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(54) Method and device for dosing, mixing and applying a specific mortar.

(57) A method and device for dosing, mixing and applying a mortar suitable for pointing, bricklaying and/or floors and consisting of at least an adhering or binding agent such as a cement and a sand fraction in addition to water, in which method use is made of at least one silo (1) provided with compartments for each fraction, wherein the fractions are dosed volumetrically, the different volumes of fraction are mixed with water to a batch suitable for applying the mortar, whereas according to the invention the total weight of the fractions present in the dosing chambers is measured additionally during dosing, and using these readings as control signal for discharging the fractions out of the dosing chambers, so obtaining the correct rate of the different components for the mortar.

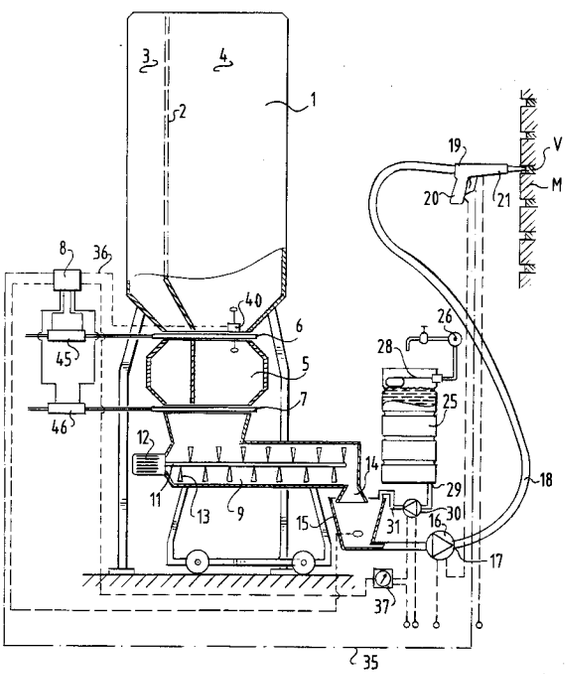

FIG.1

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The invention relates to a method and device for dosing, mixing and applying a mortar suitable for pointing, bricklaying and/or floors and consisting of at least an adhering or binding agent such as a cement and a sand fraction in addition to water, in which method use is made of at least one silo provided with compartments for each fraction, wherein the fractions are dosed volumetrically, the different volumes of fraction are mixed with water to a batch suitable for applying the mortar.

The drawback to volumetric dosing is that during discharge from the silo into the volumetric dosing chambers some fractions can take on a different specific weight per batch. This occurs because of the comparatively small flexibility of the granules in the fraction, whereby particularly in the case of cement much too little may end up in the batch compared to the sand, which has an adverse effect on the quality of the ultimately obtained mortar.

The invention has for its object to improve the above method by measuring the total weight of the fractions present in the dosing chambers during dosing and using these readings as control signal for discharging the fractions out of the dosing chambers.

Owing to these readings it is possible when there is too small a supply of a particular fraction to block the discharge from the dosing chambers until the correct weight is reached through intervention by additional means or personnel. In addition this provision results in a fully automatic dosing operation in the applying of the mortar.

It can also occur in the known methods that the fractions can remain adhered in the dosing chamber(s) so that the batch for discharging obtains unequal proportions. In order to obviate this drawback the invention proposes to also measure the zero weight of the metering chambers, only after reaching which the mixing of the fractions can take place and the dosing unit be released for a new batch.

According to a further proposal of the invention it is recommended to set the fractions in the dosing unit into vibration so that the desired maximum filling weight is achieved with certainty and the emptying of the dosing chambers is likewise ensured.

According to a particularly simple control system according to the invention it is recommended to supply the water quantity in accordance with a constant volume flow on a time basis. Only the time has to be set herewith to obtain the correct quantity of water.

An accurate water volume flow is ensured by a constant control of the intake pressure of the water supply.

The invention further relates to a device for performing the method according to the invention. The device is distinguished in that use is made of at least one silo provided with compartments for each fraction, a dosing unit arranged beneath the silo with a chamber of predetermined volume arranged for each fraction and an intake valve arranged between silo and dosing unit and an outlet valve arranged beneath the dosing unit, in addition to a control circuit for opening and closing the intake and outlet valves in turn, wherein the invention proposes to provide the control circuit with a measuring means for determining the maximum filling weight of the dosing unit and the zero weight thereof, this such that the intake valve is closed when the maximum filling weight is reached and the outlet valve is closed when the zero weight is reached.

