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(54) **INJECTION MACHINE, ADAPTER AND INJECTION METHOD FOR AN INJECTION MOULD MACHINE**

(57) Injection procedure and injection machine (8) in which an injection mechanism (11) performs the injection of metallic material (13) into a mould (10), wherein they perform a preliminary injection phase with the mould (10) still open in order to reduce the total injection cycle time

and to achieve improved expulsion of the air from the interior of the pipe (14) through which the material (13) moves towards the mould (10). The procedure and the machine comprise a safety system to prevent the expulsion of material to the exterior during the aforementioned preliminary injection phase.

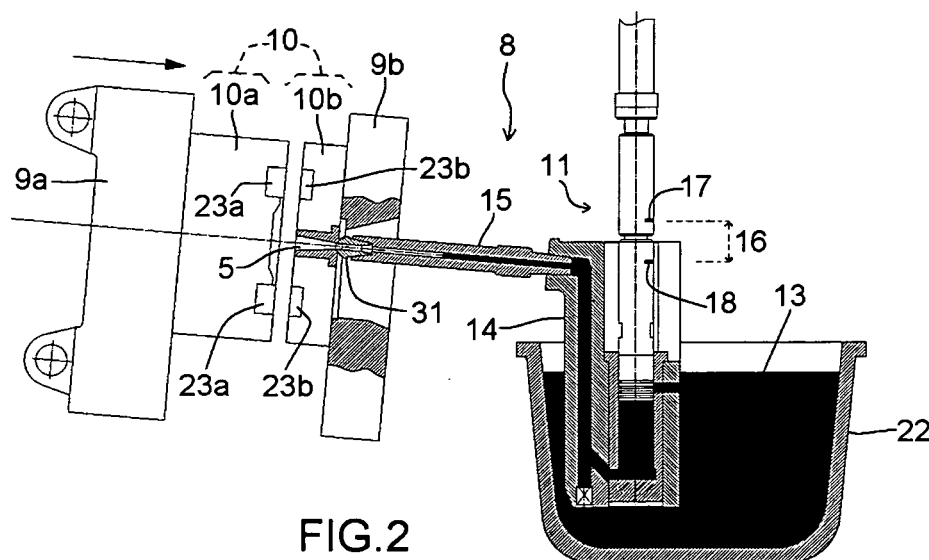


FIG. 2

Description**Technical field**

[0001] The invention refers to a procedure and a series of devices related to the manufacture of metallic parts through injection.

Prior art

[0002] Metal injection machines are based on an injection mechanism that injects melted metallic material into a mould. Among the most important components in a metal injection machine are the closure unit, whose function it is to open and close the mould at the correct pressure and at the correct times, the injection mechanism, whose function it is to introduce the melted metal in the mould at the correct times, and the extraction unit, whose function it is to extract the parts from the interior of the mould following the injection and once the metal has solidified. The metal injection machine also usually comprises a control unit that controls the functions of each section of the machine so that all the sections operate in a correct and co-ordinated manner.

[0003] The injection mechanism of a metal injection machine usually comprises an oven (or furnace) in which the metal is melted at a temperature suitable for it to be injected, a pipe that connects the oven to the mould, and a ram or piston that conveys the melted metal from the oven and towards the mould, along the pipe. Another type of injection machine is also known in which the oven is not directly connected to the mould, but in which the machine comprises a receptacle that conveys the melted material from the oven to a container with a ram then conveying the material from the container to the mould through the corresponding pipe.

[0004] In all cases the operation of the injection mechanism, closure unit and extraction mechanism for the manufacture of parts in an injection machine is normally based on the successive repetition of an injection cycle where said injection cycle usually comprises a series of fundamental steps:

- firstly the closure unit performs the pressurised closure of the mould;
- once the mould has been closed under pressure the injection mechanism begins a first injection phase in which the ram advances at a relatively slow velocity V_1 (V_1 can be constant or variable) so that the metallic material is conveyed to a specific point in the injection stroke defined by the user, which generally coincides with the intake of the feeder channels of the mould (small channels located in the mould that connect the cavities of the mould in which the parts are formed with the mould exterior); during this first injection phase the air that is inside the pipe is moved by the metallic material until it reaches the cavities

of the mould;

- at the end of the first phase, and starting from the velocity (V_1) of the first phase, the injection mechanism sharply increases the velocity of the ram and enters a second injection phase in which the ram advances at a high velocity V_2 (V_2 can be constant or variable) in order to fill the cavities of the part in a required time and compact the part in order to compress the material and ensure that the air bubbles trapped in the part are as small as possible, with this second injection phase having a duration that depends principally on the type of mould used;
- the injection mechanism then moves the ram back to its initial position;
- once the cooling period (the time required for the parts to cool) has elapsed at the end of the injection, the closure unit opens the mould;
- after the mould has opened, the extraction mechanism causes the parts to be removed from the interior of the cavities;
- finally, a sprayer mechanism sprays the cavities with a mould release liquid in order to reduce the temperature of the mould and to lubricate the cavities and thereby facilitate the extraction of the parts in the following cycle.

