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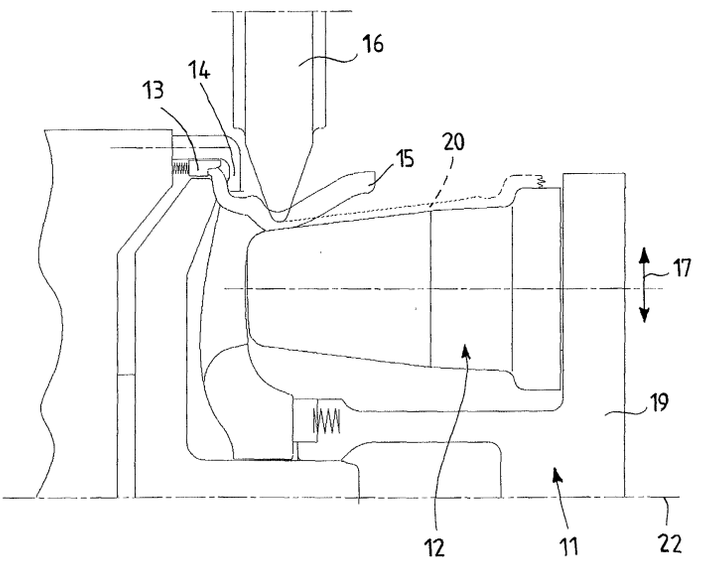
(54) Flexible procedure for flow forming light alloy wheels and the relative machine

(57) A flexible procedure for flow forming light alloy wheels wherein a preform (15) for a wheel (20, 120) is heated to about 400°C and then subject to a rolling step, wherein the preform (15) is arranged blocked in equipment at one end (at 14) and bound to a mobile centring device (13) so as to be arranged on at least three profile rollers (12), after which it is subjected to the action of at least three casting rollers (16) capable of displacing radially towards a central rotational axis (22) which deform it to the final shape of wheel (20, 120). A machine for flow forming light alloy wheels wherein the aforementioned preform (15) for a wheel (20, 120) is treated comprising equipment (11) for supporting the preform (15) and at least three casting rollers (16) acting on the preform, in which the equipment (11) comprises a structure (19) carrying at least three profile rollers (12), arranged idly on shafts carried by the structure (19), a mobile centring device (13) for one end of the preform (15) and a blocker (14) of the end of the preform.

Fig.1



EP 1 389 501 A1

Description

[0001] The present invention refers to a flexible procedure for flow forming light alloy wheels and the relative machine.

[0002] Currently, the production of light alloy wheels requires a series of steps and stages with the relative expensive equipment and long periods of time, which mean a relatively low productivity and substantial plant and treatment costs.

[0003] For example, in a traditional process, a special casting machine is required essentially consisting of a whole set of equipment which cooperates with a tailstock and rollers of a different size which act upon the material being treated according to a logic programmed by an electronic control which correlates its movement and operations.

[0004] As stated, therefore, a machine is foreseen upon which a whole set of metallic equipment is arranged which reproduces the inside of the end shape of the piece. This set of equipment comprises, as well as an outer part, which cooperates with a tailstock, which reproduces the inner shape of the end wheel, an arrangement of parts inside the equipment to heat and gear a piece to be worked, known as a "preform", for example made of light alloy, which is being treated in the equipment.

[0005] In fact, the wheel to be worked is initially obtained by fusion making a sketch of the channel shape. Then this sketch is heated up to approximately 400°C and is placed in said equipment.

[0006] Once the preform is mounted, the tailstock of the machine blocks this piece against the outer surface of the aforementioned equipment.

[0007] At this point, with the aforementioned parts blocked, the equipment and the tailstock are made to rotate and three rollers, generally of a different shape, intervene on the outer part of the preform.

[0008] Since the preform is heated, the aforementioned rollers, following different routes programmed by the electronic control of the entire machine, cast, or rather "spread", the inner part of the wheel, making it adhere to the inner shape determined by the outer surface of the equipment.

[0009] Precisely this process is commonly called "flow forming" of wheels.

[0010] During treatment, the equipment is also usually heated electrically up to 240°C, to keep the temperature of the piece constant, initially around 400°C, and to guarantee a reliable process and constant sizes of the wheel being cast.

[0011] It is clear that according to a procedure such as the one just described, for every size, shape of channel and inner shape of the wheel it is necessary to plan, manufacture and assemble a specific set of equipment for that wheel. This, as stated, involves substantial plant costs as well as tying up of capital and resources. Moreover, the maintenance of so complex piece of equipment and of its auxiliary plants requires further investment in resources and the correlating costs. The need to have different equipment available for every type of wheel rises the overall costs.

