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(54) **Mould for casting sanitary appliances with a closed integral rim, or projecting undercut parts.**

(57) The invention concerned relates to a mould for casting sanitary appliances (15) with internal projecting parts, comprising separate mould parts (1,2,3,4) which, together with one or more mould pieces, are (5,6) designed to constitute a hollow or solid casting portion in the article cast in the mould, which also comprises, for each of said separate parts, at least one rotatable member (7) housed in a convenient seat in said one or more mould pieces, its free end extending until it practically reaches the zone of contact between the corresponding mould piece and the relative separate part, where it is provided with one of the two parts of a magnetic locking system (9), this latter part being eccentric and, when the corresponding rotatable member is in two opposing angular positions, becomes aligned with and disposed laterally to the other part of the magnetic locking system, this latter part being embedded in said corresponding separate part, so as to respectively couple together and uncouple the corresponding mould piece and the relative separate part.

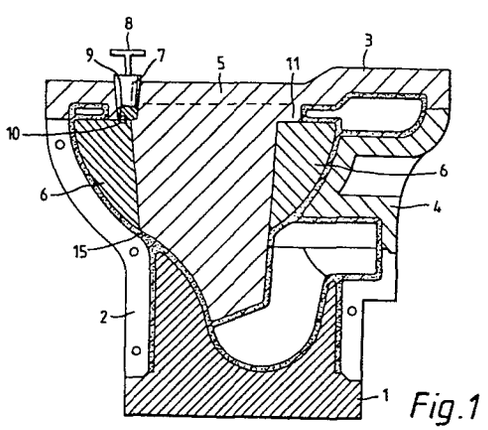

Fig.1

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MOULD FOR CASTING SANITARY APPLIANCES WITH A CLOSED INTEGRAL RIM, OR PROJECTING UNDERCUT PARTS

The present invention patent relates in an entirely general manner to a mould for casting a ceramic material of slip form. More particularly, it relates to a mould for casting sanitary appliances in which separate mould parts are required to remain suspended, for example a mould for forming sanitary appliances with a closed integral rim such as water closets, bidets or urinals, or generally with internal projecting undercut parts, such as a rib or undercut edge an example of which is an anti-drip edge.

For casting such articles, plaster moulds of the built-up type are known inter alia, which usually comprise a lower mould piece, lateral mould pieces arranged to close together on said lower mould piece to define a moulding cavity, an upper mould piece arranged to close said moulding cavity and provided lowerly with a core arranged to shape the inner part of the bowl of the article, and a collar or another analogous mould part or section for disposing in a removable manner at the base of said core, and which can either be divided into a group of separate parts or can be in one piece.

For example, the upper faces of said separate parts can be designed to form the lower wall of a possible integral rim closed by the appliance cast in the corresponding built-up mould, or a possible projecting edge inside the appliance.

When the mould has been assembled, i.e. during the casting stages, the parts which constitute said separate mould part are supported by said upper mould piece by means of suitable coupling means.

In certain cases, these coupling means are in the form of one or more springs for each separate mould part, these being housed in suitable apertures provided in the upper mould piece, and being hooked to the corresponding part at one end, whereas their other ends comprise a hook or a cross-bar.

Said hook and cross-bar are designed respectively, when the spring is under tension, to be hooked to a suitable member of the upper mould piece or to be disposed transversely relative to the aperture housing the corresponding spring.

In other cases, the aforesaid coupling means are in the form of threaded members which traverse the upper mould piece to reach and support the underlying separate parts which constitute said collar.

In further cases, said coupling means are essentially constituted by rings of metal wire used together with hooks, wedges or other similar elements.

The continuous widespread use of the known moulds equipped in this manner has however brought to light drawbacks which are briefly listed hereinafter, and which are due practically entirely to the means for coupling the separate mould part or parts.

These drawbacks arise from the fact that the coupling and uncoupling of said coupling devices require excessively long times and are complicated, and in certain cases are not sufficiently precise.