According to a further development the dosing unit is provided with a shaking or vibrating means, for example an eccentric masses motor.

Recommended for use as measuring means is a strain gauge rod arranged between the silo wall and the wall of the dosing unit. The zero weight and the maximum weight of the dosing unit can be determined herewith in simple manner and used as signal for the control circuit.

In order to effect a constant water volume flow the invention proposes to use a time controlled feed pump of determined capacity. In a further development the inlet of this feed pump is connected to the outlet of a water tank with level control. Due to this level control the pressure at the inlet of the feed pump is constant or virtually constant so that a precisely adjustable quantity of water can be supplied to the mixing device.

The control circuit is also provided with a signal generator at the spray nozzle for applying the finished mortar so that a new batch can be supplied each time by re-starting the dosing cycle.

According to another embodiment the dosing unit consists of a housing slidable relative to the outlet of the silo and provided with a number of dosing chambers and with a valve closing the outlet opening of the silo, wherein beneath the slidable housing is a fixed base plate having a passage opening moved relative to the outlet opening of the silo for discharging the fractions into the dosing housing.

Mentioned and other features will be further elucidated in the figure description hereinbelow of a number of embodiments. In the drawing:

Fig. 1 shows a schematic, standing side view of a device for performing the method according to the invention,

fig. 2 shows a detail on enlarged scale of a part of the device, in particular the dosing unit according to a second embodiment,

fig. 3 is a perspective top view of the underside of the silo with dosing unit according to a second variant,

fig. 4 is a side view of the embodiment of fig. 3 which is provided here however with a weight measuring means.

The device according to fig. 1 consists of a silo 1 which is divided into two compartments by a partition 2. The smaller compartment 3 can for instance be used for storing cement, while the compartment 4 may contain sand. It will be apparent that within the scope of the invention more partitions 2 can be arranged in the silo 1 if more fractions are required for the mortar, or that more than one silo can be used.

Arranged under the silo 1 is a dosing unit 5, wherein an in-feed valve 6 is slidable between the dosing unit 5 and silo 1 and an outlet valve 7 is slidable beneath the dosing unit 5 such that the passage between silo 1 and dosing unit 5 is respectively released and closed and on the other side the outlet opening of the dosing unit 5 is released and closed by the valve 7. Control of the valves is carried out by a central control unit 8 which is further elucidated below. Connecting onto the underside of the dosing unit is a mixing device 9 which can be of random type but consists here of a trough-like housing 10 in which a shaft 11 is rotatably received. The shaft 11 is set into rotation by a motor 12, wherein the shaft 11 is provided with stirring and transporting members 13. At the ends remote from the motor 12 the trough-like housing 10 is embodied with an outlet opening 14 which connects onto a funnel-shaped inlet opening 15 of a transporting pump 16. The latter has an outlet 17 onto which is connected a flexible hose 18 which leads to the spray nozzle 19 of randomly adapted form. The spray nozzle 19 consists here of a pistol-grip 20 with dosing pipe 21 suitable for applying pointing mortar in the joint V of a brick wall M. This embodiment of the spray nozzle 19 is purely random and can be substituted by nozzles for feeding floor mortar onto a pre-cast underfloor or for supplying bricklaying mortar when arranging bricks for a wall.

Finally, it is noted that a water tank 25 is arranged which is connected to a water main 26, whereof a mains pressure conduit 27 leads to a level control 28. The drain opening 29 of the tank 25 is connected to a pump 30, the outlet of which leads via tube 31 to the funnel 15 of the mortar pump 16.

According to the invention diverse motors and valves are actuated by a central control unit 8. The central control unit 8 is embodied for this purpose with a measuring means 40, for instance in the form of a rack bar, see fig. 2, which is arranged between the wall of the silo 1 and the wall of dosing unit 5. The rack bar can be of random form and to increase accuracy can be embodied with one or more strain gauges 41 which are freely available commercially. A determined maximum weight and a zero weight of the dosing unit 5 can be determined with the strain gauges 41, wherein the total dosing unit 5 can be suspended from three or more rack bars 40, which bars are distributed uniformly over the periphery thereof, or from one bar 40, wherein the upper flange 42 of the dosing unit is suspended pivotally at 43 on the lower flange 44 of the silo.

