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(11) **EP 1 145 812 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
08.03.2006 Bulletin 2006/10

(51) Int Cl.:
B28B 7/02 (2006.01) **B28B 3/06** (2006.01)
B30B 15/02 (2006.01)

(21) Application number: **00560001.0**

(22) Date of filing: **11.04.2000**

(54) **Autonomous hydraulic mould for the formation of ceramic elements**

Autonomome hydraulische Form für Herstellung von keramischen Elementen

Moule hydraulique autonome pour la production d'éléments céramiques

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

(30) Priority: **06.03.2000 ES 200000720 U**

(43) Date of publication of application:
17.10.2001 Bulletin 2001/42

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Description

[0001] This invention is a mould for the manufacture of ceramic articles (floor tiles, wall tiles, pavement, coverings, etc), which does not depend on the movement of accessories of the press for its own movement, either by forming an indivisible part of the press or by some mechanical or hydraulic element that is attached to it for the movement of the mould, as was the case with traditional moulds. In this case, the autonomous hydraulic mould uses the hydraulic energy of the press for its movements, eliminating all the elements that existed on the press for the movement of moulds but taking advantage of the control mechanisms that the press includes, (electrovalves, control systems, safety mechanisms, etc.).

BACKGROUND OF THE INVENTION

[0002] Many systems, mechanisms or means for the movement of moulds on ceramic presses are known see for example WO-A-93/22117. What differentiates them from the present system is that all of them are external to the mould, or in other words, they are mechanical or hydraulic elements that form part of the press or that are installed beneath the mould for the mould to move, when the press decides, during the formation process of the ceramic parts. Of these existing systems, there are different types on the market. Some in which the movement is transmitted to the mould by connecting rods that are situated underneath the bedplate of the press (the part where the mould rests in order to work with the press). These connecting rods are moved by a mechanical mechanism that includes some hydraulic pistons to move the connecting rods vertically. These rods then transmit the movement to the mould. These systems also include electrical or pneumatic elements for the correct regulation of the different positions to be able to co-ordinate the movements with the rest of the press.

[0003] In order to house all these elements, the presses that include these systems must have a well under the press made specifically on the ground together with the base of the press.

[0004] Other existing systems, of a more modern conception, are installed directly on the press bedplate and the mould is then installed on these. These systems also include connecting rods or a plate where the inferior part of the mould is fixed so that the movement is transmitted directly to the mould for all these elements move together.

DESCRIPTION OF THE INVENTION

[0005] The autonomous hydraulic mould changes the traditional functioning concept for moulds in the formation of ceramic elements, because it is no longer a passive part of the press, it is now an active part of the press.

[0006] The most relevant advantages of this new mould are the elimination, on the press where it is installed, of:

- ♦ The hydraulic ejector of the press with all its mechanical, hydraulic, electric elements, etc, usually situated under the press in the well. This implies a considerable saving in possible breakdowns that are not easily observed.

- ♦ The electric or mechanical regulation system of the thickness of the ceramic parts to be pressed and of the plungers used in the mould.

- ♦ The blocking system for the extra elevation of the mould in order to extract the inferior plungers from the mould.

- ♦ Elimination of all the costly and laborious regulation and maintenance operations, that were made worse, by the inconvenience of having to be carried out underneath the press in the well mentioned above, and sometimes by more than one operator.

[0007] Another advantage is that the moulds of the press can be changed more quickly, and the elimination of the regulations necessary after installing a new mould on the press, with the obvious saving in the time production is stopped.

[0008] One more advantage is that one autonomous hydraulic mould can be used on different types of press, only depending on its size. In other words, it can work correctly independently from the brand or model of the press on which it is installed.

[0009] The main elements of this type of autonomous hydraulic mould continue to be practically the same as a traditional mould:

- ♦ Matrix, Figure 1 & 2, (1). This is the part of the mould that limits the linear measurements (perimeter) of the tile to be manufactured, basically this element will not be modified in the use of these new moulds.

- ♦ Inferior plunger, Figure 1 & 2, (2). This is the element of the mould that forms the visible side of the tile, that may be smooth or in relief. This part will not be modified either.

- ♦ Matrix rods, Figure 1 & 2, (8). Depending on the models, they will continue to be fixed with possibilities of regulation or hydraulic with possibilities of regulation in order to change the working height of the matrix.

