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(71) Applicants
Fijon Ltd., Fitzwilton
House, Dublin, 2, Ireland,
Irish Republic
(72) Inventor
Patrick Guy Evans
(74) Agents
Kilburn & Strode

(54) **Artificial granite**

(57) Artificial granite comprises a cured mix of a curable resin and a granular filler, the filler comprising a mix of

1. one or more of
- (a) rock glass chips
- (b) man-made white glass particles
- (c) real quartz particles
2. one or more of:
- (d) black marble chips
- (e) carborundum, and
3. (f) white marble chips.

Or alternatively the filler comprises a mix of crushed marble dust and crushed granite.

An artificial granite product may be made by casting a mix of a curable resin and a granular filler in a mould, the mix having a constituency and a curing rate which allows at least some

of the granular filler to gravitate, allowing the resin at least partially to cure and removing the product from the mould.

An artificial quoin comprising two plate-like interengaging webs lying at an angle to one another may be made by casting one web with a mix of a settable resin and a granular filler in one section of a mould, the one section having an upwardly facing mould surface, at least partially curing the mix in the one section, turning the mould until the second section has a surface facing upwardly and casting the same mix in the second section such that an edge of a second web formed in that section integrates with an edge of the first web, at least partially curing the second web, and removing the quoin from the mould.

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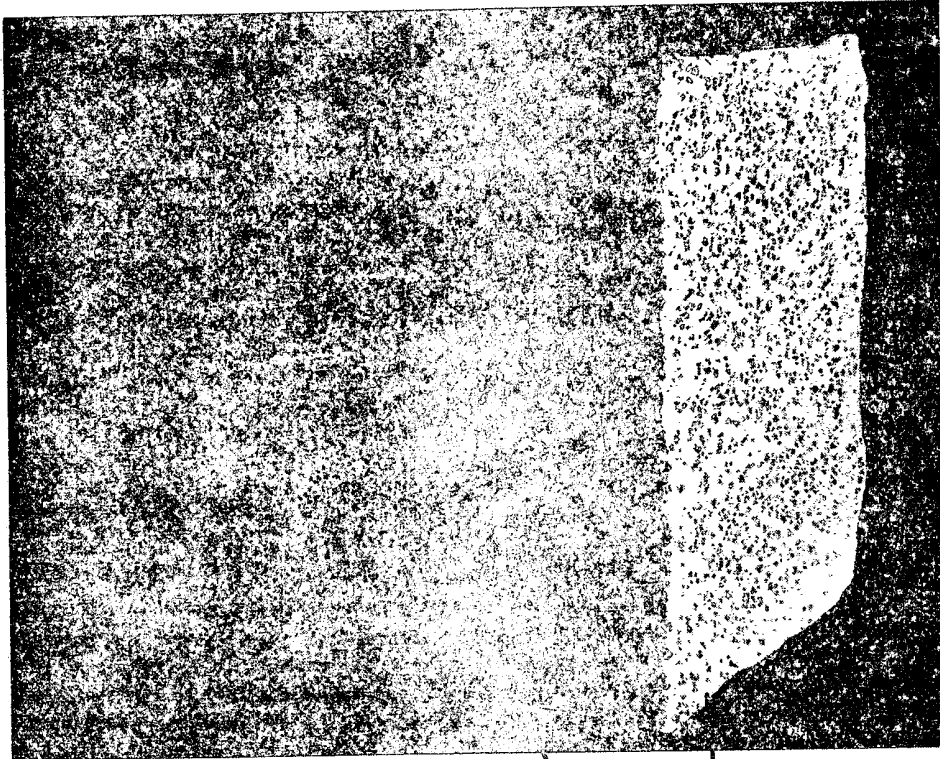


