlocking for the front and rear side surfaces of the die cutter in linkage with the left die pressing plate or the right die pressing plate, two pressing cylinders are disposed at the right and left sides of the die cutter fixing plate respectively, the two pressing cylinders act simultaneously to press or release the die cutter, limiting screws are disposed between the left die pressing plate/the right die pressing plate and the die cutter fixing plate, and the limiting screws are used respectively to limit a maximum distance between the left die pressing plate/the right die pressing plate and the die cutter fixing plate.

2. The high-speed smart numerical control hydraulic cutting machine of claim 1, wherein the pressing cylinder comprises a cylindrical hole, a valve core shaft, an upper piston, a lower piston, an upper air chamber and a lower air chamber, the cylindrical hole is disposed inside the die cutter fixing plate, and the valve core shaft, the upper piston, the lower piston, the upper air chamber and the lower air chamber are disposed inside the cylindrical hole, the upper piston and the lower piston are disposed on the valve core shaft respectively, the upper air chamber is disposed between the upper piston and the top wall of the cylindrical hole, the lower air chamber is disposed between the upper piston and the lower piston, an upper air pipe connector and a lower air pipe connector are disposed on the die cutter fixing plate respectively, and the upper air pipe connector and the lower air pipe connector are in communication with the upper air chamber and the lower air chamber through an upper channel and a lower channel disposed in the die cutter fixing plate.

3. The high-speed smart numerical control hydraulic cutting machine of claim 2, wherein a stop washer is disposed on an inner wall of the cylindrical hole to limit a movement position of the lower piston.

4. The high-speed smart numerical control hydraulic cutting machine of claim 2, wherein side covers are further disposed on the die cutter fixing plate.

5. The high-speed smart numerical control hydraulic cutting machine of claim 1, wherein the rear limiting component comprises a limiting block and a fastening bolt, the limiting block limits the movement position of the die cutter, and the fastening bolt fixes the limiting block on a side surface of the die cutter fixing plate.

6. The high-speed smart numerical control hydraulic cutting machine of claim 1, wherein the front limiting component comprises a first connection bar, a second connection bar, a first rotary shaft, a second rotary shaft, and a third rotary shaft, the first rotary shaft is fixed on the die cutter fixing plate, the third rotary shaft is fixed on the left die pressing plate or the right die pressing plate, the first rotary shaft is movable disposed in the middle of the first connection bar, the second rotary shaft movably connects an end of the first connection bar to an end of the second connection bar, a blocking portion is disposed on the other end of the first connection bar to limit the die cutter, and the other end of the second connection bar is movably connected with the third rotary shaft.

7. The high-speed smart numerical control hydraulic cutting machine of claim 6, wherein one segment of inclined surface or arc-shaped surface is disposed on the blocking portion of the first connection bar.

