

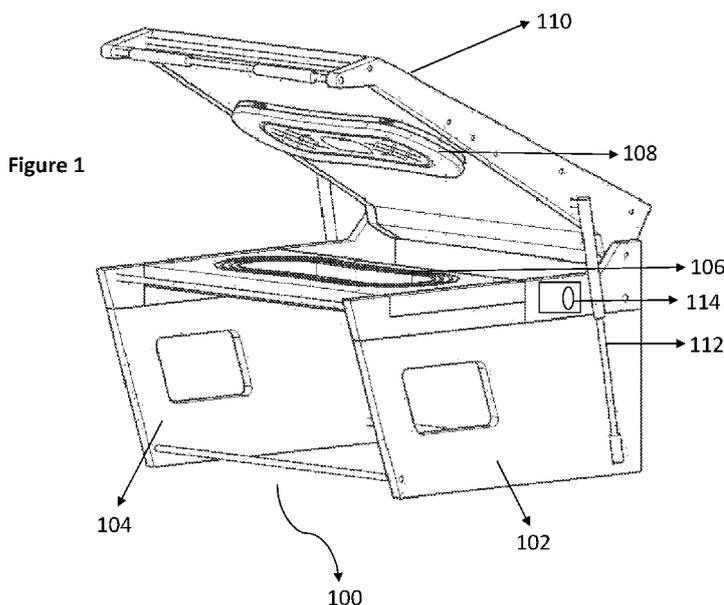


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(54) Title: LOW COST APPARATUS & METHOD TO MANUFACTURE DISPOSABLE ABSORBENT ARTICLES



(57) Abstract: The present invention discloses a cost-effective apparatus to manufacture disposable absorbent articles. The apparatus is a unique embossing, sealing, and cutting device that packages an absorbent core with a top- and back-sheet through a uniform sealing and cutting mechanism to yield a cost-effective and efficient disposable absorbent article. The apparatus of the present invention comprise a sealing and cutting base and an upper lid, the bottom portion of which further comprise an arrangement to emboss, heat-seal and cut. A process to manufacture disposable absorbent articles using the apparatus of the present invention is also disclosed.

**LOW COST APPARATUS & METHOD TO MANUFACTURE DISPOSABLE  
ABSORBENT ARTICLES**

**FIELD OF INVENTION**

[0001] The present invention relates to an apparatus and a process to manufacture disposable absorbent articles. More specifically, it relates to a heat-sealing, packaging device that seals and packages an absorbent core in a cost-effective yet efficient manner to yield disposable absorbent articles. Examples of the disposable absorbent articles of the present invention are sanitary napkins and diapers.

**BACKGROUND OF THE INVENTION**

[0002] Disposable absorbent articles that absorb and retain discharged bodily fluids like urine, menses, and incontinence matter are known in the art. Typical examples are sanitary napkins and pads, and diapers etc. Such disposable absorbent articles typically comprise a three-layered structure, viz., a liquid permeable top-sheet, an absorbent member, and an impervious back sheet. Whereas the top- and the back-sheet conventionally comprise of non-biodegradable plastic (polyethylene and/or polypropylene sheet or film) material, the absorbent member generally comprises a pulp matter, which are fluid absorptive and retentive in nature. This pulp matter has conventionally been derived from cellulose and/or cotton based naturally available or artificially made products. Typical examples are cotton waste, pine wood pulp etc.

[0003] The art is also replete with various manufacturing process and machines that yield such disposable absorbent articles. Most of them rely upon an integrated machine that are suited for a large scale commercial production and follow a sequential process of manufacture, which again is well known in the art.

[0004] One of the earliest patents granted in this domain is US 1869177 and since then there has been numerous instances, both as patent publications and non-patent literature on the various machines and their modalities of working.

[0005] While most of such machines effectively manufactures disposable absorbent articles in commercial quantities, it is widely understood that the milieu that exists in India and other developing and under-developed nations, the problem lies not in manufacturing such articles but in making available the these products at an affordable price. Most of the manufacturers relying on integrated machines cannot offer such products at economical prices because of the cost incurred in the manufacturing process itself plus the cost incurred in procuring such machines.

