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(54) **Accessory consisting of a lock accessory**

Zubehör bestehend aus einem Schlosszubehör

Accessoire constitué d'un accessoire de serrure

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Description

[0001] The present invention relates to an accessory consisting of a lock accessory.

[0002] In detail, the invention relates to a lock accessory in the most general meaning of the word, i.e. comprising: actuating mechanisms, handles, panic bars, padlocks, handgrips, handles and knobs for doors and windows, built-in handles, handles for wardrobes, cabinets and others.

[0003] It is known that these accessories are presently produced using materials capable of meeting fundamental physico-mechanical requirements, such as duration and resistance to wear, and enabling pieces having complicated shapes and high aesthetic features to be obtained.

[0004] Therefore the materials presently used for manufacturing these accessories are the different types of brass, i.e. zinc-copper alloys to which, depending on the required features, other elements such as manganese, tin, iron, aluminium and lead are added.

[0005] These particular alloys can be worked either by cold chamber die casting or by hot moulding. In detail, hot moulding is more expensive as compared with die casting because it requires a greater number of mechanical working operations on the workpiece, but produces accessories of higher quality due to the greater compactness of the material.

[0006] In recent years, due to the great increase in costs for brass and, in particular, copper, production of these accessories has been increasingly more oriented to use of alternative materials such as Zamak® for example, a material identifying a family of zinc-based alloys having aluminium, copper and magnesium as the main alloy elements. Other materials are described in patent applications GB-A-427238, BE-A-439656, US-A-5765623 and GB-A-512758.

[0007] Zamak®, unlike brass, has reduced costs, low melting point and high flowability and, therefore, is particularly suitable for production of accessories by hot chamber die casting, this working enabling very complicated pieces to be obtained with important saving in terms of finish working operations.

[0008] Finally, to give the desired aesthetic aspect, the Zamak® jets are usually submitted to a coating process and in some cases to painting processes in order to increase the aesthetic quality thereof.

[0009] The known art mentioned above has some important drawbacks.

[0010] In fact, the accessories made of Zamak® have high porosity giving rise to formation of bubbles inside the accessory that, once the accessory has solidified, determine important decay of the physico-mechanical properties of the finished product.

[0011] Another defect belonging to accessories made of Zamak® is the impossibility of carrying out welding operations and the poor resistance to oxidation.

[0012] A further defect of accessories made of Zamak® resides in that, due to the reticular parameters of the crystal lattice thereof, they are weakly plastically deformable. In particular, these accessories can be only made by die casting which leads to formation of inner faults, such as porosity, limiting the accessory integrity.

[0013] Generally, uncoated accessories made of Zamak® are characterised by surface deterioration giving rise to worsening of the aesthetic features and the mechanical and tribologic features. It is therefore necessary to coat said accessories immediately after being produced, exactly for counteracting surface oxidation or general deterioration.

[0014] The above described deterioration is further increased because these accessories, due to their arrangement outdoors and the mechanical functions the lock portions perform, are often submitted to impacts, friction and various stresses that can lead to breaking of the accessory itself.

[0015] To obviate the aforesaid drawbacks suitable zinc alloys have been made that have better mechanical features as compared with Zamak®.

[0016] In some of these alloys high workability and physico-chemical features are obtained by means of particular elements such as lead, bismuth, and still other elements.

[0017] In particular, patent US-B3880679 discloses a particular zinc alloy using bismuth for improving the chemical features of the compound.

[0018] However, lead is considered dangerous for the environment, in particular during the disposal step. In addition it is not yet clear how to dispose of bismuth, and are not yet clear the potential dangerous effects that the latter could have on the environment.

[0019] Another type of alloy is disclosed in patent JP-A-06049572. These alloys have good physico-mechanical features in particular resulting from the high amount of copper or a particularly high amount of aluminium. However these alloys cannot be worked with tools acting by chip removal and by hot deformation or moulding, but only by casting.

