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(54) **Ceramic double-loading carriage**

(57) A loading carriage for ceramic moulds which present at least one forming cavity (4) defined by a lower die (5) comprises a reciprocating powder guide screen (9) arranged to slide between a withdrawn position in which it lies above an underlying horizontal slide table (1) coplanar with the mouth of said cavity, and an advanced position in which it lies above said cavity, and presenting a rectangular aperture (10) the minor and major sides of which are positioned respectively transversely and parallel to the direction of travel of said screen and are respectively substantially equal to and greater than the corresponding dimensions of said cavity,

on said screen there being positioned a rear dispenser (14) and a front dispenser (15) which are intended to contain respectively at least one first material (140) and at least one second material (150) generally in the form of powders and having generally different characteristics, said dispensers being arranged to move relative to said aperture, when this is stationary above said cavity, in such a manner that said rear dispenser deposits into said cavity a layer of said at least one first material, and said rear dispenser deposits onto said layer of at least one first material a layer of said at least one second material, which remains retained by the walls of said aperture (10) until the final lowering of said lower die (5).

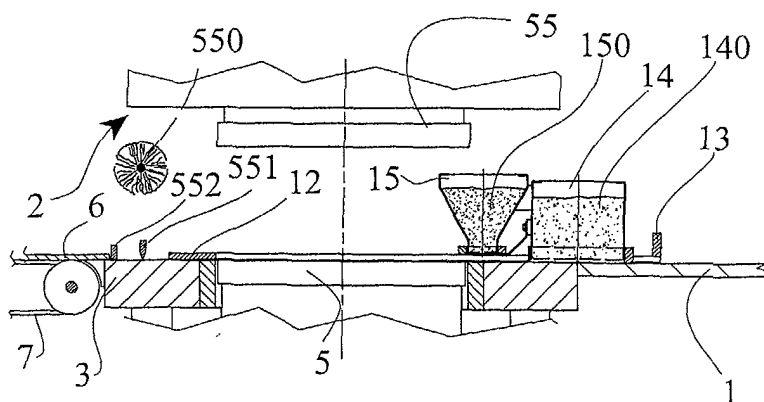


FIG. 5

Description

[0001] This invention relates to a double-loading carriage typically used for tile manufacture.

[0002] As is well known, the so-called pressure-glazing method has been in use for some time in the ceramic tile production field.

[0003] According to said method, a layer of at least one base material generally in powder form, for example atomized clay, is deposited into the at least one forming cavity of a usual ceramic mould to form the body of the tile; a layer of at least one finishing material generally in powder form, for example ceramic glaze, is deposited onto said base material to form the tile decoration; after which the two layers are compacted to obtain an already decorated tile which is then fed to firing.

[0004] To load said superposed layers of generally powder material, such as said atomized clay and ceramic glaze, loading units are known comprising two carriages, driven with reciprocating horizontal rectilinear movement, which are disposed on one and the other side of the mould forming cavity.

[0005] When the clay carriage advances, the glaze carriage remains at rest in its maximum withdrawal position.

[0006] The clay carriage then withdraws to smooth the layer deposited in the forming cavity, then the lower die of said cavity is lowered through a predetermined amount, after which the glaze carriage advances to deposit a layer of glaze into the highest part of the cavity which has been freed following the lowering of the lower die.

[0007] After this the glaze carriage returns to its starting position, the lower die is lowered to attain its pressing position, pressing is effected, and another loading cycle commences after extracting the tile by raising the lower die, which firstly reaches the level of the forming cavity mouth and is then lowered into the position for receiving the layer of clay.

[0008] The widespread use of such loading units provided with two carriages has proved unsatisfactory at least for the following reasons:

[0009] Firstly, they involve relatively very lengthy operating times, which is in total contrast to modern production cycles which are well known to be characterised by high productivity

[0010] In addition, the provision of two carriages considerably increases the complexity, the cost and the overall dimensions of such loading units.

[0011] In this respect, separate independent drive units have to be provided for said carriages, which have to move according to a predetermined precise sequence.

[0012] Consequently in this sector there is a strongly felt requirement for loading means able to operate at a production rate in line with that of said modern plants, but which incorporate a simplified operating and control system. The main object of this invention is to satisfy

said requirement within the context of a simple, rational, reliable and low-cost construction of small space requirement.

[0013] Said object is attained by a double-loading carriage presenting the characteristics indicated in the claims.

[0014] The constructional and operational characteristics and merits of the invention will be more apparent from the ensuing reference to the accompanying drawings which show a particular preferred embodiment thereof by way of non-limiting example.

[0015] Figure 1 is a sectional side view of the invention associated with a ceramic mould.

[0016] Figure 2 is a partial view on an enlarged scale in the direction II indicated in Figure 1.

[0017] Figure 3 is a section on the line III-III of Figure 2.

[0018] Figure 4 is a section on the line IV-IV of Figure 2.

[0019] Figures from 5 to 9 are views similar to that of Figure 1 but on a smaller scale, showing different significant operative positions of the carriage during the deposition of the base material.

[0020] Figure 10 is a view on an enlarged scale in the direction X of Figure 9.

[0021] Figures from 11 to 14 are views similar to those of Figures from 5 to 9, and relate to the final stages of a complete loading cycle.

