(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 689 916 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.01.1996 Bulletin 1996/01

(21) Application number: **95109994.4**

(22) Date of filing: **27.06.1995**

(51) Int. Cl.[6]: **B28B 13/02**, B28B 1/08, B28B 1/16, B28B 1/00, E04C 2/04

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **01.07.1994 DE 4423200**

(71) Applicant: **SPAVIK, S.A.**
E-22420 Almunia de San Juan (Huesca) (ES)

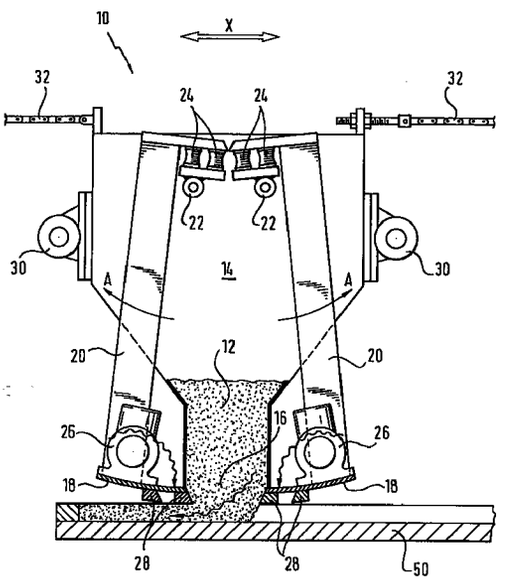
(72) Inventor: **Virgilio, Marco Gracia**
E-22420 Almunia de San Juan, Huesca (ES)

(74) Representative: **Görg, Klaus, Dipl.-Ing. et al**
D-81925 München (DE)

(54) Process for producing a plate-like prefabricated member

(57) For producing a plate-like prefabricated member (200), concrete is lead into a discharging apparatus, comprising a container (14), a closure (18) and a vibrator (26) attached to the closure (18) such that the material leaving the container and the material discharged into the mould (50) is vibrated. A layer of concrete is cast in a mould (50) and the casting is subsequently dried. By using a casting template (300), webs (206) which form channels (208,210) therebetween can also be performed according to this process .

Fig.1



EP 0 689 916 A2

Description

The present invention relates to a process for producing a plate-like prefabricated member.

Such a process is known from DE-GM 86 25 477. In this, the prefabricated member is cast in a base mould which is open towards the top and has an attachable profile mould cover. The base mould is arranged on a vibrating table. In this known process, fresh concrete is first filled into the base mould and the profile mould is then placed on top of the base mould. Subsequently, light concrete is poured in and the entire mould is vibrated. In this way, both types of concrete are permanently connected with each other by vibrating the freshly poured concrete.

In this known production process, it has proved to be disadvantageous that the entire mould must be vibrated during the casting process, as a relatively complicated and thus expensive vibrating table is required for this.

Additionally, the plates produced according to the known process have a compactness and surface finish which still require improvement.

It is therefore the problem forming the basis of the present invention to provide a process for producing a plate-like prefabricated member which allows a cost-effective production of prefabricated members that have high inner strength and at least one side with a very smooth surface.

This underlying technical problem (object) is solved by a process including the features of claim 1.

In accordance with the invention, the preprepared concrete is lead into a discharging apparatus provided with a closure and a layer of concrete is poured into a mould. The concrete which leaves the discharging apparatus and the concrete which is already present in the mould is vibrated by a vibrator arranged on the closure. The casting is subsequently dried.

In accordance with the inventive process, only the closure of the discharging apparatus is vibrated, on account of which a complicated vibrating table is no longer required. Simultaneously, the vibration of the concrete leaving the discharging apparatus in the inventive process is transferred to the concrete in the mould, on account of which it is ensured that the prefabricated member has a particularly smooth surface. Surprisingly, it has been shown that it is not necessary to vibrate the entire mould in an effortful manner. Rather, according to the invention, it is entirely sufficient to only vibrate the closure of the discharging apparatus because the vibrations are transmitted to the concrete already in the mould and also to the mould itself. In this manner, the finished product has at least one side with an extremely smooth surface.

Discharging apparatus for concrete with a vibrator are known from DE 30 41 905 C2 and DD-PS 122 218. However, here the vibrators merely serve as discharging aids and are therefore not provided on the closure of the container.

Advantageous embodiments of the inventive process are defined in the dependent claims 2 to 13.

A second layer of a filling material which can include polystyrene and/or perlite may be placed on the concrete poured into the mould. Such a second layer has very good thermal insulation properties.

According to a further embodiment, a third layer consisting of concrete can be applied on the second layer. In this way, a composite plate is provided which can be especially used as a prefabricated member for forming the interior side of outer walls on account of the good thermal insulation properties. Additionally, in the case of this prefabricated member consisting of three layers, the middle layer being of a different material than both outer layers, an excellent acoustic insulation is achieved, since this composition of different materials in one plate substantially reduces the transfer of the sound waves.

