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(71) Applicant: **Kostka, Pavel**
253 01 Hostivice (CZ)

(72) Inventor: **Kostka, Pavel**
253 01 Hostivice (CZ)

(54) A DISPOSABLE, RESISTIVE, SOLID, EXTRA LOW VOLTAGE HEATER AND A FOOD PACK USING THE HEATER

(57) The present invention describes a disposable, resistive, solid, extra-low-voltage heater for use in a heatable food pack and a food pack using the heater. More particularly, the heater (108) comprises an at least partially flexible heating portion (100), a casing (102), and a mechanism (104) adapted for compacting the heating portion, after use, substantially inside the casing. The heater can be configured to electrically disconnect the resistor (148) upon use of the mechanism. The food pack includes a foodstuff (106) to be heated and the heater having the heating portion disposed substantially inside the foodstuff. The food pack can further comprise a wrapper (192, 1192) mechanically coupled to the heater. The resistor can comprise aluminium. The heating portion can further include a thermal fuse (204) adapted for enabling the mechanism to compact the heating portion substantially into the casing.

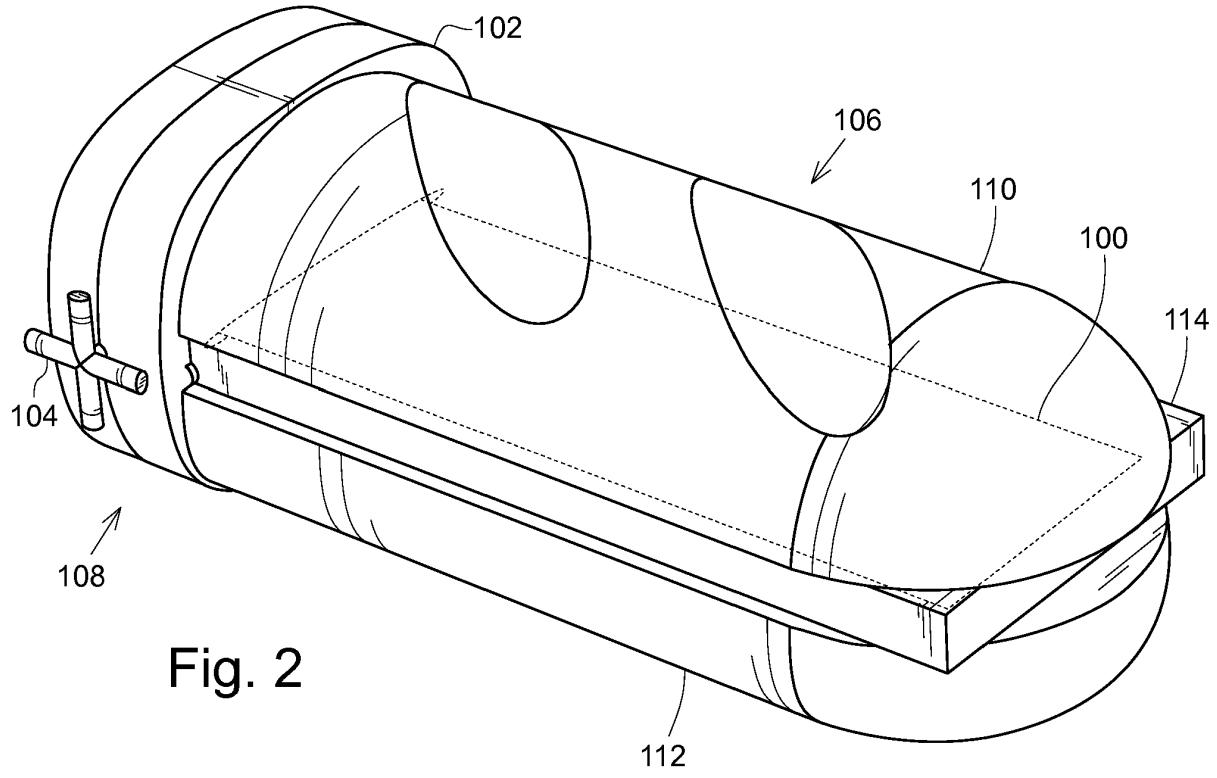

Fig. 2

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of disposable heaters and food packs heated by the heaters.

BACKGROUND OF THE INVENTION

[0002] I described in application EP15185483.3 a heatable food pack comprising a foodstuff and a disposable heater positioned substantially inside the foodstuff. The application introduced an insulation component intended to be used for thermal insulation of a heating portion of the heater after use thereof. According to that application, a consumer is expected either to insert the hot heating portion into such insulation or pull two parts of the insulation over the heating portion. In certain cases, e.g. in a moving car, that could still pose a risk since the consumer needs to manipulate with exposed hot heating portion. Thus, there remains a space for a heater and a food pack using the heater that would allow even safer disposal.

BRIEF SUMMARY OF THE INVENTION

[0003] The present invention relates to a disposable, resistive, solid, extra low voltage heater for use in a heatable food pack and a food pack using the heater.

[0004] More particularly, the heater comprises an at least partially flexible heating portion, a casing and a mechanism adapted for compacting the heating portion substantially into the casing.

[0005] The food pack comprises the heater and a foodstuff, wherein the heating portion of the heater is disposed substantially inside the foodstuff.

[0006] According to one preferred configuration, the heater further comprises a plurality of electrical conductors, the heating portion comprises a resistor electrically coupled to the plurality of conductors, and the heater is configured to electrically disconnect the resistor from at least one of the plurality of conductors upon use of the mechanism.

[0007] According to another configuration, the mechanism comprises a shaft and the mechanism is configured to wind the heating portion around the shaft substantially into the casing.

[0008] According to yet another configuration, the food pack further comprises a wrapper mechanically coupled to the heater.

[0009] According to other configuration the resistor comprises aluminium.

[0010] According to yet another configuration, the heating portion further includes a thermal fuse adapted for enabling the mechanism to compact the heating portion substantially into the casing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention will be more clearly understood from the following description given by way of example only, with reference to the accompanying figures.

Fig. 1 is a perspective view of a disposable, resistive, solid, extra low voltage heater for use in a heatable food pack according to the present invention.
Fig. 2 is a perspective view of a food pack according to the present invention.
Fig. 3 is an enlarged exploded perspective view of the heater.
Fig. 4 is a perspective rotated, compared to Fig. 1, view of the heater.
Fig. 5 is an electric scheme of the heater.
Fig. 6 is an exploded perspective view showing fixation of a flexible sheet to a shaft.
Fig. 7 is an exploded perspective view of the flexible sheet.
Fig. 8 is an enlarged perspective partially exploded view of a frame.
Fig. 9 is an enlarged perspective view of a fragment of the heater displayed without insulative blocks and a connector and showing electrical and mechanical coupling of the flexible sheet to the plurality of conductors.
Fig. 10 is an enlarged perspective view of the heater with compacted heating portion having, for the illustration purpose, part of the insulative blocks cut off.
Fig. 11 is a close-up perspective view of a detail shown in Fig. 10.
Fig. 12 is an exploded perspective view of an alternative preparation of a middle section.
Fig. 13 is a shrunk cross-sectional view of the food pack including a wrapper.
Fig. 14 is a fragment of a shrunk cross-sectional view of a food pack having a different configuration of a wrapper.
Fig. 15 is a close-up view of a detail shown in Fig 14.
Fig. 16 is a partially exploded perspective view of a middle section having incorporated a thermal fuse.
Fig. 17 is a close-up perspective fragment of the middle section shown in Fig. 16 with assembled fuse.
Fig. 18 is an exploded perspective view of an alternative casing.
Fig. 19 is an exploded enlarged perspective view of a shaft and a frame of yet another casing.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Technical terms used in the text are defined in Glossary section below.

[0013] Fig. 1 is a perspective view of a disposable, resistive, solid, extra low voltage heater for use in a heatable food pack as shown in exemplary Figs. 2, 13 and 14. The heater comprises a flexible heating portion 100, a casing 102 and a mechanism 104 (only a part is visible,

the rest is in the casing) adapted for compacting the portion 100, after use of the heater, substantially into the casing 102. The portion 100 is shown straight for the sake of clarity with regard to Fig. 2 though, due to gravity, the portion 100 would be in reality rather bent down as it is flexible. The same is applicable for Figs. 3, 4, 6, 7, 9, 12, 16 and 17.

[0014] Fig. 2 is a perspective view of a food pack according to the present invention. The food pack comprises a foodstuff 106 and the heater 108 shown in Fig. 1. The heating portion 100 is disposed substantially inside the foodstuff 106. The foodstuff 106, as an example, comprises bread cut into two halves - an upper half of bread 110 and a lower half of bread 112. The foodstuff 106 further comprises a filling 114 positioned in between the upper and lower half of bread 110, 112. The filling 114 can be e.g. a minced pre-grilled slice of meat. The heating portion 100 can be beneficially disposed inside the filling 114 (as also shown in Figs. 13, 14). A thermal gradient can be established in such sandwiched configuration: while the filling 114 can be sufficiently hot at the end of the heating, the bread on its outer surface is warm only so that the foodstuff 106 can be hold in bare hand during consummation, i.e. no extra thermal insulation is needed.