[0012] Moreover, the time required to slowly heat the equipment to the temperature indicated above lengthens the preparation time thereof and productive volumes are lost.

[0013] Moreover, it must be considered that with known equipment it has not up to now been possible to realise wheels with a profile equipped with portions with a negative draft angle.

[0014] Therefore, the main purpose of the present invention is that of defining a flexible procedure for flow forming light alloy wheels and a relative machine which offer a valid solution to the technical problem quoted above, avoiding the involvement of complex machines which are not fast nor easy to actuate.

[0015] Another purpose is that of realising a procedure and a machine suitable for carrying out the previously outlined task which is particularly simple to actuate, also in the presence of various types of wheel which one wishes to obtain.

[0016] Another purpose is that of realising a procedure and a machine in which it is not necessary to have machine groups available which are so complex like those which are known and used up to now.

[0017] Yet another further purpose of the present invention is that of realising a procedure and a machine which allow wheels with a negative draft angle to be obtained.

[0018] These and other purposes according to the present invention are achieved by realising a flexible procedure for flow forming light alloy wheels and a relative machine as outlined in the attached claims.

[0019] Advantageously, with a procedure for flow forming light alloy wheels according to the invention the production process is made flexible and the equipment cost and the set-up times thereof are reduced.

[0020] Further exemplifying characteristics of the machine of the present invention are also object of the claims.

[0021] The characteristics and advantages of a flexible procedure for flow forming light alloy wheels and a relative machine according to the present invention shall become clearer from the following description, given as an example and not for limiting purposes, of at least one embodiment with reference to the attached figures wherein:

- figure 1 is a merely schematic section view of a portion of a first example of a set of equipment or machine for the realisation of the procedure of the present invention,
- figure 2 is a merely schematic front view of the equipment of figure 1,
- figure 3 is a merely schematic section view of a portion of a second example of equipment for the real-

isation of the procedure of the present invention.

[0022] With reference to figures 1 and 2, a machine for carrying out the procedure of the present invention is shown in a totally schematic manner, at least in one portion thereof.

[0023] Such a machine comprises simple equipment 11, equipped with three roller profiles 12, of the standard cone type, in cooperation with which is foreseen a mobile centring device 13 and a blocker 14, in sections, for a preform 15 to be shaped.

[0024] Such equipment 11 works in cooperation with at least three casting rollers 16, only one of which is illustrated in figure 1, which realise the flow forming procedure.

[0025] Once the preform 15 has been heated to a temperature of 400°C, it is mounted onto this equipment 11 which is equipped with the centring device 13 and the blocker 14.

[0026] The mobile centring device 13 compensates the possible temperature differences and thus the expansion differences.

[0027] As stated previously, in the procedure of the present invention three casting rollers 16 are used which are made to engage on the preform 15 according to the radial directions of the arrow 18, thanks to the fact that they can be displaced radially towards a central rotational axis 22 of the equipment 11.

[0028] According to the invention, as a contrast and opposite engagement element for the preform 15, treated by the three casting rollers 16, three profile rollers 12 are foreseen in the equipment 11 which rotate idly on three shafts (not shown) arranged on a structure 19 of the equipment itself.

[0029] In this manner in the three areas in which the three casting rollers 16 press there are three parts of equipment (three profile rollers 12) which, according to the invention, carry out the same function as a single piece of equipment.

[0030] Therefore, a flow formed wheel 20 is obtained, schematised with a dotted and dashed line in figure 1.

[0031] In this manner, the procedure is simplified and various advantages are obtained.

[0032] For example, it is no longer necessary to heat the equipment 11; indeed, corrections in size are obtained in a simple manner by varying the radial position with respect to the structure 19 of the three profile rollers 12 according to the arrow indicated with 17.

[0033] Moreover, wheels 20 with a different diameter can be made by increasing or decreasing the radial work position both of the profile rollers 12 and of the casting rollers 16.

[0034] The variation in different profiles of the cast wheels 20 is realised by simply changing just the shape of the rollers 12 and 18.

[0035] Figure 3 then shows how it is possible to realise wheels 120 with shaped profiles with negative draft angles 21. In the example, the same reference numerals are used for identical or corresponding elements.

[0036] Indeed, once the piece, or rather the wheel 120, is cast, the three profile rollers 12, or rather the three inner shapes, can be made to translate according to the arrow 17 towards the centre, thus allowing the disengagement and the extraction of the finished piece 120.

[0037] The radial movement of the three profile rollers 12 allows the casting of profiles with a negative draft angle 21, since, after casting, it is possible to retract the rollers 12 towards the centre, not shown.

[0038] Therefore, it can be seen how the main purpose initially proposed, that being that of being able to have a simpler procedure with equally simple equipment of machinery, in short times, is effectively realised according to the present invention.