A particularly expedient production process is provided according to claim 4 in that the second and third layers are respectively applied by a second and third discharging apparatus. Additionally, this results in the possibility according to the process of claim 5 to vibrate the materials in the first discharging apparatus more strongly than in the second and third discharging apparatus. In this manner, a prefabricated member can be provided which has one side (first layer) that is completely smooth, whereas the opposing side (third layer) is rougher. As only one of both sides of the prefabricated member must be completely smooth for mounting the prefabricated members onto exterior walls (in contrast to prefabricated members which are used for interior partition walls), it is sufficient in this case that the concrete is only vibrated more strongly in the first discharging apparatus.

Simultaneously, the plate can be more easily secured to a wall with the rougher side.

Particularly good strength of the prefabricated member can be achieved in accordance with claim 6 in that the first, second and third layers are applied one directly after the other. A good connection between the individual layers is produced in this manner.

If a prefabricating member having mounting projections or mounting ribs on one side is to be provided for easier assembly, this can be achieved in a particularly easy manner in accordance with claim 7 in that after process step c) for a certain period of time, a casting template provided with openings is arranged on the already poured concrete layer. Further, a mortar-like mass can be applied on the concrete layer through the openings of the casting template. In this manner, the mortar-like mass guarantees high strength of the projections formed in the openings.

According to a further embodiment of claim 9, the casting template can be placed onto the cast concrete layer under pressure and/or while being vibrated. This causes the already cast concrete layer to be compressed and webs are formed in the openings. Additionally, both the already cast concrete layer and the ensuing webs are vibrated when the casting template is vibrated. It is particularly advantageous in this case when the casting

template is used directly after the pouring of the concrete layer, since a good formation of the webs is achieved.

In a further embodiment according to claim 11, the surfaces produced in the area of the openings can be ground down. This provides a prefabricated member having projections with a particularly high surface accuracy.

A particularly advantageous embodiment of the inventive process results according to claim 12 in that the ground down areas are provided with adhesive before drying and a prefabricated member produced in the same way is adhered to this region provided with adhesive. By applying the inventive process, a "double-wall" prefabricated member can be produced having two completely smooth surfaces at both exterior sides. Excellent acoustic insulation is also obtained in this case, in particular when the webs are produced from a material which is different to that of the plates. Additionally, both plate-like members are not connected with one another with large surfaces, but merely in a "dot-like" manner by means of the webs, the connecting surfaces having an adhesive which, in particular, has elastic properties. In this manner, the acoustic insulation is very much improved, as the transmission of the sound waves through the "dot-like" areas provided with elastic adhesive is considerably reduced. In contrast to common plate-like elements which are either produced of only one material or have connecting areas with a large cross-section, for example longitudinally extending ribs, the sound insulation in the case of the inventive plate member which only has connections within the web-shaped areas produced by an elastic adhesive layer is significantly improved.

A further advantageous embodiment follows from the process according to claim 13. Here, flat insulation material (such as wood, plastic or the like) is adhered to the produced webs, on account of which the insulation behaviour of the element is considerably improved. In the case of a single (not double) plate which is mounted to the outer facade wall, the insulation material lies against the house wall. In the case of the double element (claim 12), the respective insulation materials located on the webs lie adjacent one another.

In accordance with an advantageous embodiment in claim 15, a prefabricated member produced according to the previously described process can have an end face which is provided with a V-shaped groove, a corresponding V-shaped protrusion being provided on the opposing end face of the member. The sections of the opposing end faces which adjoin with the groove and the protrusion can be inclined towards one another as seen in cross-section. By forming the end faces of the members in such a manner, a connection between the individual members that can be very quickly and reliably made is ensured since, on the one hand, the individual members are interlocked with one another by the grooves and protrusions. On the other hand, two connected plates have a small V-shaped spacing on account of the particular design of the end faces outside of the "groove and protrusion" connection. This spacing ensures that the plates can be connected without jamming or tilting, as these only abut in the area of the grooves. Even when there is a little roughness of the walls upon which the prefabricated members are to be mounted, the V-shaped area makes it possible for a quick mounting without tilting to be made and the produced prefabricated member wall is completely flat.

If the groove and protrusion are arranged off-centre on the end faces, a completely closed surface is provided after mounting the prefabricated members in which only minimal space is present between the individual prefabricated members.

In the plate-like prefabricated member according to claim 17, the first and third layers include white cement, the casting material of the second layer and, under the circumstances also the third layer, in particular containing grey cement. This allows considerable costs to be saved, as grey cement is approximately 50% cheaper than white cement. The prefabricated members also have a suitable appearance. As often only one side of the prefabricated member faces into the living space, it is sufficient in this case that only one layer of the prefabricated member is produced from white cement.

A particularly advantageous embodiment of a plate-like prefabricated member is provided in accordance with claim 18 in that several channels are formed in the prefabricated member which respectfully connect two end faces with one another, the channels intersecting at an angle of 90°.

A wall member of concrete having several parallel through-channels is known from NL-7 100 454. However, it has been discovered that such channels extending in only one direction of the prefabricated member are not sufficient to ensure a quick and thus cheap laying of supply lines through the prefabricated members. It is ensured on the one hand by means of the intersecting channels in the prefabricated member that supply lines can be lead through the member in every direction. On the other hand, the channels contribute to good thermal insulation and to a light weight with high stability.

