



No. 11-014491-00003-0000

Fecha: 2012-01-13 15:24:01 Dep. 2020 DIR.NUEVASCOR
Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI
Act. 400 OPOSIOBSERVTER Folios: 35

SUPERINTENDENCIA DE INDUSTRIA Y

Dirección de Nuevas Creaciones

E. S. D.

Asunto	NÚMERO DE RADICACIÓN	11-14491
Trámite	PATENTES DE INVENCION	
Actuación	OPOSICIONES DE TERCEROS	
Fecha de solicitud	2011-02-08	
Título	PRODUCTOS ABSORBENTES CON SENSORES DE HUMEDAD	
Clasificación IPC	A61F 13/42 AC; A61F 13/53 AC; A61L 15/56 AC	
Solicitante	KIMBERLY-CLARK WORLDWIDE, INC.	
Inventores	SONG XUEDONG, LONG ANDREW MARK, LEE WANDUK y GIL JUNMO	
Publicación	2011-10-20, GACETA NO. 633	
Opositor	CMPC TISSUE S.A.	

MAURICIO PINZÓN PINZÓN, identificado con la cédula de ciudadanía No. 79.145.527 de Usaquén, actuando en calidad de apoderado de CMPC TISSUE S.A., procedo a presentar **DEMANDA DE OPOSICIÓN** en contra de la solicitud de Patente de Invención titulada **PRODUCTOS ABSORBENTES CON SENSORES DE HUMEDAD** y publicada en la Gaceta de la Propiedad Industrial No. 633.

PETICIÓN

1. Sirvase **DECLARAR FUNDADA** la oposición presentada contra la solicitud de Patente de Invención titulada **PRODUCTOS ABSORBENTES CON SENSORES DE HUMEDAD**.

2. Como consecuencia de lo anterior, sirvase **DENEGAR** la solicitud de Patente de Invención titulada **PRODUCTOS ABSORBENTES CON SENSORES DE HUMEDAD**.

FUNDAMENTOS DE HECHO

1. En la Gaceta de Propiedad Industrial No. 633 se publicó la solicitud de Patente de Invención titulada **PRODUCTOS ABSORBENTES CON SENSORES DE HUMEDAD**.

2. La solicitud de Patente de Invención titulada PRODUCTOS ABSORBENTES CON SENSORES DE HUMEDAD no cumple con los requisitos de patentabilidad contenidos en el artículo 14 de la Decisión 486 de la CAN, el cual reza lo siguiente: *"Los Países Miembros otorgarán patentes para las invenciones, sean de producto o de procedimiento, en todos los campos de la tecnología, siempre que sean nuevas, tengan nivel inventivo y sean susceptibles de aplicación industrial"*. (Las subrayas no hacen parte del texto original).

FUNDAMENTOS DE DERECHO

Son fundamentos de la presente demanda de oposición las siguientes normas:

1. Artículos 14, 16 y 18 de la Decisión 486 de la Comisión de la Comunidad Andina.
2. Artículo 42 de la Decisión 486 de la Comisión de la Comunidad Andina.
3. Normas pertinentes del Código Contencioso Administrativo.
4. Demás normas concordantes y complementarias.

FUNDAMENTOS DE IRREGISTRABILIDAD ALEGADOS

El artículo 14 de la Decisión 486 de la Comunidad Andina, señala que: *"Los Países Miembros otorgarán patentes para las invenciones, sean de producto o de procedimiento, en todos los campos de la tecnología, siempre que sean nuevas, tengan nivel inventivo y sean susceptibles de aplicación industrial"*. (Las subrayas y las negritas no hacen parte del texto original).

Igualmente, el artículo 16 de la Norma Andina, en materia de patentes, reza lo siguiente: *"Una invención se considerará nueva cuando no está comprendida en el estado de la técnica."*

El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización, comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida.

Sólo para el efecto de la determinación de la novedad, también se considerará dentro del estado de la técnica, el contenido de una solicitud de patente en trámite ante la oficina nacional competente, cuya fecha de presentación o de prioridad fuese anterior a la fecha de presentación o de prioridad de la solicitud de patente que se estuviese examinando, siempre que dicho contenido esté incluido en la

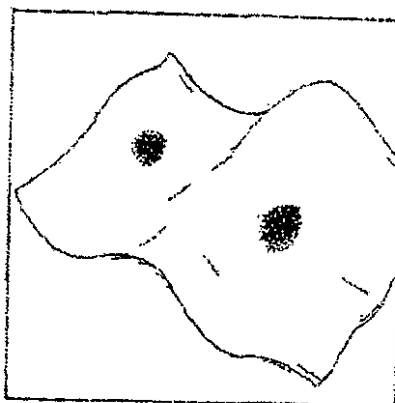
solicitud de fecha anterior cuando ella se publique o hubiese transcurrido el plazo previsto en el artículo 40". (Las subrayas no hacen parte del texto original).

De la misma forma, el artículo 18 de la Norma Andina establece lo siguiente: "Se considerará que una invención tiene nivel inventivo, si para una persona del oficio normalmente versada en la materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica". (Las subrayas no hacen parte del texto original).

ARGUMENTACIÓN

1. De la invención solicitada.

La solicitud tramitada en el Expediente No. 11-14491 presenta un sensor que involucra un cambio de color visual debido a la presencia de un líquido de base acuosa, en forma particular, se presenta un artículo absorbente que tiene un indicador de humedad que comunica a un cuidador o usuario que el artículo está listo para el recambio.



Las características que se describen en la solicitud 11-14491 carecen totalmente de novedad y altura inventiva, esto puede verificarse fácilmente a partir de las variadas tecnologías y productos absorbentes disponibles actualmente en el mercado, los cuales ya presentan las características que se describen en la mencionada solicitud. Además, ya existen documentos, del estado de la técnica, que describen las características de la solicitud 11-14491, lo cual permitiría a cualquier persona, medianamente versada en el tema, concluir que lo que se intenta proteger ya es conocido y de obviedad absoluta.

En la misma solicitud se reconoce que ya se han empleado mecanismos visuales para señalar la presencia de humedad en los artículos absorbentes, existiendo un

gran número de tecnologías de percepción de humedad. Según el solicitante, señala que la ventaja de su invención es que los materiales indicadores tienen una mayor variedad de colores y son más sensibles.

Como puede verse, el solicitante, al describir el problema técnico que resuelve su invención, no aporta un elemento técnico nuevo, lo relevante para él, es que se dispondrá de mayores colores para la indicación visual.

En los diversos productos disponibles en el estado de la técnica, ya sea en forma comercial o descritos en literatura, son ampliamente conocidos los artículos con elementos indicadores de humedad, inclusive, aquellos que comprenden un sustrato que incluye los elementos indicadores. Así, entonces, lo que el solicitante intenta proteger como una ventaja técnica, es la variedad de colores en los elementos de visualización de humedad, siendo que dicha característica no puede ser considerada como un aporte técnico novedoso y que otorgue una ventaja técnica respecto a lo conocido en el estado de la técnica, pues, que existan más colores disponibles no aporta algún tipo de funcionalidad que signifique una mejora respecto a los productos ya conocidos.

2. Carencia de Novedad y Nivel Inventivo.

El Tribunal de Justicia de la Comunidad Andina de Naciones ha señalado lo siguiente, en relación con el concepto de novedad.

"El concepto de novedad absoluta respecto de una invención implica que para que un invento sea nuevo y no se encuentre en el estado de la técnica, no puede haber sido conocido ni dentro del territorio en el que se solicita la patente, ni en ningún otro país. Es lo que se conoce como el alcance universal de la novedad, pues no basta que un invento sea nuevo y no esté en el estado de la técnica de un territorio dado, sino que tampoco lo esté en el resto del mundo, salvo el año de prioridad a que se refiere el artículo 12 de la Decisión 344. La novedad absoluta, como criterio para determinar la patentabilidad de una invención, se ha venido abriendo camino en el ámbito internacional. Así en el Reino Unido a partir de 1977 (Patents Act inglesa). En la República Federal Alemana se empezó a exigir la novedad absoluta a partir de la Ley de 16 de diciembre de 1980. En la actualidad, en los Estados Miembros de las Comunidades Europeas se ha impuesto la exigencia de la novedad absoluta como una de las consecuencias de las patentes europeas, según Tratado de Munich de 5 de Octubre de 1963. (Bercovitz, Alberto, "PROTECCIÓN DE LA

TECNOLOGÍA", en Revista del Derecho Industrial N° 35, Depalma 1990, pág. 321)"¹.

