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(54) Insulating structure of switch

Isolierende Struktur eines elektrischen Schalters

Structure isolante d'un interrupteur électrique

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- **PATENT ABSTRACTS OF JAPAN vol. 018 no. 528 (C-1258) ,6 October 1994 & JP-A-06 184398 (SUMITOMO WIRING SYST LTD) 5 July 1994,**
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Description

FIELD OF THE INVENTION

[0001] This invention relates to an insulating structure of a switch comprising a molded article of an organic composite material, which structure withstands impact of an increase in pressure inside the switch on breaking the circuit. More particularly, it relates to molded insulating structures constituting a switch, including a housing and inside parts, which do not suffer from deformation, a crack or a break even when exposed to an impact of an increase in pressure inside the switch due to explosive expansion of decomposition gas generated from the housing and the inside parts on cutting off the current.

BACKGROUND OF THE INVENTION

[0002] Fig. 1 is a schematic perspective view of a general circuit-breaker. In the figure, numerals 1, 2, and 5 are a cover, a base, and a handle, respectively. Fig. 2 is a schematic view of the circuit-breaker shown in Fig. 1 with its cover removed, in which cross-bar 3, trip bar 4, handle 5, contact point 6 of a movable contactor, and contact point 7 of a fixed contactor as shown in Fig. 3 to 6 are provided. Cross-bar 3, trip bar 4, and handle 5 are generally made of an insulating structure molded of an organic composite material.

[0003] In a switch such as a circuit-breaker, when movable contactor point 6 and fixed contactor point 7 are disconnected with electricity applied, an arc is generated between them. On account of the arc, the organic material around the contact point and inside the switch thermally decomposes to generate gas to steeply rise the pressure inside the switch. The increased pressure gives an impact to the housing of the switch, i.e., cover 1 and base 2, as well as the inside parts, i.e., handle 5, cross-bar 3, and trip bar 4.

[0004] Insulating structures in conventional circuit-breakers have been made of phenolic resins or polyester resins. Those made of phenolic resins usually comprise 50 wt% of a phenolic resin, 30 wt% of woodmeal, 15 wt% of an inorganic filler, and 5 wt% of a pigment and other additives. Insulating structures for a switch, for example, a housing comprising a polyester resin are disclosed in JP-A-5-202277. (The term "JP-A" herein used means an unexamined published Japanese patent application.) In addition, a housing comprising 25 wt% of an unsaturated polyester resin, 60 wt% of calcium carbonate, and 15 wt% of glass fiber; a handle comprising 70 wt% of polybutylene terephthalate and 30 wt% of glass fiber; a cross-bar comprising 55 wt% of a phenolic resin and 45 wt% of glass fiber; and a trip bar comprising 70 wt% of polybutylene terephthalate and 30 wt% of glass fiber are known.

[0005] In cases where a switch, such as a circuit-breaker, is reduced in size or increased in capacity to be cut off, the above-mentioned pressure rise inside the switch due to the gas of the thermally decomposed organic material is more steep than generally received. In high capacity cut-off in particular, the arc gas is nearly explosive. Therefore, the aforesaid conventional materials are insufficient for preventing deformation, cracks or breaks of the housing and inside parts after cut-off.

[0006] Furthermore, in the PATENT ABSTRACTS OF JAPAN, vol. 18, no. 528 (C-1258), October 6, 1994 & JP-A-06 184398 there is disclosed a composition suited for use as an automotive relay box, which comprises nylon 6, nylon 66 and an ethylene/α-olefin copolymer. However, the resin composition of this document also comprises modified aromatic poly(phenylene ether) as a major resin component and therefore will have a reduced arc extinguishing property.

SUMMARY OF THE INVENTION

[0007] The present invention has been achieved to solve the above-described problem of conventional techniques by incorporating an impact-absorbing component into a molding material for insulating parts composing a switch. Accordingly, an object of the present invention is to provide an insulating structure of a switch, i.e., a housing or an inside part, comprising a molded article of an organic/inorganic composite material, which structure withstands a rise of pressure inside the switch due to decomposition gas generated from the organic material of the structure at the time of high capacity cut-off of the switch without undergoing deformation, cracking or breakage.

[0008] The insulating structure of a switch according to the present invention is a molded article of an organic composite material comprising nylon 6, nylon 66, and nylon MXD 6 as matrix resins, and further an ethylene/α-olefin copolymer as an impact-absorbing component, and a reinforcement (hereafter referred to as the first embodiment).