[0005] The present invention aims to provide a series of improvements in this injection cycle for the purposes of reducing the total cycle duration time and thereby increase the number of cycles per time unit that the injection machine is capable of performing, increasing as a result the productivity of the machine.

Brief description of the invention

[0006] It is an object of the invention to define an injection procedure and a corresponding injection machine in which material can be injected into the mould without necessarily having to wait for the closure unit and the mould to close. More specifically, the inventive procedure and injection machine comprise a preliminary injection phase that takes place at a safety velocity that is generally lower than the velocity (V_1) of the first injection phase (although it can also be equal to or greater than V_1) and with the mould open. Because the mould is open, for safety purposes and to prevent a certain amount of melted metallic material from spilling outwards through the nozzle, the inventive injection procedure and the injection machine complement said injection at a safety velocity by checking the position of the ram. Thus, if the ram exits the movement range related to the movement of material up to approximately the intake of the mould, the ram is immediately halted to prevent it from advancing too far

and causing the aforementioned spillage of material.

[0007] The inventive procedure and the machine also comprise the constant checking of the injection conditions (closure of the mould, etc.) so that when said conditions are met the procedure and the machine quit the preliminary injection phase and move automatically onto the first injection phase (velocity V1) followed by the second injection phase (velocity V2).

[0008] As a preliminary injection phase is conducted with the mould still open and there is no need to wait until the mould has closed to begin the injection, the inventive procedure and injection machine are able to reduce the duration of the injection cycle and therefore increase the number of cycles that can be performed per time unit. The reduction of the duration of the cycle is estimated at between 1 and 3 seconds depending on the constructive concept of the machine (the diameter of the pipe and ram) and of the stroke of the ram during the preliminary injection phase.

[0009] Furthermore, the procedure and the injection machine offer the additional advantage of facilitating the expulsion of air from inside the pipe during the injection and of reducing the amount of air that appears inside the manufactured parts, thereby reducing the appearance of pores in the parts and increasing the strength of the parts. It should therefore be borne in mind that in contrast to the known procedures in the prior art during one of the inventive injection phases (specifically during the preliminary phase) the ram is moved with the mould open and, as a result, the air displaced by the moving material can exit freely from the nozzle towards the exterior of the mould and the machine.

[0010] To increase safety during the injection the safety velocity preferably cannot be accessed by the user.

[0011] Another aspect of this invention is an adaptor device that enables the adaptation of a traditional injection machine, of the type known in the prior art, so that it can execute the inventive injection procedure with the preliminary injection phase at a safety velocity and with the mould open, complemented by control of the ram position. The adaptor device is particularly suitable for hydraulically driven injection machines, extremely common in the prior art, although it can also be used with electrically driven injection machines. Said adaptor device comprises the input means for ascertaining the existence or otherwise of injection conditions or conditions that determine whether the ram has to be moved at the velocity V1 corresponding to the first injection phase. Said device also comprises input means to ascertain if the ram is positioned in the safety zone (between which can be included at least one sensor that can be connected to the injection machine to detect whether the ram is located in the safety zone), and input means to ascertain the existence or otherwise of a specific condition prior to the closure of the mould, which, in the event of being affirmative, begins the inventive procedure. In addition, the device comprises outlet means to communicate to the injection machine the necessary information to influ-

ence the velocity of the ram of the injection mechanism in the injection machine. Preferably the adaptor device can be activated or deactivated (even by an external order from the injection machine) so that in the event of being deactivated the outlet means do not influence the velocity of the ram of the injection mechanism in the injection machine.

Brief description of the figures

[0012] Details of the invention can be seen in the accompanying non-limiting drawings:

- Figures 1, 2 and 3 show the injection mechanism at different points of the inventive injection procedure.
- Figure 4 shows a diagram of states of an injection procedure known in the prior art.
- Figure 5 shows a generic embodiment of the inventive injection procedure.
- Figure 6 shows various injection cycles of the conventional injection procedure in Figure 4.
- Figure 7 shows various injection cycles of a particular case of the injection procedure in Figure ;**Error! No se encuentra el origen de la referencia..**
- Figure 8 shows various injection cycles of another particular case of the injection procedure in Figure ;**Error! No se encuentra el origen de la referencia..**

Detailed description of the invention

[0013] Figures 1, 2 and 3 show the parts of an injection machine (8) most important to the present invention such as the injection mechanism (11) and the closure unit (9). The closure unit (9) comprises two plates (9a, 9b) or relatively flat parts to which are connected two sections (10a, 10b) of a mould (10) comprising subcavities (23a, 23b). When the closure unit (9) closes, i.e. when the mobile plate (9a) closes on the fixed plate (9b), the sections (10a, 10b) of the mould (10) are closed causing the cavities (23) to form, thereby forming the parts when the subcavities join together (23a, 23b). The injection mechanism (11) comprises a ram (12) that moves vertically in order to push the material (13) melted in an oven (22) through a pipe (14) that comprises an outlet nozzle (15) towards the mould (10). The drawing also represents the safety zone (16) of the ram (12), which is defined as the range of positions delimited between a minimum position (18) corresponding to the position of least advance of the ram (12) and a maximum position (17) corresponding to the advance position of the ram (12) which positions the material (13) approximately at the intake of the mould (10).

