

INJECTION MOLD INSERT AND METHOD OF MANUFACTURING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims the benefit of Chinese Patent Application No. CN202211110533.6 filed on September 13, 2022 in the State Intellectual Property Office of China, the whole disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

10 The present invention relates to an injection mold insert and a method for manufacturing the injection mold insert.

Description of the Related Art

15 In the prior art, a connector product typically consists of a terminal and a plastic housing. The plastic housing is usually completed using injection molding technology, which uses an injection mold insert to form the plastic housing. The molding cycle of the injection molding process is crucial for the production efficiency of the connector housing. In the injection molding cycle, the cooling time often accounts for the majority of the entire molding cycle, sometimes even accounting for more than 50% of the molding cycle. Therefore, how to effectively reduce cooling time while ensuring product quality and production stability is crucial for reducing the molding cycle.

20 In the prior art, the injection mold insert is usually made of steel, but the thermal conductivity of steel is average. In order to improve the cooling efficiency of injection mold insert, it is usually necessary to form a cooling channel, such as a water cooling channel, in the injection mold insert. However, for the connector housing with complex structure, the cooling water path is usually difficult to reach certain hot spot areas of injection mold insert, resulting in poor cooling effect in the hot spot areas, thereby affecting the quality and molding cycle of the connector housing. In addition, for the connector housing with more complex structures and smaller space, sometimes the hot spot area does not have enough space for processing cooling channels, resulting in poor cooling effect in the hot spot area and reducing the injection molding cycle of the connector product.

SUMMARY OF THE INVENTION

35 The present invention has been made to overcome or alleviate at least one aspect of the

above mentioned disadvantages.

According to an aspect of the present invention, there is provided an injection mold insert. The injection mold insert comprises of: a first metal structure; and a second metal structure which is wrapped in the first metal structure. The hardness of the first metal structure is higher than that of the second metal structure, and the thermal conductivity of the second metal structure is higher than that of the first metal structure; at least one of the first metal structure and the second metal structure is made by heating and molting metal powder, so that the first metal structure and the second metal structure are sintered together without layering or infiltration.

According to an exemplary embodiment of the present invention, the first metal structure is a steel structure or steel alloy structure, and the second metal structure is a copper structure or copper alloy structure.

According to another exemplary embodiment of the present invention, the second metal structure comprises at least one irregularly shaped complex structural body.

According to another exemplary embodiment of the present invention, the maximum cross-sectional size of the complex structure is less than mm, mm, mm, or mm.

According to another exemplary embodiment of the present invention, the first metal structure and the second metal structure respectively include multiple layers, and the multiple layers of the first metal structure and the multiple layers of the second metal structure are alternately stacked.

According to another aspect of the present invention, there is provided a method for manufacturing the above injection mold insert, wherein the method comprises the following steps of:

S11: providing a first laser printing head and a second laser printing head; and

S12: simultaneously printing the first metal structure and the second metal structure by using the first laser printing head and the second laser printing head, respectively,

wherein the first laser printing head ejects a first metal powder and emits a first laser beam, which heats and melts the ejected first metal powder to produce the first metal structure,

wherein the second laser printing head ejects a second metal powder and emits a second laser beam, which heats and melts the ejected second metal powder to produce the second metal structure.

According to an exemplary embodiment of the present invention, the first laser printing head also ejects a first inert gas to prevent oxidation of the molten first metal powder during printing; and/or the second laser printing head also ejects a second inert gas to prevent oxidation of the molten second metal powder during printing.

According to another exemplary embodiment of the present invention, the first laser printing head comprises of: a first laser beam channel located at the center of the first laser printing head, wherein the first laser beam is emitted through the first laser beam channel; a first

metal powder channel surrounds the first laser beam channel, wherein the first metal powder is ejected from an outlet of the first metal powder channel; and a first inert gas channel surrounds the first metal powder channel, wherein the first inert gas is ejected from an outlet of the first inert gas channel.

5 According to another exemplary embodiment of the present invention, the second laser printing head comprises of: a second laser beam channel located at the center of the second laser printing head, wherein the second laser beam is emitted through the second laser beam channel; a second metal powder channel surrounds the second laser beam channel, wherein the second metal powder is ejected from an outlet of the second metal powder channel; and a second inert
10 gas channel surrounds the second metal powder channel, wherein the second inert gas is ejected from an outlet of the second inert gas channel.

