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71 Applicant: **DANSK INDUSTRI SYNDIKAT A/S**  
**No. 15-17, Herlev Hovedgade**  
**DK-2730 Herlev(DK)**

72 Inventor: **Larsen, Aage Berg**  
**Langholm 12 Veddelev**  
**DK-4000 Roskilde(DK)**

74 Representative: **Dipl.-Phys.Dr. Manitz Dipl.-Ing.**  
**Finsterwald Dipl.-Ing. Grämkow Dipl.-Chem.Dr. Heyn**  
**Dipl.-Phys.Rotermund**  
**B.Sc. Morgan Robert-Koch-Strasse 1**  
**D-8000 München 22(DE)**

54 **A method for the production of mould parts.**

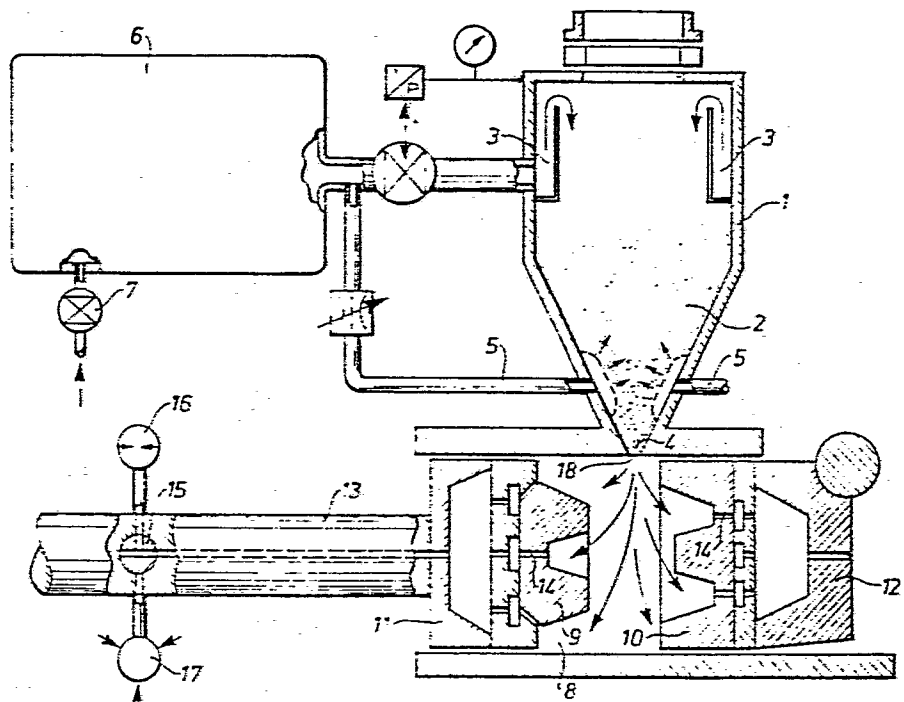
57 The method wherein

a) a pressure is injected into the supply (2) in the funnel-shaped inlet (4) for initiating the filling and fluidization of the mould material,

b) a pressure is established above the supply for insertion of mould material through the inlet, and

c) the fluidization pressure and the insertion pressure are controlled independently,

is achieved by means of an apparatus comprising a mould chamber (8) with pressure plates (11, 12) movable towards each other, to which plates mould plates (9,10) are fastened, and in which the mould chamber (8) can be connected through one or more passage apertures (14, 18) partly with a supply of mould material (2) being under pressure, partly with a vacuum source (16) and a pressure source (17) respectively.



A METHOD FOR THE PRODUCTION OF MOULD PARTSTECHNICAL FIELD

This invention relates to a method of producing mould parts by means of an automatic mould part producing apparatus of the type comprising a mould chamber having pressure plates movable towards each other, to which plates mould plates are fastened, and in which the mould chamber can receive mould material through a mainly funnel-shaped inlet from a supply above said inlet, said material supplied by pressure.

