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(54) **METHOD AND APPARATUS FOR MANUFACTURING CONCRETE ELEMENTS**

VERFAHREN UND VORRICHTUNG ZUR HERSTELLUNG VON BETONELEMENTEN

PROCEDE ET APPAREIL DE FABRICATION D'ELEMENTS EN BETON

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(56) References cited:
WO-A-85/04362 **CH-A- 401 794**
DE-B- 1 135 356 **GB-A- 1 302 188**
GB-A- 1 360 517 **US-A- 2 607 099**

EP 0 690 775 B1

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Description

[0001] The object of the invention is a method for manufacturing concrete elements, in which method backing plates are transferred on a transferring device to a conveyor, along which the backing plates are being moved, concrete is continuously fed by a feeding device onto a backing plate in a compacting machine which is situated near the feeding device, fresh concrete is pressed into the desired shape in a compacting machine and cut continuously into desirable sizes of concrete elements by using a cutting device.

[0002] Different kinds of concrete elements have been manufactured for a long time and many kinds of methods have been used in their manufacturing process. For the moment, amongst the most typical methods are: casting of concrete into a previously manufactured mould, compaction of concrete into a mould and pressing it in a form onto a fixed bed. In document WO 85/04362 has been described a method for producing a prestressed, continuous concrete product. In this method moulds are provided with prestressing wires. Document DE-B-1135356 shows concrete elements with reinforcing bars.

[0003] The disadvantage of previously known methods is the inflexibility of production and the periodicity of production essentially attached to them. It is not easy to change production to suit different kinds and/or different shapes of products such that their strength properties remain satisfactory. Much manual labour is needed in changing the shape of the final product and this is expensive. In addition, the equipments which are in use are large in size and usually require a great deal of production space.

[0004] The aim of the invention is to bring forward a method for manufacturing concrete elements, such that, by the use of this method, disadvantages connected with present methods can be avoided. In particular, the aim of the invention is to bring forward a method for continuously and economically producing concrete elements which are sufficiently strong, variable in shape and have different kinds of structures.

[0005] The aim of the invention is achieved with the method characterized in the following claims.

[0006] In the method according to the invention, reinforced bars are cut into suitable sizes according to sizes of the elements to be manufactured, precut reinforcing material is fed to the compacting machine from a reinforcing device, which is situated before a concrete feeding device, into concrete, and the concrete elements are cut by the cutting device into desired bevels with respect to the moving direction of the conveyor. As reinforcing material, any material suitable for this purpose can be used, like reinforcing bars or the equivalent. Reinforcing bars are cut into suitable sizes according to the sizes of the elements to be manufactured, either before they are placed into the reinforcing device or they can be automatically cut continuously from a coil. By means of an

automatic reinforcing device, concrete elements can obtain sufficient strength, and the structural properties of the concrete elements can be changed quickly and straightforwardly.

[0007] The place of cutting is the space between backing plates so that the packing plates do not obstruct the cutting. The backing plates can also in some embodiment be shaped so that they have places at which cutting can occur. With this method, concrete elements can be continuously cut into desired sizes and bevels. The extruded concrete can also be cut in a normal manner by using a cutting device which cuts perpendicularly.

[0008] In a favourable embodiment of the method according to the invention, the shapes of the inner parts of the compacting machine and the shapes of the surfaces of the backing plates are changed to obtain variably shaped concrete elements, the said surfaces of these backing plates being against the concrete element. The inner parts of the compacting machine can be detached from the compacting machine and changed. In this way, elements can be obtained which have different kinds of outer surface, side surfaces and inside part which are formed in the compacting machine. In addition, the shapes of the inside surfaces of the backing plates can be changed so that also the shape of this surface of the concrete can be changed. Shaping parts can be fastened removably on the inside surfaces of the backing plates. Alternatively, several forming parts with different kinds of inside surface can be used and be changed when the shape of the element to be manufactured changes. By using cutting devices, extruded concrete which comes as a continuous casting can be cut into the desired sizes of elements. With the help of this method, elements can be produced either as individual pieces, small series or mass production series. The changes in the shapes and structures of the elements are easy to make and quick to do. The changes can also be done while production is in progress.

