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(54) **DEVICE AND METHOD FOR THE PRODUCTION OF CONCRETE ARTICLES**

(57) Device for pouring concrete articles (25) such as tiles or the like, said device (1) comprising a reservoir (2) for concrete (3) with an open base which forms an exit (6) through which the concrete (3) can leave the reservoir (2), characterised in that the reservoir (2) comprises at least two spaces (7a, 7b) for concrete (3) separated from each other, whereby the spaces (7a, 7b) are separated by a fixed wall (8) which extends with a protruding section downward beyond or outside the exit (6) and divides said exit into an exit (6a, 6b) for each space (7a, 7b) on either side of the wall (8), whereby the device (1) is provided with a supporting platform (11) and a mould (4) with cavities (5), said supporting platform (11) containing a continuous groove (15) for guiding the bottom edge (14) of the fixed wall (8) with a sharp downward pointing tip, said groove (15) continuing into a mould (4) to form a separation in the upper surface of the poured article (25).

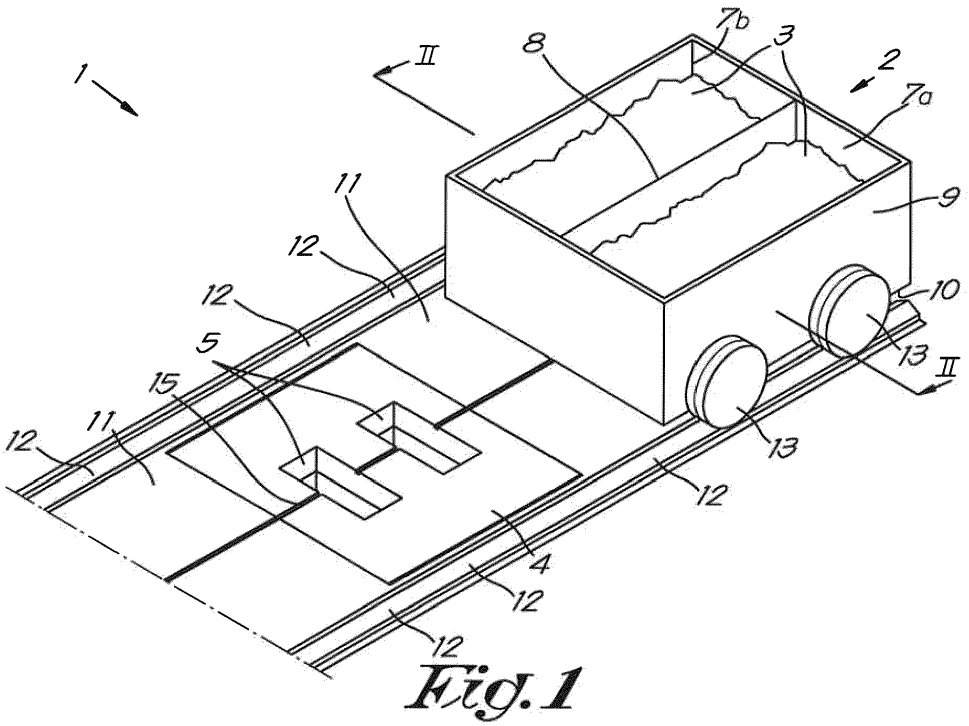

Fig. 1

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Description

[0001] The present invention relates to a device and method for manufacturing concrete articles.

[0002] More specifically, the invention is intended for manufacturing concrete articles by compressing a non-hardened concrete composition.

[0003] For example, these concrete articles can be stones, paving stones or tiles, but other articles are not excluded according to the invention.

[0004] A device for manufacturing concrete articles is already known from US 2015/0115492 in which concrete articles are manufactured from different sorts of concrete by pouring the different sorts of concrete from a reservoir with a base plate and with movable separators in a mould, whereby after removing the base plate the different sorts of concrete, together with the movable separators end up in the mould cavity, after which the separators are vertically removed for compressing.

[0005] A disadvantage of this is that it contains relatively complex and a relatively large number of moving parts such as the base and movable separators that must be able to be moved up and down by means of a mechanism. The known device is intended mainly for making concrete building bricks, the side section of which shows different colour zones.

[0006] This device is less suitable for manufacturing tiles, the top surface of which shows different colour zones which are sharply defined.

[0007] It is known that it is financially attractive to manufacture concrete articles by compressing a non-hardened concrete composition, because this allows form-stable objects to be quickly moulded which can then, outside the used mould, harden.

[0008] To this end, a certain quantity of non-hardened concrete composition is poured into a cavity of a mould provided for this purpose, which subsequently is compressed by means of a stamp with a corresponding form.

[0009] The mould is also called a moulding plate and at the bottom is sealed by a separate base plate such that, when the stamp compresses the concrete composition and subsequently the moulding plate is moved upward, the thus moulded concrete article remains on the base plate.

[0010] A disadvantage of such known methods is that they do not allow concrete articles to be produced whereby different sorts or types of concrete are combined separately next to each other in one concrete article, whereby there is a fixed straight separating line between the different sorts of concrete on the upperside of the concrete article.

[0011] To combine different sorts of concrete in one concrete article, the cavity must be filled, simultaneously or not, with the different sorts of concrete. It goes without saying that without further measures a fixed straight separating line between the different sorts of concrete can never be obtained.