According to another aspect of the present invention, there is provided a method for manufacturing the above injection mold insert, the method comprises the following steps of:

 S21: machining the first metal structure on a first metal block, wherein the first metal
15 structure has a cavity complementary to the second metal structure; and

 S22: printing the second metal structure in the cavity of the machined first metal structure by using a laser printing head,

 wherein during printing the second metal structure, the laser printing head ejects a second metal powder and emits a laser beam, which heats and melts the ejected second metal powder to
20 produce the second metal structure.

According to an exemplary embodiment of the present invention, further comprising a step of: cutting the manufactured injection mold insert from the first metal block.

According to another aspect of the present invention, there is provided a method for manufacturing the above injection mold insert, the method comprises the following steps of:

25 S31: machining the second metal structure on a second metal block; and

 S32: printing the first metal structure on the machined second metal structure by using a laser printing head,

 wherein during printing the first metal structure, the laser printing head ejects a first metal powder and emits a laser beam, which heats and melts the ejected first metal powder to produce
30 the first metal structure.

According to an exemplary embodiment of the present invention, the method further comprises a step of: cutting the manufactured injection mold insert from the second metal block.

According to another aspect of the present invention, there is provided a method for manufacturing the above injection mold insert, the method comprises the following steps of:

35 S41: manufacturing the first metal structure, which has a cavity complementary to the second metal structure;

 S42: filling the cavity of the first metal structure with a second metal powder; and

 S43: heating and melting the second metal powder to produce the second metal structure.

According to an exemplary embodiment of the present invention, wherein in the step S41, the first metal structure is manufactured by machining or printing.

In the aforementioned exemplary embodiments of the present invention, the first or second metal structure of the injection mold insert is formed by sintering metal powder, so that there is no layering or infiltration between the first and second metal structures. The method of the present invention is suitable for manufacturing injection mold insert with complex structures and injection mold insert with small dimensions.

In addition, the present invention also simplifies the manufacturing process of injection mold insert and reduces the manufacturing cost of injection mold insert. In addition, the heat in the hot spot area inside the injection mold insert can be transferred more quickly to the outside through the high thermal conductivity second metal structure, greatly improving the cooling efficiency of the injection mold insert.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

Figure 1 shows an illustrative view of using two laser printing heads to simultaneously print the first metal structure and the second metal structure according to an exemplary embodiment of the present invention, wherein the bottom portion of the first metal structure and the second metal structure have just been printed;

Figure 2 shows an illustrative view of using two laser printing heads to simultaneously print the first metal structure and the second metal structure according to an exemplary embodiment of the present invention, wherein a majority of the first metal structure and the second metal structure have been printed;

Figure 3 shows an illustrative view of using two laser printing heads to simultaneously print the first metal structure and the second metal structure according to an exemplary embodiment of the present invention, wherein the first metal structure and the second metal structure have been printed;

Figure 4 shows an illustrative view of the structure of a laser printing head according to an exemplary embodiment of the present invention;

Figure 5 shows an illustrative view of a second metal structure machined on a second metal block according to an exemplary embodiment of the present invention;

Figure 6 shows an illustrative view of a first metal structure printed on the second metal structure shown in Figure 5 using a laser printing head according to an exemplary embodiment of the present invention, wherein a large portion of the first metal structure has been printed;

Figure 7 shows an illustrative view of a first metal structure printed on the second metal structure shown in Figure 5 using a laser printing head according to an exemplary embodiment

of the present invention, wherein the first metal structure has been printed;

Figure 8 shows an illustrative view of a first metal structure machined on a first metal block according to an exemplary embodiment of the present invention;

Figure 9 shows an illustrative view of using a laser printing head to print a second metal structure in the cavity of the first metal structure shown in Figure 8, according to an exemplary embodiment of the present invention;

Figure 10 shows an illustrative view of the first metal structure manufactured according to an exemplary embodiment of the present invention;

Figure 11 shows an illustrative view of filling a second metal powder in the cavity of the first metal structure shown in Figure 10, according to an exemplary embodiment of the present invention; and

Figure 12 shows an illustrative view of heating and melting the second metal powder shown in Figure 11 according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE IVENTION

Exemplary embodiments of the present disclosure will be described hereinafter in detail with reference to the attached drawings, wherein the like reference numerals refer to the like elements. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiment set forth herein; rather, these embodiments are provided so that the present disclosure will be thorough and complete, and will fully convey the concept of the disclosure to those skilled in the art.