[0009] In the method according to this invention, backing plates and the elements on them are transferred favourably from the conveyor to a temporary store and, after a desired time, moved from the temporary store to an unloading station where the concrete elements are removed automatically from the backing plates.

[0010] When using this method, the concrete elements are favourably transferred from the unloading station after a desired period of time to a surface treatment device where their surfaces are treated. For the surface treatment, one of generally known methods can be used as, for instance, polishing, sand or grain blasting. Elements can stay at the unloading station for a desired period of time so that they can be brought to the surface treatment at a certain degree of hardening, and thus one can influence the results of the surface treatment.

[0011] In the following, the invention will be explained in more detail by referring to the attached drawing in

which

fig. 1 shows a schematic representation of a plan view of the production line, partly in cross-section and in this production line the method according to this invention has been applied,

fig. 2 shows a side view of a production line according to fig.1, and

fig. 3 shows an elevated plan view of some embodiments of concrete elements which have been manufactured by using the method and the apparatus according to this invention.

[0012] A production line or equipment according to figures 1 and 2 consists of a conveyor 2, several backing plates, a transferring device 1 for transferring backing plates to the conveyor, a reinforcing device 7, a concrete feeding device 3, a compacting machine 4, cutting devices 5 and 6, a temporary store 8, an unloading station 9 and a surface treatment device 10. The devices have been mentioned in the same order as they appear on the production line. All the devices have been placed sequentially in the immediate vicinity of the conveyor system. The production line is relatively small in size and does not require large production areas.

[0013] As a conveyor system in this embodiment a circular chain conveyor is used but, in other embodiments, other conveyor systems which are suitable for the purpose can be used. The transferring device 1 for backing plates has been arranged to lift the backing plates at the level of the conveyor and to move the backing plate to rest on the conveyor. The reinforcing device 7 comprises steering apparatus which are used for feeding reinforcing bars on to certain places in the compacting machine, these reinforcing bars having been previously cut into suitable sizes. The concrete feeding device 3 is a continuous feeding device which, in this embodiment, is an upwards and downwards opening funnel-shaped device. Concrete is continuously fed into the feeding device, and this concrete flows partly on top of backing plates which are being moved underneath and partly on top of compaction devices 11 which belong to the compacting machine 4 which is in connection with the feeding device. The compacting machine 4 is used for producing the shape of the concrete element. The compaction devices are at least partly screwshaped, longish devices which are partly underneath the feeding device. In addition, the device comprises inner parts of the compacting machine 12 which form the top and the side surfaces of concrete elements when concrete is being pressed against the inner surfaces. Correspondingly, the surfaces of the backing plate form the bottom surfaces of concrete elements. The compacting machine comprises several differently shaped inner parts which are removably fastened to it and several differently shaped surfaces of backing plates, which are facing against the concrete element. When concrete is being fed from the feeding device, the compaction devices are rotating and

simultaneously pressing fresh concrete against the inside surfaces and the backing plate thus making the structure compact and producing the shape of the concrete element. By changing the shape of these compaction devices, either hollow-cored concrete elements or solid concrete elements can be manufactured. When cores are wanted in the element, a smooth extension of every compaction device forms the core of the desired size in the element. The inner parts of the compacting machine are changed according to the shapes of the element to be formed when production must be changed to an element of a different shape. Also the shape of the inside surface of the backing plates can be changed when production changes, this shape forming the other surface of the concrete element. This can be done either by changing the inside surface itself or by changing the shapes of the backing plates.

[0014] At some distance from the compacting machine there is a cutting device 5 for cutting the extruded concrete in a perpendicular direction, and at a set distance from it there is another cutting device 6 for cutting the concrete element in a bevelled manner regarding the forward direction of the conveyour. As cutting devices in this embodiment are cross-cutting saws. The crosscutting saw 5 is moved resting on a support which reaches over the conveyor. The cross-cutting saw 6 has been fastened reversibly to a support next to the conveyor so that its angle with respect to the conveyor system can be changed.

