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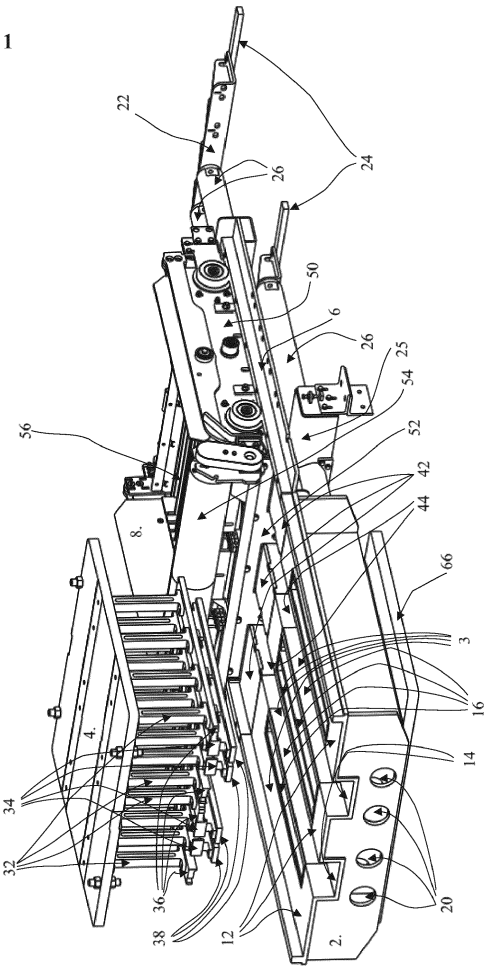
(54) MOULD FOR CONCRETE BLOCKS WITH (LARGE) LEVEL DIFFERENCES, SUCH AS KERBSTONES/BLOCKS/LOCK STONES WITH OR WITHOUT CAVITIES/DRAIN

(57) Mould (2, 4) with level differences for a concrete block machine/ concrete casting machine of the kind typically used for making cast items in the form of concrete blocks (58) for solid blocks with cavities or recesses, paving, wall construction or elements.

By the level differences blocks (58) with large level differences, typically more than 40 mm, can be made with or without cavities (60, 74), for example kerbstones with integrated drain.

By the invention is indicated a mould bottom part (2) with associated back table (6) and filling cart (8) as well as core drawing arrangement (22), including means that ensure the concrete product can be made with large level differences with or without cavities.

Fig. 1



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Description

[0001] The present invention concerns a casting equipment for making kerbstones/lock stones/blocks with large level differences, typically larger than 40 mm, with or without cavities. The casting equipment is used for concrete block machines/concrete casting machines of the kind typically used for making cast items in the form of concrete blocks for pavements, wall construction and edge elements, with or without cavities or recesses. In addition, the invention also concerns a method for making kerbstones/lock stones/blocks with large level differences, where the casting equipment is used.

Reason for the Invention

[0002] Before the invention of the present casting system, large level differences or differences greater than 40 mm have been very difficult to produce, as either it has been necessary to cast these products on manual vibration tables, typically in turning moulds or special wet casting, with consequent large costs of many moulds. Both processes are very demanding on resources. By these processes, the products are often cast upside down and are then turned out of the mould when stripping. For products cast on vibration tables, this occurs after ending vibration, and for wet-cast products this typically occurs ½ - 1 day after filling the mould with concrete.

[0003] Previous attempts of making products with large level differences of more than 40 mm on concrete block machines have been very uncertain, as either it was necessary to make difficult and complicated coverings inside the filling cart or even hydraulic or pneumatic flaps in the mould in order to limit the amount of concrete in the lower areas of the product.

[0004] The coverings in the filling cart were frequently difficult to keep clean, and even small variations in the humidity of the concrete could cause large variations in the amount of concrete in the mould.

[0005] Movable flaps in the mould were difficult to keep clean and they were vulnerable to the strong vibrations to which the casting equipment is subjected in order to compress the concrete in the mould.

[0006] In both cases, the level differences required complicated thrust plates that were difficult to clean as well. Furthermore, it was extremely difficult to make through-going cut-outs down to the core elements in the mould such that e.g. a passage could be provided for a drain cavity. If a passage was to be provided down to core elements, it required either thrust plates with complicated downwardly projecting elements be pressed through the concrete over the cores during compression in order to come into contact with the core element if making the product with coverings in the filling cart, or required a mould with a fixed core in the mould (as in this invention) combined with a movable flap in the mould limiting the amount of concrete, typically at one side of the fixed core.

[0007] When producing on vibration tables, a mould is placed on a vibration table. The mould is typically made for one concrete kerbstone/one wall element. When the mould is provided on the vibration table, the mould is filled with concrete by an operator who will ensure that the concrete is evenly distributed in the whole mould; it is often necessary to vibrate to get the concrete flowing in under possible cores and through narrow passages. When the mould is filled, a main vibration is run where the concrete is compressed, and at the final stage of the vibration the level is smoothed so that the concrete level will be flush with the top edge of the mould, being the bottom the product. The mould is then released from the vibration table, the mould is moved and turned, and the product is typically placed on a plate or directly on the factory floor. Any cores in the mould are removed from the mould before the mould is carefully opened or lifted off the product. The mould is turned back and returned to the vibration table, and possible cores are replaced in the mould before making a new product. This is a slow process requiring much manual effort, and in case of large products there is typically more than one operator. To this is added that relatively few items can be produced unless there is ample space around the vibration table or presence of a handling system for moving the plates on which the product is laid for hardening. It is also demanding on resources when the items after hardening, typically ½ - 1 day, are to be removed from the setting area and palletised.

[0008] By wet casting of products many moulds are needed as the product is to remain in the mould while the concrete hardens, and it may only come out of the mould after ½ - 1 day. By this method of production it is a major task to handle all the moulds and move them to a setting area, and in addition there is much manual work when the moulds are to be turned and the product taken out of the mould. If there are cores in the mould, they are to be removed at first before the product can come out of the mould. After cleaning, the cores are to be inserted again in the mould before the latter is ready for yet a filling. To this is added that relatively few items can be produced, unless a very large number of moulds are to be used, in turn substantially raising the costs of the products.

[0009] It is thus the object of the present invention to indicate a solution to these filling problems, complicated thrust plates or vulnerable movable flaps in the mould for producing products with larger level differences, typically greater than 40 mm, on the upwardly facing side of the cast items, with a mould concept consisting of a mould bottom part with level differences at the top side, with an associated mould top part combined with a backboard and a filling cart having the same level difference at the top side as that of the mould bottom part.