[0022] The said figures, and in particular Figures 1, 5-9 and 11-14, show a ceramic press 2, represented schematically because of usual type, on the bed of which there is positioned the die plate 3 of a likewise usual ceramic mould.

[0023] The die plate 3 presents (at least) one forming cavity 4 the base of which is defined by a reverse face die 5 provided for moulding the laying face of the pressure-glazed tile 6 (Figure 1).

[0024] With said reverse face die 5, which is vertically slidable in the manner to be described, there cooperates an overlying obverse face die 55 provided for moulding the exposed face of the tile 6 and carried by the vertically movable crosspiece of the press 2.

[0025] In the illustrated example the mould 6 is of the entering punch type, i.e. the die plate 3 is stationary in level, the obverse face die 55 being inserted into the cavity 4 during pressing.

[0026] It should be noted that the carriage of the invention can also be used for other mould types, for example those of movable die plate type in which the die plate 3 is supported by the bed of the press 2 by way of elastically yieldable devices, and in which during the pressing operation the obverse face die 55 rests against the die plate 3 to lower it.

[0027] It should also be noted that said dies 5 and 55 can be reversed compared with the illustrated arrangement, i.e. with the reverse face die 5 associated with the movable crosspiece of the press 2 and the obverse face die 55 inserted into the cavity 4.

[0028] To the left of the die plate 3 there can be seen (see Figure 1) a conveyor 7 for removing the tiles 6, and to the right a horizontal operating table 1 which is coplanar with the mouth of the cavity 4.

[0029] A carriage according to the invention, indicated overall by the reference numeral 8, is arranged to slide forwards and rearwards on said table 1.

[0030] In front of said carriage 8 (see Figures 1 and 5) there are provided a pusher 552 to discharge the tile 6, a scraper 551 to clean the upper face of the die plate 3, and a rotary brush 550 to clean the active face of the die 55.

[0031] Said pusher 552, scraper 551 and brush 550 are carried by the structure of the carriage 8, and are shown schematically as they are of usual type. They are shown only in Figures 1 and 5 for simplicity.

[0032] The said carriage 8 comprises a flat powder guide screen 8 which rests on said table 1 and presents an aperture 10 of rectangular shape, the longitudinal axis of which is parallel to the direction of travel of the carriage 8.

[0033] With reference to said direction of travel, the transverse dimension of said aperture 10 is virtually equal to the corresponding dimension of the cavity 4 (Figure 10), whereas the longitudinal dimension of said aperture 10 is much greater than the corresponding dimension of the cavity 4 (Figure 1). In the case of die plates 3 with several exits a corresponding number of apertures 10 would be provided.

[0034] Said aperture 10 is defined by two flat opposing coplanar longitudinal strips 11 and a front transverse plate 12 coplanar to them.

[0035] The flat strips 11 are connected together by an overlying rear crosspiece 13 to be connected to a drive unit, not shown because of known type, for example comprising a connecting rod-crank linkage.

[0036] The said flat strips 11 act as runways for two dispensers 14, 16, the first 14 of which is situated on the same side as the crosspiece 13, whereas the second is positioned towards the press 2.

[0037] Said dispensers 14 and 15 contain respective masses of material generally in powder 140, 150 which are fed into the dispensers 14, 15 by known supply sources, not shown for simplicity, positioned above the rear end of the table 1, at the point in which (see Figure 1) the two dispensers lie at the start of a loading cycle.

[0038] The material 140, which can consist of one or more ceramic materials generally in powder form and not of high value, usually atomized clay, is to form the body of the tile 6, whereas the material 150, which can consist of one or more ceramic materials generally in powder form and relatively valuable, such as (at least) one ceramic glaze in powder form, is to form the exposed face of the tile, i.e. its decoration.

[0039] The dispenser 14 is in the form of a lowerly open bin of rectangular plan (Figures 1-3) with its discharge mouth inserted into the aperture 10. Said rectangular profile has a dimension which is virtually equal

to the width of the aperture 10, and hence also to the corresponding dimension of the forming cavity 4, the other dimension, perpendicular thereto, being much less than the length of the aperture 10.

[0040] The illustrated dispenser 14 has a much greater capacity than the forming cavity 4 in the loading configuration of Figures 7-13, but this is not compulsory.

[0041] In this respect, as a variant the discharge mouth of the dispenser 14 can have dimensions substantially equal to those of the forming cavity 4, the dispenser 14 can have a capacity virtually equal to that of the cavity 4 when in said loading configuration, and base material retention baffles 140, such as bars disposed transversely to the travel direction of the carriage 8, can be provided in the interior of said dispenser 14.

[0042] To said discharge mouth there is fixed an outer enclosing flange 141 having two opposing sides resting on the flat strips 11 and the other two sides extending into the aperture 10, with their lower generators virtually flush with the operating table 1.

[0043] The dispenser 14 for the base material 140 (such as atomized clay) is made to slide forwards and rearwards about the screen 9 by suitable means, not shown for simplicity, for example consisting of a cylinder-piston unit, a motorized chain, an electrical actuator, or equivalent.

[0044] The dispenser 15 for the finishing material (such as ceramic glaze in powder form) is in the form of a hopper having a rectangular discharge mouth narrower than that of the dispenser 14 (Figures 1-3), a dimension of said rectangular profile being virtually equal to the width of the aperture 10.