Moreover, the larger the number of separate mould parts, the larger the number of coupling devices necessary, because of which said drawbacks are felt to a greater extent.

In addition, these drawbacks are considerably multiplied if account is taken of the fact that the casting operations for the articles are carried out in casting installations which comprise a large number of complicated moulds, which can exceed fifty in number.

Because of this, when removing the sanitary appliances from the moulds and when building-up the moulds again for a subsequent casting stage, a very large employment of labour is required.

This fact, together with the aforesaid excessive times necessary for coupling and uncoupling the known coupling devices, also affects the costs of the finished articles and the economy of the firm.

The aforesaid drawbacks are for example felt to a large extent in complex moulds for sanitary appliances with an integral rim, in which the rim is formed by a multi-piece collar suspended from the upper mould part.

The main object of the present invention patent is to provide a casting mould which remedies the aforesaid drawbacks by means of a simple, functional, rational and highly reliable constructional design.

According to the invention, the proposed mould is of the type comprising separate mould parts which, together with one or more mould pieces, are designed to form a hollow or solid casting portion in the article cast in the mould, and is characterised by providing, for each of said separate parts, at least one rotatable member housed in a convenient seat in

said one or more mould pieces, its free end extending until it practically reaches the zone of contact between the corresponding mould piece and the relative separate part, where it is provided with an eccentric magnetic block or metal pad which, when the corresponding rotatable member is in two opposing angular positions, becomes aligned with and disposed laterally to a metal pad or a magnetic block embedded in said corresponding separate part, so as to respectively couple together and uncouple the corresponding mould piece and the relative separate part.

According to a particular embodiment of the invention, which is especially suitable for casting sanitary appliances such as bidets, water closets and urinals, the proposed mould is of the type comprising a lower mould piece, lateral mould pieces arranged to close together on said lower mould piece to define a casting cavity, an upper mould piece designed to close said casting cavity, a core branching from the upper mould piece, and a collar constituted by a set of separate parts and arranged to be disposed at the base of said core in order to shape the interior of the bowl of the article to be cast and the lower wall of the corresponding closed integral rim, and is characterised by providing, for each separate part of the aforesaid collar, at least one rotatable member housed in a suitable seat of the upper mould piece, and of which the free end extends until it practically reaches the lower face of said upper mould piece where it is provided with an eccentric magnetic block which, when the corresponding rotatable member is in two opposing angular positions, is arranged to overlie and be disposed to the side of a metal pad embedded in the underlying collar part, so that this latter becomes retained against the upper mould piece, and released or uncoupled from it respectively.

As already stated, it is apparent that the magnetic block and metal pad can be reversed in position, and disposed on the

collar and on the rotatable member respectively.

In order to provide said support, the rotatable member must be constrained axially relative to the lower mould piece.

For this purpose, according to the invention, the rotatable member is of cone-frustum shape with its minor base facing the internal zone of the mould, and the magnetic block is embedded in a lateral zone of this latter, of which it occupies preferably one half.

The metal pad which is embedded into the corresponding collar part is constructed of soft iron and is of the same configuration as the magnetic block.

Finally, the axial constraint of the rotating member can be obtained by other configurations, such as a cylindrical configuration with differing cross-sections, or a funnel shape.

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

Figure 1 is a vertical section through a mould according to the invention, said section being taken on the vertical plane which separates the lateral mould pieces.

Figure 2 is another vertical section through the invention, the section plane being orthogonal to the preceding.

Figure 3 is a perspective view of the upper mould piece of a mould according to the invention, said upper mould piece being shown in an inverted position.

Figure 4 is a perspective view of one of the parts which make up the collar of the upper mould piece.

Figure 5 is a perspective view of a sanitary appliance obtained with the invention.

Figure 6 is a perspective view of one of the rotatable members with which the invention is provided.

Figures 7, 8 and 9 are partial sectional views through the mould concerned, which show the different operating positions assumed by the rotatable members during the casting stages of a sanitary appliance.

