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Europe

Process for the manufacture of substantially hollow-cylindrical castings, and a substantially hollow-cylindrical casting

The invention relates to a process for the manufacture of substantially hollow-cylindrical castings and to a substantially hollow-cylindrical casting according to the preamble of the respective independent patent claim.

Hollow-cylindrical castings are known in various forms and are used, inter alia, in high-voltage engineering. A current use of such castings is as leading-in insulators, for example in large transformers in power station engineering. In the case of such transformers, several connections or cables that are under high voltage and the electrical potential of which differs greatly are led outwards out of the transformer in order to convey the energy generated in the power station to the consumer via high-voltage lines (overhead lines, overland lines). Because the connections or cables led out of the transformer are, as already established, under high voltage, the small distance between those connections or cables and either the earthed transformer housing or the adjacent connection or cable, and the large potential difference present, may give rise to flash-over (arcing). The connections or cables are therefore led in insulated manner at least sufficiently far out of the transformer and away from the transformer housing and also away from one another that such a flash-over can no longer take place, since such flash-overs represent a considerable risk to operating safety and may even have fatal results for persons in the vicinity.

The leading-in insulators used today are manufactured, for

This Sheet Has Been Replaced



- 2 -

example, from porcelain and are filled with sulfur hexafluoride gas (SF_6 gas), for example at an operating pressure of approximately from 4000 to 8000 hP. Such porcelain insulators exhibit good weathering resistance and a good creep resistance, but have the disadvantage that they may exhibit a dangerous bursting behaviour under too high a mechanical stress since the porcelain shell may burst in the manner of an explosion owing to the porcelain's high degree of brittleness. That may have extremely serious consequences, especially as the individual pieces of burst porcelain are then, as a rule, thrown outwards in the manner of an explosion and can damage other, especially adjacent, insulators, so that a kind of "chain reaction" may occur, to say nothing of the danger to personnel in the immediate vicinity. Therefore, if they become defective, such insulators constitute a considerable safety risk.

Another current leading-in insulator has substantially the same structure as the insulator just described. In addition to the porcelain shell, however, a glass-fibre-reinforced epoxy resin tube is provided as an internal tube in the external tube defined by the porcelain shell. That internal tube is filled with SF_6 gas. The internal tube can absorb mechanical stresses. A pressure-resistant chamber is provided between the internal tube and the porcelain shell so that the porcelain shell is relieved of the operating pressure. The porcelain shell ensures good weathering resistance and creep resistance. Such insulators are, per se, very suitable for the purposes for which they are used but have the disadvantage that their structure is complicated and, accordingly, the manufacturing processes are also correspondingly complicated. As a result, such insulators are also correspondingly expensive. Furthermore, if the internal tube of such insulators becomes defective (for example in the case of a flash-over), there is still the risk that the porcelain outer shell will then burst, and the burst pieces of porcelain may



be thrown outwards with the potentially serious consequences already mentioned above.

Also known in the field of high-voltage engineering are support insulators which are manufactured, for example, from several epoxy resin systems having different properties. Processes for the manufacture of such insulators can be quite uncomplicated. Such an uncomplicated process is described, for example, in CH-A-419 272. There, the epoxy resin is introduced into a hollow-cylindrical casting mould that has previously been heated to a temperature above the gelling temperature of the epoxy resin systems, the casting mould being driven in rotation. During the rotating operation, the axis of rotation of the casting mould extends horizontally. The centrifugal force causes the casting material to be pressed against the internal wall of the mould, and a hollow-cylindrical casting (shell) is formed. Before the hollow-cylindrical casting has been cured, a further casting material (for example an epoxy resin system having different properties) is introduced by placing the casting mould in a vertical position and introducing the other casting material (core) (for example in a free jet or controlled by a funnel). It is thus possible to manufacture support insulators that can withstand mechanical stress and are also resistant to creep and weathering.

