(54) Title: A PROCESS AND A DEVICE FOR BUILDING CONSTRUCTIONS

(57) Abstract

This invention is related to a process for forming recesses (1), openings and similar when erecting buildings, especially from cast concrete, especially for doors, windows, and similar, in walls (2) and similar, characterized by arranging for defining said recess, etc., especially for forming a stop end of a concrete casting shuttering against said recess (1), one or more pre-fabricated reveal elements formed from elongated profiled members, the side of said members remote from said recess forming a cavity, which preferably is open in a direction remote from said recess, and comprising a porous filling material (8). The invention comprises also a device for carrying out said process.
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A PROCESS AND A DEVICE FOR BUILDING CONSTRUCTIONS

This invention is related to a process and a device for the production of recesses provided with reveals for doors, windows and similar in walls and similar with the use of pre-fabricated reveal elements, which simultaneously act as stop ends in moulds for casting walls or similar. Said reveal elements suitably have the particular shape defined in the claims and of which examples are shown in the enclosed drawings.

The drawings disclose in:
Figure 1 a section through a casting mould for a wall with a reveal element;
Figure 2 a view of a window reveal element;
Figure 3 a part of a reveal element and a mould, partly in section;
Figure 4 the reveal element part according to Figure 3 as a mould stop end;
Figure 5 a reveal arranged on a mould surface;
Figure 6 a section through a combination of an inner reveal and an outer reveal;
Figure 7 a section through a reveal with a frame;
Figure 8 a section through a reveal with a frame; and
Figure 9 a section through a combination of an inner reveal and an outer reveal.

Figure 1 discloses a section through a casting mould 3 for a
wall 2, of which an already cast part is shown hatched in section in the upper part of the figure and may consist of e.g. concrete. The lower part of the figure discloses the corresponding wall mould cavity comprising a reinforcement mesh 10 prior to casting, said reveal element 4 being bonded to the reinforcement with rods 11 or similar extending from the backside (side facing the concrete wall) of the reveal element, which may e.g. be fastened to the reinforcement 10 with e.g. tie wire. The part of the reveal element 4 facing the recess 1 is preferably provided with good finish, e.g. final finish, and the reveal can be provided with in the reveal or in other way fastened parts or means for fastening door frames, window frames or similar, e.g. parts of wood, plastics or metal, which permit the application of fastening means, e.g. screws, bolts, etc., and are suitably made with a cup-shaped section for partially or completely enclosing a core 8, preferably of heat and/or moisture insulating material, e.g. cellular plastics, cellular glass or similar.

Figure 2 discloses in a sketchy way a window reveal consisting of a pre-fabricated rectangular frame in which the four straight parts of the reveal are fixedly joined to each other so that the reveal can be handled as a unit. The reveal and the reveal elements may, of course, have another, in the particular case suitable shape, e.g. hexahedric, elliptic, etc.

As is obvious from Figure 1 the reveal comprises an outer shell 7 of organic and/or inorganic material, as is stated in the claims, having the stated characteristics.

Figure 3 discloses a section through a reveal (reveal profile) 4 which essentially is in the shape of a U-profile with low sides, or has the shape of three sides of a rectangle comprising a longer side and two thereto connected shorter sides. The inner part of said section is suitably
filled with a porous material 8, e.g. polystyrene foam or similar, and as is shown sketchy the filling material of the section (profile) may extend beyond the outer layer 7 of the reveal 4 at the open side of the outer layer 7 facing the casting mould cavity, which side is intended to be connected to a cast composition filled into the mould, especially concrete. The protruding part of the porous filling material 8 in the reveal profile is shown in Figure 3 as a protrusion 16 at the two sides of the profile. The figure discloses that the protrusions 16 protrude a distance d beyond the outer layer 7 of the reveal 4 on both sides thereof. The longer side of the section has an extension which on the figure is denoted e and which essentially coincides with the thickness of the wall which is intended to be cast, or the internal width g of the mould cavity which it is intended to close with the reveal 4. It is, however, often difficult to make the reveal seal completely against the mould walls, which causes a risk that the cast composition penetrates beyond the reveal. The protrusions 16 may, however, improve the seal against the mould wall if they are compressible and if the total breadth of the reveal and the protrusions e + 2d is equal to or preferably larger than the inner width g of the mould cavity between the mould walls 17. d may e.g. have a length of at least 2 mm, at least 5 mm or at least 10 mm and preferably at most 30 mm, at most 20 mm, at most 10 mm or at most 5 mm, optionally depending on e.g. the material in said protrusions, the wall thickness, the width of the mould cavity, etc. The distance which the protrusions 16 extend in the direction of the thickness of the reveal 4 is on the figure denoted c and may be e.g. at least 5 mm, at least 10 mm, optionally at most 30 mm or at most 20 mm. The thickness of the filling 8 within the profile of the reveal 4 is on Figure 3 denoted with b and may e.g. be from 10 mm or 20 mm to 200 mm or 100 mm. The total thickness of the filling is in the embodiment disclosed in the figure b + c. The thickness of the outer layer 7 is denoted a on Figure 3 and
may e.g. have the values mentioned above and in the following and in the claims.