[0009] The another insulating structure of a switch according to the present invention is a molded article of an organic composite material comprising nylon 6 and nylon 66 as matrix resins, and further an ionomer of polyolefin as an impact-absorbing component, and a reinforcement (hereafter referred to as the second embodiment).

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a schematic perspective view showing the appearance of a circuit-breaker.

[0011] Fig. 2 is schematic perspective view of the circuit-breaker with a cover removed.

[0012] Fig. 3 is a perspective view of a contact point of a movable contactor and a contact point of a fixed contactor.

[0013] Fig. 4 is a perspective view of a handle.

[0014] Fig. 5 is a perspective view of a cross-bar.

[0015] Fig. 6 is a perspective view of a trip bar.

[0016] Fig. 7 is a perspective view of a cover.

DETAILED DESCRIPTION OF THE INVENTION

[0017] The organic composite material for the insulating structures of the switch of the first embodiment comprises 35 to 39 wt% of nylon 6, 8 to 12 wt% of nylon 66, and 1 to 3 wt% of nylon MXD 6 as matrix resins, 7 to 9 wt% of an ethylene/α-olefin copolymer as an impact-absorbing component, and 40 to 45 wt% of a reinforcement. The composition ratio is based on the total weight of the organic composite material. The organic composite material having the above composition can be injection-molded to obtain each insulating structure.

[0018] The feature of the above organic composite material resides in that the combination of nylon 6 and nylon 66 has no aromatic ring and improves performance in arc extinguishing. Further, the combined use of nylon 6 and nylon 66 delays crystallization of the matrix, which favors gloss of the molded article. In further combining nylon MXD 6 with the combination of nylon 6 and nylon 66, it is preferable to fit a mold for injection molding with a quenching means so that the mold may be cooled simultaneously with injection of the resin to lower the mold temperature in contact with the surface of the insulating structure. By doing this, nylon MXD 6 is rendered less crystallizable, resulting in further improvement in gloss of the molded article. Further, since the matrix resins are thermoplastic, it is possible to reduce the curing time in molding and to obtain a molded article having a complicated shape even with a thin wall.

[0019] The term "nylon" as used herein means an ordinary synthetic linear polyamide resin. The designation "nylon mn" as used herein denotes a polycondensate of a diamine having m carbon atoms ($NH_2(CH_2)_mNH_2$) and a dibasic acid having n carbon atoms ($HOOC(CH_2)_{n-2}COOH$). The designation "nylon n" as used herein denotes a polymer of an ω-amino acid having n carbon atoms ($H_2N(CH_2)_{n-1}COOH$) or a lactam having n carbon atoms.

[0020] The organic composite material of the first embodiment contains, as an impact-absorbing component, an ethylene/α-olefin copolymer which is hardly hygroscopic, whereby the resulting molded article obtained therefrom has reduced hygroscopicity, improved impact resistance, and improved machinability in, for example, tapping and improved impact fatigue resistance.

[0021] The ethylene/α-olefin copolymer used in the first embodiment preferably contains up to 3 mol% of α-olefin as a comonomer component, examples of which includes propylene and methylpentene.

[0022] The preferred composition ratio of the above-described components was decided based on the following reasons as a result of tests on various combinations.

[0023] If the ratio of nylon 66 in the organic composite material exceeds 12 wt%, the appearance of the resulting molded article tends to be deteriorated. If it is less than 8 wt%, the molded article tends to have reduced heat resistance.

[0024] When molded at a mold temperature lower than 120°C, nylon MXD 6 in the specific organic composite material of the present invention becomes amorphous to provide satisfactory outer appearance. If the ratio of nylon MXD 6 is less than 1 wt%, the appearance tends to be deteriorated. If it exceeds 3 wt%, the aromatic ring in nylon MXD 6 tends to adversely affect the insulation performance after cut-off.

[0025] If the ratio of the ethylene/α-olefin copolymer exceeds 9 wt%, or if the ratio of the reinforcement is less than 40 wt%, the resulting molded article tends to have insufficient rigidity. If the ethylene/α-olefin copolymer is less than 7 wt%, or if the one or more reinforcements exceeds 45 wt%, the resulting molded article tends to have insufficient impact resistance.

[0026] The organic composite material for the insulating structures of the switch of the second embodiment comprises 25 to 27 wt%, particularly 26 wt% of nylon 6 and 23 to 25 wt%, particularly 24 wt% of nylon 66 as matrix resins, 6 to 8 wt%, particularly 7 wt% of an ionomer of polyolefin as an impact-absorbing component, and 42 to 44 wt%, particularly 43 wt% of a reinforcement.