[0045] To said discharge mouth there is fixed an outer enclosing flange 151 the front side and lateral sides of which are positioned flush with and resting on the flat strips 11 of the screen 9 (Figures 1 and 3), its rear side being slightly spaced from said screen 9 in order to provide the seat for a gate 16 carried by the front wall of the dispenser 14.

[0046] The plan profile of the flange 151 is preferably equal to that of the plate 12, the reason for which will be apparent hereinafter.

[0047] The gate 16 is opened and closed by the forward and rearward sliding of the front dispenser 15 relative to the rear dispenser 14. Said sliding is achieved, in the illustrated example, by two cylinder-piston units indicated by 17 in Figure 1, which connect the sides of the dispenser 14 to the sides of the dispenser 15. Other equivalent operating means can however be provided.

[0048] The invention operates substantially as follows.

[0049] At the commencement of a loading cycle the carriage 8 is in the position shown in Figure 1, in which the dispensers 14, 15 are positioned below the respective supply sources and are closed by the table 1 and the gate 16 respectively, the lower die 5 being in the position of maximum raising to offer the previously formed tile 6 to the pusher 552.

[0050] It should be noted that in the configuration of Figure 1 the plate 12 lies outside the cavity 4 and is in contact with the die plate 3 due to the fact that the illustrated mould is of the entering punch type. If the mould is of the movable die plate type the plate 12 lies in the maximum withdrawal position of the carriage 8, completely outside the die plate 3.

[0051] On commencing the cycle the carriage 8 advances with the dispensers 14, 15 which remain in their previously occupied position relative to the screen 9 until the rear edge of the plate 12 is aligned with the underlying far edge (with reference to the table 1) of the cavity 4 (Figure 5), with the pusher 552 urging the tile 6 onto the conveyor 7 (see Figure 5).

[0052] The screen 9 halts temporarily and the dispenser 14 receives the enabling signal to advance carrying with it the dispenser 15, which moves slightly beyond the plate 12 to lie against the scraper 551 while the front side of the flange 141 of the dispenser 14 positions itself virtually in contact with the rear edge of the plate 12 (Figure 6).

[0053] At this point the die 5 is lowered as shown in Figure 7 to release the discharge mouth of the dispenser 14, which begins to withdraw carrying with it the still closed dispenser 15 (loading 8). During said withdrawal the layer of base material 140 deposited into the cavity 4 is gradually scraped by the front edge of the flange 141 to make room for the finishing material 150.

[0054] When the flange 151 has been aligned vertically with the plate 12, the cylinder-piston units 17 cause the dispenser 15 to advance with the same speed as the withdrawal of the dispenser 14, so that the gate 16 frees the discharge mouth of the dispenser 15 and the material 150 rests temporarily on the plate 12, where it is retained laterally by the flange 151 and by the front edge of the gate 16 (see Figure 9).

[0055] After this the two dispensers 14, 15 slide rearwards together (Figure 11), with the base material 140 continuing to be deposited into the cavity 4 while the forming material 150 is deposited onto the preceding 140 but outside the cavity 4, where it is temporarily retained by the powder guide screen 9.

[0056] Basically, to deposit the forming material 150 it is not necessary to lower the die 5 seeing that the thickness of said forming material 150 is established by the thickness of the screen 9.

[0057] When the rear edge of the discharge mouth of the dispenser 15 reaches the rear edge (with reference to the table 1) of the cavity 4 (Figure 12), the dispenser 14 is halted and the dispenser 15 withdraws to become closed as shown in Figure 13, after which the die 5 is moved into the lowered pressing position (see Figure 14) to hence free the aperture 10 from the forming material 150, and the carriage 8 returns to the initial position of Figure 1, ready to carry out another loading cycle on termination of pressing.

[0058] Said loading cycle can vary with respect to that described. For example, to advantageously reduce the

operating times the advancement of the dispensers 14, 15 along the screen 9 can take place simultaneously with that of the screen 9 itself, rather than after this latter has halted in the position of maximum advancement as already described with reference to Figures 5 and 6. Essentially, when the screen 9 halts in said position of maximum advancement the configuration of Figure 6 will be obtained. Moreover, in said position of maximum advancement the rear edge of the plate 12 can lie beyond the far edge of the cavity 4 if particular parameters of the operation underway, or other requirements, necessitate it. For example this can be opportune if the powder contained in the aperture 10, and collected during the preceding advancement of the screen 9, is present in a quantity such as to hinder the correct positioning of the dispenser 14 as shown in Figure 6.

[0059] In this case during the next stage, i.e. at the moment of lowering the die 5, the screen is made to withdraw as shown in Figure 7.

[0060] Again, the opening of the dispenser 15 can take place in a different manner than that described with reference to Figures 8 and 9. In particular the two dispensers 14, 15 can begin to withdraw with the cylinder-piston units 17 shortened, then after a certain delay, for example when the central vertical axis of the dispenser 14 is close to the central vertical axis of the cavity 4, and the dispenser 15 has passed beyond the plate 12, the cylinder-piston units extend as shown in Figure 11, after which the cycle is completed as stated heretofore.

[0061] All the initially stated problems of the known art are overcome with a loading system according to the invention.

[0062] In this respect, the presence of a single carriage on the one hand enables the operating times to be drastically reduced to adapt them to the modern high-productivity processing cycles, and on the other hand enables the complication of the drive means for the dispenser 15 to be considerably reduced.

