EUROPEAN PATENT APPLICATION

EXTRUSION PRESS WITH AUTOMATICALLY WORKING PRECISE CENTERING DEVICE FOR THE DIE

An extrusion press comprises a device to precisely center a die (4) of said extrusion press (1) in relation its axis or extrusion axis (W) on at least one of two planes that are orthogonal to each other, i.e. one vertical and one horizontal, the die (4) being contained in a drawer (3) movable on the horizontal plane (5) of a load-bearing structure (8), wherein on one side of said drawer (3) there is a false drawer (21) fixed to the load-bearing structure (8) and to which is connected a drawer-moving cylinder (21 A). Pushing means (13, 14) are provided, associated with their own moving means (15, 16) capable of directly moving said die (4), independently of said drawer (3), on at least one of said planes.
This invention relates to an extrusion press provided with a device to precisely center a die of a press or extruder in relation to an extrusion axis according to the pre-characterizing clause of the main claim.

As is known, in an extruder there is a continuous need to keep the extrusion die perfectly centered in relation to the axis of a press in order to enable optimum performance of the extrusion operation of a metal billet (made, for example, of an aluminum alloy or other extrusion material) introduced into the die. Operations and devices are known that are capable of enabling this adjustment that occurs on at least one of two planes that are orthogonal to each other: a first vertical plane, orthogonal to the axis of the press, and a horizontal plane containing this axis and orthogonal to the vertical plane.

More particularly, the die is contained in a drawer, on the side of which is a false drawer. This assembly is placed near a "tower," in front of which is a container of a metal billet (made of aluminum, for example) to be extruded, in front of an opening of which (container) the die is placed. This assembly rests on a base of the extruder: in particular, the drawer and die rest on a flat portion of said drawer relative to which moves an organ for positioning the billet in front of the die (which has an opening arranged coaxially to that of the container).

A known device for adjusting the vertical position of the die is that which involves using one or more wedge-shaped elements arranged between the drawer and the flat portion that supports it. This solution, however, requires an intervention by an operator in order to position each wedge, which is not easy and which in any event involves considerable machine downtime. The positioning thus achieved, however, cannot be checked and precisely repeated.

The adjustment of the vertical position of the die in relation to the axis of the press (and to the container) is instead achieved, with the known solutions, by using screw devices operated by ring nuts placed at one end of an actuator operated by fluid (oil or air or oil and air) present on the side of the drawer and capable of moving the assembly in order to replace the die on the flat part that supports it. The (fine) adjustment of the position of the die in relation to the container is achieved by this ring nut being turned by an operator.

However, this known solution too has the drawbacks of the one used to adjust the vertical position of the die described above.

DE 3 120 770 describes that the adjustment of the die, along parallel guides and at right angles to the extrusion axis is also described; it is also generally described that adjustment means are provided on said (fixed) parallel guides in order to align the drawer with the dies so as to center them on the extrusion axis.

DE 3 120 770 describes that the adjustment of the die occurs together with that of the die, but does not describe the possibility of adjusting only the position of the die in relation to the drawer on the vertical and horizontal planes, i.e. on a plane in which said extrusion axis cuts across perpendicularly (vertical plane) and on a (horizontal) plane containing said axis and orthogonal to the vertical plane.

This does not allow fine and precise adjustment of the position of the die in the drawer in relation to said extrusion axis.

The aim of the present invention is to offer an extrusion press or extruder provided with a device for precisely and automatically centering an extrusion die of the extruder in relation to the opening of the container of the billet to be extruded, arranging said die in perfect alignment with the axis of the press.

Another aim is to offer an extrusion press with a device of the type described that enables such precise centering of the die to be achieved in a repeatable manner.

A further aim is to offer an extrusion press with a device of the type described that can also be used on extruders that are already operating.

These and other aims, which will be obvious to a person skilled in the art, will be achieved by an extrusion press according to the accompanying claims.

