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- (54) **Eljárás belső égésű motorhoz való dugattyú előállítására**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

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Technical field

The invention relates to a method for producing a piston for an internal combustion engine.

In engine pistons, the region of the uppermost annular groove and the combustion chamber recess is exposed to particular stresses. This is often accommodated by an annular support or an annular groove reinforcement. At the same time an annular cooling channel is often provided which is located in this region.

State of the art

It is known to cast annular supports and/or to provide salt cores which leave an annular cooling channel including inflows and outflows after rinsing out.

Furthermore, a piston is known for example from German Offenlegungsschrift 19 915 782, during the production of which a cooling channel is formed, which is closed subsequently by an aluminium component produced by powder metallurgy, away from the piston base by rotating with feed in axial direction of the piston.

Similar arrangements are known from East German 130 368 Z, German Auslegeschrift 1 033 954, German Offenlegungsschrift 10 2006 027 355, German Offenlegungsschrift 3 518 497, Japanese 58 190 538 A2, German Patentschrift 1 583 747, United States application 3 181 514, French application 1 301 299, German Auslegeschrift 1 001 862, French application 1 246 794, German Auslegeschrift 1 025 221 and German Auslegeschrift 1 019 519.

Presentation of the invention

The object of the invention is to provide a manufacturing method which is improved with regard to efficiency for pistons for internal combustion engines and a piston produced accordingly.

The solution to this object is effected firstly by the method described in patent claim 1.

Therefore a groove is worked in a cast piston blank starting from a combustion chamber recess in largely radial direction and subsequently closed to form a cooling channel. Hence,

firstly the salt core required hitherto for forming the cooling channel may be avoided in advantageous manner and the casting process may thus be automated. Furthermore, considerably more extensive machine processing is achieved, and processing by hand is reduced, which increases the reliability, reduces waste and thus makes the method as a whole more efficient. Furthermore, due to the fact that the cooling channel is located in a region "next" to the combustion chamber recess, the cooling effect may be improved in the regions which are particularly stressed. In particular the cooling channel is arranged to be comparatively high compared to traditional designs, in particular higher than the uppermost annular groove, so that the advantage described may be achieved. Finally, covering or closing of the cooling channel by a material which is separate with respect to the casting material of the piston blank, offers the possibility of adapting the latter in a particular manner with regard to the requirements relating to heat resistance and, as illustrated more precisely below, of providing it with properties which are particularly advantageous for this.

Preferred developments of the method of the invention are described in the further claims.

The requirements may be fulfilled particularly well, and at the same time it offers advantages for simplification within the framework of the production method, if the closing of the cooling channel is effected by a metal sheet. The latter may be connected by means of a joining method to the piston blank, which may be pre-processed in the region in question.

Even due to the joining process, but equally well after joining, remelting of the metal sheet may be effected in advantageous manner at least in some regions to thus refine the structure and hence to form a particularly resistant structure in the highly stressed region. The metal sheet is preferably made of aluminium or an aluminium alloy so that the thermophysical properties of the metal sheet are similar to those of the piston, since the latter likewise is made of aluminium or an aluminium alloy. The two alloys or materials are preferably essentially identical. With regard to the remelting of the closure, in particular of the metal sheet of the cooling channel, it should be mentioned that this measure develops its advantages even without the radial design of the cooling channel and in this respect is to be seen as an independent innovation described herein. However, it may be combined with all measures described herein.

The casting process may be simplified further if in advantageous manner an annular support may also be avoided as a casting part in that on the outer side of the piston, a further radial groove is introduced, filled with material and an annular groove is worked therein. The groove may be formed, for example to be essentially V-shaped, and the material may be introduced, for example by thermal injection moulding. Also for the described design of a radial groove on the outer side, it should be mentioned that it may be combined with any design of a cooling channel, in particular also with a cooling channel produced in axial direction and also in this case by avoiding cast parts develops its advantageous effects. A combination with all further measures described herein is however possible and advantageous.

Brief description of the drawings

An exemplary embodiment of the invention shown in the drawings is illustrated in more detail below.

Figure 1 shows a sectional view of a piston of the invention in a first stage;

Figure 2 shows a sectional view of a piston of the invention in a second stage; and

Figure 3 shows a sectional view of a piston of the invention in a third stage

Detailed description of a preferred embodiment of the invention

Figure 1 shows somewhat more than half of an upper edge region of a piston of the invention, which is provided with several annular grooves, wherein the uppermost annular groove 12 has been formed in particular manner and without cast parts which are necessary in the casting process, such as for example annular supports. In particular a radial, essentially V-shaped groove has been formed on the cast piston blank and filled with a particularly wear-resistant material 14, for example by thermal injection moulding. The groove 12 has been worked therefrom and is thus formed completely in a particularly wear-resistant material and in advantageous manner withstands the particular stresses in this region.

This applies in the same manner to the particular design of a cooling channel 16 and its cover in the form of a metal sheet 18. Figure 1 shows one stage within the framework of production, in that a piston blank, which typically has been cast and mechanically pre-processed, has been provided starting from the combustion chamber recess 20 in radial

direction (according to Figure 1 to the left) with a groove for the later cooling channel 16. As is shown in the figures, the cooling channel may be provided in suitable manner towards the outer side, that is towards the annular groove 12 of the piston, with a rounded groove base. This groove is closed in the example shown by a metal sheet 18 which is attached using a suitable joining process. The metal sheet closing the later cooling channel 16 has essentially an annular shape. Also the V shape of the material 14 in the region of the uppermost annular groove and the groove provided therefor may have a rounded tip of the "V".

As shown in Figure 2, the metalsheet 18 at least in some regions, in the case shown for example on the upper and lower end, may be processed by remelting such that refining of the structure occurs. Furthermore, this may be carried out for regions 22 adjacent thereto on the piston blank, in the case shown on the combustion chamber recess. As mentioned, this remelting may be effected within the framework of the joining process of the metal sheet 18 or as a separate, subsequent processing step.

Finally, Figure 3 shows how after remelting, essentially the entire lateral boundary of the combustion chamber recess 20 is finished in suitable manner and typically by machining to form the required contour. The processing described as well as the casting process, in which in advantageous manner inserts may be dispensed with, may be extensively automated so that the efficiency is increased and the frequency of errors is reduced.

ELJÁRÁS BELSŐ ÉGÉSŰ MOTORHOZ VALÓ DUGATTYÚ ELŐÁLLÍTÁSÁRA

SZABADALMI IGÉNYPONTOK

1. Eljárás belső égésű motorhoz való dugattyú (10) előállítására, amelynek során öntött nyersdugattyúba egy égéstér-mélyedésből (20) kiindulva messzemenően sugárirányban egy hornyot munkálunk, és utána egy hűtőcsatorna (16) kialakítására a hornyot lezárjuk.

2. Az 1. igénypont szerinti eljárás, **azzal jellemezve**, hogy a hornyot fémlemez (18) segítségével zárjuk le.

3. A 2. igénypont szerinti eljárás, **azzal jellemezve**, hogy a fémlemezt (18) legalábbis helyenként újraolvasztjuk.

4. Az előző igénypontok egyike szerinti eljárás, **azzal jellemezve**, hogy ezen kívül a dugattyú (10) külső oldala felől egy sugárirányú hornyot alakítunk ki és megtöltjük anyaggal (14), és az anyagból kimunkálunk egy gyűrűhornyot (12).

A meghatalmazott:

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