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(54) **DIE CASTING ALUMINUM ALLOY, PRODUCTION METHOD OF DIE CASTING ALUMINUM ALLOY, AND COMMUNICATIONS PRODUCT**

DRUCKGUSSALUMINIUMLEGIERUNG, HERSTELLUNGSVERFAHREN FÜR DIE DRUCKGUSSALUMINIUMLEGIERUNG UND KOMMUNIKATIONSPRODUKT

ALLIAGE D'ALUMINIUM COULÉ SOUS PRESSION, PROCÉDÉ DE PRODUCTION D'UN ALLIAGE D'ALUMINIUM COULÉ SOUS PRESSION ET PRODUIT DE COMMUNICATIONS

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of aluminum alloy material technologies, and in particular, to a die casting aluminum alloy, a production method of the die casting aluminum alloy, and a communications product.

BACKGROUND

[0002] With the development of a 4G/5G communications technology, a communications product constantly strives for large power, miniaturization, and lightness. Consequently an increasingly high requirement is imposed on a heat dissipation capability of a die casting material of the communications product. Currently, a commonly used die casting material of the communications product is mainly a die casting aluminum alloy. However, common thermal conductivity of a die casting aluminum alloy in the communications product industry is 90 W/(m·K) to 150 W/(m·K), and a requirement of a future product with high heat flux density and large power cannot be met. In addition, a communications die-casting fitting is usually in a complex structure with a large quantity of complex thin-wall heat sink fins, higher and lower bosses, and deep-cavity structures, and has relatively large dimensions. A heat sink fin layout of a future heat sink is to be denser and thinner, and a fin shape is to be more complex. Therefore, a requirement on casting fluidity of the die casting material of the communications product is to be higher. Fluidity of an aluminum-silicon (Al-Si) series die casting aluminum alloy commonly used in a current industry increases as content of silicon increases, and the fluidity is the best in a eutectic composition, but thermal conductivity of the alloy decreases at the same time. Therefore, it is difficult to have both a high heat-conducting property and good formability. WO 2018 095 186 discloses an Al-Si-Mg alloy that has been developed to provide an alternative alloy to ADC12 for use in electronic applications that has improved heat conduction properties whilst still maintaining high strength.

[0003] Therefore, currently, to develop a die casting aluminum alloy with both a high heat-conducting property and good formability has become an urgent need in the communications industry.

SUMMARY

[0004] In view of this, a first aspect of embodiments of the present invention provides a die casting aluminum alloy according to independent claim 1, that has both a high heat-conducting property and good formability, to resolve a prior-art problem that forming and heat dissipation requirements of a communications product with a complex structure, high heat flux density, and large power cannot be met at the same time because it is difficult for a die casting aluminum alloy to have both a high heat-conducting property and good formability.

[0005] Specifically, the first aspect of the embodiments of the present invention provides the die casting aluminum alloy, including constituents with the following mass percentages:

silicon: 4.0% to 10.0%;
magnesium: 0.2% to 1.0%;
copper: ≤0.1%;
manganese: ≤0.1%;
zinc: ≤0.1%;
iron: 0.5% to 1.0%;
titanium: 0.05% to 0.2%.

in the embodiments of the present invention, content of the silicon in the die casting aluminum alloy is controlled within 4.0% to 10.0% to improve thermal conductivity of the aluminum alloy and ensure formability of the aluminum alloy, content of elements such as the magnesium is also properly controlled so that the aluminum alloy has a mechanical property and corrosion resistance, and total content of other elements in the aluminum alloy other than aluminum is relatively low, to ensure that the aluminum alloy has a relatively high heat-conducting property; and inevitable impurities: ≤0.15%; and the rest: the aluminum.

[0006] In the first aspect of the present invention, a mass percentage of the silicon is 5.5% to 6.5%.

[0007] In the first aspect of the present invention, the mass percentage of the silicon is 5.8% to 6.3%.

[0008] In the first aspect of the present invention, the mass percentage of the silicon is 5.7%.

[0009] In the first aspect of the present invention, a mass percentage of the silicon is 4.3% to 5.0%.

[0010] In the first aspect of the present invention, the mass percentage of the silicon is 4.4% to 4.8%.

[0011] In the first aspect of the present invention, a mass percentage of the silicon is 6.5% to 7.5%.

[0012] In the first aspect of the present invention, a mass percentage of the magnesium is 0.3% to 0.8%.

[0013] In the first aspect of the present invention, the mass percentage of the magnesium is 0.4% to 0.7%.

[0014] In the first aspect of the present invention, the mass percentage of the magnesium is 0.5% to 0.6%.

[0015] In the first aspect of the present invention, a mass percentage of the copper is 0.001% to 0.05%.

[0016] In the first aspect of the present invention, the mass percentage of the copper is 0.01% to 0.03%.

[0017] In the first aspect of the present invention, a mass percentage of the manganese is 0.001% to 0.006%.

[0018] In the first aspect of the present invention, the mass percentage of the manganese is 0.002% to 0.004%.

[0019] In the first aspect of the present invention, a mass percentage of the zinc is 0.001% to 0.02%.

[0020] In the first aspect of the present invention, the mass percentage of the zinc is 0.001% to 0.008%.

[0021] In the first aspect of the present invention, the mass percentage of the iron is 0.5% to 0.7%.

[0022] In the first aspect of the present invention, a mass percentage of the titanium is 0.05% to 0.06%.

[0023] A total mass percentage of elements other than the aluminum in the die casting aluminum alloy in the present invention is less than 10%.

[0024] The total mass percentage of the elements other than the aluminum in the die casting aluminum alloy in the present invention is 5.0% to 8.0%.

[0025] Phases inside an organization structure of the die casting aluminum alloy include a hypoeutectic α-Al phase, a eutectic α-Al phase, a eutectic Si phase, and an intermetallic compound, the intermetallic compound is distributed at a grain boundary location or is precipitated in the hypoeutectic α-Al phase and the eutectic α-Al phase, and the intermetallic compound includes an Mg_2Si phase. When the constituents of the die casting aluminum alloy further include an element Fe and an element Cu, the intermetallic compound further includes an Al_3Fe phase, an Al_2Cu phase, and a ternary compound Al-Si-Fe phase.

[0026] In the present invention, a coefficient of thermal conductivity of the die casting aluminum alloy is 170 W/(m·K) to 195 W/(m·K).

