

# Food Packaging and Salmonella Prevention through Packaging

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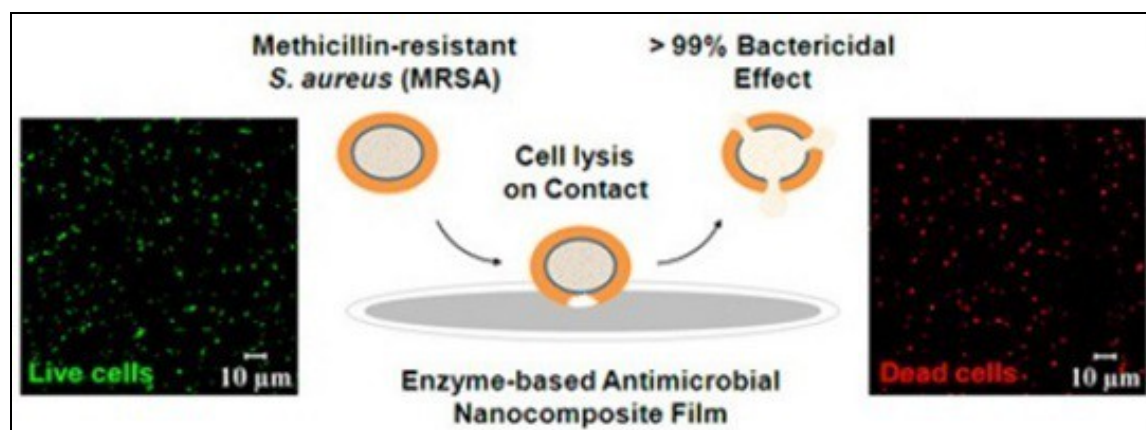
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## Objective

The objective is to provide a landscape of the latest Food Packaging technologies that provide added consumer benefits. We will explore patent data bases to extract these technologies and highlight any claims mentioned that discuss new and beneficial consumer benefits. In addition, this final report will show where this technology is being developed, who is developing technologies in food packaging and white space potential.

## Background

The major role of packaging is to protect the food product it contains against water, water vapor, air, oxygen, microorganisms, insects, other intruders, dirt, pilferage, etc. Besides protection, containment, communication, unitization, sanitation, dispensing, convenience, are some of the other package functions. One major benefit to the consumer from packaging is the safety of the product that it holds. [Book on Development of Packaging for Food Products](#). Active packaging interacts with a product by releasing or absorbing substances to/from the packed food product and thereby extending shelf-life and improving food safety and quality. Some of the active packaging concepts include anti-microbial films, anti-oxidant films, and scavenging concepts such as oxygen scavenging, ethylene scavenging, moisture regulation etc. to preserve the freshness of the food product. [Paperimpact](#). Researchers have also shown the migration of the antimicrobial compound such as ethyl lauryl arginate (LAE) to chicken breast to be within the regulated limits when using an active packaging. LAE has been shown to be effective against *Listeria*. [FoodProduction Daily](#). Release of salicylic acid from polymer films can prevent the formation of *Salmonella typhimurium* biofilms. [Review article of Rutgers University](#).



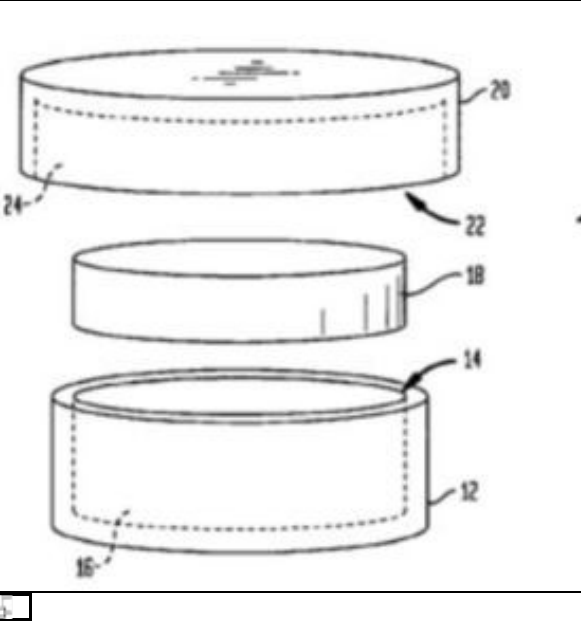
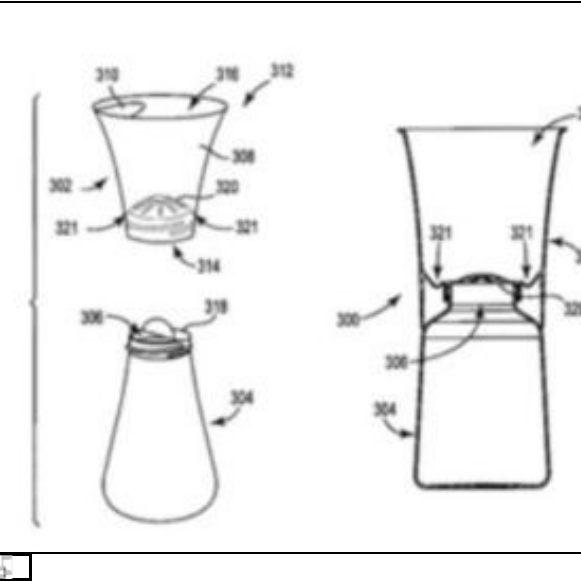
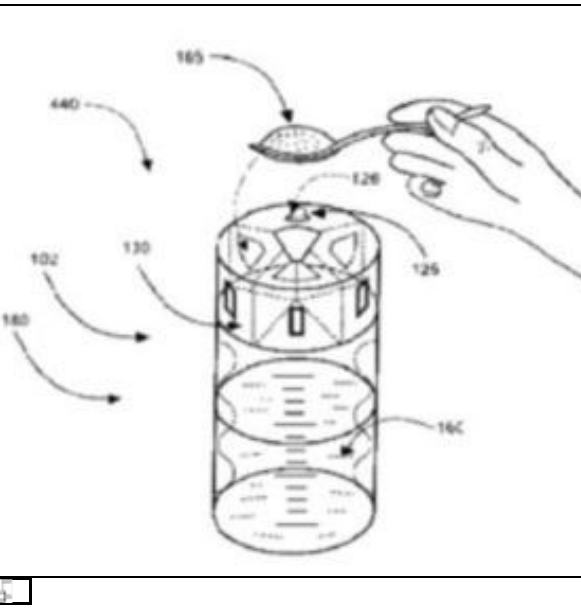
## Food Packaging