[0015] Fig. 3 is an enlarged exploded perspective view of the heater 108. The heater 108 further comprises a flexible sheet 130, a connector 138 and a plurality of electrical conductors 134 and 136. The flexible heating portion 100 is one part of the flexible sheet 130 as shown further in Figs. 5-7. The casing 102 comprises an insulative block 118, an insulative block 120 having an opening 140, and a frame 122. The mechanism 104 comprises a shaft 126 including an opening 131, a cap 124, a handle 128, a pin 133, four staples 116 and a couple of clips 132. The conductors 134 and 136 electrically connect the connector 138 to the sheet 130 (the length of the conductors in the figure is illustrative only, in reality they are as short as possible). They can be made e.g. from aluminium and their cross-sectional area shall be chosen with regard to the current density so that they do not overheat significantly, typically each of the conductor can be 1.5-3 mm in diameter. The conductors 134 and 136 shall be electrically insulated, e.g. by processed-cellulose insulation (e.g. ethyl- or acetate- cellulose) or by e.g. PET or Nylon thin film. The connector 138 can be made from the same material, i.e. e.g. as a moulded piece of PET that has two electrical contacts (not specifically numbered) e.g. riveted onto that.

[0016] Each of the insulative blocks 118 and 120 can be fabricated as a cardboard pocket filled by recycled cellulose and enveloped by sulphite or baking paper. The cardboard and cellulose can be impregnated by borax, sodium bicarbonate or another green fire retardant to improve fire safety.

[0017] The handle 128 can be made from any cheap and recyclable material e.g. from plastic or wood. The handle 128 has an opening (not visible) allowing to attach the shaft 126 thereto during assembly. The clip 132 can be made from any elastic material, e.g. PET.

[0018] Fig. 4 is a rotated (compared to Fig. 1) perspective view of the heater 108 showing a front side of the heater 108 with the connector 138.

[0019] Fig. 5 is an electric scheme of the heater 108. The scheme comprises the connector 138, the conductors 134 and 136 and schematically depicted sheet 130. The sheet 130 comprises a couple of tape contacts 142 and 144, a leading portion 146 and the heating portion 100 (the sheet and both portions are schematically depicted by dashed polygons). The connector 138 is connected via the conductor 136 to the tape contact 142 and via the conductor 134 to the tape contact 144. The heating portion 100 comprises a solid resistor 148. The leading portion 146 interconnects the tape contacts 142 and 144 with the resistor 148 (leads are not specifically numbered), i.e. the resistor 148 is electrically coupled to the plurality of conductors 134 and 136 that are coupled to the connector 138.

[0020] Fig. 6 is an exploded perspective view showing a fixation of the flexible sheet 130 to the shaft 126.

[0021] The shaft 126 comprises a shaft body 157 and a fastening member 150, both manufactured e.g. from aluminium, PET, steel, etc. The shaft body 157 has a groove 158 having plurality of protrusions 152. The sheet 130 has plurality of openings 156 that correspond to the plurality of protrusions 152. The fastening member 150 has plurality of openings 159 that also correspond to the protrusions 152. The sheet 130 is attached to the shaft 126 so that the plurality of protrusions 152 are pushed through the plurality of openings 156 and the sheet 130 is fastened there by the fastening member 150. A border line 154, purely schematically, separates the leading portion 146 from the heating portion 100 as depicted in Fig. 5.

[0022] Fig. 7 is an exploded perspective view of the sheet 130. The sheet 130 comprises a middle section 168, an upper cover 164 and a lower cover 166. The upper cover 164 and the lower cover 166 are constructed identically - each as a metallic foil 162 laminated onto a plastic foil 160. The middle section 168 comprises a metallic conductive path 161 and a plastic foil 165. The path 161 includes the two tape contacts 142 and 144, the (meandering) resistor 148 and non-numbered leads interconnecting the contacts 142, 144 and the resistor 148. The path 161 is a cut from a metallic foil and laminated onto the foil 165 so that the contacts 142, 144 are metallic only while the rest of the path 161 is attached to the foil 165.

[0023] Equivalently to Fig. 6, the border line 154 schematically separates the leading portion 146 and the heating portion 100 of the assembled sheet 130. The upper and lower covers 164 and 166 are laminated symmetrically onto the middle section 168 so that the tape contacts 142 and 144 remain only metallic, i.e. without any plastic support. The contacts 142 and 144 are so electrically conductive but also easily tearable while the rest of the sheet 130 can withstand mechanical drawing. A couple of openings 163 are cut into middle section 168. A contour

167 schematically shows that the upper and lower covers 164 and 166 have greater surface area than the middle section 168 and thus the covers 164, 168 cover and provide electric insulation of the conductive path 161. The plurality of openings 156 are made into the sheet 130 once all foils are laminated together, e.g. by punching. The couple of openings 163 correspond to the two outer openings 156 but have larger diameter so that the couple of foils 162 do not accidentally short-circuit the path 161. The plastic foil 160 is preferably thin, typically 10-100 micrometers thick, e.g. from PET or Nylon. The conductive path 161 can be made e.g. from aluminium or iron foil, i.e. also the resistor 148, being part of the conductive path 161, can comprise aluminium or iron. The thickness, width and length of the path of the resistor 148 shall be chosen according to the type of power supply intended to be used (e.g. a car cigarette lighter connector can typically deliver up to 150 W while e.g. a notebook power-supply adapter, that can be used as a power supply, can deliver 50 - 70 W). For instance, the resistor having the path of 18-micrometer thick and 3-mm wide can dissipate approximately 2 W per 1 cm of its length. The leads (not numbered) of the leading portion 146 as well as the tape contacts 142 and 144 shall be substantially wider (or alternatively thicker) so that these sections of the sheet 130 are not significantly heated by passing current, e.g. the width of each of the tape contacts 142 and 144 shall be 4-10 times wider than the the width of the path of the resistor 148. The metallic foil 162 shall have thickness of 5 - 200 micrometers. The metallic foil 162 supports the plastic foil 160 during lamination process as the metal has significantly higher melting point than the plastic foil 160 and thus the metallic foil 162 helps to keep the final shape of the sheet 130. While the plastic foil 160 electrically insulates the path 161, the metallic foil 160 partially averages, despite its minute thickness, temperature of the heating portion 100 by heat conduction along its surface.

[0024] The amount of laminated foils of the sheet 130 can vary depending on the type of foodstuff intended to be heated. For instance, aluminium can be, in general, in direct contact with those foodstuffs that has neutral or close-to-neutral pH. If the pH is acidic or basic, a couple of extra outer plastic foils can be laminated onto the outer surfaces of the couple of foils 162.

[0025] Fig. 8 is an enlarged perspective partially exploded view of the frame 122. It is optimized for the cost of used material, simplicity of assembly and biodegradability. From that perspective, the frame 122 can be e.g. spot-welded from steel wire segments, cut for instance from a MIG wire of thickness 1-2 mm, e.g. by a CNC spot welding machine. The frame 122 comprises segments 170 - 178 and a plurality of washers 180. A couple of segments 170 and a couple of segments 172 make up a border (not numbered) of the frame 122, a segment 176 is intended as a support for electrical coupling of the conductors 134 and 136 to the flexible sheet 130 (see below), a couple of segments 174 reinforces the border and also can be used for fixation of the conductors 134 and 136 and a bent segment 178 is intended for support of the flexible sheet 130. The couple of washers 180 are each spot-welded onto the segments 170 and 178 as hinted by a couple of dash-and-dot lines. Segments can be alternatively partially replaced by one shaped and spot-welded long wire.

[0026] Referring to Figs. 3 and 8: During assembly of the heater 108, the shaft 126 with the attached sheet 130 is inserted into the couple of the washers 180, as indicated by two segmented dash-and-dot lines in Fig. 3. The cap 124 is clapped on one longitudinal end of the shaft 126, the handle 128 is fastened (e.g. by gluing) on the other end and the pin 133 is inserted into the opening 131. The cap 124 and the pin 133 keep the shaft 126 within the washers 180 so that the shaft 126 can rotate along its longitudinal axis.

[0027] The mechanism 104 is substantially disposed (except for the handle 128 and a part of the shaft 126 leading to the handle) inside the casing 102. The mechanism 104 is so configured to wind the heating portion 100 around the shaft 126 substantially into the casing, after use of the heater 108.

[0028] The conductors 134 and 136 are electrically coupled to the connector 138, pulled through the insulative block 118 and electrically coupled to the sheet 130 (as explained in detail below). The connector 138 is attached to a hole (not shown nor numbered) on the outer side of the insulative block 118. The conductors 134 and 136 are folded around the frame 122, the heating portion 100 pulled through the opening 140 and the two insulative blocks 118 and 120 put together and stapled by the four staples 116.

[0029] Fig. 9 is an enlarged perspective view of a fragment of the heater 108 displayed without the insulative blocks 118, 120 and showing electrical and mechanical coupling of the flexible sheet 130 to the conductors 134 and 136. The conductors 134 and 136 are shaped so that their non-insulated conductive ends (not specifically numbered) are positioned along with the segment 176. The widths of the non-insulated conductive ends correspond to the widths of the tape contacts 142 and 144. The segment 176 is electrically insulated (insulation not shown), e.g. by a turn of baking paper, by a thin film of PET, etc. Each non-insulated conductive end of each of the conductors 134 and 136 is wrapped by the corresponding tape contact 142 and 144 and is affixed on the segment 176 by the clip 132. The plurality of clips 132 mechanically maintain the electrical interconnection between the conductor ends and the tape contacts 142 and 144. The length of the leading portion 146 is chosen so that the segment of the portion 146 between the plurality of clips 132 and the shaft 126 (not specifically numbered) is loose. That prevents unintended damage of the tape contacts 142 and 144 during manipulation. Alternatively, the handle 128 can be taped to the casing 102 by a tape seal (not shown) intended to be broken by the consumer when using the mechanism 104.