Figure 4 discloses a section through a part of a mould arrangement with mould walls 17, a reveal 4 according to Figure 3 which seals the mould cavity between the mould walls 17 with the protrusions 16 which act as sealing elements against a cast composition 2 which is filled into the mould cavity. The reveal 4 is maintained in position in the mould cavity e.g. with a two-legged angular transverse support 13 formed by two straight legs which form an angle of preferably 90°. The two legs may also be connected with a brace 20 as is indicated with broken lines on Figure 4. The two legs of the transverse support 13 can at their point of connection be fixedly or pivotably connected to each other, whereby the angle between the legs in the last-mentioned case may be variable, preferably by changing the length of the brace part 20 or the position of the connection point or points thereof to the legs 13a, 13b.

The transverse support 13 is in the figure shown fixed to one of the mould walls 17 with joints (bolt joints) 19, and the reveal 4 is fixed to the transverse support with joints (bolt joints) 18. The recess which is to be formed in the wall is denoted 1.

Figure 5 discloses a square frame shaped reveal 4, which is indicated as being fastened to a mould wall 17 with transverse supports formed by two legs 13a, 13b. The frame 4 comprises four frame parts (reveal parts) 4a - 4d which preferably can have the same cross-section shape, e.g. the shape disclosed on Figures 3 and 4. Figures 3 and 4 can be regarded as corresponding to sections along lines A-A on Figure 5. Transverse supports 13 or other fastening means are suitably arranged at each of the four frame parts 4a - 4d. The reveal frame 4 can be produced as one coherent piece or
from several parts, preferably from profiled rods which are cut or produced to suitable lengths and which can be connected to each other, e.g. along abutting surfaces extending in right angle 21 to one of the frame parts or obliquely 22, preferably at an angle of 45°, to both frame parts. The frame parts can be glued or bonded to each other in other suitable ways at the connection surfaces.

Figure 5 discloses also fastening means for e.g. window frames 23, door frames and similar consisting of pieces 24 of a material which gives support for fastening means, e.g. screws 25, for fastening e.g. window or door frames. The fastening means may consist of e.g. plastics, wood, metal, etc. and may apply against the inner surface of the outer layer 7 of the reveal, be embedded in the filling material 8 of the reveal, be embeddable in the cast composition in the mould cavity or several of said alternatives simultaneously.

Figure 6 discloses an alternative embodiment of a reveal arrangement with an inner reveal 26 and an outer reveal 27, which are shaped so that they fit to each other, preferably along one or more flat or curved contact surfaces 30. The reveal parts are in addition preferably provided with in said parts arranged or embedded elongated profiles 28, 29 of e.g. plastics, metal, e.g. light metal or galvanized steel, or similar, which can give hold for fastening means, e.g. bolt fastening means, for holding together the reveal parts and/or fastening lining boards or other parts.

Figure 7 shows a cross-section through a reveal 4 with an outer layer 7 and a filling material 8, connected to a cast wall 2. En frame 23 is secured in the reveal with screws 25 which have a hold in blocks 24 of e.g. plastics, which are partly cast into the wall 2.

Figure 8 shows an alternative embodiment wherein the screw 25
is secured in a V-profile of plastics or metal which is arranged at the inner side of the outer layer of the reveal.