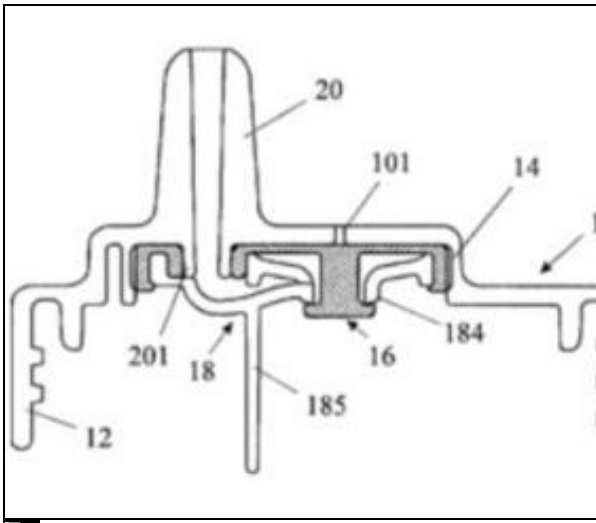
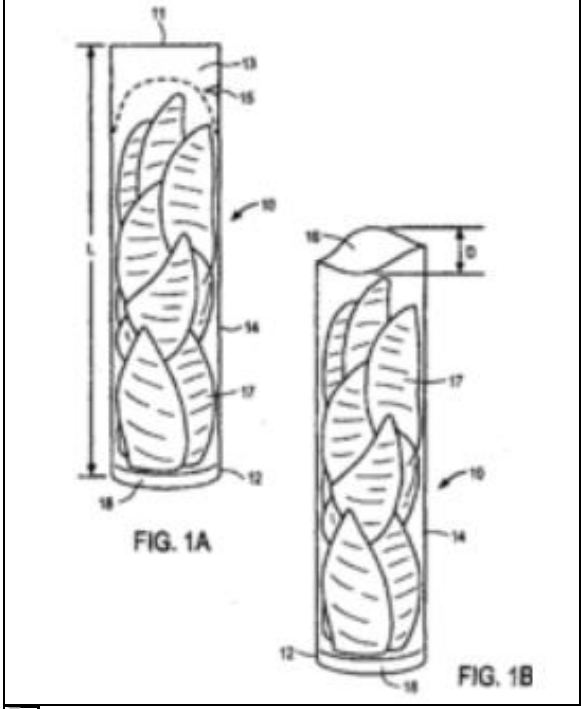
### Old Sample patents

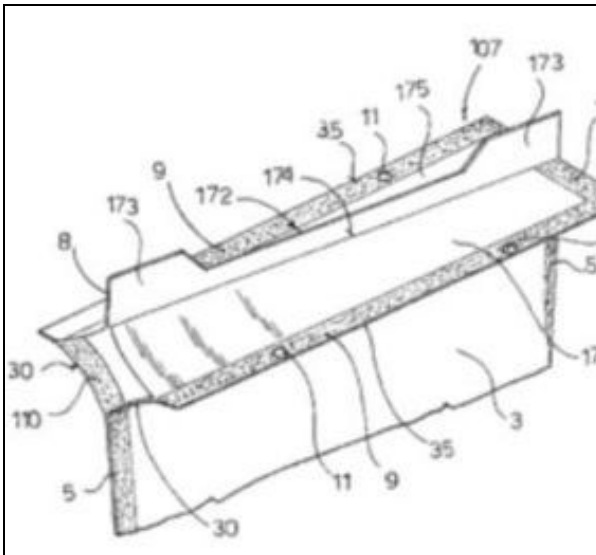
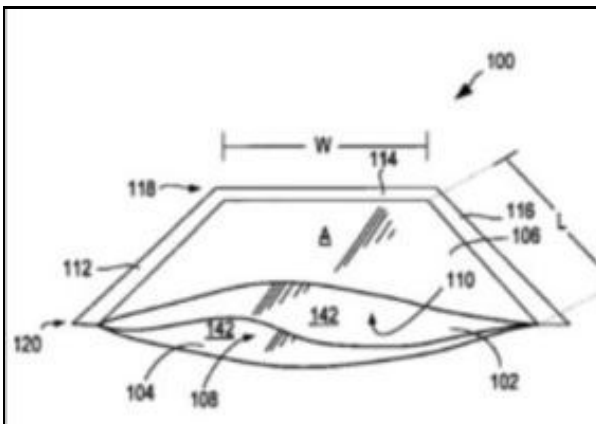
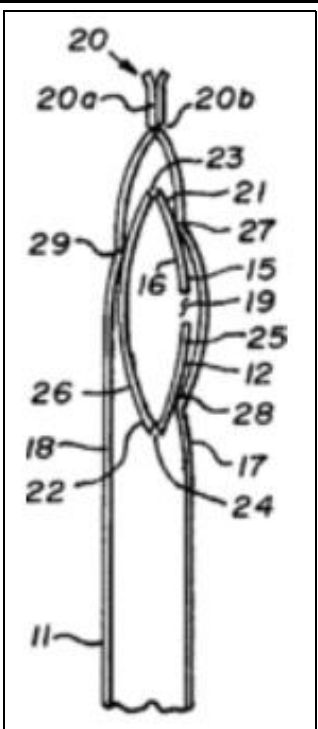
### Revised Sample patents

