(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 974 550 A9**

(12) **CORRECTED EUROPEAN PATENT APPLICATION**

(15) Correction information:
Corrected version no 1 (W1 A1)
Corrections, see
Description Paragraph(s) 32, 33, 34, 44, 45, 66

(48) Corrigendum issued on:
18.05.2022 Bulletin 2022/20

(43) Date of publication:
30.03.2022 Bulletin 2022/13

(21) Application number: **21199212.8**

(22) Date of filing: **27.09.2021**

(51) International Patent Classification (IPC):
C22C 1/02 *(2006.01)* ***C22C 21/00*** *(2006.01)*
C22C 21/06 *(2006.01)* ***C22F 1/04*** *(2006.01)*
C22F 1/047 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
C22C 21/00; C22C 1/026; C22C 21/06; C22F 1/04; C22F 1/047

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **28.09.2020 DE 102020125252**

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(54) **METHOD FOR PROVIDING ALUMINIUM CAN MATERIAL**

(57) The present invention relates to a method for providing aluminium can material (83, 171, 273, 302, 304, 306), in particular aluminium can strip, in which an aluminium melt (11, 111, 211) is provided and in which the can material (83,171, 273, 302, 304, 306) is produced from the aluminium melt (11, 111, 211), wherein the aluminium melt (11, 111, 211) is at least in part provided by melting an amount of non-UBC aluminium scrap (12,112, 212). The present invention further relates to the use of non-UBC scrap (12, 112, 212), in particular aluminium lithographic scrap or scrap according to ISRI code Taint/Tabor, Twitch or Zorba, for providing can material (83,171, 273, 302, 304, 306), in particular can end material or can body material, in particular for producing can ends (310), can tabs (314) or can bodies (318) of aluminium beverage cans (322).

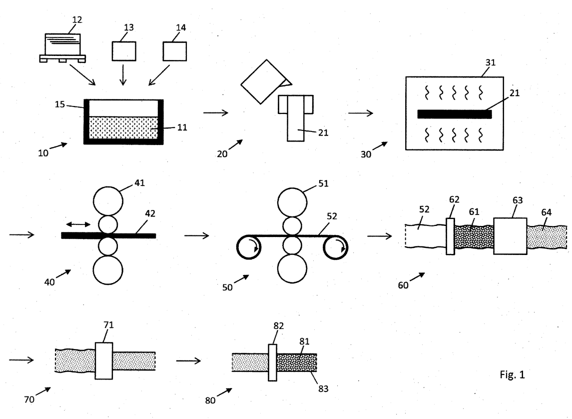

Fig. 1

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Description

[0001] The present invention relates to a method for providing aluminium can material, in particular aluminium can strip.

[0002] In the production of aluminium cans, there is a general demand for a higher use of aluminium scrap metal in order to reduce carbon dioxide footprint and costs and save valuable resources.

[0003] In general, different aluminium alloys are used for the can body on the one side and the can end (i.e. the can lid) and the can tab on the other side. A 3xxx aluminium alloy, typically 3104, is usually used for the can body and a 5xxx aluminium alloy, typically 5182, is usually used for the can end and can tab.

[0004] In the past, can production scrap, e.g. trimming scrap of can body strips or can end or tab strips, have been remelted to produce new can body material or can end or tab material, respectively.

[0005] However, it has proven difficult so far to use significant amounts of post consumer scrap (PCS) for production of new can body material or can end or tab material as the mixture of different alloys of the can body and the can end or tab in used beverage can (UBC) scrap makes it difficult to achieve the alloy specification for either new can body or new can end or tab material. For example, the increased Mg content in 5xxx can end alloys make it difficult to fulfil the Mg limits in 3xxx can body alloys and the typical contents of Si, Zn or Cu in the 3xxx can body alloys make it difficult to fulfil the respective limits for the 5xxx can end or tab alloy.

[0006] In view of this, it is an object of the present invention to provide aluminium can material, in particular aluminium can end, can tab and/or aluminium can body material with a better use of scrap material, in particular PCS material.

[0007] According to a first aspect of the present disclosure, this object is achieved by a method for providing aluminium can material, in particular aluminium can strip, in which an aluminium melt is provided and in which the can material is produced from the aluminium melt, wherein the aluminium melt is at least in part provided by melting an amount of non-UBC aluminium scrap.

[0008] "Aluminium melt" as used in this document is in particular understood to mean "aluminium alloy melt".

[0009] It has been found that a higher percentage of scrap material may be used for providing aluminium can material by using, at least in part, non-UBC aluminium scrap instead of or in addition to UBC aluminium scrap. In particular, non-UBC aluminium scrap allows to achieve the target composition for aluminium can body or aluminium can end or tab material with a higher proportion of scrap and less primary material used for providing the aluminium melt.

[0010] The aluminium melt is at least in part provided by melting an amount of non-UBC aluminium scrap. For example, at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-%, of the melt may be provided by melting non-UBC aluminium scrap. The rest of the melt may be provided, for example, by melting primary aluminium or aluminium alloys, other alloying material, e.g. alloying material containing particular alloying elements such as Mg, Mn, Ti etc., and even a certain amount of UBC scrap if desired. The selection of materials and their respective amounts melted to provide the melt are in particular selected such that the desired composition of the melt is achieved.

[0011] Aluminium can material is then produced from the aluminium melt. The can material is in particular aluminium beverage can material.

[0012] Producing the can material from the aluminium melt may in particular include: casting the melt by means of discontinuous or semi-continuous casting, optionally ingot sawing and/or scalping, optionally ingot homogenizing, hot rolling, cold rolling, optionally intermediate annealing and/or trimming.

[0013] In the following, several embodiment of the method will be described. The individual embodiments may be combined with each other in any conceivable combination.

[0014] According to an embodiment, at least 40 wt.-%, preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the aluminium melt is provided by melting the amount of non-UBC aluminium scrap. It has been found that the use of non-UBC scrap allows relatively high proportions of scrap use for providing the can material. With a higher scrap proportion, the carbon dioxide footprint and costs may be reduced and recycling rate may be increased.

[0015] According to a further embodiment, the amount of non-UBC aluminium scrap is an amount of non-UBC post consumer scrap. Unlike UBC post consumer scrap, which due to the mixture of can body and can end and can tab alloys make it difficult to increase the scrap proportion for producing aluminium can material above a certain level, it has been found that non-UBC post consumer scrap may be suitable to achieve higher scrap proportions. Also, the use of post consumer scrap is advantageous in order to increase the overall recycling rate.

[0016] According to a further embodiment, the can material is aluminium can end or can tab material. The use of large UBC scrap proportions for producing can end or can tab material is particularly difficult since the can end or tab makes up the minor weight share of an aluminium can in comparison to the can body and therefore the minor weight share in UBC scrap. As a consequence of that, using a large proportion of UBC scrap makes it difficult to match the desired alloy specification for can end or tab material. Accordingly, the method described above is particularly useful to provide aluminium can end or tab material with an increased scrap use proportion.