BACKGROUND ART

When using the known methods of producing mould parts, it has been a problem for a long time both to achieve the high degree of compression of the mould material in the entire mould part, which is necessary for the stability of the mould, and to have a sufficiently high production speed. Particularly in case of complicated mould parts with projecting ribs and the like, turbulent flows are generated in certain parts of the mould cavity, if the mould material is introduced under a high pressure. The turbulent flows give rise to uneven filling and consequently uneven density in the mould part. When introducing the mould material under a relatively low pressure, the cycle time will increase unacceptably, and sufficient density cannot be achieved everywhere in the mould part.

DISCLOSURE OF THE INVENTION

It is an object of this invention to show a method of producing mould parts, whereby, using a low cycle time, mould parts with a stable high density are obtained.

5 According to the invention, this object is achieved by a method of the kind mentioned in the introduction, which is characteristic in

- 10 a) that a pressure is injected inside the supply in the funnel-shaped inlet for initiating the filling and fluidization of the mould material,
- b) that a pressure is established above the supply for insertion of mould material through the inlet, and
- 15 c) that the fluidization pressure and the insertion pressure are controlled independently.

It is possible to obtain a low cycle time by this combination because of the introduction of the pressure in the funnel-inlet itself, as this allows operation with a relatively high filling pressure from the beginning with no  
20 danger of forming bridges in the funnel. Fluidization of the funnel area ensures a laminar flow during the last part of the filling, as a low friction is provided between the components of the mould material. The independent control of the fluidization pressure and the filling pressure  
25 offers the possibility of adjusting the degree of pressures which have proven through tests to be the most optimal ones when producing mould parts of a given form.

In case of the hitherto known apparatus, both the insertion pressure and the fluidization pressure have been controlled  
30 independent of the momentary pressure values above the supply and within the funnel-shaped inlet. Whereas no attempts have been made to procure a continuous adjustment

of dependence of the realized values in the relevant areas and therefore, there has been no possibility of making the pressure development dependent on the exact form of the mould parts produced.

- 5 In a possible embodiment of the process according to the invention, the mould chamber can be connected to a vacuum source at certain points at the "shadow areas".

In this way the following is achieved, partly a reduction of the cycle time and partly a better filling of the  
10 critical "shadow areas" in the mould cavity, i.e. areas behind the projecting ribs and the like.

In German published specification No. 1.941.736 a method is described according to which the mould chamber is subjected to a vacuum during the insertion of sand, but  
15 the vacuum is provided solely to increase the effective pressure difference between the mould cavity and the space above the supply by connecting the mould cavity with the vacuum source through a relatively wide slot in the bottom of the mould chamber. In the German published specification  
20 there is no description of providing vacuum through apertures spaced in the surface of the mould chamber.

By engaging a pressure source instead of the vacuum source when stripping, as suggested according to the invention, effective cleaning is ensured of the filters or nozzles  
25 through which the vacuum is produced at the passage apertures, and the same passage apertures and supply lines for inserting vacuum and pressure to the mould chamber can be used. Furthermore, the pressure injection appropriate for the stripping is particularly favourable as regards the  
30 aforementioned critical "shadow areas".

### BRIEF DESCRIPTION OF THE DRAWING

In the following the invention will be further explained with reference made to the drawing, the only figure of which shows schematically an apparatus for use when  
5 exerting the method.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

In the apparatus shown on the drawing, a container 1 is used for storage of the mould sand 2, which, as the name indicates, normally is sand, but it is possible also to  
10 use other suitable mould materials. Through air channels 3 at the side walls of the container, pressure air is injected into the space above the sand 2. In the embodiment shown, a fluidization of the sand is provided at the funnel-shaped inlet 4 of the container, air being supplied  
15 under high pressure through the supply ducts 5, and by this, air pockets and a fluidization are provided immediately above the inlet 4, as indicated by the arrows and the dotted lines.

In the shown embodiment, the pressurized air is supplied  
20 from a pressure air container 6 which is provided with pressurized air from a compressor through a valve 7.

Under the container 1, a mould chamber 8 is provided which is limited in the lateral direction by mould plates 9 and 10. The mould plates are supported by pressure plates 11 and 12 respectively which by means of a piston system 13  
25 (only one piston is shown) is arranged so that they can be led towards each other under high pressure. In the mould plates, passage apertures 14 are designed which via supply lines and a three-way valve 15 can be connected to  
30 a vacuum source 16 and a pressure source 17 respectively.