[0027] In the present invention, Brinell hardness of the die casting aluminum alloy is 60 HBW to 80 HBW, tensile strength is 170 MPa to 220 MPa, yield strength is greater than or equal to 100 MPa, and an elongation rate is greater than or equal to 2%.

[0028] The die casting aluminum alloy provided in the first aspect of the embodiments of the present invention has both a high heat-conducting property and good formability, also has high corrosion resistance, a good mechanical property, and low costs, and can meet forming and heat dissipation requirements of a communications product with a complex structure.

[0029] A second aspect of the embodiments of the present invention provides a production method of a die casting aluminum alloy, including the following steps:

providing raw materials based on constituents of a die casting aluminum alloy, and performing heat treatment at any temperature within 180°C to 375°C after casting, to obtain a die casting aluminum alloy, where the die casting aluminum alloy includes constituents with the following mass percentages: silicon: 4.0% to 10.0%; magnesium: 0.2% to 1.0%; copper: ≤0.1%; manganese: ≤0.1%; zinc: ≤0.1%; iron: 0.5% to≤1.0%; titanium: 0.05% to 0.2%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0030] The foregoing heat treatment process may be at a constant temperature, or may be at a non-constant temperature. In some implementations, a temperature may be selected from 180°C to 375°C to perform heat treatment. In other implementations, a plurality of temperatures may be separately selected from 180°C to 375°C as heat treatment temperatures at a plurality of heat treatment stages.

[0031] In the production method in the present invention, the casting is performed through liquid die casting, semi-solid die casting, vacuum die casting, investment casting, gravity casting, or squeeze casting.

[0032] In the production method in the present invention, time for the heat treatment is 0.2h to 8h.

[0033] A process of the production method provided in the second aspect of the present invention is simple, and the produced die casting aluminum alloy has both a high heat-conducting property and good formability, and also has high corrosion resistance and a good mechanical property.

[0034] A third aspect of the embodiments of the present invention provides a communications product, including a housing and a power supply circuit and a functional circuit that are located in the housing, where the power supply circuit supplies power to the functional circuit, and the housing is obtained through casting by using the die casting aluminum alloy according to the first aspect of the embodiments of the present invention.

[0035] The communications product provided in the third aspect of the embodiments of the present invention has a high heat-conducting property, good formability, high corrosion resistance, and a mechanical property, and can meet a design requirement for high density and large power.

DESCRIPTION OF EMBODIMENTS

[0036] Embodiments of the present invention are described below with reference to some specific implementations of the present invention.

[0037] As a communications product constantly strives for large power, miniaturization, and lightness, the industry imposes an increasingly high requirement on a heat dissipation capability of a die casting material of the communications product. Currently, a commonly used die casting material of the communications product is mainly a die casting aluminum alloy. However, common thermal conductivity of a die casting aluminum alloy in the communications product industry is 90 W/(m·K) to 150 W/(m·K), and a requirement of a future product with high heat flux density and large power cannot be met. In addition, a communications die-casting fitting is usually in a complex structure with a large quantity of complex thin-wall heat sink fins, higher and lower bosses, and deep-cavity structures, and has relatively large dimensions. A heat sink fin layout of a future heat sink is to be denser and thinner, and a fin shape is to be more complex. Therefore, a requirement on casting fluidity of the die casting material of the communications product is to be higher. Fluidity of an Al-Si series die casting aluminum alloy commonly used in a current industry increases as content of silicon increases, and the fluidity is the best in a eutectic composition, but thermal conductivity of the alloy decreases at the same time. Therefore, it is difficult to have both a high heat-conducting property and good formability. In view of this, currently, to develop a die casting aluminum alloy with both a high heat-conducting property and good formability has become an urgent need in the communications industry. In addition, because communications products are used in a diversity of environments and are often in relatively poor environments, such as seawater, acid rain, and an environment with alternate high and low temperatures, and it needs to be ensured that the communications products are maintenance-free, the die casting aluminum alloy needs to have both relatively high corrosion resistance and a mechanical property.

[0038] Specifically, the present invention provides a die casting aluminum alloy that has both a high heat-conducting property and good formability. The die casting aluminum alloy includes constituents with the following mass percentages:

silicon: 4.0% to 8.0%;
magnesium: 0.2% to 1.0%;
copper: ≤0.1%;
manganese: ≤0.1%;
zinc: ≤0.1%;
iron: 0.5% to 1.0%;
titanium: 0.05% to 0.2%; and
inevitable impurities: ≤0.15%; and the rest: aluminum.

[0039] According to the high heat-conductive casting aluminum alloy provided in this embodiment of the present invention, the constituents of the alloy are determined by comprehensively considering contribution of each chemical element to an integrated performance index (including thermal conductivity, fluidity, corrosion resistance, hardness, strength, and the like) of the alloy, and with a joint effect of various elements of the foregoing specific content, different types of performance are balanced, and a stable crystal structure is formed, so that a die casting aluminum alloy with good integrated performance is obtained.

[0040] Phases inside an organization structure of the die casting aluminum alloy in this embodiment of the present invention include a hypoeutectic α-Al phase, a eutectic α-Al phase, a eutectic Si phase, and an intermetallic compound, and the intermetallic compound is distributed at a grain boundary location or is precipitated in the α-Al phases. The phase means uniform and continuous components having a same chemical composition, a same atom aggregation state, and a same atom property, and different phases are separated by an interface. The intermetallic compound is a compound including a metal and a metal, or a metal and a metalloid. Specifically, in a crystal structure of the die casting aluminum alloy in the present invention, the intermetallic compound mainly includes an Mg_2Si phase. When the constituents of the die casting aluminum alloy further include an element Fe and an element Cu, the intermetallic compound further includes an Al_3Fe phase, an Al_2Cu phase, a ternary compound Al-Si-Fe phase, and the like. The iron, the copper, the magnesium, the manganese, the zinc, and the titanium are partially solidly dissolved in the hypoeutectic α-Al phase and the eutectic α-Al phase in a form of atoms. The Al_2Cu phase and the Mg_2Si phase are uniformly dispersed and distributed.