[0017] According to a further embodiment, the amount of non-UBC aluminium scrap comprises or consists of aluminium lithographic scrap, in particular scrap lithographic sheets. It has been found that aluminium lithographic scrap is particularly suitable for producing aluminium can end or tab material. In particular, aluminium lithographic scrap usually consists to a large proportion of aluminium alloys with contents of particular alloying elements, such as Si, Zn and/or Cu, that allow to comply with upper limits of these elements of typical aluminium can end or tab alloy specifications, in particular 5xxx aluminium alloys such as 5182 aluminium alloy, even when using a high scrap proportion for the melt. In particular, at least 40 wt.-%, preferably at least 50 wt.-%, more preferably at least or more than 75 wt.-% of the melt are provided by melting the aluminium lithographic scrap.

[0018] In particular, the aluminium lithographic scrap may primarily or essentially completely consist of scrap pieces of 1xxx alloys.

[0019] In order to provide a melt with a 5xxx alloy composition, in particular 5182 aluminium alloy, alloying material comprising Mg and/or Mn may be added to provide the melt.

[0020] Aluminium lithographic scrap is scrap from lithographic aluminium material, in particular for offset printing, such as from aluminium strips for lithographic printing plate supports, from lithographic printing plate supports or from lithographic printing plates before or after use, potentially post-treated such as, e.g., washed.

[0021] According to a further embodiment, the amount of non-UBC aluminium scrap comprises or consists of post consumer scrap from lithographic sheets, in particular from blue-washed lithographic sheets. Post consumer scrap from lithographic sheets, in particular from blue-washed lithographic sheets, are generally available on the scrap market as regular commodity and with high degree of varietal purity. Therefore, the use of such scrap allows a good control of the alloy composition of the aluminium can cap or tab material to be provided as this type of scrap contains little contamination by non-lithographic aluminium scrap. The post consumer scrap from lithographic sheets may in particular comprise lithographic scrap from offset printing plants.

[0022] The lithographic scrap may in particular comprise or consist of scrap according to the ISRI code "Tablet" and/or "Tabloid".

[0023] The ISRI codes are specified in the Guidelines for Nonferrous Scrap of the Institute of Scrap Recycling Industries Inc. (ISRI), available from isri.org/specs. For this application, version NF-2020 is used. The ISRI codes are widely used on the international scrap market to classify different kinds of nonferrous scrap material, in particular aluminium scrap material.

[0024] Scrap of the ISRI code "Tabloid" is defined as follows:

Tabloid	NEW, CLEAN ALUMINUM LITHOGRAPHIC SHEETS To consist of 1000 and/or 3000 series alloys, uncoated, unpainted, to be free of paper, plastic, ink, and any other contaminants. Minimum size of 3" (8 cm) in any direction.

[0025] Scrap of the ISRI code "Tablet" is defined as follows:

Tablet	CLEAN ALUMINUM LITHOGRAPHIC SHEETS To consist of 1000 and/or 3000 series alloys, to be free of paper, plastic, excessively inked sheets, and any other contaminants. Minimum size of 3" (8 cm) in any direction.

[0026] The use of scrap according to ISRI code "Tablet" is preferred over "Tabloid" since "Tablet" scrap is post consumer scrap, the use of which increases the overall post consumer scrap recycling rate and significantly reduces the waste of resources. Therefore, preferably more scrap according to ISRI code "Tablet" than scrap according to ISRI code "Tabloid" is used to provide the melt. Preferably at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the melt are provided by melting scrap according to ISRI code "Tablet".

[0027] According to a further embodiment, the aluminium can end or can tab material has a composition according to a 5xxx aluminium alloy, in particular 5182 aluminium alloy. 5xxx aluminium alloy, in particular 5182 aluminium alloy melt, has strict upper limits for particular alloying elements such as Si, Zn and/or Cu which are difficult to comply with when using large proportions of UBC scrap for providing the melt. The use of aluminium lithographic scrap allows use of a large scrap proportion while complying with the upper limits for these alloying elements.

[0028] According to a further embodiment, the aluminium can end material is provided as aluminium can end strip or sheet.

[0029] The aluminium can end material, in particular can end strip, may have a thickness in the range of between 165 μm and 350 μm which is a suitable thickness for using the aluminium can end material for producing can ends.

[0030] The aluminium can end material, in particular can end strip, may have a yield strength $R_{p0,2}$ in the range of between 310 MPa and 380 MPa, which is a suitable yield strength for using the aluminium can end material for producing can ends.

[0031] The aluminium can end material, in particular can end strip, may have a tensile strength R_m in the range of between 360 MPa and 440 MPa, which is a suitable tensile strength for using the aluminium can end material for producing can ends.

[0032] The aluminium can end material, in particular can end strip, may have an elongation A_{50} of 4% or more, in particular 5% or more, which is a suitable elongation for using the aluminium can end material for producing can ends.

[0033] The ranges for $R_{p0,2}$ and R_m and the lower limit for A_{50} named above are typical requirements for can end material that can be met when producing the can end material from the melt by adjusting the production parameters in a commonly known manner, in particular with a 5xxx composition, more particular 5182 composition, of the can end material.

[0034] Throughout this specification, $R_{p0,2}$, R_m and A_{50} are determined according to DIN EN ISO 6892-1:2019, wherein specimen are taken both in rolling direction and with an angle of 45° to the rolling direction. The given limits and ranges apply to both of these directions.

[0035] The aluminium can end material, in particular can end strip, may comprise a coating, in particular a stove-enamelled coating. The aluminium end material may further comprise a wax layer on the coating.

[0036] The aluminium can end material, in particular can end strip, may be in a strain-hardened state H, in particular in a strain-hardened and stove-enamelled state such as H42, H44, H46, H48 or H49, in particular in state H48 or H49.

[0037] Throughout this specification, the material states, such as H48 or H49, refer to the material states according to DIN EN 515.

[0038] According to a further embodiment, producing the aluminium can end material from the melt comprises: DC casting of the melt into an ingot, optionally sawing and/or scalping the ingot, optionally homogenizing the ingot, hot rolling the ingot to form a hot strip, in particular with a final hot strip thickness in the range of 1.5 to 4 mm, in particular 1.5 to 3 mm, cold rolling the hot strip to form a cold strip, in particular with an end thickness in the range of 165 μm to 350 μm, optionally trimming and/or intermediate annealing during cold rolling, optionally stove-enamelling the cold strip at end thickness with a stove-enamelled coating, optionally applying a waxing layer on the stove-enamelled coating.

[0039] According to a further embodiment, the method further comprises: producing an aluminium can end from the aluminium can end strip or sheet. In this embodiment, the method for providing an aluminium can material is in particular a method for providing a can end.