The valves 6 and 7 are operated for instance by respective control cylinders 45 and 46 of pneumatic or hydraulic type which are actuated by the central control unit 8. Finally, a control signal can be generated with the spray nozzle 19 via line 35 to the central control unit 8.

The control unit 8 is connected via line 36 to the motor 12 and the motor 30 via the time switch 37.

Motor 16 is energized by means of the handgrip of the spray nozzle 19.

Dosing according to the invention takes place as follows: Assuming that the central control unit 8 has received a signal from the spray nozzle 19 that the dosing cycle can begin, valve 6 is opened by means of the control cylinder 45. From the compartments of silo 1 a quantity of cement and sand fraction passes into the dosing chambers of dosing unit 5, whereafter, when a maximum weight has been reached which is detected via the rack bar 40, the valve 6 is returned to the closing position via the control cylinder 45. The outlet valve 7 can then be opened via cylinder 46 whereby the content of the dosing unit 5 passes into the mixing unit 9, after the motor 12 has already been started beforehand by the central control unit 8. Due to the transporting and mixing action of the members 13 an intensive mixing of the fractions takes place which exit via the outlet opening into the funnel 15. The time clock 37 provides for a delayed starting of the pump 30 which, using the same time clock 37, is only set into operation for a predetermined time. A fixed volume of water is specified for this time, which volume is not influenced by the inlet pressure of the pump 30, since this is held constant in view of the small difference in liquid level in the tank 25. After draining a quantity water for a batch of mortar the water is immediately topped up owing to the level control 28.

A level detecting means 50 in the funnel 15 finally provides for zero setting of the central control unit 8 so that the total cycle can begin once again following the signal from the spray nozzle 19.

It is noted that the pump motor 16 is controlled by the spray nozzle 19 independently of the central control unit 8.

The central control unit 8 can also be provided with a protection during the zero measuring of the dosing unit 5 such that, after reaching the zero weight, the valve 7 is returned to the closed position. Thus ensured is that the dosing unit 5 is completely emptied.

Proposed in fig. 2 is to embody the dosing unit 5 with a vibrating or eccentric mass motor 51, which is preferably arranged on the side of the cement dosing chamber. Thus is ensured that the dosing unit 5 is set into vibration and a correct quantity of cement can be carried out of the silo into the dosing unit in order to reach the desired weight in volumetric measured cement fraction.

Fig. 4 shows an embodiment wherein the dosing unit consists of a dosing housing 55 provided with three dosing chambers 56. The latter connect onto the compartment silo 1 which is provided here with two partitions P'. Because the partitions are arranged at a determined position in the dosing housing 55, the content of the dosing chamber 56 in the dosing housing 55 will differ depending on the desired volumetric mixing of the fractions for the mortar. The dosing housing 55 is closed on the underside by a fixed base plate 57 which leads to a passage opening 58 of a downward oriented funnel 59. The funnel 59 connects for instance onto a mixing device 9 from fig. 1.

The dosing housing 55 is also provided with a closing plate 60 fixed thereto, the breadth of which corresponds with the breadth of the outlet opening of the silo 1 and the length of which corresponds with the length of travel of the dosing housing 55 when this can slide reciprocally in the direction of arrow P1 from the position drawn in fig. 3 to the position above the passage opening 58. The sliding of the housing 55 can be carried out in random manner and is depicted here as a gear rack and gear wheel drive, wherein the gear rack 61 is fixed to the valve 60 and the gear wheel 62 is driven by a reversible motor 63.

Fig. 4 shows an embodiment which corresponds substantially with that of fig. 3, with the understanding that in the base plate 57 is arranged a measuring device 64 which can generate a signal to the central control unit 8 such that only when a determined filling weight is reached in the dosing housing 55 is the displacing of the housing 55 started by the starting signal for the motor 63 from the central control unit 8. Mixing and applying will otherwise take place in the manner as described with reference to fig. 1.

The invention is not limited to the above described embodiments.