[0063] It should be noted that the reduction in operating times results not only from the fact that the base material 140 and forming material 150 are loaded in a single passage, but also from the fact that the powder guide screen 9 forms an upward prolongation of the forming cavity 4, which does not require a second intermediate lowering of the lower die 5 as is the case in the known art.

Claims

1. A loading carriage for ceramic moulds which comprise at least one forming cavity (4) defined by a lower die (5), **characterised by** comprising a reciprocating powder guide screen (9) arranged to slide between a withdrawn position in which it lies above an underlying horizontal slide table (1) coplanar with the mouth of said cavity, and an advanced position in which it lies above said cavity, and present-

ing a rectangular aperture (10) the minor and major sides of which are positioned respectively transversely and parallel to the direction of travel of said screen and are respectively substantially equal to and greater than the corresponding dimensions of said cavity, on said screen there being positioned a rear dispenser (14) and a front dispenser (15) which are intended to contain respectively at least one first material (140) and at least one second material (150) generally in the form of powders and having generally different characteristics, said dispensers being arranged to move relative to said aperture, when this is stationary above said cavity, in such a manner that said rear dispenser deposits into said cavity a layer of said at least one first material, and said rear dispenser deposits onto said layer of at least one first material a layer of said at least one second material, which remains retained by the walls of said aperture (10) until the final lowering of said lower die (5).

2. A carriage as claimed in claim 1, **characterised in that** said screen comprises two flat longitudinal opposing coplanar strips which act as runways for said rear and front dispensers and have their front ends connected together by a transverse coplanar plate and their rear ends connected to a carriage operating unit.

3. A carriage as claimed in claim 1, **characterised in that** said rear dispenser is connected to the structure of said screen by independent drive means.

4. A carriage as claimed in claim 1, **characterised in that** said rear dispenser presents a discharge mouth which lies at the level of said slide table and is of rectangular shape, with that side transverse to the screen travel direction being substantially equal to said minor side of said aperture.

5. A carriage as claimed in claim 4, **characterised in that** said discharge mouth of said rear dispenser carries an outer perimetral flange, two opposing sides of which are slidably positioned on said flat strips of said screen, the remaining sides being inserted into the opening in the screen with their lower generators flush with said slide table.

6. A carriage as claimed in claim 1, **characterised in that** said front dispenser is connected to the structure of said rear dispenser by independent drive means.

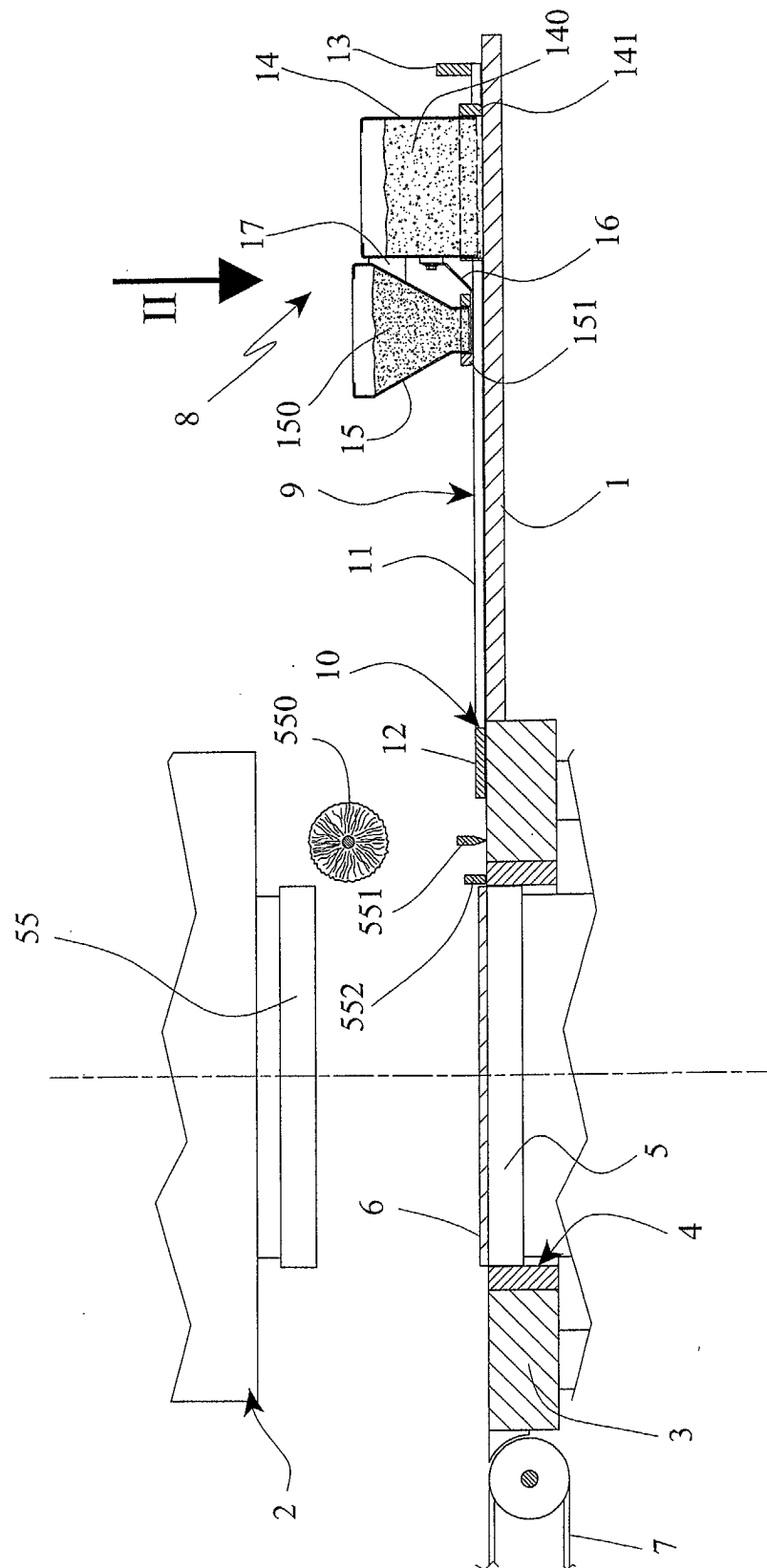
7. A carriage as claimed in claim 1, **characterised in that** said front dispenser presents a discharge mouth with respective shutter situated at the level of the upper face of said screen and is in the shape of a rectangle disposed transversely to the screen

