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[54] **APPARATUS FOR PRODUCING FOUNDRY CORES**

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[51] **Int. Cl.** **B22c 15/08**

[58] **Field of Search** 164/20, 22, 37, 169, 200, 164/201, 228

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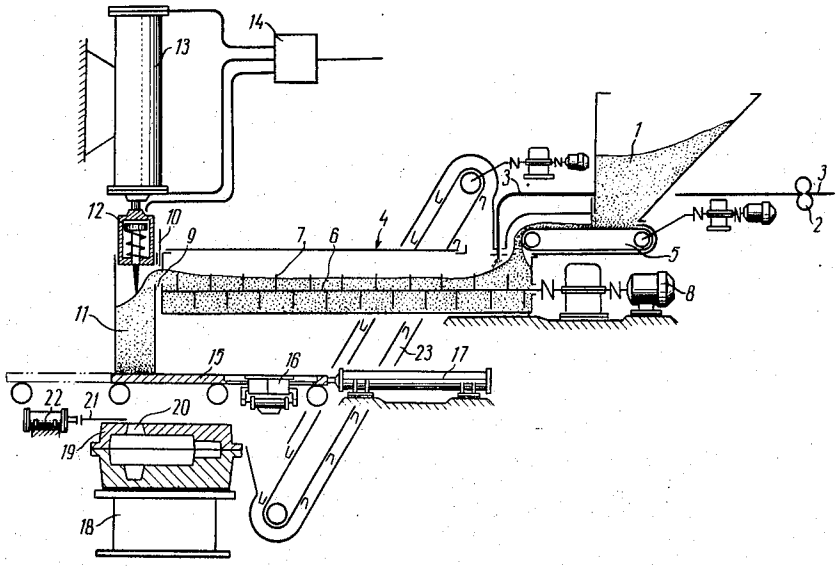
[57] **ABSTRACT**

An apparatus for the building up in a core box filled with a fluid sand mixture of a pressure on the above mixture which is maintained within the length of time sufficient for a strong skin 1 to 25 mm. thick to be formed on the surface of the core being moulded; a piston located in a proportioning chamber of an apparatus is of a telescopic type, each piston stage having an individual drive; abutting upon an outlet port of the proportioning chamber is a gate rigid with a shaped nozzle mounted to reciprocate in such a manner that it closes the outlet port of the proportioning chamber alternatively with the gate; the shaped nozzle is detachable; the apparatus is furnished with a gear adapted to return mixture leftovers from the nozzle to a mixer to be recovered therein.