From said figures, and in particular figures 1 and 2, it can be seen that the mould according to the invention is composed of a lower mould piece 1, which is of plaster as are the other mould pieces which constitute said mould, on which two lateral mould pieces 2 rest and are clamped together. These latter are disposed symmetrically relative to the lower mould piece 1, and are designed to constitute a suitable casting cavity inside the mould.

Furthermore, the pair of lateral mould pieces 2 is designed to externally shape a sanitary appliance 15 which is cast into the mould. On the pair of lateral mould pieces 2, there rests an upper mould piece 3, with a core 5 projecting from the central zone of its lower face.

At the point at which said core 5 joins to the upper mould piece 3, as shown also in Figure 3, there is provided a perimetral step 11 which, during the casting of the article 15, receives a collar constructed of plaster as is the core 5, and which is constituted by a set of separate parts 6, each of which is in the shape of a wedge or tooth. The mould shown also comprises a rear mould piece 4 which, in

combination with the pair of lateral mould pieces 2, is designed to shape the wall discharge for the sanitary appliance 15.

The core 5 and collar 6 are obviously provided for shaping the interior of the bowl of the sanitary appliance 15 and the lower wall of the closed integral rim thereof. Although the accompanying figures show a water closet with wall discharge, it must be stated at this point that the invention is in no way limited to a particular type or form of article to be cast in the mould, as it is equally suitable for casting water closets with floor discharge, and for casting bidets and urinals. Each separate part of the collar 6 is provided, at that longitudinal edge designed to rest against the perimetral step 11, with a metal pad 10 constructed of soft iron.

In alignment with the corresponding metal pad 10 when the upper mould piece 3 is completely assembled, there is provided a cavity 12 which traverses the entire thickness of the upper mould piece 3 to at least partly emerge above the perimetral step 11. A rotatable member 7 is intended for insertion into said cone-frustum cavity 12, and is also of cone-frustum shape, i.e. is configured as a plug, in order to prevent it moving axially inside the corresponding cavity 12 when the casting mould is completely assembled.

As is apparent from the accompanying figures, each rotatable member 7 has its minor base facing the internal zone of the casting mould, where it is provided with an eccentric magnetic block 9 which occupies substantially one half of said minor base. This block is embedded in the material which constitutes the rotatable member 7, and which can be plaster, a synthetic material or any other convenient material.

An operating handle 8 projects from the central zone of the major or outer base of the rotatable member 7.

The dimensions of the rotatable member 7 are obviously the same as those of the corresponding cavity 12, so that when said rotatable member 7 is inserted into said cavity 12, the minor base of the rotatable member 7 becomes disposed substantially coplanar with the support zone for the perimetral step 11 of the upper mould piece 3.

When a casting operation is to be carried out, the mould pieces which constitute the casting mould are assembled in the usual manner, and the separate parts 6 which constitute the collar of the core 5 are retained against the upper mould piece 3 by the rotatable members 7 which are rotated in the operational position shown in Figures 1, 2 and 7.

With this configuration, the magnetic block 9 of each rotatable member 7 lies directly above the metal pad 10 of the corresponding separate part of the collar 6, so that it keeps this separate part in its correct operational position.

With the mould assembled in this manner, the mould is filled with the ceramic material of slip form, which is subjected to a certain hydrostatic head. After this, a certain predetermined casting period is allowed to pass, and then the excess slip is drained from the mould.

During said casting period, the walls of the sanitary appliance 15 become formed inside the mould, and at the same time an integral rim of closed type is also defined.

This is shown in Figure 8, and the rotatable members 7 always maintain the same operating position described heretofore.

After said draining stage, the mould is opened, and the article is extracted for conveying to the next stages of the production cycle.

The configuration of the parts proposed by the invention offers great advantages over conventional systems, even during mould opening.

In this respect, it is known that during mould stripping, all the separate mould parts fixed to the upper mould piece by means of screws, springs and cross-bars have to be replaced in position, with serious loss of time and risk of damage.