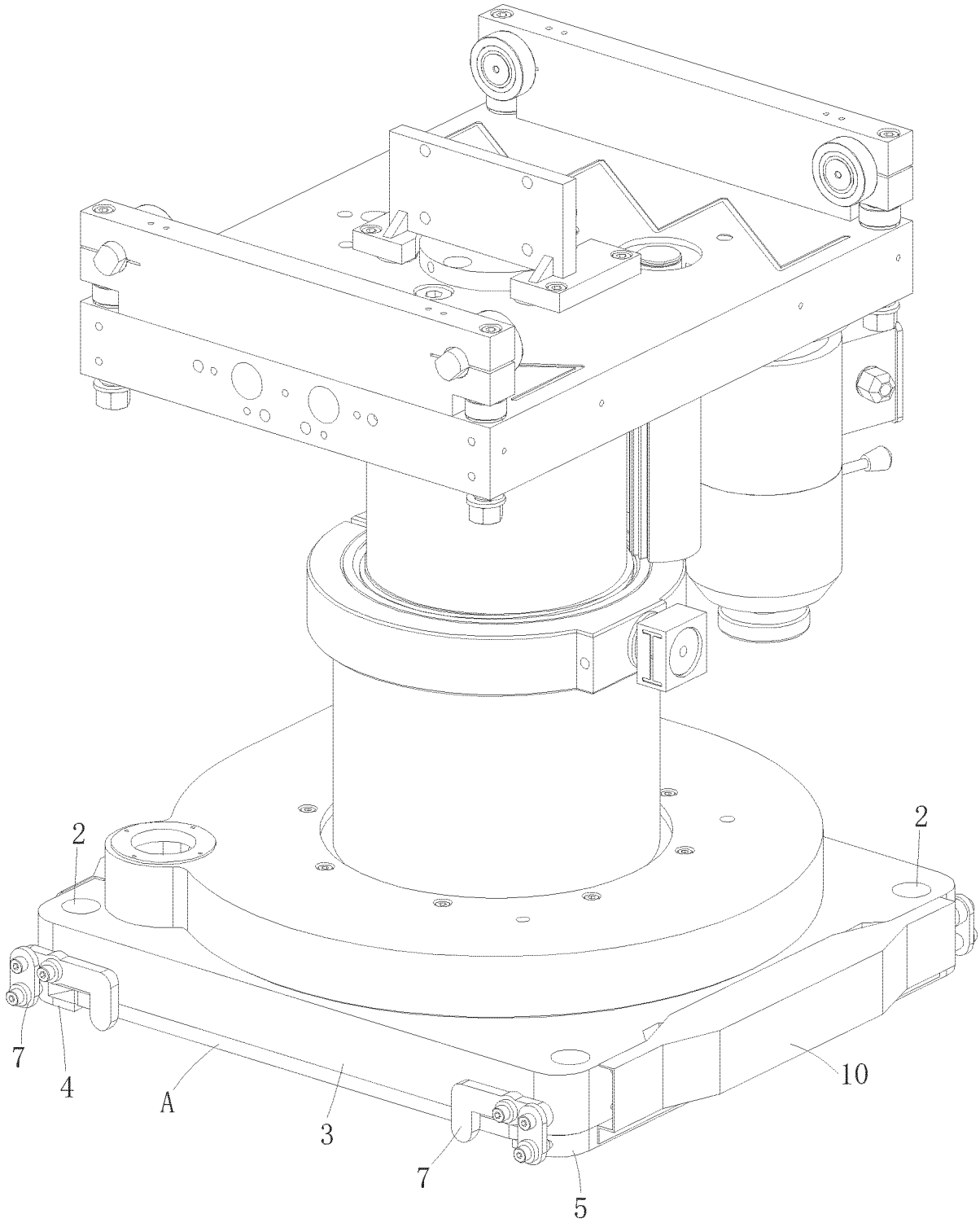

FIG.1

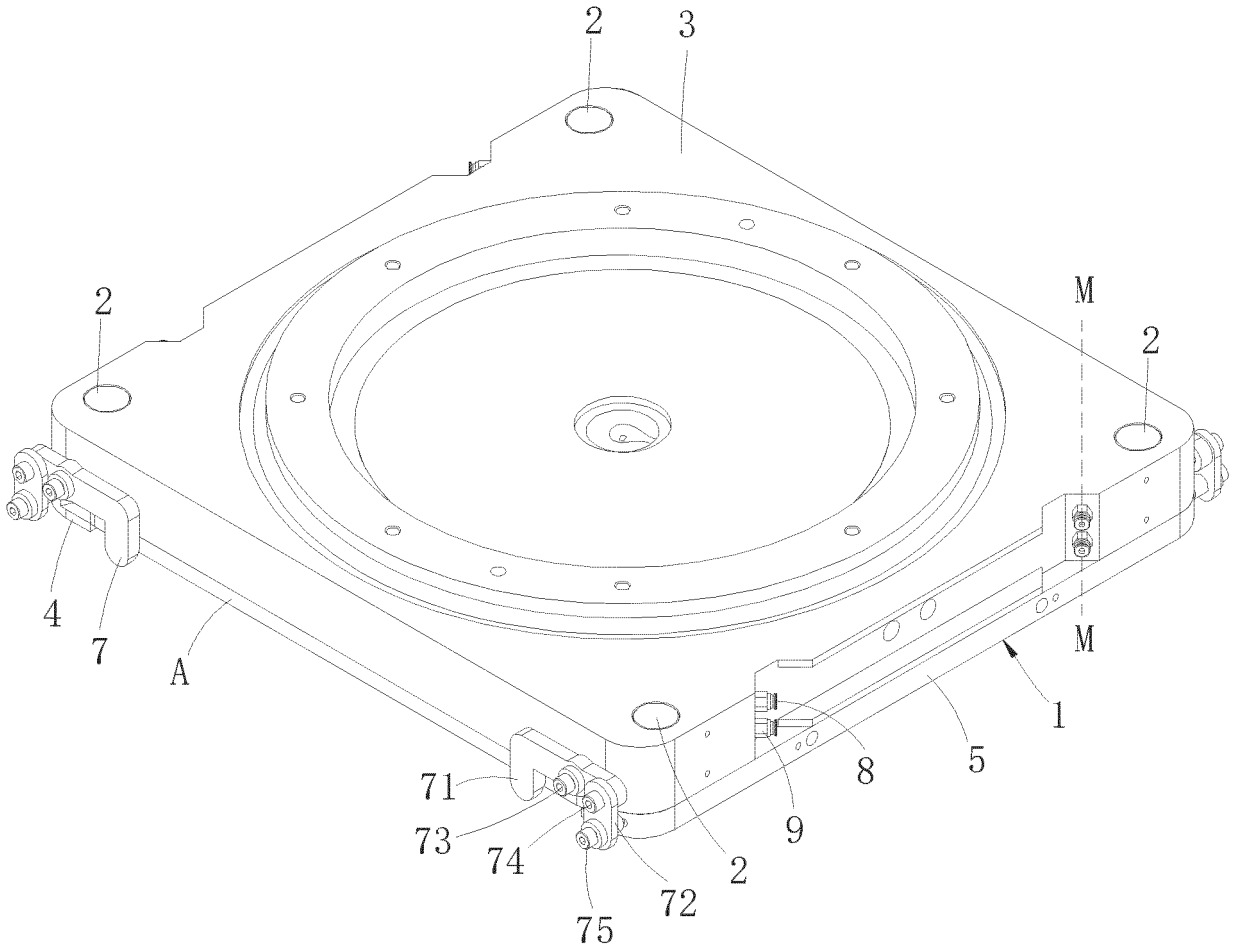

FIG.2

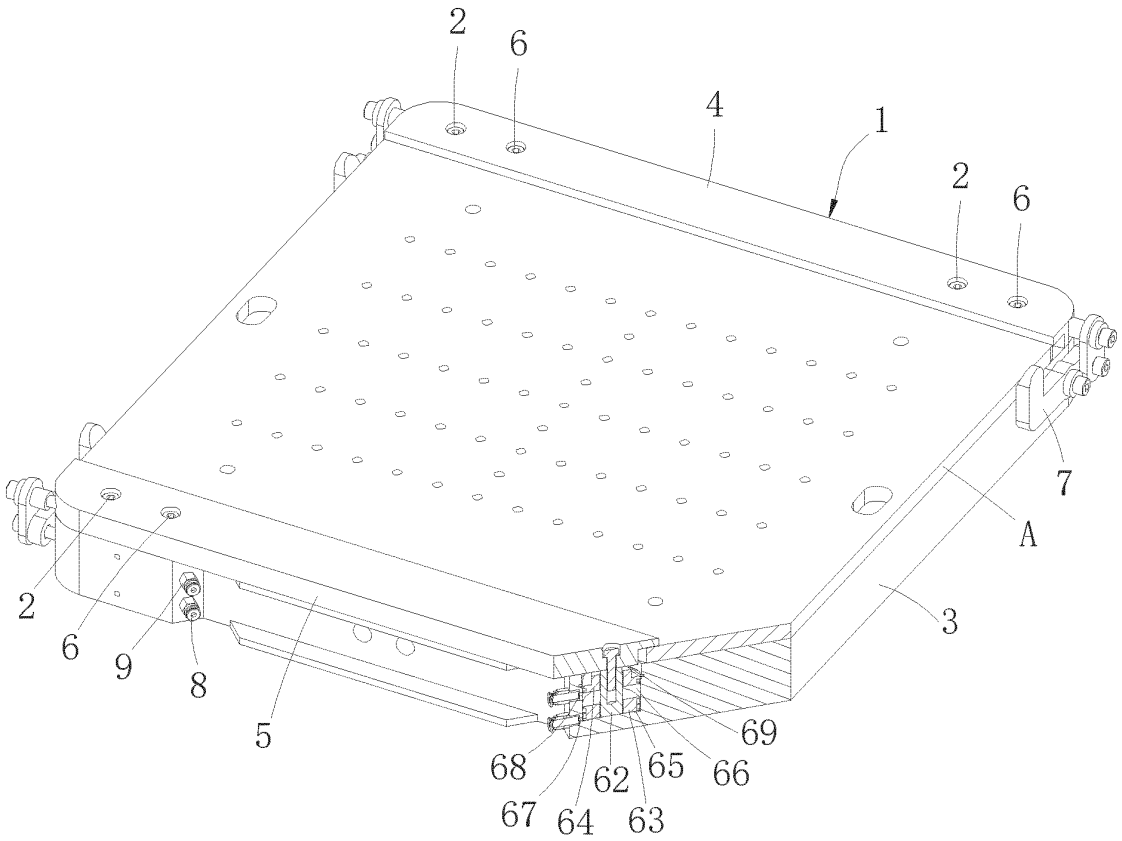

FIG.3

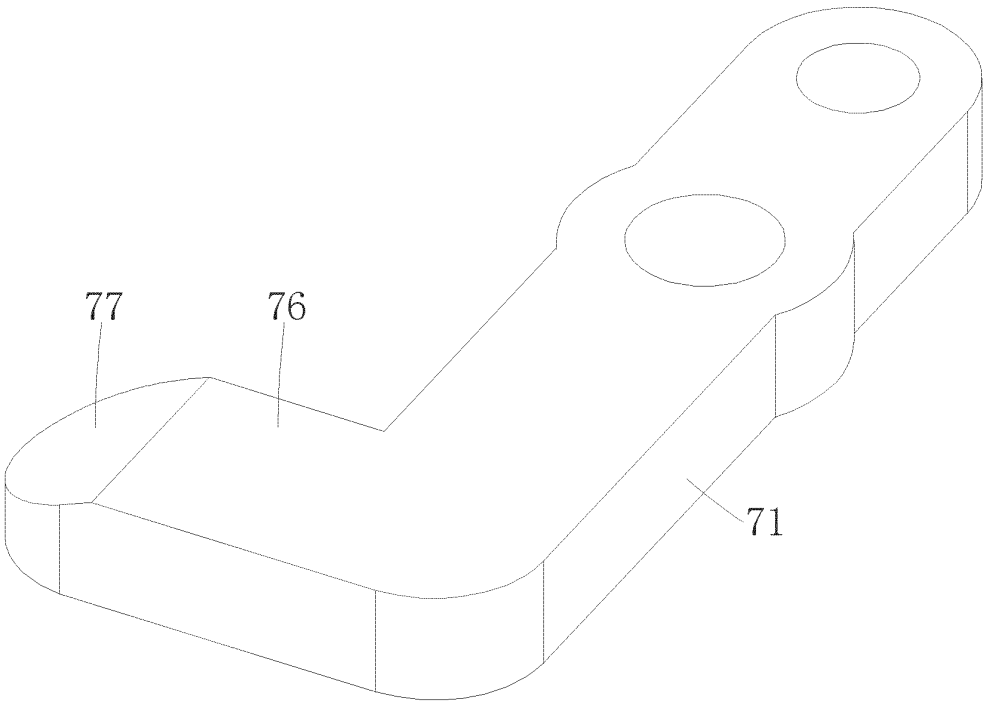

FIG.4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/138069

A. CLASSIFICATION OF SUBJECT MATTER

B26D 7/26(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)

B26D,B26F,B23B,B21D

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)

CNTXT, CNKI, VEN: 裁断机, 刀模, 夹紧, 限位, 气缸, 压模板, punch+, cutting w die, mold, fix+, limit+, cylinder

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 113172694 A (QUZHOU TAIWEI MACHINERY IND CO., LTD.) 27 July 2021 (2021-07-27) claims 1-7	1-7
PX	CN 113134863 A (QUZHOU TAIWEI MACHINERY IND CO., LTD.) 20 July 2021 (2021-07-20) description, paragraphs 34-49 and figures 10-13	1-7
