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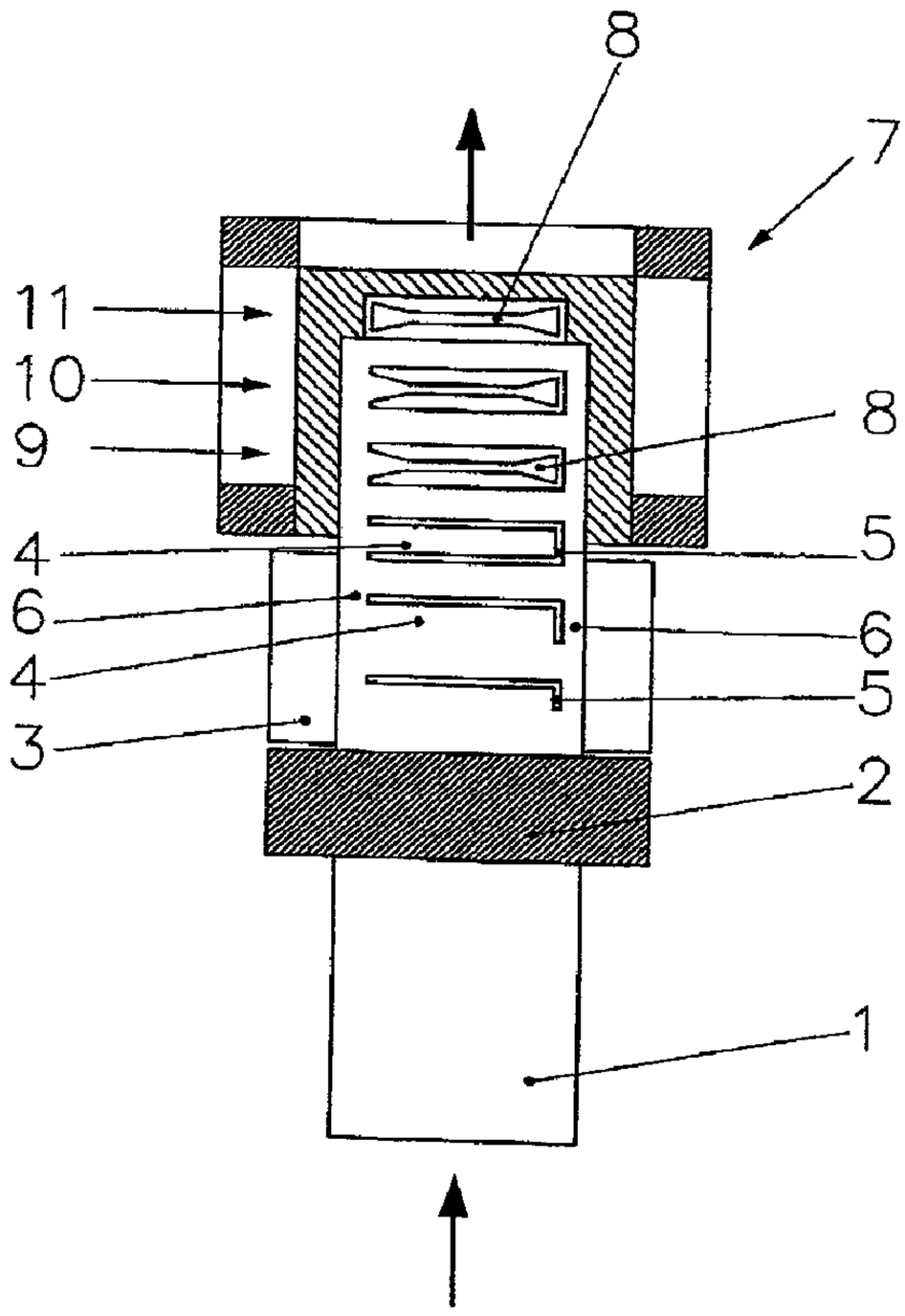


(57) Abrégé/Abstract:
A simpler and less expensive method of fabricating pressed components from sheet steel that can be heat treated while inside the press, whereby the material is heated to above its transformation point Ac3, pressed, and cooled, controlled, to below its crystalline-transformation point. The sheet is unwound from a coil (1), heated to above its transformation point, pressed in a press, and separated.

Abstract

A simpler and less expensive method of fabricating pressed components from sheet steel that can be heat treated while inside the press, whereby the material is heated to above its transformation point Ac3, pressed, and cooled, controlled, to below its crystalline-transformation point. The sheet is unwound from a coil (1), heated to above its transformation point, pressed in a press, and separated.