In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

According to a general concept of the present invention, there is provided an injection mold insert. The injection mold insert comprises of: a first metal structure; and a second metal structure which is wrapped in the first metal structure. The hardness of the first metal structure is higher than that of the second metal structure, and the thermal conductivity of the second metal structure is higher than that of the first metal structure; at least one of the first metal structure and the second metal structure is made by heating and molting metal powder, so that the first metal structure and the second metal structure are sintered together without layering or infiltration.

According to another general concept of the present invention, there is provided a method for manufacturing the above injection mold insert, wherein the method comprises the following steps of: providing a first laser printing head and a second laser printing head; and simultaneously printing the first metal structure and the second metal structure by using the first

laser printing head and the second laser printing head, respectively. The first laser printing head ejects a first metal powder and emits a first laser beam, which heats and melts the ejected first metal powder to produce the first metal structure. The second laser printing head ejects a second metal powder and emits a second laser beam, which heats and melts the ejected second metal powder to produce the second metal structure.

According to another general concept of the present invention, there is provided a method for manufacturing the above injection mold insert, the method comprises the following steps of: machining the first metal structure on a first metal block, wherein the first metal structure has a cavity complementary to the second metal structure; and printing the second metal structure in the cavity of the machined first metal structure by using a laser printing head. During printing the second metal structure, the laser printing head ejects a second metal powder and emits a laser beam, which heats and melts the ejected second metal powder to produce the second metal structure.

According to an aspect of the present invention, there is provided a method for manufacturing the above injection mold insert, the method comprises the following steps of: machining the second metal structure on a second metal block; and printing the first metal structure on the machined second metal structure by using a laser printing head. During printing the first metal structure, the laser printing head ejects a first metal powder and emits a laser beam, which heats and melts the ejected first metal powder to produce the first metal structure.

According to another general concept of the present invention, there is provided a method for manufacturing the above injection mold insert, the method comprises the following steps of: manufacturing the first metal structure, which has a cavity complementary to the second metal structure; filling the cavity of the first metal structure with a second metal powder; and heating and melting the second metal powder to produce the second metal structure.

Figure 1 shows an illustrative view of using two laser printing heads 1 and 2 to simultaneously print the first metal structure/1 and the second metal structure 12 according to an exemplary embodiment of the present invention, wherein the bottom parts of the first metal structure 11 and the second metal structure 12 have just been printed; Figure 2 shows an illustrative view of using two laser printing heads 1 and 2 to simultaneously print the first metal structure 11 and the second metal structure 12 according to an exemplary embodiment of the present invention, wherein a large portion of the first metal structure 11 and the second metal structure 12 have been printed; Figure 3 shows an illustrative view of using two laser printing heads 1 and 2 to simultaneously print the first metal structure 11 and the second metal structure 12 according to an exemplary embodiment of the present invention, wherein the first metal structure 11 and the second metal structure 12 have been printed; Figure 4 shows an illustrative view of the structure of laser printing heads 1 and 2 according to an exemplary embodiment of the present invention.

As shown in Figures 1 to 4, in an exemplary embodiment of the present invention, a

method for manufacturing an injection mold insert 10 is disclosed. The method for manufacturing the injection mold insert 10 mainly includes the following steps of:

S11: providing the first laser printing head 1 and the second laser printing head 2; and

S12: using the first laser printing head 1 and the second laser printing head 2 to simultaneously and respectively print the first metal structure 11 and the second metal structure 12 on the substrate 3.

As shown in Figures 1 to 4, in the illustrated embodiments, during printing, the first laser printing head 1 ejects a first metal powder and emits a first laser beam. The first laser beam heats and melts the ejected first metal powder to produce the first metal structure 11.

As shown in Figures 1 to 4, in the illustrated embodiments, during printing, the second laser printing head 2 ejects a second metal powder and emits a second laser beam, which heats and melts the ejected second metal powder to form the second metal structure 12.

