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(11)

EP 1 348 770 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.10.2003 Bulletin 2003/40

(51) Int Cl.7: **C21D 9/00, B21K 1/44**

(21) Application number: **02006521.5**

(22) Date of filing: **19.03.2002**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

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(54) Plant and procedure for the production of small parts in hot formed steel

(57) The invention concerns a plant for the production of small parts in hot formed steel comprising

- means (1) suitable to hot-press small parts in steel;
- means (2) suitable to perform a first cooling of the hot-pressed small parts to a temperature of

400-450°C at an average cooling speed of 8-12°C/second.

- means (3) suitable to perform a second cooling of the hot-pressed steel from 400-450°C to ambient temperature at an average speed of 30-50°C/hour.

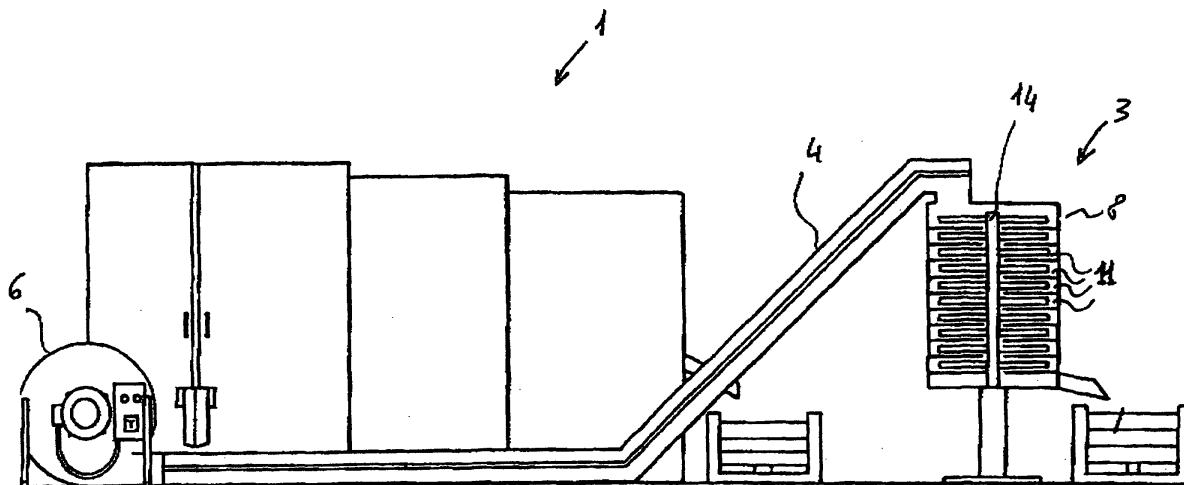


Fig. 1

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Description

[0001] The present finding relates to a plant and a procedure for the production of small parts in hot formed steel.

[0002] The production of small parts in hot formed steel can be performed by hot-pressing and successive hardening heat treatment, followed by successive tempering heat treatment.

[0003] The procedure for the production of small parts in hot formed steel currently known requires a considerable quantity of power consumption.

[0004] The object of the present invention is to obviate the problem of prior art by proposing a plant and procedure that make it possible to reduced the power consumption.

[0005] Said object is attained with a plant and a procedure conforming to the respective independent claims.

[0006] A possible embodiment of the plant, conforming to the precept of the patent claims, is described below with reference to the accompanying tables in which:

Fig. 1 is a schematic view of the plant in question;

Fig. 2 is a front section view of a first cooling device that forms an integral part of the plant;

Fig. 3 is a top view of a part of a second cooling device that forms an integral part of the plant;

Fig. 4 is a top view of a second cooling device that forms an integral part of the plant;

Fig. 5 is a top, partially sectional view of said second cooling device.

[0007] With reference to the aforesaid figures the plant comprises means 1 suitable to hot-press small parts in steel, typically a pressing heat 1 of the known type.

[0008] The hot-pressed small parts are delivered from the heat at an average temperature of approximately 900-950°C.

[0009] Means 2, suitable to perform a first cooling of the small parts delivered from the heat, and means 3 suitable to perform a second cooling to ambient temperature, are provided.