[0012] The purpose of the present invention is to provide a solution to one or more of the aforementioned and other disadvantages by providing a device and method which allows a concrete article to be manufactured whereby different sorts or types of concrete are combined separately next to each other.

[0013] The object of the present invention is a device for pouring concrete articles such as tiles or the like, said device comprising a reservoir for concrete with an open base which forms an exit through which the concrete can leave the reservoir, characterised in that the reservoir comprises at least two spaces for concrete separated from each other, whereby the spaces are separated by a fixed wall which extends with a protruding section downward beyond or outside the exit and divides said exit into an exit for each space on either side of the wall, whereby the device is provided with at least one supporting platform with at least one mould adjoining thereto or therein with an upperside which when pouring the article is located in the same plane as the supporting platform and which is provided with one or more cavities, whereby each cavity has the negative form of an article to be moulded, and whereby the reservoir is movable in relation to the supporting platform and the mould between a filling position, whereby the reservoir rests with its open base on the supporting platform and a pouring position, whereby the reservoir with said exits of the at least two spaces is located above at least one mould cavity and whereby in the supporting platform a continuous groove is provided for guiding the bottom edge of the fixed wall with a sharp downward pointing tip while moving the reservoir, said groove continuing into the one or more moulds to form a separation in the upper surface of the poured article in the mould between the concrete coming from two adjacent spaces of the reservoir.

[0014] This provides the advantage that two or more sorts of concrete can be poured into the reservoir separately from each other, thanks to the different spaces.

[0015] This provides the advantage that as the wall is fixed in the reservoir, the protruding section can move freely over the mould cavity without a guide having to be provided over the mould cavity.

[0016] The different sorts of concrete may for example differ in composition or colour. It is also possible that the surface structure of the hardened concrete is different in that different aggregates are used.

[0017] The divided exit means the two sorts of concrete can fall simultaneously and separately from each other in a mould cavity whereby the wall in the exit will ensure the separation between both sorts of concrete.

[0018] In this way a fixed separation between both sorts of concrete can be obtained.

[0019] According to the invention, the fixed wall partially extends beyond or outside the exit.

[0020] This has the advantage that the wall will ensure a good separation between the different sorts of concrete in the mould cavity, because the wall will keep both sorts of concrete separate from each other in this location. The eventual concrete article will therefore have a sharp and

fixed separating line between both sorts of concrete.

[0021] Preferably the device also comprises at least one mould with one or more cavities, whereby the reservoir is configured to be moved with its exit over the mould cavities or whereby the mould is configured to be moved with its cavities under the exit of the reservoir.

[0022] For this, a groove is provided in the mould in which the wall can slide.

[0023] This has the advantage that the wall can slide with its edge through the mould cavity as it were when the exit moves over the cavity. This will provide a guide, such that based on the location of the groove the separation between both sorts of concrete in the eventual concrete article can be determined.

[0024] One must ensure that the straight wall extends in the movement direction of the reservoir while it moves over the cavities or that the straight wall extends in the movement direction of the mould while it is moved under the exit of the reservoir.

[0025] In a practical embodiment the reservoir is executed as an open container with an open base that serves as said exit, whereby in the open container said wall is made as a separator between the spaces and as wall dividing the exit.

[0026] The advantage of such fixed wall which serves as separator which extends to beyond the exit and thus divides the exit, is that no seals are needed to prevent leaking of concrete.

[0027] Another advantage of such fixed wall is that no mechanism must be provided for moving the wall up and down to obtain a clear separation.

[0028] The advantage of such execution is that the reservoir can be filled easily and that there is a big exit opening, such that it is guaranteed the mould cavities are completely filled when the exit moves over it.

[0029] The invention also relates to a method for pouring concrete articles such as tiles or the like, characterised in that a device is used according to any one of the previous claims and that the method comprises the following steps:

- providing at least one supporting platform with at least one mould with one or more cavities adjoining thereto, each with a negative form of an article to be moulded, whereby the supporting platform and the mould are provided with a continuous groove which continues into the one or more moulds;
- providing a movable reservoir with a fixed wall which at the bottom protrudes downward with a section;
- mounting the reservoir on the supporting platform in a filling position and filling each space of the reservoir with a no-slump concrete, whereby for at least two spaces a different sort of concrete is chosen;
- pouring the concrete in the mould by moving the reservoir with no-slump concrete from the filling position to a pouring position above one or more mould cavities to be filled, whereby the protruding section of the wall of the reservoir (2) is guided in said continuous groove (15);
- freeing the cavities (5) of the mould (4) by moving the reservoir away from the pouring position.

[0030] The advantages of such method, using a device according to the invention, are similar to the aforementioned benefits of the device.

[0031] With the intention of better showing the characteristics of the invention, hereinafter, by way of an example without any limiting nature, a number of preferred variants are described of a device according to the invention for manufacturing concrete articles and a method applied thereby, with reference to the accompanying drawings, wherein:

figure 1 schematically shows a perspective view of a device according to the invention;
figure 2 shows the cross-section according to the line II-II of figure 1;
figures 3 to 8 show different steps of a method according to the invention.

[0032] The device 1 schematically shown in figure 1 according to the invention for pouring concrete articles such as tiles or the like, essentially comprises a reservoir 2 for concrete 3 and, in this case, also a mould 4 with one or more cavities 5.

[0033] In the example shown, the mould 4 has two cavities 5, but this can also be only one cavity 5 or more than two cavities 5, whereby each cavity 5 of the mould 4 has the negative form of an article to be moulded 25.