[0041] Adding of the element silicon (Si) can improve casting fluidity of an Al-Si series alloy, and in the alloy, Si and Al form an (α-Al+Si) eutectic phase. This is a main reason why casting fluidity of the aluminum-silicon alloy is improved. However, thermal conductivity of the alloy decreases as content of Si increases. For example, thermal conductivity of an aluminum alloy with a Japanese designation ADC12 (in which content of silicon is 9.6% to 12%) is only 95 W/(m·K). This is because a large amount of Si in the Al-Si alloy exists mainly in a form of primary Si or eutectic Si or is solidly dissolved in an Al matrix, and consequently the thermal conductivity of the alloy greatly decreases. Therefore, to obtain relatively high thermal conductivity, Si needs to be controlled at lower content. In consideration of both fluidity and thermal conductivity, in this embodiment of the present invention, a mass percentage of the silicon is controlled within 4.0% to 8.0%. Further, in an implementation of the present invention, the mass percentage of the silicon is specifically controlled within 5.5% to 6.5%, and is further 5.8% to 6.3%, or 5.7%, or 6.0%. In another implementation of the present invention, the mass percentage of the silicon is specifically controlled within 4.3% to 5.0%, and is further 4.4% to 4.8%, or 4.5%,

or 4.7%. In other implementations of the present invention, the mass percentage of the silicon may alternatively be 6.5% to 7.5%, and is further 7.0%.

[0042] The element magnesium (Mg) is a main strengthening element in the aluminum-silicon alloy. Mg and Si form the Mg_2Si phase that is uniformly dispersed and distributed in the organization structure of the alloy and performs a dispersion strengthening function. The dispersion strengthening means a material strengthening effect achieved by organizing and mixing a plurality of phases. The dispersion strengthening is essentially using dispersed ultra-fine particles to hinder dislocation motion, thereby improving a mechanical property of a material at a high temperature. When it is ensured that a weight ratio of Mg to Si meets $Mg/Si<1.73$, higher content of the element Mg leads to a better mechanical property of the alloy. However, excessive elements Mg lead to an increase in a grain quantity and an increase in a grain boundary quantity of the grains. The grain boundary is an interface between grains with a same structure and different orientations, in other words, a contact interface between grains. At the crystal boundary, atom arrangement is in transition from one orientation to another. The atom arrangement is in a transition state at the crystal boundary. Consequently, a heat conduction path loses continuity at the crystal boundary, and finally thermal conductivity of a material decreases. Therefore, in consideration of both the mechanical property and the thermal conductivity, in an implementation of the present invention, a mass percentage of the element Mg is controlled within 0.2% to 1.0%. Further, in an implementation of the present invention, the mass percentage of the magnesium is 0.3% to 0.8%, and is further 0.4% to 0.7% or 0.5% to 0.6%.

[0043] The element copper (Cu) is also a main strengthening element in the aluminum-silicon alloy. Cu and Al form the Al_2Cu phase that is uniformly dispersed and distributed in the organization structure of the alloy and performs a dispersion strengthening function. Because solidly dissolved copper has a high cathode effect on the alloy, a copper ion that enters a liquid corrosion dielectric solution is re-plated on a surface of the aluminum alloy in a state of a fine metallic copper grain, to form activity and even large galvanic corrosion, thereby reducing corrosion resistance of the alloy. Specifically, the solidly dissolved copper and a metal that is in the alloy and that has different potential from that of the copper form a micro battery when there is the corrosion dielectric solution. The copper acts as a cathode, and another metal with relatively negative potential acts as an anode. In a battery reaction, the copper ion in the corrosion dielectric solution is reduced to metallic copper and the metallic copper is deposited on a surface of the aluminum alloy, thereby accelerating electrochemical corrosion. Therefore, for obtaining superior corrosion resistance, content of the copper needs to be controlled to control content of solidly dissolved copper, so as to reduce galvanic corrosion. In an implementation of the present invention, a mass percentage of the element Cu is controlled to be less than or equal to 0.1%. Further, in an implementation of the present invention, the mass percentage of the copper is 0.001% to 0.05%, and further, the mass percentage of the copper is 0.003% to 0.005%, or 0.008% to 0.01%, or 0.01% to 0.03%, or 0.02% to 0.05%, or 0.03% to 0.04%. In another implementation of the present invention, the mass percentage of the copper is 0.07% to 0.1%, and is further 0.08% to 0.09%.

[0044] The element iron (Fe) forms a needle-like brittle phase in the die casting aluminum alloy. Existence of the Fe splits a matrix, it is likely to cause stress concentration around the brittle phase, and a fatigue crack or static load fracture occurs on the alloy, thereby reducing a mechanical property of the alloy. Therefore, content of Fe is limited to some extent. However, excessively low content of Fe leads to an increase in a mold sticking risk during casting, and the element Fe has relatively small impact on thermal conductivity. Therefore, after comprehensive consideration, a mass percentage of the element Fe is controlled to be less than 0.5-1.0% in the present invention. In an implementation of the present invention, the mass percentage of the iron is 0.5% to 0.7%, and is further 0.7% to 0.9%, or 0.8% to 1.0%.

[0045] Adding of the element manganese (Mn) may improve a mechanical property and corrosion resistance of the aluminum-silicon alloy. However, Mn has relatively large impact on thermal conductivity at the same time, and reduces a heat-conducting property of the alloy. Therefore, a content range of the element Mn may be specifically determined based on the content of the element Fe, and is specifically controlled to be less than or equal to 0.1% in this embodiment of the present invention. In an implementation of the present invention, a mass percentage of the manganese is 0.001% to 0.006%, and is further 0.002% to 0.003%. In other implementations of the present invention, a mass percentage of the manganese may alternatively be 0.004% to 0.005%, or 0.008% to 0.01%, or 0.012% to 0.05%, or 0.04% to 0.06%, or 0.07% to 0.08%.

[0046] In an aluminum alloy casting process, the element titanium (Ti) preferentially reacts with Al to form an Al_3Ti grain refiner that can convert α-Al grains from a thick branch shape into fine and uniform equiaxed grains, so that strength and plasticity of the aluminum alloy are improved, but a heat-conducting property of a material is reduced at the same time. The Al_3Ti grain refiner has an excellent refinement effect, improves surface quality of castings so that the castings obtain fine equiaxed grains, especially reduces casting cold shuts and eliminates a trichite and a columnar crystal, and can effectively overcome casting cracks and improve a casting appearance. The equiaxed grains are grains with a relatively small grain dimension difference in all orientations. Therefore, in comprehensive consideration of thermal conductivity and a mechanical property during actual production, in this embodiment of the present invention, a mass percentage of the titanium is controlled to be greater than 0 and less than or equal to 0.2%. Further, in an implementation of the present invention, the mass percentage of the titanium is 0.05% to 0.06%. In other implementations of the present

invention, the mass percentage of the titanium may alternatively be 0.07% to 0.08% or 0.1% to 0.15%.