FIG. 10 12

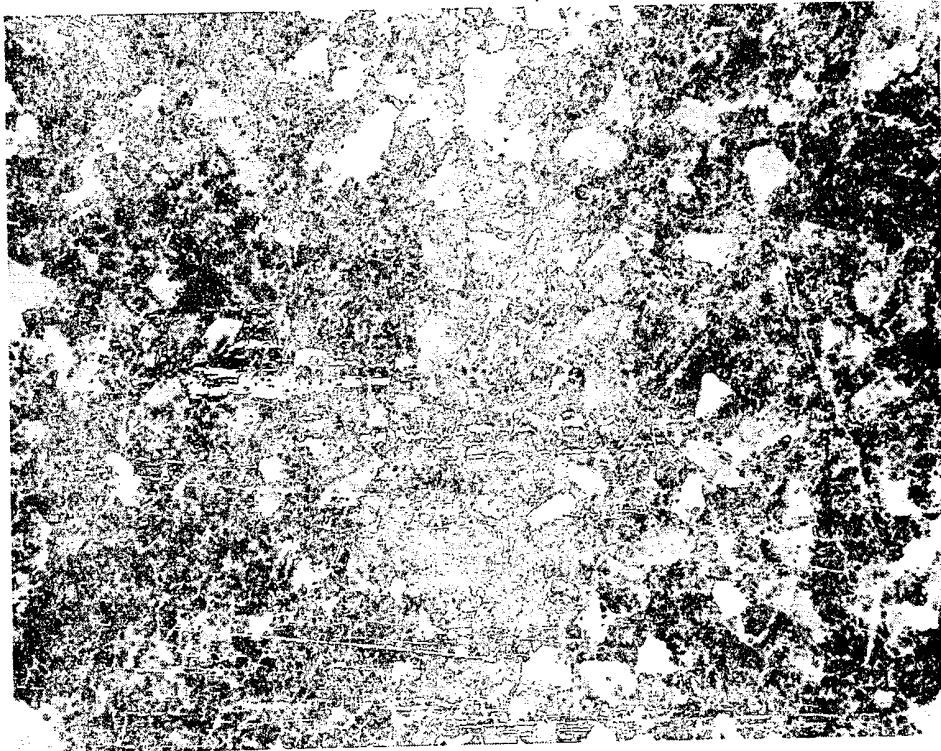


FIG. 2.

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FIG. 3.

18

SPECIFICATION

Artificial granite

This invention relates to artificial granite products and processes for the production thereof.

5 The quarrying of granite and the shaping of pieces of granite, for example for building purposes, is an extremely expensive process and as a consequence in recent years architects and builders have had to look to other materials than granite for building purposes, which is unfortunate because granite provides an excellent building material having very desirable structural and aesthetic characteristics.

10 The production of ornaments, statues or statuettes from granite is also an expensive process due both to the cost of quarrying and the labour involved.

According to one aspect of the present invention, an artificial granite product comprises a cured mix of a curable resin and a granular filler which produces an external surface to the product having a substantially granite-like appearance, the filler including a mix of:—

1. one or more of:
 - 25 (a) rock glass chips
 - (b) man-made white glass particles
 - (c) real quartz particles
2. one or more of:
 - 30 (d) black marble chips
 - (e) carborundum, and
 - (f) white marble chips.

Specifically the resin may be present in a percentage by volume of between 15 per cent and 70 per cent. The filler may be present in a percentage by volume of between 30 per cent and 85 per cent.

Specifically the percentage ranges of the constituents of the filler referred to above by volume are:

- 40 1. 10 per cent to 80 per cent
2. 10 per cent to 80 per cent
3. 10 per cent to 40 per cent

A particularly pleasing appearance is obtained when the filler includes a mix by volume of substantially one third rock glass chips, one third crushed black marble chips and one third crushed white marble chips. Whilst the ratio of resin to filler can vary according to requirements it is found desirable if the resin and filler each comprise substantially 50 per cent by volume of the product. Again the appearance can be varied depending on the size of the constituents of the mix but according to a specific aspect of the present invention, for a coarse blue-grey granite appearance, the rock glass chips and/or the black marble chips, prior to mixing with the resin are passed through a three sixteenth inch (4.8 mm) sieve and that which passes through this sieve is placed in a one sixty-fourth inch (0.4 mm) sieve and briefly shaken to remove a substantial portion (but not all) of the particles smaller than one sixty-fourth of an inch (0.4 mm).

