BEND-SHAPING DEVICE

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ABSTRACT

A bend-shaping device with a movable ram and a work table in which a tool holder is fixed both on the ram and on the work table and in which the tool holder fixed to the table has a bottom-die with two working positions with which a first tool, fixed directly in the tool holder of the ram, and a second tool, displaceably connected to the tool holder, coact interchangeably. The tool holder of said second tool is mounted on the tool holder of said first tool displaceably from the interposed position into an inoperative position approximately in the direction of withdrawal, while in the interposed position the second tool lies in the actuation path of said first tool and is pressed by this against the bottom die.

6 Claims, 2 Drawing Figures
BEND-SHAPING DEVICE

The invention is particularly concerned with bendshaping apparatus of the kind in which a ram is moveable relative to a work-table, on which can be mounted a bottom-die, so that a tool supported in the tool-holder can be made by movement of the ram to coat with a working position in the bottom-die supported by the work-table.

Applicant previously developed bend-shaping apparatus of this kind, in which the bottom-die is provided with two separate working positions, with one of which coats the tool supported in the tool-holder and is actuable directly thereby, while with the other working position of the bottom-die there coats a second tool, supported in a second tool-holder pivotally mounted upon the first tool-holder about an axis perpendicular to the direction of movement of the ram, so that it can be moved from an inoperative position into an operative position where it coats with the second working position of the bottom-die.

This arrangement has shown much promise in various industrial operations, especially where bend-shaping operations are to be carried out in accordance with a pre-determined program. It is therefore the purpose of the present invention to provide an improved bend-shaping apparatus of this kind.

According to the present invention there is provided bend-shaping apparatus, comprising a work-table adapted to support a bottom-die having a first working position and at least one further working position, a ram moveable relative to said work-table, said ram being provided with a first tool-holder adapted to support a first tool moveable with the ram and actuable directly thereby to coat with the first working position of the bottom-die, and in which there is provided at least one secondary tool-holder mounted upon the first tool-holder and displaceable between operative and inoperative positions, said secondary tool-holder(s) being adapted to support a further tool moveable with the ram and, when said secondary tool-holder is in its operative position, actuable indirectly thereby via a tool supported in said first tool-holder to coat with a further working position of said bottom-die, said secondary tool-holder(s) being displaceable from the operative to the inoperative position partly laterally but mainly by retraction along substantially the direction of movement of said ram.

The secondary tool holder can advantageously be mounted for pivotal movement about a pivot point fixedly mounted upon the first tool-holder, one end of the secondary tool-holder being adapted to support the further tool, while the first tool-holder interconnected with the secondary tool-holder at or adjacent its other end via a double-acting piston-and-cylinder assembly so as to permit the secondary tool-holder to be pivoted and thus the further tool to be shifted in and out of the operative position laterally with respect to the direction of movement of the ram. In order to achieve retraction of the secondary tool-holder along the direction of movement of the ram, the secondary tool-holder may conveniently include a pivotally-mounted piston-and-cylinder assembly disposed substantially parallel to the direction of movement of said ram, at one end adapted to support said further tool and at or adjacent the other end remote therefrom interconnected with said first tool-holder.

Alternatively, the secondary tool-holder can also advantageously be mounted laterally of and substantially co-axially with the first tool-holder, and can then be bodily displaced laterally relative to the first tool-holder by means of at least one double-acting piston-and-cylinder assembly, and preferably two such assemblies, via which it is mounted thereon. Here again, in order to achieve retraction of the secondary tool-holder along the line of movement of the ram the secondary tool-holder can advantageously include a piston-and-cylinder assembly disposed substantially parallel to the direction of movement of the ram, at one end adapted to support the further tool, which thus permits retraction thereof in substantially the direction of movement of the ram.

The bend-shaping apparatus preferably incorporates both a first tool supported in the first tool-holder and at least one further tool supported in at least one of the secondary tool-holders, and the second tool(s) desirably will have a cut-away portion, forming a step against which (in the operative position of the second tool) the first tool abuts.

In one of the preferred embodiments the secondary tool-holder is constructed as a two-armed lever supported intermediate its ends at pivot point fixedly secured to the first tool-holder, the further tool being supported at one end of the two-armed lever while the other, remote end of the secondary tool-holder is connected to the first tool-holder by means of a reciprocable pivoting piston-and-cylinder assembly.

In order that the invention may be well understood it will now be further described, though only by way of illustration, with reference to the accompanying drawings, in which:

FIG. 1 is a schematic representation, in elevation, of one preferred embodiment of the invention; and

FIG. 2 is a representation, similar to that of FIG. 1, of another embodiment of the invention.