[0027] The feature of the above organic composite material resides in that the matrix resin is a thermoplastic resin comprising nylon 6 and nylon 66 so that the curing time in molding may be shortened and a molded article of complicated shape can be obtained even with a small wall thickness. Further, the ionomer of a polyolefin copolymer compounded as an impact-absorbing component serves as an elastomeric component to improve impact resistance and arc extinguishing properties.

[0028] Since the composite material contains an ionomer of polyolefin which is hardly hygroscopic and a reinforcement, the insulating structures obtained therefrom have reduced hygroscopicity. Further, the incorporation of an ionomer of poleolefin improves physical machinability, for example, in tapping and it also brings about an improvement in impact fatigue resistance.

[0029] The ionomer of polyolefin used in the second embodiment is not particularly limited, and it may be a conventional thermoplastic resin having polyolefin chains crosslinked by ionic bond. Preferred examples are modified or unmodified EPDM (ethylene/propylene/diene/monomer) rubbers, and terpolymers of ethylene, methacrylic acid-zinc neutralization product and an acrylic acid ester.

[0030] The reinforcement to be used in both the first and second embodiments of the present invention will be illustrated below. The insulating structure of a switch according to the present invention is a molded article of an organic composite material containing resins, an impact-absorbing component, and at least one kind of a reinforcement. The reinforcement is used for improvements of strength against pressure, rigidity, and arc extinguishing properties. The reinforcement comprises at least one kind selected from the group consisting of glass fiber, inorganic minerals, and ceramic fiber.

[0031] Substances present as impurity in the reinforcement of an insulating structure of a switch are decomposed by the high temperature of the arc at the time of high capacity current cut-off into molecular gas. Among such impurities a compound of a metal of the Group 1A of the Periodic Table (e.g., Li, Na, K, Rb, Cs or Fr) is decomposed into conducting ion gas by the heat of the arc. The resultant conducting ion interferes with arc extinguishing and reduces the arc extinguishing performance of a switch. In addition, the conducting ion is chemically bonded to other ion gas generated therearound and thus deposited on the inside of the switch. Having conductivity, the deposit has been a cause of deterioration of insulating performance after cut-off.

[0032] As a result of experimentation, where the content of a metallic compound of a metal of the Group 1A of the Periodic Table in the form of an oxide (e.g., Na_2O, K_2O or Li_2O) in the reinforcement exceeds 1 wt%, the arc extinguishing performance is considerably reduced. A range of the metallic compound content in the reinforcement which will not give influences on the arc extinguishing performance is not more than 0.6 wt%, preferably not more than 0.15 wt%. Removal of the Group 1A metal oxides involves an increase in cost for purification of the reinforcement. A preferred metal oxide content which does not greatly impair the arc extinguishing performance and the insulating performance without causing an increase of purification cost ranges from 0.6 to 0.1 wt% based on the total weight of the reinforcement.

[0033] Specific examples of the inorganic minerals to be combined as a reinforcement include calcium carbonate, clay, talc, mica, barium peroxide, aluminum oxide, zircon, cordierite, murite, wollastonite, muscovite, magnesium carbonate, dolomite, magnesium sulfate, aluminum sulfate, potassium sulfate, barium sulfate, zinc fluoride, and magnesium fluoride. They are effective to improve heat distortion resistance and dimensional stability.

[0034] Calcium carbonate, talc, wollastonite, barium peroxide, aluminum oxide, magnesium carbonate, magnesium sulfate, aluminum sulfate, potassium sulfate, barium sulfate, zinc fluoride, and magnesium fluoride are preferred reinforcements; for they satisfy the requirement of the total content of the Group 1A metal compounds.

[0035] From the viewpoint of strength against pressure, calcium carbonate is preferably treated with a surface modifier, such as an aliphatic modifier, e.g., stearic acid, so as to have improved dispersibility in the matrix resin.

[0036] The terminology "ceramic fiber" as used herein means fibrous materials made of ceramics. The ceramic fiber is not particularly limited as long as the condition described above with respect to the total content of metallic compounds of the Group IA metal of the Periodic Table is satisfied. Specific examples of the ceramic fiber include aluminum silicate fiber, aluminum borate whisker, and alumina whisker. They are favorable from the standpoint of improvement in arc extinguishing properties and strength against pressure.

[0037] The ceramic fiber preferably has a diameter of 1 to 10 μm and an aspect ratio of not smaller than 10 from the viewpoint of strength against pressure.