[0034] It is also not excluded that several moulds 4 are provided. For example, these moulds 4 can be set up behind each other, such as can be the case for example in a production line.

[0035] According to the invention the reservoir 2 comprises an exit 6 through which the concrete 3 can leave the reservoir 2, and comprises at least two spaces 7a, 7b for concrete 3 separated from each other.

[0036] Said spaces 7a, 7b are connected to the exit 6, whereby a straight and fixed wall 8 divides the exit 6 into two parts 6a, 6b.

[0037] In each of said spaces 7a, 7b another type of concrete 3 can be applied, such as schematically shown in the figures.

[0038] In the example of figure 1, and also visible in the cross-section of figure 2, said wall 8 also serves as separator 8 between said spaces 7a, 7b of the reservoir 2.

[0039] In other words, the fixed wall 8 continues from the reservoir 2 to beyond the exit 6, such that the reservoir 2 comprises at least two spaces 7a, 7b for concrete 3 separated by a wall 8, whereby the spaces 7a, 7b are connected to the exit 6, whereby the wall 8 continues to outside the exit 6, such that the exit 6 is divided into two parts 6a, 6b.

[0040] As shown in figures 1 and 2, the reservoir 2 is executed as a sort of open container 9 with an open base 10 which serves as said exit 6. It is understood that this

is only one possible embodiment.

[0041] It will also be clear that in the same way three spaces 7 can also be created, whereby the exit 6 is divided into three parts.

[0042] As shown in figures 1 and 2 the device 1 also comprises one or more supporting platforms 11 which were mounted before and/or behind the mould 4.

[0043] In this case the device 1 is provided with a supporting platform 11 with adjoining thereto or therein a mould 4, whereby the upperside of the mould 4 when pouring the article 25 is located in the same plane as the supporting platform 11.

[0044] The reservoir 2 is movable in relation to the supporting platform 11 and the mould 4 between a filling position, whereby the reservoir 2 rests with its open base 10 on the supporting platform 11 and a pouring position, whereby the reservoir 2 is located with said exits 6a, 6b of the at least two spaces 7a and 7b above at least one cavity 5 of the mould 4.

In said pouring position the cavities 5 in the mould 4 do not contain any separation between the concrete 3 coming from adjacent spaces 7a and 7b of the reservoir 2.

[0045] To this end, the supporting platform 11 is provided with rails 12 and the reservoir 2 is provided with wheels 13 to travel on said rails 12.

[0046] This means the reservoir 2 is configured to be moved with its exit 6 over the cavities 5 of the mould 4.

[0047] Figure 3 shows a cross-section as shown in figure 2, but whereby the reservoir 2 is moved and is located partially above the mould 4.

[0048] It is understood that this can also be realised in another way than with the help of said rails 12 and wheels 13.

[0049] By using the wheels 13, the reservoir 2 is executed as a so-called filling cart, which can drive over the mould 4 as it were.

[0050] But the mould 4 can also be configured to be moved with its cavities 5 under the exit 6 of the reservoir 2, i.e. the reservoir 2 is set up to be unmovable.

[0051] As is clearly visible in figures 1 to 3, the wall 8 partially protrudes beyond or outside the exit 6. Later it will become clear that this is advantageous for obtaining a perfect fixed separating line between the different sorts of concrete 3 in the eventually created concrete article.

[0052] For example, the fixed wall 8 can protrude with an edge 14 approximately half to five centimetres outside or beyond the exit 6. It is not excluded that the wall 8 protrudes less than half or more than five centimetres outside or beyond the exit 6, this will depend mainly on the dimensions of the eventual concrete article 25 to be manufactured.

[0053] To ensure that the reservoir 2 with protruding wall 8 is able to smoothly slide over the mould 4 and the supporting platform 11, said supporting platform 11 is provided with a continuous groove 15 for guiding the downward protruding edge 14 of the fixed wall 8 when the reservoir 2 is travelling.

[0054] Preferably, the bottom edge 14 of the fixed wall 8 is executed in a V-shape with a sharp downward pointing tip to form a sharply defined groove which forms a separation between the concrete on either side of the groove formed in the upper surface.

[0055] In practice good results are obtained with a bottom edge with an acute included angle of approximately sixty degrees.

[0056] It is also preferable that the groove 15 in the supporting platform and the mould 4 have a complementary form to said bottom edge 14.

[0057] Said groove 15 continues into the one or more moulds 4 to form a separation in the upper surface of the poured article 25 in the mould 4 between the concrete 3 coming from two adjacent spaces 7a and 7b of the reservoir 2.

[0058] It is understood that the groove 15 is at least as deep as the protruding edge 14 of the wall 8.

[0059] With regard to the mould 4, in this embodiment it is made from the moulding plate 16 in which the one or more cavities 5 are made and a separate bottom plate 17 which forms the base of the cavities 5.

[0060] This is shown in figure 3.

[0061] In this case, but not necessarily, the device 1 is also provided with means 18 to lift up the moulding plate 16 and means 19 to exchange the bottom plates 17.

[0062] Said means can be either mechanical or robotic means 18, 19 in a production line or the like, but can also for example be handles 20 to manually lift the moulding plate 16 or handles 20 to be able to take away, slide or lift the bottom plate 17.

[0063] The operation of the device 1 for manufacturing concrete articles is very simple and as follows.

