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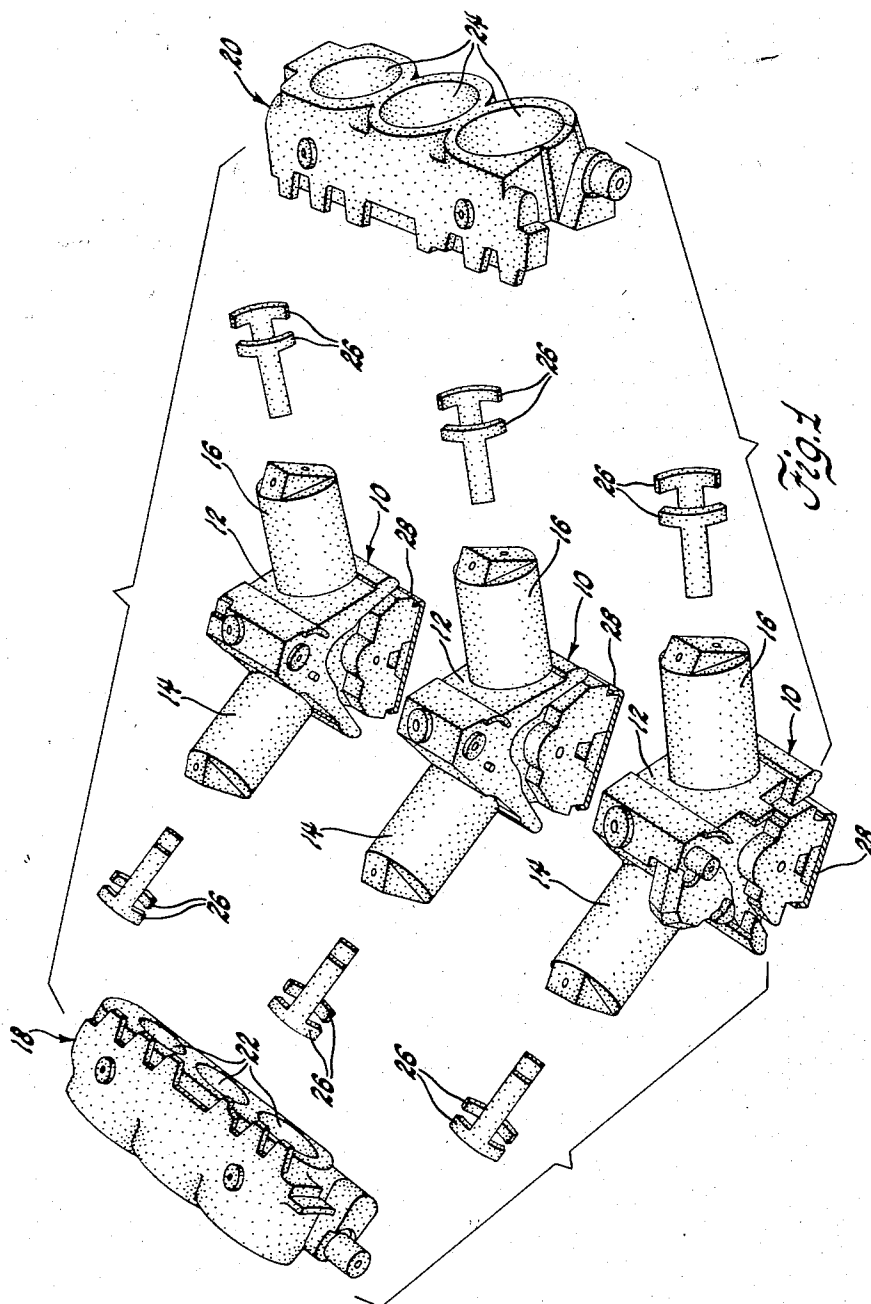
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METHOD OF USING VAPORIZABLE CORE ASSEMBLY SPACERS

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2 Sheets-Sheet 1.