[0047] In an implementation of the present invention, a mass percentage of the zinc is specifically 0.001% to 0.02%, and is further 0.001% to 0.008%. In another implementation of the present invention, a mass percentage of the zinc is greater than 0 and less than or equal to 0.001%. In other implementations of the present invention, a mass percentage of the zinc may alternatively be 0.03% to 0.06%, or 0.07% to 0.08%, or 0.09% to 0.1%.

[0048] In an implementation of the present invention, because an increase in an impurity element leads to reduction in thermal conductivity of a material, in this embodiment of the present invention, content of the inevitable impurity elements is controlled to be less than or equal to 0.15%.

[0049] In a specific example not falling within the scope of the invention, the die casting aluminum alloy includes constituents with the following mass percentages: silicon: 5.8% to 6.3%; magnesium: 0.3% to 0.4%; copper: <0.1%; manganese: <0.08%; zinc: <0.02%; iron: 0.5% to 0.68%; titanium: >0% and <0.02%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0050] In another specific example not falling within the scope of the invention, the die casting aluminum alloy includes constituents with the following mass percentages: silicon: 5.7%; magnesium: 0.33%; copper: 0.1%; manganese: 0.001%; zinc: <0.001%; iron: 0.58%; titanium: <0.001%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0051] Adding of each element to pure metal aluminum leads to reduction in orderly arrangement of a crystal lattice of a material, and leads to lattice distortion and limited periodic motion of electrons, and a heat-conducting property and electrical conductivity of the material are reduced. Therefore, in an implementation of the present invention, for obtaining a relatively high heat-conducting property, a total mass percentage of elements other than the aluminum in the die casting aluminum alloy is controlled to be less than 10%, and is further controlled within 5.0% to 8.0%, or within 5.5% to 7.5%, or within 6.0% to 6.5%.

[0052] In an implementation of the present invention, with a comprehensive effect of specific content of specific elements, a coefficient of thermal conductivity of the die casting aluminum alloy reaches 170 W/(m·K) to 195 W/(m·K), Brinell hardness is 60 HBW to 80 HBW, tensile strength is 170 MPa to 220 MPa, yield strength is greater than or equal to 100 MPa, and an elongation rate is greater than or equal to 2%.

[0053] The tensile strength is a critical value at which a metal is in transition from uniform plastic deformation to local-concentrated plastic deformation, and is also a maximum bearing capability of the metal in a case of static stretching. The tensile strength indicates resistance to maximum uniform plastic deformation of a material, and deformation of a tensile sample is uniform and consistent before the tensile sample bears maximum tensile stress. However, after the maximum tensile stress is exceeded, a necking phenomenon starts to occur on the metal, to be specific, concentrated deformation occurs. The yield strength is a yield limit when a yield phenomenon occurs on a metal material, in other words, stress that resists microplastic deformation. For a metal material on which no apparent yield phenomenon occurs, it is specified that a stress value corresponding to residual deformation of 0.2% is used as a yield limit of the metal material, and is referred to as a conditional yield limit or conditional yield strength. The elongation rate is an index for describing plastic performance of a material, and is a percentage of a ratio of total deformation ΔL of a gauge section after tensile fracture of a sample to an original gauge length L.

[0054] The die casting aluminum alloy provided in the present invention has a high heat-conducting property, good formability, high corrosion resistance, and a mechanical property, can be applied to a harsh outdoor environment, can be used for forming complex thin-wall castings (such as a heat sink) to meet a design requirement for high density and large power, and can be specifically used in fields such as a mobile phone, a notebook computer, a communications device industry, an automobile, and civil hardware. More specifically, an embodiment of the present invention provides a communications product, including a housing and a power supply circuit and a functional circuit that are located in the housing, where the power supply circuit supplies power to the functional circuit, and the housing is obtained through casting by using the die casting aluminum alloy provided in the embodiments of the present invention. The communications product may be a heat sink. Certainly, in the communications product, another component that can use an aluminum alloy part may also be obtained through casting by using the die casting aluminum alloy in the embodiments of the present invention, such as a handle, a maintenance cavity cover, a guide rail, a rotating shaft, and a supporting kit.

[0055] Correspondingly, an embodiment of the present invention further provides a production method of a die casting aluminum alloy, including the following steps:

S10. Provide raw materials based on constituents of a die casting aluminum alloy, and perform casting through liquid die casting, semi-solid die casting, vacuum die casting, investment casting, gravity casting, or squeeze casting.
S20. Perform heat treatment within 180°C to 375°C after casting and cooling, to obtain a die casting aluminum alloy, where the die casting aluminum alloy includes constituents with the following mass percentages: silicon: 4.0% to 8.0%; magnesium: 0.2% to 1.0%; copper: ≤0.1%; manganese: ≤0.1%; zinc: ≤0.1%; iron: 0.5% to 1.0%; titanium: 0.05% to 0.2%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0056] In the present invention, in step S10, all the liquid die casting, the semi-solid die casting, the vacuum die casting,

the investment casting, the gravity casting, and the squeeze casting are existing conventional processes. Raw materials and process parameters required for each process are not specially limited in the present invention, and only need to be selected and set according to an industry requirement and an actual requirement.