[0064] One starts from a point of departure as shown in figures 1 and 2, whereby the reservoir 2 finds itself in a filling position on the supporting platform 11 next to the mould 4.

[0065] Each space of the reservoir is filled with the desired sorts of concrete in the filling position.

[0066] Subsequently, the reservoir 2 will move to the mould 4, such that it can move over the mould 3 to the pouring position. This is shown in figure 3.

[0067] One must ensure that the straight wall 8 extends in the movement direction of the reservoir 2 while the reservoir 2 is travelling.

[0068] During this motion the fixed wall 8 will slide in the groove 15 in the supporting platform 11 and subsequently in the possible groove 15 of the mould 4. This will cause an automatic correct alignment of the reservoir 2 and in particular of the exit 6 with the mould 4 as it were.

[0069] When the reservoir 2 moves or travels with its exit 6 over the cavity 5, as shown in figure 4, concrete 3 will be poured via the exit 6 in the cavity 5 of the mould 4.

[0070] As both parts 6a, 6b of the exit 6 extend at least partially above the cavity 5, both types or sorts of concrete 3 will be poured simultaneously into the cavity 5.

[0071] The protruding wall 8 means both types of concrete 3 will end up in the one or more cavities 5 separately from each other.

[0072] Consequently a fixed separating line 21 is obtained in the concrete 3, as shown in figure 5. This separating line 21 is created by the compression caused by the protruding wall 8 in the concrete 3 when sliding over the cavity 5.

[0073] After pouring the concrete, the reservoir 2 will leave the pouring position and free the mould 4 cavities 5 by moving to the next supporting platform 11 or returning to the supporting platform 11 where it came from, all this depending on the arrangement of the production line. This means that the reservoir 2 is no longer located over or above the mould 4.

[0074] After leaving the pouring position, the reservoir 2 can be moved back to the filling position where the reservoir 2 can be filled again.

[0075] In a next step the concrete 3 can be compressed. So-called stamps 22 are used for this.
To this end the device 1 is provided with one or more stamps 22 which can be moved up and down into the cavities 5 of the mould 4.

[0076] An equal number of stamps 22 as there are cavities 5 in the mould 4 can be provided for this. If there are several moulds 4, for example in a production line, the stamps 22 can be moved from mould 4 to mould 4 or the moulds 4 can be successively moved under the stamps 22.

[0077] The stamps 22 will be lowered toward the moulds 4 to compress or press the concrete 3 in the cavities 5.

[0078] This is shown in figures 5 and 6.

[0079] In this case, but not necessarily for the invention, the stamps 22 are provided with a linear protruding profiling 24 on their underside 23 which is in line with the geometric plane of the wall 8 of the reservoir 2.

[0080] With said profiling 24, the stamp 22 will press in said separating line 21 of the concrete 3 to realise a fixed separating line of preferably 2 to 3 mm.

[0081] In this way the separating line 21 is emphasised and tightened even more.

[0082] After the stamps 22 have compressed the concrete 3, the moulding plate 16 and the stamp 22 are lifted up, as shown in figures 7 and 8.

[0083] The bottom plate 17 remains in place, together with the thus created compressed concrete articles 25, which in this case are tiles 25.

[0084] Said bottom plate 17 can be removed and taken to a drying place where the tiles 25 can dry.

[0085] A new bottom plate 17 or bottom plates 17 can be installed and the moulding plate 16 or other moulding plates 16 can be lowered again or moulding plates 16 can be lowered when one wants to make other concrete articles 25.

[0086] It is not excluded that the device 1 is provided with a second reservoir 2 for concrete 3, similar to the first reservoir 2 described above, but with that difference that it only comprises one space 7a, 7b for concrete 3, i. e. is not provided with a wall 8.

[0087] The second reservoir 2 can be used to first pour a so-called core concrete 3 in the mould 4, whereby it will be the first to travel over the mould 4, after which subsequently the first reservoir 2 will travel over the mould 4 to pour the two sorts of concrete 3 over the core concrete 3, whereby here also a fixed separating line 21 between both sorts of concrete 3 will be obtained.

[0088] It is not excluded that the core concrete 3 is the same as one of the two types of concrete 3 in the first reservoir 2.

[0089] It is hereby possible that both reservoirs 2 travel behind each other, successively over the mould 4 or a series of moulds 4 placed behind each other, but it is also possible that a reservoir 2 is installed on either side of the mould 4, whereby first the second reservoir 2 travels back and forth over the mould 4 to pour the core concrete 3, after which subsequently the first reservoir 2 travels back and forth over the mould 4 to pour the two types of concrete 3.

[0090] Subsequently the method can be continued as described above.

[0091] The present invention is by no means limited to the embodiments described as an example and shown in the figures, however, a device according to the invention for manufacturing concrete articles and a method applied thereby can be realised according to different variants, without departing from the scope of the invention.

