

CLAMP APPARATUS

This application claims priority to Chinese Patent Application No. 202322983269.3, titled "FIXTURE DEVICE", filed on November 6, 2023 with the China National Intellectual
5 Property Administration, which is incorporated herein by reference in its entirety.

FIELD

[0001] The present application relates to the technical field of plastic bottle production, and in particular to a fixture device.

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BACKGROUND

[0002] The continuous plastic bottle production is to achieve the manufacture of a continuous product chain by opening and closing repeatedly a single set of mold during the production process of plastic bottles. The product chain is a combination chain of plastic
15 bottles made by the bottle-making machine and the waste area. The mold is closed to clamp the hot-melt plastic hollow film bubble so as to produce a bottle, and is opened for manufacture a next plastic bottle in the chain after the plastic bottle is formed.

[0003] A fixture for continuous production is disclosed in the Chinese patent application publication No. CN215661323U, including a fixed frame, a lifting mechanism provided on
20 the fixed frame to drive a fixing plate to ascend and descend, a horizontal driving connected to the fixing plate, and a horizontal moving mechanism drivingly connected to the two ends of the horizontal driving mechanism, a fixed fixture connected to the horizontal moving mechanism. The horizontal moving mechanism is slidably connected to the fixing plate, and is drivingly connected to a rotary shaft connected to a rotary fixture. Since the fixture
25 functions to center the parison, the hot parison in contact with the fixture will be pressed and shaped, but this part of the material is waste. Thus, the smaller the stroke of the clamped parison in contact state, the smaller the waste of material. However, the stroke of the parison clamped by the rotary fixture is long, resulting in waste of a lot of plastic materials during continuous operation of equipment. As a result, the production cost is increased.

[0004] Thus, it is desired for those skilled in the art to solve the problem of how to reduce
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waste of plastic materials at present.

SUMMARY

[0005] An object of the present application is to provide a fixture device, which can solve the problem of waste of plastic materials occurred in the conventional technology.

[0006] To achieve the above object, there is provided a fixture device, including a fixed frame, and a lifting mechanism provided on the fixed frame and configured to drive a first fixed plate and a second fixed plate to move up or down. Two mold driving plates are provided on the second fixed plate and are movable relative to each other. The first fixed plate is slidably provided on two guide rails that are movable vertically. Horizontal moving mechanisms are provided on the first fixed plate in such a manner as to be slidable horizontally. Two first fixtures are provided on tops of the respective horizontal moving mechanisms and extend into a mold to clamp a molded product chain. The fixture device further includes:

[0007] a first guide seat and a second guide seat spaced apart and provided on the second fixed plate;

[0008] two guide rods provided on the first guide seat and the second guide seat in such a manner as to be slidable horizontally;

[0009] two first connecting seats being slidable on the two respective guide rods;

[0010] two second connecting seats fixedly provided on the two respective guide rods, wherein the first connecting seats and the second connecting seats are both located between the first guide seat and the second guide seat;

[0011] a second fixture located above the first fixture and including a first clamping plate and a second clamping plate, wherein the first clamping plate is fixedly provided at bottom ends of the two first connecting seats, and the second clamping plate is fixedly provided at bottom ends of the two second connecting seats; and

[0012] a drive assembly connecting the first clamping plate and the second clamping plate, and configured to move the first clamping plate and the second clamping plate towards or away from each other synchronously to achieve closing or opening of the second fixture.

[0013] In an embodiment, the drive assembly includes a parallel opening-closing piston cylinder and a connecting plate. The connecting plate is configured to connect the two guide rods. The parallel opening-closing piston cylinder is fixedly provided on the first guide seat, and has a first end connected to the connecting plate and a second end connected to the first clamping plate. The first end and the second end of the parallel opening-closing piston cylinder are extendable or retractable synchronously.

[0014] In an embodiment, two left and right guide engaging plates are further included. The two guide engaging plates are fixedly connected to the respective mold driving plates, and are slidably connected to ends of the first guide seat and the second guide seat facing away from the second fixed plate.

[0015] In an embodiment, a central axis of the first fixture and a central axis of the second fixture are located in the same straight line.

[0016] In an embodiment, an end of the first clamping plate away from the first connecting seats and an end of the second clamping plate away from the second connecting seats are each provided with a clamping surface for clamping a product chain. The clamping surface has a width of 1mm to 10mm.

[0017] In an embodiment, each of the first clamping plate and the second clamping plate is provided with a cooling medium channel.

