

**DEVICE FOR LUBRICATING AND COOLING
MOLDS, IN PARTICULAR FORGING DIES AND
TOOLS IN METAL FORMING**

**CROSS-REFERENCE TO RELATED
APPLICATIONS**

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/650 419, filed Feb. 4, 2005, which is incorporated herein in its entirety. The following disclosure is based on European Patent Application No. 04022305, filed Sep. 20, 2004, which is incorporated into this application by reference.

FIELD OF THE INVENTION

[0002] The invention relates to a device for lubricating and cooling molds, in particular forging dies and tools in metal forming, having flow passages for feeding a lubricant and a coolant and having nozzles for spraying the lubricant and the coolant.

BACKGROUND OF THE INVENTION

[0003] It is known that, for the accurate development of the shape of die-forged parts and for the release of the forged parts from the die and for reducing the tool wear, it is necessary to lubricate the impressions of the dies and to keep the working temperature of the dies within a defined temperature range by cooling. Plate spray heads are known (EP Patent 0724486) which, by making up the external form, can be adapted to the shape of the die and which have, in a plate facing the impression, bores for the discharge of a mixture consisting of lubricant and water. Such spray heads are relatively complicated and have the disadvantage that the lubricant/water mixture cannot be sprayed in an optimum manner, so that the lubricant consumption is relatively high.

[0004] Pneumatic atomizer nozzles which are guided by an industrial robot and travel along paths to cover the impression of the die and spray with a lubricant/water mixture are known.

[0005] Spray elements, in particular for molds, which produce and deliver a lubricant/coolant mixture have been disclosed, for example, by DE 44 20 679 A1. Considerable effort is required in order to manipulate such individual spray nozzles.

[0006] The object of the invention is therefore to simplify such lubricant and cooling devices and in particular to keep the lubricant consumption as low as possible.

SUMMARY OF THE INVENTION

[0007] To achieve this object, provision is made in a device of the type mentioned at the beginning for the flow passages for lubricant and the flow passages for coolant to be separate from one another, and for nozzles designed for spraying the lubricant to be assigned to the lubricant flow passages, and for nozzles designed for spraying the coolant to be assigned to the coolant flow passages. By means of this measure, the spray nozzles for coolant on the one hand and for the lubricant on the other hand can be designed in an optimum manner, and, for example, "minimum lubrication nozzles" can be provided for spraying the lubricant, so that the consumption of lubricant can be considerably reduced.

The same also applies to the coolant consumption, for optimum nozzle types can be used for spraying the coolant here too.

[0008] In an especially advantageous manner, the flow passages for the lubricant and for the coolant may in this case be laid in a common housing, that is to say in a single spray head, it being possible for this housing to be attached in a manner known per se to guide arms which can be moved into the open molds or dies. Separate guidance of coolant or lubricant nozzles therefore becomes unnecessary, and a compact form of a spray head of relatively simple construction can then be achieved in particular when the housing is provided with a central chamber and with at least one cover which covers the chamber, and has flow passages, in particular annular passages, which are subjected separately from the chamber to the admission of at least one of the media required for the spraying operation.

[0009] In a development of the invention, the flow passages in the cover may be annular passages which are fed via external feed passages with one of the media required for the spraying operation. These feed passages may in this case open radially into the annular passages. In this case, the central chamber is expediently provided with a feed passage, opening out radially, for the coolant and is closed off by a circular cover disk which is provided with a plurality of coolant nozzles arranged so as to be distributed uniformly over a diameter of the cover disk. This cover disk may in this case be screwed into a cover ring and be closed off toward the central chamber by a flat gasket. This results in a simple construction of the spray device.

[0010] In a further configuration of the invention, a swirl insert is arranged upstream of each coolant nozzle, it being possible for these swirl inserts to be screwed into tapped holes which are provided on the side of the coolant nozzle bores which points toward the central chamber.

[0011] In a configuration of the invention, the annular passages may be provided as encircling grooves in that region of the housing which surrounds the chamber, these grooves being closed off by a cover ring which encloses the cover disk and into which the cover disk is also screwed.

[0012] In a configuration of the invention, the outer annular passage may be connected to a feed passage for lubricant, and the inner annular passage may be connected to a feed passage for compressed air.

[0013] In a further configuration, lubricant spray nozzles, in particular in the form of minimum lubrication nozzles, may be provided in the cover ring, these lubricant spray nozzles being arranged so as to be distributed uniformly over a diameter and being connected to respective branch passages for the compressed-air feed, which lead to the inner annular passage. These branch passages in turn may be designed as transverse bores which open into the core hole of the fastening thread for the lubricant spray nozzle.

[0014] Finally, the feed passages for coolant, lubricant and compressed air may be laid so as to run parallel to one another in a connection piece which serves as guide arm and via which the device according to the invention, i.e. the spray head according to the invention, can be inserted into the forging die or into the tool.