- ♦ Inferior electromagnetic plunger holders, Figure 1 & 2, (3). These are the elements that hold the inferior plungers by means of an electromagnetic system, and transmit the movement to them. It will not be necessary to transform them.

[0010] The elements that will be different to those of a traditional mould, are the parts of the mould that are defined as the base plate and the ejector plate. The base plate, Figure 1 & 2, (7), is the part of the mould that is screwed to the bedplate of the press. The ejector plate, Figure 1 & 2, (5), is where the plunger holders are fixed in order to transmit the movement to the inferior plungers

inside the matrix.

[0011] All the hydraulic, mechanical, electronic, pneumatic and electrical systems will be installed in the combination of base plate (7) and ejector plate (5). They will transmit the movement and the regulations to the autonomous hydraulic mould for its correct and co-ordinated movement together with the press.

[0012] The whole is protected from possible entry of strange bodies and dust by a leather skirting, Figure 1 & 2, (6), closing the entire perimeter of the base plate (7) and the ejector plate (5).

[0013] If necessary, this combination of base plate (7) and ejector plate (5), because of changes in production depending on the needs of the ceramist, may be attached to the bedplate of the press, in which case, it would only be necessary to change 50% of the mould and the cost of the investment and of maintenance for the client would be much lower.

[0014] For all the elements to work in co-ordination with the movement of the press, this type of mould must include an electronic panel with an automatic system which manages the orders received from the press and sends the necessary signals for the mould to work correctly.

[0015] The automatic system communicates with the operator through the screen of a digital monitor, where a number of images inform the operator of the operations the mould is undertaking and of those the operator should carry out. On this screen the operator may also correct or modify instructions, values, etc, or with a bar code scanner, introduce the working parameters directly to the automatic system.

[0016] This scanner reads the data from a label, supplied by the manufacturer of the mould or the person who repairs the mould, which makes the start up of this type of mould much easier and faster.

[0017] The software of the automatic system regulates the load of ceramic paste that the mould is going to press, regulates the height of the inferior plungers that the mould will be using, reads and manages the pressure of each one of the tiles that is being pressed at a given moment, controls the temperature of the plungers, moves the mould in order to extract the plungers, moves the mould in order to remove it from the press, controls the magnetic fixing system of the plungers, reads the bar codes with technical and regulation specifications with which the mould is delivered to the ceramist, accumulates production values, etc, etc.

[0018] Obviously, it also sends the emergency and blocking signals for the press, and obeys the signals that the press sends for its correct function.

[0019] In existing traditional systems mentioned above, many of these regulations and movements have to be carried out by complicated mechanical regulations directly on the mechanical elements that move the mould.

DISCRIPTION OF THE DRAWINGS

[0020] In order to understand the different parts of a

mould as usually defined, we enclose drawings where Figure 1 shows a perspective of the whole and Figure 2 the profile in order to be able to see the main parts of an autonomous hydraulic mould. These drawings are not binding. They are only an example because the external aspect may vary depending on the number of exits, size of those exits, etc.

DESCRIPTION OF MANUFACTURING PROCESS

[0021] As explained above, the mechanical, electrical, electronic, etc. elements that make the autonomous hydraulic mould work are installed inside the whole made up of (Figure 1 & 2) base plate (7) and the ejector plate (5). This whole is closed and isolated from the exterior by leather skirting (6). On the back of the base plate (7) we install the hydraulic pistons so that, through some holes drilled in the base plate we can supply the oil necessary for the pistons to move. These holes are connected to the outside of the mould and at the same time to the hydraulic circuit of the press by means of some pressure connectors situated on the hydraulic block (4). This base plate (7) is, in turn, directly fixed to the bedplate of the press.

[0022] The hydraulic pistons move the ejector plate (5) they are fixed to at the cylinders so that on its upstroke and downstroke movement it positions the ejector plate (5) and, obviously, the other elements fixed to it: plunger holders (3), plungers (2), etc. These different positions will adapt based on the different orders that the press sends to the automatic system of the mould and on the orders that the automatic system sends to the press. All this is managed through the sensors and encoders that are strategically situated inside the combination of base plate (7) and ejector plate (5). These sensors and encoders measure the different positions of the pistons and of the mechanical elements related to them so that the automatic system may indicate to the press, to the mould and to the operator the position and state of the mould for the necessary actions to be carried out.