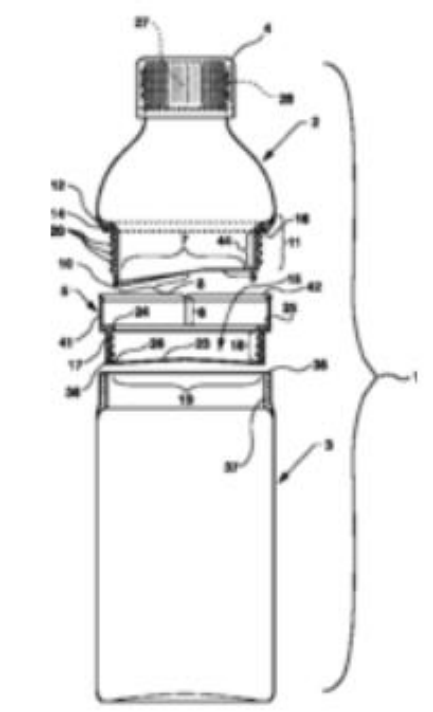
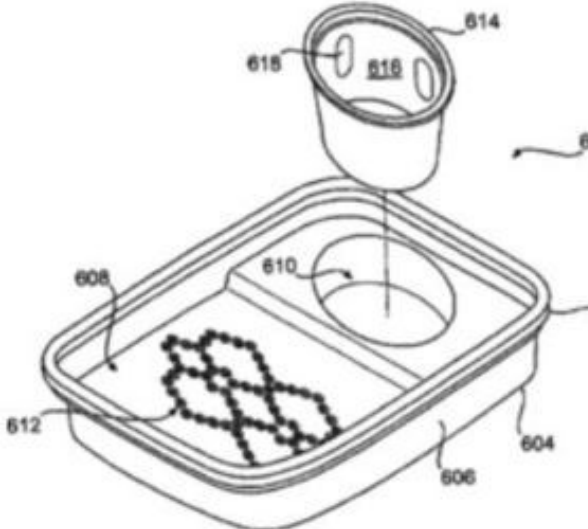
### Revised Sample patents-Consumer Perspective

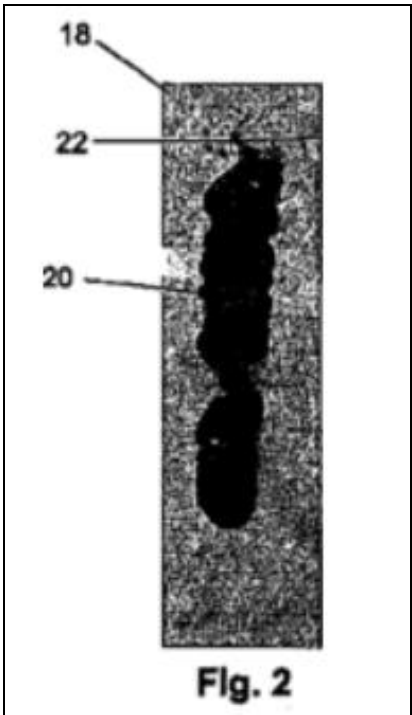
| Patent/Publication No. | Publication Year | Assignee / Applicant | Title | Dolcera summary | Image |
|------------------------|------------------|----------------------|-------|-----------------|-------|
|------------------------|------------------|----------------------|-------|-----------------|-------|

|                             |      |                                                                                                                         |                                                                         |                                                                                                                      |                                                                                       |
|-----------------------------|------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <a href="#">US8481134B2</a> | 2013 | L?oreal.  <br>atis, balanda<br>  pradier,<br>fran?ois  <br>kanji,<br>mohamed  <br>brereton,<br>evelyn  <br>gavin, linda | Biodegradable<br>moisture-impermeable<br>packages for<br>consumer goods | Biodegradable and<br>moisture<br>impermeable                                                                         |     |
| <a href="#">US8485378B2</a> | 2013 | General mills,<br>inc.   zoss,<br>robert a.  <br>scholtes,<br>bryan  <br>genord, dan                                    | Multi-container<br>packages for<br>dispensing liquid and<br>dry food    | Package for<br>multi-component<br>such as cereal and<br>milk                                                         |   |
| <a href="#">US8475856B2</a> | 2013 | Sheehan,<br>andrew  <br>sheehan,<br>andrew                                                                              | OTG (on the go)<br>specialty<br>multi-beverage<br>container systems     | On the go specialty<br>multicontainer for<br>mixing and<br>transporting a<br>variety of<br>powder-based<br>beverages |  |

