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(54) **A MOULD INSERT WITH EXTENDED SERVICE LIFE FOR PRESS-MOULDING OF STAMPINGS**

(57) The subject of the invention is a mould insert with extended service life for forming stampings by means of the press-moulding method, especially stampings from refractory materials supplied in the form of refractory powders or granulates, whereas said insert constituting one of side wall linings of the mould cavity is made of alloy steel in the form of a cuboidal solid characterised in that its outer working surface (3) is joined inseparably with metallic coating (4) with thickness $g = 0.2-0.4$ mm and hardness 2750-2785 HV, and the coating contains in its composition 86-90% by weight of tungsten carbide and 10-14% by weight of cobalt

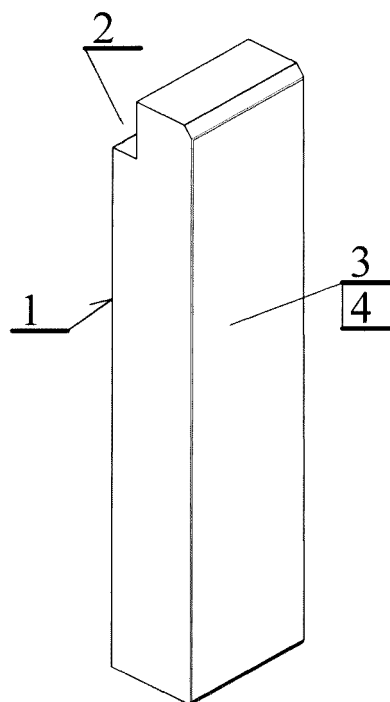


Fig. 1

Description

[0001] The subject of the invention is a mould insert with extended service life for forming stampings by means of press moulding method, especially stampings from refractory materials in the form of powders or granulates.

[0002] The moulds for fabrication of cuboidal stampings out of powdered refractory materials known to date have usually a frame provided with a through opening with rectangular profile in which a die is mounted composed of four side monolithic plate-shaped inserts made of tool alloy steel of NC11 grade with hardness of 60HRC.

[0003] Replaceable inserts for these moulds, as a result of friction occurring between them and the powdered refractory material under pressure exerted on them in the course of press moulding, after fabrication of certain number of stampings are subject to significant wear-out which results in rejection of the manufactured stampings and ultimate scrapping of the inserts after several cycles of renovation. The wear is also the cause of prolonged stoppages in the stampings production process relating to the necessity to remove the mould from the press, uninstall the worn-out inserts, and install analogous replacement inserts.

[0004] The objective of the present invention is to eliminate the above-quoted inconveniences characterising the plate-shaped steel mould inserts constituting the cavity of the mould used to fabricate the stampings.

[0005] According to the invention, the essential feature of the mould insert with extended service life for forming stampings by means of the press moulding method, especially out of refractory materials in the form of powders or granulates, constituting one of linings of side walls of the mould die and made of alloy steel in the form of plate-shaped cuboidal solid consists in that its outer working surface is joined inseparably with a metallic coating with thickness of 0.2-0.4 mm and hardness of 2750-2785HV, whereas the coating contains in its composition 86-90% by weight of tungsten carbide and 10-14% by weight of cobalt. Favourably, the inseparable joint between the outer working surface of the mould insert with the metallic coating is made by means of plasma-spraying of powder with grain size $(45 \pm 15) \mu\text{m}$.

[0006] The new design solution of the mould insert with increased service life for forming stampings of refractory materials supplied in the form of powders or granulates according to the present invention allowed to reduce significantly the operating costs related to the use of said form, and thus to reduce also the overall cost of the products fabricated in these moulds. The above-mentioned merits of the mould insert according to the invention are evidenced, among other things, by the following facts:

- the monolithic, massive, one-piece mould insert made of alloy tool steel was replaced with an analogous monolithic mould insert but with a metallic coating containing tungsten carbides in a cobalt ma-

trix deposited by means of plasma-spraying of powder with grain size of $(45 \pm 15) \mu\text{m}$ on the insert working surface and joined permanently with said surface which resulted in a multiple increase of service life of such mould insert compared to previously used inserts without such coating, and moreover

- the increase of the service life of mould inserts, and at the same the service life of the mould for production of stampings of powdered refractory materials allowed to reduce the stoppage time connected with the necessity to remove the mould from press, uninstall the worn-out inserts, and install new ones. This allowed also to reduce significantly consumption of expensive tool steel of which the monolithic mould inserts were fabricated to date, subject to scrapping once their working surfaces were deteriorated.