[0014] Figure 1 specifically shows an initial situation in which the mould (10) is open, the ram (12) is in its minimum position (18) or higher, the material (13) is inside the pipe (14) and level with the oven (22), and most of the pipe (14) is full of air. According to the inventive in-

jection procedure it is from this initial situation that the preliminary injection phase commences in which the ram (12) is moved at a safety velocity (V_s) even with the mould (10) open. Figure 2 shows the injection mechanism (11) during the preliminary injection phase, which takes place while the closure unit (9) and the mould (10) are closing. In this situation if the material (13) reaches approximately the outlet (31) of the nozzle (15) towards the mould (10) or, what is the same, the ram (12) reaches the maximum position (17) of the safety zone (16) or exceeds said position slightly (both conditions are contemplated by the invention), the ram (12) stops in order to prevent material (13) from spilling out to the exterior of the nozzle (15). Meanwhile, the closure unit (9) and the mould (10) continue to close.

[0015] When the injection machine (8) detects that specific injection conditions arise, which can preferably be summarised in that the mould (10) is closed under pressure, the injection machine (8) moves to the first injection phase at velocity (V_1), in which the material (13) is conveyed substantially to the intake (5) of the mould (10), and to the second injection phase at high velocity (V_2), in which the cavities (23) of the mould (10) are filled with material (13). The final situation of the injection machine (8) after the second injection phase can be seen in Figure 3.

[0016] Figure 4 shows a diagram of states of an injection procedure known in the prior art. Starting from an initial state (26) the procedure commences when specific injection conditions (4) are detected and which generally indicate that the pressurised closure of the mould has been completed and that the conditions required for the injection of material to commence have been met. Once the presence of said injection conditions have been detected (4), a first injection phase (19) begins in which the ram moves at a relatively slow velocity (V_1) in order to inject material substantially up to the mould (normally up to the intake of the feeder channels of the mould). The procedure then continues with a second injection phase (20) in which the ram is moved at high velocity (V_2) in order to inject material substantially in the mould (specifically in the cavities of the mould in which the parts are formed). At the end of the second injection phase (20) the injection mechanism returns to the initial state (26) with other mechanisms operating, such as the closure unit to open the mould and the extraction unit to extract the parts. The procedure, as can be seen in the figure, is cyclical.

[0017] Figure 5 shows a diagram of states of a generic mode of embodiment of the inventive injection procedure. As can be seen in the figure, unlike the state of the prior art the invention proposes a series of actions between the initial state (26) of the procedure and the first injection phase (19) at a relatively slow velocity (V_1). Specifically, in the initial state (26) the state of a specific condition is analysed (3) and, in the event that the compliance of said specific condition (3) is detected, a time (2) greater or equal to zero, preferably configurable, is allowed to

elapse. At the end of this time (2) a decision is taken (24) depending on whether the ram (12) is in the safety zone (16) or not: if the ram (12) is in the safety zone (16), a condition represented in the figure as an existence of safety ($S=1$), the injection mechanism (11) enters a preliminary injection phase (21) in which the ram (12) begins to move at a safety velocity (V_s) in order to convey the material (13) towards the nozzle (15) at said safety velocity (V_s) and expel air from the interior of the pipe (14); in contrast if the ram (12) is not in the safety zone (16), a condition represented in the figure as a non-existence of safety ($S=0$), the ram remains stationary, with the situation of the stationary ram (12) as a state (25) being represented in the figure. Furthermore, in the first of the cases if, when the ram (12) is moving at the safety velocity, (V_s) the piston (12) is not in or exits the safety zone (16), the ram (12) also moves to the state (25), i.e. it stops.

[0018] In any state (2, 21, 25), when the specific injection conditions (4) are met the ram (12) moves at the velocity (V_1) corresponding to the first injection phase (19). The specific injection conditions (4) indicate that the pressurised closure of the mould has been completed and that conditions required for the injection of material to commence have been met, and shall preferably be defined as the simultaneous compliance of at least two of the following conditions: that the closure unit (9) is closed under pressure, i.e. that the mobile plate (9a) is in its most advanced position and is exerting pressure towards the fixed plate (9b), that the mould (10) is positioned against the nozzle (15) or end of the pipe, and that cylinders or members whose function it is to push the nozzle (15) or end of the pipe against the mould (10) are in fact exerting pressure to push the nozzle (15) against the mould (10).

[0019] The specific condition (3) that begins the procedure (1) precedes the closure of the mould (10) in all cases. In particular the invention contemplates two preferred modes of embodiment: a first mode in which the specific condition (3) is that the closure unit (9) and the mould (10) begin to close; a second mode in which the specific condition (3) is that the closure unit (9) and subsequently the mould (10) have opened (whether the extraction of the parts or another action parallel to the injection have been completed or not).