[0040] According to a further embodiment, the aluminium can tab material is provided as aluminium can tab strip or sheet.

[0041] The aluminium can tab material, in particular can tab strip, may have a thickness in the range of between 230 μm and 350 μm which is a suitable thickness for using the aluminium can tab material for producing can tabs.

[0042] The aluminium can tab material, in particular can tab strip, may have a yield strength $R_{p0,2}$ in the range of between 290 MPa and 390 MPa, which is a suitable yield strength for using the aluminium can tab material for producing can tabs.

[0043] The aluminium can tab material, in particular can tab strip, may have a tensile strength R_m in the range of between 330 MPa and 440 MPa, which is a suitable tensile strength for using the aluminium can tab material for producing can tabs.

[0044] The aluminium can tab material, in particular can tab strip, may have an elongation A_{50} of 3% or more, in particular 4% or more, which is a suitable elongation for using the aluminium can tab material for producing can tabs.

[0045] The ranges for $R_{p0,2}$ and R_m and the lower limit for A_{50} named above are typical requirements for can tab material that can be met when producing the can tab material from the melt by adjusting the production parameters in a commonly known manner, in particular with a 5xxx composition, more particular 5182 composition, of the can tab material.

[0046] The aluminium can tab material, in particular can tab strip, may comprise a coating, in particular a stove-enamelled coating.

[0047] The aluminium can tab material, in particular can tab strip, may be in a strain-hardened state H, in particular in a strain-hardened and stove-enamelled state such as H42, H44, H46, H48 or H49, in particular in state H48 or H49.

[0048] The aluminium can tab material, in particular strip, may have a width in the range of between 20 and 150 mm, in particular between 20 and 100 mm.

[0049] According to a further embodiment, producing the aluminium can tab material from the melt comprises: DC casting of the melt into an ingot, optionally sawing and/or scalping the ingot, optionally homogenizing the ingot, hot rolling the ingot to form a hot strip, in particular with a final hot strip thickness in the range of 1.5 to 4 mm, in particular 1.5 to 3 mm, cold rolling the hot strip to form a cold strip, in particular with an end thickness in the range of 230 μm to 350 μm, optionally trimming and/or intermediate annealing during cold rolling, optionally stove-enamelling the cold strip at end thickness with a stove-enamelled coating, optionally slitting the cold strip at end thickness into strips, in particular having a width in the range of between 60 and 100 mm.

[0050] According to a further embodiment, the method further comprises: producing aluminium can tab from the aluminium tab end strip or sheet. In this embodiment, the method for providing an aluminium can material is in particular a method for providing a can tab.

[0051] According to a further embodiment, the can material is aluminium can body material. Although the can body makes the major weight share of an aluminium can and thus of UBC scrap, the weight proportion of the can end and can tab in UBC scrap results in a combined UBC scrap composition that makes it difficult to comply with the alloying limits of certain elements, in particular Mg, for aluminium can body material. Therefore, the method described is also useful to provide aluminium can body material with an increased scrap use proportion.

[0052] According to a further embodiment, the amount of non-UBC aluminium scrap comprises or consists of lithographic scrap and/or scrap according to ISRI code Taint/Tabor, Twitch or Zorba or a combination thereof. Preferably, at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the melt are provided by melting lithographic scrap and/or scrap according to ISRI code Taint/Tabor, Twitch or Zorba or a combination thereof.

[0053] The lithographic scrap may in particular be scrap according to ISRI code Tabloid or Tablet. The lithographic scrap may in particular be post consumer lithographic scrap, in particular according to ISRI code Tablet.

[0054] Scrap of the ISRI code "Taint/Tabor" is defined as follows:

Taint/Tabor	CLEAN MIXED OLD ALLOY SHEET ALUMINUM Shall consist of clean old alloy aluminum sheet of two or more alloys, free of foil, venetian blinds, castings, hair wire, screen wire, food or beverage containers, radiator shells, airplane sheet, bottle caps, plastic, dirt, and other non-metallic items. Oil and grease not to total more than 1%. Up to 10% Tale permitted.

[0055] Scrap of the ISRI code "Twitch" is defined as follows:

Twitch	FLOATED FRAGMENTIZER ALUMINUM SCRAP (from Automobile Shredders) Derived from wet or dry media separation device, the material must be dry and not contain more than 1% maximum free zinc, 1% maximum free magnesium, and 1% maximum of analytical iron. Not to contain more than a total 2% maximum of non-metallics, of which no more than 1% shall be rubber and plastics. To be free of excessively oxidized material, air bag canisters, or any sealed or pressurized items. Any variation to be sold by special arrangement between buyer and seller.

[0056] Scrap of the ISRI code "Zorba" is defined as follows:

Zorba	SHREDDED NONFERROUS SCRAP (predominantly aluminum) Shall be made up of a combination of the nonferrous metals: aluminum, copper, lead, magnesium, stainless steel, nickel, tin, and zinc, in elemental or alloyed (solid) form. The percentage of each metal within the nonferrous concentrate shall be subject to agreement between buyer and seller. Material generated by eddy current, air separation, flotation, screening, other segregation technique(s), or a combination thereof. Shall have passed one or more magnets to reduce or eliminate free iron and/or large iron attachments. Shall be free of radioactive material, dross, or ash. Material to be bought/sold under this guideline shall be identified as "Zorba" with a number to follow indicating the estimated percentage nonferrous metal content of the material (e.g., "Zorba 90" means the material contains approximately 90% nonferrous metal content). May also be screened to permit description by specific size ranges. (Refer also to Zorba under Mixed Metals.)

[0057] It has been found that the composition of lithography scrap and of scrap with ISRI codes "Taint/Tabor", "Twitch" and "Zorba" is suitable to comply with typical alloying specifications for aluminium can body material, preferably 3xxx, in particular 3104 aluminium alloy. In particular, these scrap kinds allow a high proportion of scrap for producing the aluminium can body material while complying with the alloying limits, in particular upper limits, of certain elements, in particular Mg.

[0058] Furthermore, "Taint/Tabor", "Twitch" and "Zorba" scrap is generally available at large quantities and rather considered as low-quality aluminium scrap, in particular "Zorba", for which dedicated product recycling routes do not exist or at least not in large scale. The finding that such scrap is particularly suitable for producing aluminium can body material therewith allows a better use of the scrap, in particular for an upcycling. It was further found that this also became possible in particular by improved sorting techniques applied today, e.g. X ray sorting techniques, which result in less contaminations, e.g. from heavy metals, and a higher degree of varietal purity in "Taint/Tabor", "Twitch" and "Zorba" scrap.