De otra parte, en cuanto al concepto de nivel inventivo, dicha Corporación ha sostenido lo siguiente:

*"Con el requisito del nivel inventivo, lo que se pretende es dotar al examinador técnico de un elemento que le permita afirmar o no si a la invención objeto de estudio no se habría podido llegar a partir de los conocimientos técnicos que existían en ese momento dentro del estado de la técnica... En este punto conviene advertir que uno es el examen que realiza el técnico medio respecto de la novedad y otro el que se efectúa con respecto al nivel inventivo; si bien en uno y otro se utiliza como parámetro de referencia el 'estado de la técnica', en el primero, se coteja la invención con las 'anterioridades' existentes dentro de aquella, cada uno (sic) por separado, mientras que en el segundo (nivel inventivo) se exige que el técnico medio que realiza el examen debe partir del conocimiento general que él tiene sobre el estado de la técnica y realizar el cotejo comparativo con su apreciación de conjunto, determinando si con tales conocimientos técnicos existentes ha podido o no producirse tal invención"*².

En la solicitud tramitada en el Expediente No. 11-14491 se presenta un pliego de reivindicaciones que incluye: un sensor para detectar la presencia de un líquido de base acuosa, el cual comprende un sustrato que tiene por lo menos un tipo de material indicador de humedad el cual esta inmovilizado o impreso sobre una capa del sustrato; el material indicador contiene por lo menos un tinte leuco donante de electrón y un receptor deficiente de electrón; el material indicador de dicho sensor exhibe un color en estado seco y el color se desvanece o desaparece al entrar en contacto con un líquido que contenga agua. También está descrito un artículo absorbente el cual incorpora tal sensor para comunicar al usuario que el artículo ha sido expuesto a líquidos que contienen agua. Por último, se reivindica un sustrato de base celulósica, teniendo por lo menos un tipo de material indicador de mojado inmovilizado o impreso sobre una capa de dicho sustrato.

Para complementar nuestra oposición se adjuntan copias y análisis de los siguientes documentos:

- 1) **US 5389093** de fecha de publicación 14 de febrero de 1995; y
- 2) **US 2007197986** de fecha de publicación 23 de agosto de 2007;

¹ TJCA, Proceso No. 88-IP-2005.

² Op. Cit.

Todos los documentos antes mencionados, tienen fecha de publicación anterior a la fecha del documento de prioridad declarado para la solicitud 11-14491.

El documento **US 5389093** describe un pañal reusable que utiliza un indicador sensible a la temperatura que muestra cuando el pañal ha sido ensuciado. El pañal incluye un material que en forma parcial aísla térmicamente una superficie exterior y una superficie interior. Además tiene un indicador sobre la superficie exterior, que proporciona un indicador visual cuando la superficie exterior tiene una temperatura por sobre el umbral determinado. Una tinta termocrónica indica un cambio de temperatura del pañal. Dicho indicador no está presente cuando el material está seco. Los indicadores se distribuyen en toda la superficie exterior del pañal.

Como se observa, en este documento **US 5389093** ya se divulga un artículo absorbente que incluye un sistema indicador de humedad, donde existe un sensor que cambia al entrar en contacto con el fluido, dando una indicación visual al usuario que muestra que el artículo ha sido ensuciado. Todo lo anterior abarca la generalidad que se describe en la solicitud 11-14491.

En conclusión, el artículo reivindicado en la solicitud tramitada en el Expediente No. 11-14491 no presenta características que le otorguen novedad frente a lo descrito en el documento **US 5389093**.

El documento **US 2007197986** describe un artículo absorbente, que comprende una lámina superior permeable al líquido, un absorbente, una lámina impermeabilizada permeable al vapor de agua y una lámina posterior impermeable al líquido, incluyendo un indicador de humedad que está siempre en una superficie interior de la lámina impermeabilizada permeable al vapor de agua, en donde el indicador está constituido por una capa recubierta con resina hidrofílica y provee una señal o marca informativa sobre la superficie interior de dicha capa de recubrimiento de resina hidrofílica. Además, el documento señala que el indicador está formado por una tinta de color, borrable, de un color acromático que pasa a un color específico sobre la base de un contacto molecular de uno o más electrones.

Así entonces, se tiene que el documento **US 2007197986** ya divulga un artículo absorbente que incluye una señal que indica la presencia de humedad cuando está en contacto con fluidos. Todo lo anterior abarca la generalidad que se describe en la solicitud 11-14491.

En conclusión, el artículo reivindicado en la solicitud 11-14491 no presenta características que le otorguen novedad frente a lo descrito en el documento **US 2007197986**.

3. Conclusiones.

Por todo lo anteriormente descrito, además del análisis profundo de los documentos antes mencionados y acompañados, se puede asegurar que el artículo absorbente descrito en la solicitud No. 11-14491 no tiene novedad, además, de la combinación de los mismos documentos, resulta obvio el artículo absorbente, careciendo, por lo tanto, de altura inventiva.

Las características que se entregan en todas las reivindicaciones de la solicitud No. 11-14491 son ampliamente conocidas en el estado de la técnica y no pueden considerarse como características que representen una novedad y, menos aún, un avance en el estado de la técnica.

Por todo lo anterior estimamos que la solicitud No. 11-14491, debe ser rechazada en su totalidad.

ANEXOS

1. Recibo de consignación a favor de la Superintendencia de Industria y Comercio por concepto de tasas oficiales.
2. Poder general otorgado por CMPC TISSUE S.A.
3. Copia del presente escrito para su correspondiente traslado.
4. Anterioridades mencionadas en el presente escrito.

NOTIFICACIONES

1. Al solicitante y su apoderado en la dirección consignada en la solicitud de Patente de Invención.
2. El suscrito recibirá notificaciones en la Secretaría de esa Dirección o en la Calle 99 No. 12-39, Piso 4 de la ciudad de Bogotá D.C., teléfono 6219721.

Atentamente,


MAURICIO PINZÓN PINZÓN
C.C. No. 79.145.527 de Usaquén
T.P. No. 37.242 del C. S. de la J.

LFPF/36240

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
NIT : 800.176.089-2
 - / -

 Industria y Comercio SUPERINTENDENCIA	RECIBO DE CAJA	No. 12 - 002950
		Bogotá D.C., Enero 12 de 2012 - 15:05:01

RECIBIDO DE : PINZON PINZON & ASOCIADOS ABOGADOS S.A. NI 830.005.919

*** Soporte del Pago ***

TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	VR PAGO
CONSIGNACION	BANCO DE BOGOTA	062754387	131539940	12/01/2012	315.000.00

*** Conceptos Pagados ***

CANT.	RENTISTICO	CONCEPTO	VR. UNIDITARIO	VR. CONCEPTO
1	50005-01-04	PRESENTACION DE OBSERVACIONES A SOLICITUDES	12	MARCAS Y LEMAS COMERCIALES
			315.000.00	315.000.00
				\$315.000.00

SON: **TRESCIENTOSQUINCE MIL PESOS MONEDA CORRIENTE**

Responsable: _____

Recibo de Caja Aplicado al Expediente No. _____

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 11-014491- -00003-0000

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 Tra. 11 PATENTEIYII Eva: 378 FASENACIONALI
 Act. 400 OPOSIOBSERVTER Folios: 35

Sede Centro: Carrera 13 No. 27 - 00 Pisos 3,4,5 y 10 Bogotá, D.C.- Colombia

Web: www.sic.gov.co e-mail: info@sic.gov.co Conmutador: (571) 5870000 Fax: (571) 5870284 Línea: 018000-910165 Call Center: (571) 6513240

Enero 12 de 2012 - 15:05:02

POWER OF ATTORNEY

Be it known that

Legally representing and acting on behalf of

a corporation addressed in

does hereby grant **GENERAL POWER OF ATTORNEY** to:

**MAURICIO PINZON PINZON
SILVIA GARCIA CHACON**

Lawyers in practice, of legal age, residing in Bogota D.C., Republic of Colombia, so that they may act in his own name and representation in order to carry out all the necessary steps and processes before the judicial, administrative and other authorities of the Republic of Colombia and in any other countries necessary in order to:

1) Obtain the registration and protection of the Intellectual Property Rights such as trademarks, industrial designs, utility models, patents, commercial names and ensigns, copyrights, domain names, including all the steps, procedures and actions necessary for their defense, protection and conservancy, including the capability of granting licenses and to assign registrations.

