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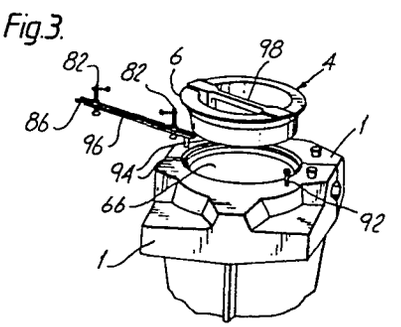
(54) **Mould, particularly for casting sanitary appliances with an integral rim of closed or open type.**

(57) The patent concerned relates to a mould for casting sanitary appliances with an open or closed integral rim, comprising a lower mould piece and at least two lateral mould pieces arranged to close together on this latter with a horizontal mutual approach movement, and further comprising, at the upper ends of the inner surfaces of the two lateral mould pieces, coplanar perimetral ledges which project towards the central zone of the mould such that the upper horizontal wall of the open or closed integral rim of the article to be cast becomes formed on their lower faces during the casting stages; the aperture defined by said coplanar perimetral ledges being closed by a suitable plug, of which that portion inserted into the aperture constitutes the forming surface for the inner vertical wall of the open or closed rim.

Fig.3.



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MOULD, PARTICULARLY FOR CASTING SANITARY APPLIANCES WITH AN INTEGRAL RIM OF CLOSED OR OPEN TYPE

The present invention relates in an entirely general manner to a mould for casting sanitary appliances in vitreous china, and more particularly relates to a mould for casting articles with an integral rim, this latter being closed or open. For example, such articles can be water closets, bidets or other similar appliances.

It is well known that these latter are cast in complicated moulds composed of a series of mould pieces which can be assembled together to form a casting cavity into which a ceramic material in the form of a slip is subsequently fed.

Casting moulds are known, inter alia, comprising a lower mould piece arranged to form the inner cavity of the pedestal of the article to be cast, two lateral mould pieces arranged to close together on said lower mould piece with a horizontal movement, and designed to form the external shape of the article, and an upper mould piece or cover arranged to be rested on the lateral mould pieces in order to close the upper mouth of the casting cavity defined by said lower and lateral mould pieces.

Said cover, which is of plaster as are the other component mould pieces of the mould, is normally constituted by a flat body, the perimetral edge of which rests on the upper faces

of the lateral mould pieces, from its lower face there branching an appendix which penetrates to a certain distance into the mould casting cavity. The lower end of this appendix can be flat or can be provided with a dome-shaped impression facing said casting cavity. This lower end is also usually lined with a thin synthetic resin layer impermeable to air, or is constituted by a synthetic insert which is embedded into the plaster of the cover.

Furthermore, the side wall of the appendix of this latter is separated over a certain distance from the upper edge of the inner surface of the lateral mould pieces in order to constitute an integral rim of open type in the finished article, with the cooperation of said upper edges of the lateral mould pieces and said lower face of the cover.

However, although casting moulds of the aforesaid type are still widely used, they have given rise, and still give rise, to the drawbacks listed briefly hereinafter.

These latter are due practically completely to the configuration of said cover and said upper edges of the lateral mould pieces.

In this respect, because of the fact that the upper horizontal and inner vertical walls of the rim become formed respectively on the lower face of the cover and against the side surface of the appendix thereof, when the article is removed from the mould, and more specifically when the cover is raised, damage arises in certain cases to the rim which has just been cast, particularly at the connection point between its horizontal wall and the wall cast on the lateral mould pieces, with the obvious serious consequences deriving therefrom.

This obviously derives from the excessively extended surface

of the cover against which the rim is cast and adheres, this latter not yet being completely hardened and therefore not yet sufficiently resistant to the shear stress deriving from raising the cover.

In addition, a further drawback of known casting moulds derives from the fact that the cover surface area subjected to the hydrostatic thrust of the slip fed by gravity into the mould is excessive, because of which the resultant force which tends to lift the cover is relatively large, and in order to keep this latter constantly resting against the lateral mould pieces, it is necessary to furnish vertical mould locking devices which are able to counterbalance said relatively large forces.

As a direct consequence of this, these vertical locking devices have of necessity to be strong, complicated and costly, taking into account the fact that sanitary appliances are usually cast on a casting installation or bench comprising even fifty or more casting moulds.

In addition, a cover of the described type is excessively large and heavy, and therefore uncomfortable to raise and handle by the operators.

The object of the present invention is to propose and protect a mould for casting sanitary appliances with an integral rim, which, by means of a simple, functional, rational and extremely reliable design, remedies the aforesaid defects.