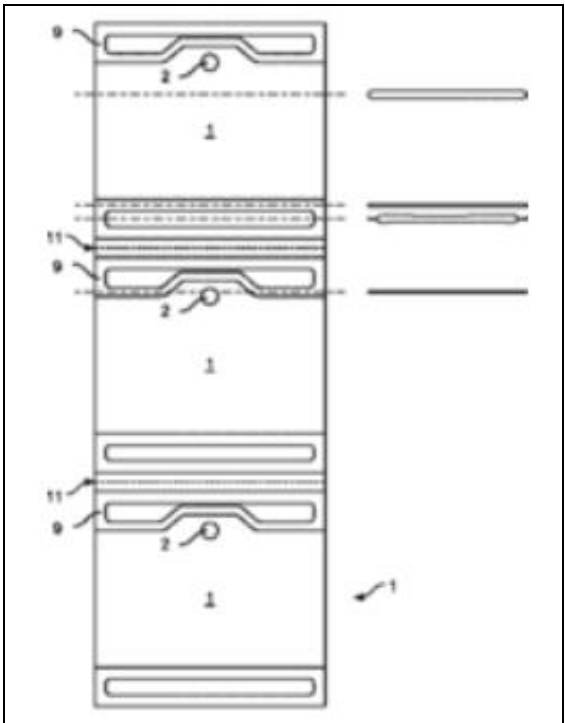
|                                |      |                                       |                                                                                                                                         |                                                                                                                                                                           |                                                                                     |
|--------------------------------|------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <a href="#">US8403164B2</a>    | 2013 | Samson, ilan                          | Cap for a spill-proof beverage container                                                                                                | Cap for a spill-proof cup with a reliable seal between the rigid and flexible members of the demand valve.                                                                |    |
| <a href="#">US8377529B2</a>    | 2013 | Cryovac, inc.<br>  bekele,<br>solomon | Ultra high barrier aseptic film and package                                                                                             | A coextruded film with good oxygen barrier properties for pouches made in a VFFS aseptic system, that exhibits extended shelf life for the contained product by providing | N/A                                                                                 |
| <a href="#">WO2013085911A2</a> | 2013 | Sepehr,<br>cyrus, a.                  | Consumer oriented system for delivery of product including single serving package for preservative-free fruit pieces                    | Single serve packaging for preservative free fruit pieces                                                                                                                 |  |
| <a href="#">US8231272B2</a>    | 2012 | Goglio s.p.a.                         | Stand-up, easy-open and easy-close package of flexible material, particularly for liquid, viscous, pasty, granular or powdered products | Flexible package for viscous, granular or powdered substances with peelable closure for easy open and close                                                               |                                                                                     |

|                             |      |                                       |                                                                     |                                                                             |                                                                                      |
|-----------------------------|------|---------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                             |      |                                       |                                                                     |                                                                             |     |
| <a href="#">US8198571B2</a> | 2012 | Graphic packaging international, inc. | Multi-compartment microwave heating package                         | <p>A microwave package for heating, browning, and/or crisping a food</p>    |   |
| <a href="#">US8167487B2</a> | 2012 | Milprint, inc.                        | Secure access easy opening tamper evident feature for sealable bags | <p>Bags with a tamper evident feature having an easy rupturable opening</p> |  |

|                             |      |                                       |                                                                      |                                                                                                                                                                                                            |                                                                                                     |
|-----------------------------|------|---------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <a href="#">US8151985B2</a> | 2012 | None                                  | Containers for storing at least two substances for subsequent mixing | <p>Disposable recyclable container for keeping two substances separate until mixed. The container can be enclosed in a tamper-evident film that includes a perforated pull strip</p>                       |                   |
| <a href="#">EP2284099B1</a> | 2012 | Graphic packaging international, inc. | Microwave packaging for multi-component meals                        | <p>Packaging constructs in the form of trays, and other package forms for heating, browning, and/or crisping at least one food item in a microwave oven</p>                                                |  <p>FIG. 6A</p> |
| <a href="#">EP2208604B1</a> | 2012 | Amcor flexibles kreuzlingen ltd.      | Packaging pouch with food flow properties                            | <p>Packaging pouch made of a flexible mono or multilayer film for packaging viscous jelly and/or gravy matrix food in a thermo cycle such as retort, pasteurisation, hot filling or aseptic conditions</p> |                                                                                                     |



1



1

[US20120168025A1](#)

2012

Nestec s.a.

Disposable very lightweight package

A biodegradable flexible pouch-like disposable package with a hermetic seal

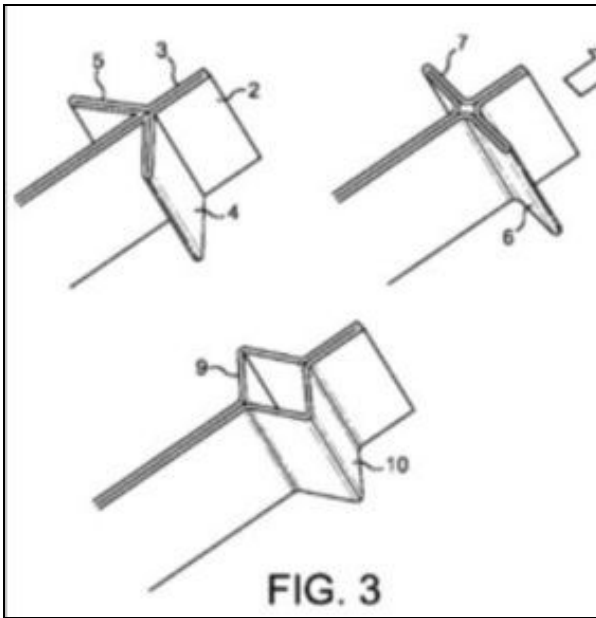
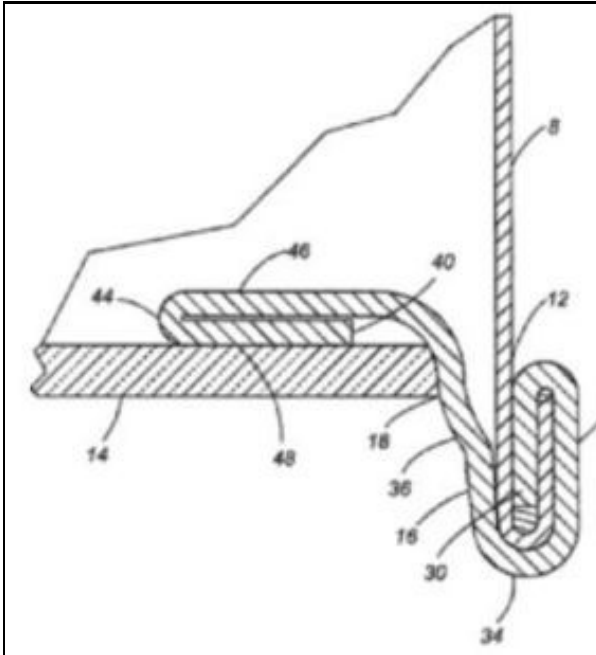
[EP2459463A1](#)