[0057] In the present invention, in step S20, further, a temperature for the heat treatment is 200°C to 300°C or 240°C to 280°C. A heat treatment process may be at a constant temperature, or may be at a non-constant temperature. Optionally, time for the heat treatment is 0.2h to 8h, and further, the time for the heat treatment is 1h to 5h or 2h to 6h. The heat treatment in the present invention can strengthen the alloy, and can not only improve a mechanical property (such as strength, hardness, and an elongation rate) of the alloy, but also improve physical performance (including density, conductivity, and thermal conductivity) and electrochemical performance (including solid solution potential) of castings. An alloy element more easily leads to reduction in the conductivity and the thermal conductivity of the alloy when existing in a form of a solid solution in comparison with being combined with another element to form an intermetallic compound. Therefore, heat treatment is even needed during production of a high heat-conductive and electricity-conductive component. After low-temperature heat treatment of 180°C-375°C in the present invention, a point defect of the alloy such as a vacancy or a solidly dissolved atom can be reduced. Specifically, at a relatively low heat treatment temperature in the present invention, the vacancy may be transferred from an interior of a material to a surface of the alloy and escapes, thereby reducing lattice distortion of the alloy, and greatly improving thermal conductivity of the alloy without reducing a mechanical property of the alloy. In addition, a dispersion strengthening phase (such as Mg_2Si or Al_2Cu) is precipitated from a solid solution, thereby reducing content of a solidly dissolved atom, so that strength and electrical conductivity of the alloy are optimized. In the die casting aluminum alloy of the present invention, most elements Mg and Cu are precipitated in a form of dispersion strengthening phases: Mg_2Si and Al_2Cu, and only a very small quantity of the elements exist inside an α-Al phase in a form of a solidly dissolved atom.

[0058] Phases inside an organization structure of the die casting aluminum alloy produced in this embodiment of the present invention include a hypoeutectic α-Al phase, a eutectic α-Al phase, a eutectic Si phase, and an intermetallic compound, and the intermetallic compound is distributed at a grain boundary location or is precipitated in the α-Al phase. The intermetallic compound mainly includes an Al_3Fe phase, an Al_2Cu phase, an Mg_2Si phase, a ternary compound Al-Si-Fe phase, and the like. The iron, the copper, the magnesium, the manganese, the zinc, and the titanium are partially solidly dissolved in the hypoeutectic α-Al phase and the eutectic α-Al phase in a form of atoms. The Al_2Cu phase and the Mg_2Si phase are uniformly dispersed and distributed.

[0059] In an implementation of the present invention, a mass percentage of the silicon is specifically controlled within 5.5% to 6.5%, and is further 4.3% to 4.8% or 4.4% to 5.0%. In other implementations of the present invention, a mass percentage of the silicon may alternatively be 4.5% to 5.0%, or 6.0% to 7.0%, or 6.5% to 7.5%.

[0060] In an implementation of the present invention, a mass percentage of the magnesium is 0.3% to 0.7%, and is further 0.4% to 0.5% or 0.6% to 0.8%.

[0061] In an implementation of the present invention, a mass percentage of the copper is 0.001% to 0.05%. In another implementation of the present invention, a mass percentage of the copper is 0.08% to 0.1%. In other implementations, a mass percentage of the copper may alternatively be 0.003% to 0.005%, or 0.008% to 0.01%, or 0.02% to 0.05%, or 0.04% to 0.06%.

[0062] In an implementation of the present invention, a mass percentage of the iron is further 0.5% to 0.7%. In an implementation of the present invention, a mass percentage of the iron may alternatively be 0.7% to 0.9%, or 0.8% to 1.0%.

[0063] In an implementation of the present invention, a mass percentage of the manganese is 0.001% to 0.006%, and is further 0.002% to 0.003%. In other implementations of the present invention, a mass percentage of the manganese may alternatively be 0.004% to 0.005%, or 0.008% to 0.01%, or 0.012% to 0.05%, or 0.04% to 0.06%, or 0.07% to 0.08%.

[0064] In an implementation of the present invention, a mass percentage of the zinc is specifically 0.001% to 0.008%.

[0065] In another implementation of the present invention, a mass percentage of the zinc is greater than 0 and less than or equal to 0.001%.

[0066] In a specific example not falling within the scope of the invention, the die casting aluminum alloy includes constituents with the following mass percentages: silicon: 5.8% to 6.3%; magnesium: 0.3% to 0.4%; copper: <0.1%; manganese: <0.08%; zinc: <0.02%; iron: 0.5% to 0.68%; titanium: >0% and <0.02%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0067] In another specific example not falling within the scope of the invention, the die casting aluminum alloy includes constituents with the following mass percentages: silicon: 5.7%; magnesium: 0.33%; copper: 0.1%; manganese: 0.001%; zinc: <0.001%; iron: 0.58%; titanium: >0% and <0.001%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0068] A process of the production method of the die casting aluminum alloy provided in this embodiment of the present invention is simple, and the produced die casting aluminum alloy has a high heat-conducting property, good formability, high corrosion resistance, and a good mechanical property.

[0069] The embodiments of the present invention are further described below by using a plurality of embodiments. The examples, which are not covered by the claims are not presented for understanding the invention.

Example 1 (not falling within the scope of the invention)

[0070] A die casting aluminum alloy includes constituents with the following mass percentages: silicon: 5.8% to 6.3%; magnesium: 0.3% to 0.4%; copper: <0.1%; manganese: <0.08%; zinc: <0.02%; iron: 0.5% to 0.68%; titanium: >0% and <0.02%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0071] A production method of a complex thin-wall communications housing that is obtained through die casting by using the die casting aluminum alloy with the constituents in this embodiment includes the following steps:
Based on the constituents of the foregoing die casting aluminum alloy, a pure aluminum A00 aluminum ingot (whose purity is 99.7%), a pure magnesium ingot, an AlSi26 intermediate alloy, an AlFe20 intermediate alloy, and the like are used as raw materials, melting, semi-solid slurrying, and semi-solid die casting are performed on the raw materials, and after cooling, 180°C to 375°C heat treatment is performed for 0.2 to 8 hours, to obtain the thin-wall communications housing.

Example 2 (not falling within the scope of the invention)

[0072] A die casting aluminum alloy includes constituents with the following mass percentages: silicon: 5.7%; magnesium: 0.33%; copper: 0.1%; manganese: 0.001%; zinc: <0.001%; iron: 0.58%; titanium: >0% and <0.001%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0073] A complex thin-wall communications housing is obtained in the manner in Embodiment 1 of the present invention through die casting by using the die casting aluminum alloy with the constituents in this embodiment.

Embodiment 3

[0074] A die casting aluminum alloy includes constituents with the following mass percentages: silicon: 4.7%; magnesium: 0.33%; copper: <0.1%; manganese: <0.05%; zinc: <0.01%; iron: 0.58%; titanium: 0.05% to 0.1%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0075] A complex thin-wall communications housing is obtained in the manner in Embodiment 1 of the present invention through die casting by using the die casting aluminum alloy with the constituents in this embodiment.