[0010] The first cooling means 2 perform cooling of the small parts from a temperature of 900-950°C to a temperature of 400-450°C in a time approximately between 50 and 100 seconds, with an average cooling speed between 8 and 12°C/second.

[0011] The second cooling means 3 perform cooling from the temperature of 400-450°C to ambient temperature at an average cooling speed of 30-50°C/hour.

[0012] The means 2 suitable to perform the first cooling comprise a tunnel 4, means 5 suitable to convey the

small metal parts essentially through the entire length of said tunnel 4, means 6 suitable to create a current of air in the tunnel 4 and means 7 suitable to introduce nebulized water into the tunnel 4.

[0013] Typically, the air and nebulized water are introduced into the tunnel at ambient temperature.

[0014] For a plant that produces 90 nuts per minute, weighing 300 grams each, the tunnel 4 is 5 metres in length and has an air flow section of 4 dm², the small parts remain in the tunnel for approximately 50 to 100 seconds, the air flow is approximately 40 m³/hour and the quantity of nebulized water introduced into the tunnel is approximately 5 m³/hour.

[0015] The small metal parts are delivered from the tunnel at an average temperature of approximately 400-450°C.

[0016] In the embodiment shown the tunnel 4 has a rectangular section and the transporting means 5 are composed of a conveyor belt 5, of the known type, arranged inside the tunnel 4, which conveys the small parts essentially along the entire length of the tunnel 4.

[0017] To create the air current inside the tunnel, a special fan 6 is provided, connected at the end of the tunnel into which the small parts, still hot, are fed.

[0018] A special pump supplies one or more nozzles which nebulize the water at the entrance to the tunnel.

[0019] The small parts enter the tunnel through a special opening transversal to the axis of the tunnel.

[0020] The nebulized water rapidly absorbs the heat of the small parts and is delivered from the end of the tunnel, together with the air, in the form of unsaturated vapour.

[0021] To regulate the cooling speed of the first means 2, means (not shown) to regulate the speed at which the small metal parts are conveyed inside the tunnel and/or means to regulate the flow of the air current inside said tunnel and/or means to regulate the flow of nebulized water are provided.

[0022] The second cooling means 3 are suitable to move the small parts in a calm air environment, to perform slow, preferably isothermal, cooling.

[0023] The means 3 suitable to perform cooling in calm air comprise a hollow cylindrical body 8, with a vertical axis, with a top feed opening 9 and a bottom delivery opening 10.

[0024] Internally the hollow cylindrical body is divided into a plurality of cylindrical chambers 11 overlapping and connected sequentially by means of openings arranged according to a helical trajectory.

[0025] Each chamber 11 is provided with a plurality of blades 13 connected to a single rotating shaft 14, suitable to give the small parts a rotatory movement in the opposite direction to said helical trajectory.

[0026] The two cooling processes give the small parts a fine crystalline structure, essentially of the bainitic type, provided with appreciable hardness and toughness (up to 36 HRC).

[0027] By varying the flow of air and/or nebulized wa-

ter and/or the time the small parts remain inside the tunnel it is possible to modify the quality of the final crystalline structure.

[0028] The plant is particularly suitable for carbon, carbon and boron, alloy and micro-alloy steels.

[0029] It is apparent that the plant described above consumes less power and its construction is relatively simple.

Claims

1. Plant for the production of small parts in hot formed steel comprising

- means (1) suitable to hot-press small parts in steel;
- means (2) suitable to perform a first cooling of the hot-pressed small parts to a temperature of 400-450°C at an average cooling speed of 8-12°C/second;
- means (3) suitable to perform a second cooling of the hot-pressed steel from 400-450°C to ambient temperature at an average speed of 30-50°C/hour.

2. Plant, as claimed in claim 1, in which said means (2) to perform said first cooling comprise:

- a tunnel (4);
- means (5) suitable to receive the hot-pressed small parts at one end of the tunnel and to convey the small metal parts through said tunnel (4);
- means (6) suitable to create a current of air in said tunnel (4);
- means (7) suitable to introduce nebulized water into said tunnel (4).