As shown in Figures 1 to 4, in the illustrated embodiments, during printing, the first laser printing head 1 also ejects a first inert gas to prevent oxidation of the molten first metal powder.

As shown in Figures 1 to 4, in the illustrated embodiments, during printing, the second laser printing head 2 also ejects a second inert gas to prevent oxidation of the molten second metal powder.

As shown in Figures 1 to 4, in the illustrated embodiment, the first laser printing head 1 includes: a first laser beam channel 1a, a first metal powder channel 1b, and a first inert gas channel 1c. The first laser beam channel 1a is located at the center of the first laser printing head 1, and the first laser beam is emitted through the first laser beam channel 1a. The first metal powder channel 1b surrounds the first laser beam channel 1a, and the first metal powder is ejected from the outlet of the first metal powder channel 1b. The first inert gas channel 1c surrounds the first metal powder channel 1b, and the first inert gas is ejected from the outlet of the first inert gas channel 1c.

As shown in Figures 1 to 4, in the illustrated embodiment, the second laser printing head 2 includes: a second laser beam channel 2a, a second metal powder channel 2b, and a second inert gas channel 2c. The second laser beam channel 2a is located at the center of the second laser printing head 2, and the second laser beam is emitted through the second laser beam channel 2a. The second metal powder channel 2b surrounds the second laser beam channel 2a, and the second metal powder is ejected from the outlet of the second metal powder channel 2b. The second inert gas channel 2c surrounds the second metal powder channel 2b, and the second inert gas is ejected from the outlet of the second inert gas channel 2c.

Figure 8 shows an illustrative view of the first metal structure 11 machined on the first metal block 110 according to an exemplary embodiment of the present invention; Figure 9 shows an illustrative view of a second metal structure 12 printed in the cavity 101 of the first metal structure 11 shown in Figure 8 using a laser printing head (see laser printing head 2 in Figures 1 to 4) according to an exemplary embodiment of the present invention.

As shown in Figures 8 and 9, in another exemplary embodiment of the present invention, a method for manufacturing an injection mold insert 10 is also disclosed. The method for manufacturing the injection mold insert 10 mainly includes the following steps:

S21: As shown in Figure 8, a first metal structure 11 is machined on the first metal block 110, and the first metal structure 11 has a cavity 101 complementary to the second metal structure 12; and

S22: As shown in Figure 9, the second metal structure 12 is printed using a laser printing head in the cavity 101 of the machined first metal structure 11.

As shown in Figures 8 and 9, in the illustrated embodiments, when printing the second metal structure 12, the laser printing head ejects the second metal powder and emits a laser beam. The laser beam heats and melts the ejected second metal powder to produce the second metal structure 12.

As shown in Figures 8 and 9, in the illustrated embodiments, after printing the second metal structure 12, the injection mold insert 10 produced is cut off from the first metal block 110 and subjected to corresponding subsequent treatments, such as polishing and heat treatment.

Figure 5 shows an illustrative view of a second metal structure 12 machined on a second metal block 120 according to an exemplary embodiment of the present invention; Figure 6 shows an illustrative view of the first metal structure 11 printed on the second metal structure 12 shown in Figure 5 using a laser printing head (see laser printing head 1 in Figures 1 to 4) according to an exemplary embodiment of the present invention, where a large portion of the first metal structure 11 has been printed; Figure 7 shows an illustrative view of using a laser printing head to print the first metal structure 11 on the second metal structure 12 shown in Figure 5, according to an exemplary embodiment of the present invention, where the first metal structure 11 has been printed.

As shown in Figures 5 to 7, in another exemplary embodiment of the present invention, a method for manufacturing an injection mold insert 10 is also disclosed. The method for manufacturing the injection mold insert 10 includes the following steps:

S31: As shown in Figure 5, the second metal structure 12 is machined on the second metal block 120; and

S32: As shown in Figures 6 and 7, the first metal structure 11 is printed on the machined second metal structure 12 using a laser printing head.

As shown in Figures 5 to 7, in the illustrated embodiments, when printing the first metal structure 11, the laser printing head ejects the first metal powder and emits a laser beam. The laser beam heats and melts the ejected first metal powder to produce the first metal structure 11.