According to the invention, the proposed casting mould is of the type comprising a lower mould piece arranged to internally form the pedestal of the article to be cast in the mould, and two lateral mould pieces able to be closed together on said lower mould piece with a horizontal mutual approach movement, and is characterised in that these latter are each provided

upperly with a perimetral ledge which projects towards the central zone of the mould, and on the lower face of which the upper horizontal wall of the integral rim of the article is formed during the casting stages.

Furthermore, said ledges are provided upperly with an enlarged shoulder which acts as a seat for a closure plug which, when the mould is assembled, closes the aperture defined by said two ledges.

In addition, said plug, which is arranged for insertion to a certain degree into the casting cavity defined by said lateral and lower mould pieces, is advantageously constituted by a core of light material, for example a synthetic expanded material, which is covered laterally with a convenient layer of plaster where the inner wall of the integral rim is formed, this latter being of closed or open type.

The objects and advantages of the invention, together with its characteristics and constructional merits, will be more clarified and apparent from the detailed description given hereinafter, with reference to the figures of the single accompanying drawing which illustrate a preferred embodiment thereof, given purely by way of non-limiting example.

Figures 1 and 2 are two vertical sections orthogonal to each other, through the upper part of an assembled mould according to the invention.

Figure 3 is a perspective view of the same upper part of the mould with the plug in the extracted position.

It can be seen that said figures show only the upper part of a plaster mould for casting a ceramic material of slip form for constituting sanitary appliances such as water closets, bidets and other similar articles.

From the particular configuration of the upper part of the mould in question, it will further be noted that this is of the type proposed for casting sanitary appliances with an integral rim. This latter can be of open type, as can be seen from the accompanying figures, but can also be of closed type as will be further specified hereinafter.

The invention consists of a lower mould piece, not shown, designed to form the inner zone of the pedestal of the article to be cast inside said mould. This latter also comprises two lateral mould pieces 1, symmetrical to each other, which are constituted of plaster as is the aforesaid lower mould piece.

The lateral mould pieces 1 are designed to be clamped together on the lower mould piece by a horizontal mutual approach movement in order to form the outer surfaces of the corresponding sanitary appliance.

As can be better seen in Figures 1 and 2, from the upper perimetral edge of the inner surface of each lateral mould piece 1 there projects a perimetral ledge 2 which extends for a certain distance towards the central zone of the casting cavity, which is defined by said lateral mould pieces 1 and the lower mould piece.

The inner edge of the perimetral ledges 2 is slightly flared upwards, and their upper corner is traversed by an enlarged shoulder 3.

When the mould is assembled, the two perimetral ledges 2 define an aperture 66 which is closed by a plug 4.

When viewed in plan, the plug 4 is in the shape of an oval which exactly mates with the aforesaid aperture 66.

The plug 4 comprises a central core 5 of light material such as an expanded synthetic material, the top of which is traversed by a suitable lightening impression which transversely contains a stiffening baffle 98.

The side wall of the synthetic core 5 is covered with a suitable thickness of plaster 7, the outer surface of which comprises an inclination which substantially coincides with the inclination of the inner edge of the perimetral ledges 2.

The plaster layer 7 is provided perimetrally at its top with a lip 6, which when the mould is assembled makes contact with the enlarged shoulder 3 of the ledges 2. In addition, the lower face of the synthetic core 5 is constituted by a concave dome-shaped recess 8, the concavity of which faces the casting cavity in which the sanitary appliance is to be cast.

The synthetic material constituting the core 5 can be either a synthetic material impermeable to air, or can be a material permeable to air which is faced, at least over the surface corresponding with the dome 8, with a suitable synthetic resin layer impermeable to air.

On using the casting mould according to the invention, the two lateral mould pieces 1 are assembled on the lower mould piece by means of a horizontal mutual approach movement, and are then locked in the lateral or horizontal direction.

The plug 4 is then inserted into the aperture 66 which defines the upper mouth of the casting cavity present in the mould, and is then pressed against the ledges 2 by a vertical locking device.

As clearly shown in the accompanying figures, this latter consists of a metal rod 96 which at one end is hinged to a

pillar 94. At its opposite end, the rod 96 is provided with a seat 86 for coupling a second pillar 92, this latter having an enlarged head. The pillars 94 and 92 branch from the upper faces of the lateral mould pieces 1, and are symmetrically disposed both about the vertical dividing plane of these latter and about a vertical plane orthogonal to said dividing plane. The rod 96 is finally provided with two threaded clamping pins 82, each provided with an upper operating cross-bar, their lower ends, which are designed to act on the baffle 98, comprising pressure discs.

At this point, the mould is ready for casting, and the slip is fed by gravity into the casting cavity defined by the mould pieces which constitute the mould, through a suitable channel normally provided in the lower mould piece. The slip rises upwards inside said casting cavity, so displacing the air contained therein, which escapes through the usual vents located at the common separation plane of the lateral mould pieces.