[0006] A few low-cost apparatus to manufacture disposable absorbent articles do exist in the market, but they have their own set of limitations that hampers the overall performance and effectiveness of such articles. These restrictions are more often related to a poor, non-uniform sealing of a top- and back-sheet to an absorbent core, and use of non-pulverized fluff material as the absorbent core material. Such strategies do yield a low cost product but as would be appreciated by someone in the art, these tactics do play havoc with the basic quality of the product offered.

[0007] There is, therefore, a need in the art to develop a low cost sanitary napkin making apparatus that not only offers a cost advantage, but also yields a no-compromise final product that is qualitatively at par compared to the existing commercialized products. It is also desirable that such apparatus is easy to operate and the product meets the standards laid down by the BIS standards.

#### **OBJECTS OF THE INVENTION**

[0008] It is an object of the invention to provide a low cost solution to the manufacture disposable absorbent articles.

[0009] It is an object of the invention to provide a low-cost apparatus that packs and seals an absorbent core to yield a disposable absorbent article.

[00010] It is an object of the invention to provide a low-cost apparatus that packs the top- and back-sheet around an absorbent core and heat seals the ends to yield a disposable absorbent article.

[00011] It is an object of the invention to provide a low-cost apparatus that achieves a minimum of 8-10mm of sealing.

[00012] It is an object of the invention to provide a low-cost apparatus that seals uniformly and is tamper-proof.

[00013] It is an object of the invention to provide a low-cost apparatus that can be operated by a semi skilled person.

[00014] It is an object of the invention to provide a manufacturing assembly comprising novel apparatus and process to manufacture a low cost disposable absorbent article.

[00015] It is a further object of the invention to provide a hand operated manufacturing assembly line for manufacture of low-cost disposable absorbent articles.

[00016] It is an object of the invention to provide a disposable absorbent article that is equivalent in quality as those commercially available.

[00017] It is an object of the invention to provide an absorbent article that meets the BIS standards as laid down by the Government of India.

[00018] It is an object of the invention to make absorbent articles like diapers and sanitary napkins widely affordable to a large, unreached section of the society.

#### **SUMMARY OF THE INVENTION**

[00019] The present invention discloses a cost-effective apparatus to manufacture disposable absorbent articles. The apparatus is a unique embossing, sealing, and cutting device that packages an absorbent core with a top- and back-sheet through a uniform sealing and cutting mechanism to yield a cost-effective and efficient disposable absorbent article. The apparatus of the present invention comprise a sealing and cutting base and an upper lid, the bottom portion of which further comprise an arrangement to emboss, heat-seal and cut . A process to manufacture disposable absorbent articles using the apparatus of the present invention is also disclosed.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[00020] The features and advantages of the present invention will become more clearly appreciated from the following description in conjunction with the accompanying drawings, in which:

[00021] FIG. 1 is a schematic front view of an embodiment of an apparatus of the present invention, to manufacture a sanitary napkin product;

[00022] FIG. 2 is a view of an embodiment of a sealing and cutting base of the apparatus of the present invention;

[00023] FIG. 3 is a facing view of an embodiment of bottom portion of lid of the apparatus of the present invention.

#### **DETAILED DESCRIPTION OF THE INVENTION**

[00024] With reference to the drawings, a preferred embodiment of the present invention will now be described.

[00025] FIG. 1 is a schematic side view of an embodiment of manufacturing equipment of one form of sanitary napkin product of the present invention. As shown in FIG. 1, the apparatus 100 of the present invention comprises side walls 102 and 104, sealing and cutting base 106, a lid with a bottom portion 108 and an upper portion 110, a gas lift 112, and a temperature regulator 114.

