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DIE QUENCHING DEVICE

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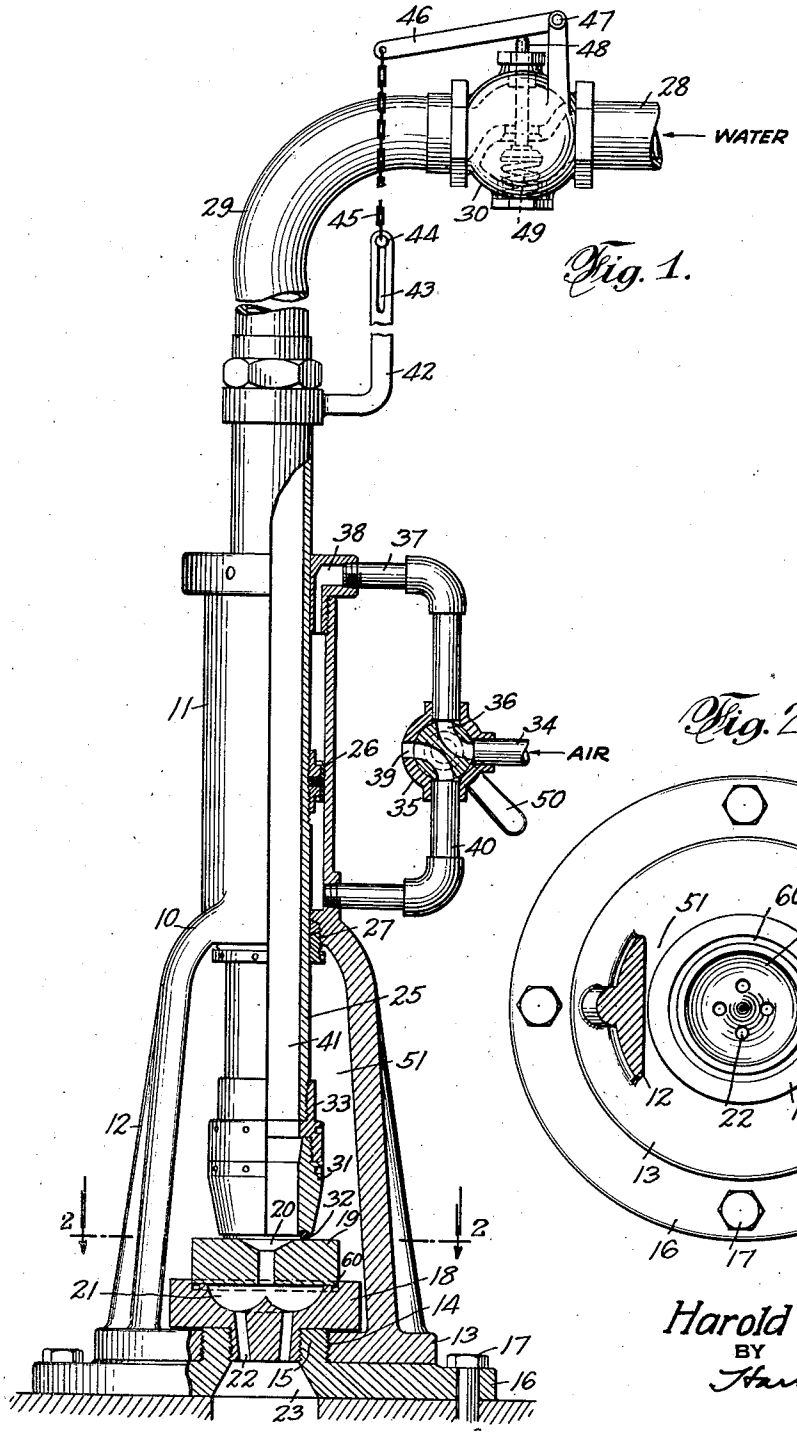


Fig. 1.

Fig. 2.

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DIE QUENCHING DEVICE

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3 Claims. (Cl. 266—6)

This invention relates to tempering devices for holding and chilling dies, and particularly to a mechanism for holding down a heated die such as is used, for example, for extruding collapsible tubes during the quenching of the die by means of a stream of water.

Such dies, and particularly the female dies, are subjected to great stresses in suitable collapsible tube-extruding presses and are desirably extremely hard, particularly at their wearing surfaces to resist such stresses and the consequent wear thereon. Heretofore, such dies have been hardened by the usual hand tempering processes including chilling with a stream of water. It has, however, been difficult to hold the hot die properly during the quenching thereof and to control the stream of water used for chilling the die, so that the desirable hardening at the areas of greatest wear has frequently been inadequately accomplished.