2) Obtain the licenses or health

PODER GENERAL

Compareció

Don Carlos Hirigoyen García

Representante legal

CMPC TISSUE S.A.

Sociedad domiciliada en:

Agustinas 1343, piso 6

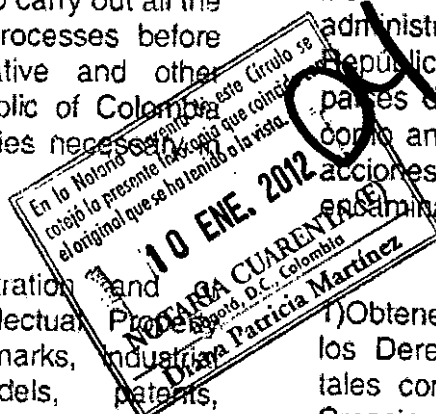
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otorgo **PODER GENERAL** a:

**MAURICIO PINZON PINZON
SILVIA GARCIA CHACON**

Abogados en ejercicio, mayores de edad, vecinos de Bogotá D.C., República de Colombia, para que en su nombre y representación adelanten ante las autoridades judiciales, administrativas o de policía de la República de Colombia y de todos los países del mundo que se requiera, así como ante terceras personas, todas las acciones o gestiones según sea el caso encaminadas a:

1) Obtener el registro y/o protección de los Derechos de propiedad intelectual tales como Signos Distintivos, Nuevas Creaciones, Derechos de Autor, nombres de dominio, comprendiendo todos los trámites, gestiones y acciones judiciales como administrativos que se hagan necesarios para su conservación y defensa, incluyendo la facultad de suscribir acuerdos y contratos en representación del poderdante, encaminados al cumplimiento de este mandato.



registration or whatever necessary for the normal development of activities as well as the commercialization of its products.

In carrying out the present mandate the proxy will be able to receive, withdraw, compromise, conciliate, substitute, resume, and in general, carry out all kinds of actions which would lead to the obtention of the pursued matter.

The proxy also is expressly authorized to to carry out for our bill the payments to third of rates, payments of services given for third parties in Colombia as in the exterior, bank commissions, freightages, notarial expenses and in general all the rest expenses that are needed for the effects of the complete fulfillment of this mandate.

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de Relaciones Exteriores de Chile
Firma del Señor Miguel Reyes Vargas

MIGUEL REYES VARGAS
Oficial de Legalizaciones
9 ABR 2010

SIGNATURE - FIRMADO

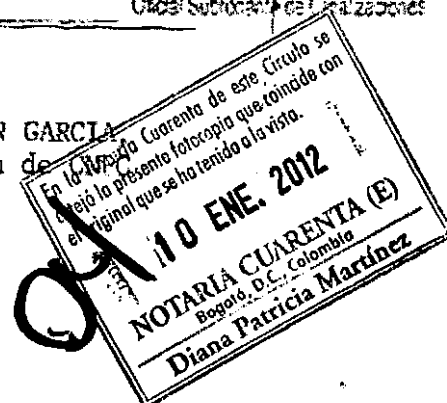
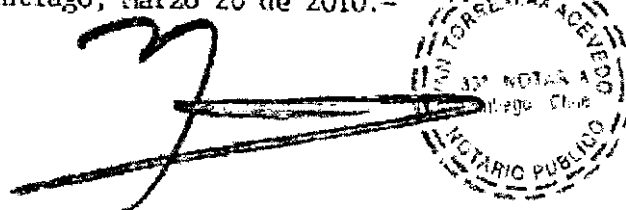
El Ministerio de Justicia de Chile
Certifica la autenticidad de la firma de don

Santiago 09 ABR 2010

VICTORIA GOMEZ LAGOS
Oficial Subrogante de Legalizaciones

FIRMA :
(Signature) Carlos Hirigoyen García
C.I. 6.062.355-4

Autorizo exclusivamente la firma de don CARLOS HIRIGOYEN GARCIA
Cédula de Identidad número 6.062.355-4 en representación de
TISSUE S.A.. Santiago, Marzo 26 de 2010.-
CCF



CONSULADO GENERAL DE COLOMBIA
Bogotá, D.C.
15 ABR 2010
El suscrito Carlos Hirigoyen García, C.I. 6.062.355-4, en su calidad de
Que el Señor Miguel Reyes Vargas
presenta documento que en la fecha anterior a la expedición del presente
as funciones de OFICIAL DE LEGALIZACIONES del MINISTERIO DE JUSTICIA
DE P.R.E.E. DE CHILE y que la firma y sello del Consulado General de Chile
aparecen como anexos a los que los y accesorios de sus actos
oficiales.
E. Carlos Hirigoyen García, C.I. 6.062.355-4, en su calidad de
documentos.

Obtener las Licencias o Registros
Sanitarios de cualquier índole,
necesarios para el normal desarrollo de
su actividad ordinaria, así como para la
comercialización de sus productos.

En desarrollo del presente mandato los
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desistir, transigir, conciliar, sustituir,
reasumir y en general realizar todo tipo
de actos que contribuyan a la obtención
del objeto perseguido

Nuestros apoderados igualmente
quedan expresamente facultados para
efectuar por cuenta nuestra el pago a
terceros de tasas, pagos de servicios
prestados por terceros en Colombia
como en el exterior, comisiones
bancarias, portes, gastos notariales y
en general todos los demás gastos que
se requieran para los efectos del cabal
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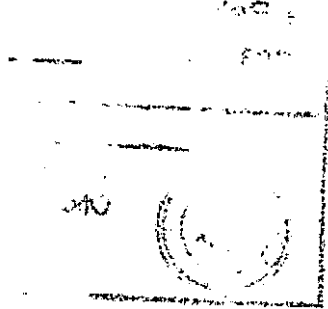
019855
Richard A. Aguilar
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AS FUNCIONES INDICADAS

MINISTERIO DE
RELACIONES EXTERIORES

2010 MAY 25 A 3-591

JEFE DE LEGALIZACIONES
BOGOTÁ D.C.

En la Notaría Cuarenta de este Circuito se
roteja la presente fotocopia que coincide con
el original que se ha tenido a la vista.
10 ENE. 2012
NOTARIA CUARENTA (E)
Bogotá, D.C., Colombia
Dña. Patricia Martínez





(Notary certificate - Corporation or Company)

CERTIFICACION NOTARIAL - SOCIEDAD

The undersigned Notary Public, certifies that: _____

Como Notario Público certifico

The above mentioned Company _____

Que la Compañía otorgante de este poder _____ CMPC TISSUE S.A. _____

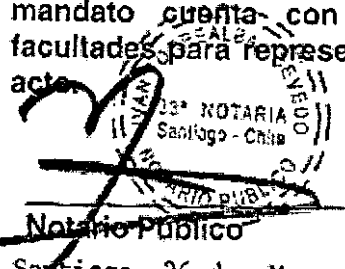
exists and is organized in accordance with the Laws of this Country / State / _____

existe y se encuentra organizada de acuerdo con las leyes de este país / estado CHILE

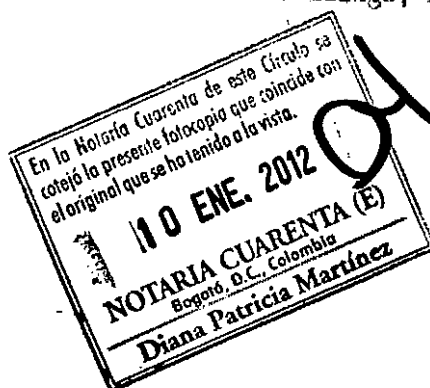
/and the person who executed the forgoing document is the authorized representative of said Corporation / Company and is empowered to execute this document on its behalf.

y la persona que en su representación suscribe el presente mandato cuenta con las debidas facultades para representarla en este acto.