Although the process, as described in CH-A-419 272, is used for the manufacture of support insulators that form a solid cylindrical body at the end of the manufacturing process, it is in principle also suitable for the manufacture of hollow-cylindrical insulators. That is also clear from CH-A-419 272 because, in the described manufacture of the solid cylindrical insulator, a hollow-cylindrical casting is produced first (into which further casting material is then introduced). If, then, a hollow-cylindrical insulator is manufactured in accordance with the casting process described, it



will exhibit good weathering resistance and also a high degree of creep resistance. The disadvantage is, however, that such hollow-cylindrical insulators manufactured from epoxy resin systems and filled with SF_6 gas may, also, burst into many individual pieces when under too great a stress, which may have the serious consequences already mentioned above.

The problem of the invention is accordingly to provide as uncomplicated an insulator as possible and as uncomplicated a process as possible for the manufacture of an insulator that exhibits a high degree of weathering resistance and a high degree of creep resistance and that, on the other hand, if it becomes defective, exhibits a bursting behaviour that constitutes as low a safety risk as possible.

The problem relating to the manufacturing process is solved in that, first, a hollow-cylindrical mesh fabric is introduced into the heated casting mould concentrically to the axis of rotation thereof, and only when the mesh fabric has been introduced is the casting material introduced into the casting mould. As a result, the bursting behaviour of the casting so manufactured is such that the casting only cracks if it becomes defective and burst pieces are not thrown outwards, whereby safety is clearly enhanced. The manufacturing process is simple and reliable and enables an insulator to be manufactured that exhibits a high degree of weathering resistance and a high degree of creep resistance and that, on the other hand, if it becomes defective, exhibits a bursting behaviour that ensures a high degree of safety, especially when the casting is used as a SF_6 leading-in insulator in high-voltage engineering.

In one form of the process, at least two mesh fabrics having different diameters are introduced into the casting mould concentrically to the axis of rotation thereof before the

This Sheet Has Been Replaced



- 5 -

casting material is introduced. As a result, the bursting behaviour can be further improved, depending on the wall thickness of the casting, and safety can accordingly be further enhanced.

Especially advantageous is a variant of the process wherein a fabric exhibiting a degree of resilience that is lower than or approximately equal to that of the casting is introduced as the mesh fabric into the casting mould. As a result, if the casting is later subjected to mechanical stress, the mesh embedded in the casting can absorb mechanical stresses or material tensions without cracks occurring. Ideally, a fabric exhibiting approximately the same degree of resilience as does the casting is introduced as the mesh fabric into the casting mould, so that the resilient properties of the mesh fabric and of the cured casting material of the casting are substantially the same, and, owing to its ability to withstand mechanical stress, the casting together with the inserted mesh fabric exhibits approximately the same behaviour as does a casting without such an inserted mesh fabric but, on the other hand, it has a substantially better bursting behaviour, as already mentioned above.

A polyester fabric is especially suitable as such a mesh fabric. That polyester fabric (for example a Diolen fabric) may, for example, be impregnated with a laminating resin before being introduced into the casting mould. The laminating resin exhibits a heat resistance that is above the temperature of the casting mould. A substance mixture of an epoxy resin, a hardener and an accelerator is used as an especially suitable laminating resin. A liquid epoxy resin of bisphenol A may be used as the epoxy resin, methyl-tetrahydrophthalic acid anhydride may be used as the hardener and 1-methyl-imidazole may be used as the accelerator in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 1 part accelerator.

This Sheet Has Been Replaced



- 6 -

In an advantageous form of the process, a substance mixture that comprises an epoxy resin, a hardener, an accelerator, a filler and a thixotropic agent is used as the casting material. Hexahydrophthalic acid diglycidyl ester may be used as the epoxy resin, hexahydrophthalic acid anhydride may be used as the hardener, a mixture of 90 parts by weight of a solution of 3680 parts of sodium methanolate in 8600 parts of methanol and 87 720 parts of polypropylene glycol and 10 parts by weight of 1-methyl-imidazole may be used as the accelerator, a silanised quartz powder, such as the reaction product of trimethoxy-3-(oxiranylmethoxy)propyl-silane and quartz, may be used as the filler, and silicon dioxide in the form of Aerosil® 200 may be used as the thixotropic agent in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 2.4 parts accelerator : 370 parts silanised quartz powder : 1.5 parts thixotropic agent.