Figure 9 shows a cross-section through a reveal device which is arranged in a wall. The reveal device comprises an inner reveal element 30 with an outer shell 31 which forms a partly open cavity 32, which suitably is filled with a heat insulating material, especially a foam or cellular plastics material, preferably with closed pores, such as porous polyvinyl, polyethylene and especially polystyrene, but the cavity can also be empty (unfilled) and when casting the reveal into a wall or a similar device be filled with the cast material. According to the disclosed embodiment the inner reveal element 30 is cast into a wall 33 of concrete or similar.

The inner reveal element 30 is at its outwards facing end provided with a set-back or step-off surface 34 which preferably is directed essentially perpendicular to an interface surface 35 formed between the reveal element and the wall 33, or essentially perpendicular to the inner or outer surface of the wall 33, so that the outwards facing part 36 of the profile of the inner reveal element is more narrow, calculated from the interface surface 35, than at least a preferably adjacent part 37 of the further inwards situated part of the profile. From the step-off surface 34 extends a surface part 38 of the inner reveal element 30, preferably to the outer end of said element, said surface part 38 preferably being parallel or nearly parallel to said interface surface 35 (e.g. deviating at most 45 or at most 30° from said interface surface 35).

At the inner reveal element 30 is arranged a thereto fitting outer reveal element 39 with an outer shell 40 which forms an open cavity 41, which similar to the cavity 32 can be filled with a porous material, e.g. those which are mentioned above.
for the cavity 32, or can be filled with other material, e.g. concrete. The outer reveal element preferably has a shape (profile shape) which makes it fit closely to the inner reveal element 30, especially so that the inner part 42 of said element 39 fits to and can be fastened to the step-off-shaped or tapering outer part 36 of the inner element 30, e.g. by press-fitting and/or with a binder at the surface 38. Fastening of the outer element 39 can also be achieved with means for fastening to the wall 33, e.g. brackets 43, e.g. V-profiles, which are fastened to the wall 33, e.g. with bolt or screw joints, and in the outer element 39, e.g. with anchor means 44, e.g. of plastics, preferably of a porous material, suitably with therein secured bolts or screws. The anchor means 44 can suitably be arranged or cast into a porous plastic material which fills the cavity of the outer element. The fastening means 43 may also be connected directly to the outer shell 40 or to anchor means, e.g. of the type mentioned above which are directly connected to the outer shell.

The outwards facing part of the outer reveal is suitably provided with a step-off (set-back) part 45 with a preferably flat outer surface 46, against which e.g. a frame 47, such as a window frame or a door frame or similar, can be applied and fastened, e.g. with bolts or screws, suitably with anchor means 48 arranged in the outer element, e.g. of the same material as the means 44, in which e.g. screws and similar can be secured.

Close to the outer reveal an insulating material 49 can suitably be arranged outside the wall 33, e.g. glass wool or porous plastics. Furthermore, an outer wall, e.g. a tile wall 50 can be arranged outside the wall 33 and the insulation 49.

The outer shells 31, 40 of the elements 30, 39 can be made from e.g. plastics, concrete, fibre reinforced concrete,
plastics concrete (concrete mixed with plastics), optionally with inorganic fibres, e.g. glass fibres, or organic fibres, e.g. plastics fibres, metal, e.g. of iron, such as galvanized iron, stainless steel, aluminum or aluminum alloys, copper and copper alloys. An outer layer of metal or plastics can also be coated on the inner side with e.g. concrete, preferably sprayed concrete, optionally with reinforcement of e.g. fibres, and thereby form a composite outer shell.

The reveal device and the reveal elements resp. are suitably made in one piece, preferably as a coherent four-sided device of four mutually interconnected straight parts, preferably with the same shape of the cross-section (profile), preferably forming a square or rectangular frame with angles of 90° between the straight parts at the connecting corners. For door reveals it may also be suitable to form the device with three interconnected or four interconnected sides with a lower part with a shape of the cross-section which is different from that of the other parts and which is suitable as a door threshold or for being connected to such a means.