[0023] Depending on the system the press originally had for auctioning of the traditional models, the autonomous hydraulic mould will either include a mechanical system to limit its stroke or a proportional control system that is included in the most modern presses. With these proportional-positioning systems the mould has no mechanical limitations as far as its stroke is concerned (upstroke or downstroke). The encoder, together with the electronic systems and the electrovalves of the proportional control system, receives and sends data on the position of the mould to the mould's automatic system and this system informs the electrovalves where they must stop the mould in its stroke in "proportion" to the signal received from the encoder. Therefore, the positions of the mould are practically unlimited. The materials, form, size, design and situation of the elements may be changed if they do not suppose an alteration in the essential conception of the invention, as defined by the ap-

pending claims.

Claims

1. An autonomous hydraulic mould for the formation of ceramic elements, to be fitted onto a bed plate of a press machine, comprising a bottom part (5, 7, 8) to be fitted to the press and in which any, electrical, electronic or mechanical elements are placed for the correct regulation and operation of the press where it is installed, comprising hydraulic means (4) for the mould to produce all its movements, the bottom part comprising the base plate (7), the ejector plate (5) and the matrix rods (8) fitted to the bed plate and the remaining elements of the mould can be dismantled without dismantling the complete mould from the press bed, **characterized in that** the mould comprises a plurality of cells, each of said cells including a number of isostatic sensors, said isostatic sensors being installed on the plungers (2), each of said sensors measuring the specific pressure of each of the cells and transmitting the corresponding information to the system for the corresponding regulation.
2. An autonomous hydraulic mould for the formation of ceramic elements, according to claim 1, **characterized in that** it includes a touch screen connected to an automatic system, said automatic system able to regulate the height of the inferior plungers (2) and thus, the height of the tile to be pressed and the height of the edge of said tile by a simple touch done on the touch screen.
3. An autonomous hydraulic mould for the formation of ceramic elements, according to claim 1, **characterized in that** it has means to operate with presses that have a traditional system for moving and regulating the mechanical parts of the mould as well as with more modern types that include proportional control regulation and movement systems.

Patentansprüche

1. Eine autonome Hydraulikform für die Herstellung von Keramikteilen, zur Montage auf der Grundplatte einer Presse, bestehend aus einem Unterteil (5,7,8), das auf der Presse angeordnet ist und in dem eine elektrische, elektronische oder mechanische Vorrichtung zur korrekten Regulierung und Bedienung der die Form tragenden Presse angebracht ist. Vorgesehen sind hydraulische Mittel (4) zur Durchführung aller Bewegungen der Form. Das Unterteil besteht aus der Grundplatte (7), der Ausstossplatte (5) und den Matrizenstangen (8), die an dem Maschinenbett befestigt sind. Der Rest der Elemente ist abbaubar, ohne dass die komplette Form vom Pres-

senbett abmontiert werden muss, **dadurch gekennzeichnet, dass** die Form aus einer Vielzahl von Zellen besteht, wobei jede der genannten Zellen mit einer bestimmten Anzahl von isostatischen Fühlern ausgestattet ist. Diese isostatischen Fühler sind auf den Kolben (2) angebracht. Jeder dieser Fühler misst den spezifischen Druck jeder der Zellen und übermittelt die entsprechende Information an das System zwecks entsprechender Regulierung.

2. Eine autonome Hydraulikform für die Herstellung von Keramikteilen nach Anspruch 1, **dadurch gekennzeichnet, dass** sie mit einem an ein automatisches System angeschlossenen Berührungsbildschirm ausgestattet ist. Dieses automatische System dient der Höheneinstellung der unteren Kolben (2) und damit der Höhe des herzustellenden Keramikteils und der Randhöhe eben dieses Keramikteils durch ein einfaches Berühren des Bildschirms.
3. Eine autonome Hydraulikform für die Herstellung von Keramikteilen nach Anspruch 1, **dadurch gekennzeichnet, dass** diese über entsprechende Mittel verfügt zum Funktionieren mit Pressen, die über ein herkömmliches System für die Bewegung und Regulierung der mechanischen Teile der Form verfügen sowie mit moderneren Typen, die mit Regulierungs- und Bewegungssystemen mit einer proportionalen Steuerung ausgestattet sind.