The following accompanying drawings, given purely by way of non-limiting examples, will enable a clearer understanding of the present invention:

Figure 1 is an exploded schematic perspective view of a part of an extruder on which is mounted the device according to the invention;
Figure 2 is a front view of the part of the extruder shown in Figure 1;
Figure 3 is a cross-sectional view along Line 3-3 in Figure 1 with some parts omitted for greater clarity;
Figure 4 is a side view of that shown in Figure 3;
Figure 5 is an enlarged perspective view of a part of Figure 4;
Figure 6 is an enlarged perspective view of another part of Figure 4;
Figure 7 is an enlarged perspective view of a portion of the part of the extruder shown in Figure 1;
Figure 8 is a front view of the portion of the part of the extruder shown in Figure 7;
Figure 9 is an enlarged view of the part indicated by A in Figure 8;
Figures 10-12 show three phases of use of the device according to the invention.
ures, an extruder is indicated generically by 1. It is shown only partially in the Figures or only in its parts having a device 2 capable of centering an extrusion die 4 in relation to the axis W (or "extrusion axis") of a piston of an extruder or press (not shown) and in relation to a container 6 capable of containing a billet 7 made of a metal material (such as aluminum) during extrusion. An exploded view of the container is shown by way of example in Figure 1. The billet is brought in the front of the extrusion die 4 by a conventional movement organ or carriage 10 in itself known that will not be described below. The extrusion die 4 is placed, with a minimum clearance, inside a drawer 3 that can be moved on a plane 5 located in front of the container 6. The organ or carriage 10 moves in front of a fixed tower 12. The device 2 is connected to this tower; the tower is supported by a base 6 of the extruder 3 that can be moved on a plane 5 located in front of the container. The die 4 is placed, with a minimum clearance, inside a drawing 3A of the drawer 3, securing the die 4 contained therein in relation to the axis W of the press. This adjustment is made before securing the die 4 in the seat or cradle 3A of the drawer 3, securing that is performed by the actuator 30 as described above.

[0020] The hydraulic actuator 30 can obviously be replaced by a gearmotor, just as each actuator 37 can be made as a pneumatic and/or hydraulic organ.

[0021] This actuator 30 and actuator 37 define the movement means 15 for the precise adjustment and fine centering on a horizontal plane (parallel to plane P) of the position of the die 4.

[0022] For the precise and fine centering on the vertical plane (orthogonal to the axis W and perpendicular to the plane P), means 14 and 16 are provided. They are shown in detail in Figures 3-6 and 10-12.

[0023] The pushing means 14 comprise a (counter) rod or push rod 41 movable between guide elements 42 solidly connected to the tower 12 and having two opposing ends and a first end 43 capable of cooperating with the die 4 and a second end 44 inserted in a body 45 having a cavity 46 in which is present a (first) rounded free end 47A of a lever 47 pivoting freely about 48 on the tower 12. The lever 47 has another, second end 49 hinged at 50 on the end 51 of a rod 52 of a hydraulic or pneumatic or hydropneumatic actuator 53 whose sleeve 54 is fixed to a support 55 solidly connected to the tower 12.

[0024] The body 45 is capable of cooperating with a screw organ 57 (or simply a screw 57), in particular of the circulating ball type, operated by an electric motor or gearmotor 58 solidly connected to a support 60 in its turn carried by the tower 12 (in particular to the support 55). This screw 57 has an end 57A capable of making contact with the die 4, as will be described below.

[0025] Below the die 4, between it and the plane P, the tower 12 carries an oil-hydraulic cylinder or actuator 62 having a sleeve 63 and a movable piston 64 capable of being brought into contact with the die 4 and of generating, together with the pushrod 41 subject to the screw organ 57 (moved by the motor 58), the movement of said die on the plane vertical to plane P and to the axis of the press. This cylinder or actuator 62, the actuator 53 and said motor 58 define the movement means 16 of said die on said plane.

[0026] The vertical adjustment or centering of the die 4 in relation to the axis W of the press will now be described with reference to Figures 10-12.

[0027] Figure 10 shows the die 4 before adjustment, with both oil-hydraulic actuators 53, 62 shown in the rest
position and the ball screws 57 in the raised position and at a distance from the die. At this point, as illustrated in Figure 11, the motor or gearmotor 58 is activated and in its turn activates the screw 57 bringing it close to the die 4. The position of the end 57A of the screw reached by activating the motor 58 is that which corresponds to the desired position of the die in the drawer 3.

The oil-hydraulic cylinder or actuator 62 is then activated and its piston 64 is brought into contact with the die 4; as a result of the thrust exerted by said piston, the die 4 moves in the drawer 3 until it comes into contact with the end 57A of the screw 57. The die 4 is thus correctly positioned, in a precise manner, in relation to the axis W of the press.

In order to detach the screw 57 from the die 4, the piston 64 must be lowered and therefore the actuator 53 is activated.