[0059] Accordingly, the scrap according to ISRI code Taint/Tabor, Twitch and/or Zorba may be pre-sorted, preferably such that the scrap complies with upper limits of 3xxx alloys, in particular of 3104 aluminium alloy, for alloying elements, in particular of Zn, Cu, Fe and/or Pb, and/or for heavy metals. In particular, the pre-sorting may include sorting out of heavy metal containing scrap fragments. In the alternative or in addition to that, the pre-sorting may include sorting out of heavy metal containing scrap fragments. In the alternative or in addition to that, the pre-sorting may include sorting out of strongly alloyed aluminium scrap fragments, e.g. scrap fragments with a content for alloying elements such as, in particular, Zn, Cu, Fe and/or Pb, that exceed the respective upper limit of 3xxx alloys, in particular of 3104 aluminium alloy, by a factor of 5 or more, in particular 2 or more. In the alternative or in addition to that, the pre-sorting may include sorting out scrap fragments from aluminium casting alloys (in contrast to aluminium wrought alloys).

[0060] According to a further embodiment, the can body material has a composition according to a 3xxx aluminium alloy, in particular 3104 aluminium alloy. 3xxx aluminium alloy, in particular 3104 aluminium alloy melt, has strict upper limits for particular alloying elements such as Mg which are difficult to comply with when using UBC scrap for providing the melt. The use of non-UBC scrap, in particular lithography scrap and/or "Taint/Tabor", "Twitch" and/or "Zorba" allows use of a large scrap proportion while complying with the upper limits for these alloying elements.

[0061] In order to provide a melt with a 3xxx alloy composition, in particular 3104 aluminium alloy, alloying material comprising Cu, Mn and/or Mg may be added to provide the melt.

[0062] According to a further embodiment, the can body material is provided as aluminium can body strip or sheet.

[0063] The aluminium can body material, in particular can body strip, may have a thickness in the range of between 180 μm and 400 μm which is a suitable thickness for using the aluminium can body material for producing can bodies.

[0064] The aluminium can body material, in particular can body strip, may have a yield strength $R_{p0,2}$ in the range of between 260 MPa and 320 MPa, which is a suitable yield strength for using the aluminium can body material for producing can bodies.

[0065] The aluminium can body material, in particular can body strip, may have a tensile strength R_m in the range of between 270 MPa and 360 MPa, which is a suitable tensile strength for using the aluminium can body material for producing can bodies.

[0066] The aluminium can body material, in particular can body strip, may have an elongation A_{50} of 1% or more, in particular of 2% or more, which is a suitable elongation for using the aluminium can body material for producing can bodies.

[0067] The aluminium can body material, in particular can body strip, may have a yield strength $R_{p0,2}$ of at least 255 MPa after an annealing at 200 °C for 7 minutes. The annealing of 7 minutes at 200°C simulates the heat-involving process of can body manufacturing. With a yield strength of at least 255 MPa after such annealing, it can be ensured that the material has sufficient yield strength after being formed into a can body.

[0068] The ranges for $R_{p0,2}$, R_m and the lower limits for A_{50} and $R_{p0,2}$ after annealing for 7 min. at 200 °C named above are typical requirements for can body material that can be met when producing the can body material from the melt by adjusting the production parameters in a commonly known manner, in particular with a 3xxx composition, more particular 3104 composition, of the can body material.

[0069] The aluminium can body material, in particular can body strip, may comprise a lubricant coating layer, e.g. a lubricant coating layer comprising an ester-based lubricant. The lubricant coating layer may have a mass per unit area of 150 - 300 mg/m^2.

[0070] The aluminium can body material, in particular can body strip, may be in a strain-hardened state H, in particular in H19 state.

[0071] According to a further embodiment, producing the aluminium can body material from the melt comprises: DC casting of the melt into an ingot, optionally sawing and/or scalping the ingot, optionally homogenizing the ingot, hot rolling the ingot to form a hot strip, in particular with a final hot strip thickness in the range of 1.5 to 4 mm, in particular 1.5 to 3 mm, cold rolling the hot strip to form a cold strip, in particular with an end thickness in the range of 180 μm to 400 μm, optionally trimming and/or intermediate annealing during cold rolling, optionally coating the cold strip at end thickness with a lubricant, e.g. an ester-based lubricant.

[0072] According to a further embodiment, the method further comprises: producing an aluminium can body from the aluminium can body strip or sheet. In this embodiment, the method for providing an aluminium can material is in particular a method for providing a can body.

[0073] According to a second object of the present disclosure, the object from above is further achieved by the use of non-UBC scrap, in particular aluminium lithographic scrap or scrap according to ISRI code Taint/Tabor, Twitch or Zorba, for providing can material, in particular can end material, can tab material or can body material, in particular for producing can ends, can tabs or can bodies of aluminium beverage cans. The embodiments of the method described above also apply, individually as well as in combination, for this use.

[0074] Further features and advantages of the method and the uses emerge from the following description of exemplary embodiments wherein reference is made to the attached drawing.

[0075] In the drawing

Fig. 1 shows a first exemplary embodiment of the method for providing can material, namely can end material,

Fig. 2 shows a second exemplary embodiment of the method for providing can material, namely can tab material,

Fig. 3 shows a third exemplary embodiment of the method for providing can material, namely can body material, and

Fig. 4 shows a method for producing an aluminium can.

[0076] Fig. 1 schematically shows a first exemplary embodiment of the method for providing can material, namely can end material.

[0077] In a first step 10, an aluminium melt 11 is provided by melting aluminium lithography scrap material 12, optionally other aluminium scrap material 13 and further alloying material 14 in a melting furnace 15. The aluminium lithography scrap material 12 is preferably post consumer scrap according to ISRI code "Tablet" and preferably makes up at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the melt 11. The aluminium lithography scrap material 12 may predominantly comprise scrap pieces of 1xxx alloys.

[0078] The further alloying material 14 may in particular comprise primary aluminium or aluminium alloys or other alloying element containing material, e.g. Mg and/or Mn containing alloying material, to match the target specification of the melt 11, which for can end material is preferably a 5xxx aluminium alloy, in particular 5182 aluminium alloy.

[0079] The target specification of the 5182 aluminium alloy is as follows:

	Si ≤	0.20 wt.-%,
	Fe ≤	0.35 wt.-%,
	Cu ≤	0.15 wt.-%,
0.20 wt.-% ≤	Mn ≤	0.50 wt.-%,
4.0 wt.-% ≤	Mg ≤	5.0 wt.-%,
	Cr ≤	0.10 wt.-%,
	Zn ≤	0.25 wt.-%,
	Ti ≤	0.10 wt.-%,

other elements: individually ≤ 0.05 wt.-%, in total ≤ 0.15 wt.-%, remainder Al.