[0039] The procedure and the machine or equipment of the present invention, thus conceived, are susceptible to numerous modifications and variants, all covered by the invention itself.

[0040] Moreover, in practice the equipments and the parts used, as well as their size and components, can be whatever according to the technical requirements.

Claims

1. Flexible procedure for flow forming light alloy wheels wherein a preform (15) for a wheel (20, 120) is heated to about 400°C then subjected to a rolling step, being arranged above equipment (11), **characterised in that** said preform (15) is arranged blocked at one end (at 14) and bound to a mobile centring device (13) so as to be arranged on at least three profile rollers (12), after which it is subjected to the action of at least three casting rollers (16) capable of displacing radially towards a central rotational axis (22) which deform it to the final shape of wheel (20, 120).

2. Procedure according to claim 1, **characterised in that** it foresees a radial displacement of said at least three profile rollers (12) to disengage a wheel (20, 120) which has a negative draft angle (21).

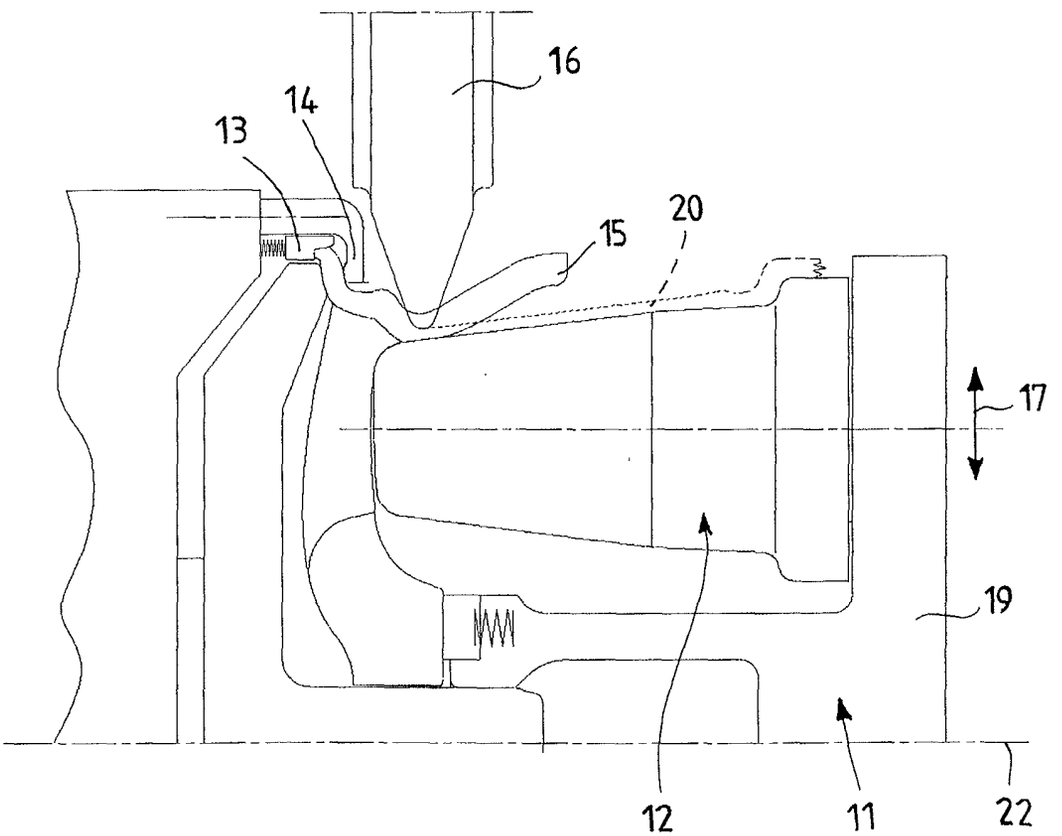
3. Machine for flow forming light alloy wheels wherein a preform (15) for a wheel (20, 120) is treated comprising equipment (11) for supporting the preform (15) and at least three casting rollers (16) acting on said preform (15), **characterised in that** said equipment (11) comprises a structure (19) carrying at least three profile rollers (12), arranged idly on shafts carried by said structure (19), a mobile centring device (13) for one end of said preform (15) and a blocker (14) of said end of said preform.

4. Machine according to claim 3, **characterised in that** said at least three profile rollers (12) are capa-

ble of displacing radially with respect to a central axis (22) of said structure (19) of said equipment (11).

5. Machine according to claim 4, **characterised in that** said at least three profile rollers (12) have a negative draft angle (21).