[00026] As depicted in FIG. 2, in an embodiment, for the manufacture of sanitary napkins, the sealing and cutting base 106 has a standard napkin-shaped mould 1062 at its centre. In a preferred embodiment, said mould 1062 is a pad-shaped depression area, configured to accept an absorbent core. The outer layer of said mould 1062 is made up of a rubber-based polymeric material. In yet another embodiment said mould 1062 is surrounded by another layer so as to form a continuous trough between said outer layer and said surrounding layer. The said trough comprises an area adapted to receive the cutting teeth from the bottom portion 108 of lid (described later).

[00027] As depicted in FIG. 3, in an embodiment of the present invention, said bottom portion 108 of lid of said apparatus 100 comprise a plurality of concentric layers adapted to emboss, seal, and cut an absorbent core placed in

said sealing and cutting base 106. In a further embodiment, said bottom portion 108 comprise an innermost embossing layer 1082, a middle sealing layer 1084, and an outermost cutting layer 1086. In a preferred embodiment, said innermost embossing layer 1082 is an outwardly projecting layer comprising a crest and trough structure designed so as to form an embossed layer on an absorbent core. Such embossed layer plays a functional role in forming channels in said absorbent core to guide the menstrual fluid to be distributed evenly in the pad. As is understood in the art, different embossing pattern in the said innermost embossing layer 1082 shall result in specific channels formed in absorbent core.

**[00028]** In yet another embodiment of the invention, said middle sealing layer 1084 is a continuous pad shaped layer, beneath which is an heating element evenly spread out (not seen in the diagrams) that heats and seals the absorbent core with a top- and back-sheet (described later). In an embodiment of the invention, the temperature of said heating element is controlled by said temperature regulator 114. The optimum temperature range for the operation of the apparatus 100 of the present invention is between 115 and 120 degree celsius. The temperature regulator 114 and its use is as is commonly known in the art.

**[00029]** In an embodiment of the present invention, said outermost cutting layer 1086 further comprises teathed structure laid down evenly along the outer periphery of said layer so as to provide a sharp, cutting mechanism when said layer 1086 is pressed against said sealing and cutting base 106 of said apparatus 100.

**[00030]** The present invention contemplates a spring actuated compression action when the lid of apparatus 100 is brought down towards the sealing and cutting base 106. The said spring actuated compression is achieved by a plurality of springs arranged in the space between said bottom portion 108 and said upper portion 110 of the lid. In a preferred embodiment of the present invention, an eight-springs arranged is laid out so as to achieve a uniform compression across the cross-section of said sealing and cutting base 106. In

yet another embodiment, said eight-springs are arranged in a manner that four of them are located at four corners of said outermost cutting layer 1086 and remaining four at four corners in the area between innermost embossing layer 1082, and a middle sealing layer 1084.

**[00031]** In its working, said apparatus 100 is placed in close proximity to an arrangement where rolls of top- and back-sheet of can be spread over said sealing and cutting base 106. The materials used for top- and back-sheet are as widely known in the art.

**[00032]** To manufacture a disposable absorbent article like sanitary napkin using the apparatus of the present invention, said apparatus 100 is connected to an electricity source and the temperature adjusted to a range of 115 – 120 degree Celsius using said temperature regulator 114. A back-sheet material is rolled over to lie above said sealing and cutting base 106 of said apparatus 100. An absorbent core prepared from known process in the art is placed in the designated space within said napkin-shaped mould 1062 of said sealing and cutting base 106 of said apparatus 100 in a manner that said back-sheet cover lies beneath said absorbent core in within said napkin-shaped mould 1062. Next, a watery-gum material is sprayed over said absorbent core using liquid dispenser/sprayer as commonly known in the art. The spraying prepares said absorbent core to attach a top-sheet material in a uniform and consistent manner. The top-sheet is rolled over said absorbent cover so as to occupy said sealing and cutting base 106. Once the back-sheet - absorbent core - top-sheet arrangement lies over said napkin-shaped mould 1062 of said sealing and cutting base 106, said lid of said apparatus 100 is pulled down. Presence of gas lifts 112 eases the operation of the lid to pull it down and later, to push it up. Pulling down of said lid over said sealing and cutting base 106 effectuates a first level of action, whereby said innermost embossing layer 1082 presses against said absorbent core to form the specific channel design on it. Further, during the same step, said middle sealing layer 1084 heat-seals the top-sheet and back-sheet onto said absorbent core so as to form a compact and sealed disposable absorbent article like sanitary napkin. The heat-sealing achieved by