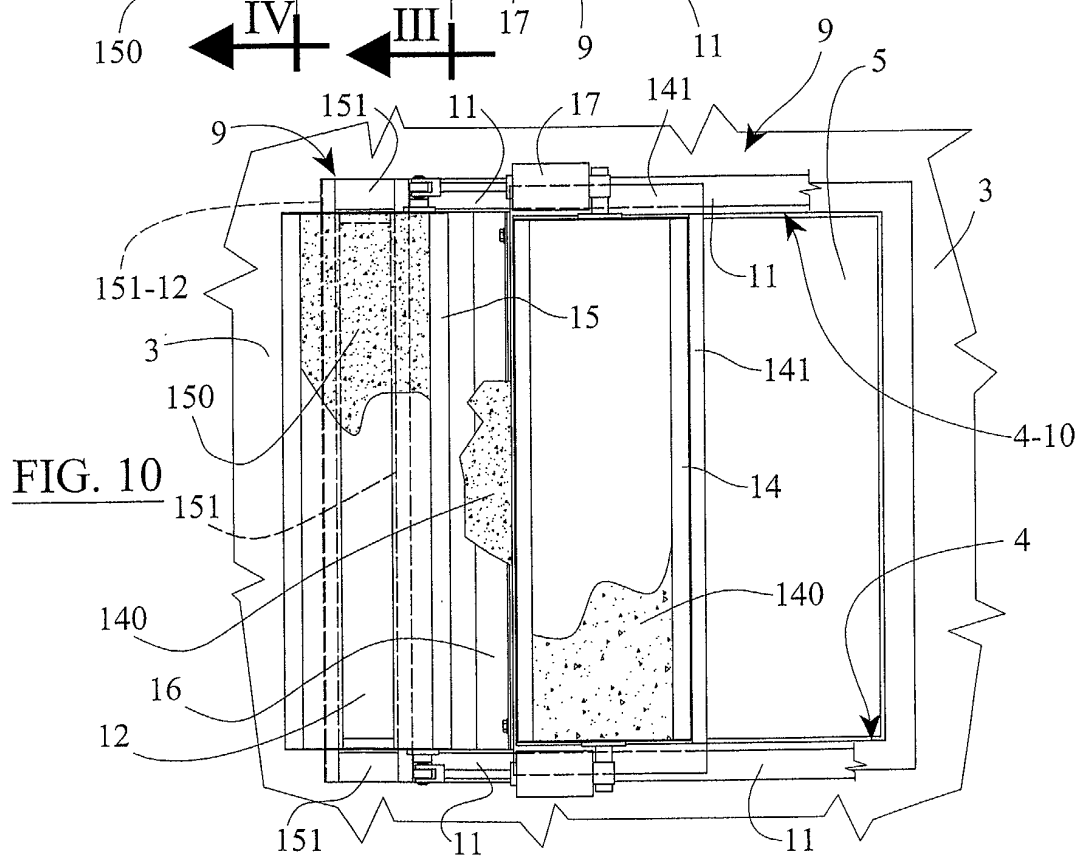
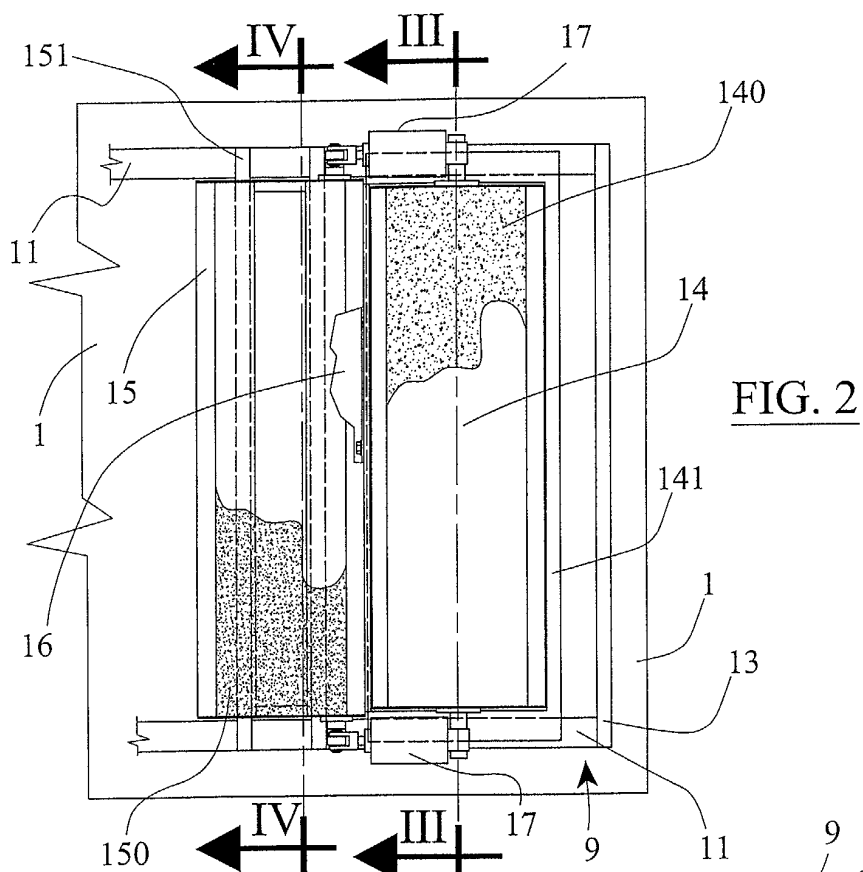
travel direction and having its major side substantially equal to, and its minor side substantially less than, the corresponding dimensions of the forming cavity.