This is due to the fact that in order for them to be returned to their position under the upper mould piece, this latter has to be accessible from above in order to operate the relative coupling means, and as the upper mould piece is raised this is not possible.

In contrast, according to the invention, mould stripping is carried out as follows:

The opening of the mould firstly requires extracting the upper mould piece 3, together with which the core 5 becomes extracted. Before raising said upper mould piece 3, all the rotatable members 7 are rotated into the position of "disengagement" between the magnetic blocks 9 and metal pads 10.

The upper mould piece 3 with the core 5 is then raised by means of suitable devices from which it is suspended, through a small distance for example 1-2 cm, in order to provide a modest spacing between the blocks 9 and pads 10.

After this the members 7 are again rotated into their position of "engagement", and the mould pieces 3 and 5 are then completely extracted.

Because of the aforesaid spacing, there is obviously no locking action between the blocks 9 and pads 10.

At this point, the separate pieces of the collar 6 are removed, and these are then returned to their position under the raised upper mould pieces 3-5. This is made possible because the members 7 are rotated into their position of "engagement", and avoids having to temporarily replace the collar parts, with amongst other things the risk of damaging them.

It should be noted that in order to carry out said extraction, each separate part of the collar 6 has to be pulled downwards and towards the inside of the bowl of the appliance 15.

When all the separate parts of the collar 6 have been removed and reassembled with the upper mould piece, the entire upper part of the mould 3-5-6 is already recomposed and ready for the next casting.

As soon as the collar 6 has been completely removed, the rear mould piece 4 is extracted and the lateral mould pieces of the mould 2 are opened. Finally, the sanitary appliance 15 is removed from the lower mould piece 1, and the mould is ready for a new casting stage.

Although not stated heretofore, it is apparent that the upper or outer base of each rotatable member 7 is provided with a suitable index mark which enables the position occupied by the corresponding underlying magnetic block 9 to be determined.

Although the magnetic locking heretofore described is particularly suitable for moulds for casting sanitary appliances with a closed integral rim, such as water closets, bidets and urinals, it can be advantageously used in all cases in which a mould for casting a ceramic material of slip form is required to constitute inside the cast article a hollow or solid casting region, the constituent walls of which are defined by separate parts, as is the case of the collar 6 and

the upper mould piece 3 in the example shown.

The invention is not limited to the single embodiment heretofore described, and modifications and improvements can be made thereto without leaving the scope of the inventive idea. Thus for example, the rotatable members 7 do not necessarily have to be of cone-frustum shape, but can assume any shape which prevents them from moving axially inside the corresponding cavity 12.

In this respect, alternatively, according to the invention each rotatable member 7 can be in the form of a cylinder of two different cross-sections, of which the smaller cross-section is that provided for the magnetic block 9.

In this case, the cavity 12 will obviously have a conjugate cylindrical configuration. In addition, the rotatable members and corresponding cavities can be of funnel configuration.

Finally, it will be apparent that for each separate part of the collar 6, more than one magnetic block of the type represented and described heretofore can be provided.

PATENT CLAIMS

1. A mould for casting sanitary appliances with internal projecting parts, such as a closed integral rim or an anti-splash edge, as heretofore described, of the type comprising separate mould parts which, together with one or more mould pieces, are designed to constitute a hollow or solid casting portion in the article cast in the mould, characterised by providing, for each of said separate parts, at least one rotatable member housed in a convenient seat in said one or more mould pieces, its free end extending until it practically reaches the zone of contact between the corresponding mould piece and the relative separate part, where it is provided with one of the two parts of a magnetic locking system, this part being eccentric and, when the corresponding rotatable member is in two opposing angular positions, becoming aligned with and disposed laterally to the other part of the magnetic locking system, this latter part being embedded in said corresponding separate part, so as to respectively couple together and uncouple from each other the corresponding mould piece and the relative separate part.

2. A mould as claimed in claim 1, characterised in that one of the two parts of the magnetic locking system is constituted by a magnetic block, whereas the other part is constituted by a metal pad.