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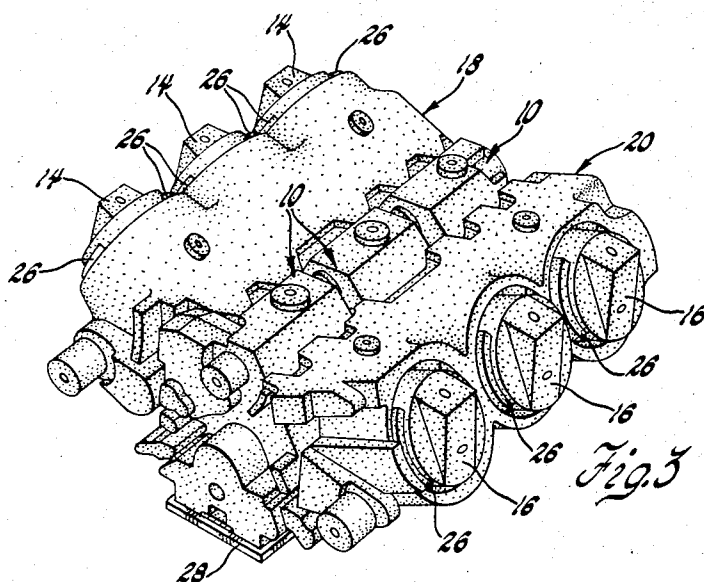
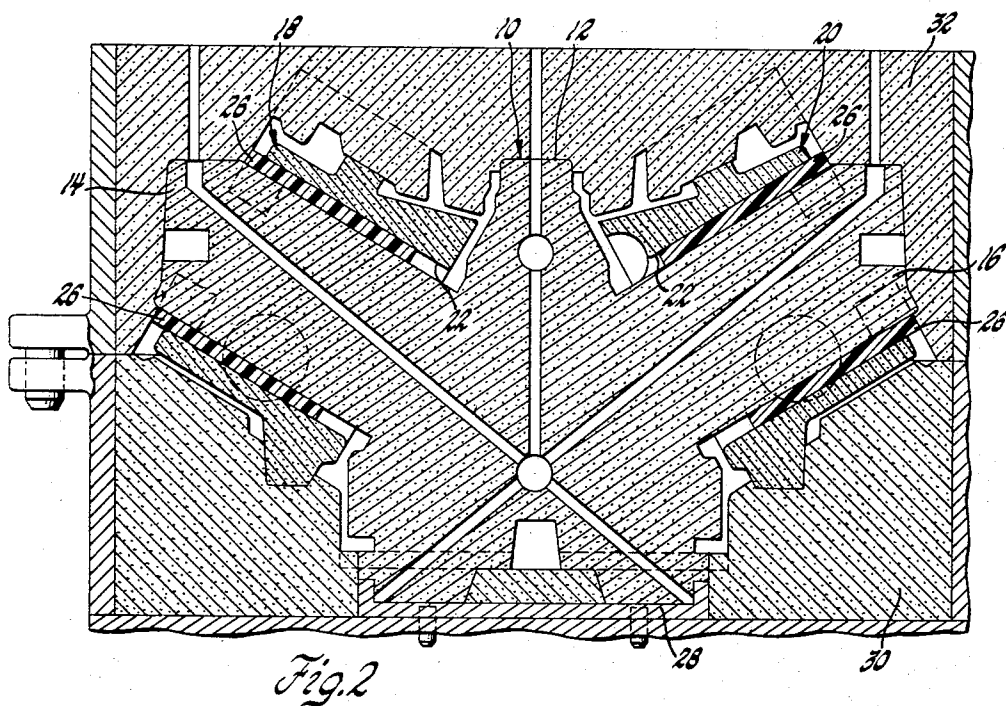
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METHOD OF USING VAPORIZABLE CORE ASSEMBLY SPACERS

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ABSTRACT OF THE DISCLOSURE

The speed and economy of preparing a mold which includes an assembly of two or more cores cemented together in a predetermined relationship, suitable for casting intricate articles is markedly improved by employing preformed expanded synthetic resin spacers to maintain the assembled cores in a desired spatial relationship to each other while the cement dries and/or the assembled cores are positioned in the mold, the resin spacers being vaporized by molten metal which is subsequently poured into the mold to form the cast article.

This invention relates to foundry operations and more particularly it relates to a method of preparing a complex core assembly using preformed expanded plastic spacers.

There are many well-known devices which aid in the assembly of cores and in supporting the cores within the mold. For example frequently cores have one or more projections from their surface called core prints which fit into mating cavities in the mold. The purpose of the core print is to prevent the core from shifting in the mold when the molten metal enters the cavity. Another device which is used to support cores within the mold is the chaplet. A chaplet consists of a stem with one or two heads. It is usually made of metal and may be used between two cores or between a core and the mold to maintain a desired dimension between the two surfaces. Ultimately, chaplets become a part of the casting. Although core prints and chaplets are quite useful for the purpose they serve it is necessary in the assembly of some complex core assemblies to use a spacer form which extends over a more broad area and better maintains a desired dimension between adjacent cores.