Revendications

1. Un moule hydraulique autonome pour la formation d'éléments céramiques devant être placé sur la base d'une machine à presse, dont la partie inférieure (5, 7, 8) est placée sur la presse et dans laquelle sont introduits tous éléments électriques, électroniques ou mécaniques visant à la régulation et au fonctionnement adéquats de la presse où le moule est installé, comprenant des moyens hydrauliques (4) permettant le mouvement du moule, et la partie inférieure incluant la plaque de base (7), la plaque d'éjection (5) et les tiges de la matrice (8) fixées au banc. Le reste des éléments peut être démonté sans besoin de démonter le moule complet du banc de la presse. Le moule est **caractérisé par** le fait de comprendre une pluralité de cellules, dont chacune inclue un certain nombre de senseurs isostatiques, étant lesdits senseurs isostatiques placés sur les pistons (2) et chacun des senseurs mesurant la pression spécifique de chaque cellule et transmettant l'information pertinente au système pour sa régulation.
2. Un moule hydraulique autonome pour la formation d'éléments céramiques, selon la revendication 1, **caractérisé par** le fait d'inclure un écran tactile relié à un système automatique susceptible de régler la

hauteur des pistons inférieurs (2) ainsi que la hauteur de la pièce céramique pressée et celle du bord de ladite pièce céramique par le simple contact sur l'écran tactile.

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3. Un moule hydraulique autonome pour la formation d'éléments céramiques, selon la revendication 1, **caractérisé par** le fait de fonctionner avec des presses à système traditionnel pour le mouvement et la régulation des pièces mécaniques du moule, ainsi que pour des types de presse plus modernes qui incluent un système de régulation et de mouvement à contrôle proportionnel.

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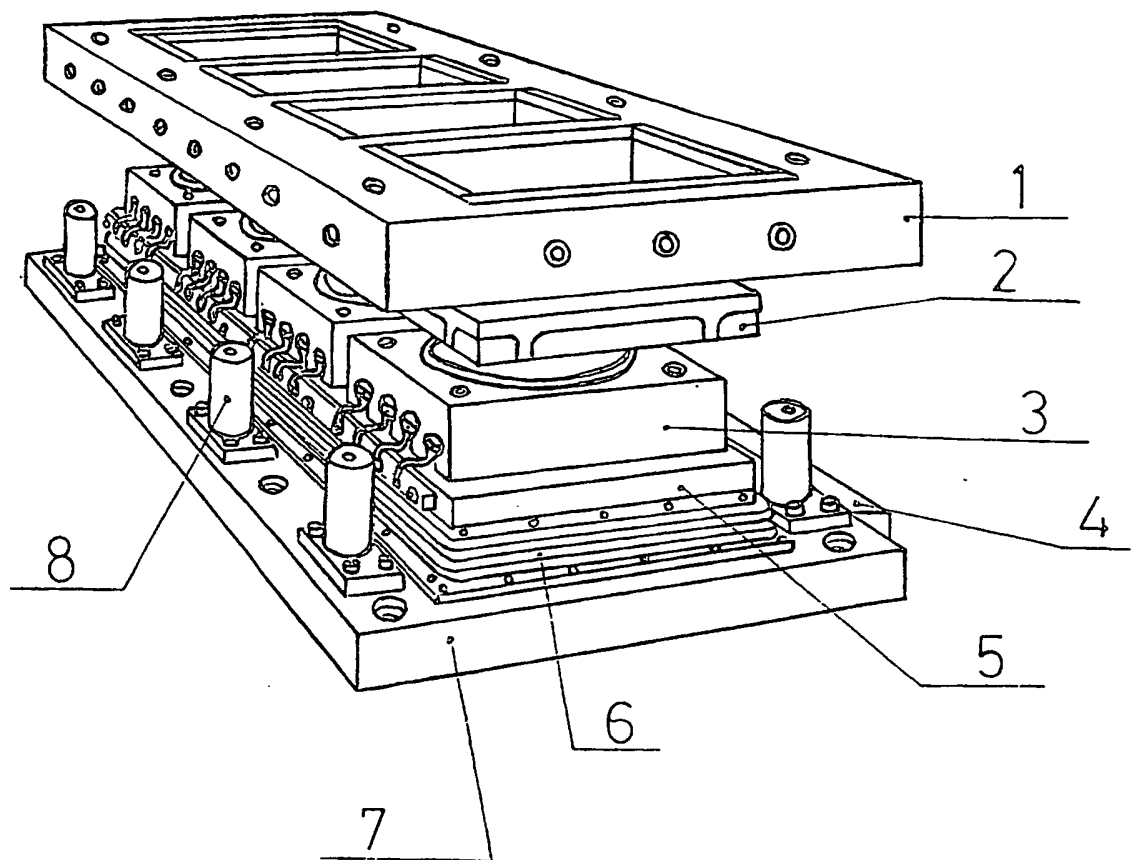