Thanks to the invention, therefore, it is possible to center the position of the die 4 precisely in relation to the axis of the press both on a horizontal plane and on a vertical plane. This centering is achieved using methods that are automatic and controlled by a conventional control unit (not shown), preferably the same unit that controls the operation of the entire extruder 1. Furthermore, centering is achieved in a precise and repeatable manner. In particular, a centering operation is performed during a first extrusion by operating the pushing means 13, 14 and the relative moving means 15, 16. After checking the correctness of this centering, the control unit activates said means 13, 14 and 15, 16 for several subsequent phases in order to repeat the conditions of verified and accepted centering.

A preferred embodiment of the invention has been described. Others are, however, possible: for example, the press can have only one of the pairs of means for centering the die 4 in front of the drawer 3 in order to position it precisely on a vertical plane or on the horizontal plane in relation to the axis W of the press. These solutions and others that can be deduced from the above description are also deemed to fall within the scope of the following claims.

Claims

1. Extrusion press comprising a device to precisely center a die (4) of said extrusion press (1) in relation to an axis or extrusion axis (W) of the press on at least one of two planes that are orthogonal to each other, i.e. one vertical and one horizontal, the vertical plane being orthogonal to said axis or extrusion axis (W), the die (4) being contained in a drawer (3) movable on the horizontal plane (5) of a load-bearing structure (8) located beneath the drawer (3), wherein on one side of said drawer (3) there is a false drawer (21) fixed to the load-bearing structure (8) and to which is connected a drawer-moving cylinder (21 A) capable of moving said drawer (3) and the die (4) on said horizontal plane (5) laterally to the extrusion axis (W) of the press, said die (4) and drawer (3) being placed near a container (6) for a billet (7) in which the latter is placed during extrusion, characterized in that adjustment pushing means (13, 14) are provided, associated with their own moving means (15, 16) capable of directly moving said die (4), independently of said drawer (3), on at least one of said planes so as precisely to adjust the position of the above-mentioned die (4) in relation to said extrusion axis (W).

2. Device according to claim 1, characterized in that the pushing means (13) capable of moving the die (4) on the horizontal plane comprise pressing elements associated with the false drawer (21) of the extrusion press (1) and capable of intervening separately on the die (4) and on the drawer (3) that contains it.

3. Device according to claim 2, characterized in that the pressing elements comprise a movable rod (32) operated by a hydraulic and/or pneumatic actuator (30) and pressing on the die (4) and at least one screw organ (38) operated by an electric actuator (37) capable of acting on the drawer (3), said actuators (30, 37) being solidly connected to a fixed plate (25) of the extrusion press (1) and solidly connected to the false drawer (21) and defining the moving means (13) of the die (4) on the horizontal plane.

4. Device according to claim 3, characterized in that a drawer-moving cylinder (3) is associated with said fixed plate (25).

5. Device according to claim 1, characterized in that the pushing means (14) capable of moving the die (4) on the vertical plane comprise pressing elements (57, 64) arranged at the opposite sides of the above-mentioned die.

6. Device according to claim 5, characterized in that said pressing elements (14) are a rod or pushrod (41) subject to a screw organ (57) operated by an electric motor or gearmotor (58) and a movable piston (64), part of a hydraulic and/or pneumatic actuator (68), said electric actuator and the screw organ (57) and the hydraulic and/or pneumatic actuator (68) defining the moving means (16) to move the extrusion die on a vertical plane.

7. Device according to claim 6, characterized in that said rod or pushrod (41) is movable between a guide element (42) solidly connected to a fixed part (12) of the extrusion press (1) fixed to the load-bearing structure (8) of said press (1), said rod or pushrod (41) having a first end (43) capable of selectively cooperating with the die (4) and a second end (44)
inserted in a body (45) operationally solidly connected to a first free end (44) of a lever (47) pivoting freely on said fixed part (12) of the extruder (1), said lever having a second end (49) hinged to a rod (52) of a hydraulic and/or pneumatic actuator (53) supported by said fixed part (12), said body (45) in which is inserted the second end (44) of the rod or pushrod (41) cooperating with said screw organ (57).

8. Device according to claim 8, characterized in that the actuator (53) operating the lever (47) is capable of detaching said pushrod or rod (41) from the die after assuming its vertical position.

9. Device according to claim 1, characterized in that said adjustment pushing means (13, 14) are controlled in their action by a control unit that also supervises the operation of the extrusion press (1), said control occurring automatically after checking a centered position of the die (4) on the extrusion axis (W) during a first extrusion.
### DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims.

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For more details about this annex: see Official Journal of the European Patent Office, No. 12/82.
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