[0020] Figures 6, 7 and 8 show three sets of velocity-time graphs of the closure (6), injection (1) and extraction (7) procedures based on the repetition of cycles, with Figure 6 corresponding to the conventional procedure, Figure 7 to the aforementioned first inventive mode of embodiment of the procedure, and Figure 8 to the aforementioned second inventive mode of embodiment of the procedure.

[0021] Figure 6 shows the different phases of the conventional closure/injection/extraction cycle: a closure phase (27) or phase in which the mobile plate (9a) advances on the fixed plate (9b) of the closure unit (9), which ends when the closure unit (9) is closed under pressure; the first injection phase (19), which ends when

the ram (12) reaches the start level of the second injection phase; the second injection phase (20), the duration of which is the specific injection time; a cooling phase (28) during which the piston (12) moves back; an opening phase (29) during which the mould opens; an extraction phase (30) during which the parts are extracted from the interior of the mould (10).

[0022] Figure 7 shows that, according to the first inventive mode of embodiment, a preliminary injection phase (21) is added at the safety velocity (Vs). Said preliminary injection phase (21) is performed before the mould is closed, i.e. during the closure phase (27), specifically a time (2) after said closure phase (27) begins. Given that in this preliminary injection phase (21) the material advances partially (the case in the present figure) or completely along the pipe, the duration of the first injection phase (19) in order to convey the material to the intake of the feeder channels is reduced (the case in the present figure) in relation to the previous figure or is even cancelled. In this way the present figure shows how a greater number of injection cycles per time unit can be performed, increasing the productivity of the machine.

[0023] Figure 8 shows the second inventive mode of embodiment in which the preliminary injection phase (21) at the safety velocity (Vs) begins before the closure phase (27), i.e. just after the mould (10) opens. Specifically, in the case of the present figure, the specific condition (3) that starts the time counter (2) after which the preliminary injection phase (21) begins is that the mould is open, i.e. that the opening phase (29) has ended. In this case, in comparison with Figures 6 and 7, the duration of the first injection phase (19) is reduced more significantly, thereby creating a shorter cycle time and an improved performance of the injection machine.

[0024] The invention contemplates the embodiment of the injection procedure with all types of values of the safety velocity (Vs), the velocity (V1) of the first injection phase (19), the velocity (V2) of the second injection phase (20). In this respect, as has been mentioned, the safety velocity (Vs) can be smaller than, equal to or greater than V1. In addition, as has already been mentioned, although the preferred case is that the velocity V1 is smaller than V2, alternatives are contemplated in which the first injection phase (19) and the second injection phase (20) are conducted at the same velocity, etc. with the configuration of velocities and times of injection phases different to the preliminary injection phase (21) not being, in any case, relevant to the present invention.

Claims

1. Injection procedure (1) for injecting metallic material (13) into a mould (10) in an injection machine (8), where said injection machine (8) comprises a closure unit (9) that can open and close the mould (10), an injection mechanism (11) that comprises a ram (12) that pushes the material through a pipe (14) towards

the mould (10), where in said ram (12) a safety zone (16) is defined as the range of positions of the ram (12) which is delimited between a minimum position (18) corresponding to the position of least advance of the ram (12) and a maximum position (17) corresponding to the position in which the ram (12) positions the material (13) substantially at the end of the pipe (14), where in said injection procedure (1), when specific injection conditions (4) are met, one or various injection phases (19, 20) are executed in which the ram (12) moves material (13) to the interior of the mould (10), which is **characterised in that** it comprises the following phases:

- before the specific injection conditions are met (4) and after a time (2) greater than or equal to zero following a specific condition (3) prior to the closure of the mould (10), if the ram (12) is in the safety zone (16), the injection mechanism (11) enters a preliminary injection phase (21) in which the ram (12) moves at a safety velocity (Vs) in order to convey the material (13) towards the mould (10) and expel air from the interior of the pipe (14),
- whereas if, before the specific injection conditions (4) are met and after a time (2) greater than or equal to zero following a specific condition (3), the ram (12) is not in the safety zone (16) or if when the ram (12) is moving at the safety velocity (Vs) the ram (12) is not in or has exited the safety zone (16), the ram (12) moves to a state (25) in which it does not move at the safety velocity (Vs),
- at any moment (2, 21, 25), when the specific injection conditions (4) are met, the injection procedure (1) switches to the injection phases (19, 20).

2. Injection procedure (1), in accordance with claim 1, **characterised in that** when the ram (12) is in the state (25) in which it does not move at the safety velocity (Vs), the ram (12) is stationary.
3. Injection procedure (1), in accordance with claim 1, **characterised in that** the specific injection conditions (4) comprise the simultaneous activation of at least two of the following conditions: that the closure unit (9) is closed under pressure, that the mould (10) is positioned against the end of the pipe (14) closest to the mould (10), and that the members whose function it is to push said end of the pipe (14) against the mould (10) are in fact exerting pressure to push said end of the pipe (14) against the mould (10).
4. Injection procedure (1), in accordance with claim 1, **characterised in that** the time (2) is adjustable.
5. Injection procedure (1), in accordance with claim 1,

characterised in that the specific condition (3) after which the time begins to be counted (2) is substantially that the closure unit (9) begins to close.