FIG. 1

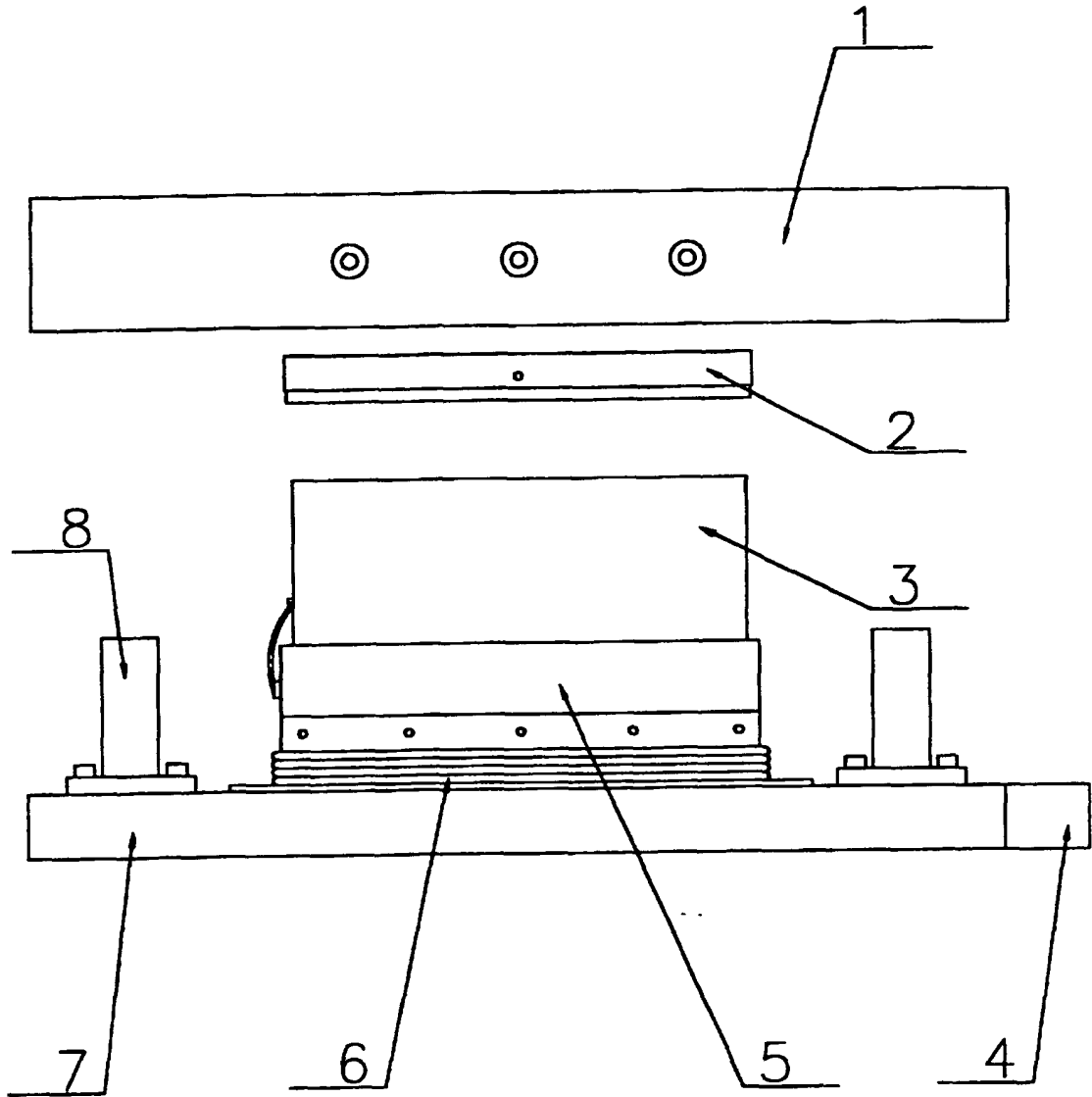


FIG. 2