As is obvious from that which is stated above the shell which forms the outer part of the reveal, preferably the part facing the recess, can be made from various kinds of inorganic and/or organic materials, e.g. metals, such as light metal, preferably aluminum and aluminum alloys, steel, galvanized and/or plastics coated steel, stainless steel, etc., materials bonded with hydraulic binders, such as Portland cement or other cements, such as concrete, optionally reinforced with inorganic and/or organic fibres, concrete containing organic binders, such as plastics concrete, plastics of the curable or thermoplastic types, such as polyethylene, polypropylene, PVC and similar, polyester plastics or other curable plastics, especially containing various kinds of reinforcements, such as glass fibres and similar. The thickness of the outer part can vary within
broad limits depending upon the material and the size of the reveal, but can be selected so that the reveal can withstand the intended casting pressure from the surrounding cast composition, optionally with supports at least at one point between the end points of the longest reveal element part, or e.g. at most one support per 5 dm longitudinal extension or 1 m longitudinal extension. A common thickness, preferably of sheet (metal sheet), is at least 0.5 mm, at least 1 mm or at least 2 mm, for plastics, concrete and similar often at least 1 mm, at least 2 mm, at least 3 mm or at least 5 mm, and usually the thickness is selected as small as possible with regard to weight and costs, e.g. to at most 30 mm, at most 20 mm, at most 15 mm, at most 10 mm, at most 8 mm or at most 5 mm. Preferably the thickness of said layer is essentially uniform within the entire or main part of the cross-section of said layer, e.g. with a variation of the thickness of at most 50% within at least 50% of the cross-section.

Preferably the reveal is produced with good surface finish on at least the side facing the recess, especially that part which will be visible in the finished building construction. Optionally said part is produced with final finish, e.g. so that no after treatment or only a finishing coating with a surface treating material (painting) is required. This can be achieved by casting of a surface layer forming material, e.g. concrete of various types, against a mould surface having good surface finish, or casting in a mould which remains in the reveal.

The porous filler material which preferably is arranged as a core in the cross-section of the reveal extends preferably along at least 50%, preferably at least 75% or at least 90% and up to 100% of the longitudinal extension of the elongated reveal parts. The porous core may at one or more areas be completely or partly substituted with a less porous or massive material of e.g. plastics, wood, concrete or similar,
e.g. for stiffening and/or preferably for acting as or co-operating with fastening means, e.g. for door or window frames or for joining an outer reveal to an inner reveal, e.g. with screws, bolts, nails or other fastening means. These less porous parts often have an extension of at least 5 and/or at most 20 cm in the longitudinal direction of the reveal part.

The porous filling material may consist of an inorganic and/or organic material. Suitable are e.g. cellular glass or cellular plastics, e.g. cellular polyethylene, polypropylene, polyvinyl chloride and polystyrene, especially polystyrene. Preferably such qualities thereof are used, which have previously been used and preferably accepted for casting into concrete or similar for building purposes, e.g. with a volume weight of at least 20, at least 40, at least 60, at least 80 or at least 100 kilograms per cubic metre. In some cases also a fibrous material can be used, such as mineral wool fibres, e.g. glass fibres or so-called rock-wool. The porous material can suitably be arranged so that it counteracts diffusion or penetration of moisture from the composition cast against the reveal, which can e.g. contribute to protect window frames and similar, which are arranged in the reveal, against moisture damages. It is also suitable that the porous core is bonded well to the outer shell, e.g. by gluing or by being cast into the shell, e.g. by casting the shell in a mould in which the porous core material is arranged as a core which completely or partly is surrounded by the cast shell material, e.g. a concrete material. Optionally the surface of the core material may be made rough in order to improve the bonding.

The part of the outer surface of the reveal which is arranged facing a mould cavity and which preferably acts as an end stop in said mould cavity against a recess for a door, a window or similar, may to the main part be formed by the
porous filling material or core of the reveal. The porous filling material may extend out beyond the shell and have a larger breadth than said shell so that the filling material, especially if it is compressible, can seal against mould cavity walls arranged at a smaller mutual distance than the breadth of said filling material, as is disclosed e.g. on Figures 3 and 4. The shell may, however, also extend inwards over or beyond the filling material from one side of the shell or from both sides thereof, as is disclosed e.g. on Figures 1 and 9, preferably forming flange-like parts (15 on Figure 1) of the cross-section, especially directed essentially perpendicular to the mould wall surface, preferably directed towards each other in case flanges are arranged at both sides of the cross-section. Said inwardly directed flange-like part may e.g. extend at least 1 cm, e.g. at least 2 cm and e.g. at most 5 cm inwards from the outer part of the shell or of a porous core arranged within said shell.