[0010] The mould system may be combined with a core arrangement making cavities in the cast products, not extending completely down to the bottom side of the product, and which is drawn out before stripping and/or with

a steel casting plate with profiling, half-cores that produce cavities in the cast products extending completely down to the bottom side of the cast product and which are withdrawn before stripping. It is possible to combine these cavity types such that there are cores making cavities in the product and withdrawn before stripping, and steel casting plates with half-cores making cavities under the product and which are withdrawn before stripping. In cases with cores in the mould as well as half-core on the steel casting plate, it is necessary with an extra drawing arrangement in order to bring the cores into the mould after lowering the mould. The cycle is as described below.

[0011] The mould bottom part can furthermore have fixed cores in the mould with downwardly projecting elements, the downwardly projecting elements e.g. extending down to contact with cores that are drawn out of the mould before stripping such that there are opening from the top side of the finished product to the cavity formed by the core. These downwardly projecting elements can be through-going either to the core in the mould space and/or the half-core that is fixed on the steel withdrawal plate.

[0012] Another significant improvement is by production on a concrete block machine 2-4 products can typically be made in about 20-30 seconds, where production on vibration tables typically takes 2-3 minutes for producing 1-2 products, and production by wet casting takes about ½-1 minute to fill the mould, to which is added ½-1 minute for getting the hardened product out of the mould, in addition to handling and hardening time. By production on a concrete block machine there is also typically automatic palletising of the products.

[0013] The production time per product on a concrete block machine is typically 5-15 seconds compared with 2-3 minutes per product by casting on vibration tables and by wet casting. Besides, the production conditions on a concrete block machine are more uniform such that the quality of the products is more uniform.

[0014] The casting equipment according to the invention comprises a casting equipment for making kerbstones/lock stones/blocks with large level differences with or without cavities, wherein the casting equipment is used for concrete block machines/concreting machines of the kind typically used for making cast items in the form of concrete blocks for pavement, wall construction and edge elements with or without cavities and recesses, the casting equipment including:

- a production board upon which
- a cellular bottom part with cells opening upwards as well as downwards is provided, the bottom part defining the desired basic shape of the individual blocks and elements, and the height of the cells being delimited by upper delimitations that provide the desired level difference at the top side of the cast product, and where the delimitations extend throughout the length of the bottom part, where the bottom part is delimited by a number of sides;
- and where in connection with the bottom there is provided fixed cores delimiting the level differences;
- a corresponding top part, where the top part is provided with an upper retainer plate with downwardly projecting pressing pistons connected with thrust plates corresponding to the desired level differences, the thrust plates designed such that the thrust plates fit down into respective underlying cells in the bottom part and at level with the upper delimitations, and such that the thrust plates thereby become downward retainers during the compression stage and contribute to ejection of the cast items after finishing compressing/concreting;
- a filling cart bringing concrete to the mould, the filling cart having corresponding level differences adapted to the upper delimitations on the bottom part such that the filling cart can pass across the bottom part for filling and scraping off the amount of concrete for the concrete blocks.

[0015] The cellular bottom part with both upwards and downwards open cells defines the desired basic shape of the individual concrete blocks or elements. The height of the cells is divided with uppermost delimitations that provide the desired level difference at the top side of the cast product and go through to the top side of the cast product, and a corresponding top part. The top part is provided with thrust plates from an upper retainer plate with downwardly projecting pressing pistons to the desired level differences that are formed with lower thrust plates fitting into respective underlying cells in the bottom part. The thrust plates are thereby useful for downwards directed retainers during the compression stage and for pushing out the cast items from the cells after finished casting.

[0016] In a further preferred embodiment, the delimitation between the levels can include the fixed cores being secured in the bottom part.

[0017] The fixed core or cores in the mould may furthermore have downwardly projecting elements that meet the possible core forming cavities in the block, and which are drawn out before stripping.

[0018] Furthermore, the fixed core or cores in the mould can have a bevelling between the levels and thereby a relatively flat thrust plate, or the fixed cores can be with a vertical milling and then a bevelling between the levels, if desired, can be made by the thrust plate for high level having downwards directed bevelling between the levels. In the shown embodiment of the invention, the bevelling is between the levels in the fixed core in the mould.

[0019] In order to enable the greater level differences at the top side of the mould, it is necessary that also on the backboard, meaning the table supporting the filling

cart of the machine, there is the same level difference, and that the filling cart of the machine is adapted to fit with the level difference on mould and backboard as well.

[0020] In connection with casting concrete blocks in which larger level differences and possible cavities are desired, it is necessary to have level differences at the top side of the mould, and if cavities are desired, that there are core elements to be withdrawn before stripping such that the mould can be lifted without destroying the newly cast product. In a further preferred embodiment, this is provided in that one or more cut-outs are provided in a side of the bottom part, and that a core drawing arrangement is arranged such that one or more core elements can be inserted and drawn out from the bottom part through the cut-outs. If the cavity is through-going, there are to be cut-outs at the opposite side in the bottom part as well such that the core elements can extend all the way through the mould.

[0021] The mould dealt with by this invention has large level differences at the top side of the mould such that the mould cell are to be filled with concrete at several levels. This implies that the filling cart bringing concrete to the mould is also to have these level differences in order to be able to fill and scrape off the concrete for the concrete block. In a preferred embodiment, the casting equipment has, apart from a filling cart bringing concrete to the mould with corresponding level differences adapted to the upper delimitations on the bottom part such that the filling cart can pass across the bottom part for filling and scraping off the amount of concrete for the concrete block, additionally a parking space, the backboard on which the filling cart is parked after filling concrete. This back plate is also to have the same level differences as the mould.

[0022] If the concrete product is to have cavities it is necessary that cores are placed in the mould which are drawn out/away before stripping.

[0023] Frequently it is also desired with profiling at the bottom side of the product, which can be applied to the product by using a steel casting plate that is withdrawn before stripping. In a further preferred embodiment, this is provided for by a casting plate being provided between the production board and the bottom part, preferably a steel casting plate, where the casting plate is provided with a profiling or relief. A steel casting plate is often used for protecting the production board during the production.

[0024] If cores drawn away before stripping as well as a steel casting plate are desired, it is required with an extra withdrawal arrangement.

[0025] The steel casting plate functions in the way that it is disposed between the production board and the bottom mould part. The steel casting plate is placed here during filling and during compression of the concrete which occurs by strong shock vibration of production board and mould from below by a vibration table. After ending compression, the steel casting plate is drawn out together with possible cores, and the mould is lowered together with the products, thereby placed on the production board before stripping, before they then are moved out of the machine and a new production board is moved in together with the steel casting plate, after which possible cores are inserted in the mould after lowering the mould.

[0026] The equipment is used in the way that the bottom part of the mould is placed on a production board, possibly with a steel casting plate between the bottom part and the production board. All the parts are placed on a vibration table. If the mould contains core elements, these are then displaced forward into the mould, and the mould top part is lifted to a position above the bottom mould part.