In the advantageous embodiment according to claim 19, the prefabricated members can be quickly and simply intermeshed with one another on account of which a partition wall can be set up in a short time.

If the channels of the prefabricated member are formed by separate webs which are arranged in a grid-like manner, high stability of the prefabricated member is achieved while several supply channels are simultaneously provided, which provides great flexibility.

If the webs extend in the longitudinal direction of the member and have greater strength than the remainder of the member, a particularly high compactness and total strength of the prefabricated member is achieved.

According to a further embodiment of the invention, the webs can particularly include grey cement. This again allows for great savings in cost as the webs lying in the inner region of the prefabricated member cannot be seen from the outside and can therefore be made

from the approximately 50% cheaper grey cement. As the share of cement in the total costs is approximately 40%, the cost savings made in this way are considerable. Additionally, recyclable aggregate can be used as the material for the webs so that costs are also saved in this way.

In view of the inventive process initially described, it is a further object of the invention to provide a discharging apparatus for concrete-like materials which allows cheap production of prefabricated members with a smooth surface.

This object is solved by a discharging apparatus including the features of claim 25.

In accordance with the invention, the discharging apparatus has a container with a closure which allows the discharge of the material. The discharging apparatus is designed such that a vibrator is mounted on the closure.

The process described in claim 1 can be particularly advantageously carried out on account of this design of a discharging apparatus. It has been surprisingly found that it is not necessary to vibrate the entire container or even the mould, as in vibrating the closure, the vibrations from this are transmitted to the material which is just leaving the container. The vibrations are also transmitted to the already poured casting material and even to the mould itself during this.

In an advantageous embodiment according to claim 27, a dampening member is provided between the closure, which can be vibrated, and the container for the concrete-like material. This ensures that the produced vibrations are only transmitted to the closure and not to the entire container. Accordingly, only the concrete leaving the container is vibrated, but not the concrete remaining in the container so that there is no unmixing of the individual components of the concrete (such as sand and cement).

According to a further embodiment, at least one projection or rib can be provided on the underside of the closure. On account of this projection or rib, the surface of the casting material can be smoothened while discharging the concrete. If the discharging apparatus is moveable, the prefabricated members can be particularly efficiently produced by moving the discharging apparatus over the mould.

The present invention is described in the following in a purely exemplary manner with reference to preferred embodiments, in which:

Fig. 1 shows an embodiment of a discharging apparatus for carrying out the inventive process;

Fig. 2 shows a perspective view of a prefabricated member according to the invention;

Fig. 3 shows a view of a joint between two prefabricated members according to Fig. 2;

Fig. 4 shows an inventive prefabricated member provided with channels; and

Fig. 5 shows a casting template placed on a mould for producing a prefabricated member shown in Fig. 4.

As Fig. 1 shows, the discharging apparatus 10 for concrete-like material 12 consists of a container 14 with a closure which allows the discharge of the material 12. The container 14 is conically tapered in the lower region and forms a discharge opening 16 at its end. The discharge opening 16 can be closed by two slightly curved plates 18. Both plates 18 are respectively secured to one end of a pivoting carrier 20 which itself is pivotably supported on support blocks 22 by pneumatic cylinders. Dampening members 24 are provided between the support blocks 22 and the pivoting carriers 20.

A respective vibrator 26 is mounted to both plates 18 to vibrate the plates. Several projections 28 are formed on the botton of both plates 18.

The entire container 14 together with the pivoting carriers 20 and the parts connected therewith is moveably supported on rollers 30 so that the discharging apparatus 10 can be moved in the direction of the arrow X. Motive power is provided via a chain 32.

As Fig. 1 also shows, the moveable container is arranged above a mould 50 and can be moved along this. The container unit is moved from left to right in Fig. 1 over the mould to cast a prefabricated member. When the mould is reached, each pivoting carrier 20 is pivoted in the direction of arrow A so that both plates open the conical opening 16 of the container 14. The vibrators 26 are simultaneously activated so that the plates 18 vibrate. Subsequently, the container unit is moved over the mould 50 so that this is filled with concrete-like material.

The transmission of the ensuing vibrations is shown with wavy arrows in Fig. 1. As can be clearly seen, the vibrations are transmitted from the vibrators to the plates 18 and from there to the material leaving the container 14. The vibrations are simultaneously transmitted by the discharged material to the mould.

After the mould 50 has been filled, the pivoting carriers 20 are pivoted back against the direction of arrow A so that opening 16 of the container is closed.

A prefabricated member consisting of different layers can be produced in a simple manner with the discharging apparatus described above. For this purpose, the discharging apparatus 10 shown in Fig. 1 is moved several times over the mould and discharges different material each time. More advantageously, several discharging apparatus filled with different materials can be guided one immediately after the other over the mould. In this extremely expedient manner, a multi-layered prefabricated member can be produced which consists, for example, of three layers when three discharging apparatus are provided.

Fig. 2 shows a prefabricated member according to the invention which has three layers.

The prefabricated member 100 shown in Fig. 2 has two layers 102 and 104 of the same material and a mid-

dle layer 106 of a different material. The layers 102 and 104 are produced from a concrete which includes cement, perlite, arlite, cut polypropylene fibers and foamed polystyrene. The middle layer 106 consists of a filling material which includes cement, foamed polystyrene and/or perlite.

