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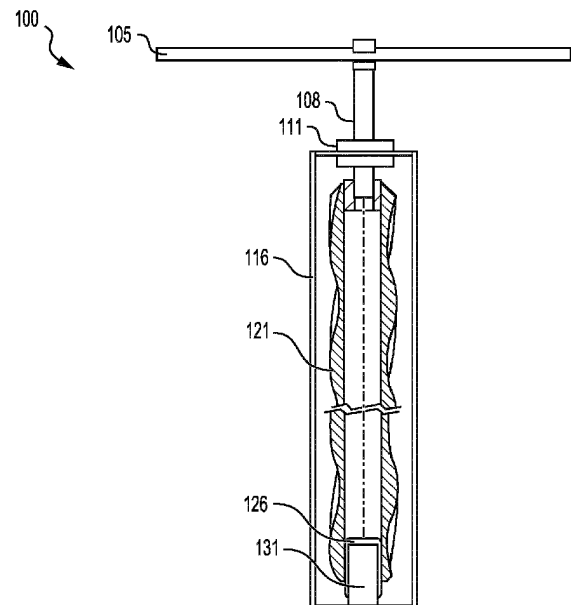
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(54) **ELECTROPLATING SHIELD DEVICE**

(57) An electroplating shield device, methods of fabricating the same, and methods of electroplating with the electroplating shield device are disclosed herein. The method of electroplating includes positioning an object in an electroplating shield device. The electroplating shield device may include a conduit configured to receive the object and a plurality of openings selectively extended between inner and outer surfaces of the conduit. The openings may be positioned between first and second ends of the conduit. The method may also include forming a layer on the object by transferring fluid through the plurality of openings to at least one of a first continuous section of the object comprising a minor of the object and a second continuous section of the object comprising a major of the object. A ratio of a thickness of the major to the minor after forming the layer may range from approximately 1: 1 to approximately 1:18.



**FIG. 1A**



## EUROPEAN SEARCH REPORT

Application Number

EP 23 19 4890

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EPO FORM 1503 03.82 (P04C01)

| 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  | US 2022/178045 A1 (PIASCIK JAMES [US] ET AL) 9 June 2022 (2022-06-09)<br>* abstract *<br>* paragraphs [0025], [0026], [0029] - [0032] *<br>* figure 2 *<br>----- | 1-7   | INV.<br>C25D5/02<br>C25D17/00<br>C25D7/00<br><br>ADD.<br>C25D17/12 |
|  |  |   | TECHNICAL FIELDS SEARCHED (IPC)                                    |
|  |  |   | C25D   |
| <del>The present search report has been drawn up for all claims</del>  |  |   |  |
| Place of search<br><b>The Hague</b>  |  | Date of completion of the search<br><b>1 February 2024</b>  | Examiner<br><b>Lange, Ronny</b>                                    |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |  | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |  |



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**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**see sheet B**

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

**2-7 (completely); 1 (partially)**

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



# LACK OF UNITY OF INVENTION SHEET B

Application Number

EP 23 19 4890

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

## 1. claims: 2-7 (completely); 1 (partially)

Inventive concept I regards a method of electroplating a part, comprising: positioning an object in an electroplating shield device, the electroplating shield device comprising a conduit configured to receive the object and a plurality of openings selectively extended between inner and outer surfaces of the conduit, the openings being positioned between first and second ends of the conduit; and forming a layer on the object by transferring fluid through the plurality of openings to at least one of a first continuous section of the object comprising a minor of the object and a second continuous section of the object comprising a major of the object; wherein a ratio of a thickness of the major to the minor after forming the layer ranges from approximately 1:1 to approximately 1: 18, wherein the plurality of openings are selectively extended in helical shape, and wherein the conduit is formed of a metal alloy.

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## 2. claims: 8-12 (completely); 1 (partially)

Inventive concept II regards a method of electroplating a part, comprising: positioning an object in an electroplating shield device, the electroplating shield device comprising a conduit configured to receive the object and a plurality of openings selectively extended between inner and outer surfaces of the conduit, the openings being positioned between first and second ends of the conduit; and forming a layer on the object by transferring fluid through the plurality of openings to at least one of a first continuous section of the object comprising a minor of the object and a second continuous section of the object comprising a major of the object; wherein a ratio of a thickness of the major to the minor after forming the layer ranges from approximately 1:1 to approximately 1: 18,, wherein the layer is formed by transferring fluid through the plurality of openings to the first continuous section of the object comprising the minor of the object and the second continuous section of the object comprising the major of the object, wherein the ratio of the thickness of the major to the minor after forming the layer is approximately 1:1.

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01-02-2024

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