[0027] A concrete filling cart is moved along the top side of the bottom part in the space below the top part for filling concrete into the casting cells. After filling, the filling cart is drawn out, and the top part is lowered until the said thrust plates abut on the concrete surfaces in respective casting cells. Then the top part is used as a multi-pressure piston for compressing the concrete mass in the individual casting cells, which is effected under strong vibration of the mould system for separating air from the concrete mass. Hereby, the cast items are compressed to the desired compact block shape and uniform thickness.

[0028] The core arrangement is drawn out from its position in the bottom mould part. Subsequently, the top part is retained at its level relative to the bottom part, and the bottom part is acted on by force to be elevated from the production board whereby the cast items, which by the retained position of the top part do not participate in this elevation, will remain standing on the casting board during the stripping. A possible steel casting plate is drawn simultaneously with the core arrangement out of its position between production board and bottom part, in this case the casting equipment is first lowered into contact with the production board before stripping.

[0029] When the stripping has ended by elevation of the bottom part to a position at which its bottom side is elevated to at least the level of the thrust plates of the top part, the compressed cast items can be removed from the vibration table by pushing out therefrom, after lifting the top part. A new casting cycle can then be initiated after lowering the bottom part to the next inserted production board, possibly with steel casting plate and insertion of the core arrangement, and elevation of the top part to it starting position.

[0030] The present invention therefore also concerns a method for utilising the casting equipment for making kerbstones/lock stones/blocks with large level differences with or without cavities, wherein the casting equipment is used for concrete block machines/concreting machines of the kind typically used for making cast items in the form of concrete blocks for pavements, wall construction and edge elements with or without cavities and recesses, by the following production steps:

a) such that in the starting position the bottom part

is provided on a production board with the corresponding top part elevated above the cells in the bottom part, and the filling cart is disposed outside the cells on means that can bring the filling cart across the open cells;

b) after which the filling cart is brought across the cells, filling the cells with the desired amount of concrete and then bringing the filling cart back to the starting position;

c) the top part is then lowered and retained such that the thrust plates are brought into the desired position, and the latter are retained while the production board, the bottom part and the top part are vibrated;

d) after which the bottom part is lifted in relation to the production board and top part;

e) after which the top part is lifted in relation to the recently cast concrete items remaining on the production board, which is then removed;

f) a new production board is placed under the bottom part, which is then lowered down upon the production board such that steps a) to e) can be repeated.

[0031] By simple means the invention allows for making concrete products with large level differences, typically more than 40 mm, in that the bottom mould part has level differences at the top of the mould table such that larger level differences can be provided at the top side of the product; at the same time there may be provided cavities in the product which either can be weight-reducing cavities or cavities made for a specific purpose, as for example drainage. When making large level differences at the top side of the mould in this way, it is necessary that both the backboard and the filling cart are designed to operate with these level differences. The scraper of the filling cart is therefore made with the same level differences as the top side of the mould in order to bring the concrete to the concrete filling and also for scraping off the concrete level after finished filling. In order that the filling cart can run back and forth between top mould part and backboard, the backboard is made with the same level difference as the top side of the bottom mould part.

[0032] In one of the embodiment, a kerbstone with integrated drain opening, there is need for a core arrangement to be extended after lowering the mould for contact with the production board, possibly upon a steel casting plate. These cores can have various cross-sectional shapes, for example round, oval, rectangular and other suitable/desired cross-sectional shapes. In the bottom mould part a fixed core with downwardly projecting elements extending completely down to contact with the withdrawable core can be indicated such that passage for water drainage from the top side to the cavity created by the withdrawable core is formed.

[0033] Another embodiment could be larger edges for locking support wall elements where at the top side there is a through-going elevation fitting into a corresponding depression at the bottom side of an adjacent product.

[0034] Typically, several cells are provided in bottom mould parts where size and design of the products provide that the cells can be arranged with the level difference being longitudinal over the entire top side of the bottom mould part and arranged such that a possible core can be through-going either as a cavity or a half-core as a recess at the bottom side of the product.

[0035] The downwardly directed thrust plates of the top mould part are correspondingly arranged in line such that they can be used a retainers during the compression stage while at the same time being aligned so as to be easier to clean by means of a brush or scraper mounted on the filling cart. It operates in the way that the top mould part is elevated to a height that enables the scraper/brush on the filling cart to scrape/brush the surface clean on the thrust plates.

[0036] If there are cavities in the product created by through-going cores to be withdrawn before stripping, it is often necessary to provide a support arrangement for the cores that supports the cores when they are withdrawn, and which also supports and guides the cores during insertion into the bottom mould part after ending lowering before a new production cycle. It is often necessary that the core drawing arrangement is very long in order to get in under the vertically sectionalised backboard. Due to the length of the cores it is often necessary to have a support arrangement under the backboard close to the mould in order to support the cores when they are withdrawn, and to guide the cores into the bottom mould part after lowering the bottom mould part before starting a new cycle.

[0037] The invention is described briefly with reference to the Figures, on which:

Fig. 1 shows an embodiment of the mould for making kerbstones with integrated drain. In the foreground appears the mould with the top part lifted above the bottom part; behind the mould is seen the backboard and upon the backboard is seen the filling cart; under the backboard appears the core arrangement with the drawing system.

Figs. 2a-c show a view of the product coming out from the mould shown in Fig. 2a, showing the product in its entirety; Figs. 2b and 2c show a section through the product with a passage for drain channel and without drain channel, respectively.

Fig. 3 shows a detail of the mould, showing bottom mould part, backboard and filling cart.

Fig. 4 shows a detail of the bottom mould part with core drawing arrangement, two cores shown inserted in bottom mould part and two cores shown drawn out.

Fig. 5 shows a detail of a core for a kerbstone mould with integrated drain, wherein the bevelling for the through-going cores can be seen at the top side.

Fig. 6 shows a detail of the mould in cross-section, where only one of the four cores is shown.

Fig. 7 shows another product that can be made on another embodiment of the invention with larger edges for locking support wall elements, where at the top side there is a through-going elevation fitting into a corresponding depression at the bottom side of an adjacent product.

[0038] Fig. 1 shows and embodiment of the invention where a bottom mould part 2 is shown standing on a production board 66 with the top mould part 4 lifted above the mould. The top sides of the mould have a high level 12 and a low level 14 flush with corresponding high 42 and low 44 levels on a backboard 6. The filling cart 8 is parked on the backboard 6. The pivoting scraper 50 of the filling cart appears here with corresponding level differences 52 at the front. The top mould part 4 is lifted above the bottom part 2 such that the thrust plates of the top part for high level 36 and low level 38 can be brushed off by the brush 54 of the filling cart 8. The drawing arrangement 22 appears behind the backboard 6, here shown with two cores 26 extended (hidden inside the bottom mould part) and two cores 26 withdrawn.