[0038] The reinforcements to be used in the molded insulating structures are preferably fibrous ones for enhancing the strength and toughness of the molded article. Glass fiber is particularly suitable for the molded insulating structures of the present invention for the following reason. Glass fiber is compatible with the matrix resins, nylon 6 and nylon 66, and is uniformly distributed throughout the molding material to provide a molded article free from local brittleness and having satisfactory impact resistance. Since glass itself is heat-resistant material, the resulting molded insulating structure has satisfactory resistance to heat and explosive gas pressure of the arc.

[0039] The terminology "glass fiber" as used herein means fibrous materials made of glass. The glass fiber is not particularly limited as long as the condition hereinafter described above with respect to the total content of metallic compounds of the Group IA metals of the Periodic Table is satisfied. Examples of glass material include E glass, S glass, D glass, T glass, and silica glass.

[0040] Fibrous glass products include long fibers, short fibers, and glass wool. Short fibers are preferred as a reinforcement for thermoplastic resins. Glass fiber as a reinforcement for thermosetting resins is not particularly restricted.

[0041] From the standpoint of strength against pressure, the glass fiber preferably has a diameter of 6 to 13 μm and an aspect ratio of not smaller than 10. The glass fiber is preferably treated with a silane coupling agent, and the like for ensuring strength against pressure.

[0042] The above-mentioned reinforcements may be used either individually or as a combination of two or more thereof. Combinations of two or more kinds of reinforcements include a combination of glass fiber and an inorganic mineral or ceramic fiber; a combination of an inorganic mineral and ceramic fiber; a combination of two or more kinds of glass fiber; a combination of two or more kinds of inorganic minerals; a combination of two or more kinds of ceramic fiber; and a combination of glass fiber, an inorganic mineral, and ceramic fiber. While not particularly limiting, the combination of glass fiber and an inorganic mineral has an advantage of low cost of raw materials.

[0043] The insulating parts of a switch according to the present invention, such as a housing, a cross-bar, a handle, and a trip bar, can easily be prepared by molding the above-described organic composite material by injection molding, and the like. The resulting housing can be prevented from being cracked, deformed or broken due to an explosive increase of the inner pressure at the time of high capacity cut-off, and the impact resistance of the switch at the time of cut-off can be improved and the insulating properties of each of these structures can be retained after the cut-off.

[0044] The present invention is further explained below with reference to the following Examples. However, the present invention should not be construed as being limited thereto.

EXAMPLE 1

[0045] A cover, a part of a housing, as shown in Fig.1 was prepared using an organic composite material comprising nylon 6, nylon 66, and nylon MXD 6 as matrix resins; an ethylene/α-olefin copolymer as an impact-absorbing component; and glass fiber, ceramic fiber, and wollastonite as reinforcements. For comparison, a cover was prepared using an unsaturated polyester resin as a matrix resin. The resulting cover was assembled into a circuit-breaker and tested by a cut-off test.

Cut-off Test:

[0046] An excessive three-phase current of 460 V/30 kA was passed with the circuit closed. The movable contactor was moved to break the contact and generate an arc current. A circuit-breaker whose housing and inside parts suffered from no breakage or cracks was regarded to be acceptable. The results obtained are shown in Table 1 below.

[0047] As is shown in Table 1, the comparative sample 1 using the conventional product suffered from damage, whereas no cracking or damage was observed with the samples of the present invention. While the samples tested were molded articles of the first embodiment, those obtained from the organic composition materials of the second embodiment were also satisfactory, being free from cracking or damage.

TABLE 1

Sample No.	Resins (wt%)			Impact-Absorbing Component (wt%)	Reinforcement(s) (wt%)			Appearance After Cut-off Test (Generation of Crack/Break)
	Nylon 6	Nylon 66	Nylon MXD 6	Ethylene/α-Olefin Copolymer	Glass Fiber	Ceramic Fiber	Inorganic Mineral	
Comparative sample 1	unsaturated polyester (25 wt%)			-	15	-	60 calcium carbonate	Cracks and breaks occurred
1	37	10	2	7	44	-	-	No crack or break occurred
2	37	10	2	8	43	-	-	"
3	37	10	2	9	42	-	-	"
4	39	10	3	8	40	-	-	"
5	35	10	2	8	45	-	-	"
6	37	10	2	8	-	45	-	"
7	37	10	2	8	35	-	10 wollastonite	"

EXAMPLE 2

[0048] A handle shown in Fig. 3, a cross-bar shown in Fig. 4, and a trip bar shown in Fig. 5 were prepared by molding the organic composite material of the second embodiment. A combination of nylon 6 and nylon 66 was used as a matrix resin, an ionomer of a polyolefin copolymer was used as an impact-absorbing component, and glass fiber, ceramic fiber and wollastonite were used as reinforcement(s).