One end face 108 of the member 100 is provided with a rib-like protrusion 110, while the oppsoing end face 112 is formed with a complementary groove 114.

As Fig. 2 further shows, a section 116 adjoining the groove 114 and a section 118 adjoining the protrusion 110 are inclined towards one another as seen in cross-section so that these form a trapezoidal surface as seen in cross-section. In this way, the prefabricated members can be intermeshed with one another as shown in Fig. 3.

Fig. 3 shows the end faces of two intermeshed prefabricated members 100, the protrusion 110 of one prefabricated member engaging in the groove 114 of the other prefabricated member. The sections 116 and 118 form a trapezoidal space which makes assembly of the members easier, as no tilting can occur because both members 100 can be moved slightly in a direction perpendicular to the member surface. Furthermore, it can be seen that the groove 114 and the protrusion 110 are arranged off-centre on the end faces of the prefabricated members 100. This excludes completely incorrect mounting of the members.

In the following, the process of producing the prefabricated members shown in Fig. 2 and 3 is described. Initially, the concrete for the first layer 102 of the prefabricated member 100 to be formed is prepared in a mixing apparatus. Subsequently, the discharging apparatus 10 shown in Fig. 1 is filled with the prepared concrete and moved over the mould 50 shown schematically in Fig. 1. The concrete is vibrated during discharge so that the surface of the layer 102 becomes very smooth.

A second and a third discharging apparatus 10 are moved over the mould directly after the above described discharging apparatus 10, the second discharging apparatus 10 being filled with the material intended for layer 106 and the third discharging apparatus 10 again being filled with the same material as contained in the first discharging apparatus 10. The second and third discharging apparatus 10 also vibrate during filling of the material, but considerably less than the first discharging apparatus 10. In this way, it is ensured on the one hand that the surface of the layer 102 has the required smoothness and, on the other hand, that there is a good mutual adhesion between the individual layers. On the other hand, the outer side of the layer 104 must not be as smooth as that of layer 102, as the former does not face into a room, but is secured to a wall.

The described prefabricated members can thus be cheaply produced with the inventive process and have excellent stability despite their large dimensions and comparatively small thickness. The shown prefabricated members are, for example, 2.70 m long, 45 cm wide and have a thickness of only 3.7 cm, the first and third layers 102 and 104 respectively being 8.5 mm thick and the third layer 106 being 20 mm thick.

A further inventive prefabricated member formed with intersecting channels is described in the following with reference to Fig. 4. The prefabricated member 200 shown in Fig. 4 consists of two identically formed partial members 202 and 204 which are stuck together. Each partial member 202 and 204 has end faces which are basically exactly the same as that of the prefabricated member 100 (Fig. 2 and 3). However, the prefabricated members 200 have a number of ribs or also webs 206 which are produced from a different material than layers 205 and 207. The partial members 202 and 204 are stuck together in such a manner at webs 206 that channels 208 and 210 intersecting at an angle of 90° are formed between the ribs. All end faces of the prefabricated member are therefore connected by the channels 208 and 210. The prefabricated members 200 can be easily intermeshed by means of the grooves 214 provided on one end face of the prefabricated member 200 and the protrusions 216 on the opposing end face.

The partial members 202 and 204 are basically produced in a similar manner as the prefabricated member 100 shown in Fig. 2. However, a casting template shown in Fig. 5 is additionally used to form the webs 206.

The casting template 300 shown in Fig. 5 is formed with a number of openings 302 into which the material forming the webs 206 is filled. The casting template 300 is in this case placed under pressure on the first concrete layer 205 or 207 in the mould 50 and simultaneously vibrated by means of vibrators 304. This vibration is on the one hand transmitted to the material which has just been filled in and forms the webs 206, and also to the already present concrete layer 205 or 207. An excellent connection between the web material and the material of the concrete layer is achieved in this way.

The concrete layer 205 or 207 consists of the same material as the layers 102 and 104 of the prefabricated member shown in Fig. 2. The webs 206 are formed of mortar which consists of grey cement and arlite, it also being possible to add recyclable aggregate material. On account of this selection of the material for the webs 206, these have a particular strength so that the prefabricated member as a whole is particularly stable.

The inventive process for producing the prefabricated member 200 shown in Fig. 4 is described in the following. Initially, in a first step, the raw material used for the layer 205 or 207 is prepared. This concrete is laid in the mould 50 while being vibrated, as was already described in connection with the prefabricated member 100. After formation of this first flat layer 205 or 207, the casting template 300 shown in Fig. 5 is placed on this concrete layer under pressure and vibrated by means of the vibrators 304. The mortar intended for the ribs 206 is subsequently poured under vibration into the openings 302 of the casting template 300 by means of a further discharging apparatus 10. The casting template is simultaneously vibrated. In this way, an excellent connection of the materials which are still damp is achieved.

After a certain drying period, the surfaces of the webs 206 of each member 204 or 205 are ground down. After grinding and dusting of the surfaces of the webs 206, these are provided with adhesives and a member 202 is stuck onto an identically formed member 204 as shown in Fig. 4. Subsequently, the prefabricated member produced in this manner is exposed to a further drying stage.