In the position shown on the drawing, mould insertion has just been initiated, and the sand 2 is forced from the funnel-shaped inlet 4 under high pressure into the mould chamber 8 by pressure injection through a porous plate at the bottom of the funnel, such as it is indicated by the arrows. The insertion of the sand and the compression in the mould chamber 8 is furthered by providing vacuum from the vacuum source 16. During the last part of the insertion of sand a controlled pressure is furthermore established over the sand, and the lower pressure injection serves to fluidization of the funnel area. While the insertion of sand is still in operation the mould plates 9 and 10 are led towards each other, activated by a working cylinder, not shown, which by pistons 13 drive the pressure plates 11 and 12 towards each other.

The movement of the pressure plates is terminated immediately after insertion of the correct quantity of sand into the mould chamber, and the mould is then finalized.

Removal of the mould plate 10 is made by moving the piston (not shown) and the pressure plate 12 from the mould in the programmed way, simultaneously supplying pressurized air from the pressure air source 17 through the passage apertures 14, so that a positive pressure against the mould limiting surfaces is provided. The mould 8 is removed from the mould chamber by means of the shown piston 13 and the pressure plate 11 and pushed forward to be put together with the previously produced moulds in a manner known per se. Finally, the mould plate 9 is stripped by moving the piston 13 and the pressure plate 11 away from the mould last produced in a programmed way, by simultaneously injecting pressure air from the source 17 through the apertures 14. The piston 13 and the pressure plate 11 turn back to their starting positions in the mould chamber. After this, the pressure plate 12 is moved back to starting position by means of the piston, not shown. Now, a new mould insertion can begin.