[0049] For comparison, a handle and a trip bar were prepared using a polybutylene terephthalate as a matrix resin (comparative samples 2 and 4), and a cross-bar was prepared using a phonolic resin as a matrix resin (comparative sample 3).

[0050] The handles, cross-bars and trip bars comprising the organic composite materials of the present invention (Sample Nos. 8 to 16) were proved satisfactory with no crack or breakage under visual observation after a cut-off test. The results of handles, cross-bars, and trip bars are shown in Tables 2, 3 and 4, respectively. Similarly, satisfactory results were obtained when these insulating structures were prepared by molding the organic composite materials of the first embodiment.

TABLE 2

Handle Sample No.	Resins (wt%) Nylon 6	Resins (wt%) Nylon 66	Impact-Absorbing Component (wt%) Ionomer of Polyolefin	Reinforcement(s) (wt%) Glass Fiber	Reinforcement(s) (wt%) Ceramic Fiber	Reinforcement(s) (wt%) Inorganic Mineral	Appearance After Cut-off Test (Generation of Crack/Break)
Comparative Sample 2	polybutylene terephthalate (70 wt%)		-	30	-	-	Cracks and breaks occurred
8	26	24	7	43	-	-	No cracks or or break occurred
9	26	24	7	-	43	-	"
10	26	24	7	35	-	10 (wollastonite)	"

TABLE 3

Cross-Bar Sample No.	Resins (wt%)		Impact-Absorbing Component (wt%)	Reinforcement(s) (wt%)			Appearance After Cut-off Test (Generation of Crack/Break)
	Nylon 6	Nylon 66	Ionomer of Polyolefin	Glass Fiber	Ceramic Fiber	Inorganic Mineral	
Comparative sample 3	phenolic resin (55 wt%)		-	45	-	-	Cracks and breaks occurred
11	26	24	7	43	-	-	No cracks or or break occurred
12	26	24	7	-	43	-	"
13	26	24	7	35	-	10 (wollastonite)	"

TABLE 4

Trip Bar Sample No.	Resins (wt%)		Impact-Absorbing Component (wt%)	Reinforcement(s) (wt%)			Appearance After Cut-off Test (Generation of Crack/Break)
	Nylon 6	Nylon 66	Ionomer of Polyolefin	Glass Fiber	Ceramic Fiber	Inorganic Mineral	
Comparative sample 3	polybutylene terephthalate (70 wt%)		-	30	-	-	Cracks and breaks occurred
14	26	24	7	43	-	-	No cracks or or break occurred
15	26	24	7	-	43	-	"
16	26	24	7	35	-	10 (wollastonite)	"

Claims

1. An insulating structure for a switch wherein the insulating structure is a molded article of an organic composite material which comprises 35 to 39 wt% of nylon 6, 8 to 12 wt% of nylon 66, 1 to 3 wt% of nylon MXD 6, 7 to 9 wt% of an ethylene/α-olefin copolymer, and 40 to 45 wt% of a reinforcement.

2. The insulating structure for a switch as in claim 1, wherein said reinforcement contains not more than 0.6 wt% of an oxide of a metal of the Group 1A of the Periodic Table based on the weight of the reinforcement.

3. The insulating structure for a switch as in claim 1, wherein said reinforcement comprises glass fiber.

4. The insulating structure for a switch as in claim 1, wherein said molded insulating structure is a housing of a switch.

5. The insulating structure for a switch as in claim 1, wherein said molded insulating structure is a handle, a cross-bar or a trip bar which is a part in the inside of a switch.

6. An insulating structure for a switch wherein the insulating structure is a molded article of an organic composite material which comprises 25-27 wt% of nylon 6, 23-25 wt% of nylon 66, 6-8 wt% of an ionomer of polyolefin, and 42-44wt% of a reinforcement.

7. The insulating structure for a switch as in claim 6, wherein said organic composite material comprises 26 wt% of nylon 6, 24 wt% of nylon 66, 7 wt% of an ionomer of a polyolefin, and 43 wt% of reinforcement.

8. The insulating structure for a switch as in claim 7, wherein said reinforcement contains not more than 0.6 wt% of an oxide of a metal of the Group 1A of the Periodic Table based on the weight of the reinforcement.