[0030] Fig. 10 is an enlarged perspective view of the heater 108 with a compacted heating portion having, for illustration purpose, part of the insulative blocks 118, 120 cut off. Fig. 11 is a close-up perspective view of a detail shown in Fig. 10. Referring to Figs. 10-11: The heating portion 100 is compacted, particularly wound, on the shaft 126. The tape contact 144 is torn up so that part of it is on the shaft 126 with the leading portion 146 (that part is not visible as it is wound on the shaft 126) and a remaining part of that contact 1144 remains affixed by the clip 132 to the segment 176. The contact 146, hidden inside the blocks 118, 120 in this figure, is torn up equivalently. The segment 178 retains the wound part of the flexible sheet 130 on the shaft 126.

MODE OF OPERATION

[0031] When the food pack is prepared, the heating portion 100 is inserted into to the foodstuff 106. The consumer, having an intention to consume the foodstuff 106, plugs an external extra low power supply to the connector 138 and heats the food pack up. Most of in-daily-life-available power supplies are 12-24-volt DC supplies, e.g. 12 or 24 V battery in a vehicle or notebook adapters.

[0032] The consumer can monitor the heating process e.g. by touching the food pack or by monitoring of the heating time. Once the foodstuff 106 is warm enough, the consumer unplugs the external power supply and rotates the handle 128 of the mechanism 104. The shaft 126 pulls the heating portion 100 out of the foodstuff 106 and simultaneously stretches the part of the leading portion (not specifically denoted) between the shaft 126 and the plurality of clips 132. Both portions, i.e. the heating portion 100 and the part of the leading portion 146 between the shaft 126 and the clips 132, are wound onto the shaft 126. The casing 102 keeps the filling 114 inside the bread halves 110, 112 during rotation. The heater 108 can be safely disposed and the heated foodstuff 106 consumed. In this way, the consumer is safeguarded from touching the heating portion 100 after use. The tape contacts 142 and 144 are torn up upon use of the mechanism 104 and so are the plurality of conductors 134 and 136 electrically disconnected from the resistor 148. Such construction provides a protection against overheating in case that the consumer forgets to unplug the heater from the external power supply before using the mechanism.

DESCRIPTION AND OPERATION OF ALTERNATIVE EMBODIMENTS

[0033] Figs. 12-19 show alternative embodiments. Parts and group of parts with the analogous function but different in a shape, size, or material, compared to the first embodiment illustrated in Figs. 1 to 11, have their referential number increased by one thousand. For instance, parts 161, 1161 and 2161 all represent a metallic conductive path, though differently shaped. Identical parts have the same referential number in all embodiments.

[0034] Fig. 12 is an exploded perspective view of an alternative preparation of a middle section. If a metallic foil, used for cutting of the path 161, is too fragile for subsequent manipulation, such metallic foil can be (prior cutting) first laminated onto an auxiliary plastic foil 182. A path 1161 is cut out from such sandwich together with a plurality of stubs 186a-c and with a border 187 attached to the path 1161 leaving in the middle section a plurality of openings 184a-c. The border 187 with the stubs 186a-c allows easier manipulation with so-made path 1161. The path 1161 is then laminated onto a plastic foil 1165 and the border 187 and stubs 186a-c subsequently trimmed according to trimming contours 188 and 190. So-prepared middle section is then laminated equivalently to the middle section 168.

[0035] Fig. 13 is a cross-sectional shrunk view of the food pack including a wrapper 192. Due to the fact that the heating portion 100 is flexible and depending on a coefficient of friction between the heating portion 100 and (the inside of) the foodstuff (not numbered), the heating portion 100 can be in certain cases susceptible for partial unintended extraction from the foodstuff e.g. during transportation. Fig. 13 shows one of many options how to prevent that. The wrapper 192 tightly encloses the foodstuff 106 and is mechanically coupled to the heater 108, particularly attached between the casing 102 and the connector 138. The wrapper 192 is preferably made from an at least partly transparent plastic that withstands elevated temperatures, e.g. from PET or PP foil. The consumer can plug an external power supply, e.g. a cable plugged into a car-cigarette-lighter connector, to the connector 138 without unwrapping the food pack, heat the foodstuff 106 and, once the heating is finished, open the wrapper 192, wind the heating portion 100 onto the shaft 126 and then dispose the heater 108. Fig. 14 is a fragment of a shrunk cross-sectional view of the food pack having a different configuration of a wrapper 1192. Fig. 15 is a close-up view of a detail shown in Fig 14. Referring to Figs. 14-15: Figs. 14-15 show a different approach how to prevent the unintended extraction of the heating portion from the foodstuff. The wrapper 1192, having a seam 194, is mechanically coupled via a bond 196, made around the longitudinal axis of the food pack, to the heater 108, particularly to the casing 102, e.g. by lamination or gluing. The wrapper 1192 also comprises a perforated seam 198 made around its longitudinal axis. A consumer can first open the seam 194, insert an external power supply connector to the connector 138 and heat the foodstuff, then use the mechanism 104 and separate the heater 108 (with the heating portion 100 wound on the shaft 126) from the foodstuff 106 by breaking the seam 196. The seam 196 allows the consumer to keep the heated foodstuff 106 inside the remaining part of the wrapper 1192.

[0036] Fig. 16 is a partially exploded perspective view of a middle section having incorporated a thermal fuse

204. The fuse 204 includes a low-melting wire 208 and a silicon-rubber sleeve 206. The middle section has a metallic conductive path 2161 modified, compared to the path 161. The path 2161 includes the resistor 1148 that has two parts (not numbered) and in between them in series incorporated contacts 200, 202. The sleeve 206 is, during manufacturing process, pulled onto the wire 208. The fuse 204 is located (together with the resistor) in a heating portion 1100 (shown without the upper and lower covers 164, 166 in this figure), as schematically depicted by a border line 1154.

[0037] The fuse 204 is configured to be burn out upon reaching a predetermined temperature preventing so the heating portion 1100 from exceeding the temperature and become so potentially too hot. Low melting wire can be e.g. an eutectic alloy of 42% tin and 58% bismuth or an alloy based on tin, bismuth and indium. The contacts 200, 202 can be ultrasonically tinned or a wetting liquid based e.g. on very dilute hydrofluoric acid can be used and the middle section subsequently washed. The wire 208 is soldered to the contacts 200, 202 so that ends are melted onto the contacts 200 and 202. The temperature shall be chosen between 60 - 200 centigrade. The fuse 204 is not a subject of the lamination of the upper and lower covers 164, 166. For instance, a hot-plate machine, used for the lamination, can have, in its hot plates, symmetrically-formed cavities corresponding to the fuse area. Alternatively, an auxiliary patch can be used to over plate the fuse area prior lamination. Such patch can be made from the same sandwich as the upper or lower covers 164, 166.

[0038] Fig. 17 is a close-up perspective fragment of the middle section shown in Fig. 16 with assembled fuse. The fuse 204 is oriented in parallel with the shaft 126. In such configuration, the heating portion 1100 can be wound onto the shaft 126 even when the fuse is semi-rigid. The fuse is so adapted for enabling the mechanism to compact the heating portion 1100 substantially into the casing. This is an example of a heating portion that is partially flexible, particularly in the direction of compacting.

[0039] Fig. 18 is an exploded perspective view of an alternative casing 1102. The casing 1102 comprises a wire frame 1122 and two paper lids 212 and 214. The paper lid 212 has an opening 220 for a connector 138 and an opening 216. The paper lid 218 has an opening 218 and opening 1140. The opening 1140 is a functional equivalent of the opening 140. The openings 216 and 218 correspond to the (visible part of) the shaft 126 (not shown). The frame 1122 is welded similarly to the frame 122. Instead of insulative blocks 118 and 120, the frame 1122 provides a cavity for the wound heating portion. The lids 212, 214 with the frame 1122 and surrounding air thermally insulates the heating portion and prevents the consumer from touching it. The frame 1122 has similar functional parts as in the first embodiment, particularly the plurality of washers 180, a segment 1178 and a segment 1176.

[0040] Fig. 19 is an exploded enlarged perspective view of a plastic shaft 1126 and a plastic frame 2122 of yet another alternative casing 2102. The casing comprises two identical frame segments 222 and a wire holder 232, all moulded from a plastic, typically PET. Each segment 222 has a plurality of spikes 224, a plurality of hollow protrusions 226, a plurality of separators 228 and a separator 230. The segments 222 are symmetrically put together as hinted in the figure. The separators 230 (one of each segment 222) are slightly bent (one up, one down) so that plurality of spikes 224 can fit into the plurality of hollow protrusions 226. The shaft 1126 (a part of alternative mechanism) has a shaft body 1157 and the member 150. The shaft body 1157, compared to the first embodiment, is moulded as one part with the washers (allowing shaft rotation) and with a handle. The wire holder 232 is moulded similarly. The separators 228 support the wire holder 232 and the shaft 1126. The separators 230 act equivalently to the wire segment of 178, i.e. they retain the wound heating portion on the shaft 1126. The wire holder 232 has the same function as the segment 176. Such frame 2122 can be used instead of frame 1122, i.e. a complete casing would also include the lids 212 and 214 shown in Fig. 18.

CONCLUSION, RAMIFICATIONS, AND SCOPE

[0041] The winding mechanism 104 presents one of many ways how to compact the heating portion. For instance, instead of winding, a heating portion can be equipped with one or more strings that pass through the casing to the front face of the connector 138. The consumer could pull these strings after use and draw so such heating portion into the casing.

[0042] The connector 138 can be optionally omitted and the heater 108 can have only exposed electrical contacts. Alternatively, instead of the connector 138, the heater can include flexible wires and a connector, e.g. a car-cigarette-lighter one.