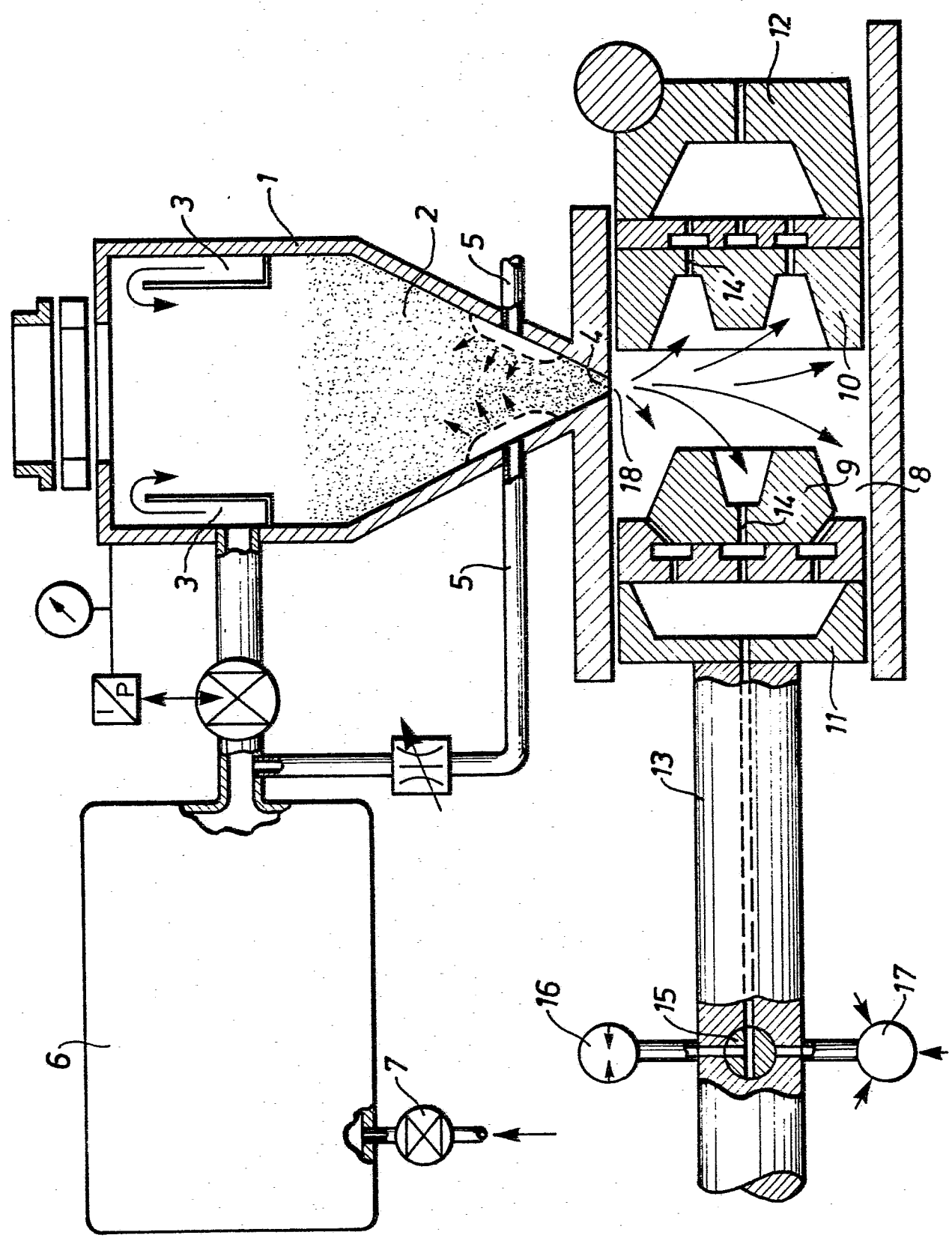
## C L A I M S: -

1. A method for the production of mould parts by an automatic mould part producing apparatus of the type that comprises a mould chamber (8) having pressure plates (11) movable towards each other, to which plates mould plates (9) are fastened, and in which mould material (2) can be fed by pressure injection into the mould chamber (8) through a mainly funnel-shaped inlet (4) from a supply above said inlet, c h a r a c t e r i z e d in
- 10 a) that a pressure is injected inside the supply (2) in the funnel-shaped inlet (4) for initiating the filling and fluidization of the mould material,
- b) that a pressure is established above the supply for insertion of mould material through the inlet, and
- 15 c) that the fluidization pressure and the insertion pressure are controlled independently.
2. A method according to claim 1, c h a r a c t e r - i z e d in that the mould chamber (8) is connected with a vacuum source (16) at certain points of the "shadow
- 20 areas" (14) of the mould chamber.
3. A method according to claim 2, c h a r a c t e r - i z e d in that when stripping, a pressure source (17) is engaged instead of the vacuum source (16).

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                |                                                |                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Citation of document with indication, where appropriate, of relevant passages                                                                                                  | Relevant to claim                              | CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)          |
| D,A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE-B-1 941 736 (BÜHLER)<br>* Figures 1-3 *                                                                                                                                     | 1,2                                            | B 22 C 11/10<br>B 22 C 15/28                            |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ---<br>DE-A-2 609 274 (BÜHLER)<br>* Figure 3; page 6, lines 20-23;<br>page 7, lines 1-5 *                                                                                      | 1,2                                            |                                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ---<br>FR-A-1 049 962 (FISCHER)<br>* Page 2, left-hand column, lines<br>31-48; figures 1,2 *                                                                                   | 1                                              |                                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ---<br>US-A-1 475 935 (C.W. COLEMAN)<br>* Figures 1,2; page 1, lines<br>26-43 *                                                                                                | 3                                              |                                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ---<br>PATENTS ABSTRACTS OF JAPAN, vol.<br>5, no. 189 (M-99) [861], 28th<br>November 1981; & JP - A - 56 109<br>145 (TAIYOU CHIYUUKI K.K.)<br>29-08-1981<br>* Whole document * | 1,2                                            | TECHNICAL FIELDS<br>SEARCHED (Int. Cl. 4,<br><br>B 22 C |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                |                                                |                                                         |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                | Date of completion of the search<br>05-09-1985 | Examiner<br>MAILLIARD A.M.                              |
| <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                |                                                |                                                         |