9. The insulating structure for a switch as in claim 7, wherein said reinforcement comprises glass fiber.

10. The insulating structure for a switch as in claim 7, wherein said molded insulating structure is a housing of a switch.

11. The insulating structure for a switch as in claim 7, wherein said molded insulating structure is a handle, a cross-bar or a trip bar which is a part in the inside of a switch.

Patentansprüche

1. Eine isolierende Struktur für einen Schalter, wobei die isolierende Struktur ein Formartikel aus einem organischen Verbundstoffmaterial ist, welches 35 bis 39 Gew.-% Nylon 6, 8 bis 12 Gew.-% Nylon 66, 1 bis 3 Gew.-% Nylon MXD 6, 7 bis 9 Gew.-% eines Ethylen/α-Olefin-Copolymers und 40 bis 45 Gew.-% eines Verstärkungsmaterials umfaßt.

2. Die isolierende Struktur für einen Schalter wie in Anspruch 1, wobei das Verstärkungsmaterial nicht mehr als 0,6 Gew.-% eines Oxids eines Metalls aus der Gruppe 1A des Periodensystems bezogen auf das Gewicht des Verstärkungsmaterials umfaßt.

3. Die isolierende Struktur für einen Schalter wie in Anspruch 1, wobei das Verstärkungsmaterial Glasfasern umfaßt.

4. Die isolierende Struktur für einen Schalter wie in Anspruch 1, wobei die geformte isolierende Struktur ein Gehäuse eines Schalters ist.

5. Die isolierende Struktur für einen Schalter wie in Anspruch 1, wobei die geformte isolierende Struktur ein Griff, ein Querriegel oder ein Auslöseriegel ist, welcher ein Teil im Inneren des Schalters ist.

6. Eine isolierende Struktur für einen Schalter, wobei die isolierende Struktur ein Formartikel aus einem organischen Verbundstoffmaterial ist, welches 25 - 27 Gew.-% Nylon 6, 23 - 25 Gew.-% Nylon 66, 6 - 8 Gew.-% eines Ionomers eines Polyolefins und 42 - 44 Gew.-% eines Verstärkungsmaterials umfaßt.

7. Die isolierende Struktur für einen Schalter wie in Anspruch 6, wobei das organische Verbundstoffmaterial 26 Gew.-

% Nylon 6, 24 Gew.-% Nylon 66, 7 Gew.-% eines Ionomers eines Polyolefins und 43 Gew.-% eines Verstärkungsmaterials umfaßt.

8. Die isolierende Struktur für einen Schalter wie in Anspruch 7, wobei das Verstärkungsmaterial nicht mehr als 0,6 Gew.-% eines Oxids eines Metalls aus der Gruppe 1A des Periodensystems bezogen auf das Gewicht des Verstärkungsmaterials umfaßt.

9. Die isolierende Struktur für einen Schalter wie in Anspruch 7, wobei das Verstärkungsmaterial Glasfasern umfaßt.

10. Die isolierende Struktur für einen Schalter wie in Anspruch 7, wobei die geformte isolierende Struktur ein Gehäuse eines Schalters ist.

11. Die isolierende Struktur für einen Schalter wie in Anspruch 7, wobei die geformte isolierende Struktur ein Griff, ein Querriegel oder ein Auslöseriegel ist, welcher ein Teil im Inneren des Schalters ist.

Revendications

1. Structure isolante pour un commutateur où la structure isolante est un article moulé d'un matériau composite organique qui comprend 35 à 39% en poids de nylon 6, 8 à 12% en poids de nylon 66, 1 à 3% en poids de nylon MXD-6, 7 à 9% en poids d'un copolymère d'éthylène/α-oléfine, et 40 à 45% en poids d'un renforcement.

2. Structure isolante pour un commutateur selon la revendication 1, où ledit renforcement ne contient pas plus de 0,6% en poids d'un oxyde d'un métal du Groupe 1A du Tableau Périodique sur la base du poids du renforcement.

3. Structure isolante pour un commutateur selon la revendication 1, où ledit renforcement comprend une fibre de verre.

4. Structure isolante pour un commutateur selon la revendication 1, où ladite structure isolante moulée est un logement d'un commutateur.

5. Structure isolante pour un commutateur selon la revendication 1, où ladite structure isolante moulée est une poignée, un élément de barres croisées ou une barre d'enclenchement qui est une partie à l'intérieur d'un commutateur.

6. Structure d'isolement pour un commutateur où la structure d'isolement est un article moulé d'un matériau composite organique qui comprend 25 à 27% en poids de nylon 6, 23 à 25% en poids de nylon 66, 6 à 8% en poids d'un ionomère de polyoléfine, et 42 à 44% d'un renforcement.