1 Claim, 2 Drawing Figures



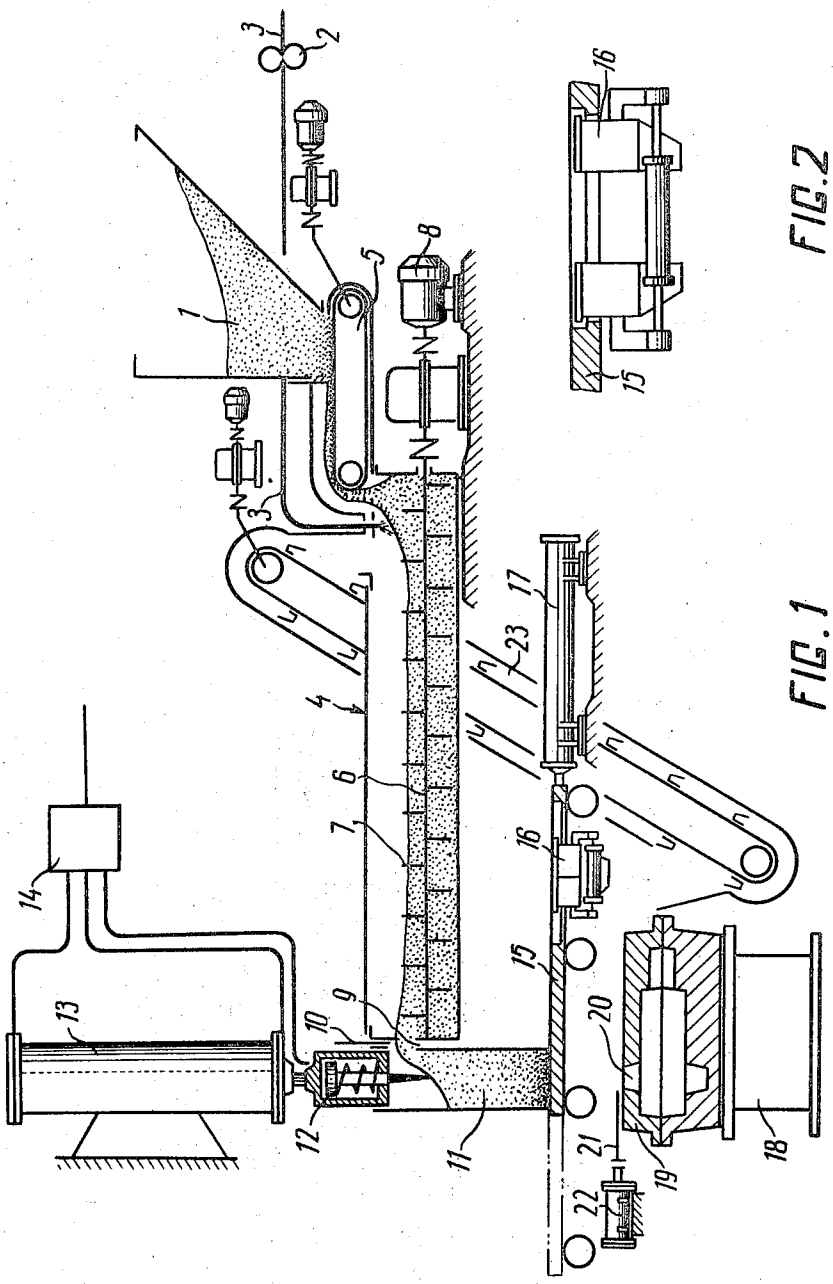


FIG. 1

FIG. 2

APPARATUS FOR PRODUCING FOUNDRY CORES

The present invention relates to a method and apparatus for the production of foundry cores from fluid sand mixtures in hot boxes.

The above invention may prove especially useful for making indicate sand cores for foundry moulds in mass, large and small-series production.

At present there are several widely known procedures for producing the cores in the hot boxes, the core-blowing-and-shooting process being most widely used and vital of them. With the above method a core-blowing machine or a core-shooter forces the core sand, rapidly hardening under the effect of heat together or by compressed air into the preheated core box. After the expiration of the time interval necessary for a core to harden, the core box is open and a finished core is removed from it.

Also known is the so-called "Shalco" method in which the injection of a dry core sand is accompanied by swinging lightly the hot core box to produce a uniform core skin.

A disadvantage of the known methods of producing cores consists in inadequate filling of the core boxes having intricate contours and a branched working surface with the core sand. Usually such boxes cannot be filled through core print holes and in this case the core must be either blown through additional holes in the working surface of the box or be made up of two or more pieces which are subsequently glued together. In both cases lower surface quality as well as lower accuracy of the cores and an increase in labour input become indispensible.

It should be also noted that the core-blowing-and-shooting method is employed for the production of relatively small-size cores (their maximum size being 0.6–0.7 m.) in the hot boxes. As the size of the cores being produced increases, their quality gets appreciably worse, which is attributable to a sharp reduction in a compacting force which occurs as the sand mixture migrates from the axis of blow holes.

Inherent in the core-blowing-and-shooting method is one more essential disadvantage in that no pressure is applied to the sand mixture in the course of hardening. This results in free shrinkage of the core sand in the core box owing to which the surface core skin is not sufficiently thick. Oftentimes peeling of the thin surface skin of the core is encountered or voids are formed under it.

The need in core vents in producing thin-walled castings leads to a highly sophisticated construction of the machine.

The basic object of the invention is to provide a method of producing foundry cores made from fluid sand mixtures and featuring good geometrical accuracy, high-quality surface and high strength properties.