In an alternative mix the carborundum, which is included instead of the black marble chips,

65 comprises one sixteenth inch (1.6 mm) granules substantially without dust.

Desirably the white marble also comprises one sixteenth inch (1.6 mm) to one eighth inch (3.2 mm) granules substantially without dust.

70 In order to produce fine-textured dark blue granite the filler may comprise:

- 10 per cent rock glass chips
- 80 per cent crushed black marble chips or carborundum,

75 and 10 per cent white marble chips. In this case the whole of the mix is passed through a one sixteenth inch (1.6 mm) sieve, and that which passes through the sieve is used as the filler.

80 For a white granite appearance the filler may comprise:

- 80 per cent rock glass chips or man-made white glass particles, or real quartz particles
- 10 per cent crushed black marble chips or

85 carborundum, and 10 per cent white marble chips.

In this case the whole of the mix is passed through a one sixteenth inch (1.6 mm) sieve, and that which passes through the sieve is used as the filler.

90 According to another aspect of the present invention, an artificial granite product comprises a cured mix of curable resin and a granular filler which gives an external surface to the product of substantially granite-like appearance, the filler including a mix of

1. crushed marble dust
2. crushed granite

The crushed granite may be in the form of natural sand. The constituents may be present in the filler in the following percentages:

1. 30 per cent to 90 per cent
2. 10 per cent to 70 per cent

The filler may include crushed white marble chips up to 10 per cent by volume of the filler.

105 In order to obtain the desirable appearance the proportion by volume of the filler is no more than four times the proportion by volume of the resin. Specifically the proportion of resin to filler is one third to two thirds by volume. The external surface may be clear of resin or alternatively may be smooth and have a thin external layer of resin. The resin may include a proportion of pigment in order to obtain the desired coloured effect.

115 The resin employed may be a polyester resin conveniently of a marine grade.

According to another aspect of the present invention, an artificial granite product comprises a plate-like cured mix of a curable resin and a granular filler, the product having one external surface of substantially granite-like appearance, and the density of the filler in the mix adjacent the one external surface being higher than at its other external surface.

125 According to a further aspect of the present invention an artificial quoin comprises two webs of platelike form lying at an angle to one another but integrated along abutting edges and each web including a layer of cured resin and a granular

filler. Any of the products so far described may include a backing layer of glass reinforced cement or a backing layer of glass fibre and a rear surface layer of sand in order to provide a suitable key

5 where the product is used as a facing for a building.

According to another aspect of the present invention a process for the production of an artificial granite product comprises making a mix

10 of a curable resin and a granular filler, casting the mix in a mould having an upwardly facing mould surface which is arranged to give the desired substantially granite-like appearance to the finish of the external surface of the product, the mix

15 having a constituency and a curing rate which allows at least some of the granular filler to gravitate towards the upwardly facing mould surface, allowing the resin at least partially to cure, and removing the product from the mould.

20 Where it is intended to provide the product with an external surface which represents polished granite, the mould surface will be smooth and no further treatment is required to the product after removal from the mould.

25 However, where it is desired to provide the product with the appearance of chipped granite, the mould surface will be suitably contoured. For example, the mould which may conveniently be made of rubber, can be produced by a clay former,

30 the surface of which before hardening, has itself been contoured by the application of a piece of chipped granite to it. Since the process tends to produce a thin layer of resin on the surface of the product, where it is desired to provide the product

35 with the appearance of chipped granite, it is desirable to include a step of roughening the external surface of the product by stripping resin from at least part of the external surface by a solvent. This may, for example, be a caustic

40 solvent, for example a proprietary paint stripper sold under the trade mark NITROMORS has been found satisfactory. After stripping, the external surface of the product is washed with water.

In order to provide the rear surface with a

45 suitable key to the remainder of a building to which it is being applied, the process preferably includes the step of applying a backing layer, for example, of glass reinforced cement to the rear face of the mix. Alternatively, the backing layer

50 may be a layer of glass fibre e.g., applied prior to full setting of the mix and a rear surface layer of sand adhering to the glass fibre layer.