As shown in Figures 5 to 7, in the illustrated embodiments, after printing the first metal structure 11, the manufactured injection mold insert 10 is cut off from the second metal block 120 and subjected to corresponding subsequent treatments, such as polishing and heat treatment.

Figure 10 shows an illustrative view of the first metal structure 11 manufactured according

to an exemplary embodiment of the present invention; Figure 11 shows an illustrative view of filling a second metal powder 12' in the cavity 101 of the first metal structure 11 shown in Figure 10, according to an exemplary embodiment of the present invention; Figure 12 shows an illustrative view of heating and melting the second metal powder 12' shown in Figure 11 according to an exemplary embodiment of the present invention.

As shown in Figures 10 to 12, in another exemplary embodiment of the present invention, a method for manufacturing an injection mold insert 10 is also disclosed. The method for manufacturing the injection mold insert 10 includes the following steps:

S41: manufacturing the first metal structure 11, which has a cavity 101 complementary to the second metal structure 12;

S42: filling the cavity 101 of the first metal structure 11 with the second metal powder 12'; and

S43: heating the second metal powder 12' to melt it to form the second metal structure 12.

As shown in Figures 5 to 7, in the illustrated embodiments, in step S41, the first metal structure 11 may be manufactured by machining or printing.

In the present invention, the aforementioned printing method may include laser 3D printing.

As shown in Figures 1 to 12, in another exemplary embodiment of the present invention, an injection mold insert 10 is also disclosed, which includes a first metal structure 11 and a second metal structure 12. The second metal structure 12 is wrapped in the first metal structure 11. The hardness of the first metal structure 11 is higher than that of the second metal structure 12, and the thermal conductivity of the second metal structure 12 is higher than that of the first metal structure 11. At least one of the first metal structure 11 and the second metal structure 12 is made by heating and melting metal powder, so that the first metal structure 11 and the second metal structure 12 are sintered together with each other without layering or infiltration.

As shown in Figures 1 to 12, in the illustrated embodiments, the first metal structure 11 is a steel structure or steel alloy structure, and the second metal structure 12 is a copper structure or copper alloy structure. Therefore, the aforementioned metal powder can be copper powder, copper alloy powder, steel powder, or steel alloy powder.

As shown in Figures 1 to 12, in the illustrated embodiments, the second metal structure 12 includes at least one irregularly shaped complex structure.

As shown in Figures 1 to 12, in the illustrated embodiments, the maximum cross-sectional size of the aforementioned complex structure is less than 4mm, 3mm, 2mm, or 1mm.

Although not shown, in an exemplary embodiment of the present invention, the first metal structure 11 and the second metal structure 12 may each include multiple layers, and the multiple layers of the first metal structure 11 and the multiple layers of the second metal structure 12 are arranged alternately in a stacked manner.

It should be appreciated for those skilled in this art that the above embodiments are

intended to be illustrated, and not restrictive. For example, many modifications may be made to the above embodiments by those skilled in this art, and various features described in different embodiments may be freely combined with each other without conflicting in configuration or principle.

5 Although several exemplary embodiments have been shown and described, it would be appreciated by those skilled in the art that various changes or modifications may be made in these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

10 As used herein, an element recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural of said elements or steps, unless such exclusion is explicitly stated. Furthermore, references to "one embodiment" of the present invention are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features. Moreover, unless explicitly stated to the contrary, embodiments "comprising" or "having" an element or a plurality of elements having a particular property may
15 include additional such elements not having that property.