METHOD FOR PRODUCING FORMED ARTICLES

The present invention concerns a method of fabricating pressed components from steel sheet that can be heat treated while inside a press as recited in Claim 1 herein.

Components, especially components for the automotive industry, are increasingly being fabricated of sheet steel or steel structural section pressed and hardened in the press itself.

These steels may for example be composed of

carbon (C) 0.19-0.25
silicon (Si) 9.15-0.50
manganese (Mn) 1.10-1.40
titanium (Ti) 0.020-0.050
boron (B) 0.002-.005
aluminum (Al) 0.02-0.06
phosphate [sic! scil. phosphorus] (P) < 0.025
sulfur (S) < 0.015
chromium (Cr) < 0.35
molybdenum (Mo) 0.35

the remainder constituting iron (Fe), including contamination from smelting.

European Patent 1 300 476 A6 discloses fabricating such components from plates and structural section. There is, however, a drawback to this method. The plates and section must be heated to at least 750° C in a continuous furnace before they can be inserted in the press. The process is accordingly complex and the equipment complicated.

The object of the present invention is accordingly a simpler method of fabricating pressed components from steel that can be heat treated while inside the press, while employing less complicated equipment.

This object is attained in accordance with the present invention in a method of the aforementioned genus by practical alternatives and advanced embodiments.

The present invention features several advantages. First, in spite of the lower investment in equipment, the fabrication process can be considerably accelerated. Again, the method in accordance with the present invention is extremely flexible, allowing the fabrication of different shapes from the same coil with no need to readjust the whole furnace and all the conveying equipment as in the conventional approach using plates of various dimensions to obtain different-sized components. Furthermore, the

equipment can be adapted later to handle uncoated sheet, the material being subjected to an inert atmosphere while in the press. Finally, the sheet can be cut while still hot, saving considerable wear on the cutter.

One embodiment of the present invention will now be specified by way of example with reference to the accompanying drawing which is a single Figure 1 showing a sectional view of the multiple-stage press used to carry out the method of the present invention.

A strip 1 of steel sheet has been wound into a coil on an unillustrated stand. Strip 1 is unwound from the coil as needed and straightened if necessary. The unwound and if necessary straightened strip is heated in a furnace 2 to a temperature above the material's transformation point Ac_3. Furnace 2 can be a transverse-field induction furnace for example, although a conventional gas-or-electrically heated furnace can be employed as an alternative. Downstream of furnace 2 is a holding section 3, where the strip is maintained at a temperature to be employed for further processing, e.g. above 850° C.

The holding section 3 in the illustrated example accommodates an unillustrated plane-traveling metal-cutting laser employed to produce a U-shaped cut 5 in plate 4. As will be evident from the schematic illustration, the cut is executed by a series of several parallel laser heads. Plate 4 is maintained fixed at one

margin 6, and no manipulating mechanisms will be necessary to forward it into the downstream multiple-stage press 7. How plate 4 is fixed at the margin will be determined by one of skill in the art in accordance with the specific situation. Separation of sheet 1, carried out in a first step, can be achieved before the sheet has been heated.

Other types of metal-cutting tools--saws or punches for example-can of course also be employed instead of a laser. A plate can alternatively be cut off the strip, in which event, however, a conveying mechanism will be needed to forward the hot plates to the different sections of multiple-stage press 7.

The schematically depicted component 8 in the present embodiment is a reinforcement of the type employed in the doors of motor vehicles to minimize damage in the event of lateral collision.

In the first processing section 9 of multiple-stage press 7, plate 4 is pressed into its intended shape and cooled in an unillustrated refrigerated press to below its crystalline transformation point, preferably in the present example to 450° C. The press is refrigerated with water and cools component 8 indirectly.

The component 8 in the illustrated embodiment is now cooled to approximately 50° C in the second processing section 10 of multiple-stage press 7. This second cooling stage can be

regulated or unregulated. The advantage of such multiple-stage cooling is that the timing can be distributed throughout the process, cutting the total fabrication time almost in half. The component can also be cooled in second processing section 10 by way of the refrigerated press, although it can also be cooled directly by air or by another coolant.

Component 8 is now, in a third processing section 11, completely separated from the plate at margin 6. The component can simultaneously or subsequently be bored or machined as necessary.

CLAIMS

1. A method for fabricating pressed components from sheet steel that can be heat treated while inside a press, comprising the steps of: heating the material above its transformation point; pressing and cooling to below its crystalline-transformation point; unwinding said sheet steel from a coil, and separating the component in two steps: carrying out the first step prior to pressing and leaving connections between the component and said coil; and carrying out the second step subsequent to pressing and separating the component completely.

