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(54) WATER-COOLED MOLD FOR CASTING ALUMINUM ALLOY WHEEL

(57) The present invention provides a water-cooled mold for casting an aluminum alloy wheel, which is composed of a top mold, a side mold and a bottom mold, wherein a side mold insert is included between the side mold and the bottom mold, the inner surface of the side mold insert faces a cavity, and the upper surface and the lower surface are matched with the side mold frame respectively; the side mold insert is made of copper; the matching surface between the side mold insert and the side mold has a contact matching surface having a length of 10-15 mm at the edges of the inner ring and the outer ring respectively, and a gap of 0.05-0.20 mm is formed between the side mold insert and the side mold between the contact matching surfaces. The advantage of the technical solution in the present invention is that by the above measures, the cooling on spoke roots is effectively improved and the influence of the cooling water channel on spokes is limited.

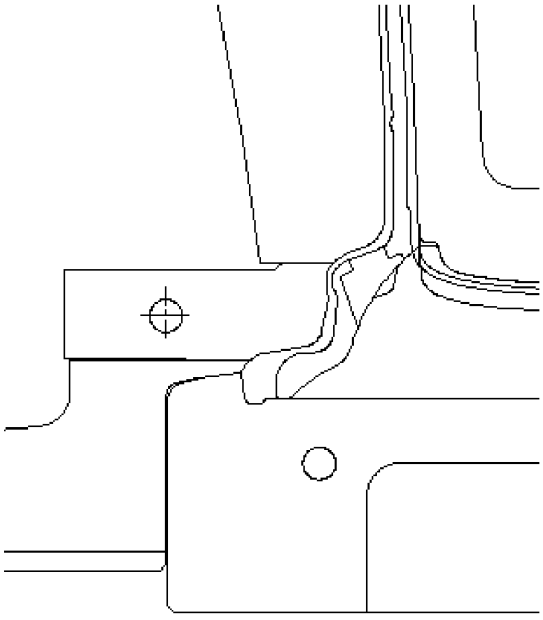

Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to a low-pressure casting mold for an aluminum wheel, specifically to a water-cooled side mold and a water-cooled bottom mold for improving the shrinkage porosity at spoke roots.

Background of the Invention

[0002] In the production process of low-pressure casting of aluminum wheels, spoke roots are very obvious hot spots where the shrinkage porosity and cavity defect easily occurs. Therefore, whether the mold design and the artificially added cooling are reasonable will greatly affect the shrinkage porosity at the spoke roots, especially the shrinkage porosity of the spoke roots produced fast is a non-negligible defect. However, the present common design cannot thoroughly and effectively solve the shrinkage porosity at the spoke roots, which brings great difficulty to speeding up the production.

[0003] Fig. 1 shows the present common cooling design of spoke roots, the side mold insert provided with a water channel 1 is made of ordinary mold steel, which causes low thermal conductivity and slow cooling of the spoke roots. Although a cooling water channel 2 is arranged in the bottom mold to assist in cooling the spoke roots, the cooling water channel 2 often affects the feeding of spokes to the spoke roots; thus arranging cooling water channel in the bottom mold brings more adverse effects. Of course, the shrinkage porosity at the spoke roots can be fed by prolonging the production cycle, adding insulation to the spokes and other measures at the expense of production efficiency.

Summary of the Invention

[0004] Accordingly, the object of the present invention is to provide a novel water-cooled mold for casting an aluminum alloy wheel, thereby overcoming the above problems.

[0005] In one aspect of the present invention, provided is a water-cooled mold for casting an aluminum alloy wheel. The water-cooled mold is composed of a top mold, a side mold and a bottom mold, and is characterized in that: a side mold insert is included between the side mold and the bottom mold, the inner surface of the side mold insert faces a cavity, and the upper surface and the lower surface are matched with the side mold frame respectively; the side mold insert is made of copper; the matching surface between the side mold insert and the side mold has a contact matching surface having a length of 10-15 mm at the edges of the inner ring and the outer ring respectively, and a gap of 0.05-0.20 mm is formed between the side mold insert and the side mold between the contact matching surfaces.