Notary Public


Notario Público

Santiago, 26 de Marzo de 2010.





United States Patent [19]
Howell

US005389093A
[11] **Patent Number:** **5,389,093**
[45] **Date of Patent:** * **Feb. 14, 1995**

- [54] **WETNESS INDICATING DIAPER**
- [76] **Inventor:** Wesley A. Howell, 6926 Doheny, Unit D, Alta Loma, Calif. 91701
- [*] **Notice:** The portion of the term of this patent subsequent to Mar. 30, 2010 has been disclaimed.
- [21] **Appl. No.:** 39,804
- [22] **Filed:** Mar. 29, 1993

4,704,108	11/1987	Okada et al.	604/361
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Primary Examiner—Randall L. Green
Assistant Examiner—Mary Beth Jones
Attorney, Agent, or Firm—Knobbe, Martens, Olson & Bear

Related U.S. Application Data

- [63] Continuation of Ser. No. 861,475, Apr. 1, 1992, Pat. No. 5,197,958.
- [51] **Int. Cl.⁶** A61F 13/15
- [52] **U.S. Cl.** 604/361; 604/385.1
- [58] **Field of Search** 604/358, 361, 385.1

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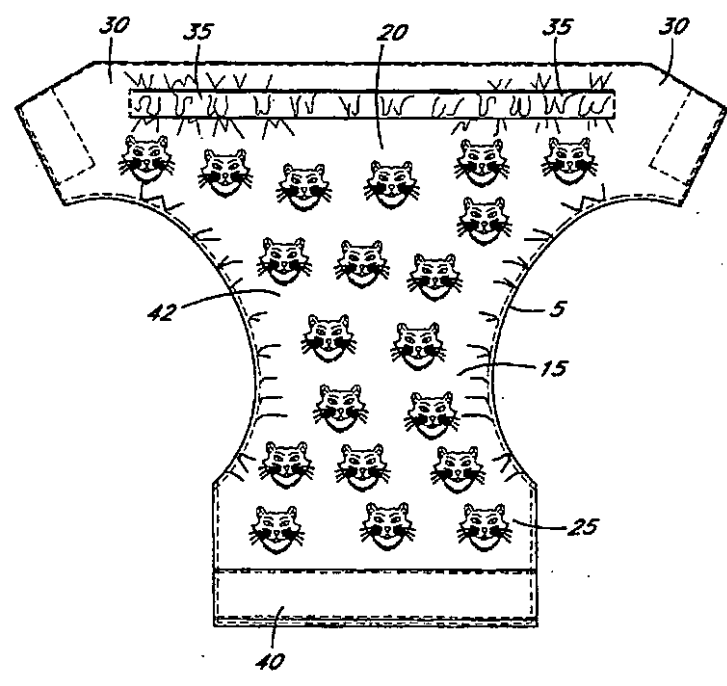
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4,287,153	9/1981	Townsend	422/56
4,327,731	5/1982	Powell	
4,356,818	11/1982	Macias et al.	
4,507,121	3/1985	Leung	604/361
4,516,975	5/1985	Mitchell	604/385 A
4,568,342	2/1986	Davis	604/391
4,653,491	3/1987	Okada et al.	
4,673,403	6/1987	Lassen et al.	604/385 R

[57] **ABSTRACT**

The present invention is a reusable wetness indicating cloth diaper which uses a thermally sensitive indicator to indicate that the diaper has become soiled. The diaper of the present invention includes material which at least partially thermally insulates the outer surface from said inner surface and an indicator on the outer surface which provides a visual indication when the outer surface has a temperature above a given threshold. The temperature threshold is chosen such that the visual indication will generally not be present when a baby wearing said diaper is dry, but will generally be present when the baby secretes waste material into the diaper. A thermochromic ink indicates a temperature change in the diaper. A plurality of discrete indicators are distributed over substantially the entire outer surface of the diaper with the indicators forming a repeating pattern. Desirably, the indicators cover a significant portion of the outer shell of the diaper so that the wetness condition can be easily detected from most viewing angles of the diaper in an aesthetically pleasing manner.