[0015] When applying the method and the apparatus according to the invention, backing plates are moved on a transferring device 1 to a conveyor system 2 continuously one after another such that there remains a short distance between them. By using a concrete feeding device 3, concrete is continuously fed on the top of the backing plate and, by using a compacting machine 4 and the backing plate, a desired shape can be formed on the concrete element. In case reinforcing material is needed, it is fed from a reinforcing device 3 into the concrete in the compacting machine. As the extruded concrete moves forward resting on the backing plates and the conveyor, it is cut by using a cutting device or cutting devices 5, 6 into elements of desired shapes and sizes.

[0016] From the conveyour, the backing plates and the concrete elements on top of them are moved to a temporary store 8 where they can be stored in piles to await the next phase. By using transferring devices, the backing plates with their concrete elements are moved to an unloading station 9 where the concrete elements are loosened from the backing plates. The concrete elements are transferred to a surface treatment device 10, and the backing plates are transferred back to the beginning of the production line or to a store. The surfaces of the concrete elements are treated in the surface treatment device in a desired manner.

[0017] By applying the method and apparatus according to the invention, sufficiently strong and variably shaped concrete elements can be manufactured contin-

uously. According to figure 3, elements can be at least solid 13, hollow-cored 14, reinforced 15, non-reinforced, smooth 16 or profiled 17 in their surface and sides or bevelled 18 in different directions at their ends. Concrete elements can be manufactured either from normal concretes or from special lightweight concrete mixtures.

[0018] The invention will not be limited to the described favourable embodiment but it may vary within the frame of the innovative idea formed by the claims.

Claims

1. A method for manufacturing static concrete elements, in which method backing plates are transferred on a transferring device (1) to a conveyor (2), along which the backing plates are being moved, concrete is continuously fed by a feeding device (3) onto a backing plate in a compacting machine (4) which is situated near the feeding device, fresh concrete is pressed into a desired shape in the compacting machine (4) and cut continuously by a cutting device (5, 6) into desirable sizes of concrete elements, **characterized** in that reinforcing bars are cut into suitable sizes according to sizes of the elements to be manufactured, the pre-cut reinforcing bars are fed to the compacting machine (4) from a reinforcing device (7) which is situated before the concrete feeding device (3), and that the concrete elements are cut by the cutting device (6) into desired bevels with respect to the moving direction of the conveyor.
2. A method according to claim 1, **characterized** in that the shapes of the inner parts of the compacting machine (12) and the shapes of the surfaces of the backing plates are changed to obtain variably shaped concrete elements, the said surfaces of these backing plates being against the concrete element.
3. A method according to claim 1 or 2, **characterized** in that from the conveyor (2) the backing plates and the elements are moved to a temporary store (8) and after a desired time, moved from the temporary store to an unloading station (9) where the concrete elements are loosened from the backing plates.
4. A method according to claim 5, **characterized** in that the concrete elements are transferred from the unloading station after a desired time to a surface treatment device (10) where their surfaces are treated.

Patentansprüche

1. Eine Verfahrensweise zur Herstellung von Beton-

fertigelemente, in welcher Verfahrensweise Pressezwischenplatten mit einer Schiebervorrichtung (1) auf eine Transportvorrichtung (2) übertragen werden, welcher entlang die Pressezwischenplatten befördert werden, Beton wird unaufhörlich mit einem Anbringer (3) auf die Pressezwischenplatten in einer Stampfmaschine (4) zugegossen, die in der Nähe von dem Anbringer gestellt worden ist, frischer Beton wird in eine gewünschte Form in der Stampfmaschine (4) gepresst und kontinuierlich mit einer Schneidemaschine (5, 6) in die gewünschten Formaten der Betonfertigelemente geschnitten, dadurch **gekennzeichnet**, dass Armierungsseisen in zugeeigneten Längen nach den Formaten der zu herstellenden Betonfertigelemente geschnitten werden, die vorgeschrittenen Armierungsseisen werden aus einer Armierungsvorrichtung (7) in die Stampfmaschine (4) hereingebracht, die sich bevor dem Betonanbringer (3) befindet, und dass die Betonfertigelemente mit der Schneidemaschine (6) mit gewünschten Schrägschnitten in die Bewegungsrichtung der Transportvorrichtung geschnitten werden.