[0018] In an embodiment, a cooling piece is provided at a lower end of the first fixture. The cooling pieces are provided with grooves on sides thereof facing each other.

[0019] In an embodiment, a first driving component is further included. Both ends of the first driving component are drivingly connected to the horizontal moving mechanisms, respectively.

[0020] In an embodiment, the two guide rods are provided in parallel.

[0021] In an embodiment, the first connecting seats are provided closer to the parallel opening-closing piston cylinder than the second connecting seats.

[0022] Compared with the above background technology, the present application provides a fixture device, in which a lifting mechanism is provided on a fixed frame and is configured to drive a first fixed plate and a second fixed plate to move up or down. Two mold driving plates are provided on the second fixed plate and are movable relative to each other. The first fixed

plate is slidably provided on two guide rails that are movable vertically. Horizontal moving mechanisms are provided on the first fixed plate in such a manner as to be slidable horizontally. Two first fixtures are provided on tops of the respective horizontal moving mechanisms. the first guide seat and the second guide seat are spaced apart on the mold driving plate, and the first guide seat and the second guide seat are arranged on the second fixed plate to keep the fixed relative position. The two guide rods are arranged on the first guide seat and the second guide seat in such a manner as to be slidable horizontally. The two first connecting seats are slidable on the two respective guide rods. The two second connecting seats are fixedly provided on the two respective guide rods. The first connecting seats and the second connecting seats are both located between the first guide seat and the second guide seat. The second fixture includes the first clamping plate fixedly provided at bottom ends of the two first connecting seats and the second clamping plate fixedly provided at bottom ends of the two second connecting seats. The drive assembly connects the first clamping plate and the second clamping plate, and is configured to move the first clamping plate and the second clamping plate towards or away from each other synchronously to achieve closing or opening of the second fixture.

[0023] It can be seen that the fixture device has the following advantageous. During the operation of the equipment, the clamping processes of the two first fixtures and the two second fixtures are independent of each other, and the first fixture located below the second fixture can be extended to the inside of the mold according to the change of the height of the mold to hold the molded product chain. In this way, the material utilization rate can be greatly improved. And, the first and second clamping plates can be driven by the drive assembly to synchronously move towards or away from each other, so as to realize the opening or closing of the second fixture, shortening the stroke of the second fixture, and thus reducing the waste of plastic materials and the production cost.

[0024] Further, the cooling pieces are provided at the lower end of the first fixtures, and are provided with grooves on the sides facing each other, so as to facilitate the cooling of the waste edges generated on both sides of the product chain during the molding process, improving the stability of the operation of the equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] In order to more clearly illustrate the technical solutions in the embodiments of the present application or in the conventional technology, the following will briefly introduce drawings required in the description of the embodiments or the conventional technology. Apparently, the drawings in the following description are only for illustrative purpose for the
5 embodiments. For those skilled in the art, other drawings can also be obtained based on these drawings without creative efforts.

[0026] FIG. 1 is a front view of a fixture device according to an embodiment of the present application;

[0027] FIG. 2 is a perspective view of a fixture device according to an embodiment of the
10 present application;

[0028] FIG. 3 is a rear view of a fixture device according to an embodiment of the present application;

[0029] FIG. 4 is a schematic view of a parallel opening-closing piston cylinder according to an embodiment of the present application;

[0030] FIG. 5 is a sectional view of FIG. 4; and
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[0031] FIG. 6 is a schematic view of a first fixture structure according to an embodiment of the present application.

[0032] The reference signs in the drawings:

1- fixed frame,	2- lifting mechanism,
20 3- mold driving plate,	4- horizontal moving mechanism,
5- first fixture,	6- first guide seat,
7- guide rod,	8- second fixture,
9- parallel opening-closing piston cylinder;	11- first fixed plate,
12- second fixed plate;	41- first driving component;
25 51- cooling piece,	52- groove;
61- second guide seat,	62- guide engaging plate;
71- first connecting seat,	72- second connecting seat;

81- first clamping plate,

82- second clamping plate,

83- cooling medium channel;

91- connecting plate.

DETAILED DESCRIPTION OF EMBODIMENTS

5 **[0033]** Hereinafter, the technical solutions in embodiments of the present application will be clearly and comprehensively described with reference to the accompanying drawings illustrating the embodiments. Apparently, the described embodiments are only part of the embodiments of the present application, not all of the embodiments of the present application. Any other embodiment obtained by those skilled in the art based on the embodiments in the
10 present application without creative efforts shall fall within the protection scope of the present application.