3. A mould for casting sanitary appliances with solid or hollow internal projecting parts, especially suitable for bidets, water closets or urinals, as heretofore described, of the type comprising a lower mould piece arranged to be rested on a convenient support, at least two lateral mould pieces arranged to be assembled on said lower mould piece to define a casting cavity, an upper mould piece designed to close said casting cavity, a core branching from the lower face of the upper mould piece, and a collar constituted by a set of separate parts and

arranged to be disposed at the base of said core in order to shape the interior of the bowl of the article to be cast and the lower face of the corresponding projecting internal part, characterised by providing, for each separate part of the aforesaid collar, at least one rotatable member housed in a suitable seat of the upper mould piece, relative to which it is locked axially, and of which the free end extends until it practically reaches the lower face of said upper mould piece where it is provided with an eccentric magnetic block which, when the corresponding rotatable member is in two opposing angular positions, is arranged to overlie and be disposed to the side of a metal pad embedded in the underlying separate collar part, so that this latter becomes retained against the upper mould piece by the rotatable member, and uncoupled from said upper mould piece respectively.

4. A mould as claimed in claims 1, 2 and 3, characterised in that said at least one rotatable member is composed of a cone-frustum body of suitable material with its minor base facing the central zone of the mould, its opposing or outer end being provided with an operating handle; said magnetic block or metal pad being embedded in a lateral zone of the minor base of said cone-frustum body, of which the containing cavity has a form conjugate thereto.

5. A mould as claimed in claims 1 and 3, characterised in that said at least one rotatable member is composed of a cylindrical body with at least two different cross-sections, the portion of smaller cross-section facing the central zone of the mould whereas that of greater cross-section faces the outside, where it is provided with an operating handle.

6. A mould as claimed in claims 1 and 3, characterised in that said at least one rotatable member and cavity for this latter are in the shape of a funnel.

7. A mould as claimed in claims 1, 2 and 3, characterised in that said metal pad or magnetic block for said at least one rotatable member is substantially configured as the corresponding magnetic block or metal pad, this latter being constructed of mild steel.