[0020] Under this situation, the technical task underlying the present invention is to conceive an accessory consisting of a lock accessory capable of substantially obviating the mentioned drawbacks.

[0021] Within the scope of this technical task, it is an important aim of the invention to provide a lock accessory that, in spite of impacts or possible contact with corrosive agents, keeps high aesthetic qualities and optimal surface finish for long.

[0022] Another important aim of the invention is to obtain a lock accessory having high aesthetic qualities while being of competitive price.

[0023] A further aim of the invention is to manufacture an accessory consisting of a lock accessory both by casting and by moulding, that is devoid of inner porosity or other defects that may give rise to breaks or other similar problems.

[0024] The technical task and the aims specified are

achieved by an accessory consisting of a lock accessory as claimed in the appended Claim 1.

[0025] Preferred embodiments are highlighted in the sub-claims.

[0026] The features and advantages of the invention are hereinafter clarified by the detailed description of a preferred embodiment of the invention, with reference to the accompanying drawings, in which:

Fig. 1 shows an accessory for access elements to inner places/rooms according to the invention; and
Fig. 2 represents a process for manufacturing an accessory according to the invention.

[0027] With reference to the mentioned figures, the accessory consisting of a lock or the like according to the invention is generally identified by reference numeral **1**.

[0028] As known, locks generally comprise handles, inner opening and closing mechanisms, padlocks or the like.

[0029] In particular, accessory 1 is intended for providing an object adapted to be disposed close to an access element, such as a door or window, a wardrobe's or cabinet's wing or a drawer, that alternately opens or closes an opening and therefore inhibits or allows access to a space/room, respectively. Accessory 1 can be therefore positioned on the outer wall of a house or a building, the boundary wall of a garden or any other wall or similar means adapted to at least partly define the perimeter of a space such as a house, room or office.

[0030] Accessory 1 is therefore the handle or inner mechanism for opening and closing doors, windows and wings, for example; or yet it consists of panic bars, knobs, built-in handles, padlocks.

[0031] Accessory 1 has a shape or body 2 defining the form of said accessory 1, and a coating 3 covering at least part of the shape or body 2.

[0032] The shape 2 is made of a zinc alloy comprising aluminium in a percentage included between 13% and 25%, magnesium in a percentage lower that 0.1% and copper in a percentage included between 0.2% and 3.5%, and a zinc percentage substantially included between 70% and 87%. Preferably, the zinc percentage in this alloy is included between 75% and 85%.

[0033] In detail, two preferred compositions have the following percent amounts. First composition: aluminium 15%±1%, magnesium 0.04%±0,02%, copper 1%±0.5%, zinc for the balance. Second composition: aluminium 22%±1%, magnesium 0.04%±0.02%, copper 2%±0.5%, zinc for the balance.

[0034] In said alloy, in addition to zinc, aluminium, copper and magnesium, impurities can be also present, i.e. other substances different from those listed above and present in percentages lower than 0.05%. In detail, among the impurities, it is possible to have: iron with a maximum concentration of 0.02% because it makes the alloy more brittle; cadmium present in a percentage not beyond 0.0015% because it makes the mechanical properties worse and induces intercrystal corrosion; and tin, present in the alloy in a maximum concentration of 0.002% because it makes the mechanical properties worse and induces intercrystal corrosion; lead, bismuth and nickel, each with a content lower than 0.004% and preferably of 0.001%.

[0035] Coating 3 is preferably carried out at least on the portion in sight, if any, of the accessory, i.e. the surface of accessory 1 adapted not to abut against the object with which it is engaged such as a door or a wall. Alternatively, it is carried out on particularly stressed mechanical elements.

[0036] This coating 3 comprises a base layer **3a** obtained through electroplating and a film **3b** deposited thereon preferably through a high vacuum process. In detail, the film 3b defines the outer surface of accessory 1, while layer 3a is enclosed between the film 3b and the shape or body 2, as shown in Fig. 2.