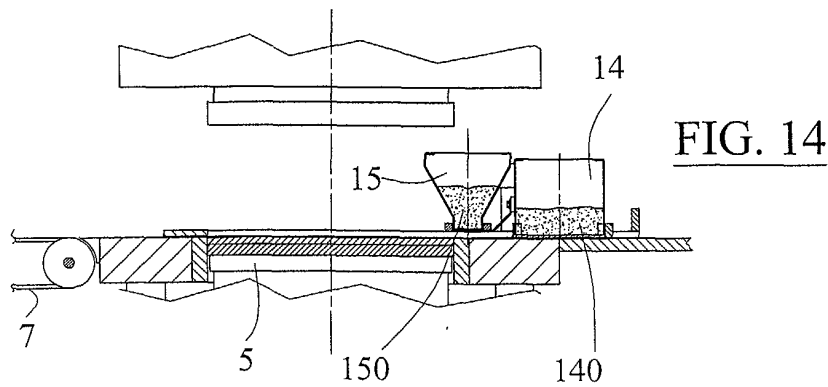
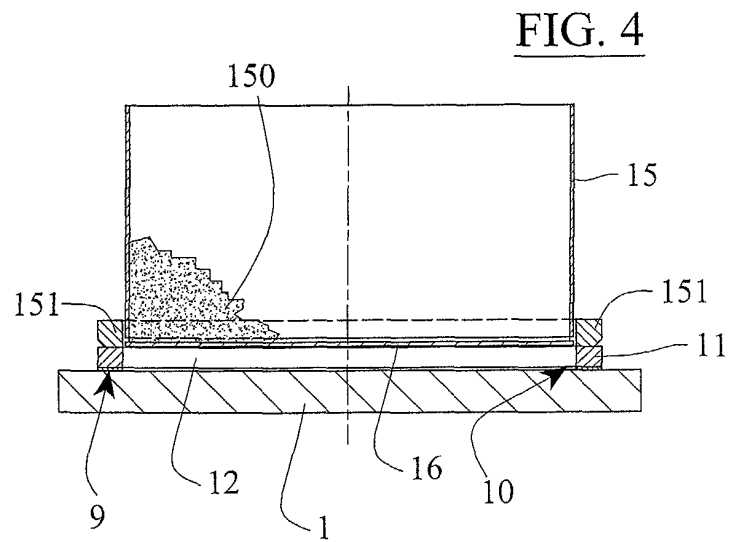
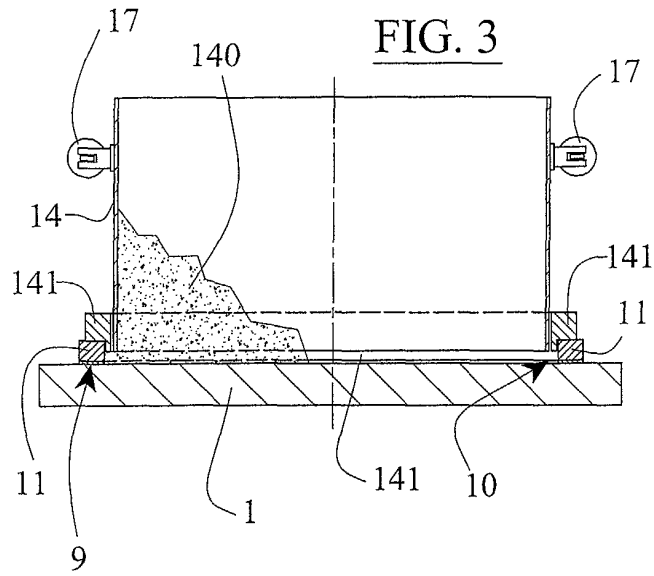
8. A carriage as claimed in claim 7, **characterised in that** said discharge mouth of said front dispenser carries an outer perimetral flange with its two longitudinal sides and front transverse side resting on said flat strips of said screen and its rear transverse side spaced from said flat strips to provide the seat for said shutter.