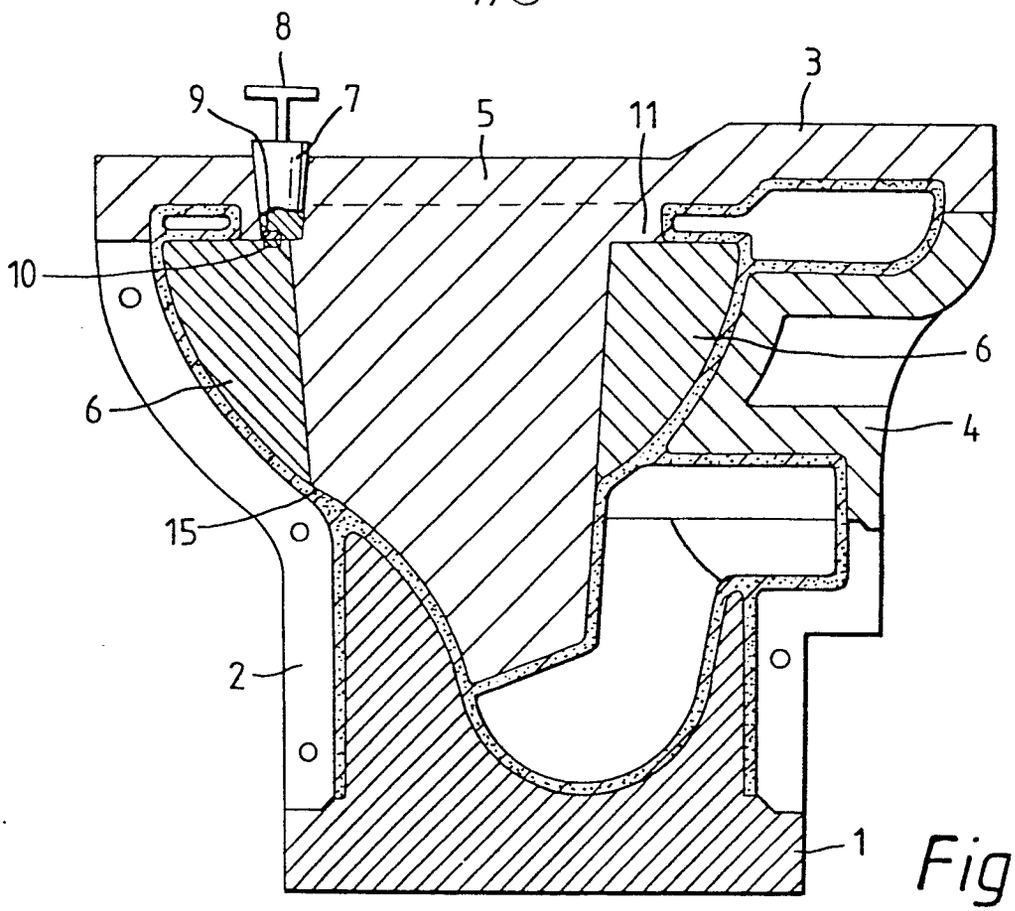

Fig.1

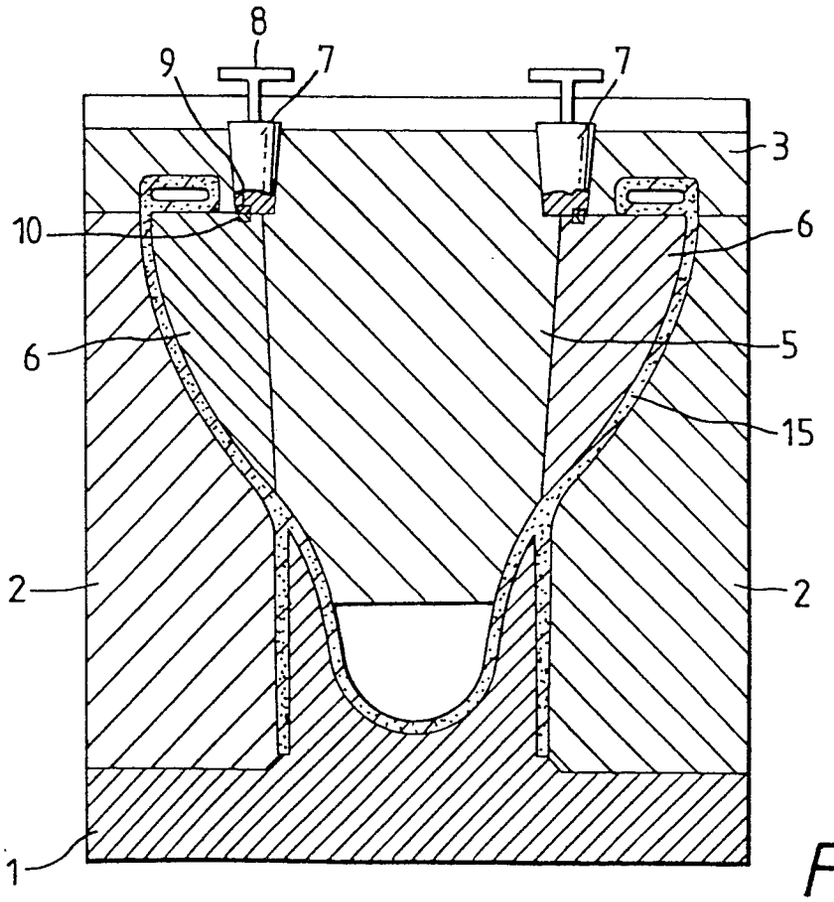

Fig.2

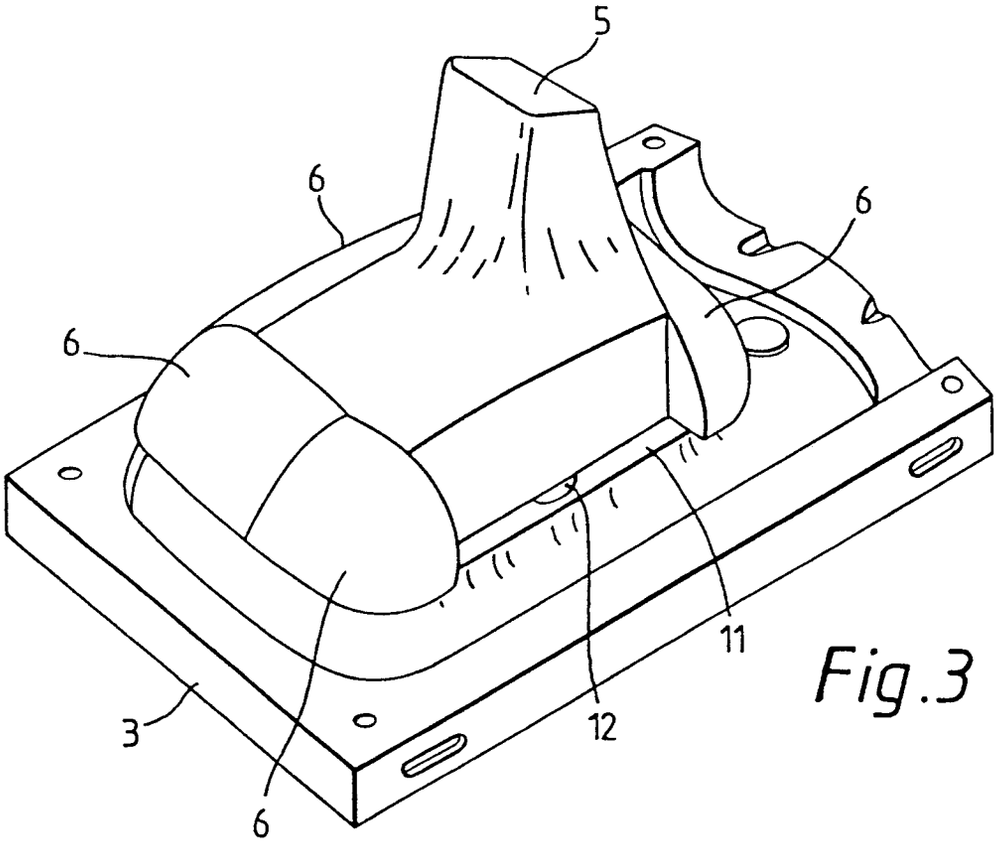

Fig.3

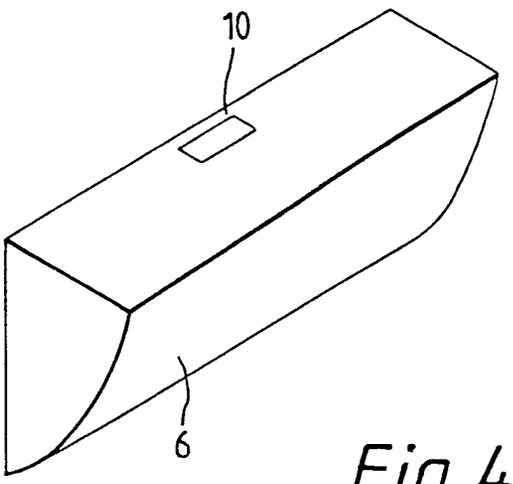

Fig.4

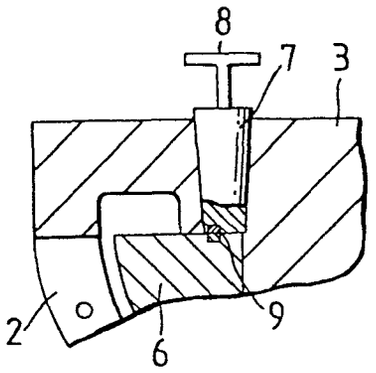

Fig.7

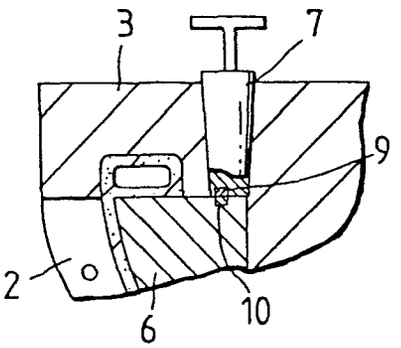

Fig.8

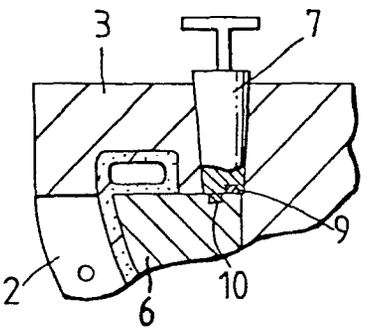

Fig.9

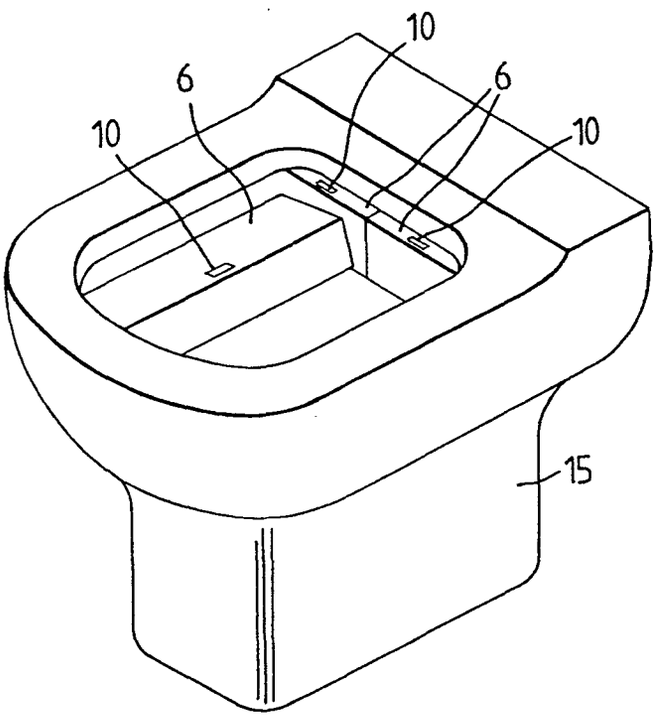

Fig.5

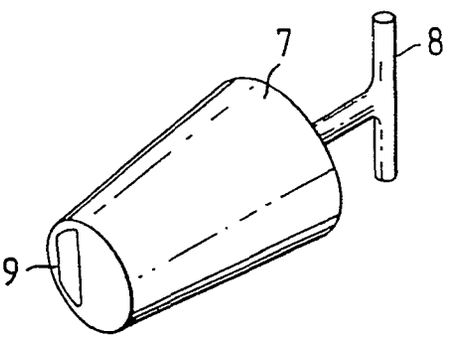

Fig.6

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 80 20 1191

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	FR - A - 1 291 804 (MISCHEK) * figures 1,2; page 1, column 1, last paragraph; page 1, column 2, paragraphs 1,2; page 2, column 1, paragraph 9 *	1,2,4,5
A	US - A - 3 461 194 (UNIVERSAL RUNDLE CORP.)	
A	DE - A - 2 323 283 (FA. E. PFEIFER)	
A	FR - A - 2 082 236 (S.L.Y.M.)	

CLASSIFICATION OF THE APPLICATION (Int Cl.³)
B 28 B 1/26

TECHNICAL FIELDS SEARCHED (Int. Cl.³)
B 28 B
B 29 C

CATEGORY OF CITED DOCUMENTS
X: particularly relevant
A: technological background
O: non-written disclosure
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E: conflicting application
D: document cited in the application
L: citation for other reasons
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X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26-03-1981	NOESEN