What is claimed is,

1. An injection mold insert, comprising:
a first metal structure (11); and
5 a second metal structure (12) which is wrapped in the first metal structure (11),
wherein the hardness of the first metal structure (11) is higher than that of the second metal structure (12), and the thermal conductivity of the second metal structure (12) is higher than that of the first metal structure (11),
wherein at least one of the first metal structure (11) and the second metal structure (12) is
10 made by heating and molting metal powder, so that the first metal structure (11) and the second metal structure (12) are sintered together without layering or infiltration.
2. The injection mold insert according to claim 1,
wherein the first metal structure (11) is a steel structure or steel alloy structure, and the
15 second metal structure (12) is a copper structure or copper alloy structure.
3. The injection mold insert according to claim 1,
wherein the second metal structure (12) comprises at least one irregularly shaped complex structural body.
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4. The injection mold insert according to claim 1,
wherein the maximum cross-sectional size of the complex structure is less than 4mm, 3mm, 2mm, or 1mm.
- 25 5. The injection mold insert according to claim 1,
wherein the first metal structure (11) and the second metal structure (12) respectively include multiple layers, and the multiple layers of the first metal structure (11) and the multiple layers of the second metal structure (12) are alternately stacked.
- 30 6. A method for manufacturing the injection mold insert according to any one of claims 1-5, wherein the method comprises the following steps of:
S11: providing a first laser printing head (1) and a second laser printing head (2); and
S12: simultaneously printing the first metal structure (11) and the second metal structure (12) by using the first laser printing head (1) and the second laser printing head (2), respectively,
35 wherein the first laser printing head (1) ejects a first metal powder and emits a first laser beam, which heats and melts the ejected first metal powder to produce the first metal structure (11),
wherein the second laser printing head (2) ejects a second metal powder and emits a second

laser beam, which heats and melts the ejected second metal powder to produce the second metal structure (12).

7. The method according to claim 6,

wherein the first laser printing head (1) also ejects a first inert gas to prevent oxidation of the molten first metal powder during printing; and/or

wherein the second laser printing head (2) also ejects a second inert gas to prevent oxidation of the molten second metal powder during printing.

8. The method according to claim 7,

wherein the first laser printing head (1) comprises of:

a first laser beam channel (1a) located at the center of the first laser printing head (1), wherein the first laser beam is emitted through the first laser beam channel (1a);

a first metal powder channel (1b) surrounds the first laser beam channel (1a), wherein the first metal powder is ejected from an outlet of the first metal powder channel (1b); and

a first inert gas channel (1c) surrounds the first metal powder channel (1b), wherein the first inert gas is ejected from an outlet of the first inert gas channel (1c).

9. The method according to claim 7,

wherein the second laser printing head (2) comprises of:

a second laser beam channel (2a) located at the center of the second laser printing head (2), wherein the second laser beam is emitted through the second laser beam channel (2a);

a second metal powder channel (2b) surrounds the second laser beam channel (2a), wherein the second metal powder is ejected from an outlet of the second metal powder channel (2b); and

a second inert gas channel (2c) surrounds the second metal powder channel (2b), wherein the second inert gas is ejected from an outlet of the second inert gas channel (2c).

10. A method for manufacturing the injection mold insert according to any one of claims 1-5, wherein the method comprises the following steps of:

S21: machining the first metal structure (11) on a first metal block (110), wherein the first metal structure (11) has a cavity (101) complementary to the second metal structure (12); and

S22: printing the second metal structure (12) in the cavity (101) of the machined first metal structure (11) by using a laser printing head,

wherein during printing the second metal structure (12), the laser printing head ejects a second metal powder and emits a laser beam, which heats and melts the ejected second metal powder to produce the second metal structure (12).

11. The method according to claim 10, further comprising a step of:
cutting the manufactured injection mold insert (10) from the first metal block (110).

5 12. A method for manufacturing the injection mold insert according to any one of claims 1-5, wherein the method comprises the following steps of:

S31: machining the second metal structure (12) on a second metal block (120); and

S32: printing the first metal structure (11) on the machined second metal structure (12) by using a laser printing head,

10 wherein during printing the first metal structure (11), the laser printing head ejects a first metal powder and emits a laser beam, which heats and melts the ejected first metal powder to produce the first metal structure (11).

13. The method according to claim 12, further comprises a step of:
cutting the manufactured injection mold insert (10) from the second metal block (120).

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14. A method for manufacturing the injection mold insert according to any one of claims 1-5, wherein the method comprises the following steps of:

S41: manufacturing the first metal structure (11), which has a cavity (101) complementary to the second metal structure (12);

20 S42: filling the cavity (101) of the first metal structure (11) with a second metal powder (12'); and

S43: heating and melting the second metal powder (12') to produce the second metal structure (12).

25 15. The method according to claim 14, wherein in the step S41, the first metal structure (11) is manufactured by machining or printing.