2. Eine Verfahrensweise nach dem Patentanspruch 1, dadurch **gekennzeichnet**, dass die Formen von den inneren Teilen der Stampfmaschine (12) und die Formen von den Oberflächen der Pressezwischenplatten geändert werden, um zu ihren Formen variierende Betonfertigelemente zu erhalten, weil die gesagten Oberflächen der Pressezwischenplatten sich gegen die Betonfertigelemente befinden.
3. Eine Verfahrensweise nach dem Patentanspruch 1 oder 2, dadurch **gekennzeichnet**, dass aus der Transportvorrichtung (2) die Pressezwischenplatten und die Elemente in ein Zwischenlager (8) übertragen werden und, nach dem Verlauf einer gewünschten Zeit, aus dem Zwischenlager zu einer Entladungsstation (9) übertragen werden, wo die Betonfertigelemente aus den Pressezwischenplatten ausgelöst werden.
4. Eine Verfahrensweise nach dem Patentanspruch 3, dadurch **gekennzeichnet**, dass die Betonfertigelemente, nach dem Verlauf einer gewünschten Zeit, aus der Entladungsstation zu einer Oberflächenbehandlungsanlage (10) befördert werden, wo sie oberflächenbearbeitet werden.

Revendications

1. Méthode de fabrication d'éléments de béton statiques dans laquelle les contreplaques sont transportées sur un dispositif de transfert (1) jusqu'à un convoyeur (2), le long duquel les contre-plaques sont déplacées, le béton est introduit continuellement

par un dispositif d'alimentation (3) sur une contre-plaque dans la machine de compactage (4), située près du dispositif d'alimentation, le béton frais est pressé dans la forme souhaitée dans la machine de compactage (4) et coupé continuellement à l'aide d'un dispositif de découpe (5,6) en éléments de béton de tailles désirées, **caractérisée** en ce que les barres d'armature sont coupées en tailles adéquates, selon les tailles des éléments à fabriquer, les barres d'armature précoupées sont introduites dans la machine de compactage (4) à partir d'un dispositif de renforcement (7) qui se trouve avant le dispositif d'alimentation de béton (3), et en ce que les éléments de béton sont taillés par le dispositif de découpe (6) en biseaux désirés par rapport à la direction de mouvement du convoyeur.

2. Méthode suivant la revendication 1, **caractérisée** en ce que les formes des parties intérieures de la machines de compactage (12) et les formes des surfaces des contre-plaques sont changées afin d'obtenir des éléments de béton de formes variées, lesdites surfaces de ces contreplaques étant contre l'élément de béton.
3. Méthode suivant la revendication 1 ou 2, **caractérisée** en ce que les contre-plaque et les éléments sont transportés du convoyeur (2) à un entrepôt temporaire (8) et dans un délai souhaité, de l'entrepôt temporaire à la station de déchargement (9) où les éléments de béton sont détaches des contre-plaques.
4. Méthode suivant la revendication 3, **caractérisée** en ce que les éléments de béton sont transportés, dans un délai souhaité, de la station de déchargement au dispositif de traitement de surface (10) où leurs surfaces sont traitées.