With regard to the insulator, the problem is solved by a substantially hollow-cylindrical casting wherein a mesh fabric is embedded in the casting concentrically to the axis of the cylinder. The bursting behaviour of a casting manufactured in that manner is such that, if the casting becomes defective, it only cracks, and burst pieces are not thrown outwards, whereby safety is clearly enhanced. The casting exhibits a high degree of weathering resistance and a high degree of creep resistance and, if it becomes defective, exhibits the above-mentioned bursting behaviour, whereby safety is considerably enhanced, especially when the casting is used as a SF₆ leading-in insulator in high-voltage engineering.

An advantageous development of the casting is distinguished by the fact that at least two mesh fabrics having different diameters are embedded in that casting concentrically to the axis of the cylinder. As a result, the bursting behaviour can



be further improved, depending on the wall thickness of the casting, and safety can therefore be enhanced even further.

In an especially advantageous form of a casting according to the invention, the mesh fabric exhibits a degree of resilience that is lower than or approximately equal to that of the casting. As a result, if the casting is later subjected to mechanical stress, the mesh embedded in the casting can absorb mechanical stresses or material tensions without cracks occurring. Ideally, the mesh fabric exhibits approximately the same degree of resilience as does the casting, so that the resilient properties of the mesh fabric and of the cured casting material of the casting are substantially the same, and, owing to its ability to withstand mechanical stress, the casting together with the inserted mesh fabric therefore exhibits approximately the same behaviour as does a casting without such an inserted mesh fabric but, on the other hand, it has a substantially better bursting behaviour, as already mentioned above.

Castings wherein the embedded mesh fabric is a polyester fabric (for example a Diolen fabric) are especially advantageous. The polyester fabric may be impregnated with a laminating resin. The laminating resin exhibits a heat resistance that is above the temperature of the casting mould. A substance mixture that comprises an epoxy resin, a hardener and an accelerator is an especially suitable laminating resin. A liquid epoxy resin of bisphenol A may be used as the epoxy resin, methyl-tetrahydrophthalic acid anhydride may be used as the hardener and 1-methyl-imidazole may be used as the accelerator in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 1 part accelerator.

With regard to the casting material, especially advantageous castings are those wherein the casting material is a



substance mixture that comprises an epoxy resin, a hardener, an accelerator, a filler and a thixotropic agent. The epoxy resin may be hexahydrophthalic acid diglycidyl ester, the hardener may be hexahydrophthalic acid anhydride, the accelerator may be a mixture of 90 parts by weight of a solution of 3680 parts of sodium methanolate in 8600 parts of methanol and 87 720 parts of polypropylene glycol and 10 parts by weight of 1-methyl-imidazole, the filler may be a silanised quartz powder, such as the reaction product of trimethoxy-3-(oxiranylmethoxy)propyl-silane and quartz, and the thixotropic agent may be silicon dioxide in the form of Aerosil[®] 200 in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 2.4 parts accelerator : 370 parts silanised quartz powder : 1.5 parts thixotropic agent.

The invention is explained in more detail in the following with reference to the drawings. Shown in diagrammatic form are:

Fig. 1 a variant of the process according to the invention in a flow diagram,

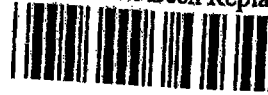
Fig. 2 an enlarged view of a process step of the flow diagram of Fig. 1,

Fig. 3 an enlarged view of the process step following the process step of Fig. 2,

Fig. 4 an embodiment of a hollow-cylindrical casting mould having two closing flanges,

Fig. 5 an embodiment of a casting according to the invention manufactured using a casting mould according to Fig. 4,

Fig. 6 a further embodiment of a hollow-cylindrical casting



mould with one closing flange,

Fig. 7 a further embodiment of a casting according to the invention manufactured using a casting mould according to Fig. 6

and

Fig. 8 cut-out portions of a casting having one embedded mesh fabric, of a casting having two embedded mesh fabrics and of a casting having three embedded mesh fabrics.