[0043] The heater can be configured to electrically disconnect the resistor upon use of the mechanism not only by tearing the contacts 142 and 144 up but e.g. by also by pulling the contacts out from the clips 132. Alternatively, only one of the contacts 142 and 144 can be torn up or pulled out, i.e. the heater can be configured to electrically disconnect the resistor 148 from at least one of the plurality of conductors 134, 136 upon use of the mechanism The mechanism can be equipped with a spring locked by a lock in its stretched position. The spring would be mechanically coupled to the shaft, e.g. via a simple PET/Nylon gear. At the end of heating, the consumer would unlock the lock and let the spring automatically wind the heating portion. The spring can be realized e.g. as a spiral spring. Alternatively, the spring could be replaced with a rubber band used e.g. for propellers of model airplanes.

[0044] Many variations and modifications of features disclosed in above-mentioned illustrative embodiment

are possible which remain within the concept, scope, and spirit of the disclosed embodiments, and these variations would become clear to those of ordinary skill in the art after perusal of this application. Accordingly, the present embodiments are to be considered as illustrative and not restrictive, and the disclosed embodiments are not to be limited to the details given herein, but may be modified within the scope and equivalents of the appended claims.

GLOSSARY

[0045] "Pack" refers to a group or a set of something.
[0046] "Casing" broadly refers to something that encases. Accompanying figures show a few examples.
[0047] "Disposable" refers to something that is primarily intended for a single use only.
[0048] "Compacting, compacted" broadly cover mechanical operations aiming at making the heating portion more compact, e.g. by bending, infolding, wrapping, winding, crumpling, etc.
[0049] "Extra-low voltage" refers to standardized voltage range (ELV) according IEC 60449,
particularly to maximal potential difference of 50 V AC or 120 V ripple-free DC.
[0050] "Resistive, solid" refers to a solid resistor wherein the electric current is conducted by free electrons, not ions, typically by metals, carbon, semiconductors or their combination.
[0051] "At least partially flexible heating portion" refers to either fully flexible heating portion shown in the first embodiment or a portion shown e.g. in Figs. 16 - 17 that is still capable of compacting.
[0052] "Heating portion is disposed substantially inside the foodstuff means that either whole or at least a substantial part of the heating portion is inside the foodstuff, particularly at least 60% of its surface.
[0053] "A mechanism adapted for compacting the heating portion substantially into the casing" means that mechanism allows to compact either whole or at least 60% of the heating portion inside the insulation.
[0054] "Cross-sectional view" shows objects touching a corresponding cutting plane, objects behind the cutting plane are not shown.
[0055] "PET" stands for polyethylene terephthalate.
[0056] "MIG" stands for Metal Inert Gas, a type of welding process.
[0057] "CNC" stands for Computerized Numerical Control.
[0058] "Lamination" refers to heat-assisted lamination, i.e. pushing a plastic sheet and second sheet together and heating them close to the melting point of the plastic sheet.
[0059] "Bread" is meant to be a food made at least from flour, water, and a leavening agent that are mixed together and baked. The leaving agent can be e.g. yeast, baking powder, dissolved carbon dioxide in the water, etc. It can be sweet, salty, etc.
[0060] "Filling" is an edible part disposed substantially inside the bread.
[0061] Indefinite article "a" or "an" carries the meaning of "one or more" in open-ended claims containing the transitional phrase "comprising".
[0062] Unless the meaning is clearly to the contrary, all ranges set forth herein are deemed to be inclusive of the endpoints.

Claims

1. A disposable, resistive, solid, extra low voltage heater for use in a heatable food pack, comprising:

   an at least partially flexible heating portion (100);
   a casing (102); and
   a mechanism (104) adapted for compacting the heating portion substantially into the casing.

2. A food pack, comprising:

   a foodstuff (106); and
   the heater (108) according to the claim 1, wherein the heating portion is disposed substantially inside the foodstuff.

3. The heater according to the claim 1, wherein the heater further comprises a plurality of electrical conductors (134, 136), the heating portion comprises a resistor (148) electrically coupled to the plurality of conductors, and the heater is configured to electrically disconnect the resistor from at least one of the plurality of conductors upon use of the mechanism.

4. The heater according to the claim 1, wherein the mechanism comprises a shaft (126) and the mechanism is configured to wind the heating portion around the shaft substantially into the casing.

5. The food pack according to the claim 2, wherein the food pack further comprises a wrapper (192, 1192) mechanically coupled to the heater.

6. The heater according to the claim 3, wherein the resistor comprises aluminium.

7. The heater according to the claim 1, wherein the heating portion further includes a thermal fuse (204) adapted for enabling the mechanism to compact the heating portion substantially into the casing.

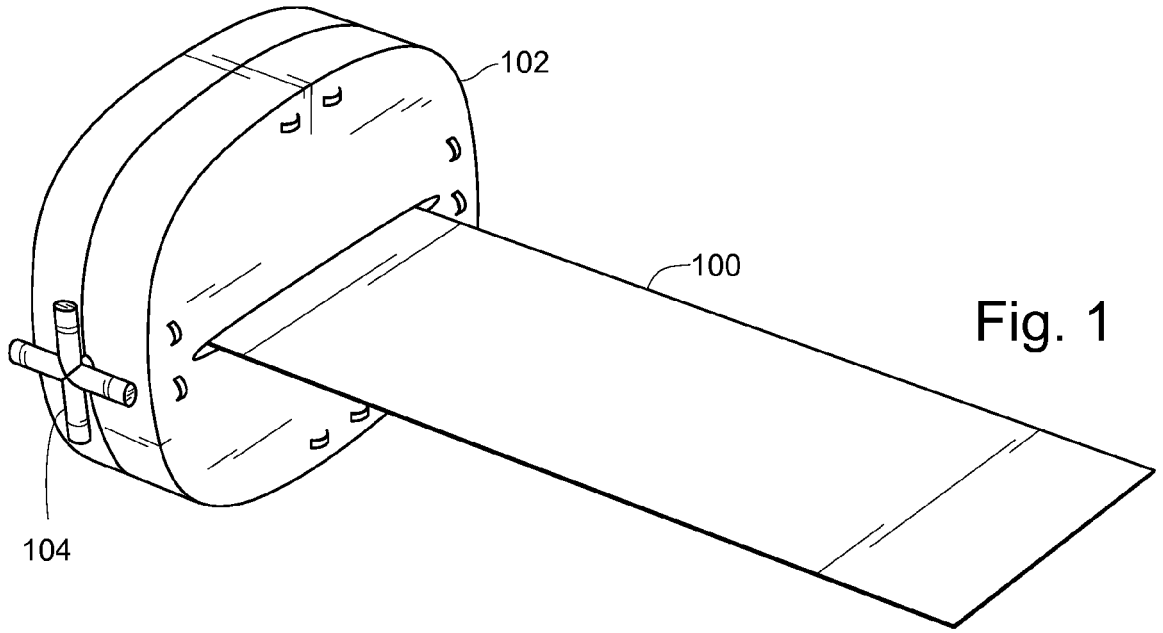
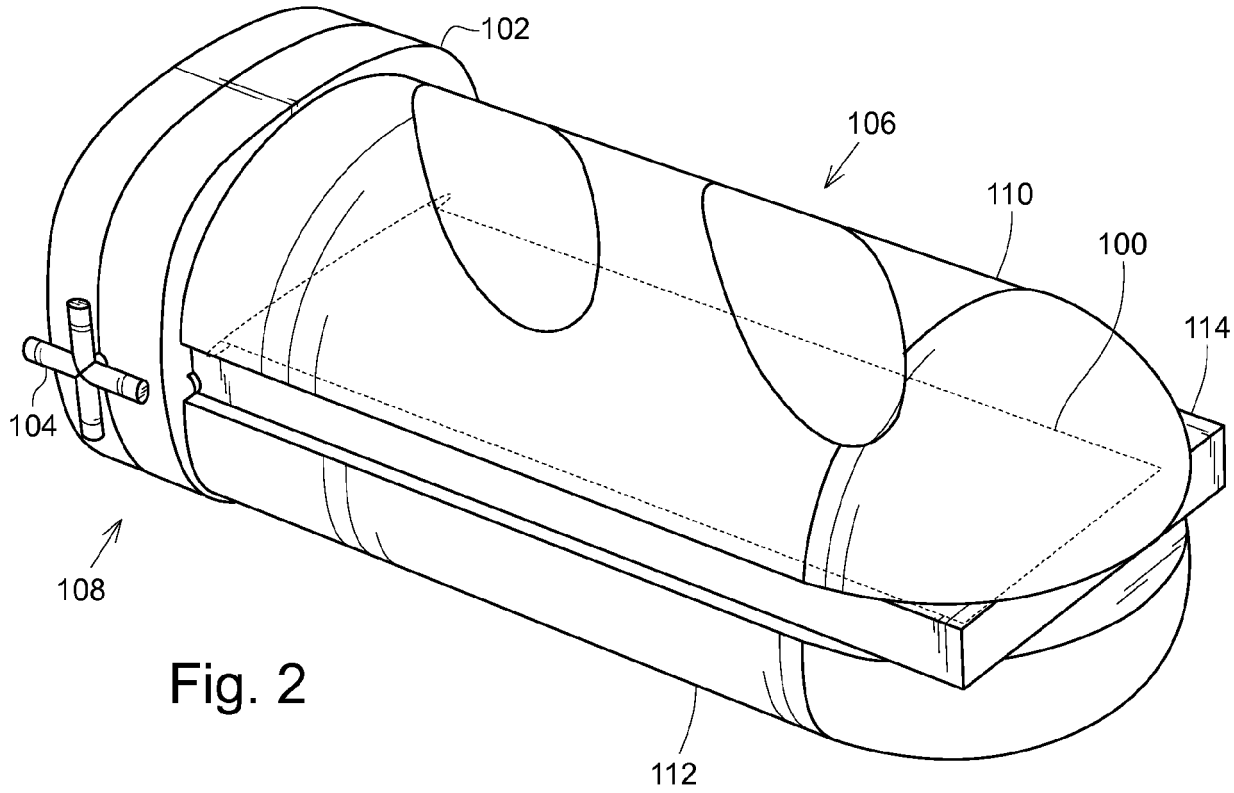