Embodiment 4

[0076] A die casting aluminum alloy includes constituents with the following mass percentages: silicon: 4.5%; magnesium: 0.46%; copper: <0.1%; manganese: <0.1%; zinc: <0.001%; iron: 0.5% to 0.58%; titanium: 0.05% to 0.1%; inevitable impurities: ≤0.15%; and the rest: aluminum.

[0077] A complex thin-wall communications housing is obtained in the manner in Embodiment 1 of the present invention through die casting by using the die casting aluminum alloy with the constituents in this embodiment.

Effect Embodiment

[0078] To provide strong support for beneficial effects brought by the technical solutions in the embodiments of the present invention, the following product performance tests are provided:
A comparison test is performed on the die casting aluminum alloys in Embodiment 1 to Embodiment 4 of the present invention and an ADC12 alloy in terms of thermal conductivity, formability, and a mechanical property (including hardness, tensile strength, yield strength, and an elongation rate). A result is as follows:

1. Thermal conductivity

[0079] A thermal conductivity test is performed on the die casting aluminum alloys in Embodiment 1 to Embodiment 4 of the present invention and the ADC12 alloy, and the thermal conductivity test is performed by using a laser flash method (ASTM E 1461-01). Sample dimensions are Φ12.7 mm×(2 to 4) mm. For heat, refer to ISO 11357 and ASTM E1269. For density, refer to ISO 1183-1:2004. A thermal conductivity result of each alloy is shown in Table 1.

Table 1 Comparison between thermal conductivity of alloys

Alloy designation	Thermal conductivity (w/m·k)
ADC12	95
Example 1	185

(continued)

Alloy designation	Thermal conductivity (w/m·k)
Example 2	190
Embodiment 3	182
Embodiment 4	180

[0080] It may be learned from the result in Table 1 that the die casting aluminum alloy in the embodiments of the present invention has a better heat-conducting property than that of the ADC12 aluminum alloy, and can meet a heat dissipation requirement of a communications product with a complex structure, high heat flux density, and large power.

2. Formability

[0081] Die casting is separately performed on three types of alloys: the alloys in Example 1 and Example 2 of the present invention and the ADC12 alloy, to obtain a complex thin-wall communications housing. When formability of the alloy is poor, a short shot defect is likely to occur on a thin-wall heat sink fin. According to existing statistics, 30 die-casting fittings are continuously produced by using each alloy. Statistical results of maximum physical dimensions of each short shot feature on 25 heat sink fins of the die-casting fittings are shown in Table 2. The maximum physical dimensions (R) are described in three categories: 0.5 mm≤R≤1.0 mm, or 1.0 mm<R≤3 mm, or R>3 mm.

Table 2 Statistics of short shot features of different alloy die-casting fittings

Alloy designation	Total defect quantity	Short shot quantity: 0.5 mm≤R≤1.0 mm	Short shot quantity: 1.0 mm<R≤3 mm	Short shot quantity: R>3 mm
ADC12	201	90	90	21
Example 1	205	124	65	16
Example 2	220	102	103	15

3. Corrosion resistance

[0082] A corrosion resistance test is performed on the die casting aluminum alloys in Embodiment 1 to Embodiment 4 of the present invention. Corrosion resistance of the die casting aluminum alloy is compared with that of an existing alloy, and a result is shown in Table 3. The corrosion resistance of the alloy is indicated by using a corrosion rate. A test method for the corrosion rate complies with the standard GB/T19292.4 and the standard GB/T 16545, and sample dimensions are 120 mm×100 mm×5 mm. For eliminating an edge effect, an edge of a corrosion rate test sample is wrapped with an adhesive tape. After 1440 h of a neutral salt spray test, an average corrosion rate is calculated by using a weight change before and after salt spray.

Table 3 Comparison between corrosion rates of alloys

Alloy designation	Corrosion rate (mg/(dm^2×d))
ADC12	34.0
Example 1	4.5
Example 2	4.3
Embodiment 3	5.0
Embodiment 4	4.6

4. Mechanical property

[0083] Die casting is separately performed on the alloys in Example 1 and Example 2 of the present invention and the ADC12 alloy, to obtain a complex thin-wall communications housing. A standard tensile mechanical test piece is cut from a product according to a GB/T 228 requirement, and the mechanical property is tested on a tensile testing machine.

A result is shown in Table 4.

Table 4 Mechanical properties of alloys

Alloy designation	Tensile strength (MPa)	Yield strength (MPa)	Elongation rate (%)	Hardness (HBW)
ADC12	260	≥100	0.7	92
Example 1	210	136	4.6	79
Example 2	199	132	4.0	70

[0084] It can be learned from the foregoing descriptions that the die casting aluminum alloy obtained in the embodiments of the present invention has both a high heat-conducting property and good formability, and also has high corrosion resistance and a good mechanical property, thereby resolving a prior-art problem that a heat dissipation requirement of a communications product with high heat flux density and large power cannot be met because a heat-conducting property of a die casting aluminum alloy is poor. Therefore, the following problems can be effectively avoided: a low yield rate of die-casting fittings, severe burn-in caused due to heat emission of a product, corrosion in a harsh environment such as a coastal area, assembling difficulties caused by an insufficient mechanical property, or severe deformation in wind load.

Claims

1. A die casting aluminum alloy, consisting of constituents with the following mass percentages:

silicon: 4.0% to 10.0%;
magnesium: 0.2% to 1.0%;
copper: ≤0.1%;
manganese: ≤0.1%;
zinc: ≤0.1%;
iron: 0.5% to 1.0%;
titanium: 0.05% to 0.2%; and
inevitable impurities: ≤0.15%; and the rest: aluminum.

2. The die casting aluminum alloy according to claim 1, wherein a mass percentage of the silicon is 5.5% to 6.5%.

3. The die casting aluminum alloy according to claim 2, wherein the mass percentage of the silicon is 5.8% to 6.3%.

4. The die casting aluminum alloy according to claim 2, wherein the mass percentage of the silicon is 5.7%.

5. The die casting aluminum alloy according to claim 1, wherein a mass percentage of the silicon is 4.3% to 5.0%.

6. The die casting aluminum alloy according to claim 5, wherein the mass percentage of the silicon is 4.4% to 4.8%.

7. The die casting aluminum alloy according to claim 1, wherein a mass percentage of the silicon is 6.5% to 7.5%.

8. The die casting aluminum alloy according to any one of claims 1 to 7, wherein a mass percentage of the magnesium is 0.3% to 0.8%.