My invention therefore contemplates the provision of means for properly holding the die while at the same time directing an adequately controlled stream of water upon those areas thereof which it is desired to harden most.

My invention further contemplates the provision of holding means for the die, which means when operated, automatically directs a stream of water upon the proper surfaces of the die and which when operated to release the die automatically cuts off the stream.

My invention further contemplates the provision of means easily operated by a single operator for holding the die for as long a time as may be desired, for directing a stream of water thereon while so held and for automatically cutting off the stream when the die is released, said means being so designed as to permit the easy insertion of the heated die therein and the easy removal of the chilled die therefrom.

The various objects of the invention will be clear from the description which follows and from the drawing, in which,

Fig. 1 is an elevational view partly in section of my new device.

Fig. 2 is a horizontal section of the same taken on the line 2—2 of Fig. 1, the die having been removed.

In the practical embodiment of the invention which I have shown by way of example, the frame 10 supports the various moving parts and comprises the cylinder 11 and the bifurcated standard 12. Said standard is provided with a base 13 having a threaded opening as 14 therein, which opening receives the upstanding extension 15 of the support base 16, the base being suitably held to a supporting surface as by means of the bolts 17. The extension 15 and the bases 13 and 16 are provided with central openings therethrough, the opening of the extension 15 being threaded to receive the threaded lower end of the lower die support 18. Preferably, the die, such as the female die 19 for use in extruding collapsible tubes, is set on the die support so that the openings 20 of said die communicate with the openings 21 and 22 of the die support and the openings 23 of the base 16, whereby the stream of water entering said opening 20 is discharged from the device into a suitable receptacle not shown. The opening 21 may be of any suitable form, preferably of concave spherical cross-section, to distribute the water to those areas of the under surface of the die which it is desired to chill and harden. The upper face of the die support is preferably provided with an annular recess 60 into which the lower part of the die 19 may be conveniently set while hot.

The combined die holding member and piston 25 is mounted for vertical reciprocation through the cylinder 11, said member carrying the annular piston 26 engaging the inner walls of said cylinder and suitably secured in place as by a screw connection at the proper point of the member 25. Said member passes through a suitable stuffing box and gland 27 at the lower end of the cylinder and also passes through the upper end of the cylinder, being adapted to reciprocate at the desired time intervals in said cylinder without leakage of fluid therebetween. The member 25 being hollow throughout, it is suitably connected at its upper end to a source of water supply such as the pipe 28 by means of the flexible hose 29, the valve 30 being interposed between the pipe 28 and the upper end of the holding member 25. The lower end of the member carries the die-engaging member 31 which is provided with a suitable heat and waterproof gasket 32 (such as a copper gasket or packing) designed to engage the hot top surface of the die and to prevent leakage of water therepast. The member 31 is readily removable for replacement and repair, being screwed into the sleeve 33 which is in turn screwed to the lower end of the piston member 25.

For vertically moving said piston member at the proper times, any suitable fluid under pressure may be used. As illustrated, compressed air entering the inlet pipe 34 is directed by a suitable two-way valve 35, first above the piston 26 to lower the piston and the member 25, and

then after the die has been sufficiently chilled, the air is directed in the cylinder below the piston 26 to raise said member 25 and to release the die. The valve 35 includes a rotatable member having the pasage 36 which, in the position shown in Fig. 1, connects the inlet pipe 34 to the pipe 37, which in turn communicates with the cylinder head pasage 38 at the top of the cylinder and above the piston 26. The rotatable member of said valve also includes the passage 39 connecting the inlet pipe 34 to the lower pipe 40 introducing air below the piston 26 when the valve member is rotated 90° in a counter-clockwise direction from the position of Fig. 1. It will be understood that by turning the valve member from its first into its second position after the desired time has elapsed, compressed air is admitted alternately above the piston and below the piston to raise the piston and then to lower it at the proper time depending upon the manipulation of the valve by the operator.

It will also be understood that when air is introduced into the pipe 37 through the passage 36, the air below the piston is discharged through the valve passage 39. Similarly, when the passage 39 connects the pipes 34 and 40 to introduce compressed air below the piston, the passage 36 permits the discharge of the air above the piston through the pipe 37. It will further be understood that any suitable fluid under pressure may be used instead of compressed air, as for example oil or water, in which case a suitable conduit is arranged at the discharge part of the valve 35 to conduct the discharged fluid to a suitable storage tank in a well-known manner, which need not be illustrated nor further described.