6. Injection procedure (1), in accordance with claim 1, **characterised in that** the specific condition (3) following which the time begins to be counted (2) is substantially that the closure unit (9) has opened. 5
7. Injection machine (8) for injecting metallic material (13) into a mould (10), where said injection machine (8) comprises a closure unit (9) that can open and close the mould (10), an injection mechanism (11) that comprises a ram (12) that pushes the material (13) through a pipe (14) towards the mould (10), where in said ram (12) a safety zone (16) is defined as the range of positions of the ram (12), which is delimited between a minimum position (18) corresponding to the position of least advance of the ram (12) and a maximum position (17) corresponding to the position in which the ram (12) positions the material (13) substantially at the end of the pipe (14), where in said injection machine (8), when specific injection conditions (4) are met one or various injection phases (19, 20) are executed in which the ram (12) moves material (13) to the interior of the mould (10), which is **characterised in that**: 10
- before the specific injection conditions (4) are met and after a time (2) greater than or equal to zero following a specific condition (3) prior to the closure of the mould (10), if the ram (12) is in the safety zone (16), the injection mechanism (11) enters a preliminary injection phase (21) in which the ram (12) moves at a safety velocity (Vs) in order to convey the material (13) towards the mould (1) and expel air from the interior of the pipe (14), 30
- whereas if, before the specific injection conditions (4) are met and after a time (2) greater than or equal to zero following a specific condition (3), the ram (12) is not in the safety zone (16) or if when the ram (12) is moving at the safety velocity (Vs) the ram (12) is not in or has exited the safety zone (16), the ram (12) moves to a state (25) in which it does not move at the safety velocity (Vs), 40
- at any moment (2, 21, 25), when the specific injection conditions (4) are met, the injection procedure (1) switches to the injection phases (19, 20). 45
8. Injection machine (8), in accordance with claim 7, **characterised in that** when the ram (12) is in the state (25) in which it does not move at the safety velocity (Vs), the ram (12) is stationary. 50
9. Injection procedure (8), in accordance with claim 7,

characterised in that the specific injection conditions (4) comprise the simultaneous activation of at least two of the following conditions: that the closure unit (9) is closed under pressure, that the mould (10) is positioned against the end of the pipe (14) closest to the mould (10), and that the members whose function it is to push said end of the pipe (14) against the mould (10) are in fact exerting pressure to push said end of the pipe (14) against the mould (10).

10. Injection procedure (8), in accordance with claim 7, **characterised in that** the time (2) is adjustable.
11. Injection procedure (8), in accordance with claim 7, **characterised in that** the specific condition (3) following which the time begins to be counted (2) is substantially that the closure unit (9) begins to close.
12. Injection procedure (8), in accordance with claim 7, **characterised in that** the specific condition (3) following which the time begins to be counted (2) is substantially that the closure unit (9) has opened.
13. Injection machine (8), in accordance with any of the claims 7 to 12, **characterised in that** the injection mechanism (11) is hydraulically operated.
14. Injection machine (8), in accordance with any of the claims 7 to 12, **characterised in that** the injection mechanism (11) is electrically operated.
15. Adaptor device to be connected to an injection machine (8) for injecting metallic material (13) into a mould (10), where said injection machine (8) comprises a closure unit (9) that can open and close the mould (10), an injection mechanism (11) that comprises a ram (12) that pushes the material (13) through a pipe (14) towards the mould (10), where in said ram (12) a safety zone (16) is defined as the range of positions of the ram (12), which is delimited between a minimum position (18) corresponding to the position of least advance of the ram (12) and a maximum position (17) corresponding to the position in which the ram (12) positions the material (13) substantially at the end of the pipe (14), where in said injection mechanism (11), when specific injection conditions (4) are met, one or various injection phases (19, 20) are executed in which the ram (12) moves material (13) to the interior of the mould (10), which is **characterised in that** it comprises:
- input means to ascertain the existence or otherwise of the specific injection conditions (4), which, in the event of being affirmative, determine that the ram (12) has to be moved according to the injection phases (19, 20),
- input means to ascertain whether the ram (12) is in the safety zone (16),