[0007] The subject of the invention is shown in its example embodiments on drawings, of which Fig. 1 shows the insert for the mould used to form stampings in a perspective view; Fig. 2 - the same insert in the front view; Fig. 3 - the same insert in vertical cross-section along line A-A; and Fig. 4 - the frame of the mould for fabrication of stampings, with rectangular die opening of the frame equipped with four inserts provided with metallic coatings on their working surfaces, in a perspective view.

Example 1

[0008] The mould insert with extended service life for press-moulding of stampings out of refractory materials constitutes a cuboidal solid made of NC 11 alloy steel with hardness $(60 \pm 1)\text{HRC}$ which on one end of its inner surface 1 has a rectangular recess 2, whereas on the whole of its outer surface 3, the solid is provided with a metallic coating 4 with thickness $g = 0.2 \text{ mm}$ and hardness of 2750HV joined permanently with said outer surface. The metallic coating 4 is deposited on surface 3 of the insert by means of plasma spraying a powder with grain size $(45 \pm 15) \mu\text{m}$ containing tungsten carbides in a cobalt matrix whereas the powder contains 86% by weight of tungsten carbide and 14% by weight of cobalt in its composition creating thus a monolithic cuboidal solid.

Example 2

[0009] The mould insert described in the first example has a metallic coating 4 with thickness $g = 0.4 \text{ mm}$ and hardness of 2785HV, whereas the powder with grain size $(45 \pm 15) \mu\text{m}$ contains in its composition 90% by weight of tungsten carbides and 10% by weight of cobalt.

[0010] In an example embodiment of the mould for fabrication of stampings presented in Fig. 7, four monolithic mould inserts according to the invention having the form of plate-shaped cuboidal solids and provided with metallic coating 4 on their outer working surfaces are placed

in a rectangular opening 5 of frame 6 of the mould used for fabrication of stampings, said inserts being joined detachably by means of any known method with walls 7 of the opening, as a result of which a die 8 is created increasing significantly the service life of the mould.

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Claims

1. A mould insert with extended service life for forming stampings by means of press moulding, especially stampings formed from refractory materials in the form of powders or granulates, constituting one of linings of the mould cavity side walls and made of alloy steel in the form of cuboidal solid **characterised in that** its outer working surface (3) is joined inseparably with a metallic coating (4) with thickness $g = 0.2-0.4$ mm and hardness of 2750-2785HV.
2. The mould insert according to claim 1 **characterised in that** the metallic coating (4) contains in its composition 86-90% by weight of tungsten carbide and 10-14% by weight of cobalt.
3. The mould insert according to claim 1 or 2 **characterised in that** the 'inseparable joint of the outer working surface (3) of the insert with the metallic coating (4) is made with the use of plasma-spraying a powder with grain size $(45 \pm 15) \mu\text{m}$.