The invention is of particular application to the manufacture of artificial quoins or corner stones

55 which comprise two plate-like interengaging webs lying at an angle e.g., of 90° to one another. According to another aspect of the invention the process includes the steps of casting a mix of a settable resin and a granular filler in one section of

60 a two section mould while the one section has an upwardly facing mould surface, at least partially curing the mix in the one section, turning the mould until the second section has a surface facing upwardly and casting the same mix in the

65 second section, such that an edge of the web

formed in that section integrates with an edge of the first web, at least partially curing the second web and removing the quoin from the mould. Again a backing layer of glass reinforced cement

70 or glass fibre plus sand may be applied to the rear surfaces of the webs of the quoin in order to provide them with a good key when being integrated in a building.

Where it is intended that the cornerstone

75 should provide surfaces of the webs lying at substantially 90° , the process preferably turns the mould through slightly less than 90° so that shrinking during the full curing process causes the final product to assume a shape in which the webs

80 lie substantially at 90° .

The invention may be carried into practice in various ways but certain specific embodiments will now be described by way of example with reference to the accompanying reproduction of

85 photographs, in which:—

FIGURE 1 is a perspective view of an artificial quoin manufactured in accordance with the present invention;

FIGURE 2 is a cross-section through the

90 thickness of one of the webs of the quoin, and

FIGURE 3 is an enlarged detail of a portion of the surface of the quoin of Figure 1.

Figure 1 comprises a reproduction of a

95 photograph of an artificial quoin having a blue granite appearance and manufactured in accordance with the present invention. The quoin comprises a pair of webs 10 and 12. The web 10 is approximately 260 mm wide whilst the web 12 is approximately 180 mm wide, each web being

100 approximately 220 mm high. Whilst the thickness of the webs varies since the quoin has an artificially chipped appearance, the thickness is generally of the order of 10 mm or less. The quoin being of blue granite appearance is produced by

105 making a mix of a curable polyester resin, preferably of marine grade, and a granular filler comprising a mixture of rock glass chips, crushed black marble chips and white marble chips.

The rock glass chips and the black marble

110 chips, prior to mixing with the resin are sieved in the manner perviously described, while the white marble chips are one sixteenth inch (1.6 mm) to one eighth inch (3.2 mm) granules substantially without dust. A convenient mix comprises these

115 three constituents each comprising one third of the filler by volume and the filler and resin each comprising 50 per cent of the mix.

The quoin is produced in a rubber mould having

120 two sections lying at slightly more than 90° to one another and each section forming a shallow tray. With one section lying horizontally with its tray upwardly facing, the mix of the resin and granular filler is poured into that section and allowed at least partially to cure. Thereafter the

125 mould is turned until the second section faces upwardly whereafter the same mix is cast into the second section such that an edge of the web formed in the second section integrates with an edge of the web formed in the first section.

130 Thereafter the mix in the second section is at least

partially cured and the quoin is then removed from the mould. In order to provide the rear surface of the quoin with a suitable key for applying the quoin to a building by cement or mortar, a backing layer of glass reinforced cement is preferably applied to the rear face of each web. Alternatively a backing layer of glass fibre may be applied to the rear face of each web prior to full setting and sand then applied to the glass fibre surface while it is still wet.

The granite-like appearance of the two webs is indicated in Figure 2. Since the intended appearance is a roughened chipped surface, the surface of the quoin is treated with a caustic solvent, for example a proprietary paint stripper sold under the trade mark NITROMORS until a surface layer of the resin has been removed to leave a substantial portion of the constituents of the mix exposed clear of the resin. After stripping, the external surface of the product is washed with water to remove all traces of the caustic solvent.

Figure 3 is a cross section of one of the webs of the quoin of Figure 1, the external surface being indicated at 14. Black marble chips are indicated at 16 and rock glass chips are indicated at 18. Resin is indicated at 20. White marble chips are indicated at 22.

During the casting process, by keeping the mix fairly fluid when it is poured into the mould, it is found that there is slight settling of the filler leaving a thin substantially filler-free skin or layer at the top (eventually the rear) surface of the product. This settling ensures that there is very little resin at the lower (eventually the front) surface of the product.