Fig. 1



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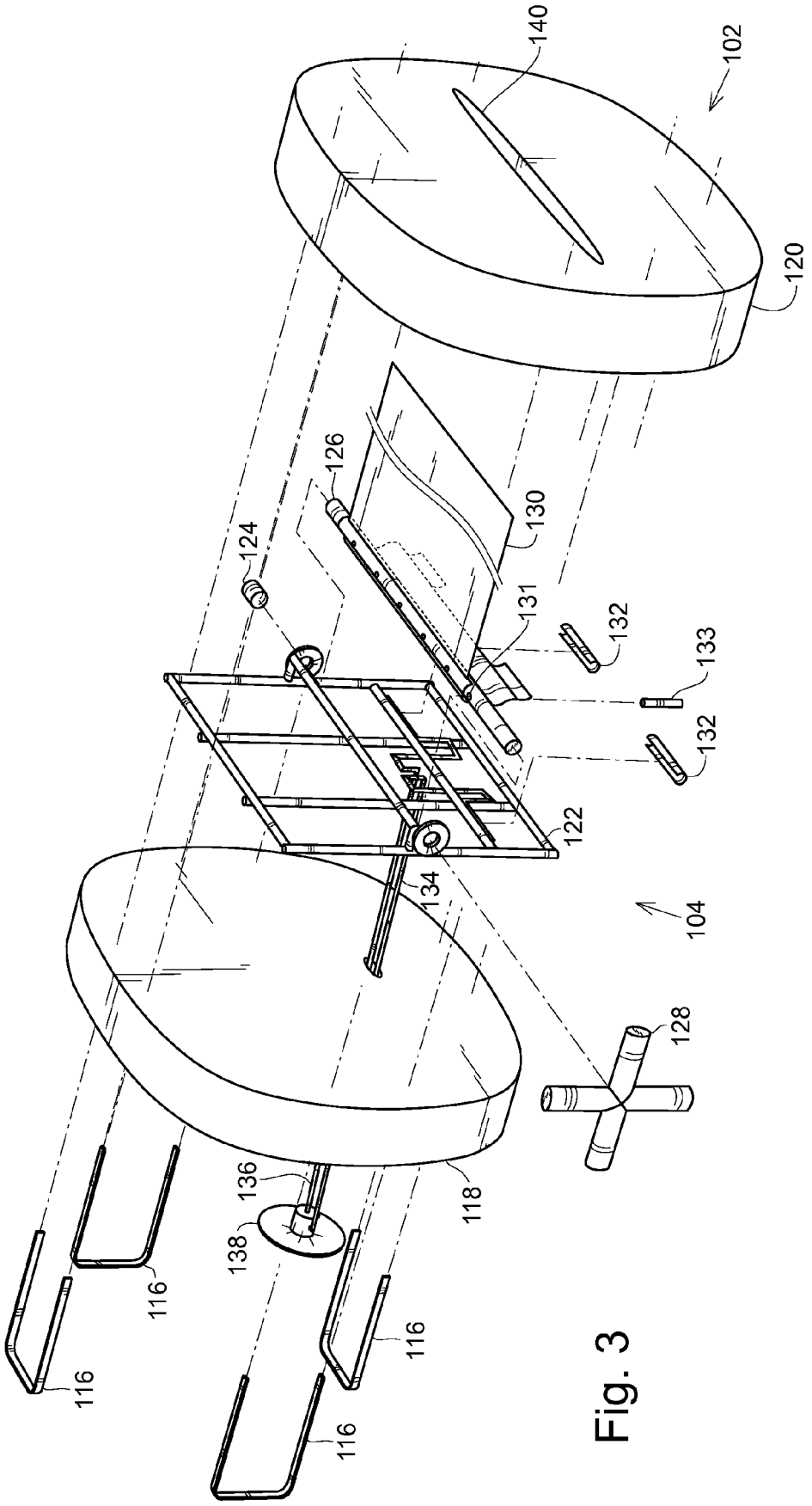
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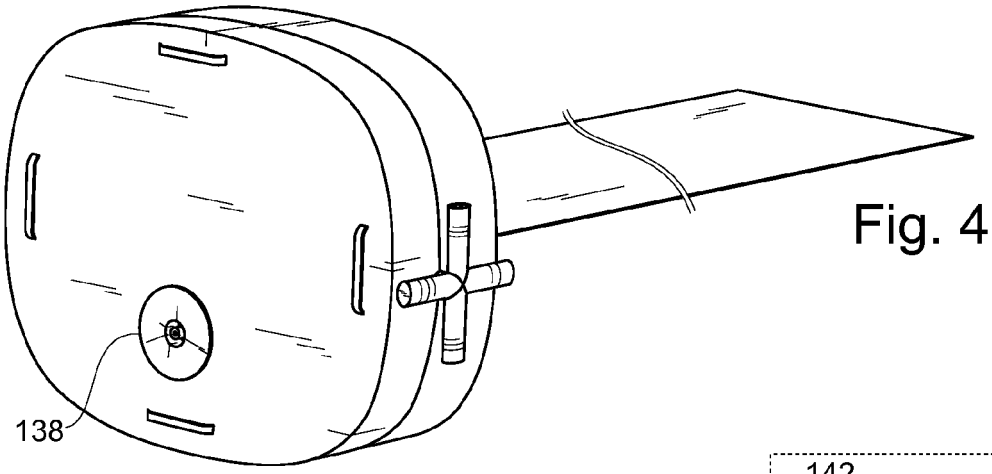
Fig. 3



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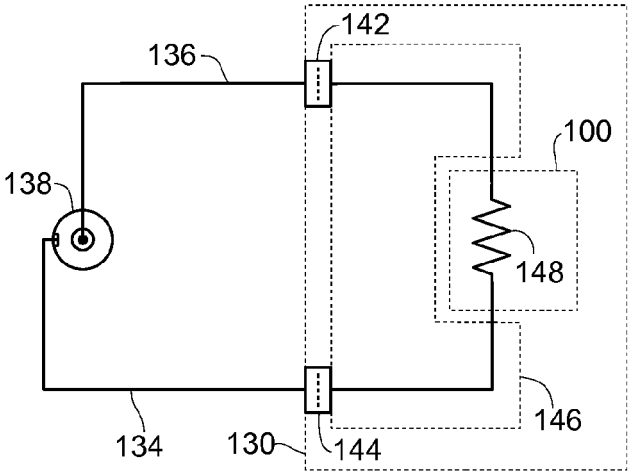

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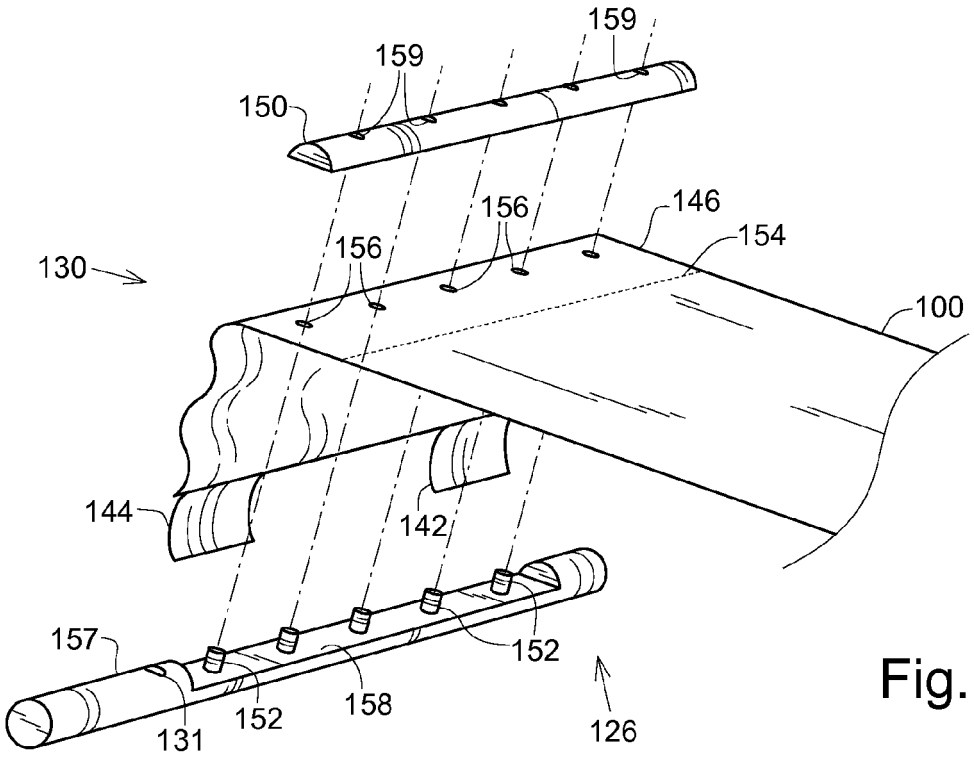