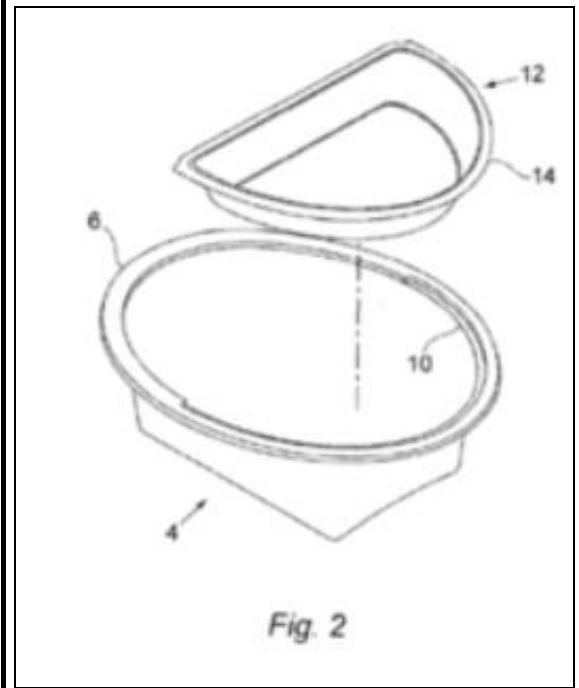
2012

Nestec s.a.

Easy opening packaging for liquid or gel products

A flexible package for a food product such as gel having a closure which is suitable for one hand operation

|                             |      |                                       |                                                                        |                                                                                                                                                                               |                                                                                                 |
|-----------------------------|------|---------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                             |      |                                       |                                                                        |                                                                                                                                                                               |  <p>FIG. 3</p> |
| <a href="#">US8080770B2</a> | 2011 | Ball corporation                      | Microwavable metallic container                                        | <p>A metallic microwavable container which is hermetically sealed and capable of storing foodstuffs for long periods of time</p>                                              |              |
| <a href="#">US7981408B2</a> | 2011 | Boston brands, inc.                   | Method of preserving food using antimicrobial packaging                | Antimicrobial film for food packaging                                                                                                                                         | N/A                                                                                             |
| <a href="#">EP1888430B1</a> | 2011 | Graphic packaging international, inc. | Microwavable food package having an easy-open feature                  | Package construct for cooking or heating a food item in a microwave oven.                                                                                                     | N/A                                                                                             |
| <a href="#">GB2476365A</a>  | 2011 | Avondale foods, limited               | Food packaging for two different food products to be stored separately | A Microwaveable food packaging containing a first outer bowl for a first food and a separable insert tray for a second food where the insert tray fits within the first bowl. |                                                                                                 |



1

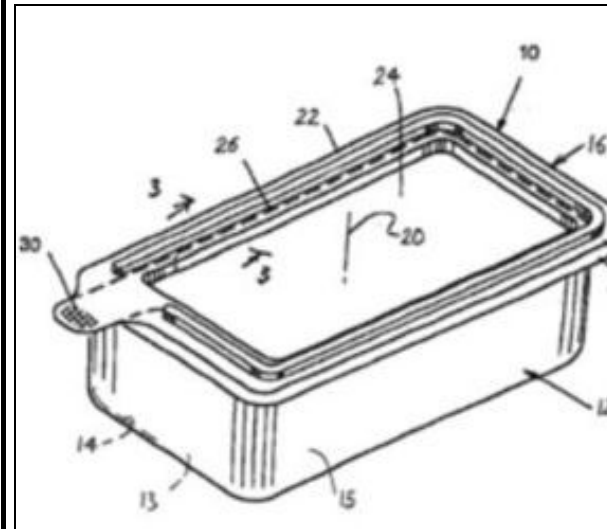
[US20100108680A1](#)

2010

None

Enhanced tamper evident container with tear-apart parts

Easily openable tamper evident container where a large sustained pull force has to be applied to separate a lid from a peripheral cover portion that is fixed to a peripheral base portion of the base



1

[EP1777173B1](#)