A suitable subsequent treatment can follow in all described processes. Such a subsequent treatment ensures that the product has sufficient strength during casting in order to be removed again out of the casting mold, whereby the hydration of the concrete is maintained. This usually ensures by adjusting the air humidity and the temperature of the ambient air. Following removement of the casting out of the casting mold, the air humidity and temperature are again appropriately adjusted to prevent cracking of the flat surface. Finally, the completed product is dryed with warm air in order to reduce the moisture content to, for example, 10% so that it has the desired strength.

The prefabricated member produced according to the above process is characterized by an extremely smooth outer surface and by strength. The weight of the prefabricated member is simultaneously relatively small and desirably many supply lines can be laid from any end face to any other end face. The outer sides of the prefabricated member 200 have an appropriate appearance on account of the use of white cement. In comparison, the webs 206 inside the prefabricated member are produced with grey cement, on account of which considerable costs can be saved. The prefabricated member also has good thermal insulation properties on account of the channels 208 and 210 formed in the member 200.

The prefabricated member 200 shown in Fig. 4 is 2.70 m long, 45 cm wide and 7.5 cm thick. The webs 206 are arranged in the longitudinal direction of the member 200 at a spacing of approximately 12 cm, the web lengths also being approximately 12 cm. The webs are also arranged at a spacing of approximately 12 cm in the transverse direction of the member 200, which results in a grid-like distribution of the webs. Each individual web 206 has a width of approximately 2.2 cm and a height of approximately 1.6 cm. On account of such an inventive structure, such a member is only approximately 35 kg in weight.

A member 202 or 204 can also be used as a prefabricated member (facade or wall covering)

Claims

1. Process for producing a plate-like prefabricated member, comprising the steps of:

   a) leading concrete into a discharging apparatus provided with a closure;
   b) pouring a layer of concrete out of the discharging apparatus into a mould;
   c) vibrating, by means of a vibrator arranged on the discharging apparatus, the concrete which leaves the discharging apparatus and the concrete which is already in the mould; and
   d) drying the casting.

2. A process according to claim 1, characterized in that a second layer (106) of a filling material which includes polystyrene and/or perlite is applied on the cast concrete (102).

3. A process according to claim 2, characterized in that a third layer (104) of concrete is applied on the filling material (106).

4. A process according to claim 3, characterized in that the second (106) and third (104) layers are applied by means of a second and a third discharging apparatus.

5. A process according to claim 4, characterized in that stronger vibration is carried out in the first discharging apparatus than in the second and third discharging apparatus.

6. A process according to one of the claims 3 to 5, characterized in that the first, second and third layers are applied one immediately after the other.

7. A process according to claim 1, characterized in that after process step c), for a certain time period, a casting template (300) provided with openings (302) is mounted, after which the casting template (300) is removed again.

8. A process according to claim 7, characterized in that a mortar-like mass is applied through the openings of the casting template onto the concrete layer (205,207).

9. A process according to claim 7 or 8, characterized in that the casting template (300) is placed under pressure and/or while being vibrated.

10. A process according to claim 7, 8 or 9, characterized in that the casting template (300) is placed directly after casting of the concrete layer (205,207).

11. A process according to one of claims 7 to 10, characterized in that the surfaces produced in the area of the openings are ground down.

12. A process according to claim 11, characterized in that before process step d) the ground down areas are provided with adhesive and stuck together with the ground down areas of a similarly produced prefabricated member.

13. A process according to one of the claims 7 to 12, characterized in that flat insulating material is applied onto the surfaces produced in the area of the openings.

14. A plate-like prefabricated member produced according to one of the preceding claims.

15. A plate-like prefabricated member produced according to claim 3, characterized in that one end face of the member is provided with a V-shaped groove (114) and the opposite end face with a corresponding V-shaped protrusion (110), and that the sections (116,118) of the opposing end faces which adjoin the groove and the protrusion are inclined toward one another as seen in cross-section.

16. A plate-like prefabricated member according to claim 15, characterized in that the groove (114) and the protrusion (110) are arranged off-centre on the end faces.

17. A plate-like prefabricated member produced according to claim 3, characterized in that at least the first (102) layer includes one or more of white cement, perlite, arlite, cut polypropylene fibers and foamed polystyrene, and that the filling material and/or the third layer include(s) cement, particularly grey cement.

18. A plate-like prefabricated member produced according to claim 12 or 13, characterized by several channels (208,210) formed in the member which respectively connect two end faces with one another and intersect at an angle of 90°.

19. A prefabricated member according to claim 18, characterized in that one end face of the member is provided with two V-shaped grooves (214) and the opposing end face with two corresponding V-shaped protrusions (216), and that the sections of the opposing end faces which adjoin the grooves and protrusions are inclined towards one another as seen in cross-section.

20. A prefabricated member according to claim 18, characterized in that the channels (208,210) are formed by separate webs (206) which are arranged in a grid-like manner.

21. A prefabricated member according to claim 20, characterized in that the webs (206) extend in the longitudinal direction of the member (200).