As has been indicated, when the member 25 is in its die-holding position shown in Fig. 1, the water control valve 30 is opened to permit a stream of water to flow through the hollow interior or longitudinal opening 41 of said member and against those surfaces or areas of the die 19 which are to be hardened, and through the die opening 20. To open and close said valve 30 at the proper time, any suitable means may be employed such as the projection 42 arranged at the upper end of the piston member 25, said member being slotted as at 43 and receiving in the slot the pin 44. A suitable chain 45, shown foreshortened in Fig. 1, connects the pin 44 to the lever 46 which is pivoted on the valve 30 as at 47. Said lever in the lowermost position of the member 25 depresses the valve stem 48 against the action of the spring 49 and thereby opens the valve for the passage of water.

When the member 25 is raised, the projection 42 moves with it, thereby releasing the tension on the chain 45 and permitting the spring 49 automatically to close the valve. It will be understood that the slot 43 may be omitted and that the chain may be of just sufficient length to become tightened at the end of the downward movement of the member 25, so that said chain is tensioned to operate the lever 46 just as the said holding member 31 engages the die. Similarly, as the upward movement of the member 25 is begun, the tension on the chain 45 is released and slackened and the spring 49 becomes operative to close the valve. It will further be understood that while I have shown and described a specific form of the valve 30, any suitable self-closing valve may be used in place thereof as will be readily understood by those skilled in the art.

In operation, the valve handle 50 is turned in the proper position to raise the member 25 from between the legs or standards 12 of the frame and to expose the clear and unobstructed space 51 therebetween. The properly heated die 19 is inserted into said space 51 and arranged into its proper position in the recess 60 of the die holder 18. The handle 50 is then moved into the position of Fig. 1, whereby the fluid under pressure enters the passage 38 and acts upon the piston 26 to lower said piston and the member 25 and to carry the packing gasket 32 firmly against the hot top surface of the die. As the piston 25 reaches its lowermost position, the chain 45 is tensioned and the valve 30 is opened to permit the stream of water to pass through the interior of the member 25 and against the selected areas of the die inside of the gasket 32. The stream of water quickly quenches the die and hardens it to the proper degree of hardness, the velocity of the stream being so regulated that the water cannot become too warm for correct tempering but circulates in and past the openings 21 and 22, backing up and swirling for a short time in the opening 21 to properly quench or chill the under surface of the die as well as the other exposed areas thereof.

When the die has been properly chilled or quenched, the handle 50 is moved into the position to connect the pipes 34 and 40 by means of the passage 39, whereby the fluid under pressure acts on the under surface of the piston 26 and raises said piston, the fluid above the piston being discharged through the passage 38, the pipe 37 and the valve passage 36. At the beginning of the upward movement of the piston 26, the chain 45 is slackened and the water valve 30 automatically closed by its spring.

It will be seen that the device is adapted for quick and easy manipulation by a single operator and that I have provided a structure well designed to meet the requirements of practical use.

While I have shown and described certain specific embodiments of my invention, I do not wish to be understood as limiting myself thereto, but intend to claim the invention as broadly as may be permitted by the state of the prior art and the scope of the appended claims.

I claim:

1. In a die-holding and tempering device, a die-holding member adapted to be moved into and out of the die-holding position thereof, means including a piston for moving said member, a spring-closed water control valve, and means including a chain operatively connecting the member and the valve to open the valve against the action of its spring when the member is in its die-holding position.

2. In a die-holding and tempering device, a hollow die-holding pipe, a cylinder for slidably supporting said pipe, a piston around the pipe within the cylinder, means for admitting fluid under pressure to one side of the piston to lower the pipe and to the other side of the piston to raise the pipe, a flexible water supply pipe communicating with the interior of said die-holding pipe, a spring closed valve for the water pipe, means including a chain operatively connecting the die-holding pipe and the valve to open the valve when the die holding pipe is in its die-holding position, and a die holder removably screwed to the lower end of the pipe.

3. In a die-holding and tempering device, a

frame including a base for supporting a die, a cylinder on said frame, a hollow pipe passing through the cylinder, an annular piston within the cylinder screw connected to the outside of said pipe, means for admitting fluid under pressure to opposite sides of said piston to raise and lower the pipe and the piston, a heat-proof and water-proof annular gasket at the lower end of said pipe adapted to engage the upper surface of the die to urge the die on to said base and to restrict the die area quenched by said device, a water supply line communicating with the interior of said pipe, a spring-closed valve in said line, and means including a chain operated on the movement of said pipe for opening the valve when the pipe is in its die-holding position.

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