2010

Mora negrin,  
pedro ramon

Easily opened flexible vacuum packaging for single portions of pasty fluids

Easy-open flexible vacuum container for single doses of viscous fluids

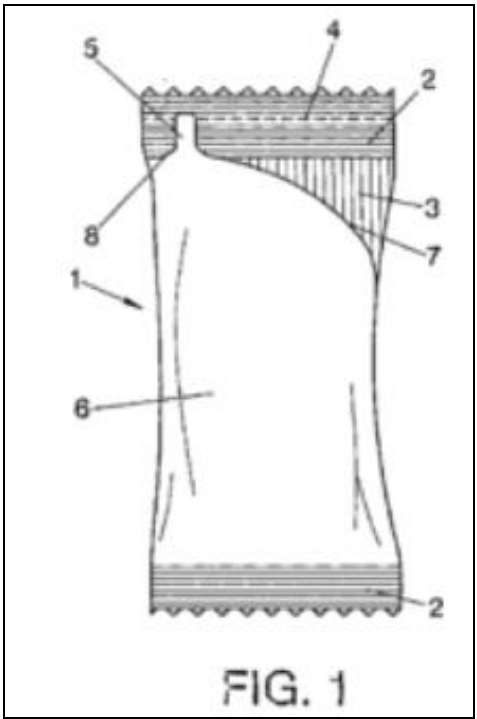


FIG. 1

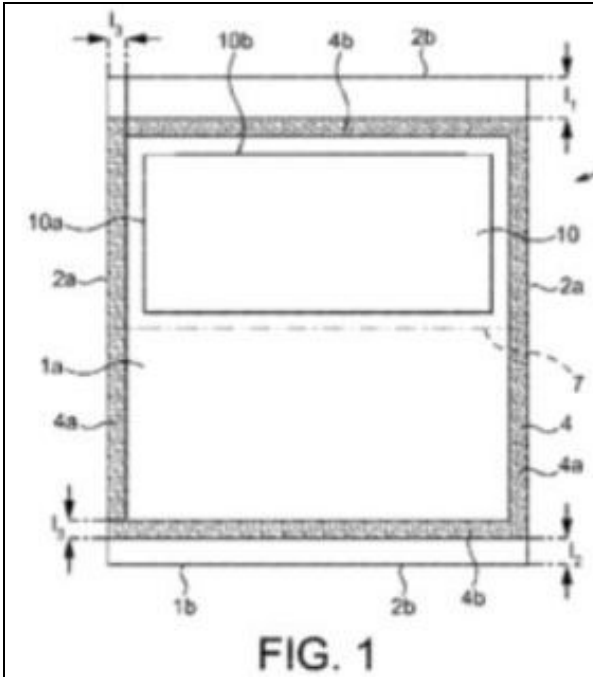
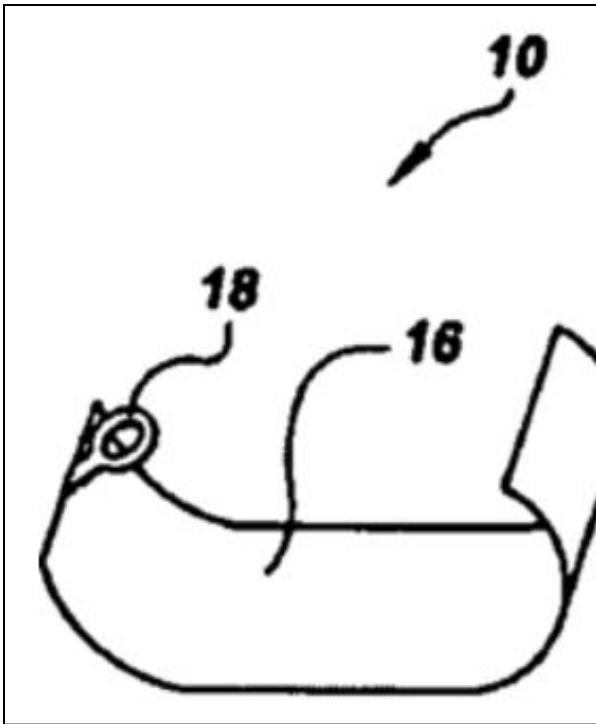


FIG. 1

|                                 |      |             |                                                   |                                                                                                          |  |
|---------------------------------|------|-------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------|--|
|                                 |      |             |                                                   |                                                                                                          |  |
| <a href="#">EP2141085A1</a>     | 2010 | Nestec s.a. | Easy opening packaging for food products          | Easy open flexible packaging for energy bars providing a bigger surface for consumer information         |  |
| <a href="#">US20090285941A1</a> | 2009 | None        | Combination package of liquid and solid foodstuff | A multi-compartment package for convenience and portability to a favorite snack such as cookies and milk |  |



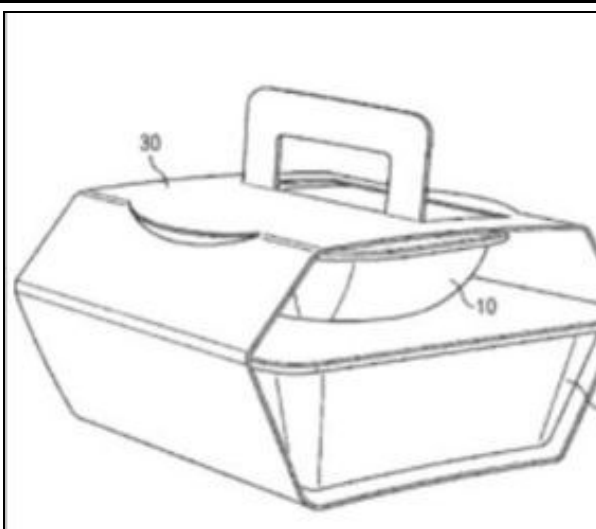
[US20090214723A1](#)

2009

None

Two component package for simultaneous heating

A package for simultaneous heating of a **crispy food product** and a **non-crispy food product** in microwave.



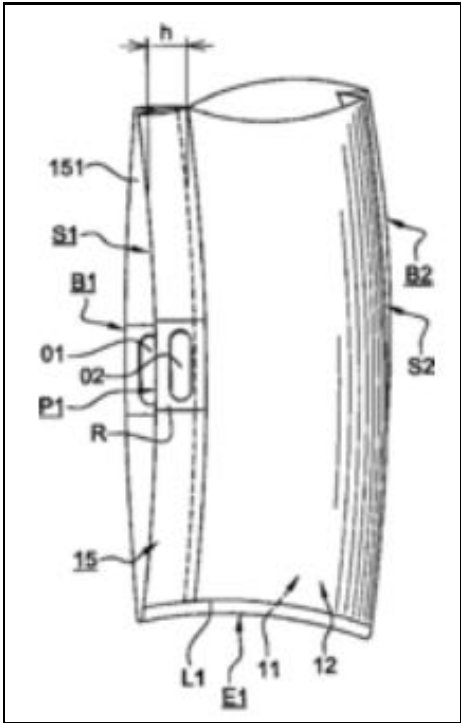
[US20090032487A1](#)

2009

Stephen s. Rekstad

Spill resistant caps and container systems

A **spill resistant cap** for a standard commercially available beverage bottle containing water, milk, juice, soda or other beverage.

|                             |      |                   |                                  |                                                                                                                                 |                                                                                     |
|-----------------------------|------|-------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                             |      |                   |                                  |                                                                                                                                 |    |
| <a href="#">US7494279B2</a> | 2009 | Mars incorporated | Ergonomic bag assembly for foods | <p>An ergonomic bag assembly for granular foods contains two bags mutually joined by a gripping element comprising a handle</p> |  |