A form of the process according to the invention is shown in Fig. 1. In a first step, a cylindrical mesh fabric 1 is first formed by winding the mesh fabric 1 round a winding body 10. The cylindrical mesh fabric 1 is then removed from the winding body 10 - such a cylindrical mesh fabric 1 removed from the winding body is shown in the second step of Fig. 1. In the next step, the cylindrical mesh fabric 1 is inserted into a substantially hollow-cylindrical mould 2. The mould 2 with the inserted mesh fabric 1 is connected to a drive device 3 that can drive the mould 2 in rotation about its longitudinal axis 22. In the next process step, a more or less liquid casting material 50, the main supply of which is stored in a large supply container 4, is introduced by means of a pouring lance 41 from an intermediate container 40 arranged in the vicinity of the casting mould 2 into that mould 2 in which the inserted mesh fabric 1 is located. As the casting material 50 is being introduced, the mould 2 is rotated by means of the drive device 3.

Fig. 2 shows once again, on an enlarged scale, the process step in which the mesh fabric 1 is inserted into the mould 2 (upper half in sectional view). That view shows clearly that the casting mould 2 is connected at its two ends to flanges

This Sheet Has Been Replaced



- 10 -

20 and 21, the flange 20 being provided with a spindle-like projection 201 which can be introduced into a correspondingly shaped receiving portion 30 of the drive device 3. The receiving portion 30 may, for example, be in the form of a chuck similar to the chuck of a lathe.

Fig. 3 shows on an enlarged scale (lower half in sectional view) the process step in which the casting material 50 is introduced into the casting mould 2. The flange 20 at the end of the casting mould facing the drive device 3 completely closes off the casting mould at that end. The flange 21, on the other hand, does not close off the casting mould 2 completely because the pouring lance 41 for introducing the casting material into the mould 2 is introduced into the interior of the mould 2 from that end and is removed again from the interior of the mould from that end when the introduction of the casting material is complete, as indicated by the arrows 42. As the casting material 50 is being introduced, the mould 2 is rotated about its longitudinal axis 22* by means of the drive device 3. Before the introduction of the casting material, the casting mould 2 has already been heated to a temperature above the gelling temperature of the casting material 50, so that the casting material gradually gels as a result of contact with the mould 2 and, thus, a substantially hollow-cylindrical casting 5 is formed in which the mesh fabric 1 is embedded.

*Translator's note: although "20" appears here in the German, it seems clear from the drawings that "22" was intended.



Fig. 2 and Fig. 3 already show that grooves 200 and 210 are provided that run all the way round the flanges 20 and 21, respectively, which are connected to the mould 2. The mesh fabric 1 can be inserted into those grooves so that the position of the mesh fabric 1 relative to the mould 2 remains unchanged during the manufacture of the casting 5. The grooves 200 and 210 are, however, shown even more clearly in Fig. 4 and Fig. 6 in which an embodiment 2a and 2b, respectively, of a casting mould is shown.

In Fig. 4, the casting mould 2a is connected to two flanges 20a and 21a in which are provided the grooves 200a and 210a, respectively, into which the mesh fabric 1 can be inserted. By means of that embodiment of the casting mould, it is possible to manufacture hollow-cylindrical castings 5a having exactly one embedded mesh fabric. If a corresponding number of grooves are provided concentrically to one another in the flanges, it is also possible to manufacture castings having several embedded mesh fabrics. That possibility is discussed further hereinafter in a separate section.