Fig.1



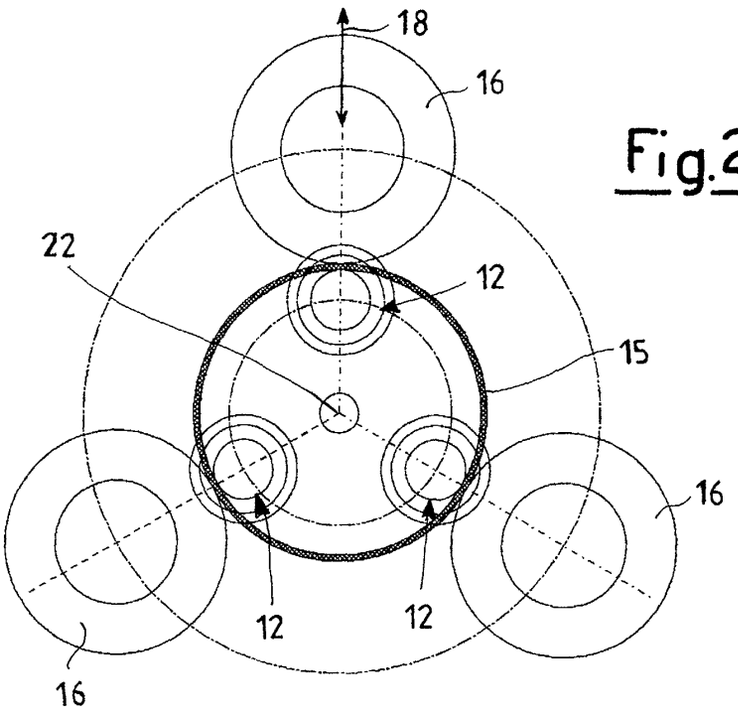


Fig.2

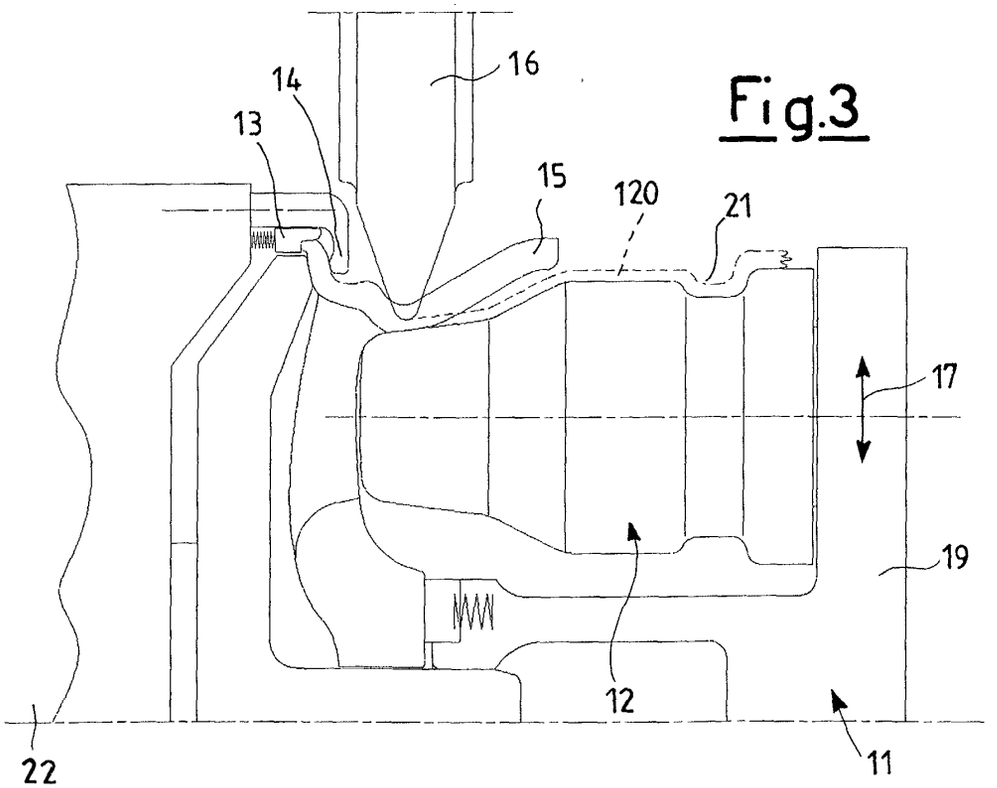


Fig.3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 07 8368

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 195 45 177 A (LEIFELD GMBH & CO) 8 August 1996 (1996-08-08) * the whole document *	1,3	B21D53/30 B21D22/14 B21H1/10
A	DE 30 19 723 A (WISSNER HANS J ING GRAD) 3 December 1981 (1981-12-03) * the whole document *	1,3	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B21D
B21H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 December 2002	Ris, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 07 8368

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82