In another embodiment of the present invention where it is desired to simulate pink granite, the filler comprises two thirds by volume of crushed pink marble dust and one third by volume of crushed granite, for example in the form of natural sand. The pink marble and the crushed granite is obtained by passing it through a one sixteenth inch (1.6 mm) sieve. If desired, white marble may also be included up to 10 per cent by volume by reducing the volume of the pink marble and the crushed granite each by 5 per cent.

Variations in the appearance can be obtained by using crushed marble dust in the range of 30 per cent to 90 per cent by volume and the crushed granite (e.g., natural sand) in the range of 10 per cent to 70 per cent by volume. The constituents and proportions of this example are used to produce a surface which simulates fine granite and is particularly attractive when used for producing statues or statuettes. Treatment with caustic solvent again produces the rough surface associated with natural untreated granite.

Various other colour granites can be simulated. For example, for a fine textured dark-blue granite the filler may comprise:

- 10 per cent rock glass chips
- 80 per cent crushed black marble chips, or carborundum
- 10 per cent white marble chips.

The whole of this mix is obtained by passing it

through a one sixteenth inch (1.6 mm) sieve.

A fine white granite appearance can be obtained by passing the following mix through a one sixteenth inch (1.6 mm) sieve.

- 70 80 per cent rock glass chips or man-made white glass particles, or real quartz particles
- 10 percent crushed black marble chips or carborundum,
- and 10 per cent white marble chips.

75 In order to produce products having a surface of revolution, a centrifugal casting process may be used.

CLAIMS

1. An artificial granite product comprising a cured mix of a curable resin and a granular filler which produces an external surface to the product having a substantially granite-like appearance, the filler including a mix of:

- 1. one or more of:
 - 85 (a) rock glass chips
 - (b) man-made white glass particles
 - (c) real quartz particles
 - 2. one or more of:
 - (d) black marble chips
 - (e) carborundum, and
 - 90 3. (f) white marble chips

2. A product as claimed in Claim 1 in which the resin is present in a percentage by volume of between 15 per cent and 70 per cent.

95 3. A product as claimed in Claim 1 or Claim 2 in which the filler is present in a percentage by volume of between 30 per cent and 75 per cent.

4. A product as claimed in any one of the preceding claims in which the resin and filler each comprise substantially 50 per cent by volume of the product.

5. A product as claimed in any one of Claims 1 to 4 in which the percentage ranges of the constituents of the filler by volume are:

- 105 1. 10 per cent to 80 per cent
- 2. 10 per cent to 80 per cent
- 3. 10 per cent to 40 per cent

6. A product as claimed in any one of the preceding claims having a grey-blue granite appearance in which the filler, by volume, comprises substantially:

- one third rock glass chips
- one third crushed black marble chips
- one third crushed white marble chips.

115 7. A product as claimed in any one of Claims 1 to 5 having a white granite appearance in which the filler, by volume, comprises substantially 80 per cent glass chips or man-made white glass particles or real quartz particles

120 10 per cent crushed black marble chips or carborundum, and 10 per cent white marble chips.

8. A product as claimed in any one of Claims 1 to 5 having a dark blue-grey appearance in which the filler comprises substantially

- 125 10 per cent rock glass chips
- 80 per cent crushed black marble chips or carborundum,
- and 10 per cent white marble chips