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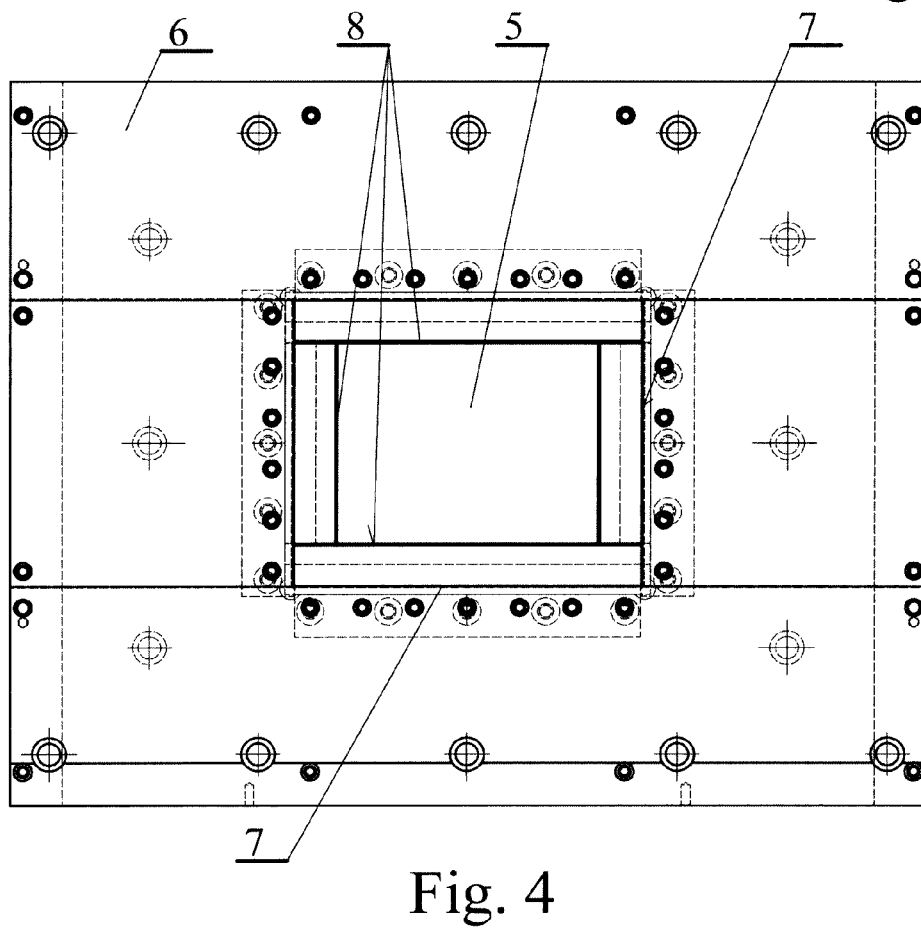
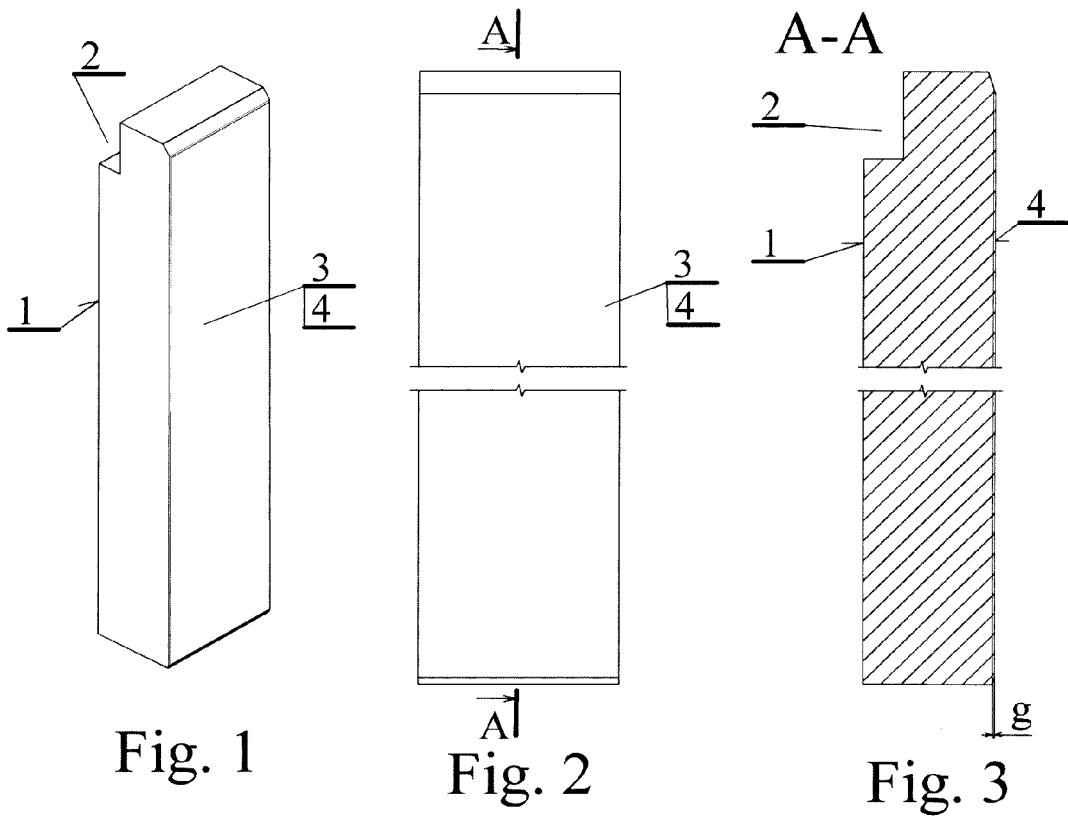
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Application Number
EP 16 46 0035

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 0 919 345 A1 (FOMB OFFICINE MECCANICHE BONGI [IT]) 2 June 1999 (1999-06-02) * the whole document *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			C23C B28B B30B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 September 2017	Examiner Hoyer, Wolfgang
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 46 0035

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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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21-09-2017

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