[0037] In detail, the base layer 3a deposited by the known electroplating technique, comprises copper and/or nickel and/or chromium, while the film 3b is of the metal type and preferably comprises, by way of non-exhaustive example: Ti, TiN, TiCN, Cr, CrN, CrCN, TiO, SiOx, DLC, etc.

[0038] Thickness of layer 3a is substantially included between 5 μm and 40 μm, while thickness of film 3b is substantially included between 0.2 μm and 2 μm. Alternatively, coating 3 comprises a single layer applied through electrophoretic painting, so as to obtain reduced environmental impact.

[0039] The invention comprises a new process **10** for manufacturing an accessory 1 for access elements to inner places or environments.

[0040] Process 10, diagrammatically shown in Fig. 2, comprises a forming step **11** in which at least one shape or body 2 of accessory 1 is made and a surface finishing step **12** adapted to create a coating 3 covering at least part of said shape or body 2.

[0041] The forming step 11 is obtained by plastic deformation and preferably hot plastic deformation, as it takes place in hot moulding, for example.

[0042] In hot moulding the alloy, in order to improve malleability thereof, is heated to a temperature usually higher than two thirds of the melting temperature, in this case between 200°C and 400°C and is subsequently introduced between the two half-dies where it is compressed until it takes the die's shape, i.e. the form of shape or body 2 of accessory 1 that is wished to be manufactured.

[0043] As an alternative to hot plastic deformation, the forming step 11 contemplates manufacture of shape 2 by die-casting.

[0044] Die-casting also referred to as "casting in an iron mould under pressure", is a particular process in permanent form in which the zinc alloy after being melted, is injected at high pressure or merely under gravity into a metal mould.

[0045] This particular working can take place both in

hot chamber and in cold chamber. In particular, in hot chamber die casting, the melting furnace is part of the machine and the injection device is placed in the crucible or melting pot and therefore is at the same temperature as the molten alloy. In detail, the melting pot, heated by a furnace, holds the molten alloy that, through a hole, enters the injection chamber and is then compressed into the mould through a suitable injector, at a pressure usually included between 2 and 15 MPa. In the cold chamber die-casting, unlike the hot chamber die casting, the zinc alloy is melted in the crucible that is separated from the mould. In detail, in this case the molten alloy after being removed from the crucible, is introduced into the injection chamber through a suitable hole and then placed inside the mould cavity at a pressure substantially included between 15 and 150 MPa.

[0046] In conclusion, the forming step 11 preferably takes place through hot chamber die-casting or, alternatively, hot moulding, as previously described or yet by means of tools acting by chip removal such as CNC (Computerised Numerical Control) machines.

[0047] Most preferably, in the forming step the zinc alloy used in hot chamber die-casting has an aluminium percentage included between 13% and 25%.

[0048] Other applicable techniques are machining by chip removal or the like, such as turning and cutting processes.

[0049] Finally, once formation of the shape 2 has been completed, by die-casting or moulding, the forming step can contemplate a final cleaning operation in which burr or other defects resulting from adopting the aforesaid working techniques are eliminated.

[0050] When the forming step 11 and the following mechanical finishing operations have been completed, other finishing operations have to be carried out which comprise surface smoothing and subsequent polishing made mechanically by means of brushes, using manual or robotized processes, or by means of mass treatments in vibrators using abrasive chips; then the surface finishing step 12 begins in which coating 3 is made.

[0051] In detail, the surface finishing step 12 preferably comprises a covering sub-step **12a** suitable for depositing the base layer 3a or, alternatively, a coating sub-step **12a** adapted to form the film 3b. More preferably, the surface finishing step 12 contemplates both the covering sub-step 12a and the coating sub-step 12b that advantageously takes place after said covering sub-step 12a.

[0052] The covering sub-step 12a is preferably obtained by the electroplating technique that, through electrolytic deposition, enables the shape 2 to be covered with layer 3a consisting of copper and/or nickel plus chromium.