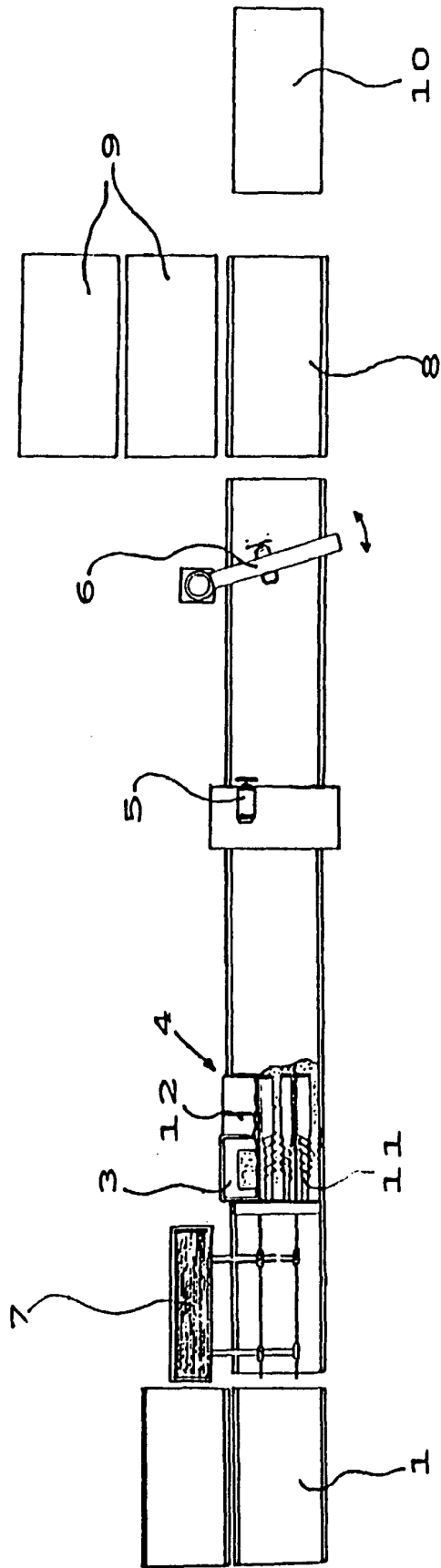


FIG. 1

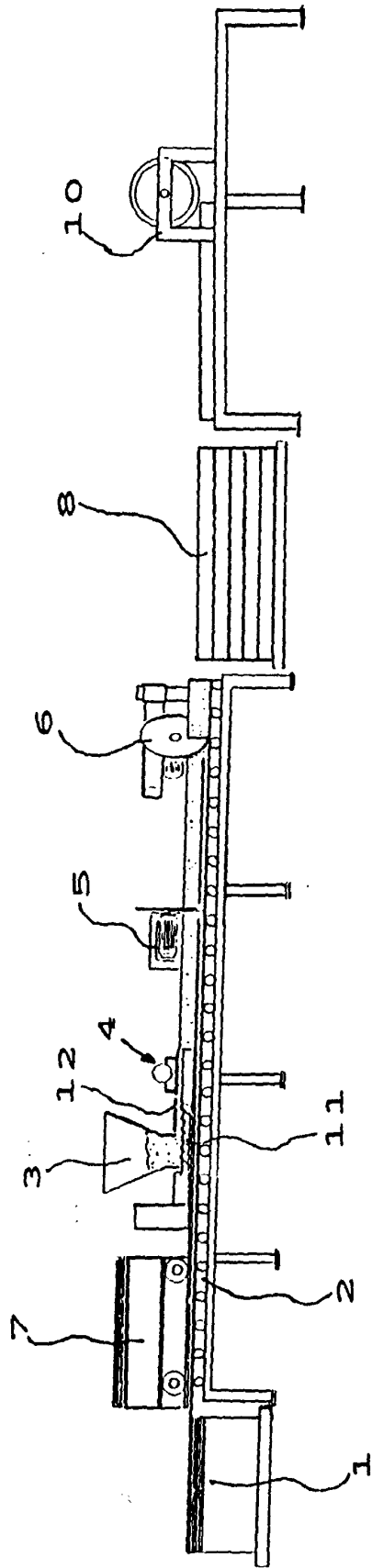