PX	CN 113510784 A (QUZHOU TAIWEI MACHINERY INDUSTRY CO., LTD.) 19 October 2021 (2021-10-19) description, paragraphs 17-34 and figures 1-4	1-7
X	CN 106734503 A (YANCHENG HUASEN MACHINERY CO., LTD.) 31 May 2017 (2017-05-31) description, paragraphs 23-32 and figures 1-6	1, 5-7
Y	CN 106734503 A (YANCHENG HUASEN MACHINERY CO., LTD.) 31 May 2017 (2017-05-31) description, paragraphs 23-32 and figures 1-6	2-4
Y	CN 1171993 A (YANG WEIXIONG et al.) 04 February 1998 (1998-02-04) description, page 2, and figure 1	2-4

☑ 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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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 February 2022	**01 March 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/138069

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 108466323 A (YANCHENG YUZHENG PREC MACH CO., LTD.) 31 August 2018 (2018-08-31) entire document	1-7
A	CN 105216058 A (YANCHENG HUASEN MACHINERY CO., LTD.) 06 January 2016 (2016-01-06) entire document	1-7
A	JP 1071598 A (ADACHI, D.) 17 March 1998 (1998-03-17) entire document	1-7

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/138069

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CN 113172694 A	27 July 2021	None	
CN 113134863 A	20 July 2021	None	
CN 113510784 A	19 October 2021	None	
CN 106734503 A	31 May 2017	None	
CN 1171993 A	04 February 1998	None	
CN 206287240 U	30 June 2017	None	
CN 108466323 A	31 August 2018	None	
CN 105216058 A	06 January 2016	None	
JP 1071598 A	17 March 1998	None	

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