[0053] The subsequent coating sub-step 12b forms the film 3b by high vacuum deposition and preferably by a PVD or PECVD process.

[0054] The expression "high vacuum deposition" is used to identify those coating processes carried out in vacuum chambers, i.e. in environments with very low inner pressure, and more specifically in high vacuum chambers with an inner pressure substantially included between 10^{-1} Pa and 10^{-5} Pa. Among the most important high vacuum processes there are those referred to as PVD or PECVD.

[0055] PVD or PECVD (which are the acronyms of "Physical Vapor Deposition" and "Plasma Enhanced Chemical Vapor Deposition" respectively) processes are atomic deposition processes in which the material to be deposited is evaporated from the solid phase and transferred, in the vapour phase, to the pieces to be covered where it deposits to form a thin film.

[0056] Alternatively, in the covering step 12a a coating is deposited that will directly constitute the outer layer of accessory 1.

[0057] The invention achieves important advantages.

[0058] In fact, accessory 1 is characterised by the raw production materials having a lower cost than that of known accessories.

[0059] This advantage is further achieved also by virtue of the high workability of said alloy that, due to the optimal aluminium and copper contents, can be worked in a simple and easy manner.

[0060] In particular, the aluminium content is in any case limited to no more than 25% and preferably 23%, so as to ensure good hot deformability and a melting temperature that is not too high.

[0061] In addition the copper content does not exceed 5% so as to obtain ideal chips in working processes by chip removal.

[0062] In addition to the above reasons, reduction in costs is obtained due to the possibility belonging to the zinc alloy of being worked both through hot moulding and through die-casting or also extrusion. In detail, use of these techniques gives rise to a reduction in costs because hot chamber die-casting ensures an almost optimal control of the operating temperature and high production rates, while hot moulding, impossible for accessories made of Zamak®, can be automated to a high degree and therefore enables high productivity.

[0063] Other advantages connected with the possibility of working the zinc alloy by hot plastic deformation are the working temperatures lower than those of brass and the consequent energy saving and moreover the high physico-mechanical features bringing about a longer duration of accessory 1 as compared with known accessories. In fact the alloy and working operations adopted enable accessories 1 to be made that are devoid of inner defects and are therefore of very high quality.

[0064] A further advantage of accessory 1 is the greater handiness and ease of use ensured by the reduced weight that, as compared with accessories made of brass and of Zamak® is respectively about 20% and 15% lower.

[0065] In addition to the preceding advantages, accessory 1, unlike those hitherto used, is characterised by a high aesthetic quality,

[0066] Furthermore, accessory 1 has high features of resistance to oxidation also when it is not coated. There-

fore it is possible to store high amounts of uncoated accessories 1 and carry out coating 3 not immediately after manufacture of shape 2 but only at the moment of sale or use, so as to optimise the logistics connected with storage.

[0067] On the contrary, this management is not possible with accessories made of Zamak®, as uncoated accessories would corrode or be submitted to decay when stored.

[0068] Another important advantage connected with use of the innovative zinc alloy is represented by the possibility of carrying out welding or other similar working operations that are not allowed in presently used alloys, such as Zamak®, for example.

[0069] A further advantage resides in that the zinc alloy is characterised by lead, bismuth and cadmium contents much smaller than those of Zamak® or other zinc alloys. In detail, this advantage results in simpler disposal and consequently less environmental impact of accessory 1 made with use of the innovative alloy, as compared with accessories made of Zamak® or other zinc alloys. Moreover, while in Zamak® or other zinc alloys lead or bismuth are necessary for carrying out the working operations, in the present alloy lead and bismuth can be fully eliminated, according to the technological limits of the state of the art.

Claims

1. An accessory consisting of a lock accessory (1) subject to manual contact comprising a body or shape (2) defining the form of said accessory (1) and wherein
said shape (2) is made of a zinc alloy comprising aluminium in a percentage included between 13% and 25%, magnesium in a percentage lower than 0.1 %, copper in a percentage between 0.2% and 3.5% and does not comprise bismuth, nickel or lead or keeps each of them in a percentage lower than 0.004% and, in addition to zinc, aluminium, copper and magnesium, impurities can be present in percentages lower than 0.05%.