## Search Methodology

### Relevant Class Codes and Definitions

IPC/ECLA

| Class     | Definition                                                                                               |
|-----------|----------------------------------------------------------------------------------------------------------|
| A23L      | Foods, foodstuffs, or non-alcoholic beverages                                                            |
| A23L0001* | Foods or foodstuffs; their preparation or treatment                                                      |
| B32B*     | Layered products, i.e. Products built-up of strata of flat or non-flat, e.g. Cellular or honeycomb, form |

|       |                                                                                                                                                                                                                                                        |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B65B* | Machines, apparatus or devices for, or methods of, packaging articles or materials; unpacking                                                                                                                                                          |
| B65D* | Containers for storage or transport of articles or materials, e.g. Bags, barrels, bottles, boxes, cans, cartons, crates, drums, jars, tanks, hoppers, forwarding containers; accessories, closures, or fittings therefor; packaging elements; packages |
| C09J* | Adhesives; non-mechanical aspects of adhesive processes in general; adhesive processes not provided for elsewhere; use of materials as adhesives                                                                                                       |
| D21H* | Pulp compositions; preparation                                                                                                                                                                                                                         |
| G01N* | Investigating or analysing materials by determining their chemical or physical properties                                                                                                                                                              |

US Class

| Class | Definition                               |
|-------|------------------------------------------|
| 428*  | Stock material or miscellaneous articles |

## Patent search

### Revised Patent Search

- Search Engine: Thomson Innovation
- Time line: 1836-01-01 to 2013-07-22
- Databases: US Grant, WO App, FR App, US App, GB App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, CN Util, JP Grant, CN App, JP App, Other

| S. No. | Scope                        | Concept                 | Query                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | No. of hits   |
|--------|------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1      | Any IPC or CPC or US class   | Food class              | AIC=(A23L0001*) OR UC=(426*) AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 550686        |
|        | Title                        | Packaging KW            | (TI=(((*Packag* or *container* or *receptacl* or bag* or sack* or pouch*2 or sachet* or *carton* or barrel* or bottle* or closure* or cap or caps or lid* or *seal or reseal* or *clos* or reclos* or zipper* or slide* or dispens*))) AND (DP>=(18360101) AND DP<=(20130722));                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |
| 2      | Any IPC or CPC or US class   | Packaging class         | (AIC=(B65D* or B65B* or B32B* or D21H* or G01N* or C09J*) OR UCC=(428*))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 866669        |
|        | Title                        | Packaging KW            | (TI=(((*Pack* or *container* or *receptacl* or bag* or sack* or pouch*2 or sachet* or *carton* or tray* or tub* or barrel* or bottle* or closure* or cap or caps or lid* or *seal or reseal* or *clos* or reclos* or tamper or zipper* or slide* or dispens*))) AND (DP>=(18360101) AND DP<=(20130722));                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |
| 3      | CTAB                         | Food KW                 | CTB=(*food* or *beverage* or snack* or past* or meal*1 or entree*1 or *soup*) AND DP>=(18360101) AND DP<=(20130722);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1970718       |
| 4      | Combined query               |                         | 2 and 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 95607         |
| 5      | Combined query               |                         | 1 or 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 640980(14971) |
| 6      | CTAB                         | KW of customer interest | CTB=((barrier near2 proper*3) or (shelf adj2 life) or (Unique near2 (shape*1 or design*1)) or aseptic*4 or retort*4 or microwave*4 or light-weight*3 or (environmentally adj2 friendly) or biodegrad*4 or recycl*4 or ((dual or duplex) adj2 (dispens* or chamber* or discharg*4)) or (single adj2 serve) or ((individual or single) adj2 (serving or portion*1)) or unitized or (eas*3 near3 (carry*4 or tear*4 or peel*4 or grip*4 or tilt*4 or open*3 or handl*3 or pour* or dispens* or transport*4)) or (consumer near3 (appeal*3 or acceptance or safety or orient*2 or favour*4)) or (one adj2 hand adj2 (open*3 or operat*4)) or "OTG" or "on the go" or ergonomic or (tamper adj2 (proof or resist*4 or prevent*4)) or (child adj2 proof) or (single adj1 handed) or dripless or ((leak*3 or spill*3 or mess or drip*3 or splash*4) adj2 (prevent*3 or resistan*2 or proof)) or nonspill*3 or (non adj2 spill*3) or ((enhanc*3 or colorful or colourful) near2 graphics)) AND DP>=(18360101) AND DP<=(20130722); | 1277116       |
| 7      | Combined query               |                         | 5 and 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 34465(17463)  |
| 8      | Time restriction for 5 years |                         | DP>=(20080722) AND DP<=(20130722);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 9329(6056)    |
| 9      | Time restriction for 4 years |                         | DP>=(20090722) AND DP<=(20130722)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 7774(5298)    |

|    |                              |                                   |            |
|----|------------------------------|-----------------------------------|------------|
| 10 | Time restriction for 3 years | DP>=(20100722) AND DP<=(20130722) | 5625(3872) |
| 11 | Time restriction for 2 years | DP>=(20110722) AND DP<=(20130722) | 3047(2088) |
| 12 | Time restriction for 1 year  | DP>=(20120722) AND DP<=(20130722) | 1336(1081) |

## Taxonomy of Food Packaging

### Interactive Taxonomy

### Revised Interactive Taxonomy

```
.markmap-node {
  cursor: pointer;
}

.markmap-node-circle {
  fill: #fff;
  stroke-width: 1.5px;
}

.markmap-node-text {
  fill: #000;
  font: 10px sans-serif;
}

.markmap-link {
  fill: none;
}

pre, .mw-code{
  background-color: transparent;
}
d3.xml("https://www.dolcera.com/wiki/images/Revised_Food_Packaging_Colgate.mm", function(error, data) {
  if (error) throw error;

  markmap("svg#mindmap_0e3a9eea39f8a9a1d3238d00a0dc0420", data, {
    preset: "colorful",
    linkShape: "diagonal"
  }, "xml");
});
```

### Sample Analysis Sheet

◊ Click here to download [Sample patent analysis sheet](#)

◊ Click here to download [Revised Sample patent analysis sheet](#)

### Dashboard link

[Please click for the dashboard link](#)

NOTE: You need to install Internet Explorer 8.0 and Adobe Flash Player to view the Dashboard.