A casting 5a having exactly one mesh fabric 1 embedded in the casting material 50a is shown in Fig. 5 (upper half in sectional view). Such a casting 5a can be manufactured by means of the casting mould 2a shown in Fig. 4 in accordance with the process described with reference to Fig. 1, Fig. 2 and Fig. 3.

Fig. 6 shows a further embodiment of a casting mould (lower half in sectional view). Here, however, the casting mould 2b is shown connected to only one closing flange 21b in which the groove 210b can again be seen. The other closing flange 20b (not shown) is, for the manufacture of a casting 5b, connected to the mould 2b in the same manner as described hereinbefore. In this case too, several mutually concentric grooves can again be provided in the flanges 20b and 21b if a



casting having several embedded mesh fabrics is to be manufactured.

A casting 5b having exactly one embedded mesh fabric 1 is shown in Fig. 7 (lower half in sectional view). Such a casting 5b can be manufactured by means of the casting mould 2b shown in Fig. 6 in accordance with the process described with reference to Fig. 1, Fig. 2 and Fig. 3. The casting 5b has "screens" 50b on its outer face. Such "screens" 50b substantially increase, for example, the tracking path for drops of moisture, which additionally impedes the occurrence of short circuits and tracking over the outer face. Purely for the sake of completeness, it may be mentioned here that the shape of the casting, especially the shape of the outer face, can of course also be varied by shaping the mould in an appropriate manner. For example, screens may be provided along the entire length of the outer face in order further to impede the occurrence of short circuits or tracking.

Finally, Fig. 8 shows the embodiments already discussed above for castings having more than one embedded mesh fabric. However, only one cut-out portion of a casting having one embedded mesh fabric, one cut-out portion of a casting having two embedded mesh fabrics 1 and 1a, and one cut-out portion of a casting having three embedded mesh fabrics 1, 1a and 1b are shown. Depending on the particular use and the type of mechanical stress, an embodiment having more than one embedded mesh fabric can withstand a greater mechanical stress without the casting becoming defective.

The mesh fabric 1 preferably exhibits a degree of resilience that is lower than or approximately equal to that of the casting 5. The "resilience" of the mesh fabric means the structural resilience, that is to say, the resilience that is governed by the structure of the mesh fabric. The mesh fabric must of course also have a certain inherent rigidity so that



it does not collapse when it is being shaped to form a hollow-cylindrical body. The use of such a mesh fabric 1 embedded in the casting 5 means that that casting 5 will only crack if it becomes defective and burst pieces will not be thrown outwards, whereby safety is clearly enhanced. That is of considerable advantage especially when the casting 5 is used as a SF_6 leading-in insulator in high-voltage engineering, since a high degree of safety can thus be ensured. In addition, the process for manufacturing such a casting is simple and reliable and thus enables an insulator to be manufactured that, on the one hand, exhibits a high degree of weathering resistance and a high degree of creep resistance and, on the other hand, if it becomes defective, exhibits a favourable bursting behaviour. In an especially preferred manner, the mesh fabric 1 exhibits a degree of resilience that is approximately as great as that of the casting 5. The bursting behaviour of the casting 5 is thereby improved even further.

The mesh fabric 1 may be, for example, a polyester fabric, specifically a Diolen fibre fabric. Because the fabric is inserted into a mould 2 that, before the introduction of the casting material 50, is heated to a temperature above the gelling temperature of the casting material 50, the mesh fabric 1 exhibits a certain temperature resistance so that its structure is maintained. In order to ensure that temperature resistance in all cases, before introduction into the casting mould 2 the mesh fabric 1 is preferably impregnated with a laminating resin that is resistant at temperatures above the temperature of the casting mould 2. The application of the laminating resin may be effected, for example, as long as the mesh fabric 1 is still wound on the winding body 10 (Fig. 1). A substance mixture that comprises an epoxy resin, a hardener and a (reaction) accelerator may be used as the laminating resin. A liquid epoxy resin of bisphenol A may be used as the epoxy resin, methyl-tetrahydrophthalic acid

This Sheet Has Been Replaced



- 14 -

anhydride may be used as the hardener and 1-methyl-imidazole may be used as the accelerator in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 1 part accelerator.