2. An accessory (1) as claimed in one or more of the preceding claims, wherein the zinc percentage in said alloy is substantially included between 70% and 87%.

3. An accessory (1) as claimed in one or more of the preceding claims, wherein said alloy does not comprise bismuth and lead or keeps each of them in a percentage lower than 0.001%.

4. A process (10) for manufacturing an accessory consisting of a lock accessory (1) that is subject to manual contact; said process comprising a forming step (11) in which at least one body or shape (2) of said accessory (1) is made; wherein said shape (2) is made of a zinc alloy comprising aluminium in a percentage included between 13% and 25%, magnesium in a percentage lower than 0.1%, copper in a percentage between 0.2% and 3.5% and does not comprise bismuth, nickel or lead or keeps each of them in a percentage lower than 0.004% and, in addition to zinc, aluminium, copper and magnesium, impurities can be present in percentages lower than 0.05%.

5. A process (10) as claimed in the preceding claim, wherein said forming step (11) is carried out by plastic deformation under heating.

6. A process (10) as claimed in one or more of claims 4-5, wherein said forming step (11) comprises hot chamber die casting.

7. A process (10) as claimed in one or more of claims 4-6, wherein said forming step (11) contemplates machining by chip removal.

Patentansprüche

1. Zubehör bestehend aus einem manuellem Kontakt ausgesetzten Schlosszubehör (1), umfassend ein die Form des genannten Zubehörs (1) definierendes Profil (2), bei dem das genannte Profil (2) aus einer Zinklegierung mit einem Aluminiumanteil zwischen 13 % und 25 %, einem Magnesiumanteil von weniger als 0,1 %, einem Kupferanteil zwischen 0,2 und 3,5 % und ohne Wismut, Nickel oder Blei oder jeweils nur bei Anteilen von unter 0,004 % hergestellt wird, wobei außer Zink, Aluminium, Kupfer und Magnesium Verunreinigungen in Anteilen von unter 0,05 % vorliegen können.

2. Zubehör (1) nach einem oder mehreren der vorangegangenen Ansprüche, bei dem der Zinkanteil der genannten Legierung im Wesentlichen zwischen 70 % und 87 % liegt.

3. Zubehör (1) nach einem der vorangegangenen Ansprüche, bei dem die genannte Legierung kein Wismut oder Blei enthält oder beide bei Anteilen von unter 0,001 % hält.

4. Verfahren (10) zur Herstellung eines manuellem Kontakt ausgesetzten Schlosszubehörs (1); wobei das genannte Verfahren einen Schritt der Formung (11) umfasst, bei dem mindestens ein Körper oder ein Profil (2) des genannten Zubehörs (1) hergestellt wird; wobei das genannte Profil (2) aus einer Zinklegierung mit einem Aluminiumanteil zwischen 13 % und 25 %, einem Magnesiumanteil von weniger als 0,1 %, einem Kupferanteil zwischen 0,2 % und 3,5 % und ohne Wismut, Nickel oder Blei oder jeweils

nur mit Anteilen von unter 0,004 % hergestellt wird, wobei außer Zink, Aluminium, Kupfer und Magnesium Verunreinigungen in Anteilen von unter 0,05 % vorliegen können.

5. Verfahren (10) nach dem vorangegangenen Anspruch, bei dem der genannte Schritt der Formung (11) durch plastisches Warmumformen erfolgt.

6. Verfahren (10) nach einem oder mehreren der Ansprüche 4-5, bei dem der genannte Schritt der Formung (11) ein Druckgussverfahren in der Warmkammer umfasst.

7. Verfahren (10) nach einem oder mehreren der Ansprüche 4-6, bei dem der genannte Schritt der Formung (11) die Bearbeitung mit spanabhebenden Maschinen umfasst.