[0034] The invention will be further described in detail with reference to the accompanying drawings and embodiments to enable those skilled in the art to better understand the invention.

15 **[0035]** Referring to FIGS. 1 to 4, there is provided a fixture device, including a fixed frame 1, and a lifting mechanism 2 provided on the fixed frame 1 and configured to drive a first fixed plate 11 and a second fixed plate 12 to move up and down. Two mold driving plates 3 are provided on the second fixed plate 12 and are movable relative to each other. The first fixed plate 11 is slidably provided on two guide rails that are movable vertically up and down,
20 so that the first fixed plate 11 can vertically slide in the longitudinal extension direction of the guide rails. Two horizontal moving mechanisms 4 are provided on the first fixed plate 11 in such a manner as to be slidable horizontally. Specifically, the two horizontal moving mechanisms 4 are provided on the first fixed plate 11 in such a manner as to be slidable left and right. Two first fixtures 5 are provided on the tops of the respective horizontal moving
25 mechanisms 4.

[0036] The fixture device further includes a first guide seat 6 and a second guide seat 61 spaced apart. The first guide seat 6 and the second guide seat 61 may be fixedly provided on the second fixed plate 12. Specifically, the first guide seat 6 is located at the left side of the second guide seat 61. Two guide rods 7 are provided on the first guide seat 6 and the second
30 guide seat 61 in such a manner as to be slidable horizontally. First connecting seats 71 are

slidably provided on the two guide rods 7, and second connecting seats 72 are fixedly provided on the two guide rods 7. Both the first connecting seats 71 and the second connecting seats 72 are located between the first guide seat 6 and the second guide seat 61. A second fixture 8 includes a first plate 81 and a second plate 82. The first plate 81 is fixedly provided at the bottom end of the two first connecting seats 71, and the second plate 82 is fixedly provided at the bottom end of the two second connecting seats 72. The first plate 81 and the second plate 82 are connected to a drive assembly, which can drive the first plate 81 and the second plate 82 to move towards or away from each other to realize opening or closing of the second fixture 8.

[0037] In use of the fixture device according to the present application, the lifting mechanism 2 controls the first fixed plate 11 and the second fixed plate 12 to move up or down, thereby adjusting the height of the first fixture 5 and the second fixture 8. The horizontal moving mechanisms 4 at both ends drive the first fixtures 5 to move towards or away from each other. Under driving of a drive assembly, the first clamping plate 81 and the second clamping plate 82 are moved synchronously towards or away from each other. Cooperation of the first fixtures 5 and the second fixture 8 can realize the function of clamping the product chain. As can be seen, different driving components are adopted to move the first fixtures 5 and the second fixture 8 respectively, that is, the two movement processes are independent of each other. Furthermore, instead of the rotary fixture in the conventional technology, the second fixture 8 in the present application moves linearly, shortening the stroke. Thus, the utilization rate of plastic materials is improved, and the production costs are reduced.

[0038] In a further embodiment, the drive assembly includes a parallel opening-closing piston cylinder 9 and connecting plates 91. The connecting plates 91 are configured to connect two guide rods 7. The fore ends and the tail ends of the two guide rods 7 are connected by the connecting plates 91 respectively, so that the two guide rods 7 are connected to each other at the head ends and the tail ends. The parallel opening-closing piston cylinder 9 is fixedly provided on the first guide seat 6. The first end of the parallel opening-closing piston cylinder 9 is connected to the connecting plate 91 close to the parallel opening-closing piston cylinder 9, and the second end of the parallel opening-closing piston cylinder 9 is connected to a first clamping plate 81. The first end and the second end of the parallel opening-closing piston cylinder 9 are extended or retracted synchronously.