Please download [Internet Explorer 8.0](#) and [Adobe Flash player](#)

#### Note:

- Use the mouse(click and drag/scroll up or down/click on nodes) to explore nodes in the detailed taxonomy
- Click on the red arrow adjacent to the node name to view the content for that particular node in the dashboard

## Antimicrobial films

### Sample Patents

| S. No. | Patent/Publication No.          | Publication Year | Assignee / Applicant                                                    | Title                                                                     |
|--------|---------------------------------|------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1      | <a href="#">US8318282B2</a>     | 2012             | 3m innovative properties company                                        | Microstructured antimicrobial film                                        |
| 2      | <a href="#">US20120087968A1</a> | 2012             | Cryovac inc.                                                            | Antimicrobial Packaging Material and Methods of Making and Using the Same |
| 3      | <a href="#">US8017667B2</a>     | 2011             | Victoria university   technion research and development foundation ltd. | Antimicrobial packaging material                                          |
| 4      | <a href="#">US7915325B2</a>     | 2011             | Kuhne anlagenbau gmbh                                                   | Antimicrobial food packaging                                              |
| 5      | <a href="#">US7705078B2</a>     | 2010             | Dupont tejijin films u.s. Limited partnership                           | Antimicrobial polymeric film                                              |

|   |                            |      |                                 |                                                                                 |
|---|----------------------------|------|---------------------------------|---------------------------------------------------------------------------------|
| 6 | <a href="#">GB2450475A</a> | 2008 | Nottingham trent university     | Antimicrobial polymer nanocomposite                                             |
| 7 | <a href="#">GB2449876A</a> | 2008 | Post harvest solutions, limited | Active packaging materials incorporating micro-porous solids and essential oils |

## Search Methodology

### Relevant Class Codes and Definitions

IPC/ECLA

| Class     | Definition                                                                                                                            |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------|
| A23L      | Foods, foodstuffs, or non-alcoholic beverages                                                                                         |
| A23L0001* | Foods or foodstuffs; their preparation or treatment                                                                                   |
| A01N*     | Preservation of bodies of humans or animals or plants or parts thereof; biocides, e.g. As disinfectants, as pesticides, as herbicides |
| B32B*     | Layered products, i.e. Products built-up of strata of flat or non-flat, e.g. Cellular or honeycomb, form                              |

### Patent search

- Search Engine: Thomson Innovation
- Time line: 18.June.2008 to 18.June.2013
- Databases: US Grant, WO App, FR App, US App, GB App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, CN Util, JP Grant, CN App, JP App, Other

| S.no. | Concept                                | Scope          | Search query                                                                                                                                              | No. of hits |
|-------|----------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1     | Preservation or layered products class | Any IPC or CPC | A01N* or B32B*                                                                                                                                            | 615(358)    |
|       | Antimicrobial film kw                  | Title          | (antimicrobial or antibacterial or (anti adj2 (bacterial or microbial)) or smart) AND (packag* or film* or sheet* or laminat* or polymer* or *composite*) |             |
| 2     | Food Kw                                | Full text      | Food*                                                                                                                                                     | 707301      |
| 3     | Combined query                         |                | 1 and 2                                                                                                                                                   | 269(148)    |
| 4     | Food Class                             | Any IPC or CPC | A23L0001*                                                                                                                                                 | 8(7)        |
|       | Antimicrobial film kw                  | Title          | (antimicrobial or antibacterial or (anti adj2 (bacterial or microbial)) or smart) AND (packag* or film* or sheet* or laminat* or polymer* or *composite*) |             |
| 5     | Combined query                         |                | 3 or 4                                                                                                                                                    | 273(152)    |
| 6     | Control patents                        |                | US8318282B2 US8017667B2 US7705078B2 US7915325B2 US20120087968A1 GB2450475A GB2449876A                                                                     | 7           |
| 7     | Combined query                         |                | 5 and 6                                                                                                                                                   | 7           |

## Taxonomy of Antimicrobial films

### Interactive Taxonomy

```

.markmap-node {
  cursor: pointer;
}

.markmap-node-circle {
  fill: #fff;
  stroke-width: 1.5px;
}

.markmap-node-text {
  fill: #000;
  font: 10px sans-serif;
}

.markmap-link {
  fill: none;
}

pre, .mw-code{
  background-color: transparent;
}
d3.xml("https://www.dolcera.com/wiki/images/Antimicrobial_films-Colgate.mm", function(error, data) {

```

```
if (error) throw error;

markmap("svg#mindmap_890805e4424c6b77393e4aa1142a8ea8", data, {
  preset: "colorful",
  linkShape: "diagonal"
}, "xml");
});
```

## Sample Analysis with Problem Solution Approach

### Revised Sample Analysis Sheet

◇ Click here to download [Revised Sample patent analysis sheet](#)

### Dashboard link

[Please click for the dashboard link](#)

NOTE: You need to install Internet Explorer 8.0 and Adobe Flash Player to view the Dashboard.

Please download [Internet Explorer 8.0](#) and [Adobe Flash player](#)

#### Note:

- Use the mouse(click and drag/scroll up or down/click on nodes) to explore nodes in the detailed taxonomy
- Click on the red arrow adjacent to the node name to view the content for that particular node in the dashboard