9. A carriage as claimed in claim 8, **characterised in that** said shutter comprises a gate which is fixed to the rearward lying rear dispenser and is inserted into said seat with its lower face coplanar with the upper face of the screen.

10. A carriage as claimed in claim 2, **characterised in that** said front plate of said screen has a plan shape at least equal to that of said discharge mouth of said front dispenser.







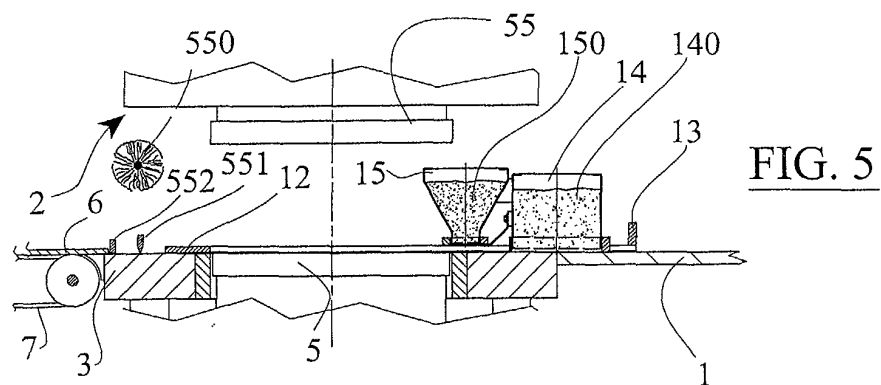


FIG. 5

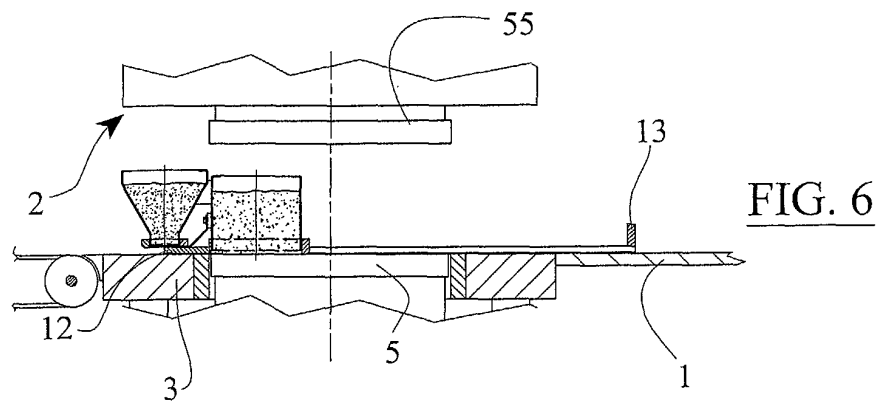


FIG. 6

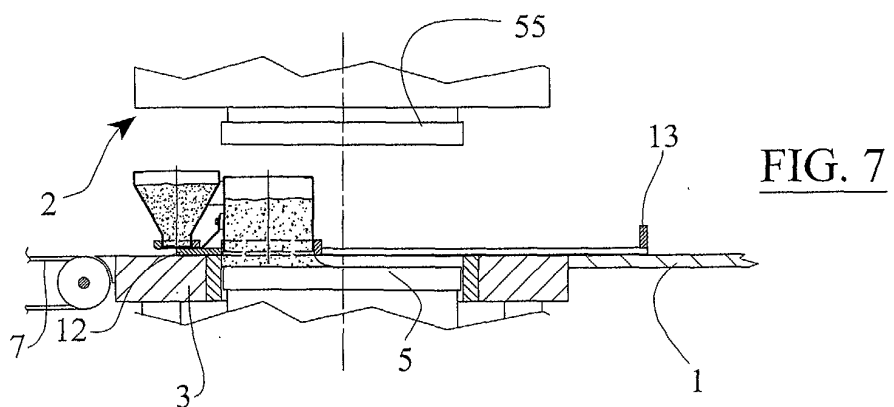