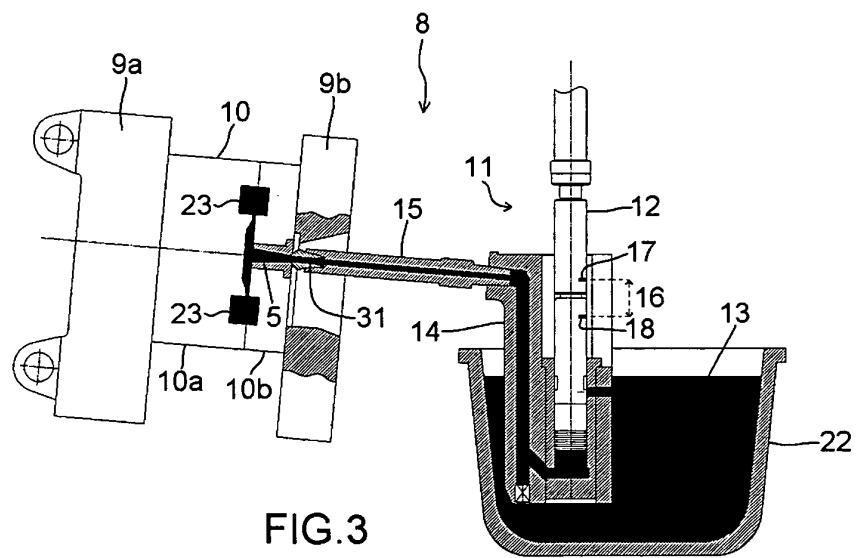
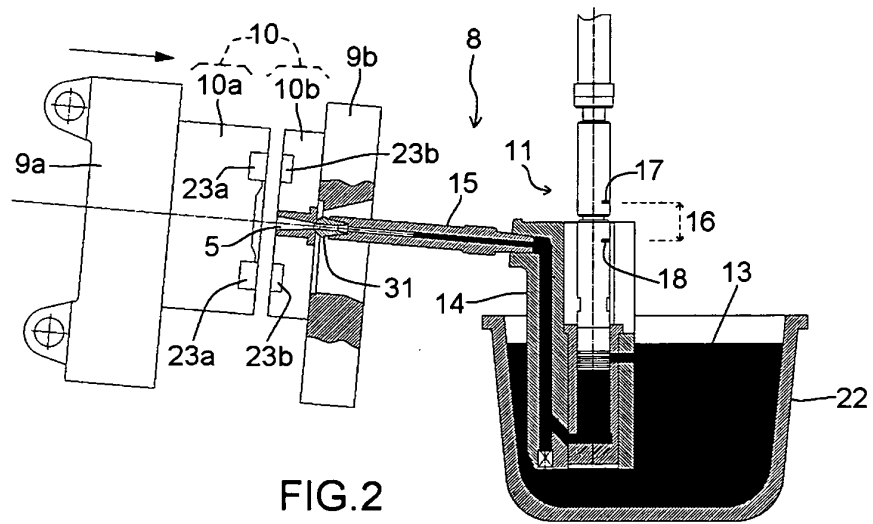
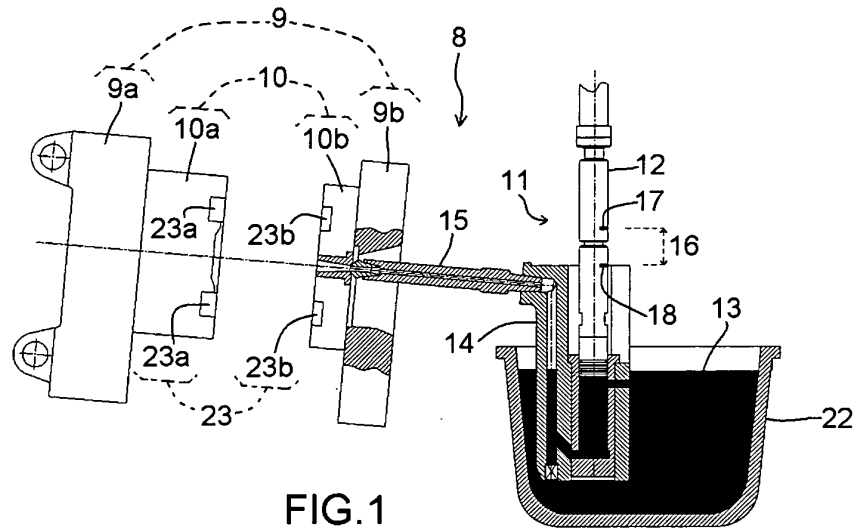
- input means to ascertain the existence or otherwise of a specific condition (3) prior to the closure of the mould (10), which, in the event of being affirmative, starts a time counter (2) greater than or equal to zero after which if the ram (12) is in the safety zone, a preliminary injection phase (21) must begin in which the ram (12) must be moved at a safety velocity (Vs) in order to convey the material (13) towards the mould (10) and expel air from the interior of the pipe (14), whereas if after the time (2) has elapsed the ram (12) is not in the safety zone (16) or if when the ram (12) is moving at the safety velocity (Vs) the ram (12) is not in or has exited the safety zone (16), the ram (12) must switch to a state (25) in which it does not move at the safety velocity (Vs),
- outlet means to communicate to the injection machine (8) the necessary information to influence the velocity of the ram (12) of the injection mechanism (11) in the injection machine (8).