9. The die casting aluminum alloy according to claim 8, wherein the mass percentage of the magnesium is 0.4% to 0.7%.

10. The die casting aluminum alloy according to claim 9, wherein the mass percentage of the magnesium is 0.5% to 0.6%.

11. The die casting aluminum alloy according to any one of claims 1 to 10, wherein a mass percentage of the copper is 0.001% to 0.05%.

12. The die casting aluminum alloy according to claim 11, wherein the mass percentage of the copper is 0.01% to 0.03%.

13. The die casting aluminum alloy according to any one of claims 1 to 12, wherein a mass percentage of the manganese

is 0.001% to 0.006%.

14. The die casting aluminum alloy according to claim 13, wherein the mass percentage of the manganese is 0.002% to 0.004%.

15. The die casting aluminum alloy according to any one of claims 1 to 14, wherein a mass percentage of the zinc is 0.001% to 0.02%.

16. The die casting aluminum alloy according to claim 15, wherein the mass percentage of the zinc is 0.001% to 0.008%.

17. The die casting aluminum alloy according to claim 1, wherein the mass percentage of the iron is 0.5% to 0.7%.

18. The die casting aluminum alloy according to any one of claims 1 to 17, wherein a mass percentage of the titanium is 0.05% to 0.06%.

19. The die casting aluminum alloy according to any one of claims 1 to 18, wherein a total mass percentage of elements other than the aluminum in the die casting aluminum alloy is less than 10%.

20. The die casting aluminum alloy according to claim 19, wherein the total mass percentage of the elements other than the aluminum in the die casting aluminum alloy is 5.0% to 8.0%.

21. The die casting aluminum alloy according to claim 1, wherein phases inside an organization structure of the die casting aluminum alloy comprise a hypoeutectic α-Al phase, a eutectic α-Al phase, a eutectic Si phase, and an intermetallic compound, the intermetallic compound is distributed at a grain boundary location or is precipitated in the hypoeutectic α-Al phase and the eutectic α-Al phase, and the intermetallic compound comprises an Mg_2Si phase.

22. The die casting aluminum alloy according to any one of claims 1 to 21, wherein a coefficient of thermal conductivity of the die casting aluminum alloy is 170 W/(m·K) to 195 W/(m·K).

23. The die casting aluminum alloy according to any one of claims 1 to 22, wherein Brinell hardness of the die casting aluminum alloy is 60 HBW to 80 HBW, tensile strength is 170 MPa to 220 MPa, yield strength is greater than or equal to 100 MPa, and an elongation rate is greater than or equal to 2%.

24. A communications product, comprising a housing and a power supply circuit and a functional circuit that are located in the housing, wherein the power supply circuit supplies power to the functional circuit, and the housing is obtained through casting by using the die casting aluminum alloy according to any one of claims 1 to 23.

Patentansprüche

1. Druckguss-Aluminiumlegierung, bestehend aus Bestandteilen mit den folgenden Massenanteilen:

   Silicium: 4,0 % bis 10,0 %;
   Magnesium: 0,2 % bis 1,0 %;
   Kupfer: ≤ 0,1 %;
   Mangan: ≤ 0,1 %;
   Zink: ≤ 0,1 %;
   Eisen: 0,5 % bis 1,0 %;
   Titan: 0,05 % bis 0,2 %; und
   unvermeidbare Verunreinigungen: ≤ 0,15 %;
   und der Rest: Aluminium.

2. Druckguss-Aluminiumlegierung gemäß Anspruch 1, wobei der Massenanteil des Siliciums 5,5 % bis 6,5 % beträgt.

3. Druckguss-Aluminiumlegierung gemäß Anspruch 2, wobei der Massenanteil des Siliciums 5,8 % bis 6,3 % beträgt.

4. Druckguss-Aluminiumlegierung gemäß Anspruch 2, wobei der Massenanteil des Siliciums 5,7 % beträgt.

5. Druckguss-Aluminiumlegierung gemäß Anspruch 1, wobei der Massenanteil des Siliciums 4,3 % bis 5,0 % beträgt.

6. Druckguss-Aluminiumlegierung gemäß Anspruch 5, wobei der Massenanteil des Siliciums 4,4 % bis 4,8 % beträgt.

7. Druckguss-Aluminiumlegierung gemäß Anspruch 1, wobei der Massenanteil des Siliciums 6,5 % bis 7,5 % beträgt.

8. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 7, wobei der Massenanteil des Magnesiums 0,3 % bis 0,8 % beträgt.

9. Druckguss-Aluminiumlegierung gemäß Anspruch 8, wobei der Massenanteil des Magnesiums 0,4 % bis 0,7 % beträgt.

10. Druckguss-Aluminiumlegierung gemäß Anspruch 9, wobei der Massenanteil des Magnesiums 0,5 % bis 0,6 % beträgt.

11. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 10, wobei der Massenanteil des Kupfers 0,001 % bis 0,05 % beträgt.

12. Druckguss-Aluminiumlegierung gemäß Anspruch 11, wobei der Massenanteil des Kupfers 0,01 % bis 0,03 % beträgt.

13. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 12, wobei der Massenanteil des Mangans 0,001 % bis 0,006 % beträgt.

14. Druckguss-Aluminiumlegierung gemäß Anspruch 13, wobei der Massenanteil des Mangans 0,002 % bis 0,004 % beträgt.

15. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 14, wobei der Massenanteil des Zinks 0,001 % bis 0,02 % beträgt.

16. Druckguss-Aluminiumlegierung gemäß Anspruch 15, wobei der Massenanteil des Zinks 0,001 % bis 0,008 % beträgt.

17. Druckguss-Aluminiumlegierung gemäß Anspruch 1, wobei der Massenanteil des Eisens 0,5 % bis 0,7 % beträgt.

18. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 17, wobei der Massenanteil des Titans 0,05 % bis 0,06 % beträgt.

19. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 18, wobei der Gesamt-Massenanteil an von Aluminium verschiedenen Elementen in der Druckguss-Aluminiumlegierung kleiner als 10 % ist.

20. Druckguss-Aluminiumlegierung gemäß Anspruch 19, wobei der Gesamt-Massenanteil der von Aluminium verschiedenen Elemente in der Druckguss-Aluminiumlegierung 5,0 % bis 8,0 % beträgt.