The thickness of the wall which is cast to the reveal can vary within broad limits, e.g. be at least 5 cm or at least 10 cm, and e.g. up to 20 cm, up to 40 cm, or more.
CLAIMS

1. A process for forming recesses (1), openings and similar in building constructions, especially of cast concrete, particularly for doors, windows and similar, formed in walls (2) and similar, characterized by arranging one or more prefabricated reveal elements for delimiting said recess, etc., especially for forming a stop end of a concrete casting mould against said recess (1), said reveal elements preferably along the main part of their longitudinal extension having the shape of elongated profiles, the side (6) of which which faces said recess being formed of a shell (layer) (7) of inorganic or organic material, the side of said shell (layer) remote from said recess forming a cavity which contains a porous filling material (8) which completely or partly is enclosed by said shell (7).

2. A process according to claim 1, characterized in that the shell (7) encloses the filling material (8) only partially, with an opening facing the mould cavity, so that the filling material can be brought into direct contact with a material cast into said mould cavity, such as concrete, and be bonded to said material directly or with a reinforcing material (10) or other intermediate means (11) which makes the bonding to a material cast into said mould possible.

3. A process according to claim 1 or 2, characterized in that said shell has a thickness of at least 0.5 mm, at least 1 mm, at least 2 mm or at least 5 mm, and preferably at most 30 mm, at most 20 mm or at most 10 mm, and in that said shell preferably is made from concrete, sheet, reinforced materials, such as fibre reinforced concrete and/or plastics-concrete.
4. A process according to any of the preceding claims, characterized in that said porous filling material comprises cellular plastic material, preferably with closed pores, such as porous polyvinyl, polyethylene and especially polystyrene.

5. A process according to any of the preceding claims, characterized in that the shell on the side of said reveal element facing the mould cavity is formed with a flange part (15) at each of the outer ends of said shell, which flanges are directed towards each other and preferably essentially perpendicular to the mould wall side, said flanges preferably extending at least 1 cm and preferably at most 5 cm in the inward direction towards the middle of the reveal element, and optionally extending inwards beyond the outer edge of a porous core (8) arranged in the reveal element, preferably a core of foamed plastics or similar, so that said core is kept in said element.

6. A process according to any of the preceding claims, characterized in that said reveal element is arranged in the form of one or more parts, preferably having a straight shape, which form one, two, three or four sides of a door reveal, window reveal, or similar, said reveal preferably being prefabricated in the shape of a finished, frame-shaped unit with two, three or four or more against each other abutting and to each other joined, at least partially essentially straight parts, preferably so that said reveal can be arranged as a unit with essentially the desired final size in said recess and be cast into said recess, preferably by acting simultaneously as a mould stop end in the casting process.

7. A process according to any of the preceding claims, characterized in that the filling material (8) of said reveal element extends outwards beyond the extension
of the outer layer (7) of the reveal element and forms a protrusion (16) which when applying against the mould wall or mould walls contributes to preventing that the casting material cast into said mould penetrates into optionally present interspaces between the reveal element and the form walls.

8. A process according to any of the preceding claims, characterized by arranging at or close to said reveal element, and preferably continuous or connected thereto, holding devices (24) for arranging fastening means (25) for fastening of e.g. a window frame (23), a door frame or other parts at said reveal element.

9. A process according to any of the preceding claims, characterized in that said reveal elements comprise an inner reveal (26) arranged as a stop end of said recess against a concrete casting mould, and an outer reveal (27), which reveals are shaped so that they fit to each other, preferably along one or more flat or curved contact surfaces (30).

10. A device for carrying out the process according to any of the preceding claims, characterized by comprising a prefabricated reveal device (4) comprising one or more reveal elements, which along the main part of the longitudinal extension thereof comprises elongated profiles (profiled bodies) which are shaped so that they can act as a stop end of a wall mould (3) or similar for casting concrete, for forming a recess (1), and preferably for making possible the prevention of intrusion of concrete into said recess during the casting, said elongated profiles comprising a layer (shell) (7) of organic or inorganic material, which layer forms the side of the reveal facing said recess, the side of said layer remote from said recess delimiting a cavity, which preferably is open in a direction remote from said recess and which contains a porous filling material (8).
A. CLASSIFICATION OF SUBJECT MATTER

IPCG: E04G 15/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARED

Minimum documentation searched (classification system followed by classification symbols)

IPCG: E04G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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