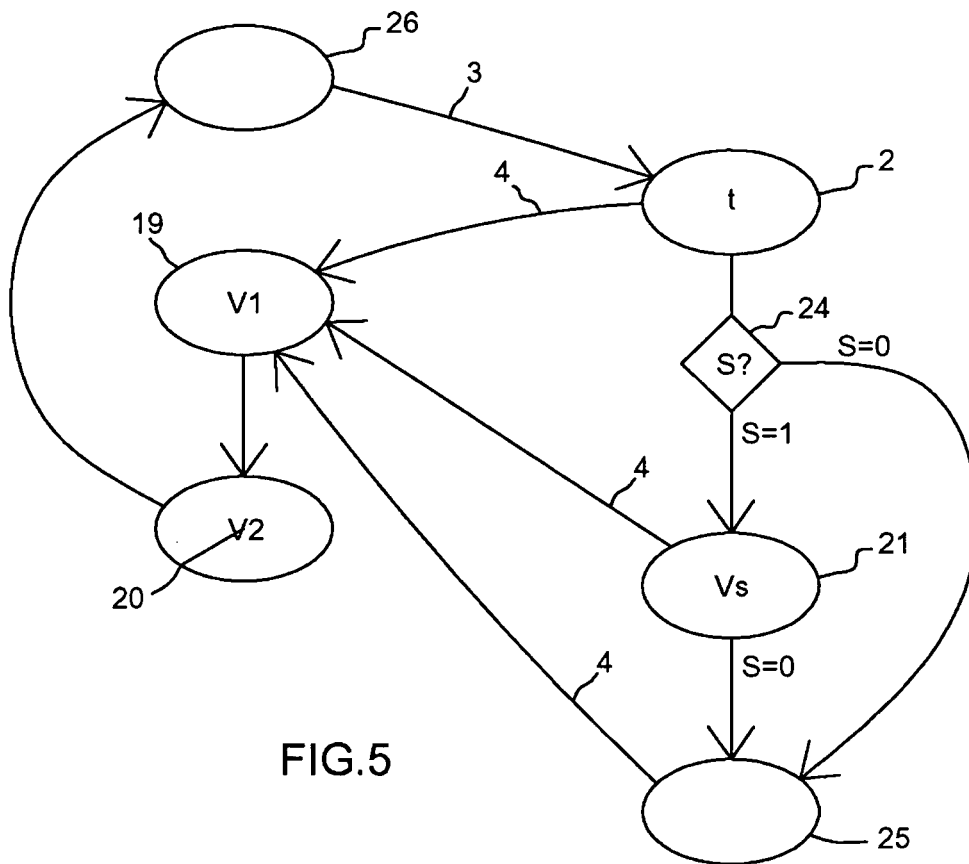
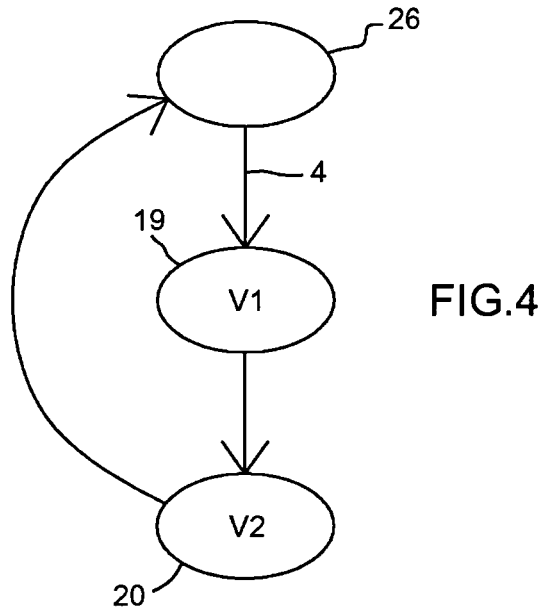
16. Adaptor device according to claim 15, **characterised in that** the time (2) is adjustable.

