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Mikhailov et al.

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[54] **INDUCTOR FOR SHAPING PARTS BY PULSED MAGNETIC FIELD PRESSURE**

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[52] **U.S. Cl.** **72/56**

[51] **Int. Cl.** **B21d 26/14**

[58] **Field of Search** ..... 72/56; 29/421 M

[56] **References Cited**

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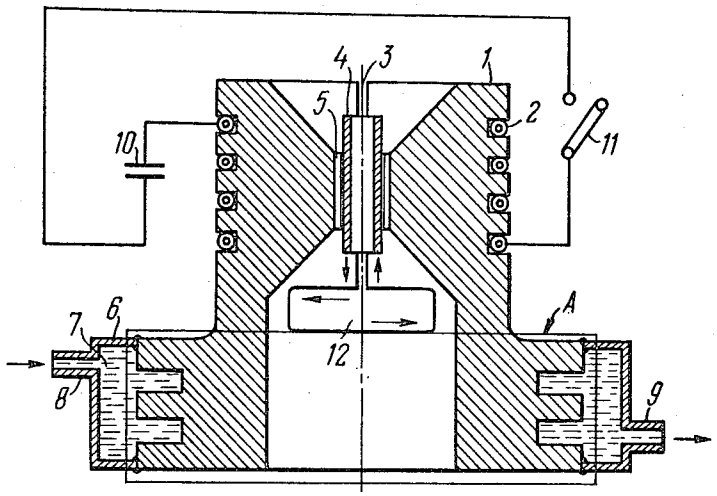
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[57] **ABSTRACT**

An inductor for shaping parts by pulsed magnetic field pressure comprising a concentrator having an axial opening for placing a part to be shaped therein, a winding disposed at the outer surface of said concentrator wherein a radial slot is made along a portion of the length of the concentrator forming laterial surface, the slot having at its end an electric circuit whose inductance is considerably higher than that of the circuit of the axial opening with a part being shaped therein.

4 Claims, 2 Drawing Figures



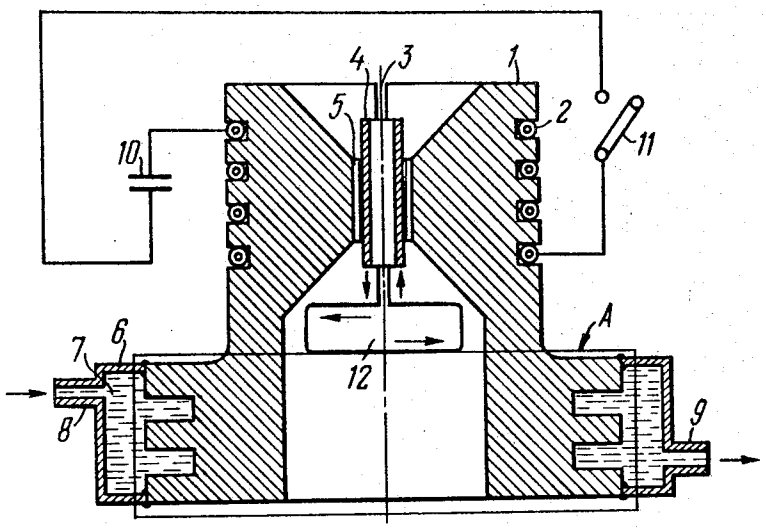


FIG. 1

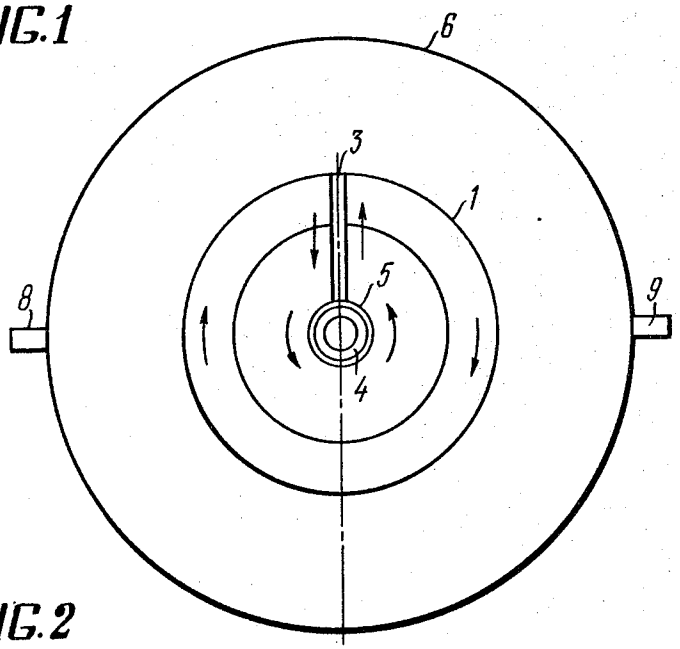


FIG. 2

INDUCTOR FOR SHAPING PARTS BY PULSED MAGNETIC FIELD PRESSURE

The present invention relates to the art of metal pressure shaping, and more specifically to inductors for shaping parts by pulsed magnetic field pressure.