the present process ensures an 8-10 mm thickness of sealing that makes the sealing process uniformly thick and tamper-proof. In a preferred embodiment, the time for which said lid is present against said sealing and cutting base 106 to effect an embossing and sealing process is in the range of 4-8 seconds.

**[00033]** Once this is achieved, said lid is pressed further so that said outermost cutting layer 1086 is pressed against said sealing and cutting base 106 of said apparatus 100. Since said outermost cutting layer 1086 further comprises teathed structure laid down evenly along the outer periphery of said layer, such pressing against said sealing and cutting base 106, provides a sharp, cutting mechanism wherein the sealed absorbent core is separated out as a single unit. This single unit comprises a back-sheet, an absorbent core with channels forms for fluid movement and retention, and an outer top-sheet, is a functional disposable absorbent articles.

**[00034]** In an embodiment of present invention, said absorbent core is prepared using known processes and systems in the art.

#### **EXAMPLES**

**[00035]** In a typical example, pine wood pulp is used as the absorbing material (90% by weight) and mixed with 10% Super Absorbent Polymer (SAP) material. This mixture is pulverized in a pulverizer to yield a fluff that is suitable to be used as an absorbent core. The pulverizer of the present invention are as known in the art and typically break down the mixture of absorbing material and SAP into uniform fluff size, which is ideal to make a uniform sized absorbent core. The fluff thus obtained is brought to a weighing unit in small quantities. 7.4 – 7.8 grams of fluff is weighed out. A tray with a plurality of standard napkin size mould is taken and the weighed fluff is evenly spread across the mould. Typically, a tray with such 4 moulds is used.

**[00036]** The next step is to take this tray to a pressing unit, wherein said tray is firmly fixed in the lower portion of said pressing unit. A typical pressing unit is known in the art and comprises a manually-operated wheel at the top, clockwise movement of which longitudinally shifts a pressing system that

corresponds with the moulds in said tray and presses the latter so as to form a uniformly compresses absorbent core. This process is repeated twice.

[00037] The absorbent core thus prepared is taken to the apparatus 100 of the present invention and the complete embossing, sealing, and cutting step takes place as described in detail in earlier sections of this document.

[00038] The sanitary napkin prepared thus is taken to a gumming step, where a thin strip of gum material is applied on the back-sheet of the napkin, over which a release paper is then pasted.

[00039] The process of manufacture culminates with UV sterilization of the sanitary napkin. In a sterilization unit, which is as understood in the art, stacks of napkins are arranged so that they do not overlap on each other. UV sterilization is carried out, typically for duration of 20 minutes, after which the napkins are taken out and packed and sealed.

[00040] The disposable absorbent articles prepared by the present apparatus and process meet the BIS standards, is hygienic and effective and as the same cost effective.

#### **ADVANTAGES OF THE INVENTION**

[00041] The present invention provides a low cost solution to the manufacture disposable absorbent articles.

[00042] The present invention provides a low-cost apparatus that packs and seals an absorbent core to yield a disposable absorbent article.

[00043] The present invention provides a low-cost apparatus that packs the top- and back-sheet around an absorbent core and heat seals the ends to yield a disposable absorbent article.

[00044] The present invention provides a low-cost apparatus that achieves a minimum of 8-10mm of sealing.

[00045] The present invention provides a low-cost apparatus that seals uniformly and is tamper-proof.

[00046] The present invention provides a low-cost apparatus that can be operated by a semi skilled person.