[0080] In a next step 20, an ingot 21 is formed from the melt 11 by DC casting. The ingot 21 may be sawn and scalped subsequently (not shown). In a next step 30, the ingot 21 may be optionally homogenized and/or heated to hot rolling temperature in an oven 31. In a next step 40, the ingot 21 is hot-rolled in a hot rolling mill 41, e.g. reversing hot rolling mill, to form a hot strip 42. Hot strip thickness after hot rolling may be between 1.5 and 4 mm. In a next step 50, after cooling of the hot strip 42, the hot strip 42 is cold-rolled in a cold rolling mill 51 in several passes to form a cold strip 52, optionally with intermediate annealing (not shown). End thickness after cold rolling may be between 165 μm and 350 μm. In a next step 60, the cold strip 52 is coated with a pigments containing lacquer coating 61 by means of a coating device 62 and the lacquer coating 61 is then burned in by means of an oven 63 to form a stove-enamelled coating 64. In a next step 70, the coated cold strip 52 is edge-trimmed by means of an edge-trimming device 71. In a next step 80, the stove-enamelled and trimmed cold strip 52 is optionally coated with a wax coating 81 by means of a coating device 82.

[0081] The resulting stove-enamelled, trimmed and optionally waxed strip 83 may then be reeled to a coil, packed and shipped as aluminium can end strip to a customer, namely to a producer of aluminium cans.

[0082] Fig. 2 schematically shows a second exemplary embodiment of the method for providing can material, namely can tab material.

[0083] In a first step 110, an aluminium melt 111 is provided by melting aluminium lithography scrap material 112, optionally other aluminium scrap material 113 and further alloying material 114 in a melting furnace 115. The aluminium lithography scrap material 112 is preferably post consumer scrap according to ISRI code "Tablet" and preferably makes up at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the melt 111. The aluminium lithography scrap material 112 may predominantly comprise scrap pieces of 1xxx alloys.

[0084] The further alloying material 114 may in particular comprise primary aluminium or aluminium alloys or other alloying element containing material, e.g. Mg and/or Mn containing alloying material, to match the target specification of the melt 111, which for can tab material is a 5xxx aluminium alloy, in particular 5182 aluminium alloy.

[0085] The target specification of the 5182 aluminium alloy is as defined above.

[0086] In a next step 120, an ingot 121 is formed from the melt 111 by DC casting. The ingot 121 may be sawn and scalped subsequently (not shown). In a next step 130, the ingot 121 may be optionally homogenized and/or heated to hot rolling temperature in an oven 131. In a next step 140, the ingot 121 is hot-rolled in a hot rolling mill 141, e.g. reversing hot rolling mill, to form a hot strip 142. Hot strip thickness after hot rolling may be between 1.5 and 4 mm. In a next step 150, after cooling of the hot strip 142, the hot strip 142 is cold-rolled in a cold rolling mill 151 in several passes to form a cold strip 152, optionally with intermediate annealing (not shown). End thickness after cold rolling may be between 230 μm and 350 μm. In a next step 160, the cold strip 152 is coated with a pigments containing lacquer coating 161 by means of a coating device 162 and the lacquer coating 161 is then burned in by means of an oven 163 to form a stove-enamelled coating 164. In a next step 170, the coated cold strip 152 is edge-trimmed and cut longitudinally into a plurality of strips 171 with a width of between 20 and 100 mm by means of a trimming-and-cutting device 172.

[0087] The resulting stove-enamelled, trimmed and longitudinally cut strips 171 may then be reeled to coils, packed and shipped as aluminium can tab strips to a customer, namely to a producer of aluminium cans.

[0088] Fig. 3 schematically shows a third exemplary embodiment of the method for providing can material, namely can body material.

[0089] In a first step 210, an aluminium melt 211 is provided by melting non-UBC aluminium post consumer scrap material 212, optionally other aluminium scrap material 213 and further alloying material 214 in a melting furnace 215. The non-UBC aluminium scrap material 212 is preferably post consumer scrap according to ISRI code "Tablet" and/or "Taint/Tabor", "Twitch" and/or "Zorba" and preferably makes up at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the melt 211. Scrap according to ISRI code "Taint/Tabor", "Twitch" and/or "Zorba" is preferably presorted, in particular essentially freed from scraps containing significant amounts of heavy metals and/or from strongly alloyed scraps.

[0090] The further alloying material 214 may in particular comprise primary aluminium or aluminium alloys or other alloying element containing material, e.g. Cu, Mn and/or Mg containing alloying material, to match the target specification of the melt 211, which for can body material is a 3xxx aluminium alloy, in particular 3104 aluminium alloy.

[0091] The target specification of the 3104 aluminium alloy is as follows:

	Si ≤	0.6 wt.-%,
	Fe ≤	0.8 wt.-%,
0.05 wt.-% ≤	Cu ≤	0.25 wt.-%,
0.8 wt.-% ≤	Mn ≤	1.4 wt.-%,
0.8 wt.-% ≤	Mg ≤	1.3 wt.-%,
	Zn ≤	0.25 wt.-%,
	Ga ≤	0.05 wt.-%,
V ≤	0.05 wt.-%,	
Ti ≤	0.10 wt.-%,	

other elements: individually ≤ 0.05 wt.-%, in total ≤ 0.15 wt.-%, remainder Al.

[0092] In a next step 220, an ingot 221 is formed from the melt 211 by DC casting. The ingot 221 may be sawn and scalped subsequently (not shown). In a next step 230, the ingot 221 may be optionally homogenized and/or heated to hot rolling temperature in an oven 231. In a next step 240, the ingot 221 is hot-rolled in a hot rolling mill 241, e.g. reversing hot rolling mill, to form a hot strip 242. Hot strip thickness after hot rolling may be between 1.5 and 4 mm. In a next step 250, after cooling of the hot strip 242, the hot strip 242 is cold-rolled in a cold rolling mill 251 in several passes to form a cold strip 252, optionally with intermediate annealing (not shown). End thickness after cold rolling may be between 180 μm and 400 μm. In a next step 260, the cold strip 252 is edge-trimmed by means of a trimming device 261. In a next step 270, the trimmed cold strip 252 is coated with a lubricant coating layer 271 (so-called "Post Lube") by means of a coating device 272. The lubricant coating layer 271 may have a mass per unit area of 150 - 300 mg/m^3. A suitable lubricant for the lubricant coating layer is, e.g. Bonderite L-FM 8320, available from Henkel AG & Co. KGaA, Duesseldorf, Germany.

[0093] The resulting trimmed and lubricant coated strip 273 may then be reeled to a coil, packed and shipped as aluminium can body strip to a customer, namely to a producer of aluminium cans.

[0094] Fig. 4 shows, very schematically, a method for producing aluminium cans from aluminium can end material 302, aluminium can tab material 304 and aluminium can body material 306.

[0095] In particular, aluminium can end strip 83 from Fig. 1 may be used as can end material 302, an aluminium can tab strip 171 from Fig. 2 may be used as can tab material 304 and/or aluminium can body strip 273 from Fig. 3 may be used as can end material 306.