Claims

1. The object of the present invention is a device for pouring concrete articles (25) such as tiles or the like, said device (1) comprising a reservoir (2) for concrete (3) with an open base which forms an exit (6) through which the concrete (3) can leave the reservoir (2), **characterised in that** the reservoir (2)comprises at least two spaces (7a, 7b) for concrete (3) separated from each other, whereby the spaces (7a, 7b) are separated by a fixed wall (8) which extends with a protruding section downward beyond or outside the exit (6) and divides said exit into an exit (6a, 6b) for each space (7a, 7b) on either side of the wall (8), whereby the device (1) is provided with at least one supporting platform (11) with at least one mould (4) adjoining thereto or therein with an upperside which when pouring the article (25) is located in the same plane as the supporting platform (11) and which is provided with one or more cavities (5), whereby each cavity has the negative form of an article (25) to be moulded, and whereby the reservoir (2) is movable in relation to the supporting platform (11) and the mould (4) between a filling position, whereby the reservoir (2) rests with its open base on the supporting platform (11) and a pouring position, whereby the reservoir (2) with said exits (7a and 7b) of the at least two spaces is located above at least one cavity (5) of the mould (4) and whereby in the

supporting platform (11) a continuous groove (15) is provided for guiding the bottom edge (14) of the fixed wall (8) with a sharp downward pointing tip (14) while moving the reservoir (2), said groove (15) continuing into the one or more moulds (4) to form a separation in the upper surface of the poured article (25) in the mould (4) between the concrete coming from two adjacent spaces (7a and 7b) of the reservoir (2).

2. Device according to claim 1, **characterised in that** the device (1) also comprises at least one mould (4) with one or more cavities (5), whereby the reservoir (2) is configured to move with its exit (6) over the cavities (5) of the mould (4) or whereby the mould (4) is configured to move with its cavities (5) under the exit (6) of the reservoir.

3. Device according to claim 1, **characterised in that** the mould (4) comprises a moulding plate (16) with one or more cavities (5) and a separate and exchangeable bottom plate (17) which forms the base of the cavities (5).

4. Device according to claim 3, **characterised in that** the device (1) is provided with means (18) to lift the moulding plates (16) and means (19) to exchange the bottom plates (17) .

5. Device according to claim 4, **characterised in that** the supporting platform (11) is provided with rails (12) and that the reservoir (2) is provided with wheels (13) which can travel on the rails (12).

6. Device according to any one of the previous claims, **characterised in that** in said pouring position, the cavities (5) in the mould (4) do not contain a separation between the concrete (3) coming from adjacent spaces (7a and 7b) of the reservoir (2).

7. Device according to any one of the previous claims, **characterised in that** the bottom edge (14) of the fixed wall (8) is preferably executed in a V-shape, whereby the associated groove (15) preferably has a complementary form to said bottom edge (14).

8. Device according to any one of the previous claims, **characterised in that** the device (1) is provided with one or more stamps (22) that can be moved up and down into the cavities (5) of the mould (4) to press the concrete into the mould cavities.

9. Device according to claim 8, **characterised in that** on their underside (23) the stamps (22) are provided with a linear protruding profiling (24) which is in line with the geometric plane of the wall of the reservoir.

10. Device according to any one of the previous claims, **characterised in that** the device (1) is further provided with a second reservoir (2) for concrete (3) with an exit (6) through which the concrete (3) can leave the reservoir (2), whereby the second reservoir (2) only comprises one space (7a, 7b) for concrete (3).

11. Method for pouring concrete articles such as tiles or the like, **characterised in that** a device (1) is used according to any one of the previous claims and that the method comprises the following steps:

- providing at least one supporting platform (11) with at least one mould (4) with one or more cavities (5) adjoining thereto, each with a negative form of an article to be moulded, whereby the supporting platform (11) and the mould (4) are provided with a continuous groove (15) which continues into the one or more moulds (4) ;
- providing a movable reservoir (2) with a fixed wall (8) which at the bottom protrudes downward with a section;
- mounting the reservoir (2) on the supporting platform (11) in a filling position and filling each space (7a and 7b) of the reservoir (2) with a no-slump concrete (3), whereby for at least two spaces a different sort of concrete (3) is chosen;
- pouring the concrete (3) in the mould (4) by moving the reservoir (2) with no-slump concrete (3) from the filling position to a pouring position above one or more cavities (5) of the mould to be filled, whereby the protruding section of the wall (8) of the reservoir (3) is guided in said continuous groove (4);
- freeing the cavities (5) of the mould (4) by moving the reservoir (2) away from the pouring position.

12. Method according to claim 11, **characterised in that** the different sorts of concrete (3) in the reservoir (2) are poured together and simultaneously in one or more cavities (5) of the mould (4) without a physical separation having to be provided in one or more cavities (5) of the mould (4).

13. Method according to claim 11, **characterised in that** one or more stamps (22) are provided for compressing the poured concrete (3) in one or more cavities (5) of the mould (4).

14. Method according to claim 13, **characterised in that** the stamps (22) are provided on their underside (23) with a linear protruding profiling (24) which makes a clear separating line in the concrete.

15. Method according to any one of the claims 11 to 14, **characterised in that** the reservoir is provided with wheels (12) and the supporting platforms (11) and moulds (4) are provided with rails (13) over which

the reservoir (2) can travel with its wheels (12).

16. Method according to claim 11, **characterised in that** the mould (4) is provided with one or more moulding plates (16) with one or more cavities (5) and one or more separate and variable bottom plates (17) which form the base of the cavities (5).