[00047] The present invention provides a manufacturing assembly comprising novel apparatus and process to manufacture a low cost disposable absorbent article.

[00048] The present invention provides a hand operated manufacturing assembly line for manufacture of low-cost disposable absorbent articles.

[00049] The present invention provides a disposable absorbent article that is equivalent in quality as those commercially available.

[00050] The present invention provides an absorbent article that meets the BIS standards as laid down by the Government of India.

[00051] The present invention makes absorbent articles like diapers and sanitary napkins widely affordable to a large, unreached section of the society.

We claim,

1. An apparatus for manufacturing a disposable absorbent article, comprising,
  - a sealing and cutting base,
  - a bottom portion of a lid of said apparatus, said bottom portion further comprising an embossing layer, a heating and sealing layer, and a cutting layer.
2. The apparatus as claimed in claim 1, wherein said sealing and cutting base is a depression-area adapted to fit an absorbent core for manufacture of a disposable absorbent article.
3. The apparatus as claimed in claim 1, wherein said heating and sealing layer further comprises a heating element placed in a space between said bottom portion of lid and an upper portion.
4. The apparatus as claimed in claim 3, wherein said sealing is achieved in the range of 8-12 mm.
5. The apparatus as claimed in claim 1, wherein said cutting layer comprise a teeth structure that fits into a groove area in said sealing and cutting base.
6. The apparatus as claimed in claim 1, wherein said lid has to be pressed once to effectuate an embossing and sealing function, and pressed further to effectuate a cutting function.
7. The apparatus as claimed in claim 1, wherein said disposable absorbent article is a sanitary napkin.
8. A process to manufacture a disposable absorbent articles, wherein said process comprise the steps of
  - pulverizing a pinewood pulp and a super absorbent polymer mix to yield a fluff;
  - putting fluff in standard sized mould and pressing it against a pressing unit to yield an absorbent core;
  - placing said absorbent core in a depression area of an apparatus and in between a top- and back-sheet material;

pressing a lid of said apparatus once to effectuate an embossing and sealing function, and further once more to effectuate a cutting function to yield a disposable absorbent article;

applying an adhesive and a release paper on a back-sheet of said article;

UV sterilizing said article; and

packaging said article.

9. A process as claimed in claim 8, wherein said apparatus for manufacturing a disposable absorbent article, comprising,
  - a sealing and cutting base,
  - a bottom portion of a lid of said apparatus, said bottom portion further comprising an embossing layer, a heating and sealing layer, and a cutting layer
10. A process as claimed in claim 8, wherein said disposable absorbent article is a sanitary napkin.