[0006] In a preferred aspect of the present invention, the matching surface between the side mold insert and the side mold has a contact matching surface having a length of 12 mm at the edges of the inner ring and the outer ring respectively, and a gap of 0.10 mm is formed between the side mold insert and the side mold between the contact matching surfaces.

[0007] In a preferred aspect of the present invention, in the water-cooled mold, a cooling water channel of the bottom mold is located on the outer side of the bottom mold.

[0008] The advantage of the technical solution in the present invention is that by the above measures, the cooling on spoke roots is effectively improved and the influence of the cooling water channel on spokes is limited.

Brief Description of the Drawings

[0009] The embodiments of the present invention will be described in detail below in combination with the accompanying drawings, in which:

Fig. 1 is a schematic diagram of a side mold insert for spoke roots in the prior art;
Fig. 2 is a schematic diagram of a side mold insert for spoke roots according to the present invention;
Fig. 3 is a schematic diagram of a matching surface of the side mold insert and a side mold according to the present invention.

[0010] In which: 1-side mold insert, 2-bottom mold cooling water channel, A-upper surface of the side mold insert, B-lower surface of the side mold insert.

Detailed Description of the Embodiments

Embodiment 1

[0011] A water-cooled mold for casting an aluminum alloy wheel is composed of a top mold, a side mold and a bottom mold, and is characterized in that: a side mold insert is included between the side mold and the bottom mold, the inner surface of the side mold insert faces a cavity, the upper surface is matched with the lower surface of the side mold, and the lower surface is matched with the upper surface of the bottom mold; the side mold insert is made of copper; the matching surface between the side mold insert and the side mold has a contact matching surface having a length L1 at the edges of the inner ring and the outer ring respectively, and a gap L2 is formed between the side mold insert and the side mold between the contact matching surfaces.

[0012] In this embodiment, the following implementation scheme is adopted for test, and the test settings are recorded in Table 1:

Table 1: Parameters of each group of test device in this embodiment

Group No.	L1/mm	L2/mm
Test group 1	10	0.05
Test group 2	12	0.10
Test group 3	15	0.20
Control group 1	The side mold insert is made of mold steel and the entire matching surface is fully fitted	
Control group 2	The side mold insert is made of red copper and the entire matching surface is fully fitted.	

[0013] The above five groups of water-cooled molds are used to produce five groups of hubs in the internal research and development workshop of CITIC Dicastal Co., Ltd., 1200 hubs constituting each group. In addition, the test results of the five test groups are measured by hub failure caused by the shrinkage porosity defect at spoke roots. The results show that the test group 2 has the best hub production quality, and the unqualified hubs caused by the shrinkage porosity defect at the spoke roots include 12 cases in test group 2, 37 cases in test group 1, 42 cases in test group 3, 81 cases in control group 1 and 54 cases in control group 2.

[0014] Hence, the mold of test group 2 reduces the ratio of the unqualified hubs caused by the shrinkage porosity defect at the spoke roots.

Claims

1. A water-cooled mold for casting an aluminum alloy wheel, being composed of a top mold, a side mold and a bottom mold, wherein a side mold insert is included between the side mold and the bottom mold, the inner surface of the side mold insert faces a cavity, and the upper surface and the lower surface are matched with the side mold frame respectively; the side mold insert is made of copper; the matching surface between the side mold insert and the side mold has a contact matching surface having a length of 10-15 mm at the edges of the inner ring and the outer ring respectively, and a gap of 0.05-0.20 mm is formed between the side mold insert and the side mold between the contact matching surfaces.

2. The water-cooled mold according to claim 1, wherein the matching surface between the side mold insert and the side mold has a contact matching surface having a length of 12 mm at the edges of the inner ring and the outer ring respectively, and a gap of 0.10 mm is formed between the side mold insert and the side mold between the contact matching surfaces.

3. The water-cooled mold according to claim 1, wherein in the water-cooled mold, a cooling water channel of the bottom mold is located on the outer side of the bottom mold.