[0039] The bottom part of the mould 2 consists of a mould table with the top side of the bottom part at a high level 12 and at a low level 14, where between the two levels there is a fixed core 16 delimiting high and low levels. On this core 16 there are downwardly projecting core elements 18 which during casting are in contact with the movable core 26, which is not seen on Fig. 1 but can be seen on Fig. 6, also showing the cellular division 3 providing the shape of the product.

[0040] The backboard 6 abutting on the bottom mould part 2 has, corresponding to the bottom mould part 2, a high level 42 and a low level 44 such that the filling cart 8, with a front scraper with level difference 52 and a not visible back scraper with level difference, can be advanced and thereby bring concrete to the cells 3 of the mould. There is a grating 56 in the filling cart 8, contributing to distribute the concrete to the cells 3. This grating can either be fixed, as shown here, or be hydraulically movable. The pivoting scraper 50 of the filling cart 8 pivots the front scraper with level differences 52 up when the filling cart runs forward, and pivots the front scraper with level differences 52 down when the filling cart is returned such that the concrete is scraped off the cells 3. Correspondingly, the not shown back scraper is pivoted down when the filling cart is moved forward such that the concrete can be brought with it.

[0041] Thrust plates for high level 36 are provided on the downwardly projecting legs 32 of the top mould part 4, and thrust plates for low level 38 are provided on the downwardly projecting legs 32 with leg extensions 34. These thrust plates fit into the cell openings 3 such that they can be used for a combined pressing piston and retainer during the compressing of the products.

[0042] Fig. 2a shows one of four products 58 which is produced in a mould according to the invention shown in Fig. 1. High level on the product 68 corresponds to high level at the top side 12 of the lower mould part 2, and low level on the product 70 corresponds to low level at the top side 14 of the lower mould part 2. Here it appears how the downwardly projecting core elements 18, not shown on the Figure, produce a passage 74 down to the through-going opening 60 formed by the through-going cores 26.

[0043] Fig. 2b shows a section through the product 58 where there is a passage to drain channel 74 produced by the downwardly projecting core elements 18 (not shown on the Figure), and Fig. 2c shows a section through the product where there is no passage, i.e. where on the fixed core 16 in the mould there are no downwardly projecting core elements 18 delimiting high and low levels in the mould, not shown on the Figure.

[0044] Fig. 3 shows the lower mould part 2 and the filling cart 8 placed on the backboard 6. It appears that the high level 12 and low level 14 of the top side of the lower mould part 2 have the same level differences on the backboard 6. High level on backboard 42 corresponds to high level at the top side 12 of the lower mould part 2, and low level on backboard 44 corresponds to low level at the top side 14 of the lower mould part. The pivoting scraper 50 of the filling cart 8 has a front scraper 52 with the same level difference as those of the lower mould part 2 and the backboard 6. Correspondingly, pivoting scraper 50 has a not shown rear scraper with the same level difference. These level differences provide that the filling cart can bring the concrete for filling the cells 3 in the lower mould part 2. When filling the lower mould part 2 with concrete, the filling cart 8 is moved forward with the front scraper 52 lifted and the not shown rear scraper lowered. The concrete in the filling cart is hereby brought over the cells 3 in the lower mould part 2. After ending filling of the lower mould part 2, the filling cart 8 is now returned with the front scraper 52 of the pivoting scraper 50 lowered and the not shown rear scraper lifted. By having the front scraper 52 lowered, the concrete level is thereby scraped off at high level as well as low level while at the same time the lifted rear scraper allows for possible waste to be collected in the filling cart again.

[0045] Fig. 4 shows the lower mould part 2 with core

drawing arrangement 10. The cores 26 are supported by a core support arrangement 25 when they are withdrawn. The support arrangement 25 is necessary for guiding the cores 26 into the openings 20 in the lower mould part 2. The core support arrangement 25 is necessary in particular if the dimensions and disposition of the cores 26 provide that the drawing beam 24 cannot be accommodated under the backboard 6. The core support arrangement 25 is always practical for securely guiding the cores 26 into the openings 20 of the lower mould part 2.

[0046] Fig. 5 shows a detail of a core 26. The core is tapering 27 for guiding the core 26 into the opening 20 of the lower mould part 2.

[0047] Fig. 6 shows a sectional view of the lower mould part 2 of the previously mentioned mould for making a kerbstone with integrated drain. The lower mould part 2 has four cells separated by a central wall 10 and cell delimitations 11 such that four products 3 are made by each stripping. The products are placed in pairs such that the low levels 14 of two products are opposite each other and abut each other, only separated by a central wall 10 and cell delimitations 11; the low levels are thereby joined to two low levels 14, a low level 14 for each pair of products. Here the cores 16 in the mould appear, delimiting high level 12 and low level 14. One of the drawable cores 26 are shown in an opening 60 in the lower mould part for cores 26. It is seen here that the core elements 18 projecting downwards from the fixed core 16 is in contact with the bevelling 28 on the core 26. The fixed cores 16 in the mould can have part of a bevelling between high and low levels, or bevelling may be omitted, whereby the bevelling between high 12 and low 14 level lies in the downwardly projecting thrust plates for high level 36, not shown on the Figure.

[0048] Fig. 7 shows an element arising from another embodiment of the mould concept of the invention. The mould for this element has a level difference at the top side of the element 68, 70, and has a channel at the bottom side of the element 72. The level difference at the top side appears in that the mould (not shown, but with same design and principle as the mould shown in Fig. 6) has an upper level 12 providing the high level of the element 68 and a lower level 14 providing the lower level on the element 70. The levels are separated by a core in the mould 16. By this core 16, the thrust plates on the top part of the mould 4 can be divided into thrust plate for high level 36 and thrust plate for low level 38. The channel at the bottom side of the element 72 appears with a withdrawal profile, a half-core on a steel casting plate.

[0049] The channel at the bottom side of the element 72 fits upon the elevation 68 on an underlying element.