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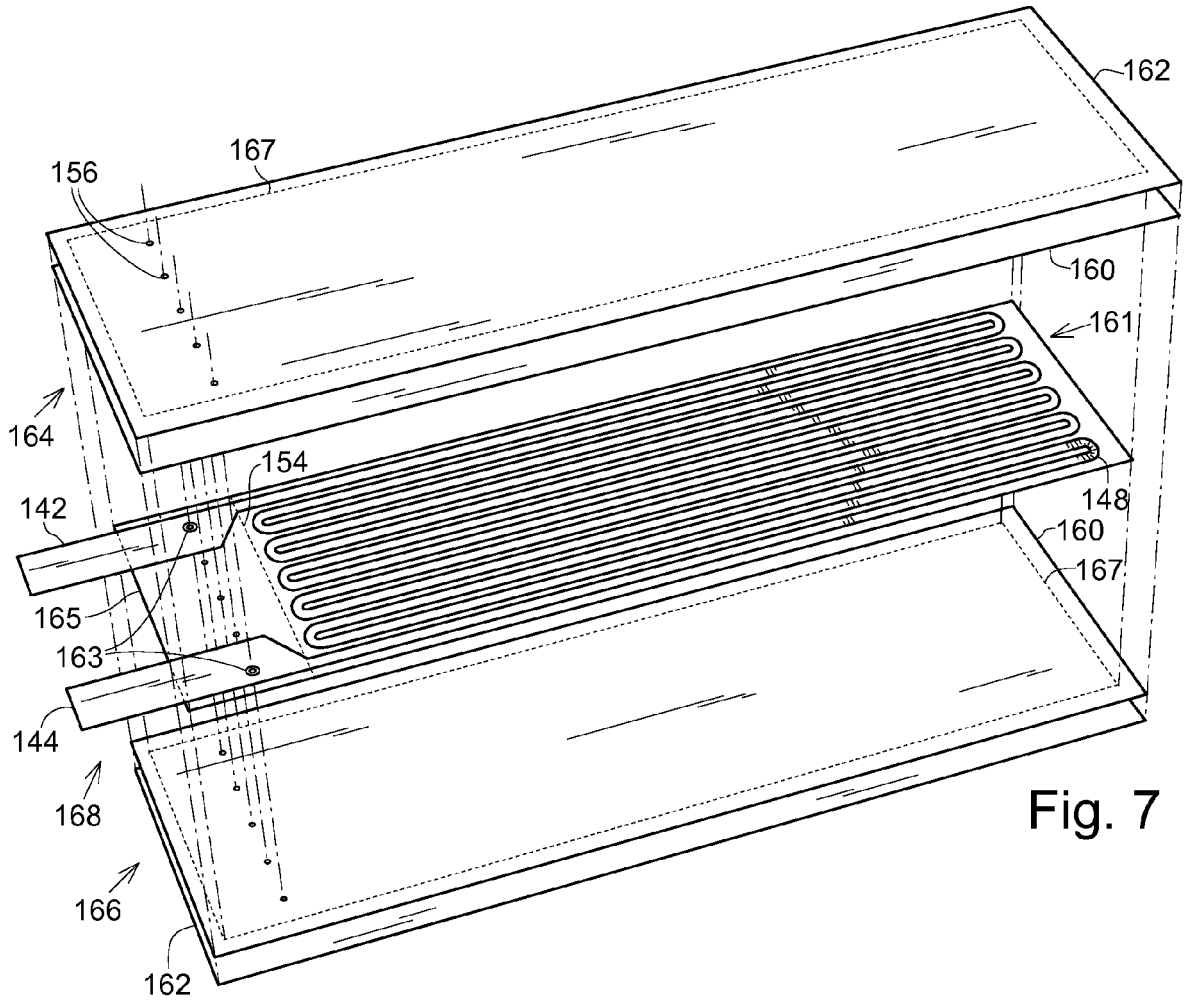
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Fig. 7

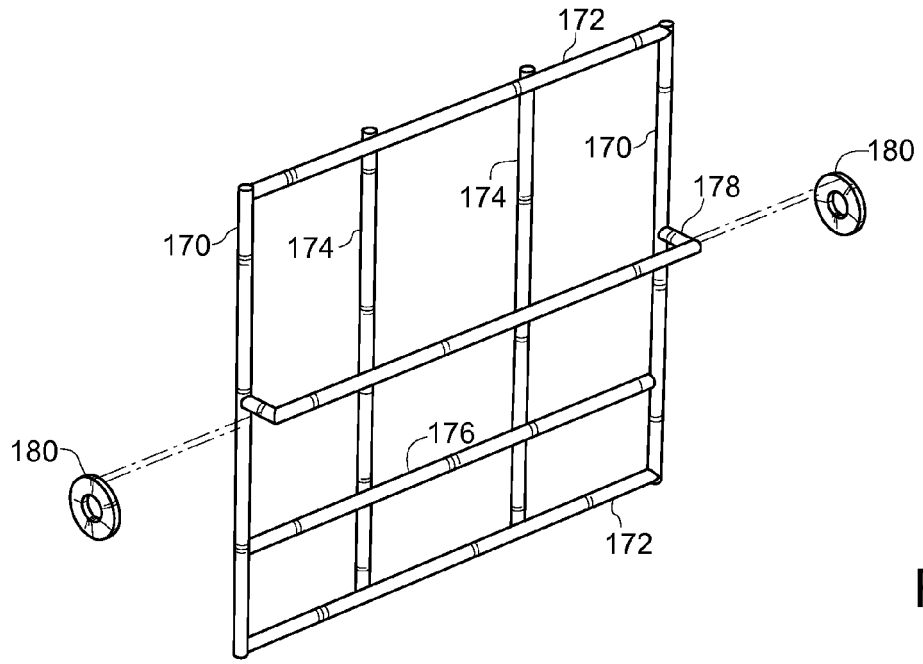
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Fig. 8

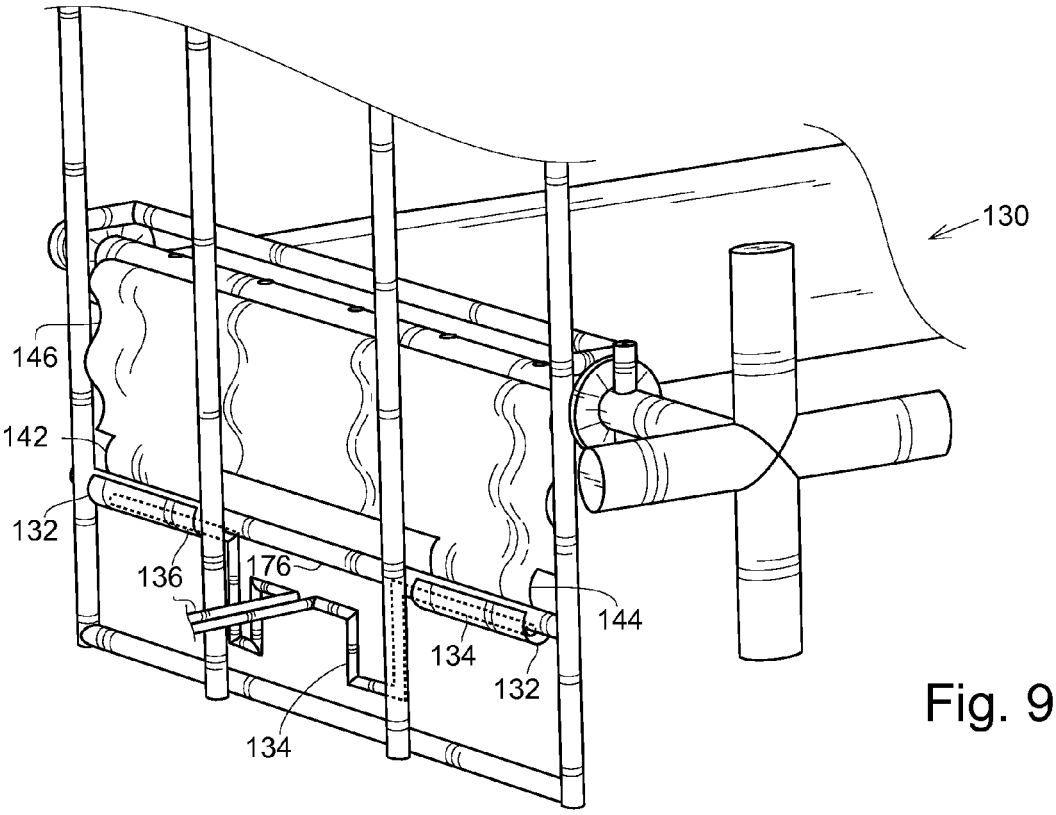
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Fig. 9

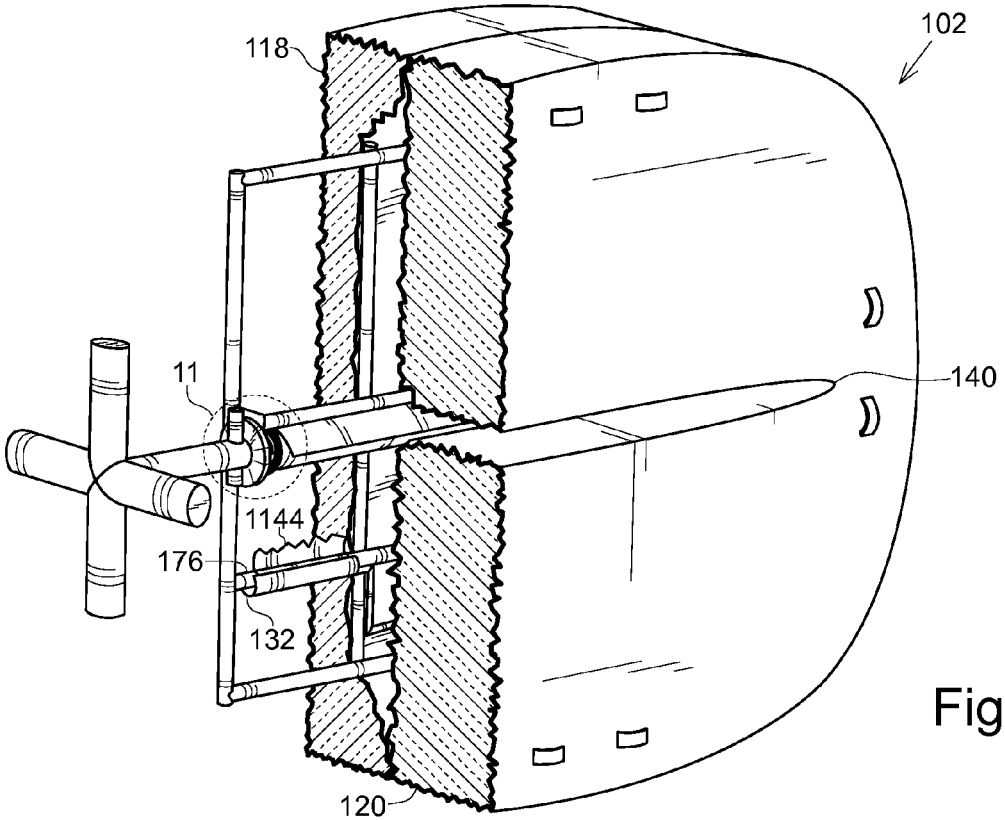
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Fig. 10