A familiar example of a casting which requires a complex core assembly is an automotive motor block. The motor block mold depending upon its particular configuration, will require several cores which may define water jackets, cylinder walls, or a camshaft cavity. It is important that the proper distances between cores be maintained in order that metal walls, which upon casting will be defined between the cores, will be of the design thickness. In the conventional practice of preparing a core assembly for a motor block, the cores are cemented together with a flour or synthetic resin based adhesive to form the core assembly. While the core cement is curing, and drying, the respective cores are supported by inserting spacers of aluminum or other suitable metal to maintain the proper configuration. Although these aluminum spacers maintain the design distance between the cores, it is necessary that they be removed before casting. When the economics of production operations are considered, it is desirable to devise a means whereby the cores could be supported without requiring subsequent removal of the spacer form.

Accordingly, it is an object of this invention to provide a method of preparing a mold for metal casting containing a complex sand core assembly in which the component cores are positioned in the desired configuration and supported therein by the insertion of expanded plastic spacers between adjacent cores.

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It is a further object of this invention to provide a method of supporting individual cores in a complex sand core assembly until they can be bonded together whereby the spacer form so used need not be removed prior to casting.

More specifically, it is an object of this invention to provide a method of preparing a green sand mold for casting automotive cylinder blocks whereby the cylinder barrel cores, the water jacket cores, and the camshaft housing core are supported in the proper position with respect to each other by inserting between them preformed expanded polystyrene spacers which need not be removed prior to casting.

In the case of casting automotive cylinder blocks these and other objects are accomplished by forming the drag and cope portions of the cylinder block mold from green sand; forming the individual component cores, such as the cylinder barrel cores, the water jacket cores, the camshaft housing core, and the base core; applying a suitable core cement and assembling them in their proper positions; placing preformed expanded polystyrene spacers between them for support until the cement has cured; placing the core assembly in the drag portion of the mold; and locating the cope portion of the mold over the drag portion and the core assembly. It is noted that the polystyrene spacers need not be removed before casting as they are burned and vaporized leaving no residue when subjected to the molten cast iron charge.

Other objects and advantages will appear to those skilled in the art from the following detailed description, reference being made to the accompanying drawings.

FIGURE 1 is an exploded perspective view showing the cores and spacers used to form a cylinder block for a V-type six cylinder internal combustion engine;

FIGURE 2 is a sectional view of the core assembly, spacers, and mold;

FIGURE 3 is a perspective view of the completed core assembly including the spacers.

Due to the large volume production of automotive cylinder blocks, a great deal of work has been done to improve the design of molds and core assemblies in which they may be cast. Accordingly, such molds and core assemblies will vary somewhat even for the same type of engine be it a V-6, V-8 or straight block. However, certain problems are common to each type of mold. Normally the core assembly is made up of two or more components between which it is necessary that a fixed predetermined dimension be maintained.

My invention is particularly applicable to V-6 and V-8 type cylinder blocks although it is by no means limited to such molds. In FIGURE 1 is shown a perspective exploded view of a core assembly only for a V-6 engine. There are three identical cylinder barrel cores 10, which in end-to-end abutment provide for the six cylinders in the motor block. They are comprised of a body portion 12, and cylindrical barrel portions 14 and 16. To be inserted over the two banks of three cylinder barrels are two water jacket cores 18 and 20 which are mirror images of each other. The two water jacket cores 18 and 20 have openings or bores therein 22 and 24. In the construction of the core assembly the water jacket cores 18 and 20 are fitted over the respective cylindrical barrel portions 14 and 16 of the cylinder barrel cores 10. The openings or bores 22 and 24 in the respective water jacket cores 18 and 20 are of larger diameter than that of the cylindrical portions 14 and 16 of the cylinder barrel cores 10. As the annular space created when the water jacket cores 18 and 20 are fitted over the cylinder barrel cores 10 ultimately will be filled with metal to form a cylinder wall, it is important that precise design dimensions be maintained. Therefore, it is necessary that means be provided to support the respective cores in proper spatial

relation until they can be rigidly bound together. In my invention, spacer forms of a suitable low density expanded plastic material such as polystyrene, polyurethane or other suitable plastic material which will burn out on contact with the molten metal to be cast without leaving significant residue, are provided for this purpose. In the drawing it is shown that two such forms 26 are provided for each cylindrical barrel portion 14 or 16.