[0096] Can end material 302 is fed into a can end manufacturing machine 308 in which can end blanks are punched out of the can end material 302 and formed into can ends 310.

[0097] Can tab material 304 is fed into a can tab manufacturing machine 312 in which can tab blanks are punched out of the can tab material 304 and formed into can tabs 314.

[0098] Can body material 306 is fed into a can body manufacturing machine 316 in which round blanks are punched out of the can body material 306 and formed into can bodies 318.

[0099] The can ends 310, can tabs 314 and can bodies 318 are supplied to a can manufacturing and filling machine 320, in which the can tabs 314 are attached to the can ends 310 and in which the can bodies 318 are painted, cleaned, filled with a beverage and closed with the can ends 310 to form an aluminium beverage can 322.

[0100] By using the aluminium can end strip 83 from Fig. 1, the aluminium can tab strip 171 from Fig. 2 and/or the aluminium can body strip 273 from Fig. 3, the post consumer scrap recycling rate may be considerably increased and the carbon dioxide footprint for producing the aluminium beverage can 322 can be considerably reduced. Preferably, at least 40 wt.-%, more preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the aluminium of aluminium beverage can 322 may be produced from post consumer scrap in that way.

Claims

1. Method for providing aluminium can material (83,171, 273, 302, 304, 306), in particular aluminium can strip,

   - in which an aluminium melt (11, 111, 211) is provided and
   - in which the can material (83, 171, 273, 302, 304, 306) is produced from the aluminium melt (11, 111, 211),

   characterized in

   - **that** the aluminium melt (11, 111, 211) is at least in part provided by melting an amount of non-UBC aluminium scrap (12, 112, 212).

2. Method according to claim 1, **characterized in that** at least 40 wt.-%, preferably at least 50 wt.-%, in particular at least or more than 75 wt.-% of the aluminium melt (11, 111, 211) is provided by melting the amount of non-UBC aluminium scrap (12,112, 212).

3. Method according to claim 1 or 2, **characterized in that** the amount of non-UBC aluminium scrap (12,112, 212) is an amount of non-UBC post consumer scrap.

4. Method according to any one of claims 1 to 3, **characterized in that** the can material is aluminium

can end material (83, 302) or aluminium can tab material (171, 304).

5. Method according to claim 4, **characterized in that** the amount of non-UBC aluminium scrap (12,112) comprises or consists of aluminium lithographic scrap, in particular scrap lithographic sheets.

6. Method according to claim 4 or 5, **characterized in that** the amount of non-UBC aluminium scrap (12,112) comprises or consists of post consumer scrap from lithographic sheets, in particular from blue-washed lithographic sheets.

7. Method according to any one of claims 4 to 6, **characterized in that** the aluminium can end material (83, 302) or the aluminium can tab material (171, 304) has a composition according to a 5xxx aluminium alloy, in particular 5182 aluminium alloy.

8. Method according to any one of claims 4 to 7, **characterized in that** the aluminium can end material (83, 302) is provided as aluminium can end strip or sheet or **in that** the aluminium can tab material (171, 304) is provided as aluminium can tab strip or sheet.

9. Method according to any one of claims 1 to 3, **characterized in that** the can material is aluminium can body material (272, 306).

10. Method according to claim 9, **characterized in that** the amount of non-UBC aluminium scrap (212) comprises or consists of lithographic scrap and/or scrap according to ISRI code Taint/Tabor, Twitch or Zorba or a combination thereof.

11. Method according to claim 9 or 10, **characterized in that** the can body material (272, 306) has a composition according to a 3xxx aluminium alloy, in particular 3104 aluminium alloy.

12. Method according to any one of claims 9 to 11, **characterized in that** the can body material (272, 306) is provided as aluminium can body strip or sheet.

13. Use of non-UBC scrap (12,112, 212), in particular aluminium lithographic scrap or scrap according to ISRI code Taint/Tabor, Twitch or Zorba, for providing can material (83,171, 273, 302, 304, 306), in particular can end material, can tab material or can body material, in particular for producing can ends (310), can tabs (314) or can bodies (318) of aluminium beverage cans (322).

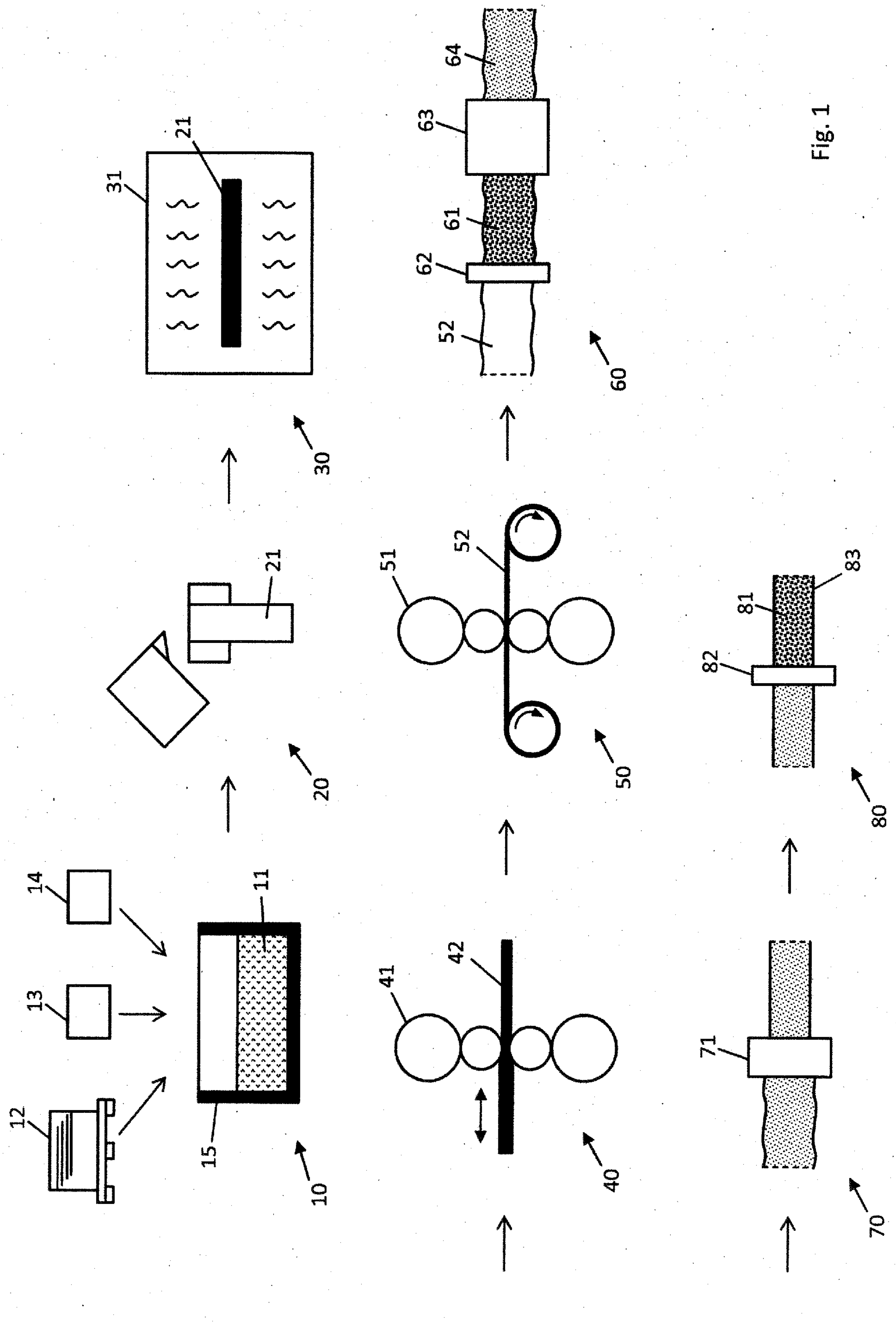
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Fig. 1