22. A prefabricated member according to claim 20 or 21, characterized in that the webs (206) have a greater strength than the remaining member (200).

23. A prefabricated member according to claim 20, characterized in that the webs (206) include one or more of the components consisting of grey cement, perlite, arlite, and recyclable aggregate material.

24. A prefabricated member produced according to claim 12, characterized in that the adhesive is elastic.

25. A prefabricated member according to claim 14, characterized in that the webs are provided with insulating material.

26. A discharging apparatus for casting concrete-like materialsin a mould, in particular for carrying out the process according to claim 1, comprising

- a container (14) with an outlet opening (16);
- a closure (18) which closes the outlet opening (16) and enables discharge of the material; and
- a vibrator (26),

characterized in that the vibrator (26) is attached to the closure (18) such that the material leaving the container (14) and the material discharged into the mould is vibrated.

27. An apparatus according to claim 26, characterized in that the closure has a plate (18) which is attached to the vibrator (26).

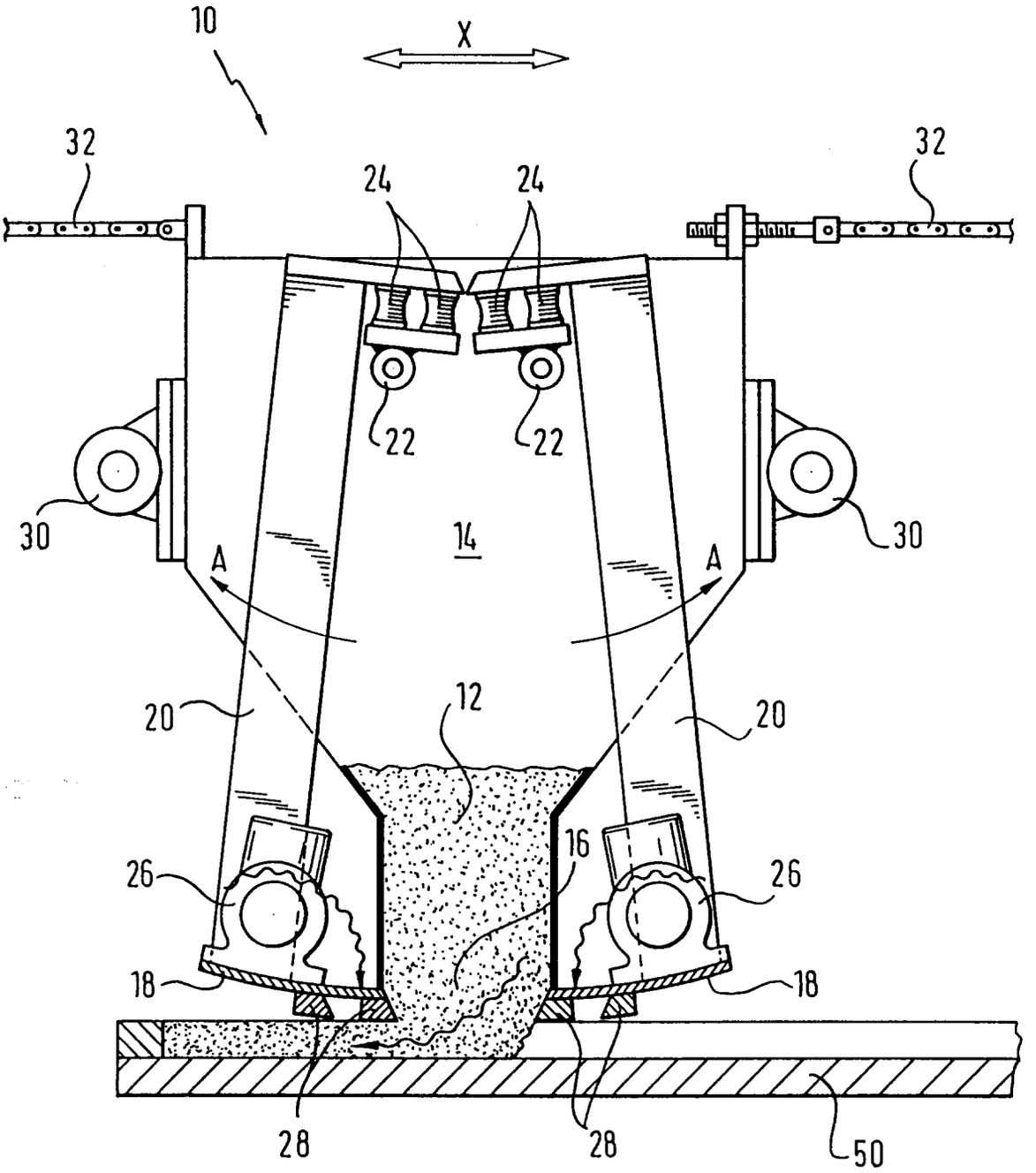
28. An apparatus according to claim 26, characterized in that a damping member (24) is provided between the closure (18) and the container (14).

29. An apparatus according to claim 26, characterized in that at least one projection (28) or rib is provided on the underside of the closure.