FIG. 7

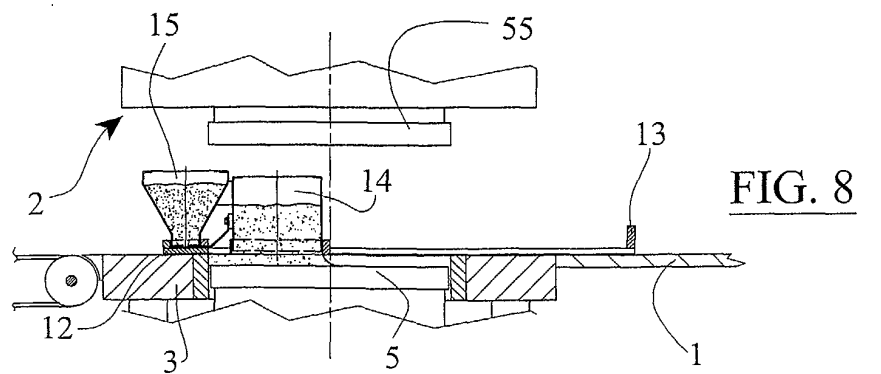
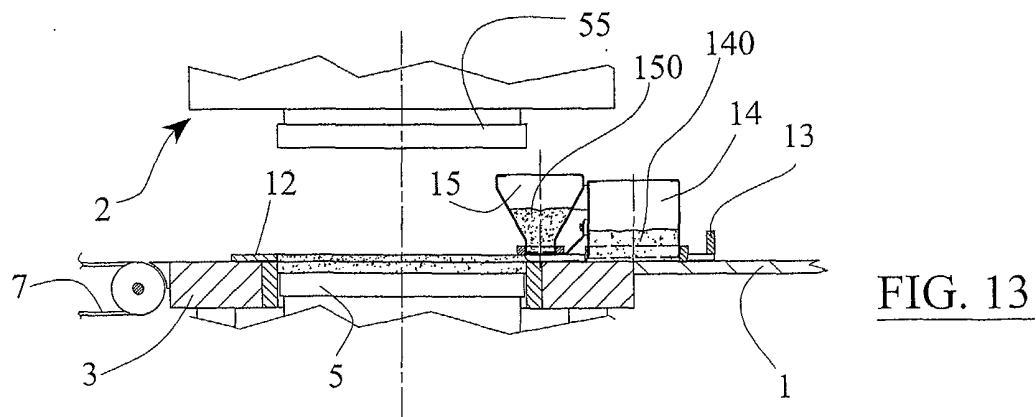
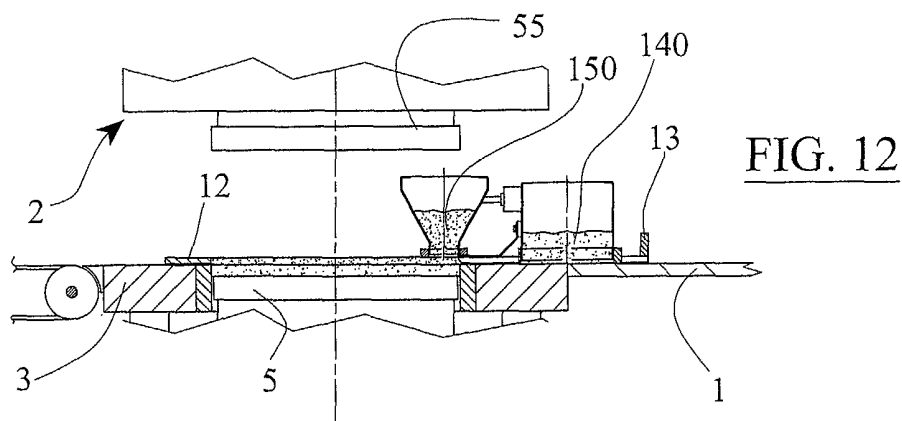
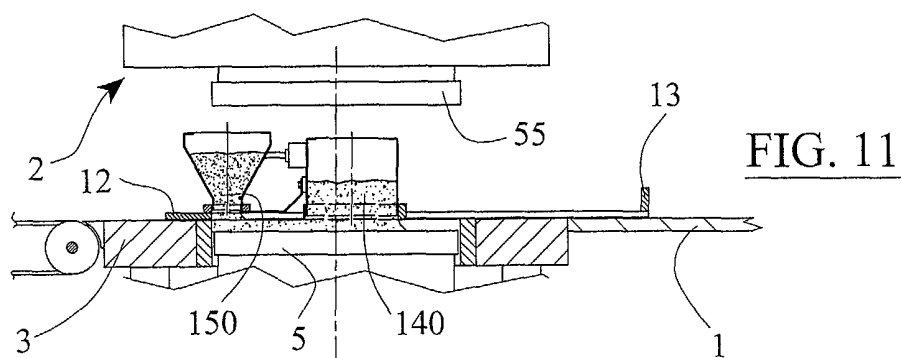
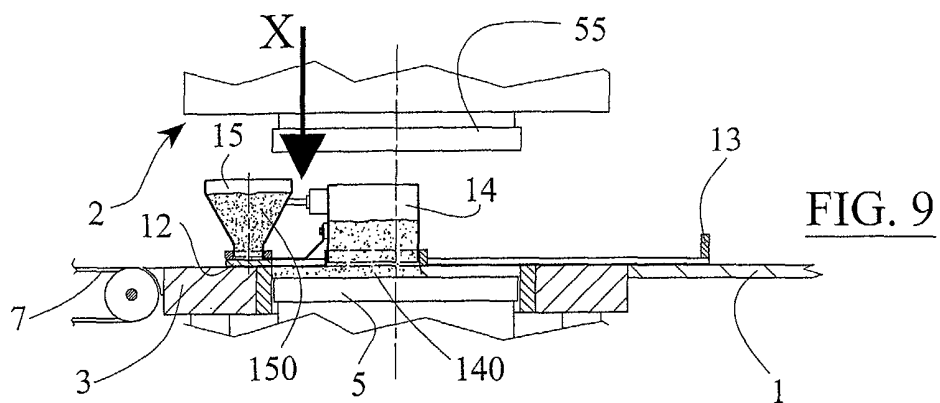


FIG. 8





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 08 0078

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 3 April 2003	Examiner Westermayer, W
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 08 0078

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03-04-2003

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