9 Claims, 3 Drawing Sheets



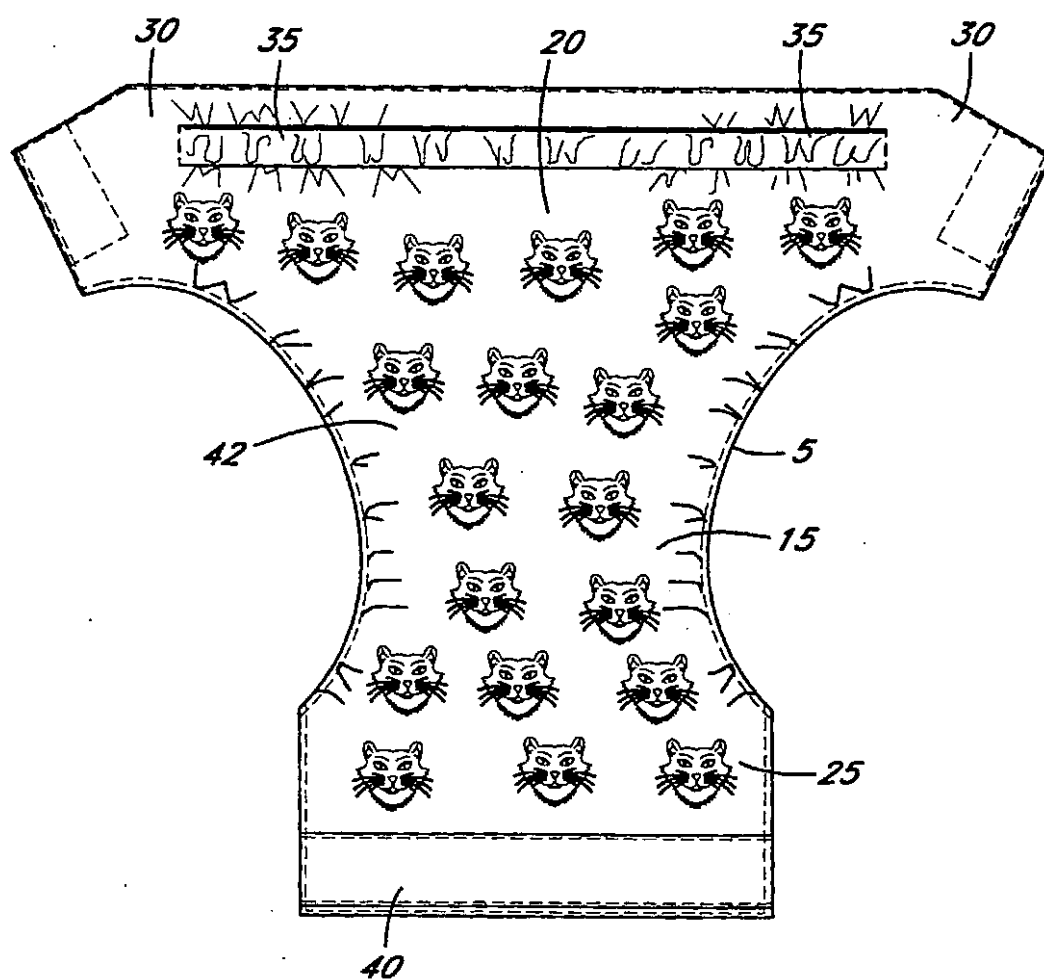


Fig. 1

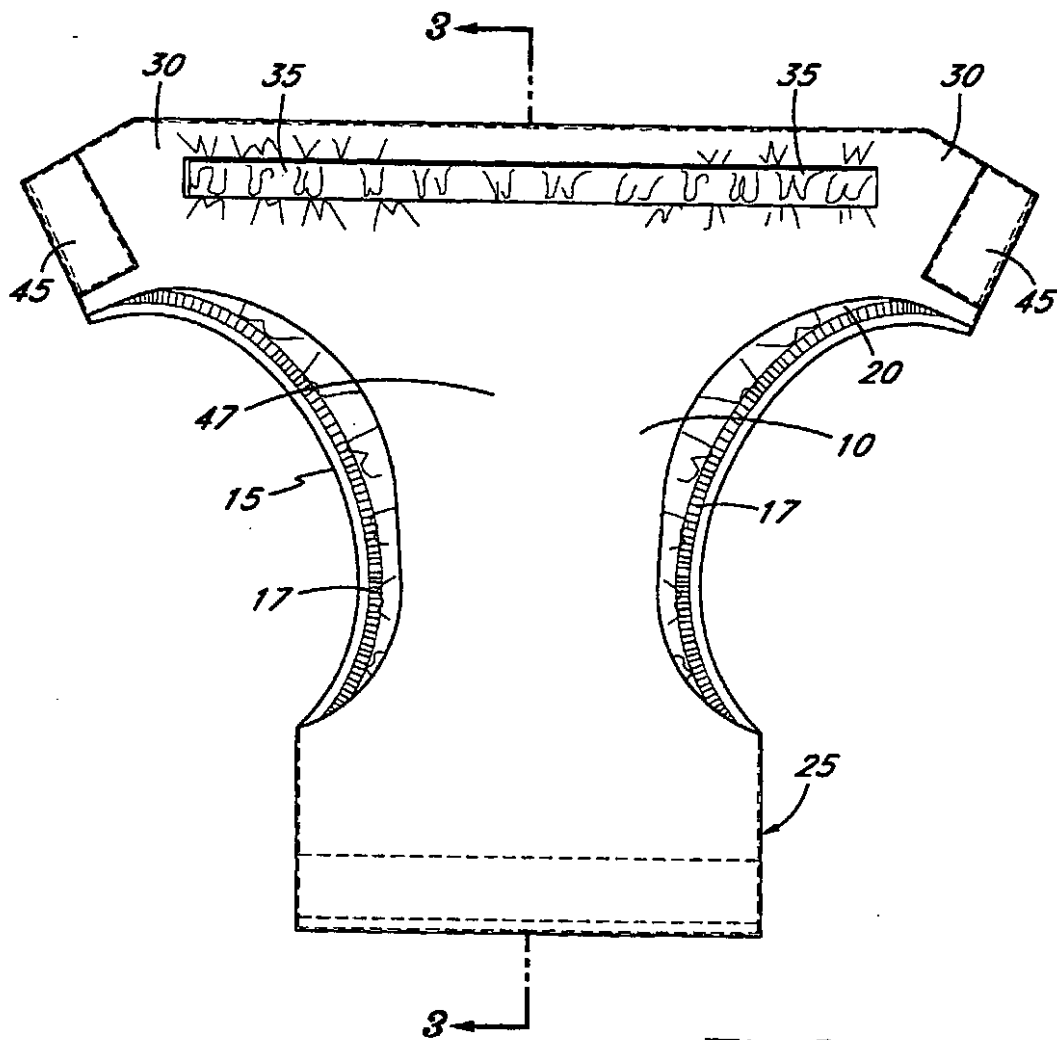


Fig. 2

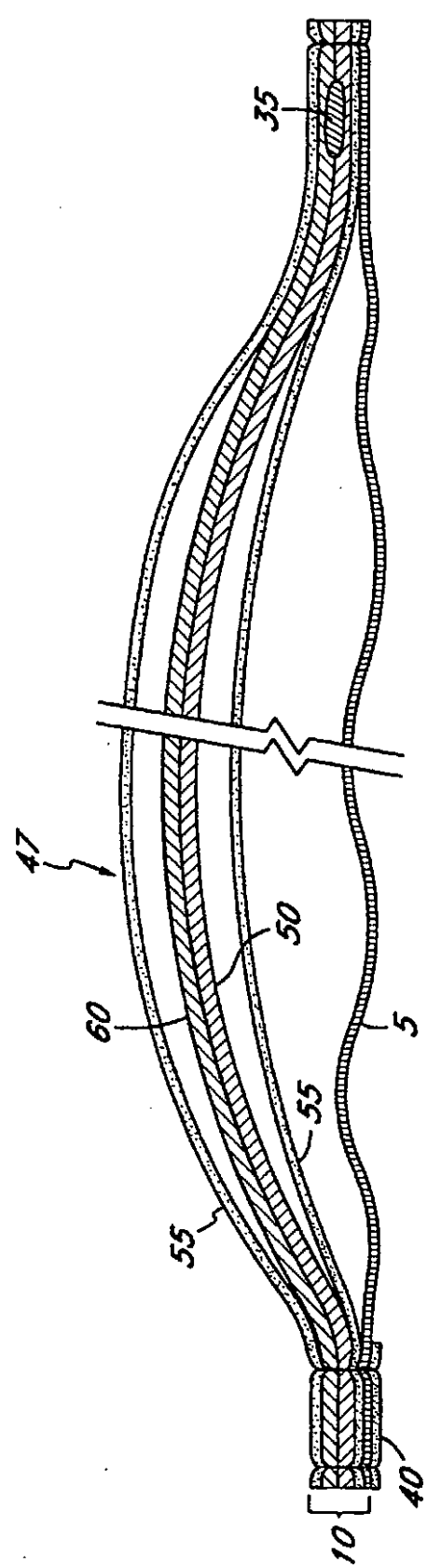


Fig. 3

WETNESS INDICATING DIAPER

This application is a continuation of application Ser. No. 07/861,475, filed Apr. 1, 1992, now U.S. Pat. No. 5,197,958.

BACKGROUND OF THE INVENTION

The present invention generally relates to diapers and, in particular, to diapers which indicate when the diaper is wet.

The concept of a wetness indicating diaper is known in the diaper art, but the various attempts at achieving this have been quite cumbersome. Some of the prior art wetness indicators are located at a single location on the diaper. Therefore, various wicking methods are required to move the wetness from its original location on the diaper to the indicator location to react with the indicating substance to signal that the diaper is wet. The prior art diapers are particularly unadvantageous when the original wetting location is significantly far from the indicator location and the amount of wetness is not substantial. In this case, the limited amount of wetness, if any, that reaches the indicator may not be enough to trigger the indicating means.

In addition, the single location indicators of the prior art are often located at either the bottom or top of the diaper and, depending on the type of outfit that the baby is wearing, can be difficult to read when the baby is fully clothed. In many cases, the baby has to be virtually undressed to find the indicator mark, thus greatly limiting the utility of a wetness indicator. Furthermore, these single location indicators are not aesthetically pleasing.

Other prior art wetness indicators have utilized complex electronic circuitry to detect moisture in the diapers such as U.S. Pat. No. 4,356,818, issued to Macias, et al. In the Macias, et al. patent, the presence of moisture causes two isolated conduits to short circuit, and thus indicate that the diaper is wet. A detector and an indicator means have to be hooked up to the conduit to signify when the short circuit condition occurred, and therefore that the diaper is wet. These electronic wetness detectors are elaborate designs which require the addition of multiple components to the assembly and use of the diaper. In addition, placing electronics in a diaper for use with a child is undesirable, as mothers may fear possible electrocution of the child, even if this is not feasible.

Many of the prior art wetness indicating systems are designed for disposable diapers, therefore the wetness indicator systems are only intended for single use applications. These single use systems for disposable diapers can not be used in cloth diapers which, after soiling, are washed, dried and then reused. Due to the added cost to the diaper as a result of the wetness indicating system, it is desirable that the diaper be reusable from a cost efficiency standpoint.