It will certainly be noted that the plug 4 extends into the casting cavity to a certain extent, and the slip continues to rise until it reaches the lower end of the plug 4.

At this point, even though not previously referred to, it should be noted that the lower mouth of the dome 8 is slightly inclined, because of which during said casting stages, the casting mould is disposed with an inclination such that said mouth of the dome 8 becomes positioned horizontally.

When the ceramic material of slip form reaches said mouth, it continues to rise to completely fill the annular chamber between the plug 4 and the upper ends of the inner surfaces of the lateral mould pieces 1. In this manner, the mould becomes completely filled with the slip, with the exception of nearly the whole of the dome 8 where a certain quantity

of air is trapped, this being at the same pressure as the hydrostatic head on the slip which originates from a normal overlying feed tank.

More precisely, because air is a compressible fluid, the free surface of the slip which is located in front of the dome 8 also touches a small perimetral portion of the surface of the dome 8, said small portion being a function of the hydrostatic head on the slip.

The mould filled in this manner is left to stand for a determined casting period, during which the walls of the article become formed on the mould pieces which constitute the mould, in that the plaster which constitutes said mould pieces absorbs the slip moisture.

More precisely, the open-type integral rim of the corresponding article is formed at the annular chamber defined by the plug 4 and by the upper ends of the lateral mould pieces 1.

In addition, the plug 4 defines the aperture of the bowl of said article.

In this respect, the outer wall of said open integral rim is formed at the upper perimetral edge of the inner surfaces of the lateral mould pieces 1, whereas the upper horizontal wall and the inner wall of said open integral rim are formed respectively at the outer surface of the plaster ring 7.

After said casting period has passed, the mould is drained through the same aperture used for the casting, and this can be done simply by gravity or by using compressed air fed into the upper zone of the mould in known manner, this latter type of drainage being particularly advantageous in accelerating drainage and for overcoming any eddy effects which would be extremely damaging for the walls just cast.

At a certain point during this draining, the free surface or level of the slip bath present inside the casting cavity of the mould completely escapes from the lower mouth of the dome 8, and substantially at this point the draining operation is halted for a certain time in order to allow the plug 4 to drip, and to prevent this dripping causing any indentation in the bowl of the article just cast.

As soon as this dripping ceases, the draining operation is terminated and the article is then removed from the mould. Said final draining can be terminated by removing the plug from the lateral mould pieces.

From the full description given heretofore, the great advantages offered by a mould equipped in this manner will certainly have been noted, but in order to prevent any misinterpretation or misunderstanding, said advantages are briefly listed hereinafter.

A first great advantage is due to the fact that with a mould formed in this manner, it is practically impossible to damage the integral rim of the article during extraction of the plug 4, because the inner wall of said rim rests against the lower face of the perimetral ledges 2.

A further great advantage is due to the fact that the hydrostatic thrust deriving from the liquid slip head during the casting stages is not completely transmitted to the plug 4, but a large part of it is supported by the ledges 2 which are in one pieces with the lateral mould pieces 1.

For this reason, vertical locking devices for a casting installation or bench can be prepared which are much less robust, less complicated and therefore less costly than the known ones, and for example of the type shown in the accompanying figures.

Moreover, because of the lightness of a plug 4 constructed in this manner, the handling of the plugs 4 is greatly facilitated for the operators and made less heavy, because of their overall size which is relatively small with respect to the prior known art.

Finally, the presence of the dome 8 is extremely advantageous, because during the casting stages, only a small edge close to its mouth becomes wetted by the slip, so that the necessary cleaning of said dome before proceeding to a subsequent casting stage is considerably simplified.

It is not however necessary for the invention to comprise a plug 4 provided with said dome 8.

For example, a mould thus constituted is equally suitable for casting sanitary appliances with a closed integral rim.

For this purpose, it is sufficient to provide for the invention an upper mould piece of known type, comprising a flat annular member for disposing on the lateral mould pieces 1, an appendix branching centrally from the lower zone of said flat annular member in order to close the aperture 66, and a removable collar disposed laterally to the zone in which said appendix is connected to the flat annular member, and consisting of a set of separate plaster parts which are each shaped as a wedge or tooth.

During the casting stages, said removable collar is supported by suitable coupling means disposed on the lower face of the flat annular member of the upper mould piece.

In this specific case, on the appendix of the upper mould piece there is provided a suitable seat for receiving and correctly positioning the removable collar, of which the upper

flat surface is designed to form the horizontal lower wall of a closed integral rim, in known manner.

For the same reasons as stated heretofore, in this specific case, i.e. for sanitary appliances with a closed integral rim, the upper central zone of the mould is also obviously constituted as shown in the accompanying figures.