30. An apparatus according to claim 26, characterized in that the closure (18) is attached to a pivotable support (20).

31. An apparatus according to claim 26, characterized in that it is moveable.

Fig.1



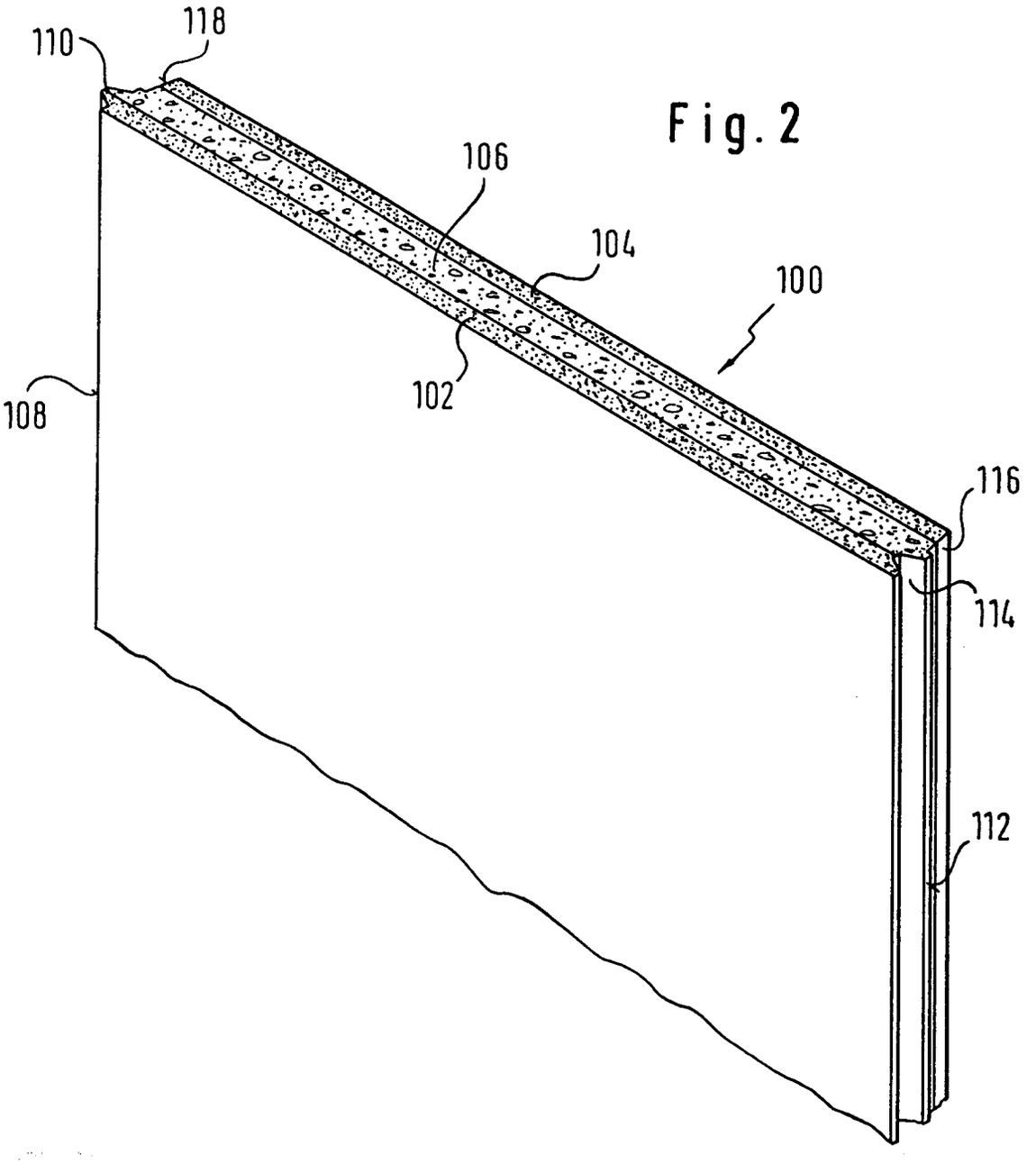
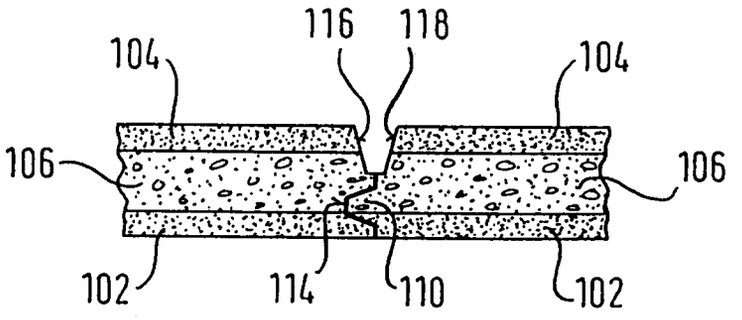