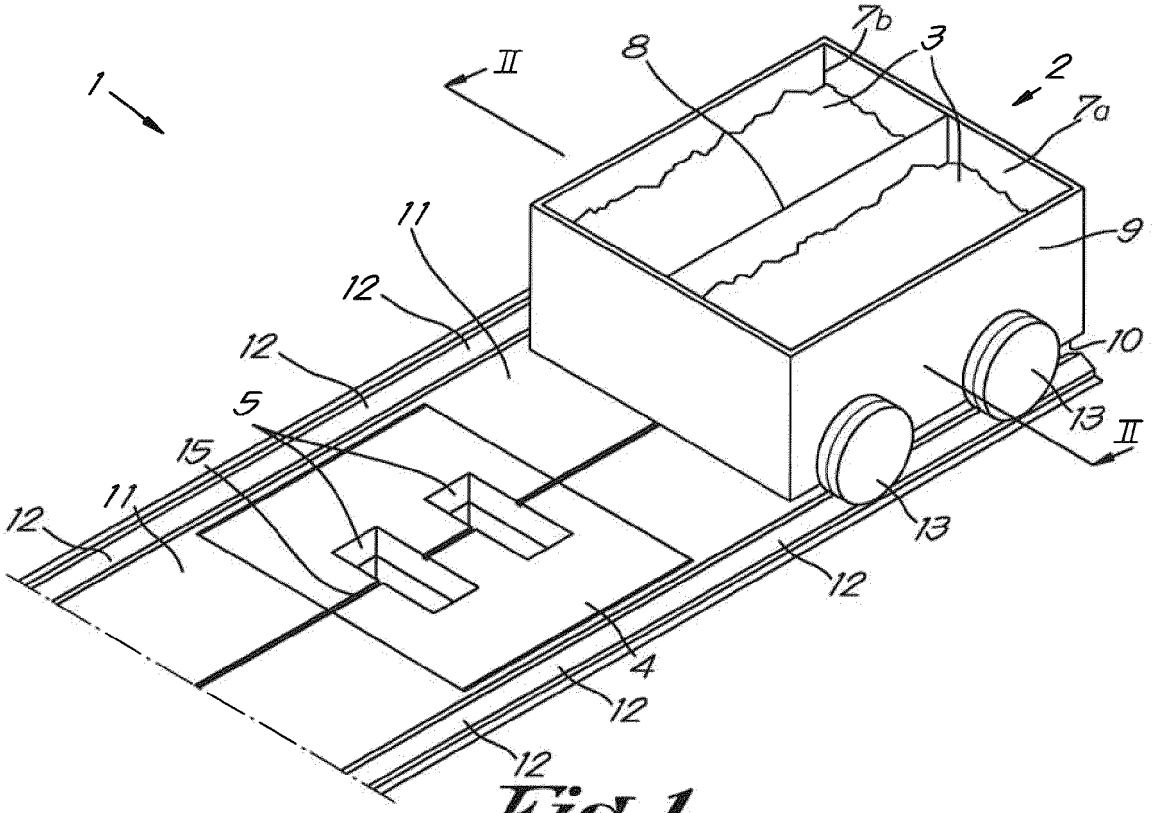

Fig. 1

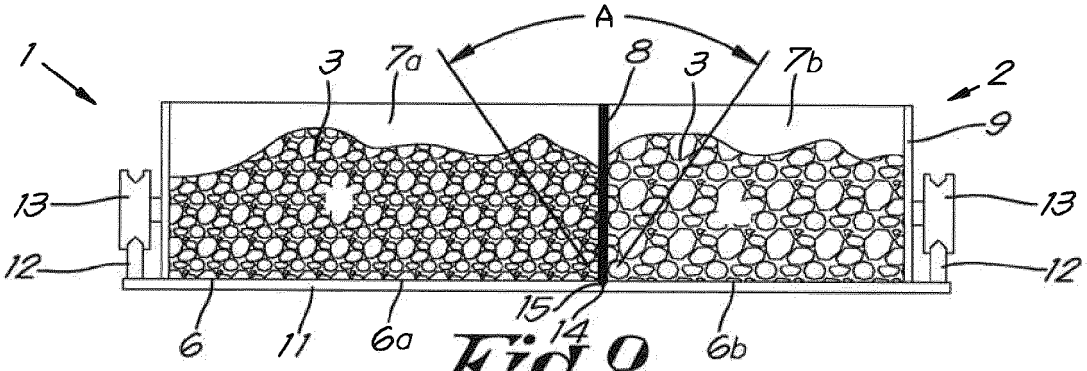

Fig. 2

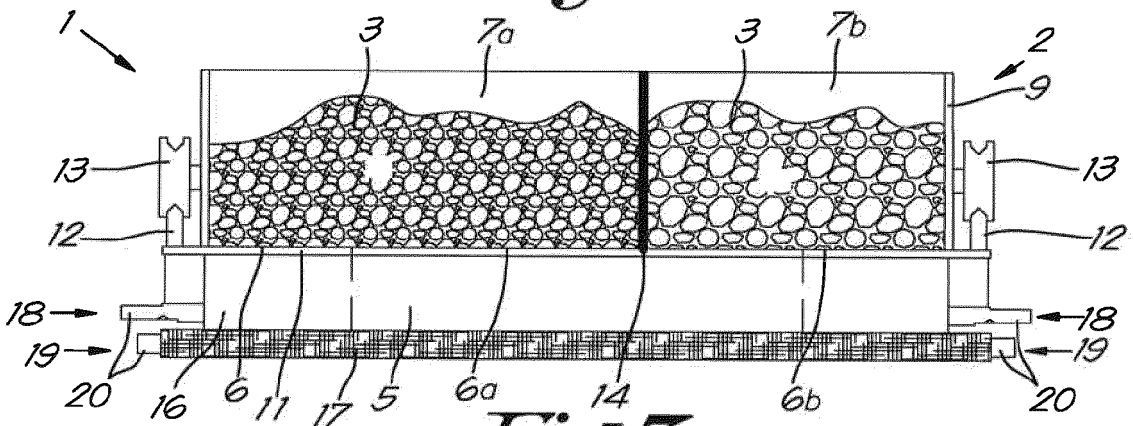

Fig. 3

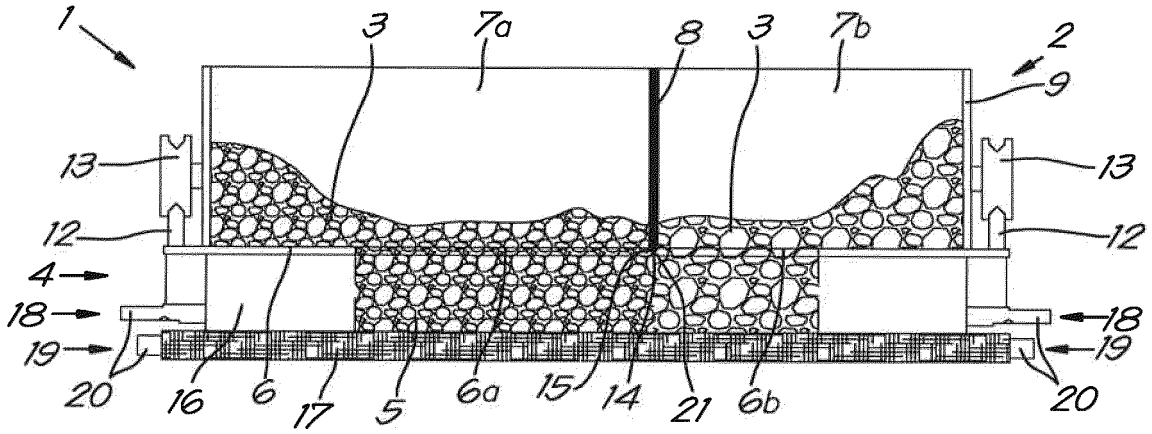
