Title: METHOD AND APPARATUS FOR COMPONENT REMOVAL

Abstract: The proposed invention relates to an apparatus and a method of separating all the parts including but not limited to electronic components, mechanical components, and electromechanical components, modules etc either individually or in sections and modular parts from the main input PCB. The proposed invention is an apparatus and method for component removal during recycling of an electronic device comprising in combination an isothermal system; heating to achieve desired range of temperature within the said isothermal system; at least one system for mechanical handling of the object being recycled; at least one system for selective separation of components being removed.

Declarations under Rule 4.17:
— as to the identity of the inventor (Rule 4.17(i))
— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
— as to inventorship (Rule 4.17(iv))

Published:
— with international search report (Art. 21(3))
— with amended claims and statement (Art. 19(1))

(88) Date of publication of the international search report: 23 May 2013

Date of publication of the amended claims and statement: 11 May 2013
We claim:

1. An apparatus for component removal during recycling of an electronic device comprising in combination:
   a. an isothermal system;
   b. at least one inlet to the said isothermal system;
   c. at least one means for heating to achieve desired range of temperature within the said isothermal system;
   d. at least one system for mechanical handling of the object being recycled;
   e. at least one system for selective separation of components being removed;
   f. at least one system for enabling uninterrupted movement of the said object being recycled;
   g. a conveyor system; and
   h. at least one outlet;

wherein, the said means for heating comprises plurality of heating sources [10a];
the said system for mechanical handling of the object being recycled comprises gravity effect in combination with vibration system by virtue of pulley [18] and lever [20] system;
the said system for selective separation of components being removed comprises mesh table [4] allowing the components separated from the said object to drop down through the mesh;
the said system for enabling uninterrupted movement of the said object being recycled comprises slant or inclined platform arrangement of mesh table [4];
the said means for heating is so arranged in the said apparatus that the resultant distance of the heating rods [10a] from the said object being recycled on the mesh table [4] is in the range of 5 - 15 centimeter; and
the said conveyor system enables the said object being recycled to enter the said isothermal system and further enables the separated Printed Circuit Board and components be conveyed for further processing from the said outlet.

2. [DELETED]

3. An apparatus for component removal during recycling of an electronic device comprising in combination:
   a. an isothermal system;
   b. at least one inlet to the said isothermal system;
   c. at least one means for heating to achieve desired range of temperature within the said isothermal system;
   d. at least one system for mechanical handling of the object being recycled;
   e. at least one system for selective separation of components being removed;
   f. at least one system for flipping the object being recycled upside down during processing in the said isothermal system;
   g. a conveyor system; and
   h. at least one outlet;

wherein,

the said means for heating comprises plurality of heating rods [10a];
the said system for mechanical handling of the object being recycled comprises gravity effect in combination with vibration system by virtue of pulley [18] and lever [20] system;
the said system for selective separation of components being removed comprises mesh table [4] allowing the components separated from the said object to drop down through the mesh;
the said system for flipping the object being recycled enables components of both sides of the said object to be removed;
the said means for heating is so arranged in the said apparatus that the resultant
distance of the heating rods [10a] from the said object being recycled on the mesh
table [4] is in the range of 5 - 15 centimeter; and
the said conveyor system comprises specialized conveyor means for resisting high
temperature and enabling the said object being recycled to be conveyed from the
inlet of the said isothermal system through the said system and further conveyance
of the separated Printed Circuit Board and components for further processing from
the said outlet.

4. [DELETED]

5. A process for removal of components during recycling of an electronic device
comprising the steps of:
   a. heating the said device being recycled at a desired temperature in an isothermal
      chamber;
   b. removing mechanically the dislodged components under the effect of gravity;
      and
   c. separating the said dislodged components on the basis of parameters including
      but not limited to size, shape, weight, density, melting points, or physical
      properties known in the state of the art.

6. The process for removal of components as claimed in claim 5, wherein the said
temperature desired for heating is in the range of 180 - 400 degree centigrade.

7. The process for removal of components as claimed in claim 5, wherein the said
dislodged components are removed mechanically under the effect of vibration and
gravity.
8. An apparatus for component removal during recycling of an electronic device and the process thereof as substantially described herein the specification and accompanying drawings.
STATEMENT UNDER ARTICLE (19)

After reviewing the citations of ISR, the applicant has amended the claims and the same are enclosed herewith. Comments on the Written Opinion and citations are as below:

The present invention is not 'merely a collection of components using a generic set of devices', but is in effect an inventive assembly of the components for the purpose of arriving at a novel system for removal of components of various devices including electronic devices. Further, it is not limited to the reuse of the workable components of thus recycled devices, but is expanded to any method which involves or includes recovery of precious metals and recycling of electronic items.

The claims are amended in view of the ISR so as to differentiate the invention from the prior art.

The claims 6 & 7 are amended to correct the pre-existing typographical error and incorrect reference to preceding claim. The following table describes wherein the changes made in the claims:

<table>
<thead>
<tr>
<th>Old Claim</th>
<th>New Claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim 1 and 3</td>
<td>Amended</td>
</tr>
<tr>
<td>Claim 2 and 4</td>
<td>Deleted</td>
</tr>
<tr>
<td>Claim 5</td>
<td>No Amendment</td>
</tr>
<tr>
<td>Claims 6, 7</td>
<td>Amended</td>
</tr>
</tbody>
</table>

The basis of claim amendment is indicated below:

<table>
<thead>
<tr>
<th>Claim Amendment</th>
<th>Basis of Amendment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim 1</td>
<td>Claim 2 as originally filed</td>
</tr>
<tr>
<td>Claim 3</td>
<td>Claim 4 as originally filed</td>
</tr>
<tr>
<td>Claims 6 &amp; 7</td>
<td>Claim reference [as originally filed] correction</td>
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<tr>
<td>[typographical</td>
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<tr>
<td>amendment]</td>
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