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YIELDABLE CORE FOR CASTING HEAVY HOLLOW STEEL BLOCKS

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Fig. 1

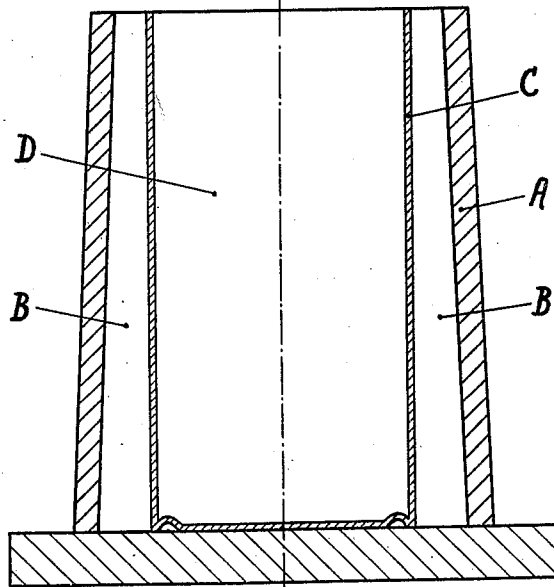
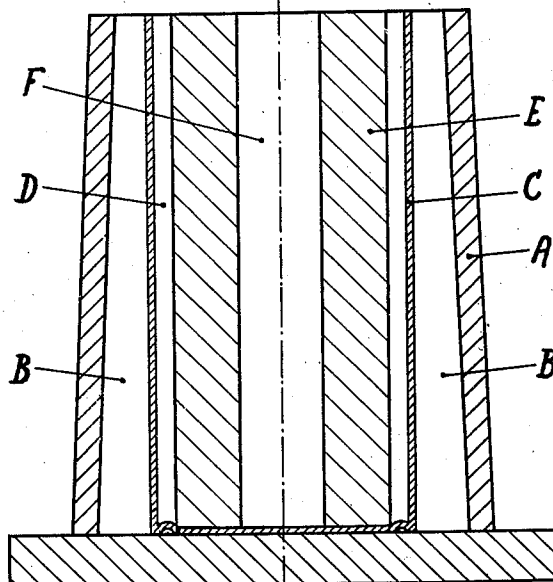


Fig. 2



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YIELDABLE CORE FOR CASTING HEAVY
HOLLOW STEEL BLOCKS

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2 Claims. (Cl. 22-165)

This invention relates to a yieldable core for casting heavy hollow steel blocks.

It is known, to use for casting hollow steel blocks cores which consist of a thin sheet metal casing with yieldable filling. Hitherto sand and metal chips have been tried as filling mass. The sand filling is open to the objection of a very low heat conductivity so that the steel does not solidify from the inner wall under the same favourable conditions as from the chill wall. Moreover, the sheet metal welds with the material being cast with the result that the block has an impure inner surface. The use of sand-filled sheet metal cores is open to the further objection that special precautionary measures are necessary when casting. As the sand cannot conduct off to a sufficient extent the heat of the material being cast, the simplest casting method, drop casting, cannot possibly be used for high blocks. The sheet metal casing would be prematurely destroyed by the washing action of the casting jet. The frictional resistance of the solid filling material is another objection which renders difficult an easy and uniform shrinkage during the solidifying and cooling proceeding, so that, to prevent shrinkage cracks, the solid filling mass must be removed after the solidification has attained a certain degree. The heat conductivity of the metal chips is better than that of the sand but it is insufficient to prevent the destruction of the sheet metal casing by the liquid metal in the case of large block dimensions. By tightly packing the metal chips the heat conductivity can be improved to a certain extent but at the same time the yieldability of the core is reduced by this procedure to below the degree necessary for avoiding shrinkage cracks. Therefore, only hollow steel blocks of small dimensions can be produced according to this process.

These difficulties are overcome according to the invention in that liquid lead is used as filling mass. Practical tests have shown that only lead in liquid state enables the production of heavy hollow steel bodies which are free from shrinkage cracks and possess an inner surface free from scale and an ordered position of the segregations.

The use of a liquid material exerting a damping effect is known for the filling of the casing of a centrifugal casting mould. The filling material serves in this instance to counteract the centrifugal force of the casting material. However, the invention relates to the filling of a core with liquid lead, the lead serving for counter-acting the shrinkage pressure. Only thus it is possible to obtain a constant bearing of the core against

the casting material and a desired conducting off of heat in inward direction.