Revendications

1. Accessoire constitué d'un accessoire de serrure (1) sujet au contact manuel comprenant un gabarit (2) définissant la forme dudit accessoire (1) et dans lequel ledit gabarit (2) est réalisé en un alliage de zinc comprenant de l'aluminium en pourcentage compris entre 13 % et 25 %, du magnésium en pourcentage inférieur à 0,1 %, du cuivre en pourcentage entre 0,2 et 3,5 % et ne comprenant ni du bismuth, ni du nickel ni du plomb ou les maintenant chacun à un pourcentage inférieur à 0,004 % et outre le zinc, l'aluminium, le cuivre et le magnésium, les impuretés peuvent être présentes en pourcentages inférieurs à 0,05 %.

2. Accessoire (1) selon l'une ou plusieurs des revendications précédentes, dans lequel le pourcentage de zinc dans ledit alliage est fondamentalement compris entre 70 % et 87 %.

3. Accessoire (1) selon l'une ou plusieurs des revendications précédentes, dans lequel ledit alliage ne comprend ni du bismuth ni du plomb ou les maintient tous les deux en pourcentages inférieurs à 0,001 %.

4. Procédé (10) pour la réalisation d'un accessoires de serrure (1) sujet au contact manuel ; ledit procédé comprenant une phase de moulage (11) dans laquelle est réalisé au moins un corps ou un gabarit (2) dudit accessoire (1) ; dans lequel ledit gabarit (2) est réalisé en un alliage de zinc comprenant de l'aluminium en pourcentage compris entre 13 % et 25 %, du magnésium en pourcentage inférieur à 0,1 %, du cuivre en pourcentage entre 0,2 et 3,5 % et ne comprend ni du bismuth, ni du nickel, ni du plomb ou les maintient chacun en pourcentages inférieurs à 0,004 % et outre le zinc, l'aluminium, le cuivre et le magnésium, les impuretés peuvent être présentes en pourcentages inférieurs à 0,05 %.

5. Procédé (10) selon la revendication précédente, dans lequel ladite phase de moulage (11) est réalisée par déformation plastique à chaud.

6. Procédé (10) selon l'une ou plusieurs des revendications 4-5, dans lequel ladite phase de moulage (11) comprend le moulage sous pression à chambre chaude.

7. Procédé (10) selon l'une ou plusieurs des revendications 4-6, dans lequel ladite phase de moulage (11) comprend l'usinage par machines-outils à enlèvement de copeaux.