Referring first to FIG. 1, it will be seen that a tool-holder 1 extends vertically downwards from the ram R of the bend-shaping apparatus. Supported upon the tool-holder 1 is an interchangeable bending tool 2. Beneath the ram, tool-holder 1 and tool 2 there is arranged a work-table 3 which carries a tool-holder 4 which in turn supports a bottom-die 5, having two working positions indicated 6 and 7. The bending tool 2 coats with the working position 6, while a second tool 8 coats with the working position 7. The arrangement therefore is such that the tool 8 can be shifted from the operative, interposed position shown into an inoperative position in which on the movement of the ram the bending tool 2 becomes effective. The tool 8 includes a lateral, step-shaped recess 9, in which the tool 2 is received in the operative, interposed position of the tool 8, so that the pressure from the tool holder 1 necessary for shaping is applied directly to the tool 8.

The tool 8 is mounted upon a piston rod 10, secured to a piston 11 which fits within a double-acting working cylinder 12. The working cylinder 12 is pivotally mounted upon the tool holder 1, the fixing position being denoted by 13. The other end of the working cylinder 12 remote from the tool 8 is connected pivotally to the tool holder 1 by means of a reciprocable piston-and-cylinder assembly comprising cylinder 14 and piston 15 and piston rod 16. This reciprocable cylinder 14 is also double-acting.
In the position shown, the piston 15 is extended and consequently the working cylinder 12 together with piston rod 10 are swung about pivot point 13 in such a way that tool 8 is inserted into the interposed, operative position. It will be seen that a two-armed lever is formed by piston rod 10, piston 11 and working cylinder 12, this two-armed lever being pivotable about the fixing position 13. If the reciprocable cylinder 14 is retracted in the clockwise direction, then the working cylinder 12 together with piston rod 10 can then subsequently be retracted upwards by means of the piston 11 in the working cylinder 12. In this way the tool 8 is completely removed from the path of movement of the bending tool 2, which can then be brought into operation.

Referring to the second embodiment of the invention shown in FIG. 2, it will be noted that here for convenience similar parts are again denoted by the same reference numerals as in FIG. 1, and need not be further described. However, in this embodiment the working cylinder 12 is mounted upon the tool-holder 1, both at the top and bottom of the former, via respective double-acting piston-and-cylinder assemblies, designated 17 and 18. If the two piston-and-cylinder assemblies 17 and 18 are actuated simultaneously the working cylinder 12 together with piston rod 10 and tool 8 will be bodily displaced laterally while remaining parallel to the tool-holder 1, so that the tool 8 is removed from the region of the bending tool 2, whereupon the latter can be brought into operation.

What I claim is:

1. Bend-shaping apparatus, comprising a work-table adapted to support a bottom-die having a first working position and at least one further working position, a ram moveable relative to said work-table, said ram being provided with a first tool-holder adapted to support a first tool moveable with the ram and actuable directly thereby to coat with the first working position of the bottom-die, and in which there is provided at least one secondary tool-holder mounted upon the first tool-holder and displaceable between operative and inoperative positions, said secondary tool-holder being adapted to support a further tool moveable with the ram and, when said secondary tool-holder is in its operative position, actuable indirectly thereby via a tool supported in said first tool-holder to coat with a further working position of said bottom-die, said secondary tool-holder being displaceable from the operative to the inoperative position partly laterally but mainly by retraction in substantially the direction of movement of said ram.

2. Bend-shaping apparatus according to claim 1, in which the secondary tool-holder is mounted for pivotal movement about a pivot point fixedly mounted upon the first tool-holder, one end of the secondary tool-holder being adapted to support the further tool and the other end remote therefrom being interconnected with the first tool-holder via a double-acting piston-and-cylinder assembly so as to permit the further tool to be shifted laterally in and out of the operative position in the direction of movement of the ram.

3. Bend-shaping apparatus according to claim 2, in which the secondary tool-holder includes a pivotally mounted piston-and-cylinder assembly disposed substantially parallel to the direction of movement of said ram, at one end adapted to support said further tool and at or adjacent the other end remote therefrom interconnected with said first tool-holder.

4. Bend-shaping apparatus according to claim 1, in which the secondary tool-holder is mounted laterally of and substantially parallel with the first tool-holder, and is bodily displaceable laterally relative to the first tool-holder by means of at least one double-acting piston-and-cylinder assembly via which it is mounted thereon.

5. Bend-shaping apparatus according to claim 4, in which said secondary tool-holder includes a piston-and-cylinder assembly disposed substantially parallel to the direction of movement of the ram, at one end adapted to support the further tool, and thus permitting retraction thereof in substantially the direction of movement of the ram.

6. Bend-shaping apparatus according to claim 1, also incorporating a first tool supported in said first tool-holder and a further tool supported in said secondary tool-holder, the second tool having a cut-away portion forming a step against which, in the operative position of the second tool, abuts the first tool.

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