Claims

1. Method for dosing, mixing and applying a mortar suitable for pointing, bricklaying and/or floors and consisting of at least a bonding agent or binder such as a cement and a sand fraction in addition to water, in which method use is made of at least one silo provided with compartments for each fraction, wherein the fractions are dosed volumetrically, the different volumes of fraction are mixed with water to a batch suitable for applying of the mortar, characterized in that during dosing of the fractions the total weight of the fractions present in the dosing chambers is measured and the readings are used as control signal for discharging the fractions out of the dosing chambers.

2. Method as claimed in claim 1, **characterized in that** after emptying of the metering chambers the zero weight of the dosing chambers is also measured, which reading is used as control signal for starting the following dosing step.

3. Method as claimed in claim 1 or 2, **characterized in that** the fractions are set into vibration during dosing.

4. Method as claimed in any of the foregoing claims, **characterized in that** the quantity of water for a batch is supplied in the form of a constant volume flow which is controlled on a time basis.

5. Method as claimed in claim 4, **characterized in that** the pressure of the volume flow of water is held constant.

6. Device for performing the method as claimed in any of the foregoing claims, which device is provided with at least one silo having compartments for each fraction, a dosing unit arranged beneath the silo having a chamber of predetermined volume arranged for each fraction, and an in-feed valve arranged between silo and dosing unit and an outlet valve arranged beneath the dosing unit in addition to a control circuit for opening and closing the in-feed and outlet valves in turn, **characterized in that** the control circuit is provided with a measuring means for determining the maximum filling weight of the dosing unit, this such that the in-feed valve is set into closed position by the control circuit when the maximum filling weight is reached.

7. Device as claimed in claim 6, **characterized in that** the outlet valve is set into a closed position by the control circuit when the zero weight of the dosing unit determined by the measuring means is reached.

8. Device as claimed in claim 6 or 7, **characterized in that** the dosing unit is provided with a shaking or vibrating means, for example an eccentric masses motor.

9. Device as claimed in any of the claims 6-8, **characterized in that** as measuring means at least a strain gauge rod, if necessary provided with one strain gauge, is arranged between the silo wall and the wall of the dosing unit.

10. Device as claimed in any of the foregoing claims 6-9, **characterized in that** the control circuit is provided with a signal generator at the spray nozzle for applying the finished mortar for re-starting the dosing cycle for manufacturing a new batch.

11. Device as claimed in any of the foregoing claims 6-10, **characterized in that** a time controlled feed pump of determined capacity is arranged for supplying the water quantity for a batch.

12. Device as claimed in claim 10, **characterized in that** the inlet of the feed pump is connected to the outlet of a water tank with level control.

13. Device provided with a silo having compartments for each fraction, a dosing unit arranged under the silo with a chamber of predetermined volume arranged for each fraction, **characterized in that** the dosing unit consists of a housing slidable relative to the outlet of the silo and provided with a number of dosing chambers and with a valve closing the outlet opening of a silo, wherein beneath the slidable housing is arranged a fixed base plate having a passage opening moved relative to the outlet opening of the silo for discharging the fractions out of the dosing housing.

14. Device as claimed in claim 13, **characterized by** the steps as claimed in any of the claims 6-11.

15. Device as claimed in claim 13, **characterized in that** a measuring means is arranged in the base plate for determining the total filling weight and the zero weight of the dosing unit.