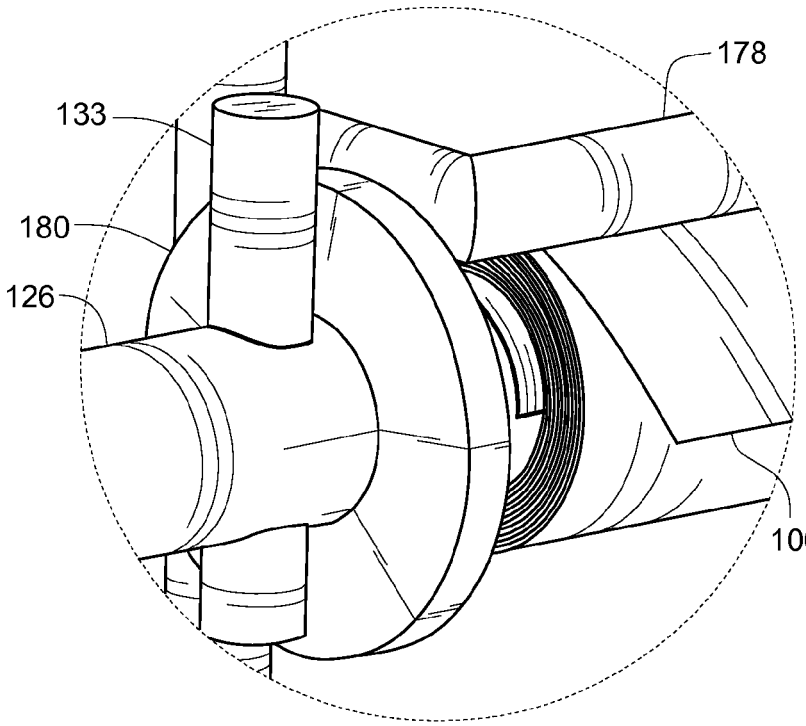
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Fig. 11

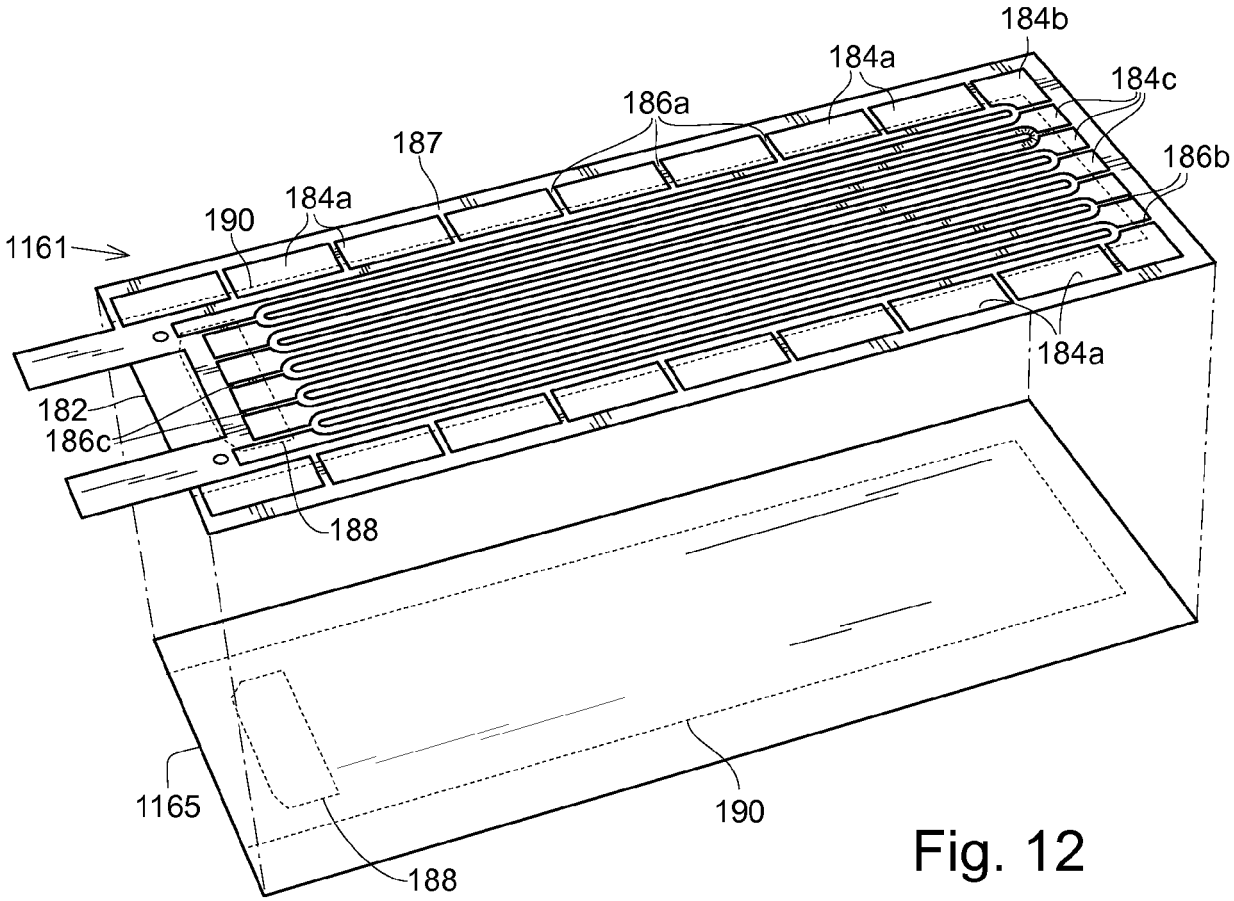
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Fig. 12