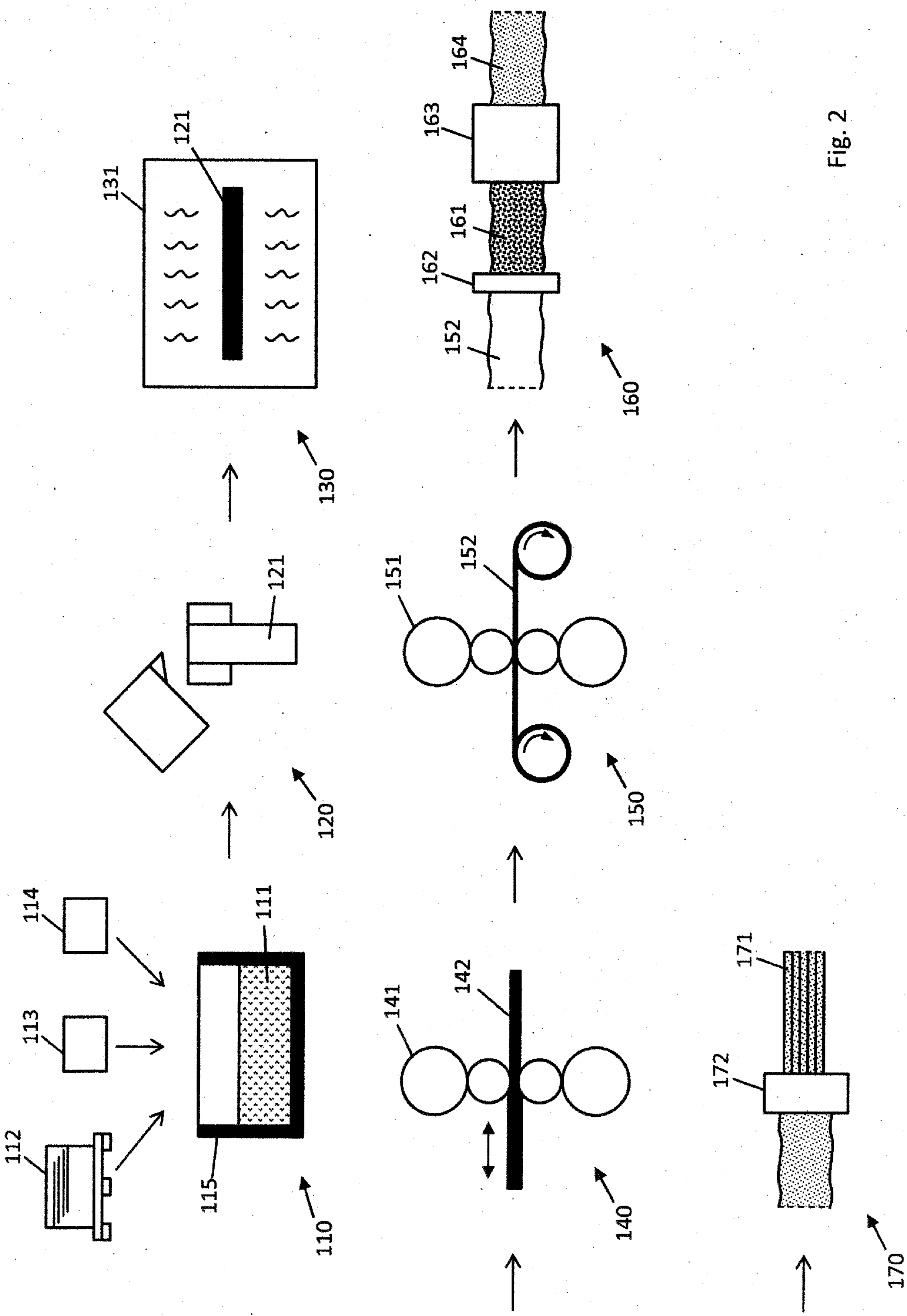

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Fig. 2

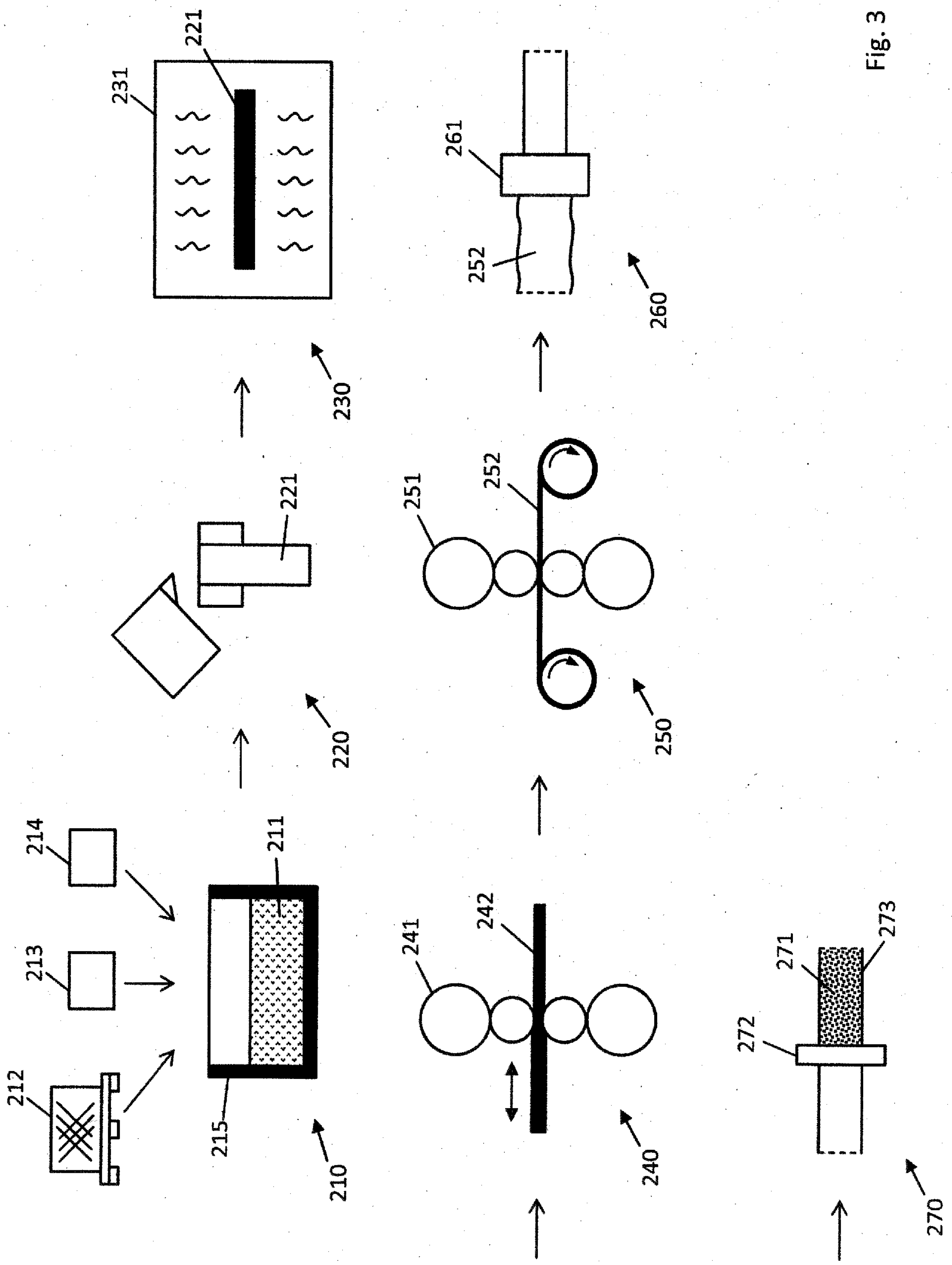
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Fig. 3

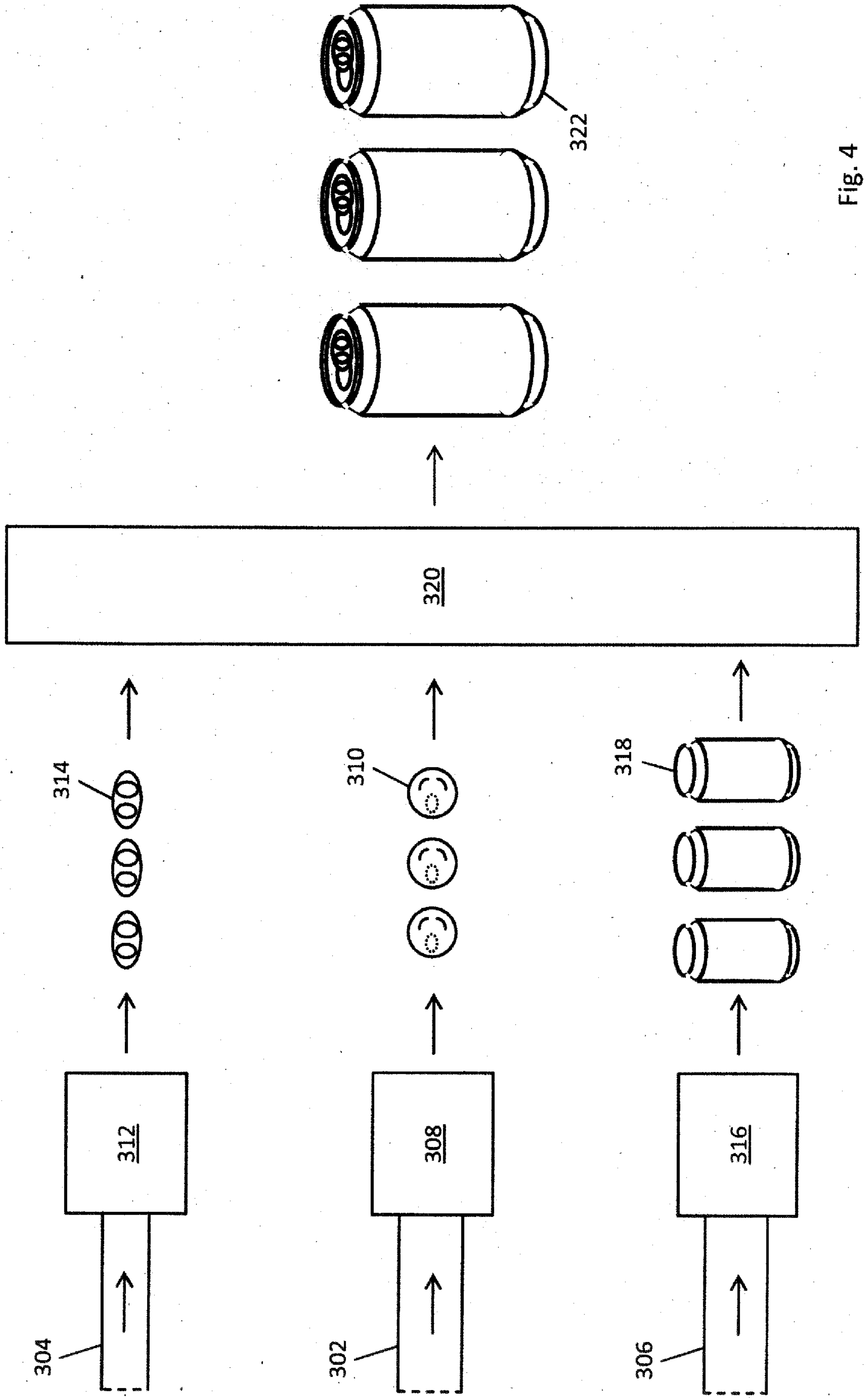

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 9212

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2008 114439 A (FUJIFILM CORP) 22 May 2008 (2008-05-22) * abstract * * paragraph [0219] * * example 8; table 1 * -----	1-13	INV. C22C1/02 C22C21/00 C22C21/06 C22F1/04 C22F1/047
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T	HOYLE W. C. ET AL: "Trends and needs in can stock: A packaging company's perspective", JOM: JOURNAL OF METALS, vol. 48, no. 11, 30 November 1996 (1996-11-30), pages 33-36, XP055883442, United States ISSN: 1047-4838, DOI: 10.1007/BF03223241 * Section Body Stock, Alloys * * Section End Stock, Alloys * * Section Tab Stock * -----		TECHNICAL FIELDS SEARCHED (IPC) C22C C22F
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1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 January 2022	Rosciano, Fabio

CATEGORY OF CITED DOCUMENTS

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