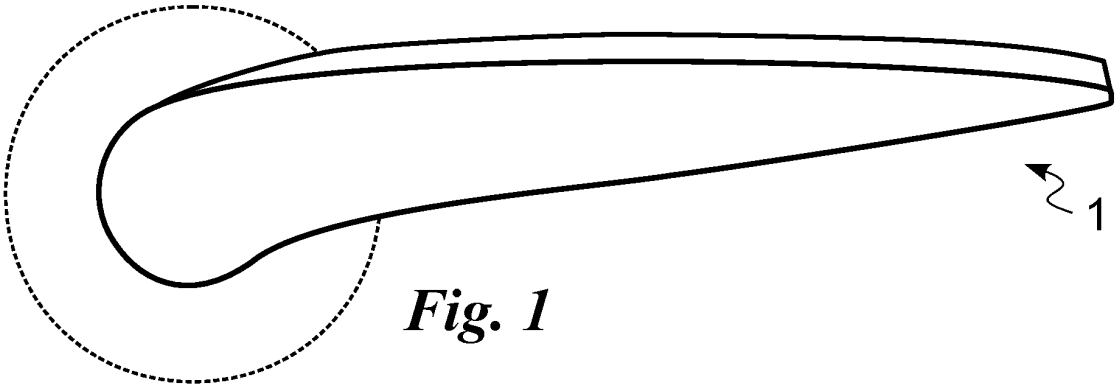
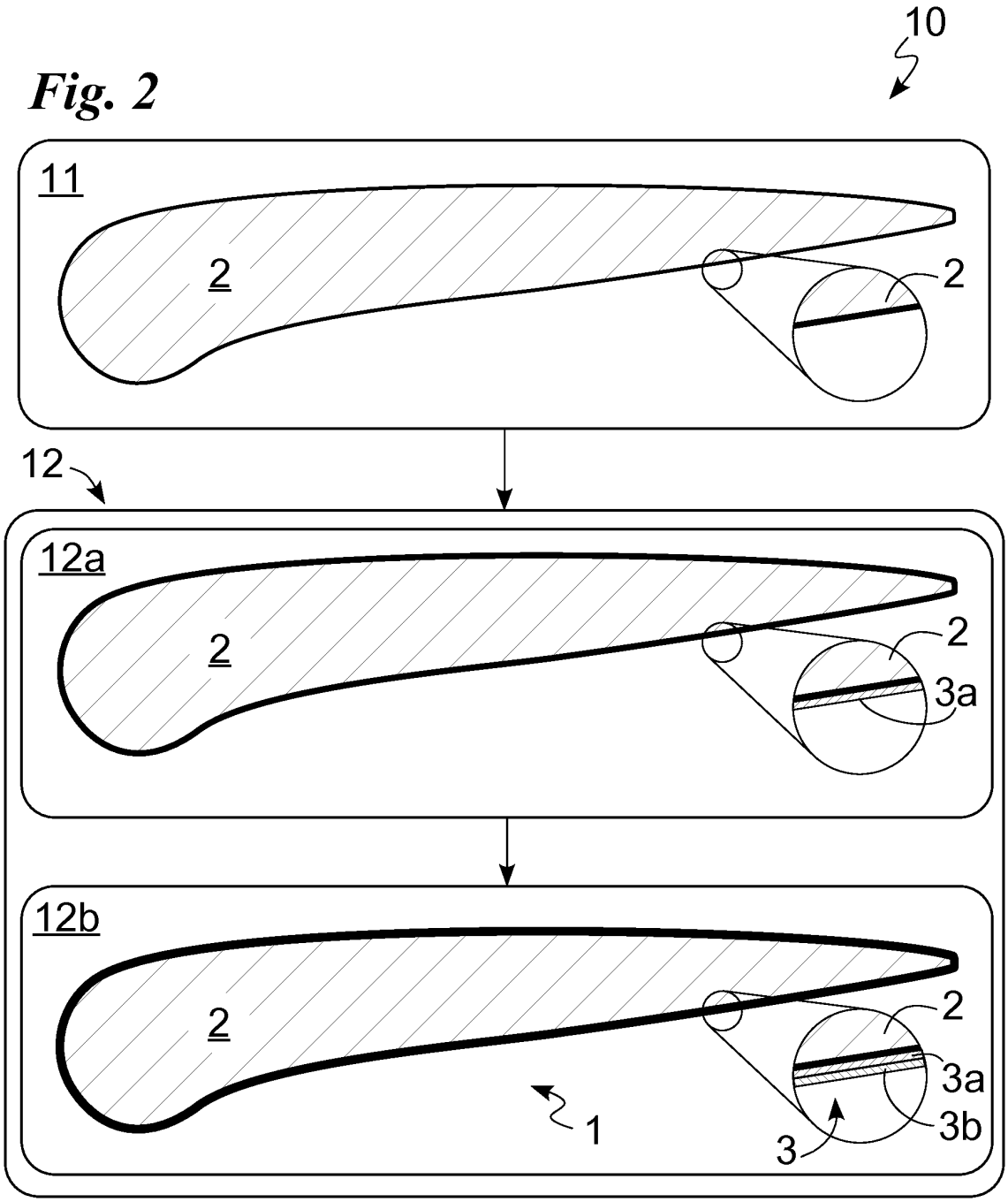


Fig. 1

Fig. 2



REFERENCES CITED IN THE DESCRIPTION

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