A substance mixture that comprises an epoxy resin, a hardener, an accelerator, a filler and a thixotropic agent may be used as the casting material. Hexahydrophthalic acid diglycidyl ester may be used as the epoxy resin, hexahydrophthalic acid anhydride may be used as the hardener, a mixture of 90 parts by weight of a solution of 3680 parts of sodium methanolate in 8600 parts of methanol and 87 720 parts of polypropylene glycol and 10 parts by weight of 1-methyl-imidazole may be used as the accelerator, a silanised quartz powder, such as the reaction product of trimethoxy-3-(oxiranylmethoxy)propyl-silane and quartz, may be used as the filler, and silicon dioxide in the form of Aerosil® 200 may be used as the thixotropic agent in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 2.4 parts accelerator : 370 parts silanised quartz powder : 1.5 parts thixotropic agent.

In a practical example of implementation, by proceeding in that manner and using the substances described, castings of the type described with reference to Fig. 7 can be manufactured. The length of such a casting 5b may be, for example, approximately 300 mm, the outside diameter (viewed without the screens) approximately 170 mm and the diameter of the mesh fabric 1 approximately 163 mm; the wall thickness of the casting (again viewed without screens) may be approximately 7.5 mm. The mesh size of the mesh fabric 1 may be approximately 18 mm. When the casting material is introduced into the casting mould 2, the temperature of the above-mentioned casting material may be approximately from 70°C to 80°C. The temperature of the mould 2 with the already inserted mesh fabric 1 may be from 110°C to 130°C. The mould is rotated by

the drive device at a rate of approximately 250 revolutions per minute over a period of approximately from 15 to 40 minutes. During that period, therefore, the casting is cast (centrifuged) and the material gelled. The casting is then removed from the mould and cured in an oven for a period of approximately 10 hours so that the mould is in the meantime available for the manufacture of other castings. Such a casting exhibits a very favourable bursting behaviour at a bursting pressure of 40 000 hPa and with the use of nitrogen as the gas.

As a result of the invention, therefore, the bursting behaviour of such a casting is such that, if the casting becomes defective, it will only crack, and burst pieces will not be thrown outwards, whereby safety is clearly enhanced. The manufacturing process is simple and reliable and enables an insulator to be manufactured that exhibits a high degree of weathering resistance and a high degree of creep resistance and that, on the other hand, if it becomes defective, exhibits a bursting behaviour that ensures a high degree of safety, especially when the casting is used as a SF₆ leading-in insulator in high-voltage engineering.

This Sheet Has Been Replaced



This Sheet Has Been Replaced



- 16 -

Patent Claims

1. A process for the manufacture of a substantially hollow-cylindrical casting (5), especially a leading-in insulator for conductors under high voltage, in which process a more or less liquid casting material (50) is introduced into a substantially hollow-cylindrical casting mould (2) that is driven in rotation and that is heated, before the introduction of the casting material, to a temperature above the gelling temperature of the casting material, in which process the casting mould (2) filled with casting material (50) is driven in rotation until a casting (5) that is substantially set solid has been formed, and in which process the casting so formed is then removed from the casting mould, wherein, first, a substantially hollow-cylindrical mesh fabric (1) is introduced into the heated casting mould (2) concentrically to the axis of rotation (22*) thereof, and only when the mesh fabric (1) has been introduced is the casting material (50) introduced into the casting mould (2).

2. A process according to claim 1, wherein at least two mesh fabrics (1, 1a) having different diameters are introduced into the casting mould (2) concentrically to the axis of rotation thereof before the casting material (50) is introduced.

3. A process according to either claim 1 or claim 2, wherein a fabric exhibiting a degree of resilience that is lower than or approximately equal to that of the casting (5) is introduced as the mesh fabric (1) into the casting mould (2).