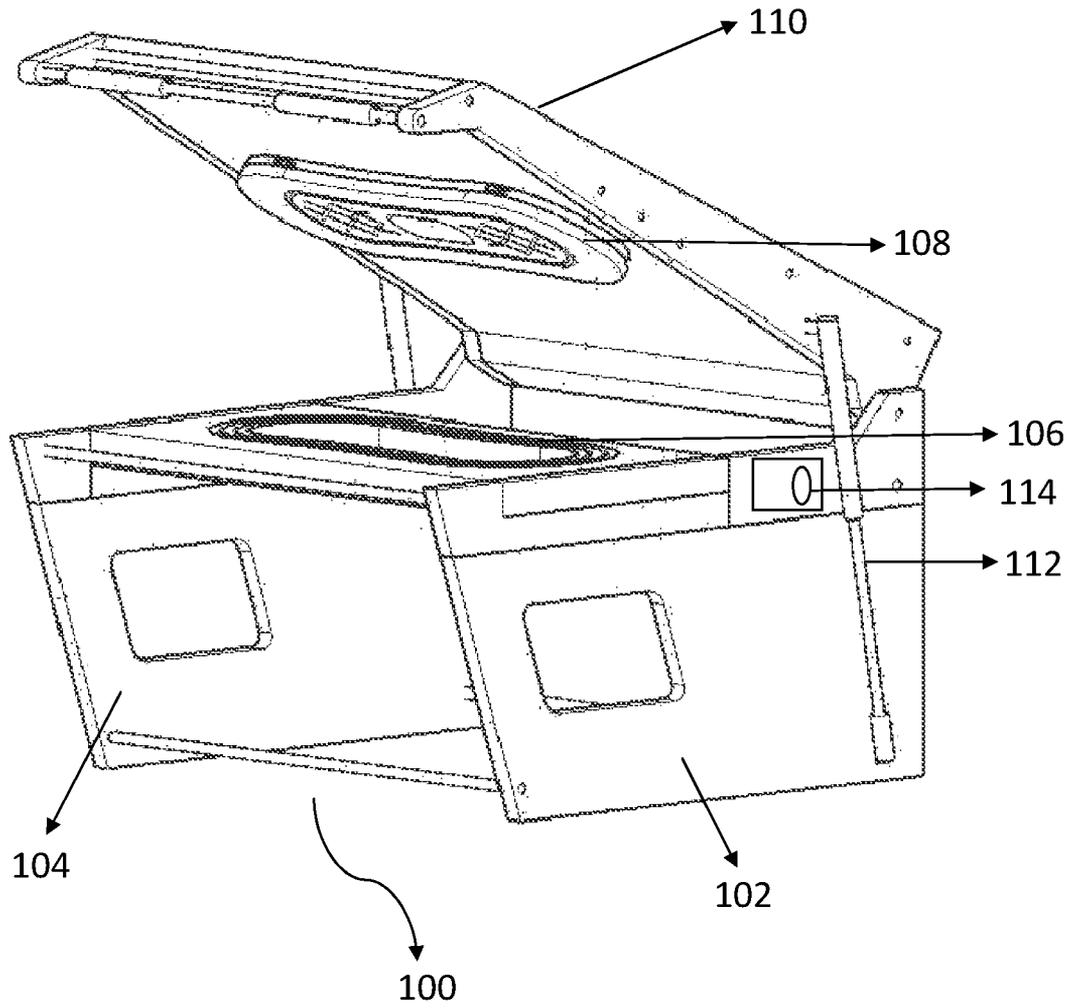


Figure 1

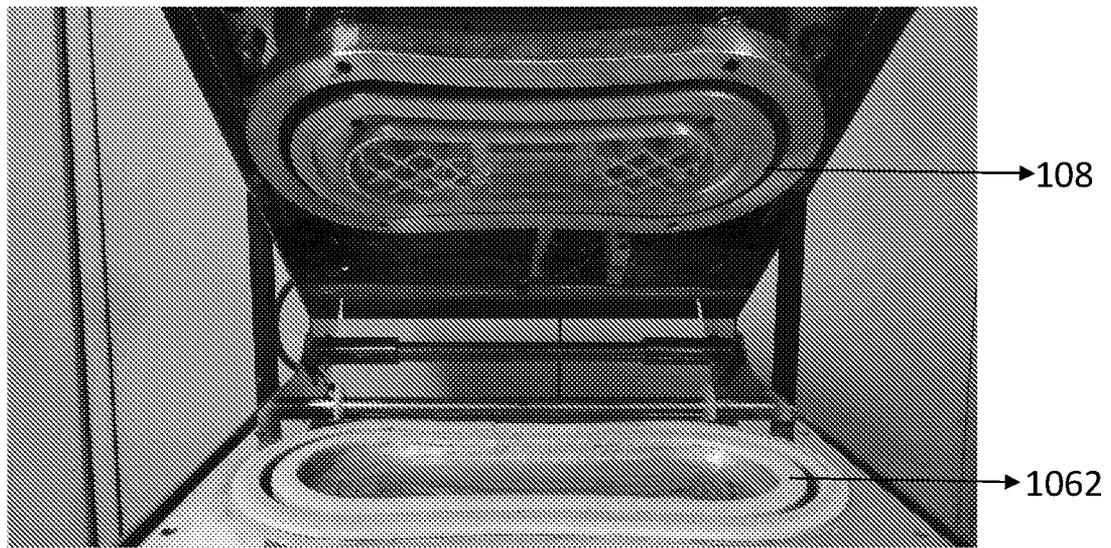


Figure 2

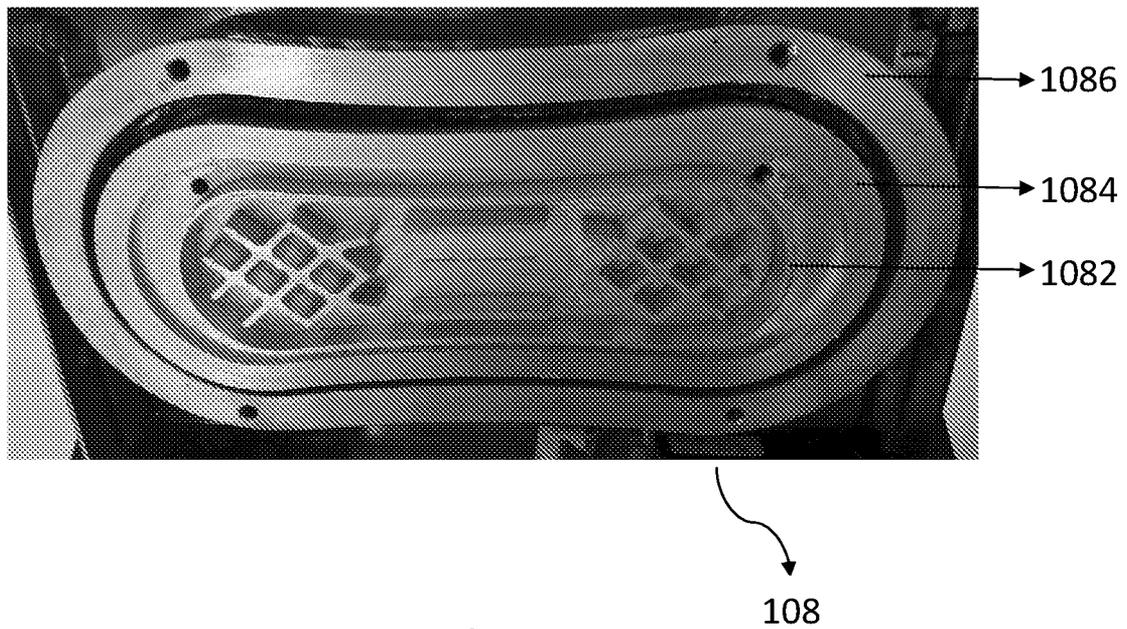


Figure 3

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2014/066290

A. CLASSIFICATION OF SUBJECT MATTER  
A61F13/15,A61F13/49,A61L15/00 Version=2014.01

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61F, A61L.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DATABASES: QUESTEL , IPO INTERNAL  
SEARCH TERMS: SANITARY, DISPOSABLE, ABSORBENT, SEAL, PULP, EMBOSSING.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20070135787 A1 (Maria Raidel, Franz Aschenbrenner, Jan Ullman) 14-06-2007 Abstract, Figs 1-10 and Pages 1-11.	1-10
X	WO 1998029070 A1 (Boulanger Roger, Johnson & Johnson Inc) 09-07-1998 whole document.	1-10
Y	US 6234229 B1 (TAO MACHINE INDUSTRY INC) 22-05-2001 Abstract, Figs 1-15, Columns 3-12 and claims 1-9.	1-10
Y	US 6170393 B1 (The Procter & Gamble Company) 09-01-2001 Abstract, Figs 1-5A, Claim 1 and columns 2-4.	1-10

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 02-03-2015	Date of mailing of the international search report 02-03-2015
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Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer Swati Pandey Telephone No. +91-1125300200
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INTERNATIONAL SEARCH REPORT  
Information on patent family members

International application No.  
PCT/IB2014/066290

Citation	Pub.Date	Family	Pub.Date
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