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Fig.4

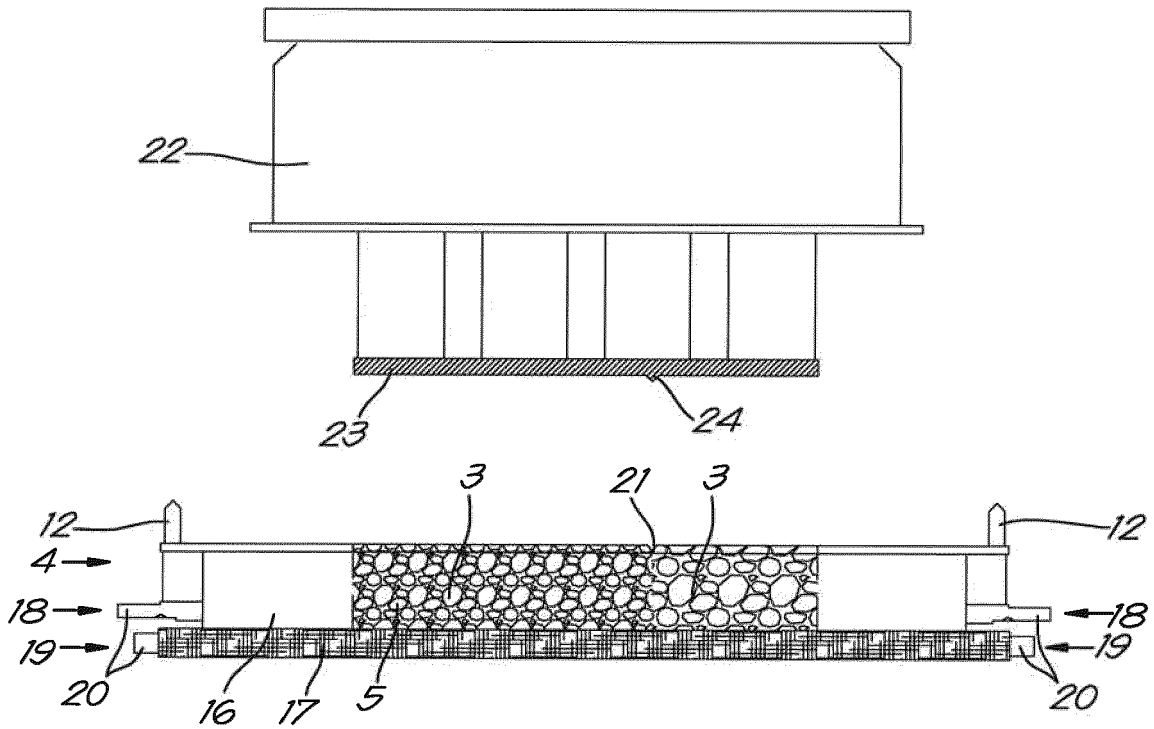
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Fig.5