According to these and other objects in a method of producing foundry cores by forcing a fluid sand mixture into a hot core box, conforming to the present invention, upon filling the core box a pressure of 3 to 40 kg/cm^2 is applied to the fluid sand mixture and maintained the length of time sufficient for the formation of a strong skin 1 to 25 mm. thick on the surface of the core being moulded.

This enables the production of the strong skin on the the core being moulded which will ensure high quality and close dimensional accuracy of the casting.

As to the pressure of the fluid sand mixture within the core box it can be maintained between 3 to 20 kg/cm^2 for 5 to 30 seconds, which shall be followed by a gradial increase in the pressure up to 40 kg/cm^2 within the next 5–60 seconds.

This will make it possible to provide a maximum sand pressure within the core box at the moment of formation of the surface core skin enhancing therefore both its soundness and strength.

To realize the above method there has been provided an apparatus comprising hoppers for raw materials connected with a mixer from which the fluid sand mixture produced therein under the action through the proportioning chamber and a shaped nozzle abutting upon the chamber and fitted with a gate into a core box, the piston being made, according to the invention of a telescopic type, each piston stage being provided with an individual drive, the core box is furnished with a sealing means, the nozzle is rigid with the gate and both of them are mounted to reciprocate so that the cover alternately the outlet port of the proportioning chamber, the apparatus being also fitted with a gear adapted to return mixture leftovers from the nozzle, which is made detachable to the mixer.

With the above construction principle the requisite pressure can be built-up and increased, as required, within the core box to be applied to the fluid sand mixture.

The invention will now be explained in greater detail with reference to an exemplary embodiment thereof which is represented in the accompanying drawings, wherein:

FIG. 1 is a longitudinal sectional view of an apparatus according to the invention;

FIG. 2 shows the nozzle of the apparatus in the extended position.

The aforesaid apparatus comprises a sand hopper **1** (FIG. 1) and a vessel (not shown in the drawing) for a fluid composition (comprising binders and a foaming agent) from which it is delivered by a pump **2** into a continuous mixer **4** via a pipeline **3.** The hopper **1** communicates also with the mixer **4** by means a belt weigh-feeder **5.** The mixer incorporates two shafts **6** rotating one - clockwise and the other one-counterclockwise and carrying blades **7** mounted along a helix. The shafts **6** of the mixer **4** receive rotation from an electric motor **8.** In the face end of the mixer **4** there is an outlet **9** closed by a gate **10.** Abutting upon the outlet **9** is a cylindrical proportioning chamber **11** which incorporates a piston **12** coupled to a pneumo-hydraulic drive **13** controlled by a slide **14.** The piston **12** is of an extensible (telescopic) type, each stage being provided with an individual drive. Abutting upon the outlet port of the proportioning chamber **11** is a gate **15** mounting a shaped nozzle **16** (FIG. 2) set up flush with the gate surface facing the proportioning chamber **11.** As to the nozzle shape, it may be made, for instance, in the form of a cone. Both the gate **15** and nozzle **16** are connected with a drive **17** imparting them a reciprocating motion in the horizontal plane. Under the proportioning chamber **11** and nozzle **16** a core box **19** is installed on a lifting platform **18.** The core box is located in such a way that its core print hole **20** is strictly opposite the outlet port of the proportioning chamber **11.** To pro-

vide sealing of the core box **19** it is furnished with a gate **21** operated by a drive **22.** The apparatus is furnished with a gear **23** adapted to return mixture leftovers to the mixer **4** from the nozzle **16** after the core box **19** has been filled with the sand mixture. The returning gear **23** can be made in the form of an elevator, screw, etc.

The above apparatus functions in the following manner. Sand is continuously fed into a mixer **4** from a hopper **1** (FIG.1) by a belt weigh-feeder **5.** Simultaneously a liquid composition is delivered to the mixer **4** by a pump **2** via a pipeline **3.** As the mixture is being stirred and advanced along the mixer **4,** it passes into a fluid state and fills a proportioning chamber **11** through an outlet **9.** At the moment a preheated core box **19** is mounted on a lifting platform **18,** the proportioning chamber **11** is completely filled with the fluid sand mixture. The core box **19** is so disposed on the lifting platform **18** that its print hole is arranged strictly opposite the outlet port of the proportioning chamber.