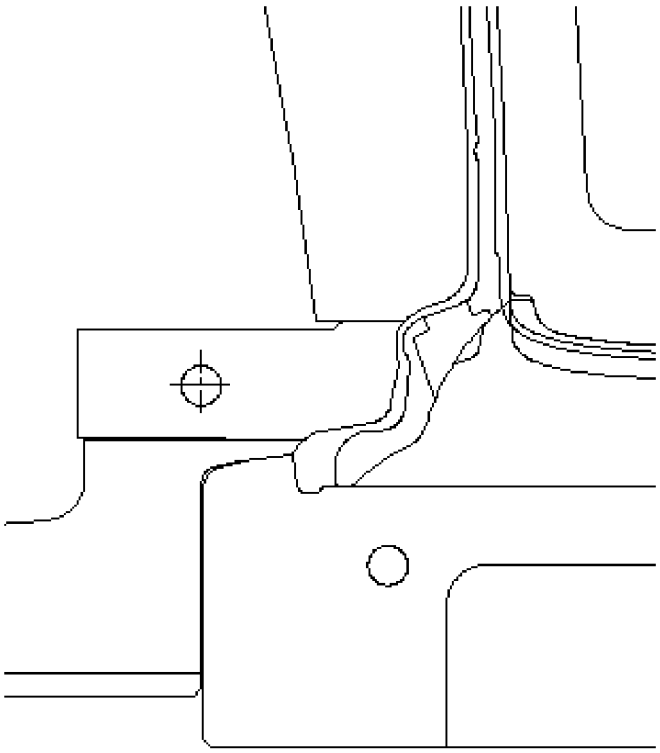

Fig. 1

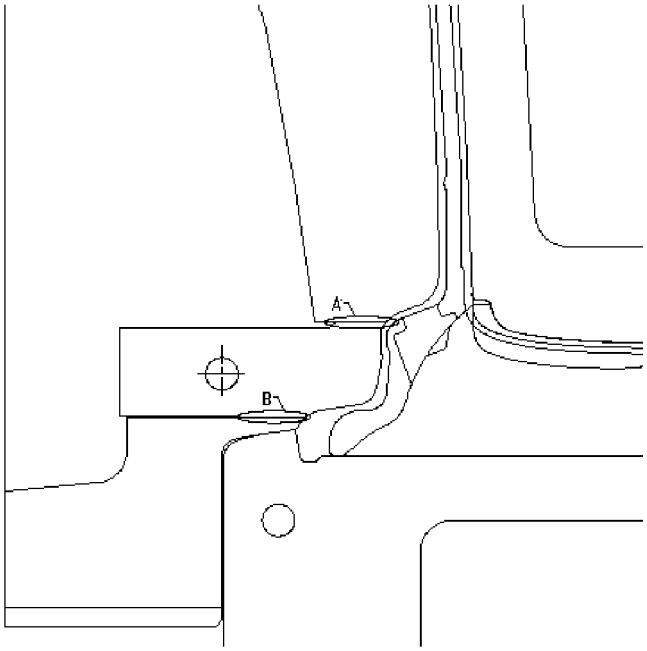

Fig. 2

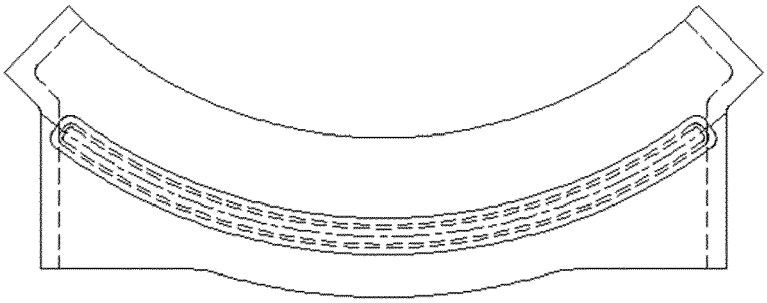

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 6074

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 204 209 101 U (CITIC DICASTAL CO LTD) 18 March 2015 (2015-03-18) * the whole document *	1-3	INV. B22C9/06 B22C9/28
X	CN 205 702 388 U (CITIC DICASTAL CO LTD) 23 November 2016 (2016-11-23) * the whole document *	1-3	
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TECHNICAL FIELDS SEARCHED (IPC)

B22C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 March 2019	Scheid, Michael

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 20 6074

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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13-03-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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CN 205702388 U	23-11-2016	NONE	
CN 106077575 A	09-11-2016	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82