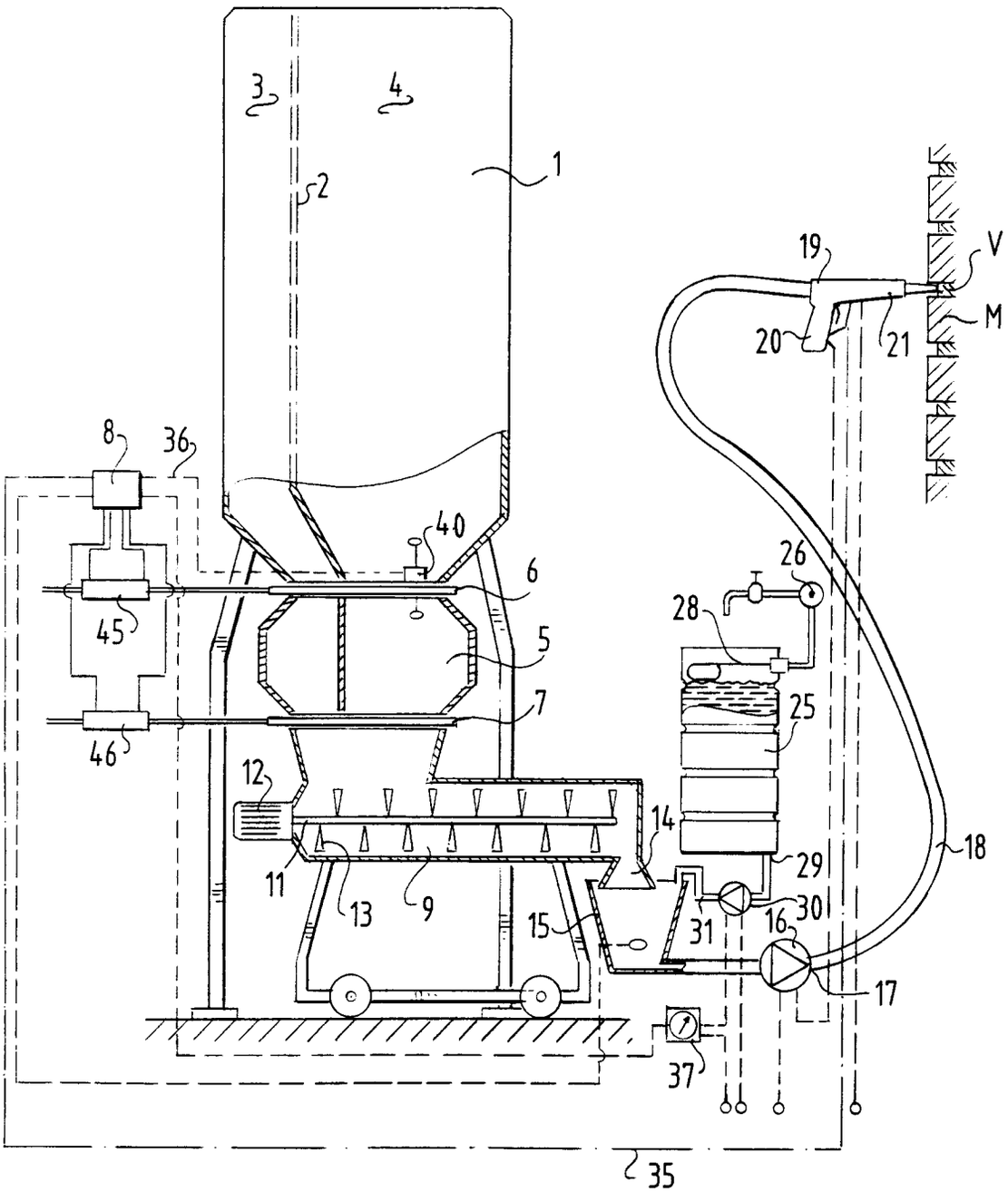
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FIG.1