110
118
106
104
100
102
108
116
114
112

Fig. 2

Fig. 3


116
118
104
104
106
106
102
114
110
102

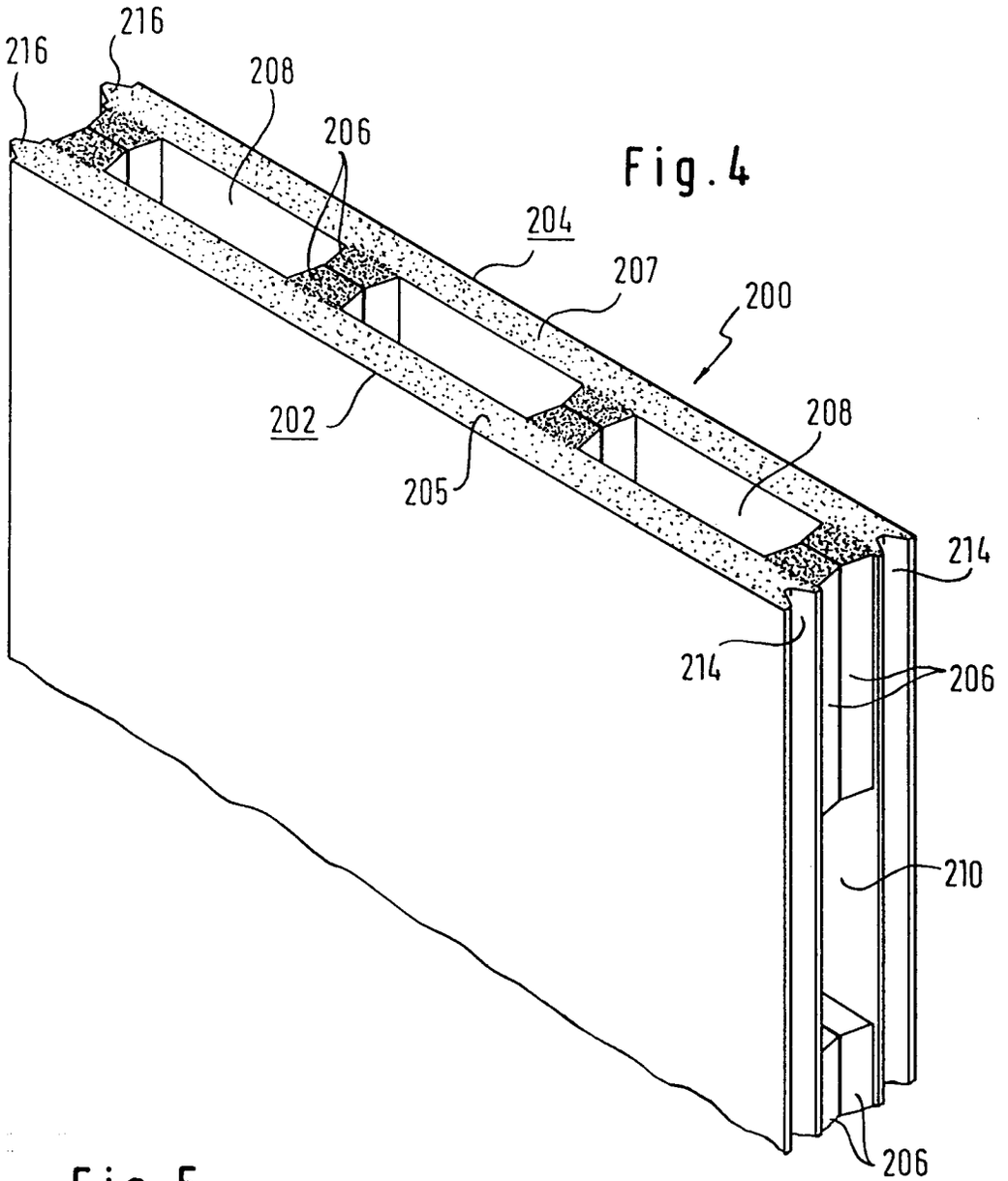
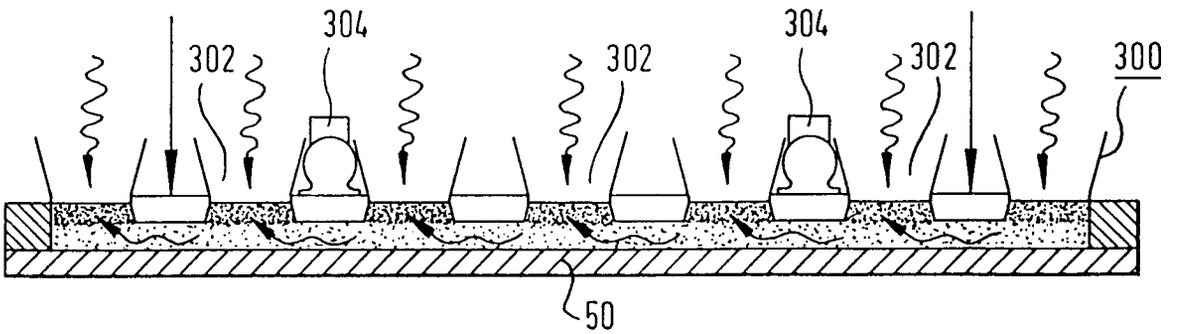

216
216
208
206
204
207
200
202
208
205
214
214
206
210
206

Fig.4

Fig.5


304
302
302
304
302
300
50