List of reference numbers:

[0050]

2. lower mould part
3. cells in lower mould part
4. top mould part
6. backboard
8. filling cart
10. central wall
11. cell delimitations
12. top side of lower mould part - high level
14. top side of lower mould part - low level
16. core in mould delimiting high and low levels in mould
18. downwardly projecting core element having contact with movable cores
20. opening for cores
22. core drawing arrangement shown with two cores back and two core forward
24. draw beam to which the cores are fastened
25. support arrangement for cores
26. core
27. bevelling on cores so that core can engage openings better
28. bevelling on core for meeting downwardly projecting elements from cores
30. bottom side of top mould part
32. downwardly projecting legs
34. extension for leg for low level
36. thrust plates high level
38. thrust plates low level
40. backboard on which filling cart is parked
42. high level backboard
44. low level backboard
48. drive rails
50. pivoting scraper
52. front of pivoting scraper with level difference
54. brush for cleaning thrust plates
56. grating in filling cart
58. kerbstone with through-going drain and outlet
60. through-going opening, drain cavity
62. drain cavity formed by through-going drawable core
64. bevelling between high and low level either appearing with inclining intermediate core in lower mould part or a downwardly projecting thrust plate from top mould part
66. production board
68. high level on product
70. low level on product
72. channel on bottom side of the product
74. opening down to through-going drain cavity

Claims

1. A casting equipment for making kerbstones/lock stones/blocks with large level differences with or without cavities, wherein the casting equipment is used for concrete block machines/concreting machines of the kind typically used for making cast items in the form of concrete blocks for paving, erected

walls and edge elements with or without cavities and recesses, the casting equipment including:

- a production board upon which
- a cellular bottom part with cells opening upwards as well as downwards is provided, the bottom part defining the desired basic shape of the individual blocks and elements, and the height of the cells being delimited by upper delimitations that provide the desired level difference at the top side of the cast product, and where the delimitations extend throughout the length of the bottom part, where the bottom part is delimited by a number of sides;
- and where in connection with the bottom there is provided fixed cores delimiting the level differences;
- a corresponding top part, where the top part is provided with an upper retainer plate with downwardly projecting pressing pistons connected with thrust plates corresponding to the desired level differences, the thrust plates designed such that the thrust plates fit down into respective underlying cells in the bottom part and at level with the upper delimitations, and the thrust plates thereby are downwardly extending retainers during the compression stage, and contributing to ejection of the cast items after concreting;
- a filling cart bringing concrete to the mould, the filling cart having corresponding level differences adapted to the upper delimitations on the bottom part such that the filling cart can pass across the bottom part for filling and scraping off the amount of concrete for the concrete blocks.

2. Casting equipment according to claim 1, **characterised in** a parking plate is provided for the filling cart in continuation of the bottom part such that the level differences present in the bottom part as well as in the filling cart are also provided in the parking plate on which the filling cart is parked after filling concrete.

3. Casting equipment according to one or more preceding claims, **characterised in that** the fixed cores are secured in the bottom part.

4. Casting equipment according to one or more preceding claims, **characterised in that** one or more cut-outs are provided in a side of the bottom part, and that a core drawing arrangement is arranged such that one or more core elements can be inserted and drawn out from the bottom part through the cut-outs, and at through-going cavities there is furthermore provided one or more cut-outs at the opposite side.

5. Casting equipment according to one or more preceding claims, **characterised in that** in a bottom part of the fixed core elements there is a downwardly projecting core element in longitudinal direction of the core element, the downwardly projecting core element being in contact with the drawable cores/half-cores during casting.

6. Casting equipment according to one or more preceding claims, **characterised in that** in an top part of the core elements there is provided a bevelling in longitudinal direction of the core element.

7. Casting equipment according to claim 1, **characterised in that** a casting plate is provided between the production board and the bottom part, preferably a steel casting plate, the casting plate provided with a profiling or relief.

8. A method for making kerbstones/lock stones/blocks with large level differences with or without cavities, wherein the casting equipment is used for concrete block machines/concreting machines of the kind typically used for making cast items in the form of concrete blocks for paving, erected walls and edge elements with or without cavities and recesses, where in the method is used a casting equipment including:

- a production board;
- a cellular bottom part with cells opening upwards as well as downwards defining the desired basic shape of the individual blocks and elements, and where the height of the cells is delimited by upper delimitations that provide the desired level difference(s) at the top side of the moulded product, and that the delimitations extend throughout the length of the bottom part;
- a corresponding top part, where the top part is provided with an upper retainer plate with downwardly projecting pressing pistons connected with thrust plates corresponding toe the desired level differences, the thrust plates designed such that the thrust plates fit down into respective underlying cells in the bottom part and at level with the upper delimitations, and the thrust plates thereby become downward retainers during the compression stage and contribute to ejection of the cast items after concreting;
- a filling cart bringing concrete to the mould, the filling cart having corresponding level differences adapted to the upper delimitations on the bottom part such that the filling cart can pass across the bottom part for filling and scrape off the amount of concrete for the concrete blocks, with the following production differences:

  a) such that in the starting position the bottom part is provided on a production board with the corresponding top part elevated

above the cells in the bottom part, and the filling cart is disposed outside the cells on means that can bring the filling cart across the open cells;

b) after which the filling cart is brought across the cells, filling the cells with the desired amount of concrete and then bringing the filling cart back to the starting position;

c) the top part is then lowered and retained such that the thrust plates are brought into the desired position, and the latter are retained while the production board, the bottom part and the top part are vibrated;

d) after which the bottom part is lifted in relation to the production board and top part;

e) after which the top part is lifted in relation to the recently cast concrete items remaining on the production board, which is then removed;

f) a new production board is placed under the bottom part, which is then lowered down upon the production board such that differences a) to e) can be repeated.

9. Method according to claim 8, **characterised in that** the bottom mould is defined by a number of sides, and that in a side, and possibly in opposite side, there is provided one or more cutouts with a cross-section corresponding to the cross-section of one or more insertable cores, the cores being inserted in a direction in parallel with the surface of the production board, and that the one or more cores are passed through the cutouts into the bottom part between differences a) and b), and that the casting plate is pulled out from under the bottom part before difference d).

10. Method according to claim 8, **characterised in that** a casting plate is provided upon the production board, the casting plate including a profiling or relief, and that the casting plate is pulled out from under the bottom plate before difference d).