A reusable cloth diaper needs a wetness indicating system that after drying will reindicate a dry condition and then reindicate a wet condition when the diaper is again wet. In contrast, most of the disposable indicating systems of the prior art cannot be reused. In addition, the prior art wetness indicating systems are generally not durable enough to withstand the continual washings of the cloth diaper. The washing process repeatedly subjects the diapers to detergents and heat, and the

indicating systems of the prior art are not able to withstand these harsh environments.

Finally, the disposable diapers of the prior art are not reusable and therefore not recyclable. With the current heavy burden on the landfills in this country, a reusable diaper that is easy to use, and commercially appealing is needed. For these and other reasons, the wetness indicating diapers of the prior art have not gained widespread acceptance, therefore there exists a need for an improved wetness indicating reusable diaper.

SUMMARY OF THE INVENTION

The present invention is a reusable wetness indicating cloth diaper which uses a thermally sensitive indicator to indicate that the diaper has become soiled. The diaper of the present invention comprises an inner surface adapted to be positioned against the skin of a baby, an outer surface generally opposed to the inner surface adapted to form the exterior of the diaper, material which at least partially thermally insulates the outer surface from the inner surface and an indicator on the outer surface which provides a visual indication when the outer surface has a temperature above a given threshold. The temperature threshold is chosen such that the visual indication will generally not be present when a baby wearing the diaper is dry, but will generally be present when the baby secretes waste material into the diaper. The material of the diaper when dry is insufficiently thermally conductive for a normal body temperature to raise the outer surface above a given threshold, but is sufficiently thermally conductive when wet to raise the outer surface temperature above a given threshold. More specifically a layer of the material provides at least some thermal insulation capacity when dry and a lower thermal insulation capacity when wet. In addition, the material of the diaper is provided to wick the moisture secreted from the baby toward the outer layer to further assist in the indication of wetness.

The preferred construction of the diaper comprises an outer shell having a front portion, a back portion and a connecting portion extending between the front and back portions, an inner pad attached to the outer shell solely at the front portion and the back portion, and an indicator on the outer shell which provides a visual indication when the outer shell has a temperature above a given threshold. The inner pad defines an inner surface adapted to be positioned against the skin of a baby when the diaper is worn, and, when dry, at least partially thermally insulates the inner surface from the outer shell. The inner pad has a thickness of at least $\frac{1}{4}$ of an inch and further comprises a sorbent layer, a protective cover defining the inner surface of the diaper, and a layer of wicking material between the protective cover and the sorbent layer. The protective cover surrounds the sorbent layer, thereby separating the sorbent layer from the outer shell.

The cloth of the diaper is sufficiently durable to withstand multiple washings, and defines an inner surface adapted to be positioned against the skin of a baby and an outer surface. The cloth of the diaper further comprises a front portion, a back portion adapted to receive the buttocks of the wearer, and a connecting portion connecting the front portion and the back portion. The connecting portion is also adapted to extend between the legs of the wearer. The back portion further defines a pair of opposing laterally extending tabs which include fasteners secured to one of the front portion and

3

4

back portion. The fasteners are adapted to connect the tabs to the front portion when the diaper is worn.

The preferred embodiment of the diaper uses a thermochromic ink, similar to the thermochromic ink of U.S. Pat. No. 4,826,550, assigned to Sakura Color Corporation, to provide the indication of a temperature change in the diaper.

Using conventional silk screening techniques applied to the thermochromic ink, a plurality of discrete indicators, such as small cartoon figures, are distributed over the outer surface of the diaper with the indicators forming a repeating pattern. Each of the plurality of indicators provides a visual indication when the outer surface has a temperature above a given threshold. Desirably, the indicators cover a significant portion of the outer shell of the diaper so that the wetness condition can be easily detected from most viewing angles of the diaper in an aesthetically pleasing manner.

The temperature threshold which results in a visual indication may advantageously be at temperatures above 60° F., is desirably above 70° F., is more desirably above 80° F. and preferably is above 87° F. Desirably, the visual indication of a change in temperature threshold is a change in color. The diaper desirably returns to its non-indicating color when the temperature of the diaper falls below the given threshold. The thermochromic ink that is screened onto the diaper may comprise a mixture of thermochromic inks or a single thermochromic ink depending on the type of color change that is desired. In one embodiment, the indicators may be visible when the outer surface has a temperature above a given threshold. In another embodiment, the indicators are not visible when the outer surface has a temperature above a given threshold. In still another embodiment, the indicators appear one color when the outer surface has a temperature above a given threshold and appear another color when the outer surface has a temperature below the threshold.

The present invention further comprises a method of detecting the wetness of a diaper having an inner surface, an outer surface and a thermal indicator. The method of detecting the wetness of a diaper comprises at least partially thermally insulating the inner surface of the diaper from the outer surface of the diaper, wicking any moisture from the inner surface towards the outer surface to bring the moisture into thermal contact with the thermal indicator, and providing a visual indication when the thermal indicator is exposed to a temperature above a given threshold.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a bottom plan view of the preferred embodiment of the diaper of the present invention.

FIG. 2 is a top plan view of the preferred embodiment of the present invention.

FIG. 3 is a cross-sectional view of the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1 and 2 illustrate a preferred embodiment of a reusable cloth diaper that indicates when a baby wearing the diaper is wet by detecting a change in temperature. The diaper comprises a substantially non-absorbent outer shell which is made from a durable soft fabric material, an inner pad and an indicator which provides visual indication when the outer shell of the diaper has a temperature above a given threshold. The threshold is

chosen so that the visual indication is not present when the baby wearing the diaper is dry, and will be present when the baby secretes waste material into the diaper. The inner pad substantially absorbs the waste of the baby and provides a partially thermally insulating layer between the baby wearing the diaper and the outer shell of the diaper. The preferred embodiment of the invention utilizes a thermally sensitive ink to provide an indication of a wetness condition.

The preferred configuration of the diaper, comprises an outer shell 5 connected to an inner pad 10. The outer shell 5 further comprises a back portion 20, a front portion 25, and a connecting portion 15 that connects the front portion and the back portion of the diaper. The inner pad 10 is only connected to the outer shell 5 at the front 25 and back 20 portions of the outer shell 5. The connecting portion 15 of the diaper is substantially rounded to fit comfortably between the legs of an infant. The connecting portion 15 also includes a woven elastic band 17 sewn onto the outer shell 5 to gently hold the diaper onto the child's legs to prevent gaping of the diaper as the child moves.

The front portion 25 folds onto the stomach of the wearer while the back portion 20 of the diaper cradles the buttocks. The back portion also has a pair of opposing laterally extending tabs 30 which wrap around the child's sides to meet the front portion 25 of the diaper. In order to secure the diaper on the wearer, fasteners, such as hook and loop fasteners sold under the name "VELCRO", are attached to the front 25 and back 20 portions of the diaper to connect the tabs to the front portion 25 when the diaper is worn. An elastic band 35 is sewn onto the tabs 30 as the material of the tabs is gathered to form a stretchable waist band which can be adjusted to wrap around the sides of most children. The front portion 25 of the diaper preferably has a strip of the looped VELCRO fastener 40, style #71, attached to the outer surface 42 of the outer shell 5 of the diaper along the entire top of the front portion 25 of the diaper. Preferably, the two elasticized back tabs 30 each have a piece of the hooked VELCRO fasteners 45, style #704, sewn onto an inner surface 47 of the diaper.

When the elasticized tabs 30 of the back portion 20 of the diaper are stretched around the sides of the baby's waist, the hooked VELCRO fasteners 45 can attach to any location on the looped VELCRO fastener 40 along the front portion 25 of the diaper. Thus, the diaper can be used on various sizes of children by varying the amount of stretch that is required of the elasticized back tabs 30, and the location on the front looped fastener 40 that the hooked fasteners 45 on the back tabs 30 are attached.