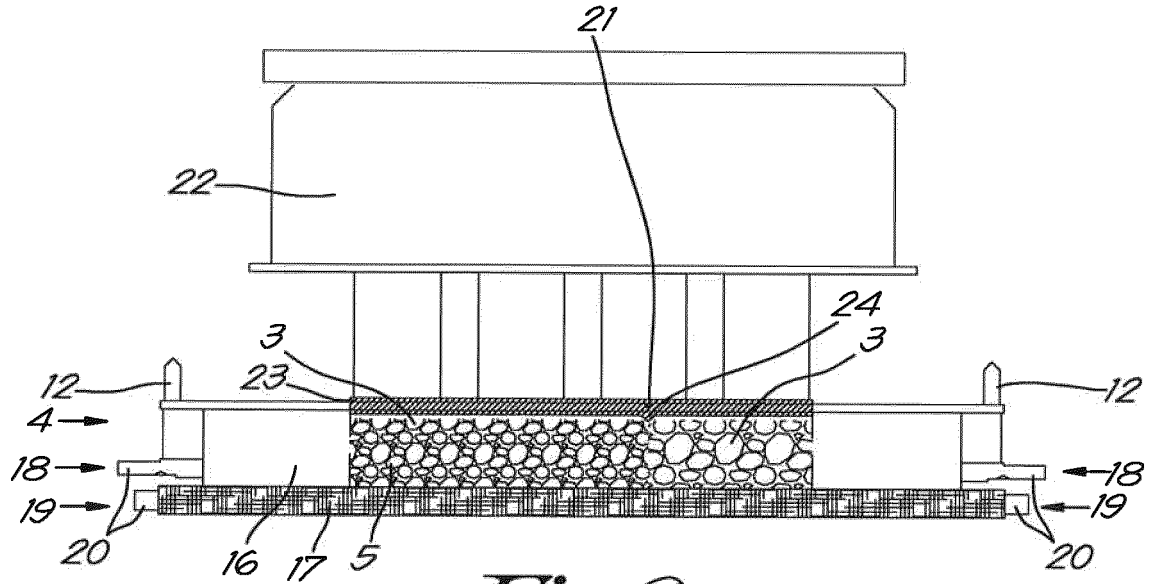

Fig.6

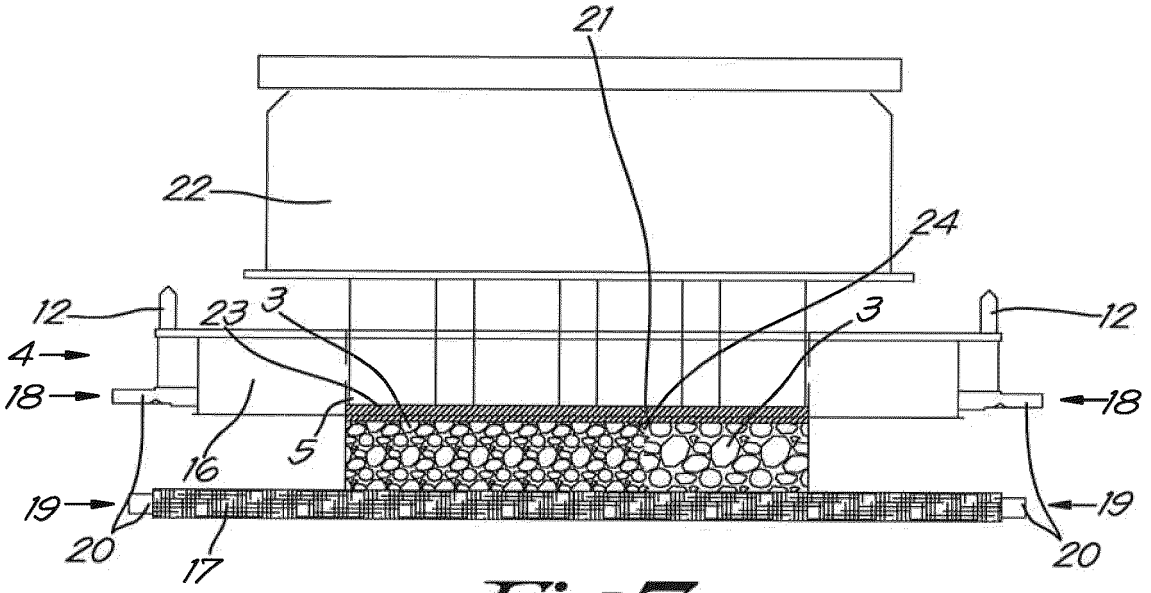

Fig.7

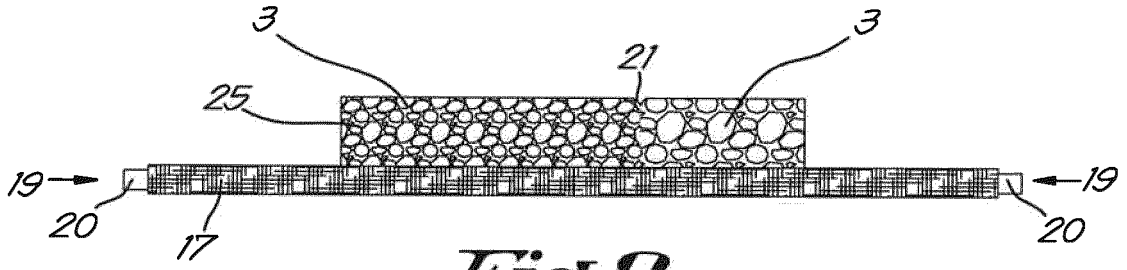

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 1088

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Place of search	Date of completion of the search	Examiner
The Hague	10 September 2020	Orij, Jack

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