To enable the cooling proceeding of the elastically yieldable core to be regulated extensively the sheet metal casing may, according to the invention, contain an insert body for example of metal or steel, to which the heat of the casting material is transmitted by the lead located in the sheet metal casing.

Other cooling or heating devices may be provided within the insert body for still further regulating the cooling.

By the use of liquid lead as filling mass for the yieldable core the guarantee is given that the core, owing to the elasticity but with preservation of an elastic resistance, can yield to the shrinkage pressure right from the outset. The shrinkage cracks on the inner wall of the hollow body which are so objectionable are thus avoided. In this manner the inner wall of the hollow body is absolutely smooth, even has metallic brightness and requires no subsequent machining.

The advantages attained by the invention are hereinafter explained by way of a practical example. According to experience the shrinkage commences as soon as a continuous solid layer of casting material has formed around the core and not only after this layer has attained a certain thickness. The danger of crack formation on the inner wall is therefore very great up to this moment, without it having been hitherto possible to effectively counteract this danger. If the core according to the invention is a thin walled sheet metal vessel, for example with wall thickness of about 0.3 to 1 mm., and filled with liquid lead, the counter pressure of the core relative to the steel, as long as this steel is still liquid, is determined by the difference in the specific gravities of the lead and of the steel and by the height of the hollow body. It amounts to about $3 \text{ gr/cm}^3 \times \text{height (in cms.)}$. Therefore at the beginning of the solidifying, for example 1 m. below the surface of the block, a pressure of only about 300 g/cm^2 opposes the shrinkage. As the sheet metal casing is heated during the casting to temperatures at which its heat resistance is only very slight, the resistance offered by the sheet metal to the shrinkage is practically negligible. The formation of shrinkage cracks is therefore absolutely excluded even in the first stage of the solidification, this being not so in the process hitherto known.

The good heat conductivity of the lead prevents the sheet metal casing from being heated by the liquid steel to melting or welding tem-

perature. On the other hand the lead does not act on the sheet metal casing even at high temperatures. For these reasons the hollow steel bodies, produced with the aid of the core according to the invention, are characterized by a smooth inner surface of metallic brightness which renders unnecessary finish turning or cleaning before further machining. The heat is lead off extremely uniformly because the thin sheet metal casing conforms absolutely to the cast material. At the same time the heat exchange is very good on account of the slight thickness of the sheet metal. As the boiling point of the lead is higher than the usual casting temperatures of the steel, the cooling of the inner wall of the hollow body can be retarded, for example by re-heating the lead, to such an extent that the solidification of the hollow body takes place practically entirely from the outer side inwards, which was hitherto not possible without affecting the shrinkage.

Two embodiments of the invention are illustrated, by way of example, in the accompanying drawing, in which:

Fig. 1 shows a core in vertical central section.

Fig. 2 is a similar view of a modified form of construction.

According to Fig. 1, a vessel C, for example a sheet metal cylinder, is placed as core in a mold A which determines the outer shape of the hollow body B to be produced. The core C is filled with lead D in liquid state whose melting point lies lower than that of the casting material forming the hollow body B. The amount of

heat conducted off in inward direction can be varied as desired by the height of the temperature of the liquid lead D at the beginning of the casting process and by additionally supplying or conducting off heat during the casting process. The wall thickness and the shape of the core are so chosen that the core can follow the shrinkage of the hollow body B.

In Fig. 2 a sheet metal cylinder C is placed as a core in a chill A and in the core C a body E is inserted whose diameter is smaller than the internal diameter of the core C so that the filling material D of the core C fills the space between the insert body E and the inner wall of the core. Liquid lead or the like is used as filling material D. As soon as the casting material B has been poured into the chill A, heat exchange takes place from the hollow body B to be produced to the core C, the filling material D and from this to the insert body E. To enable the conducting off of the heat imparted to the insert body E to be regulated, the insert body E may have a bore F in which means for supplying or conducting off heat may be inserted.

I claim:

1. A yieldable core for casting heavy hollow steel blocks, comprising in combination an outer casing of thin sheet metal, and a filling of liquid lead in said casing.

2. In a core as specified in claim 1, an insert body with relatively high melting point inserted in said sheet metal casing and separated therefrom by the filling of liquid lead.

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