Known in the prior art is an inductor for shaping parts by pulsed magnetic field pressure comprising a winding and a concentrator having a radial slot, an axial opening for placing a part to be shaped therein and a cooling system arranged outside the zone of the winding and axial opening. The concentrator outer surface may be made smooth, or it may have spiral or annular recesses for placing winding turns therein.

The concentrator radial slot of this prior art inductor is made along the entire length of the concentrator forming lateral surface.

One of the disadvantages of the prior art inductor is that the concentrator cooling system is electrically alive. Due to this, the system construction is significantly complex and expensive. Another disadvantage of the prior art inductor is the poor resistance of the concentrator to the forces which tend to expand the radial slot and increase the transverse dimensions of the axial opening. This phenomenon accelerates the failure of the whole inductor.

It is an object of the present invention to provide an inductor which eliminates the afore-mentioned disadvantages.

It is another object of the present invention to provide an inductor having a concentrator whose cooling system is electrically dead, wherein the concentrator has a higher resistance to the forces which tend to expand the radial slot and increase the transverse dimensions of the axial opening.

These and other objects and purposes of the invention are achieved by making the radial slot only along a portion of the concentrator forming lateral surface with an electric circuit at the end thereof, wherein the inductance of this electric circuit is considerably higher than that of the circuit of the axial opening with a part being shaped therein.

The above solution ensures the removal of electric voltage from the concentrator cooling system, thus making the system construction simpler and cheaper. In addition, the resistance of the concentrator to the forces tending to expand the radial slot and increase the transverse dimensions of the axial opening is improved. This results in an increase in the inductor service life in terms of the number of production operations within the specified tolerance dimensions.

The present invention will now be explained in greater detail with reference to an embodiment thereof which is represented in the accompanying drawings, wherein:

FIG. 1 is a sectional view which shows an inductor for shaping parts by pulsed magnetic field pressure, and an electrical circuit illustrating its connection to a power supply source; and

FIG. 2 is a top view of an inductor for shaping parts by pulsed magnetic field pressure.

The inductor for shaping parts by pulsed magnetic field pressure consists of a concentrator 1 (FIGS. 1 and 2) which is a massive body of a good conducting material, and a winding 2 placed in a cylindrical spiral recess at the outer surface of concentrator 1. Concentrator 1 has a radial slot 3 and an axial opening wherein a part

4 to be shaped is placed. Part 4 to be shaped is electrically insulated from concentrator 1 by an insulating or dielectric bush 5. Concentrator 1 has a portion A with an extensively finned surface enclosed in a metal jacket 6 forming, together with this surface, a chamber for a cooling agent 7. Pipe connections 8 and 9 serve for passing a cooling agent 7 through the chamber. Winding 2 of the inductor is connected to a power supply source which may be a capacitor bank 10, via a controlled switching means 11. Radial slot 3 of concentrator 1 is made along a portion of the concentrator forming lateral surface and has an electric circuit 12 at the end thereof. This electric circuit is made in the form of a radial opening in the body of concentrator 1.

Upon closing of controlled switching means 11, capacitor bank 10 discharges into inductor winding 2. The pulsed magnetic field fof the winding induces an electric current in concentrator 1. This electric current, due to the presence of radial slot 3, flows around the axial opening with the part 4 therein and electric circuit 12. The directions of the current flow through concentrator 1 are shown by the arrows in FIGS. 1 and 2.

A pulsed magnetic field for deforming part 4 is established in the axial opening of concentrator 1. The inductance of electric circuit 12 is considerably higher than that of the axial opening circuit of concentrator 1 with part 4 being shaped therein. Therefore, the currents flowing in circuit 12 are not significant. Due to the presence of this electric circuit 12, currents do not flow through the elements of the concentrator cooling system, and these elements are electrically dead. The cooling of concentrator 1 is effected by passing cooling agent around portion A having an extensively finned surface.

Winding 2 of the inductor may be placed in annular recesses or wound on a smooth outer surface of concentrator 1. Concentrator 1 may be cooled without the use of a special cooling agent by convectional heat exchange of the extensively finned surface of portion A with the ambient environment. The invention is well suited for inductors whose concentrators are used without a cooling system in order to improve the strength of concentrator 1.

We claim:

1. An inductor for shaping parts by pulsed magnetic field pressure comprising: a concentrator having an outer surface and being provided with an axial opening for placing a part to be shaped therein; a winding disposed at the outer surface of said concentrator; said concentrator having a radial slot extending axially along only a portion of the length of said concentrator, said slot having an end with an electric circuit at said end of the slot, said electric circuit having an inductance considerably higher than that of the circuit of said axial opening, said electric circuit extending axially from said slot over only a portion of the concentrator remaining beyond said end of the slot.

2. An inductor as claimed in claim 1 wherein said electric circuit is constituted by a radial opening in said concentrator at said end of the slot, said radial opening being substantially wider than said slot.

3. An inductor as claimed in claim 2 wherein said concentrator includes a solid portion extending beyond said radial opening in a direction away from said slot, and means for cooling said solid portion.

4. An inductor as claimed in claim 2 wherein said axial opening has a smaller diameter portion for receiving the part to be shaped, and a larger diameter portion in the remainder of the concentrator.

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