Preferably low density expanded polystyrene is used at present. It can be obtained in a variety of sizes and shapes and may be easily worked without special tools so that it may be shaped to the proper dimensions. If necessary, two or more forms may be bonded together by light aerosol spraying with solvents. In accordance with my invention a polystyrene form is shaped to the precise dimension which must be maintained between two adjacent cores. After the cores have been fabricated cement may be applied to the mating surfaces and they may be positioned together. One or more suitable expanded polystyrene forms may be inserted between the cores to maintain them in this position until the cement is cured. The completely assembled cores and spacers are shown in FIGURES 2 and 3. Formerly an aluminum spacer was used to support the cores until the cement had cured. It is then necessary to remove the spacer before the core assembly was inserted into the drag portion of the mold. By use of the process of my invention removal of the spacer forms is unnecessary and substantial labor savings may be realized in the production of cylinder block molds.

Thus, after suitable cores have been shaped such as the cylinder barrel cores 10, and the water jacket cores 18 and 20 of the V-6 engine cylinder blocks as shown in the drawings, core cement is applied to the appropriate surfaces and they may be fitted together. They are maintained in proper position relative to each other until the cement hardens and is dried by the insertion of one or more expanded polystyrene spacers 26. There are many core cements which are well known in foundry art. The synthetic resin polyvinyl chloride forms the basis for an excellent core adhesive. Protein based adhesives, derived from animal hides and the like have been used to bond individual cores together for years. Casein, a protein derived from milk and the like, may also be used as a base for glue. Flour and water have also been used. It is common practice to dry the bonded core assembly after one or more of these adhesives have been applied.

As shown in FIGURE 2, the completed core assembly is then carefully placed in the previously formed drag portion 30 of a green sand mold having a suitable cavity. Sometimes a small base core 28 is used to facilitate the transfer. The cope portion 32 of the mold is formed and positioned over the drag portion and the core assembly. Subsequently, the molten cast iron charge is poured into the mold to form the engine block. The polystyrene spacer forms are burned and vaporized. They have no harmful effect upon the final casting and the time ordinarily expended in removing spacer forms by hand is thus saved.

Of course, it is to be realized that in other core assemblies additional or alternative spacer forms may be required. Although it is not shown in the drawing, a separate camshaft housing core may be required in a specific engine design. In this case the expanded plastic spacers of my invention will find suitable application to maintain such a camshaft core in proper position with respect to the other cores. It may also be seen that these spacers which may be readily machined to any desired configuration may find application in the assembly and construc-

tion of core configurations in applications other than automotive cylinder blocks. Furthermore, they may be used in core assemblies for molds other than green sand molds. They are equally useful for example, in shell molds and permanent molds.

Thus, while this invention has been described in terms of certain preferred embodiments, it is to be understood that other applications would be apparent to those skilled in the art and are within the scope of this invention as defined by the following claims.

I claim:

1. A method of casting an article in a mold comprising cope and drag portions which form a cavity therebetween and at least two cores supported in spaced relation within said cavity, said method comprising forming said component cores adapted to be positioned within said mold cavity, applying a core cement to adjoining surfaces of said cores, placing said cores in proper spaced relation with respect to each other, inserting preformed expanded synthetic resin spacers between adjacent cores whereby said assembled cores are maintained in said proper spaced relation until said core cement has cured to rigidly support said core assembly, placing said core assembly in said drag portion, placing said cope portion over said drag portion and core assembly and pouring molten metal into said mold whereby the cast article is formed and said expanded synthetic resin spacers are vaporized or burned out of said mold substantially without residue.

2. A method as in claim 1 wherein said cores are assembled in proper spaced relation with respect to each other within said drag portion in the first instance.

3. A method as in claim 1 wherein said expanded synthetic resin spacers are preformed from expanded polystyrene.

4. A method as in claim 2 wherein said expanded synthetic resin spacers are preformed from expanded polystyrene.

5. A method of casting a cylinder block of an internal combustion engine in a mold comprising cope and drag portions which form a cavity therebetween and an assembly of cores supported in spaced relation within said cavity, said method comprising forming the cylinder barrel cores, the water jacket cores, the camshaft housing core and a base core; applying a core cement to adjoining surfaces of said cores; placing said cores in proper spaced relation with respect to each other; inserting preformed expanded polystyrene spacers between adjacent cores whereby said assembled cores are maintained in said proper spaced relation until said core cement has cured to rigidly support said core assembly; placing said assembled cores in said drag portion; closing said mold by placing said cope portion over said drag portion; and pouring molten metal into said mold whereby the cast cylinder block is formed and said polystyrene spacers are vaporized or burned out of said mold substantially without residue.

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