Before the core box **19** is filled with the sand mixture a gate **10** closes the outlet **9,** a drive **17** adapted for traversing a nozzle **16** and a gate **15** is actuated, the nozzle **16** coincides with the outlet port of the proportioning chamber **11.** At the same time the lifting platform **18** forces the core box **19** against the nozzle **16.** Next a pneumo-hydraulic drive **13** of a piston **12** is actuated with the aid of a slide **14.** The fluid sand mixture is forced out of the proportioning chamber **11,** filling up the core box **19.** A pressure of 3 kg/cm^2 is created within the core box **19,** being applied to the fluid sand mixture for 5 seconds and it is under the influence of this pressure that a solid skin 1 mm. thick is formed on the surface of the core during this length of time. After the expiration of the above time interval a drive **22** of a gate **21** is actuated, the core box **19** being sealed at this. Upon sealing the pressure within the core box **19** is maintained constant, the skin thickness being increased thereby up to 3 mm.

If the initial pressure acting on the fluid sand mixture is specified to be equal to 40 kg/cm^2, a solid core skin up to 25 mm. thick is attainable. With the core production cycle envisaging a stepwise rise in pressure, at first a 5-kg/cm^2 pressure is being maintained for 5 seconds, whereafter the slide actuates the second stage of the piston **12.** The pressure within the core box rises to 10 kg/cm^2 and is kept at this level for another 5 seconds. (The piston **12** can be built-up of more than two stages, if required by the process, this being stipulated by core contours and size). Over this period of time the thick skin is being formed on the core surface. The skin thickness, which is a function of the pressure within the core box **19** and mixture holding time under this pressure, ranges from 1 to 25 mm. After the expiration of the above interval the drive **22** of the gate **21** is activated and the core box **19** is sealed. Then the slide **14** sends a signal to the piston **12** to travel upward. The lifting platform **18** descends and the core box **19** with the partially hardened core is transferred to the next technological position.

Simultaneously the reciprocating drive **17** displaces the nozzle **16** to its extreme right-hand position with respect to the proportioning chamber **11,** the chamber outlet port (not shown in the drawing) being closed by the gate **15.**

The nozzle **16** (FIG. 2) being open, mixture leftovers, which have lost their flowability under high pressure, are fed by the gear **23** from the nozzle **16** to the mixer for recovery. Within the length of time in which the core box **19** is filled with the sand mixture and the piston **12** is returned to its upper original position, the fluid sand mixture is being accumulated in the mixer **4.** As the gate **10** opens, the fluid sand mixture is again admitted into the proportioning chamber **11** through the outlet **9** to fill it up. Further the operational sequence of the apparatus devices and gears is repeated.

Where a 20 kg/cm^2 initial pressure is specified to be applied to the fluid sand mixture enclosed in the core box being kept at this level for 30 seconds whereafter it is gradually increased to 40 kg/cm^2 within a time period of 60 sec., the thickness of the strong core skin will increase to 25 mm.

Thus, the use of the above method and apparatus for producing foundry cores will offer a substantial reduction in the labour input required by the production process, an increase in labour productivity along with high accuracy and enhanced quality of the cores and castings.

What we claim is:

1. An apparatus for the production of foundry cores comprising hoppers for raw materials;

a mixer connected with said hoppers and adapted for producing a fluid sand mixture from said raw materials;

a proportioning chamber is communication with said mixer;

a piston arranged in said proportioning chamber, being of a telescopic type and having an individual drive for each stage; a gate abutting upon the outlet port of said proportioning chamber;

a shaped nozzle which is detachable, rigid with said gate and mounted to reciprocate in such a manner that it closes alternately with the gate the outlet port of the said proportioning chamber;

a core box disposed under the outlet port of said proportioning chamber.

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