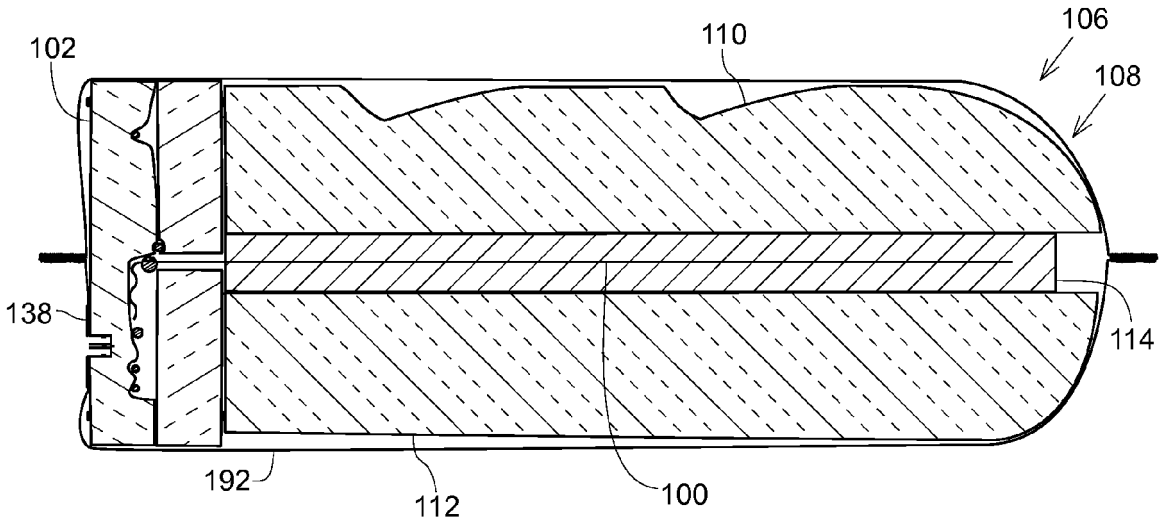

Fig. 13

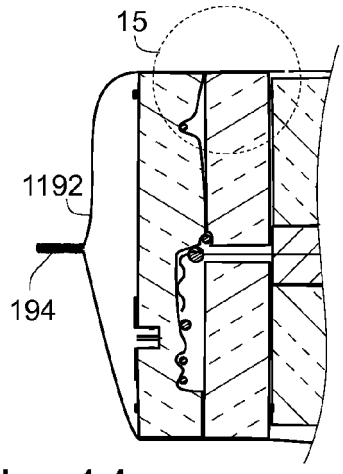

Fig. 14

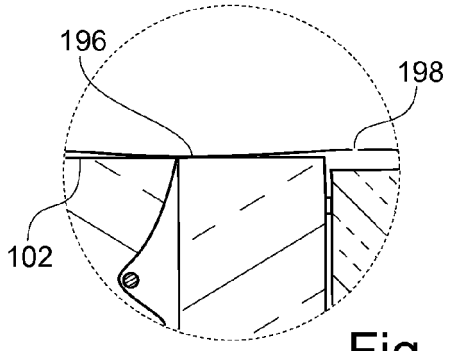

Fig. 15

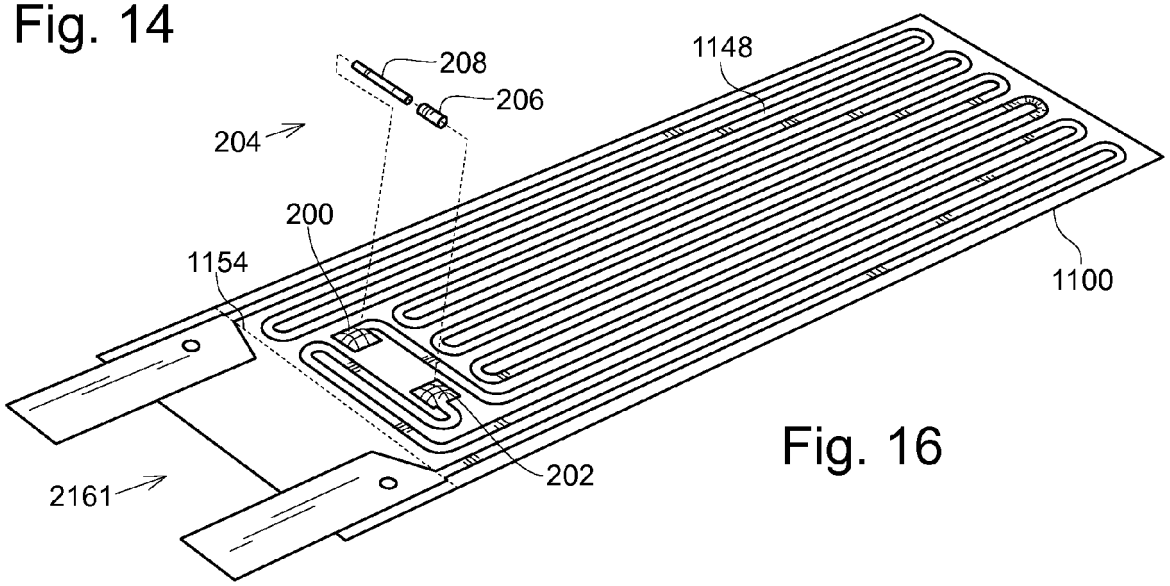

Fig. 16

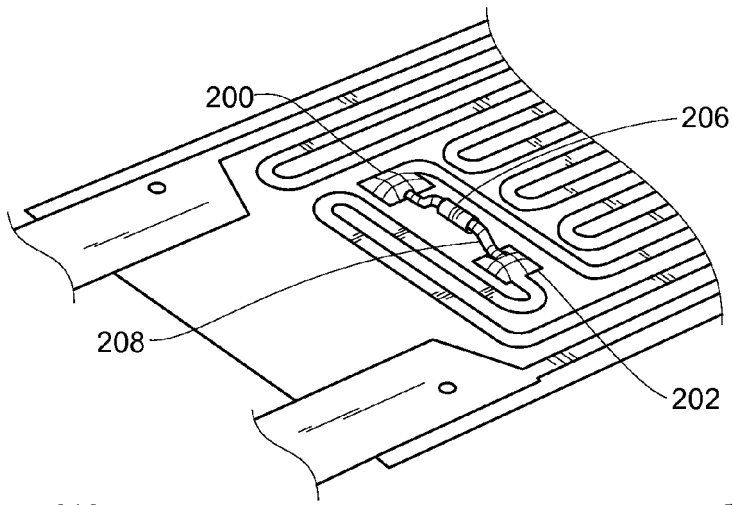

Fig. 17

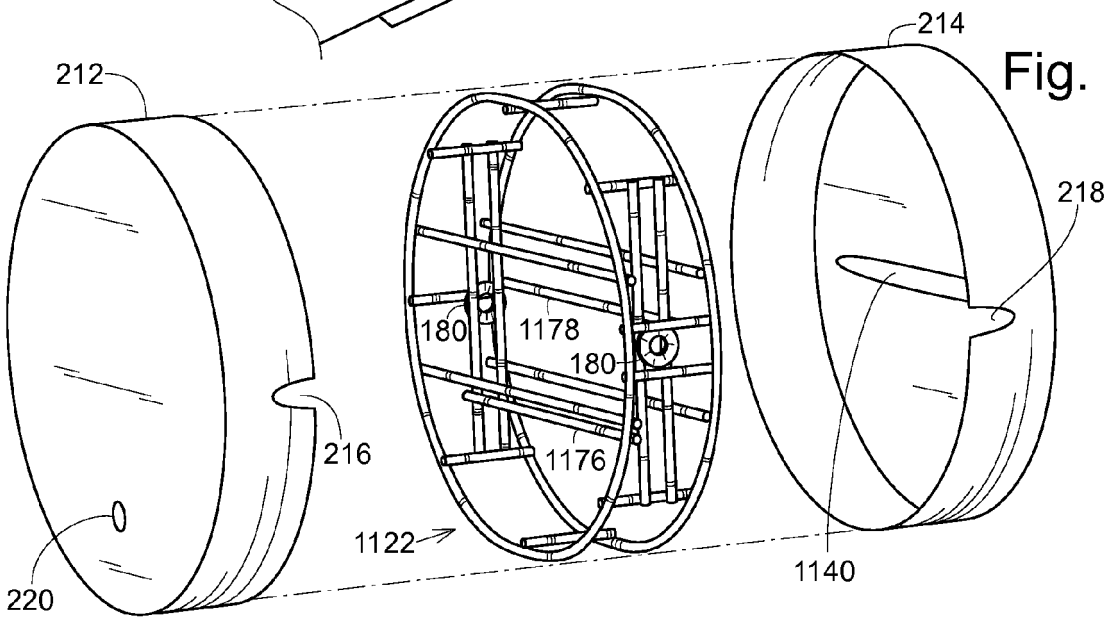

Fig. 18

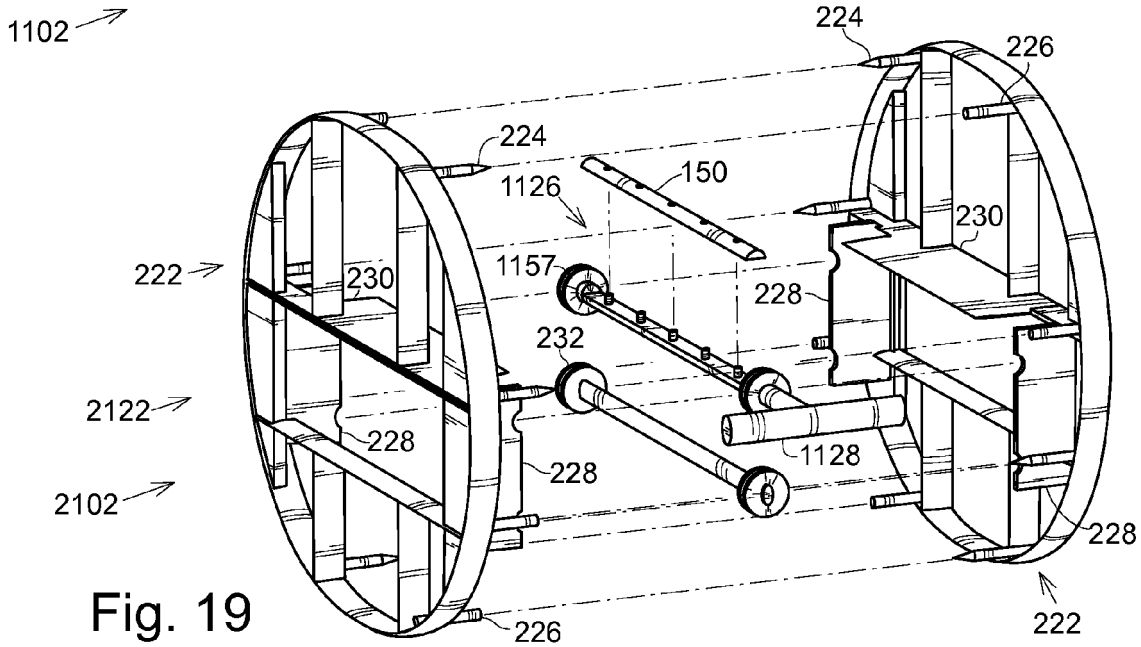

Fig. 19

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EUROPEAN SEARCH REPORT

Application Number
EP 15 19 7798

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 995 835 A (CUNNINGHAM PAUL A [US] ET AL) 26 February 1991 (1991-02-26) * abstract * * figures 1-5 * * column 1, lines 37-62 * * column 2, line 35 - column 3, line 48 *	1-7	INV. H05B3/34 B65D81/34
A	US 3 210 199 A (SCHLAF STANLEY O) 5 October 1965 (1965-10-05) * column 1, lines 47-53 * * column 1, line 26 - column 3, line 37 * * figures 1-4 *	1-7	
A	WO 2005/055664 A1 (SAADOUN SERGE [FR]) 16 June 2005 (2005-06-16) * abstract * * figures 1-5 * * page 6, line 1 - page 10, line 7 *	1-7	
A	US 4 143 165 A (DASWICK ALEXANDER C) 6 March 1979 (1979-03-06) * abstract * * figures 1-11 * * column 2, line 22 - column 3, line 45 *	1-7	TECHNICAL FIELDS SEARCHED (IPC) H05B B65D A47J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 June 2016	de la Tassa Laforgue

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09-06-2016

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