[0039] In this application, the first and second ends of the parallel opening-closing piston cylinder 9 are extended or retracted synchronously. When the first and second ends of the parallel opening-closing piston cylinder 9 in the present application are extended, the first end of the parallel opening-closing piston cylinder 9 drives the connecting plate 91 to move away from the parallel opening-closing piston cylinder 9, and enables the second connecting seats 72 to move in the direction close to the parallel opening-closing piston cylinder 9 since the second connecting seats 72 are fixedly provided on the two guide rods 7 and the second clamping plate 82 is fixedly provided on the bottom end of the second connecting seats 72; and the second end of the parallel opening-closing piston cylinder 9 enables the first clamping plate 81 to move in the direction far away from the parallel opening-closing piston cylinder 9 since the first connecting seats 71 are slidably provided on the two guide rods 7 and the second end of the parallel opening-closing piston cylinder 9 is connected to the first clamping plate 81. That is, by extending the first and second ends of the parallel opening-closing piston cylinder 9, the first and second clamping plates 81 and 82 are moved towards each other, thereby closing the second fixture 8. In contrast, when the first and second ends of the parallel opening-closing piston cylinder 9 are retracted, the first and second clamping plates 81 and 82 are moved away from each other, thereby opening the second fixture 8.

[0040] The fixture device further includes two guide engaging plates 62. The two guide engaging plates 62 are fixedly connected to the respective mold driving plates 3, and are slidably connected to the ends of the first and second guide seats 6 and 61 facing away from the second fixed plate 12, respectively. When the two mold driving plates 3 are moved relative to each other, the two guide engaging plates 62 can be driven to move close to or far away from each other. During the movement of the two guide engaging plates 62, the two guide engaging plates 62 slide relative to the first and second guide seats 6 and 61 because the first and second guide seats 6 and 61 always remain stationary. Thus, it can realize the sliding positioning between the two guide plates 62 and the first and second guide seats 6 and 61, so as to avoid the ends of the cantilevered first and second guide seats 6 and 61 from upwarping or sagging, and ensuring that the first and second guide seats 6 and 61 are kept parallel to the mold.

[0041] The parallel opening-closing piston cylinder 9 is also used in the conventional technology, and thus will not be described herein in details. Preferably, in the present application, the parallel opening-closing piston cylinder 9 may be replaced by a parallel

opening-closing gas claw.

[0042] In a further embodiment, the central axis of the first fixtures 5 and the central axis of the second fixture 8 are the same straight line. The end of the first clamping plate 81 facing away from the first connecting seats 71 and the end of the second clamping plate 82 facing away from the second connecting seats 72 are each provided with a clamping surface for clamping the product chain. The width of the clamping surface is in the range of 1mm to 10mm, preferably 3mm. As such, compared with the size of 12mm in the conventional technology, it can reduce the clamping area and thus reduce waste of material.

[0043] The first and second clamping plates 81 and 82 are each provided with a cooling medium channel 83. The end of the first clamping plate 81 facing away from the first connecting seats 71 and the end of the second clamping plate 82 facing away from the second connecting seats 72 both have the clamping surfaces with small sizes, i.e., reducing the contact area during clamping. The cooling medium channels 83 provided in the first and second clamping plates 81 and 82 are used for the flow and cooling of the hot-melt film bubbles.

[0044] In a further embodiment, the lifting mechanism 2 includes two parallel lead screws, each of which is driven by a motor. The lead screws pass through the first and second fixed plates 11 and 12 and are threadedly connected with the first and second fixed plates 11 and 12. In this way, the lead screws are driven to rotate to realize the upward and downward movement of the first and second fixed plates 11 and 12 together with the devices on the first and second fixed plates 11 and 12. The lifting mechanism 2 is fixed to the fixed frame 1 to ensure the stability of the whole device.

[0045] In a further embodiment, a first driving component 41 is further included, and drivingly connected to the horizontal moving mechanisms 4 at both ends thereof respectively. The first driving component 41 is located on the central axis of the first fixed plate 11. The horizontal moving mechanisms 4 are symmetrically arranged relative to the first driving member 41. The first fixed plate 11 is provided with a guide rail, along which the horizontal moving mechanisms 4 are movable. The horizontal moving mechanisms 4 are driven by the first driving component 41 to move towards or away from each other along the guide rail simultaneously, thereby realizing movement of the first fixtures 5 in the horizontal direction.

[0046] The first driving component 41 may be a driving cylinder, and the two horizontal

moving mechanisms 4 are driven by the driving cylinder to move for opening or closing. A synchronizer is connected between the two horizontal moving mechanisms 4. It can ensure the synchronization of movement of the left and right fixtures, and ensure that the central plane between the closed fixtures is always in a predetermined position. The synchronizer in this embodiment may adopt a structure having a pinion and two racks.

[0047] In a further embodiment, a cooling piece 51 is provided at the lower end of each of the first fixtures 5. The cooling pieces 51 are provided with grooves 52 on the sides facing each other.