The diaper is preferably made from material that is sufficiently durable to withstand multiple washings. The outer shell 5 of the diaper is made from a substantially nonabsorbent material that provides a sturdy exterior of the diaper. The preferred embodiment of the outer shell 5 comprises Dupont style #22-2 material which is 97% Dacron and 6% Lycra. As illustrated in FIG. 3, the inner pad 10 preferably comprises multiple layers: a sorbent layer 50, a protective covering 55 and a layer of wicking material 60 between the protective covering 55 and the sorbent layer 50. The protective covering 55 defines the inner surface 47 of the diaper which is adapted to be positioned against the skin of the baby when the diaper is worn. The protective covering 55 further surrounds the sorbent layer 50 thereby separating the sorbent layer 50 from the outer shell 5. The

5

inner pad 10 is at least partially thermally insulates the inner surface 47 of the diaper from the outer shell 5. The preferred embodiment of the protecting covering 55 comprises a layer of BIRD'S EYE 100% cotton which is soft and substantially non-irritating to the skin of the infant wearing the diaper. The preferred embodiment of the sorbent layer 50 comprises looped terry 100% cotton having a thickness of at least $\frac{1}{4}$ of an inch, and the preferred embodiment of the wicking layer 60 comprises Du Pont style #1178 B (poly thyon) material. The wicking layer 60 draws the moisture away from the baby's buttocks to the sorbent layer 50. The wicking layer 60 not only removes the wetness from the baby's buttocks and provides greater comfort for the child, but by quickly wicking the wetness to the sorban layer, it quickly brings the waste into thermal contact with the heat sensitive ink on the outer shell 5 of the diaper.

As stated above, the preferred embodiment of the present invention is designed to be extremely durable. The materials that were chosen can be washed and dried several times, and still be in a condition for repeated use. In order to wash the diaper, the diaper is turned inside out so the hooked VELCRO fasteners 45 on the extended tabs 30 are between the outer shell 5 and the inner pad 10. By turning the diaper inside out, the hooked VELCRO fasteners 45 are no longer able to come into contact with or snag any article that the diaper is being washed with. Further, by turning the diaper inside out the drying time of the diaper is re-

6

the thermally sensitive ink. The thermally sensitive ink is designed to change color when the heat from the wet and soiled diaper reaches the outer shell of the diaper. Therefore, the color of the thermally sensitive pattern, i.e. the cartoon figures, will change when the diaper becomes wet. This is much more aesthetically pleasing than the spot indicators of the prior art. In addition, the repeated pattern is desirably placed over substantially the entire outer surface 42 of the outer shell 5 of the diaper; therefore, from virtually any angle there will be an indicating means available to the parent to determine if the diaper is wet.

The thermally sensitive ink used is desirably a thermochromic ink. The thermochromic ink is an organic compound that effectuates the reversible color change when a specific temperature threshold is crossed. The thermochromic ink that is used is similar to the thermochromic ink of U.S. Pat. No. 4,826,550, assigned to Sakura Color Corporation, and which is hereby incorporated by reference.

The basic composition of the thermochromic color changeable ink consists of three components which perform the following functions: (1) an electron donating coloring organic compound for determining the color, (2) an electron accepting compound for determining the concentration of the color, and (3) a fatty acid for determining the color-change temperature. The mechanism that causes the color change to occur is described in Table 1 below:

TABLE 1

Composition	Function	get,0001	get,0002
Coloring matter	determining the color	Electron donating coloring organic compound (leuco dye) (pressure sensitive dye) (heat sensitive dye)	Electron donating coloring organic compound (leuco dye) (pressure sensitive dye)
Color developing matter	giving color to coloring matter	Phenol compound	Phenol compound
Desensitizer	determining the discoloring temperature	Acid clay	Triazole compound
		X	Alcohol, fatty acid
			Amido compound
			Ester compound

duced by $\frac{1}{3}$ of the normal rate.

Another feature that reduces drying time is the manner in which the inner pad 10 is connected to the outer shell 5. The inner pad 10 and the outer shell 5 of the diaper are only attached at the front 25 and back 20 portions of the outer shell 5, therefore the inner pad 10 of the diaper is free to move independently from the outer shell 5 of the diaper. This independent movement of the inner pad 10 from the outer shell 5 allows air to pass between the inner pad 10 and the outer shell 5 to ventilate the diaper which assists in reducing the drying time. More importantly, this ventilation allows the heat from the child's body to escape from the diaper and helps prevent the heat sensitive wetness indicating ink from changing color when the diaper is not wet. The inner pad 10 of the diaper is designed for optimal thickness to insulate the child's body temperature from the outer shell 5 of the diaper, while still allowing the wetness to be drawn to the outer shell 5 by the wicking layer 60 and effectuate the color change in the thermal sensitive ink when the diaper is soiled.

The outer shell 5 of the diaper is screened using conventional silk screening techniques to screen a repeating pattern, such as several small cartoon figures, covering substantially the entire outer surface of the diaper using

Although it is not entirely clear why the above composition is subject to thermochromism, it is generally understood as thermal equilibrium of an electron movement.

In order to control the temperature at which the color change occurs different types of fatty acids are used. The discoloring temperature corresponds to the fusing temperature of a fatty acid. The fatty acid will change from a solid state to a liquid state when heated, therefore when the thermochromic ink is heated the fatty acid will change state and effectuate the color change. As the thermochromic ink cools, the fatty acid will solidify and return the ink to its original color. Further, it is possible to minutely regulate the discoloring temperature by using two or more kinds of fatty acids mixedly. Table 2 shows different fatty acids and their respective transition temperatures.

TABLE 2

FATTY ACID		transition temp. (°C.)
capric acid	(carbon No. 10)	31
lauric acid	12	44
myristic acid	14	53

TABLE 2-continued

FATTY ACID	transition temp. (°C.)
palmitic acid	16
stearic acid	18
behenic acid	22

In order to determine the color of the thermochromic ink, different electron donating compounds are used. The electron donating coloring organic compound is colorless in its simple substance. However, when coming into contact with an electron accepting compound such as solid acid, the electron donating coloring organic compound exhibits color. Specifically, names of electron donating coloring organic compound and their hues are:

3,6-dimethoxyfluoran	yellow
3-cyclohexylamino-6-chlorofluoran	orange
3-diethylamin-6-methyl-7-chlorofluaran	vermillion
3-diethylaminobenzfluoran	pink
rhodamine B lactam	red
crystal violet lactone	blue
3-diethylamino-7-dibenzylaminofluoran	green
3-diethylamino-6-methyl-7-anilinofluoran	black

Further, if these compounds are mixed, their mixed colors can also be obtained. In fact, these coloring matters are used for pressure sensitive copy paper, heat sensitive recording paper and the like. The use of these coloring matters is prevalent in our daily life.

On the other hand, phenols are used as electron accepting compounds. An example of general composition of thermochromic ink is:

1) Coloring matter	1 group
2) Phenols	5 groups
3) Fatty acids	50 groups

Thermochromic (TC) ink depends on the balance of composition of the aforementioned three components. In the case where the balance of composition is lose through the repeating process of exhibiting and disappearing color, thermochromic ink can no longer dis- color to the set color at the set discoloring temperature. Particularly, the fatty acid which determines the discoloring temperature exhibits and disappears the color by changing from the solid to the liquid or vice versa. Accordingly, the fatty acid, in its liquid state, is liable to move outside the system.

Therefore, the composition of the three components is required to be encapsulated in a microcapsule. This technique is referred to as microencapsulation, and is necessary for putting the thermochromic ink into practical use.

Various methods of microencapsulation are known in the art, some of which are set forth in Table 3. However, since fatty acids have a high chemical activity, the usable microencapsulation methods are very limited.