3. Plant, as claimed in claim 2, in which means to regulate the speed at which the small metal parts are conveyed and/or means to regulate the flow of the air current inside said tunnel and/or means to regulate the flow of nebulized water are provided.

4. Plant, as claimed in any of the previous claims, in which said means (3) suitable to perform cooling in calm air comprise a hollow cylindrical body (8), with a vertical axis, with a top feed opening (9) and a bottom delivery opening (10) and divided internally into a plurality of overlapping cylindrical chambers (11) connected sequentially by means of openings (12) arranged according to a helical trajectory, provided in each chamber (11) with a plurality of blades (13), connected to a single rotating shaft (14), suitable to give the small parts a rotatory movement in the opposite direction to said helical trajectory.

5. Procedure for the production of small parts in hardened steel comprising the following steps:

- hot-pressing of the small metal parts;
- reducing the temperature of the small parts from 900-950°C to 400-450°C at an average speed of 8-12°C/second;
- reducing the temperature of the small parts from 400-450°C to ambient temperature at an average speed of 30-50°C/hour.

6. Procedure, as claimed in claim 5, in which said first cooling is performed with a flow of air and nebulized water.

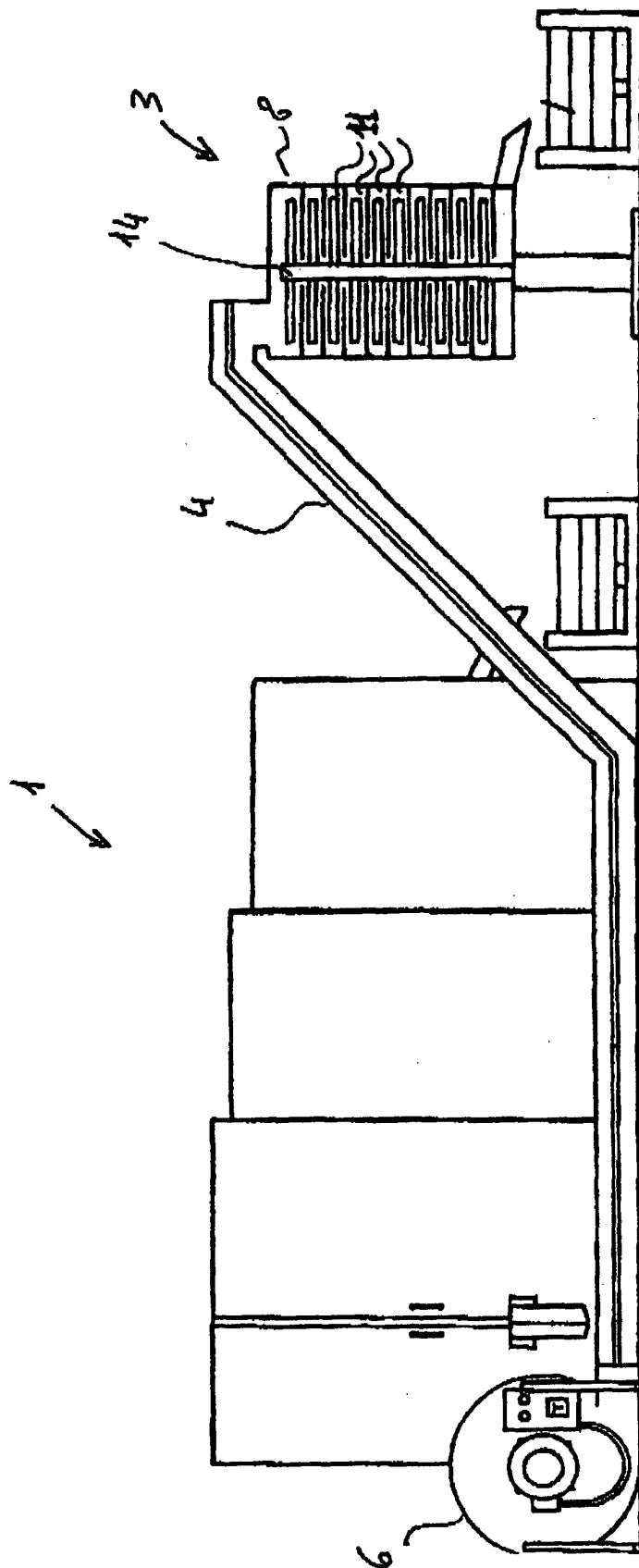


Fig. 1

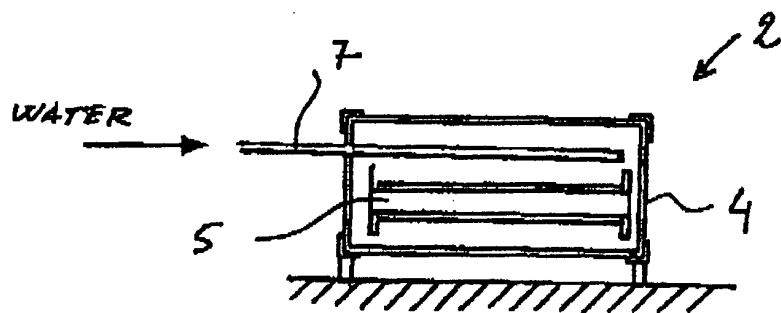


Fig. 2

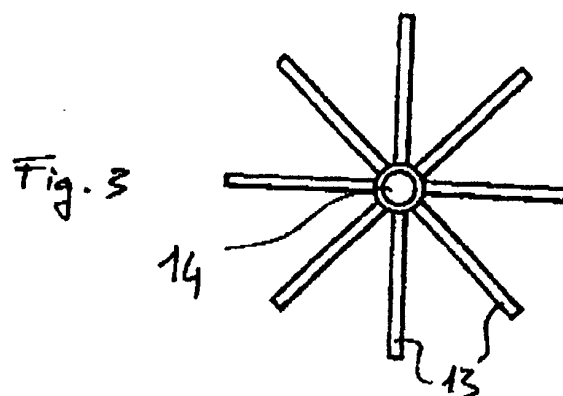


Fig. 3

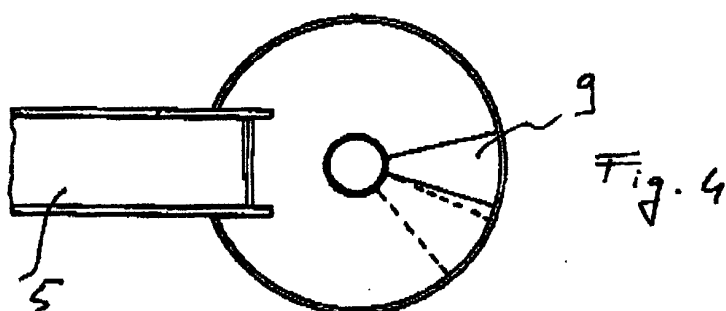


Fig. 4

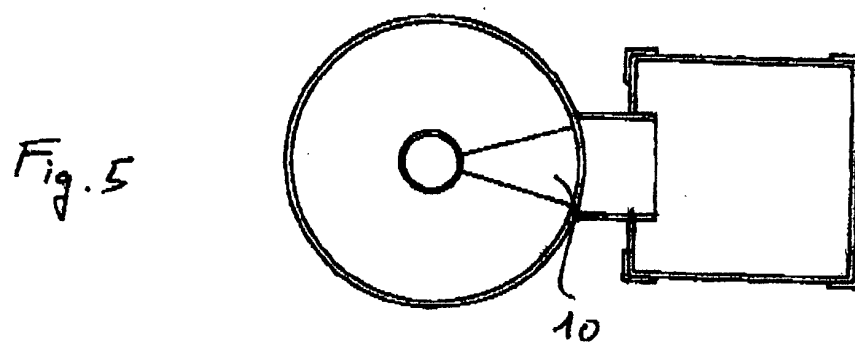


Fig. 5



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Place of search THE HAGUE		Date of completion of the search 18 July 2003	Examiner Vlassi, E
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