[0048] The cooling pieces 51 function to better cool the waste edges generated on both sides of the product chain during the mold forming process. The waste edges are thick and the cooling speed is slow, affecting the stability of the operation of the equipment. The grooves 52 are located at the positioning projection of the product chain corresponding to the auxiliary cooling piece.

[0049] It is to be noted that, in this specification, relationship terms such as “first” and “second” are used only to distinguish one entity from several others, and do not necessarily require or imply the existence of any such actual relationship or order between these entities.

[0050] Specific examples are used herein to illustrate the principle and implementation of a fixture device provided in the present application, and the above illustrations of the embodiments are only used to help understand the method of the present invention and its core ideas. It should be noted that those skilled in the art may make modifications and improvements to the invention without departing from the principle of the invention, which also fall within the scope of protection of the claims of the application.

CLAIMS

1. A fixture device, comprising:

a fixed frame (1);

5 a lifting mechanism (2) provided on the fixed frame (1) and configured to drive a first fixed plate (11) and a second fixed plate (12) to move up or down, wherein two mold driving plates (3) are provided on the second fixed plate (12) and are movable relative to each other, the first fixed plate (11) is slidably provided on two guide rails that are movable vertically, horizontal moving mechanisms (4) are provided on the first fixed plate (11) in such a manner
10 as to be slidable horizontally, and two first fixtures (5) are provided on tops of the respective horizontal moving mechanisms (4) and extend into a mold to clamp a molded product chain;

a first guide seat (6) and a second guide seat (61) spaced apart and provided on the second fixed plate (12);

two guide rods (7) provided on the first guide seat (6) and the second guide seat (61) in
15 such a manner as to be slidable horizontally;

two first connecting seats (71) being slidable on the two respective guide rods (7);

two second connecting seats (72) fixedly provided on the two respective guide rods (7), wherein the first connecting seats (71) and the second connecting seats (72) are both located between the first guide seat (6) and the second guide seat (61);

20 a second fixture (8) located above the first fixture (5) and comprising a first clamping plate (81) and a second clamping plate (82), wherein the first clamping plate (81) is fixedly provided at bottom ends of the two first connecting seats (71), and the second clamping plate (82) is fixedly provided at bottom ends of the two second connecting seats (72); and

a drive assembly connecting the first clamping plate (81) and the second clamping plate
25 (82), and configured to move the first clamping plate (81) and the second clamping plate (82) towards or away from each other synchronously to achieve closing or opening of the second fixture (8).

2. The fixture device according to claim 1, wherein the drive assembly comprises a

parallel opening-closing piston cylinder (9) and a connecting plate (91),

the connecting plate (91) is configured to connect the two guide rods (7), and

the parallel opening-closing piston cylinder (9) is fixedly provided on the first guide seat (6), and has a first end connected to the connecting plate (91) and a second end connected to the first clamping plate (81), and the first end and the second end of the parallel opening-closing piston cylinder (9) are extendable or retractable synchronously.

3. The fixture device according to claim 2, further comprising two guide engaging plates (62) on left and right sides, wherein the two guide engaging plates (62) are fixedly connected to the respective mold driving plates (3), and are slidably connected to ends of the first guide seat (6) and the second guide seat (61) facing away from the second fixed plate (12).

4. A fixture device according to claim 3, wherein a central axis of the first fixture (5) and a central axis of the second fixture (8) are located in the same straight line.

5. The fixture device according to claim 4, wherein an end of the first clamping plate (81) away from the first connecting seats (71) and an end of the second clamping plate (82) away from the second connecting seats (72) are each provided with a clamping surface for clamping a product chain, and the clamping surface has a width of 1mm to 10mm.

6. The fixture device according to any one of claims 2 to 5, wherein each of the first clamping plate (81) and the second clamping plate (82) is provided with a cooling medium channel (83).

7. The fixture device according to claim 6, wherein a cooling piece (51) is provided at a lower end of the first fixture (5), and the cooling pieces (51) are provided with grooves (52) on sides thereof facing each other.

8. The fixture device according to claim 7, further comprising a first driving component (41), wherein both ends of the first driving component (41) are drivingly connected to the horizontal moving mechanisms (4), respectively.

5 9. The fixture device according to claim 8, wherein the two guide rods (7) are provided in parallel.

10 10. The fixture device according to claim 9, wherein the first connecting seats (71) are provided closer to the parallel opening-closing piston cylinder (9) than the second connecting seats (72).