It is however not necessary for the upper mould piece to comprise a central core 5 covered with a layer of plaster 7, and it can simply consist of a solid profiled plaster member suitably equipped for receiving the aforesaid removable collar.

The invention is not limited only to the embodiments heretofore described, and modifications and improvements can be made thereto without leaving the scope of the inventive idea, the basic characteristics of which are summarised in the following claims.

PATENT CLAIMS

1. A mould particularly for casting sanitary appliances with an open or closed integral rim, as heretofore described, of the type comprising a lower mould piece and at least two lateral mould pieces arranged to close together on this latter with a horizontal mutual approach movement, characterised in that said lateral mould pieces are provided upperly with coplanar perimetral ledges which project towards the central zone of the mould such that the upper horizontal wall of the open or closed integral rim of the article to be cast becomes formed on their lower faces during the casting stages; the aperture defined by said coplanar perimetral ledges being closed by a suitable plug, of which that portion inserted into the aperture constitutes the forming surface for the inner vertical wall of the open or closed rim.

2. A mould as claimed in claim 1, characterised in that the inner edge of said perimetral ledges is slightly flared upwards, and their inner upper corner is traversed by an enlarged shoulder.

3. A mould as claimed in claim 1, characterised in that said closure plug comprises a central core of a light material such as a synthetic material, arranged to penetrate to a certain extent into the casting cavity present in the assembled mould, and of which the side surface is lined with a suitable plaster layer provided upperly with a perimetral lip having a shape conjugate to that of the enlarged shoulder of said perimetral ledges.

Fig.1.

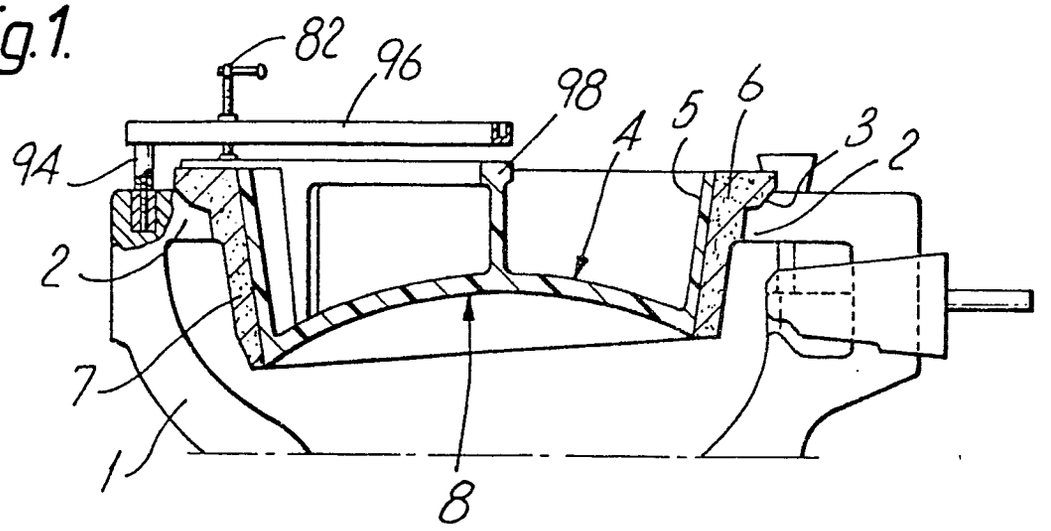

Fig.2.

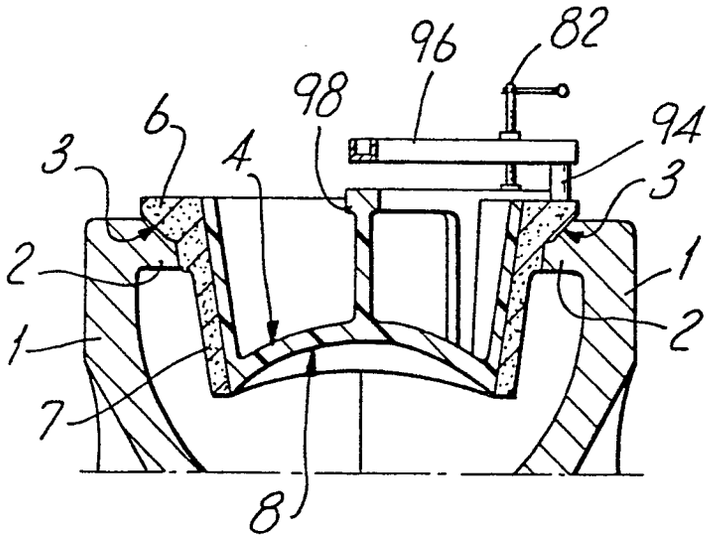

Fig.3.