7. Structure isolante pour un commutateur selon la revendication 6, où ledit matériau composite organique comprend 26% en poids de nylon 6, 24% en poids de nylon 66, 7% en poids d'un ionomère d'une polyoléfine, et 43% en poids d'un renforcement.

8. Structure isolante pour un commutateur selon la revendication 7, où ledit renforcement ne contient pas plus de 0,6% en poids d'un oxyde d'un métal du Groupe 1A du Tableau Périodique sur la base du poids du renforcement.

9. Structure isolante pour un commutateur selon la revendication 7, où ledit renforcement comprend une fibre de verre.

10. Structure isolante pour un commutateur selon la revendication 7, où ladite structure isolante moulée est un logement d'un commutateur.

11. Structure isolante pour un commutateur selon la revendication 7, où ladite structure isolante moulée est un poignée, un élément de barres croisées, ou une barre d'enclenchement qui est une partie à l'intérieur d'un commutateur.

FIG. 1

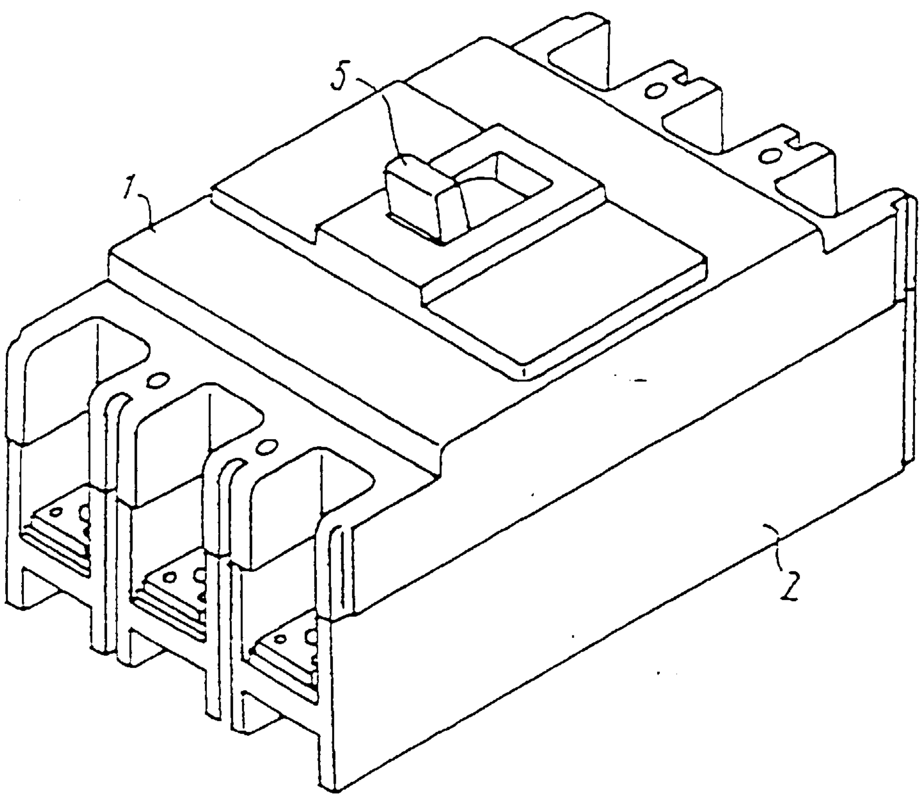

FIG. 2

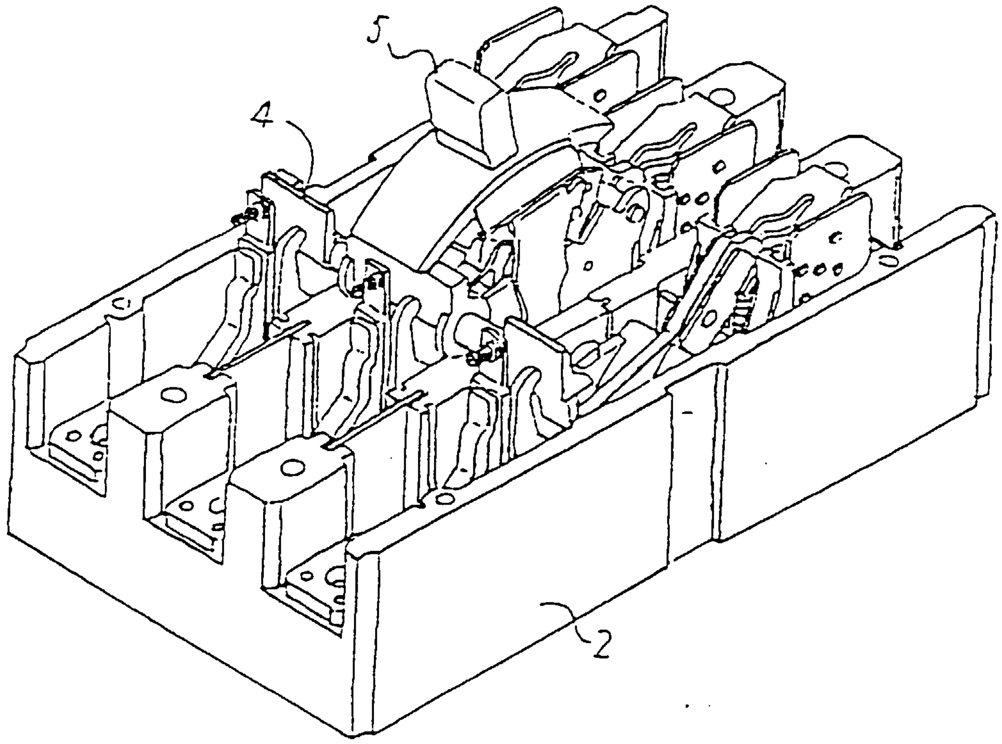

FIG. 3

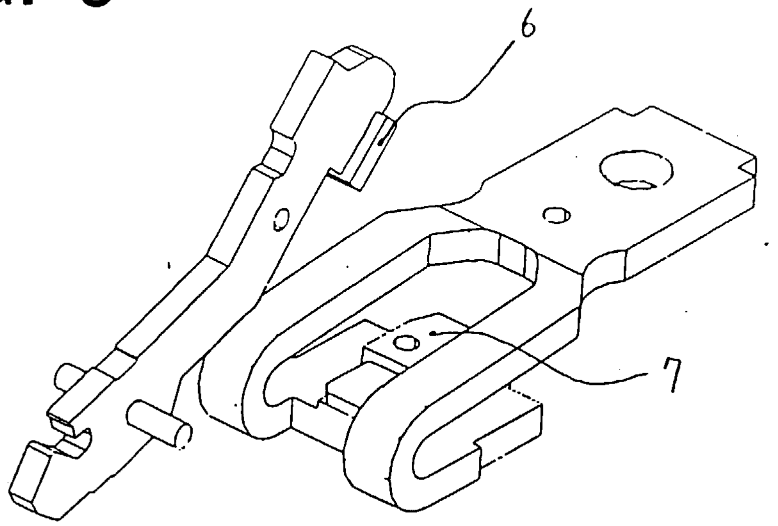

FIG. 4

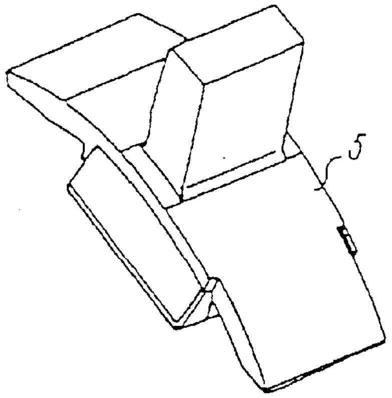

FIG. 5

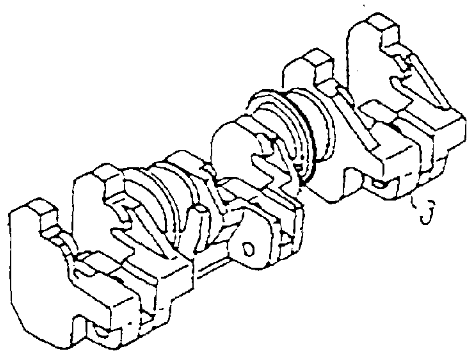

FIG. 6

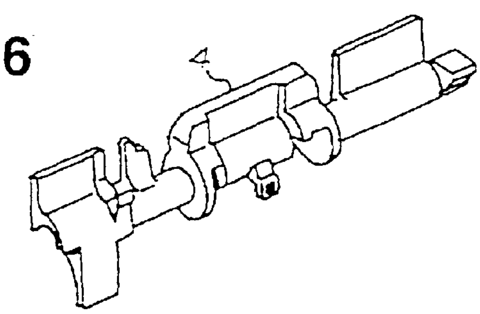

FIG. 7