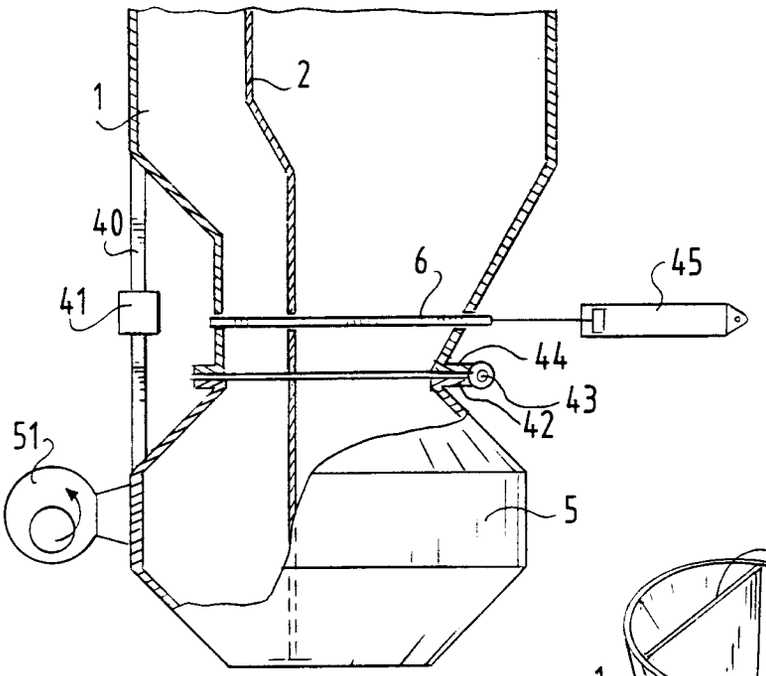

FIG.2

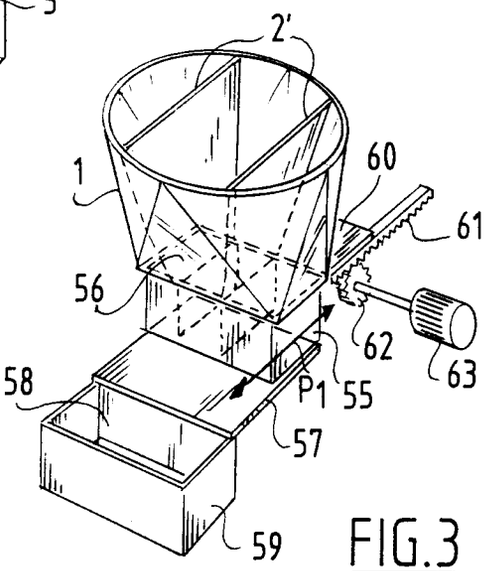

FIG.3

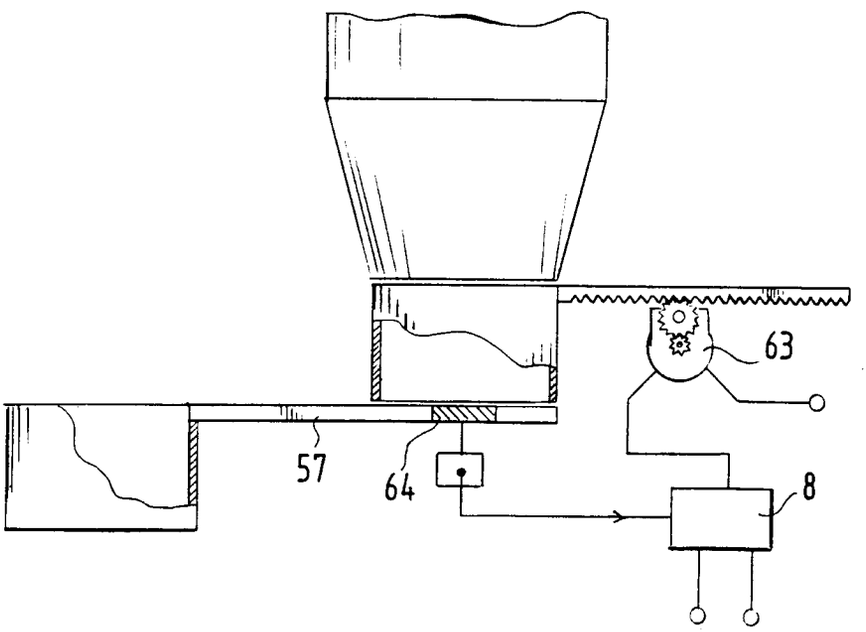

FIG.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 20 2749

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 697 054 (MORATSCHEK) * abstract; figures *	1,4-6, 11,12	B28C7/04
X	US-A-3 002 575 (APPEL) * column 2, line 4 - column 2, line 18; figures *	1,6	
A	FR-A-1 193 639 (EGLI) * page 1, column 2, paragraph 1; figures *	3,8	
A	US-A-3 220 499 (BERESIC) * column 2, line 14 - column 2, line 21; figures *	3,7	
A	US-A-2 922 610 (BALE) * column 3, line 12 - column 3, line 22; figures *	3,7	
A	GB-A-2 091 906 (LIEBHERR) * abstract *	10	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	US-A-1 378 572 * figures *	13	B28C
A	BE-A-628 847 (ESCOFFIER)		
A	BE-A-566 739 (MERTENS)		
A	US-A-3 058 622 (BALLESRA)		
A	US-A-3 746 313 (WEEKS)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 JANUARY 1992	PEETERS S.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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