Fig. 1

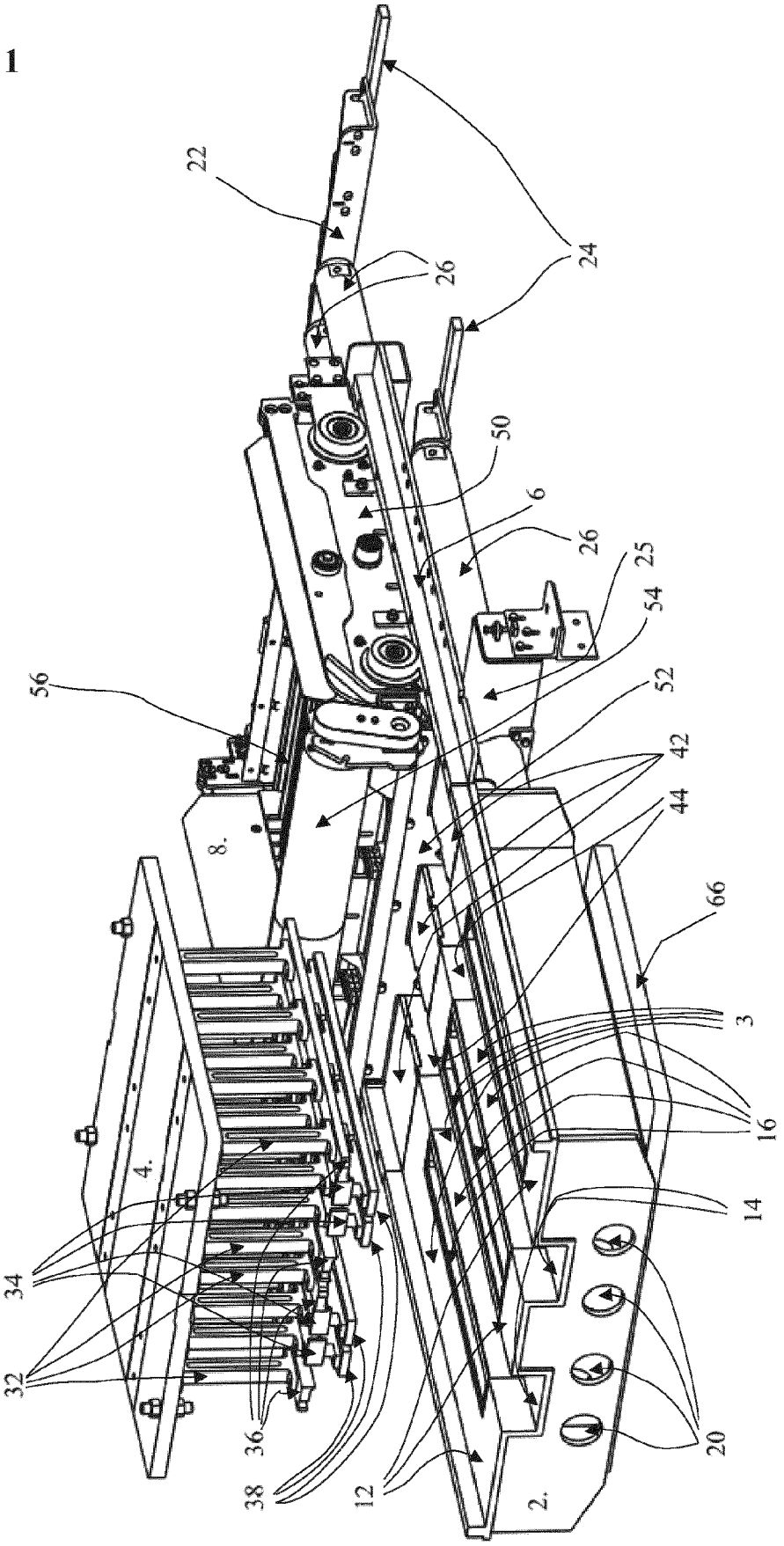


Fig. 2a

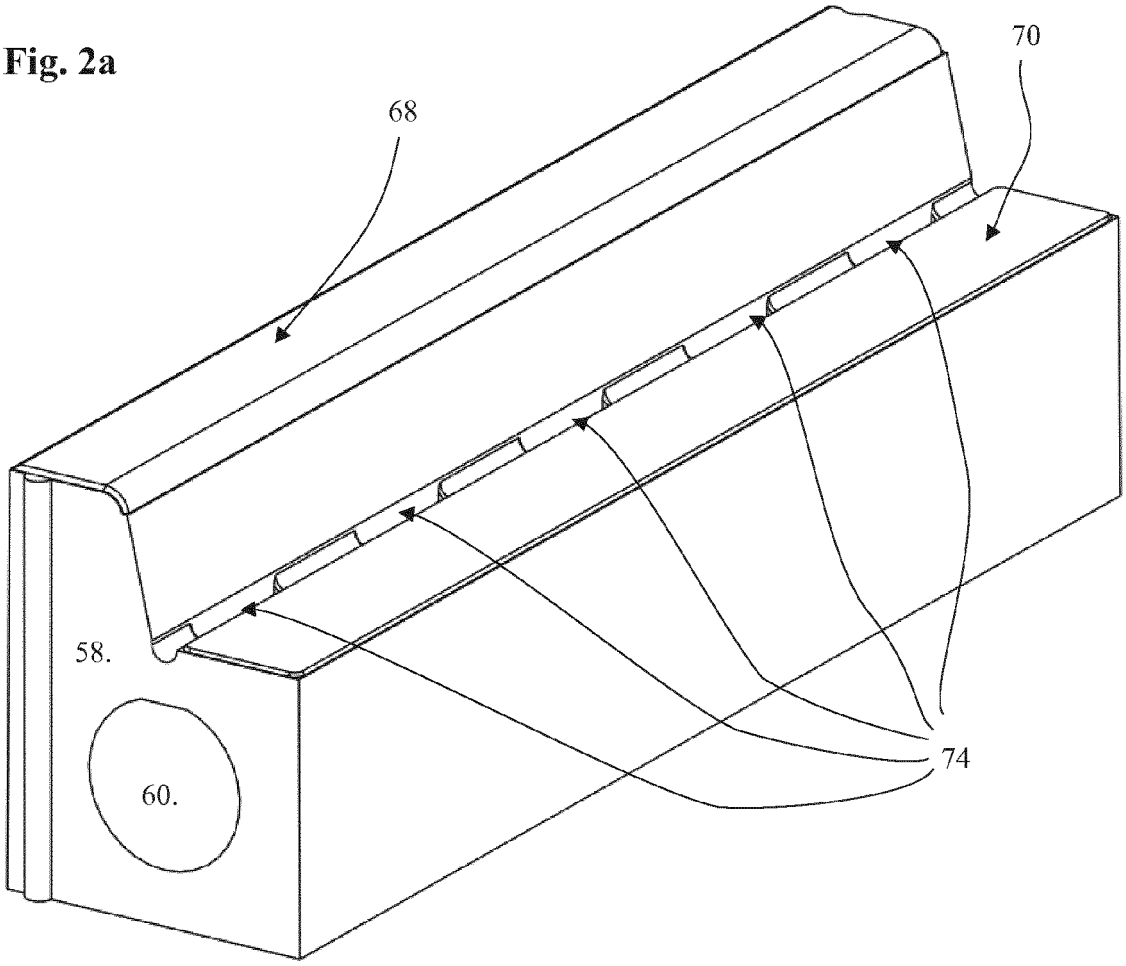


Fig. 2b

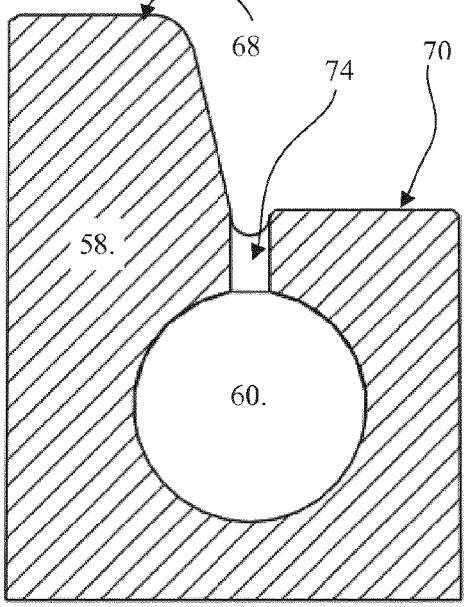


Fig. 2c

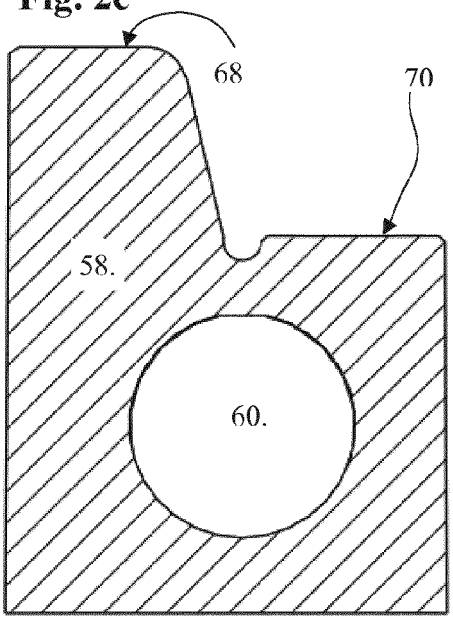


Fig. 3

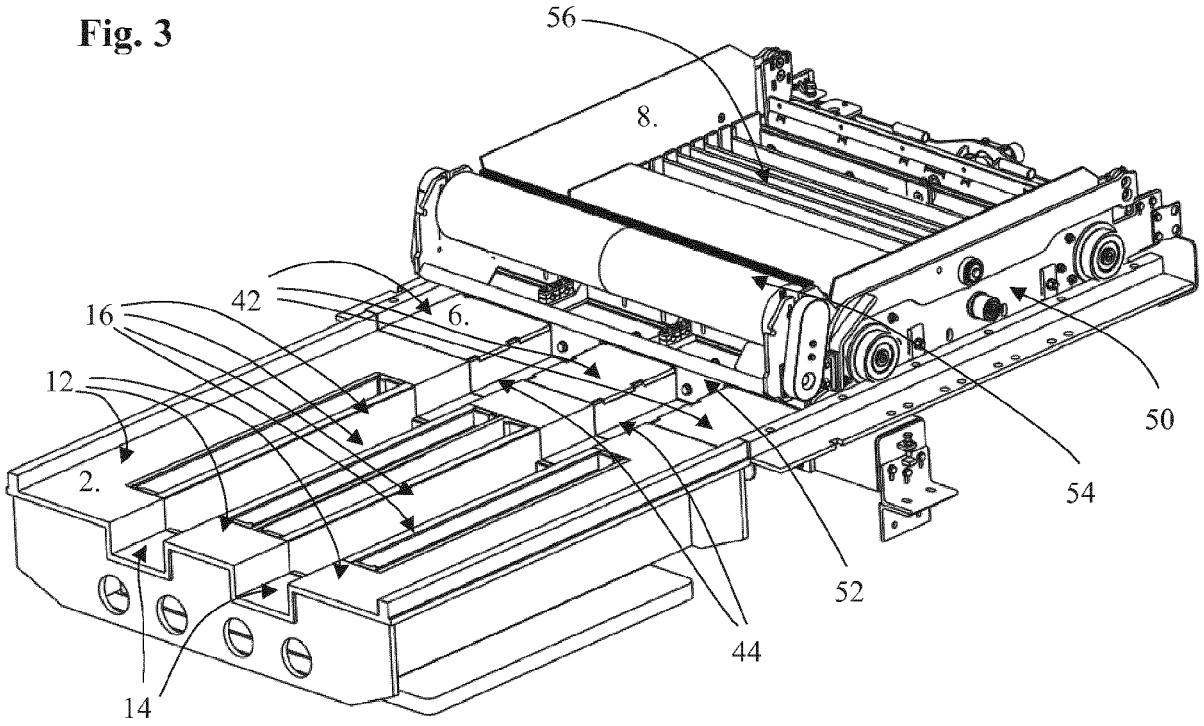


Fig. 4