FIG. 2

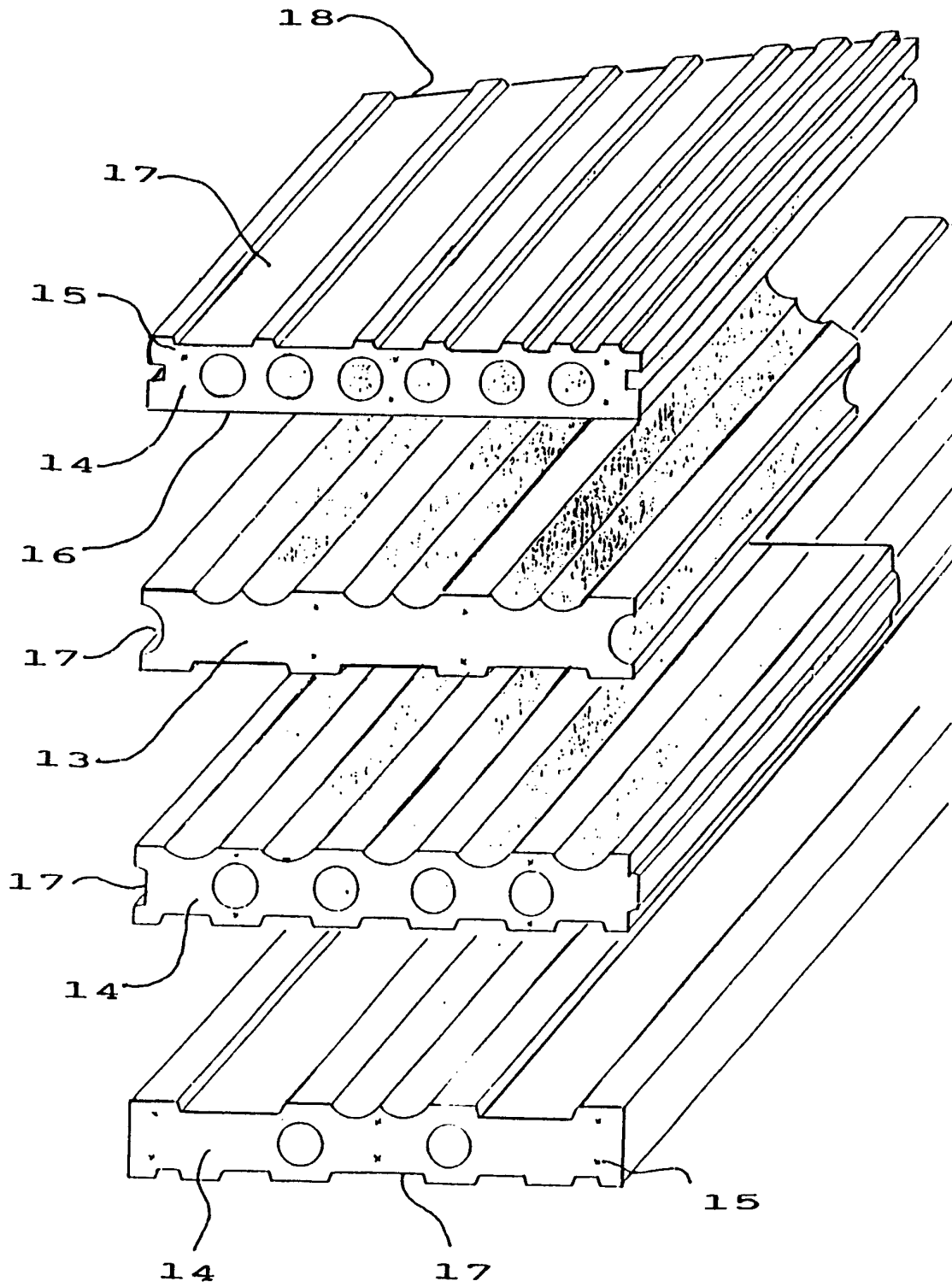


FIG. 3