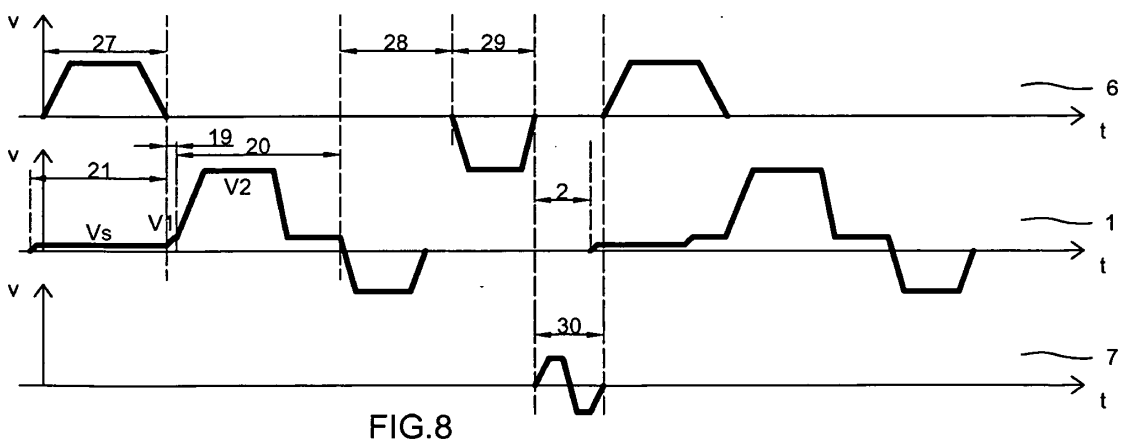
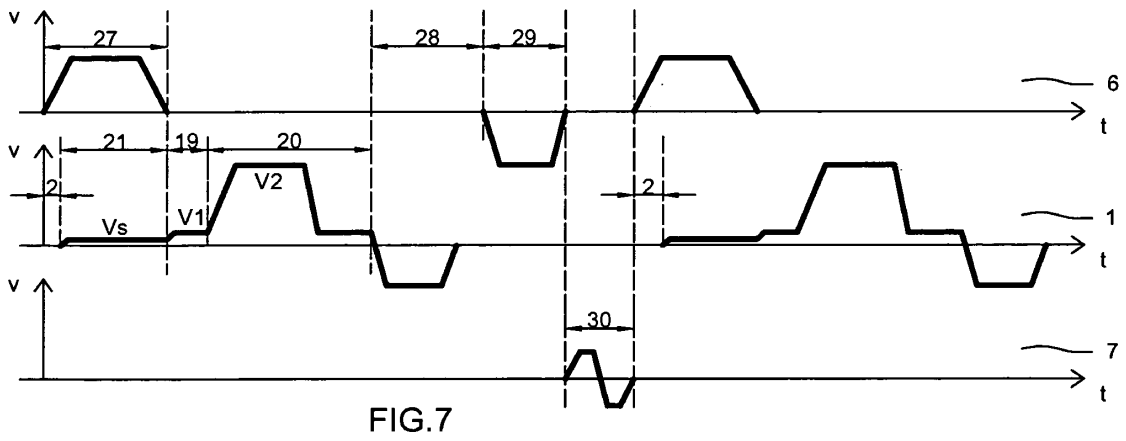
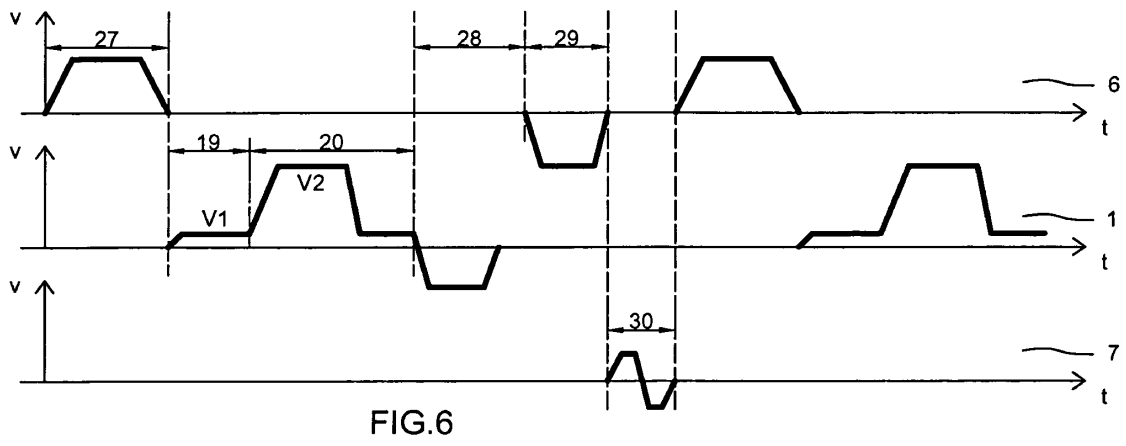
17. Adaptor device according to claim 15, **characterised in that** the input means for ascertaining whether the ram (12) is in the safety zone (16) comprise at least a sensor that can be connected to the injection machine (8) to detect whether the ram (12) is in the safety zone (16).

18. Adaptor device according to claim 15, **characterised in that** its operation can be activated or deactivated, with the outlet means being such that they do not influence the velocity of the ram (12) of the injection mechanism (11) in the injection machine (8) in the event of the adaptor device being disabled.

19. Adaptor device according to claim 18, **characterised in that** it comprises the input means necessary to receive an external activation or deactivation order for its operation.







INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2005/000503

A. CLASSIFICATION OF SUBJECT MATTER INV. B22D17/00 B22D17/20 B22D17/32		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) B22D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, PAJ, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/029596 A1 (FINK RONALD) 13 February 2003 (2003-02-13)	1-3, 6-9, 12, 15, 16, 18, 19
X	paragraphs [0007], [0018] - [0023]; claims 1-14; figures 1-3 -----	4, 5, 10, 11, 13, 14, 17
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Date of the actual completion of the international search 16 June 2006		Date of mailing of the international search report 26/06/2006
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Scheid, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/ES2005/000503

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