9. A product as claimed in any one of the preceding claims having a coarse granite appearance in which the rock glass chips and/or the black marble chips, prior to mixing with the resin, are passed through a three sixteenth inch (4.8 mm) sieve and that which passes through this sieve is placed in a one sixty-fourth inch (0.4 mm) sieve and briefly shaken to remove a substantial portion (but not all) of the particles smaller than one sixty-fourth of an inch (0.4 mm).
10. A product as claimed in any one of the preceding claims including carborundum comprising one sixteenth granules substantially without dust.
11. A product as claimed in any one of the preceding claims including white marble comprising one sixteenth to one eighth granules substantially without dust.
12. An artificial granite product comprising a cured mix of curable resin and a granular filler which gives an external surface of the product of substantially granite-like appearance, the filler including a mix of:
1. crushed marble dust
 2. crushed granite
13. A product as claimed in Claim 12 in which the crushed granite is in the form of natural sand.
14. A product as claimed in Claims 12 or 13 in which the constituents are present in the filler in the following percentages:
1. 30 per cent to 90 per cent
 2. 10 per cent to 70 per cent
15. A product as claimed in any one of Claims 12 to 14 in which the filler includes crushed white marble chips up to 10 per cent by volume of the filler.
16. A product as claimed in any one of Claims 12 to 15 in which the whole of the filler is that which has passed through a one sixteenth inch (1.6 mm) sieve.
17. A product as claimed in any one of the preceding claims in which the proportion by volume of the filler is no more than four times the proportion by volume of the resin.
18. A product as claimed in any one of the preceding claims in which the proportions of resin to filler is one third to two thirds by volume.
19. A product as claimed in any one of the preceding claims in which the external surface of the product is clear of resin.
20. A product as claimed in any one of Claims 1 to 18 in which the external surface is smooth and has a thin external layer of resin.
21. A product as claimed in any one of the preceding claims in which the resin includes a proportion of pigment.
22. A product as claimed in any one of the preceding claims in which the resin is a polyester resin.
23. An artificial granite product comprising a platelike cured mix of a curable resin and a granular filler, the product having one external surface of substantially granite-like appearance, and the density of the filler in the mix adjacent the one external surface being higher than at its other external surface.
24. An artificial quoin comprising two webs of plate-like form lying at an angle to one another but integrated along abutting edges and each web including a layer of a cured resin and a granular filler.
25. An artificial quoin as claimed in Claim 23 in which the two webs lie at right angles to one another.
26. A product as claimed in any one of the preceding claims including a backing layer of glass reinforced cement.
27. A product as claimed in any one of Claims 1 to 25 including a backing layer of glass fibre and a rear surface layer of sand.
28. A process for the production of an artificial granite product comprising making a mix of a curable resin and a granular filler, casting the mix in a mould having an upwardly facing mould surface which is arranged to give the desired substantially granite-like appearance to the finish of the external surface of the product, the mix having a constituency and a curing rate which allows at least some of the granular filler to gravitate towards the upwardly facing mould surface, allowing the resin at least partially to cure, and removing the product from the mould.
29. A process as claimed in Claim 28 including roughening the external surface of the product by stripping resin from at least part of the external surface by a solvent.
30. A process as claimed in Claim 29 including washing the external surface with water to wash away the solvent after the step of stripping.
31. A process as claimed in any one of Claims 28 to 30 including applying a backing layer of glass reinforced cement to a rear face of the mix.
32. A process as claimed in any one of Claims 28 to 31 including applying a backing layer of glass fibre and a rear surface layer of sand to adhere to the glass fibre layer.
33. A process as claimed in Claim 32 in which the glass fibre is applied to the rear face of the mix prior to setting thereof.
34. A process for making an artificial quoin comprising two plate-like interengaging webs lying at an angle to one another, the process including the steps of casting one web with a mix of a settable resin and a granular filler in one section of a mould while the one section has an upwardly facing mould surface, at least partially curing the mix in the one section, turning the mould until the second section has a surface facing upwardly and casting the same mix in the second section such that an edge of a second web formed in that section integrates with an edge of the first web, at least partially curing the second web, and removing the quoin from the mould.
35. A process as claimed in Claim 34 including applying a backing layer of glass-reinforced cement to the rear face of each web.
36. A process as claimed in Claim 34 including applying a backing layer of glass-fibre to the rear face of each web prior to full setting and applying sand to the glass-fibre surface whilst still wet.

37. A process as claimed in Claim 34 in which the mould is turned through slightly less than 90° and the full curing process causes the final product to assume the shape in which the webs lie substantially at 90° .

38. A process as claimed in any one of Claims 34 to 37 in which the mix has a consistency and a curing rate which allows at least some of the granular filler to gravitate towards the upwardly facing mould surface.