*Translator's note: please see note on page 10.





4. A process according to claim 3, wherein a fabric exhibiting approximately the same degree of resilience as does the casting is introduced as the mesh fabric into the casting mould.

5. A process according to any one of claims 1 to 4, wherein a polyester fabric is used as the mesh fabric.

6. A process according to claim 5, wherein the polyester fabric is impregnated with a laminating resin before being introduced into the casting mould.

7. A process according to any one of claims 6 to 8, wherein a substance mixture that comprises an epoxy resin, a hardener and an accelerator is used as the laminating resin.

8. A process according to claim 7, wherein an epoxy resin of bisphenol A is used as the epoxy resin, methyl-tetrahydro-phthalic acid anhydride is used as the hardener and 1-methyl-imidazole is used as the accelerator in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 1 part accelerator.

9. A process according to any one of claims 1 to 8, wherein a substance mixture that comprises an epoxy resin, a hardener, an accelerator, a filler and a thixotropic agent is used as the casting material.

10. A process according to claim 9, wherein hexahydrophthalic acid diglycidyl ester is used as the epoxy resin, hexahydro-phthalic acid anhydride is used as the hardener, a mixture of 90 parts by weight of a solution of 3680 parts of sodium methanolate in 8600 parts of methanol and 87 720 parts of polypropylene glycol and 10 parts by weight of 1-methyl-imidazole is used as the accelerator, a silanised quartz powder, such as the reaction product of trimethoxy-3-(oxi-





ranylmethoxy)propyl-silane and quartz, is used as the filler, and silicon dioxide in the form of Aerosil® 200 is used as the thixotropic agent in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 2.4 parts accelerator : 370 parts silanised quartz powder : 1.5 parts thixotropic agent.

11. A substantially hollow-cylindrical casting (5), especially a leading-in insulator for a conductor under high voltage, wherein a mesh fabric (1) is embedded in the casting (5) concentrically to the axis of the cylinder.

12. A casting according to claim 11, wherein at least two mesh fabrics (1, 1a) having different diameters are embedded in the casting (5) concentrically to the axis of the cylinder.

13. A casting according to claim 11 or claim 12, wherein the mesh fabric (1) exhibits a degree of resilience that is lower than or approximately equal to that of the casting (5).

14. A casting according to claim 13, wherein the mesh fabric exhibits approximately the same degree of resilience as does the casting.

15. A casting according to any one of claims 11 to 14, wherein the mesh fabric is a polyester fabric.

16. A casting according to claim 15, wherein the polyester fabric is impregnated with a laminating resin.

17. A casting according to claim 16, wherein the laminating resin is a substance mixture that comprises an epoxy resin, a hardener and an accelerator.

18. A casting according to claim 17, wherein the epoxy resin



is a liquid epoxy resin of bisphenol A, the hardener is methyl-tetrahydrophthalic acid anhydride, and the accelerator is 1-methyl-imidazole in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 1 part accelerator.

19. A casting according to any one of claims 11 to 18, wherein the casting material is a substance mixture that comprises an epoxy resin, a hardener, an accelerator, a filler and a thixotropic agent.

20. A casting according to claim 19, wherein the epoxy resin is hexahydrophthalic acid diglycidyl ester, the hardener is hexahydrophthalic acid anhydride, the accelerator is a mixture of 90 parts by weight of a solution of 3680 parts of sodium methanolate in 8600 parts of methanol and 87 720 parts of polypropylene glycol and 10 parts by weight of 1-methyl-imidazole, the filler is a silanised quartz powder, such as the reaction product of trimethoxy-3-(oxiranylmethoxy)-propyl-silane and quartz, and the thixotropic agent is silicon dioxide in the form of Aerosil® 200 in a ratio by weight of approximately 100 parts epoxy resin : 90 parts hardener : 2.4 parts accelerator : 370 parts filler : 1.5 parts thixotropic agent.

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