21. Druckguss-Aluminiumlegierung gemäß Anspruch 1, wobei Phasen in einer Organisationsstruktur der Druckguss-Aluminiumlegierung eine hypoeutektische α-Al-Phase, eine eutektische α-Al-Phase, eine eutektische Si-Phase und eine intermetallische Verbindung umfassen, wobei die intermetallische Verbindung an einer Korngrenzenlage verteilt ist oder in der hypoeutektischen α-Al-Phase und der eutektischen α-Al-Phase präzipitiert ist und die intermetallische Verbindung eine Mg_2Si-Phase umfasst.

22. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 21, wobei ein Wärmeleitungskoeffizient der Druckguss-Aluminiumlegierung 170 W/(m·K) bis 195 W/(m·K) beträgt.

23. Druckguss-Aluminiumlegierung gemäß einem der Ansprüche 1 bis 22, wobei die Brinell-Härte der Druckguss-Aluminiumlegierung 60 HBW bis 80 HBW beträgt, die Zugfestigkeit 170 MPa bis 220 MPa beträgt, die Streckgrenze größer als oder gleich 100 MPa ist und die Dehnungsrate größer als oder gleich 2 % ist.

24. Kommunikationsprodukt, umfassend ein Gehäuse und eine Stromversorgungsschaltung und eine Funktionsschaltung, die in dem Gehäuse angeordnet sind, wobei die Stromversorgungsschaltung die Funktionsschaltung mit Strom versorgt und das Gehäuse durch Gießen unter Verwendung der Druckguss-Aluminiumlegierung gemäß einem der

Ansprüche 1 bis 23 erhalten ist.

Revendications

1. Alliage d'aluminium pour la coulée sous pression, constitué de constituants dotés des pourcentages en masse suivants :

   silicium : 4,0 % à 10,0 % ;
   magnésium : 0,2 % à 1,0 % ;
   cuivre : ≤ 0,1 % ;
   manganèse : ≤ 0,1 % ;
   zinc : ≤ 0,1 % ;
   fer: 0,5 % à 1,0 % ;
   titane : 0,05 % à 0,2 % ; et
   impuretés inévitables : ≤ 0,15 % ; et le reste : aluminium.

2. Alliage d'aluminium pour la coulée sous pression selon la revendication 1, un pourcentage en masse du silicium étant de 5,5 % à 6,5 %.

3. Alliage d'aluminium pour la coulée sous pression selon la revendication 2, le pourcentage en masse du silicium étant de 5,8 % à 6,3 %.

4. Alliage d'aluminium pour la coulée sous pression selon la revendication 2, le pourcentage en masse du silicium étant de 5,7 %.

5. Alliage d'aluminium pour la coulée sous pression selon la revendication 1, un pourcentage en masse du silicium étant de 4,3 % à 5,0 %.

6. Alliage d'aluminium pour la coulée sous pression selon la revendication 5, le pourcentage en masse du silicium étant de 4,4 % à 4,8 %.

7. Alliage d'aluminium pour la coulée sous pression selon la revendication 1, un pourcentage en masse du silicium étant de 6,5 % à 7,5 %.

8. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 7, un pourcentage en masse du magnésium étant de 0,3 % à 0,8 %.

9. Alliage d'aluminium pour la coulée sous pression selon la revendication 8, le pourcentage en masse du magnésium étant de 0,4 % à 0,7 %.

10. Alliage d'aluminium pour la coulée sous pression selon la revendication 9, le pourcentage en masse du magnésium étant de 0,5 % à 0,6 %.

11. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 10, un pourcentage en masse du cuivre étant de 0,001 % à 0,05 %.

12. Alliage d'aluminium pour la coulée sous pression selon la revendication 11, le pourcentage en masse du cuivre étant de 0,01 % à 0,03 %.

13. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 12, un pourcentage en masse du manganèse étant de 0,001 % à 0,006 %.

14. Alliage d'aluminium pour la coulée sous pression selon la revendication 13, le pourcentage en masse du manganèse étant de 0,002 % à 0,004 %.

15. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 14, un pourcentage en masse du zinc étant de 0,001 % à 0,02 %.

16. Alliage d'aluminium pour la coulée sous pression selon la revendication 15, le pourcentage en masse du zinc étant de 0,001 % à 0,008 %.

17. Alliage d'aluminium pour la coulée sous pression selon la revendication 1, le pourcentage en masse du fer étant de 0,5 % à 0,7 %.

18. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 17, un pourcentage en masse du titane étant de 0,05 % à 0,06 %.

19. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 18, un pourcentage total en masse d'éléments autres que l'aluminium dans l'alliage d'aluminium pour la coulée sous pression étant inférieur à 10 %.

20. Alliage d'aluminium pour la coulée sous pression selon la revendication 19, le pourcentage total en masse des éléments autres que l'aluminium dans l'alliage d'aluminium pour la coulée sous pression étant de 5,0 % à 8,0 %.

21. Alliage d'aluminium pour la coulée sous pression selon la revendication 1, des phases à l'intérieur d'une structure organisationnelle de l'alliage d'aluminium pour la coulée sous pression comprenant une phase d'a-Al hypoeutectique, une phase d'a-Al eutectique, une phase de Si eutectique, et un composé intermétallique, le composé intermétallique étant distribué au niveau d'un emplacement de joint de grain ou étant précipité dans la phase d'a-Al hypoeutectique et la phase d'α-Al eutectique, et le composé intermétallique comprenant une phase de Mg_2Si.

22. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 21, un coefficient de conductivité thermique de l'alliage d'aluminium pour la coulée sous pression étant de 170 W/(m·K) à 195 W/(m·K).

23. Alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 22, la dureté Brinell de l'alliage d'aluminium pour la coulée sous pression étant de 60 HBW à 80 HBW, la résistance en traction étant de 170 MPa à 220 MPa, la limite d'élasticité étant supérieure ou égale à 100 MPa, et un taux d'élongation étant supérieur ou égal à 2 %.

24. Produit de communications, comprenant un boîtier et un circuit d'alimentation électrique et un circuit fonctionnel qui sont situés dans le boîtier, le circuit d'alimentation électrique fournissant de l'énergie au circuit fonctionnel, et le boîtier étant obtenu par coulée en utilisant l'alliage d'aluminium pour la coulée sous pression selon l'une quelconque des revendications 1 à 23.

REFERENCES CITED IN THE DESCRIPTION

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