2. The method is defined in claim 1, wherein the component is heated in a continuous furnace.

3. The method as defined in claim 1, wherein the component is heated inductively.

4. The method as defined in claim 3, wherein the component is heated inductively by transverse field heating.

5. The method as defined in claim 1, wherein the component is inductively heated to a preliminary temperature in two steps and thereafter to a final temperature in a continuous furnace.

6. The method as defined in claim 1, wherein the first step of separation is carried out before the component has been heated.

7. The method as defined in claim 1, wherein at least one separation in carried out with a laser.

8. The method as defined in claim 1, wherein the component is cooled in two steps: cooling the component in the first step to below the material's crystalline transformation point and cooling in the second step to approximately 50°C.

9. The method as defined in claim 8, including controlling the cooling during the second step.

10. The method as defined in claim 1, wherein the starting material is coated steel sheet.

11. The method as defined in claim 1, wherein the starting material is uncoated steel sheet subjected to an inert atmosphere at least before being exposed to heat prior to pressing.

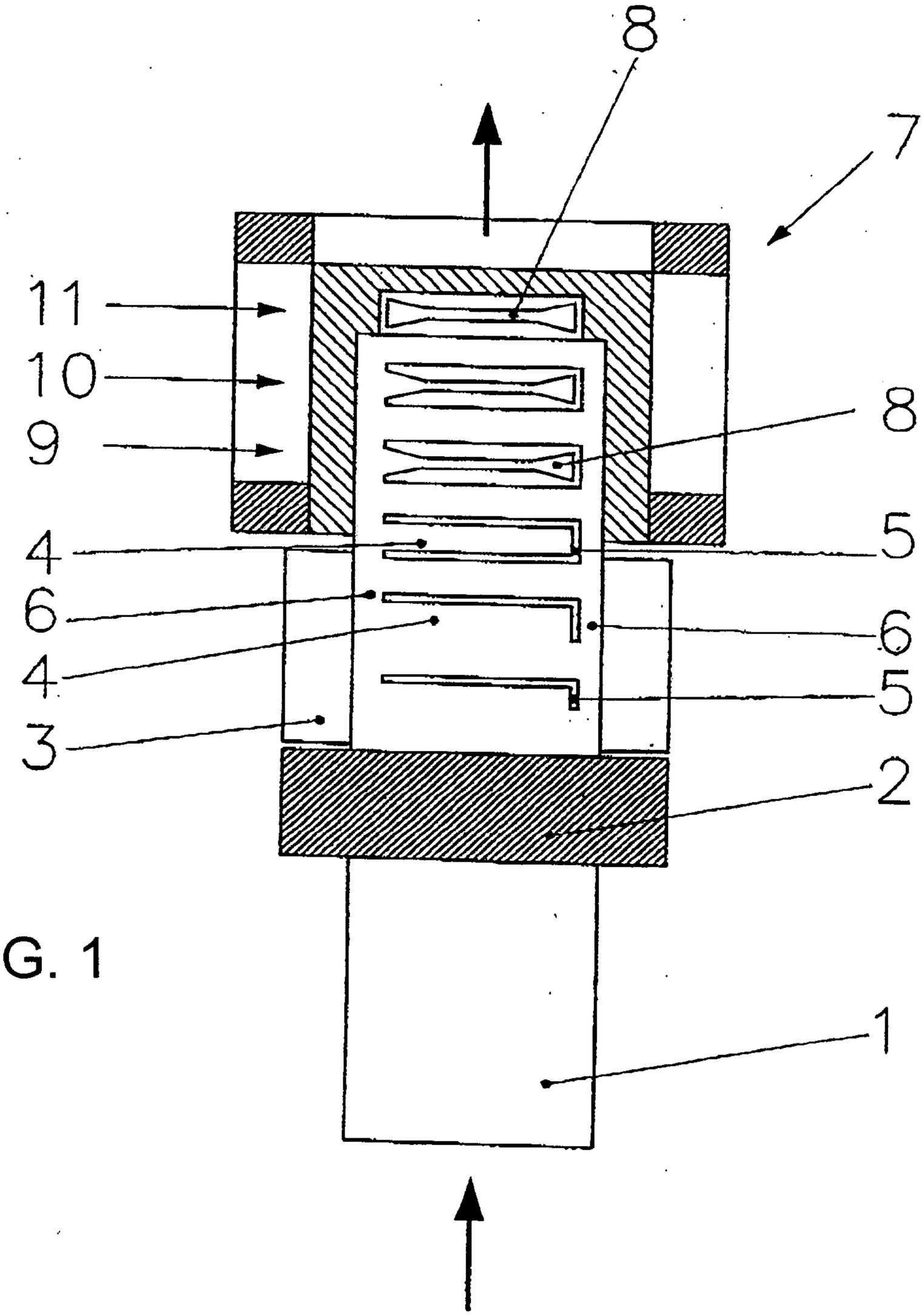
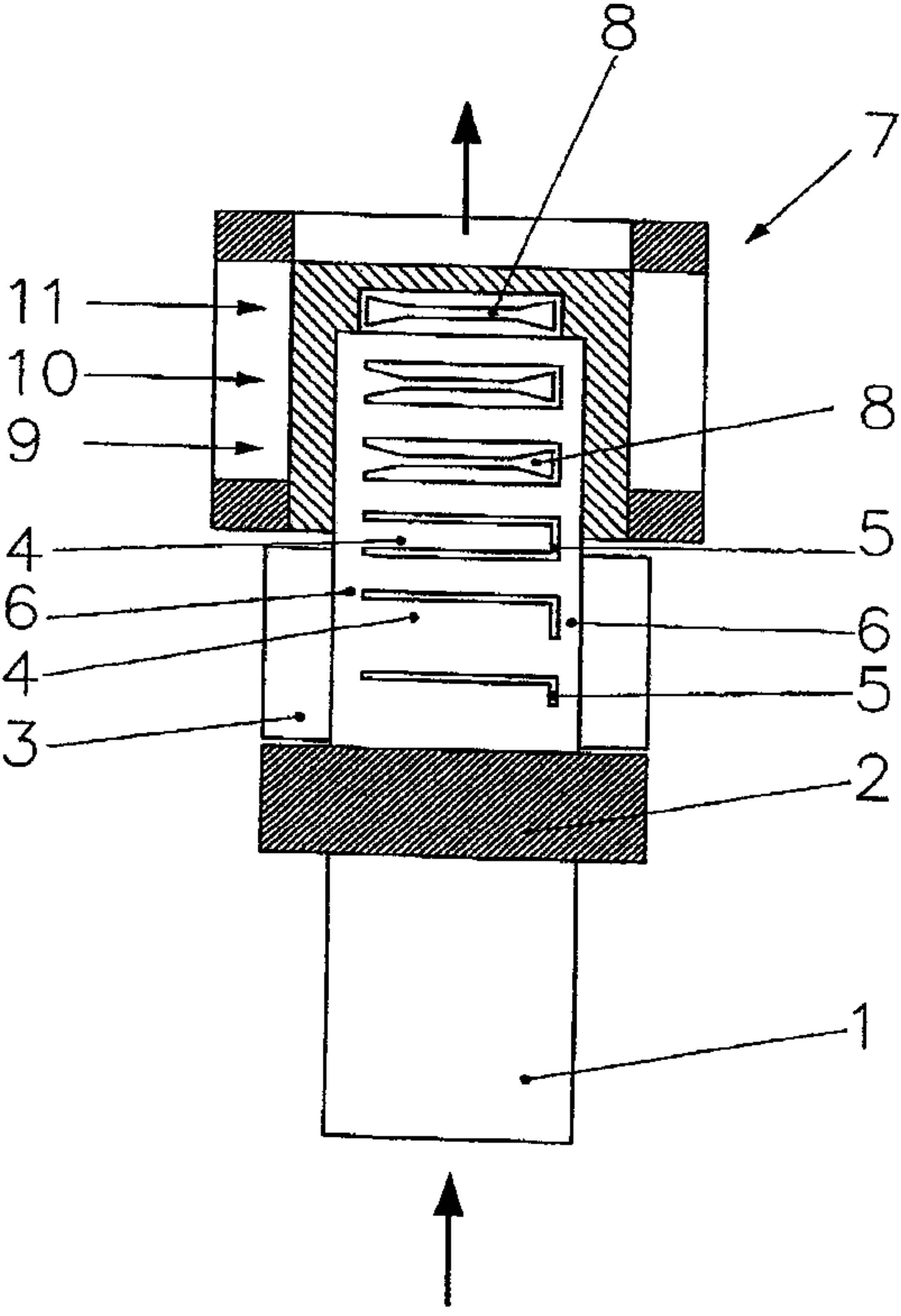


FIG. 1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