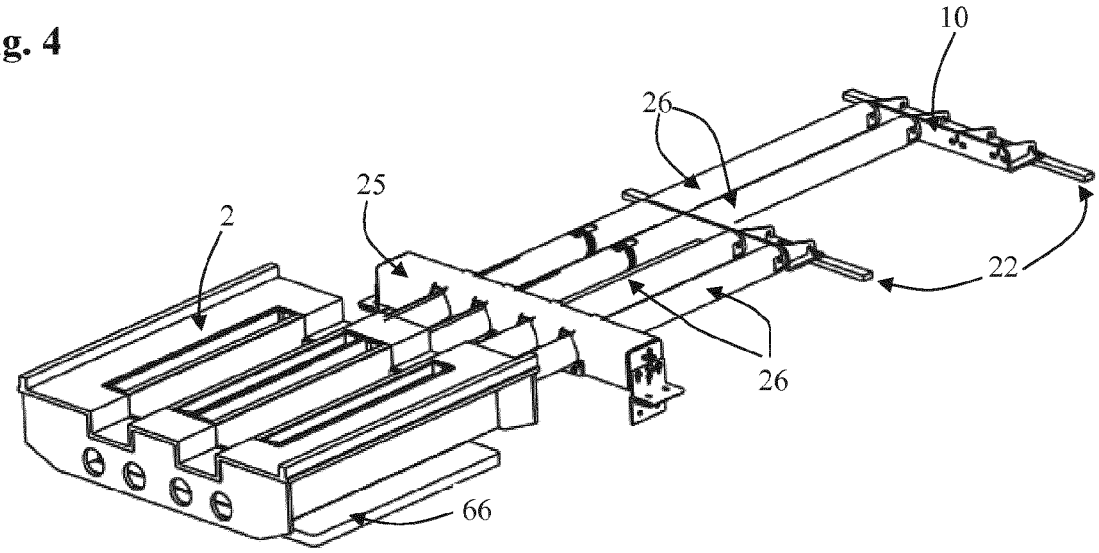


Fig. 5

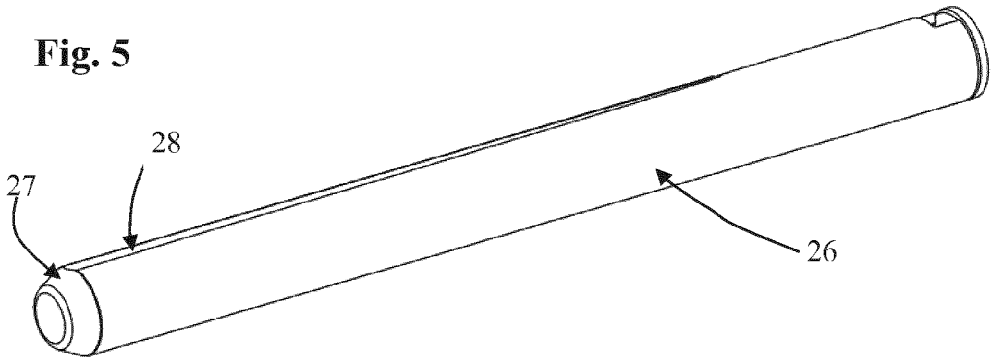


Fig. 6

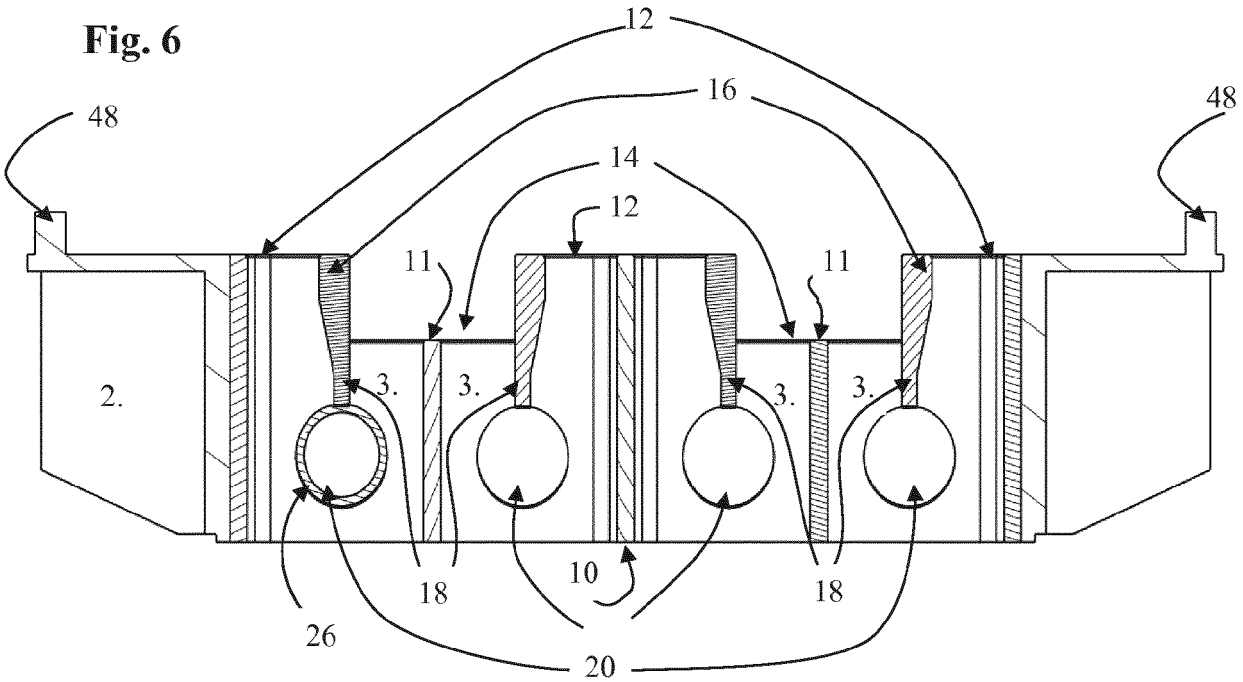
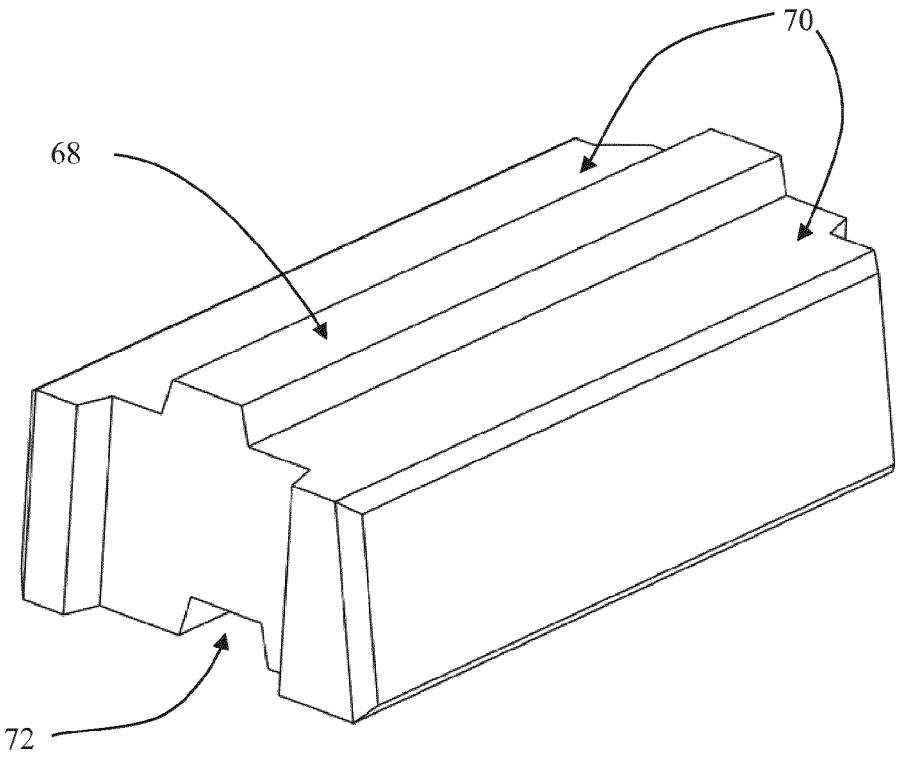


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 18 18 4745

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Y	US 2014/373479 A1 (KARAU WILLIAM H [US]) 25 December 2014 (2014-12-25) * paragraph [0021] - paragraph [0022]; figures 4A,4B *	7,10	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 January 2019	Orij, Jack

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