TABLE 3

Method of Encapsulation and Its Classification	
Classification by encapsulation process	Method of encapsulation
1. Chemical method	(1) Method by interfacial reaction Interfacial

TABLE 3-continued

Method of Encapsulation and Its Classification	
Classification by encapsulation process	Method of encapsulation
2. Physical and chemical method	reaction Interfacial polymerization (2) In-situ polymerization (3) Hardening and coating in liquid Dispersing Method Orifice Method (1) Coacervation (phase separation) from aqueous solution Simple coacervation Compound coacervation (2) Coacervation from organic solution By changing temperature By adding insoluble solvent By adding inductive agent for phase separation (3) Drying method in liquid (4) Melting and cooling method (5) Exchanging internal phase
	(1) Wurster method (2) Spray drying (3) Mechanochemical method (mixing powder) (4) Vacuum deposition coat (5) Electrostatic coat (6) By shocking in high speed air current
3. Mechanochemical and physical method	

At present, thermochromic ink is made with microencapsulation that is effected by the In-situ polymerization with urca formalin resin used as wall material.

In this way, three components encapsulated in the microcapsule are used as primary material for thermochromic ink. Since microencapsulation is to be effected in the liquid phase, the primary material for thermochromic ink is in a water disperse state containing about 45% wt. of capsule particles. The capsulated thermochromic ink when dispersed in water containing the 45% wt. of capsule particles is called a TC slurry. The TC slurry is blended with water base binders at a 3/4 ratio respectively to form the thermochromic water-based ink used in the present invention.

Thus, the thermochromic ink used in the present invention provides the following advantages:

- (1) The choice of a desired color, e.g., orange, pink, red, purple, blue, green, and black;
- (2) The free setting of a discoloring temperature in the temperature range of -30° C. to +80° C.;
- (3) Basic color changes from color to colorless and vice versa;
- (4) By blending the coloring matter which are not to discolor according to the temperature change, the color change can be designed so as to discolor from color A to color B and vice versa;
- (5) Sensitivity of discoloration has a range of ±1 to 2° C., but sensitivity of the temperature is slightly inferior to that of liquid crystal;

(6) Repeatability of the color change, potentially tens of thousands of times. However, it is expected that the use of discoloration may not be repeated as many times depending upon how the heat is applied.

The thermochromic ink that is used in the preferred embodiment of the present invention provides an indication of wetness when the temperature of the ink exceeds a specific threshold. It has been determined that the temperature threshold is advantageously about 60° F., is desirably above 70° F., is more desirably above 80° F. and is preferably above 87° F. for the indicators of the present invention. The indicator advantageously returns to its normal color when the temperature falls below the specified threshold temperature. In one embodiment of the present invention, the ink that is screened onto the preferred embodiment of the diaper is a mixture of two thermochromic inks, one of which becomes colorless at temperatures above the specified threshold value. Thus, the indication of wetness occurs when one of the two thermochromic inks of the preferred embodiment becomes colorless, and thereby effectuates the color change. In an alternate embodiment of the present invention, the diaper is screened using a thermochromic ink that is colorless below a given threshold temperature, and is colorful above a given threshold level. In this embodiment the indicators are colorful when the diaper is wet, and are colorless when the diaper is dry. In a further embodiment of the present invention, the diaper is screened using a thermochromic ink that is colorless above a given threshold temperature, and is therefore colorful below the given threshold level. In this further embodiment, the indicators are colorless when the diaper is wet, and are colorful when the diaper is dry.

As described above, the heat sensitive thermochromic ink will change colors when the dye reaches the color change threshold temperature. In previous applications of thermochromic dyes on clothing, it was desirable to effectuate the color change when the wearer of the garment became hot. In this case, it is only desirable to have a color change when the infant soils his diapers, not when the infant becomes hot. In order to prevent undesired color change, the inner pad 10 of the diaper is designed to insulate the baby's skin temperature from contacting the outer shell 5 where the heat sensitive dye is located, while still allowing the wetness to be drawn into thermal contact with the outer shell 5 and effectuate the color change in the thermal sensitive ink. The material of the inner pad 10 is insufficiently thermally conductive for a normal body temperature to raise the outer surface above a given threshold, but is sufficiently thermally conductive when wet to raise the outer surface temperature above a given threshold. This thickness of the inner pad 10 is therefore at least $\frac{1}{4}$ of an inch thick. The insulative property of the diaper that prevents the heat from the baby's skin to cause a false color change is therefore based on the effectiveness of the insulative material as well as the thickness of the layers of material that comprises the inner pad 10.

In addition, by screening the thermochromic inks onto the garment in a repeated pattern, such as a cartoon type design, it allows the color change to be limited to a controlled area. Several prior art applications of the thermochromic inks were used on the entire garment or a significant portion of the garment. This would not be desirable for use on diapers because when the child wets his diaper the garment would change colors along the entire soiled area of the garment. This

would result in an unattractive blotch of the changed color. In contrast, the design of the present invention allows for the coverage of substantially the entire outer shell 5 of the diaper with the indicating ink, yet limits the area of the color change to an appealing pattern or figure.

In addition, the thermochromic screened ink is a durable indicator which can be washed repeatedly with various laundry detergents and dried in a hot dryer, and continue to properly indicate diaper wetness. The prior art wetness indicating diapers have not provided the durability of the present invention and therefore did not provide the market with a functional nor practical design.

In addition, the diaper of the present invention is reusable, and therefore a recyclable product. As the land fills in our country become full, mostly due to the amount of disposable diapers that are throw away each year, the need for a better reusable diaper will continue to grow. The wetness indicating diaper is designed to make the use of cloth diapers easier, and more appealing to the marketplace.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

I claim:

1. A diaper system for indicating wetness, comprising an outer shell having a front portion, a back portion and a connecting portion extending between said front and back portions, said outer shell defining an outer surface; an insulation layer positioned between a wearer and said outer shell which, when dry is insufficiently thermally conductive for a normal body temperature to raise said outer surface above a given threshold, but being sufficiently thermally conductive when wet to raise said outer surface temperature above a given threshold, at least partially thermally insulates said outer surface from said inner surface;

a thermal indicator on said outer surface which provides a visual indication when said outer surface has a temperature above a given threshold; and said threshold being chosen such that said visual indication will generally not be present when said wearer is dry, but will generally be present when said wearer secretes waste material which is absorbed by said insulation layer.

2. The diaper system of claim 1, wherein said material wicks moisture secreted from said wearer toward said outer layer.

3. The diaper system of claim 1, wherein said threshold is above 80 degrees Fahrenheit.

4. The diaper system of claim 1, wherein said threshold is above 87 degrees Fahrenheit.

5. The diaper system of claims 1, wherein said indicator is no longer visible when said outer shell has a temperature which falls below said threshold.

6. The diaper system of claim 2, wherein said indicator comprises thermochromic ink.

7. The diaper system of claim 5, wherein said indicator comprises a mixture of thermochromic inks, one of which becomes colorless above said threshold.

11

8. A method of detecting when a wearer has excreted moisture between its legs, comprising:
providing an outer shell having a front portion, a back portion and a connecting portion extending between said front and back portions, said outer shell defining an outer surface on which is positioned a thermal indicator;
positioning said outer shell on said wearer such that said connecting portion fits between the legs of said wearer;

12

at least partially thermally insulating;
wicking moisture excreted from said wearer from said wearer towards said outer surface to bring said moisture into thermal contact with said thermal indicator; and,
providing a visual indication when said thermal indicator is exposed to a temperature above a given threshold.
9. The method of claim 8, wherein said visual indication is provided by means of a change in color;
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(76) Inventor: **Tomotsugu Matsui, Ehime (JP)**

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Correspondence Address:
LADAS & PARRY
5670 WILSHIRE BOULEVARD, SUITE 2100
LOS ANGELES, CA 90036-5679 (US)

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(57) **ABSTRACT**

In an absorbent article structured by integrally forming at least a liquid permeable top sheet, an absorbent, a water vapor permeable waterproof sheet, and a liquid impermeable back sheet in this order, a water content indicator is provided on an inner surface of the water vapor permeable waterproof sheet, the water content indicator being constituted by a hydrophilic resin coating layer and an information mark provided on an inner surface of the hydrophilic resin coating layer.

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§ 371(c)(1),
(2), (4) Date: **Sep. 15, 2006**

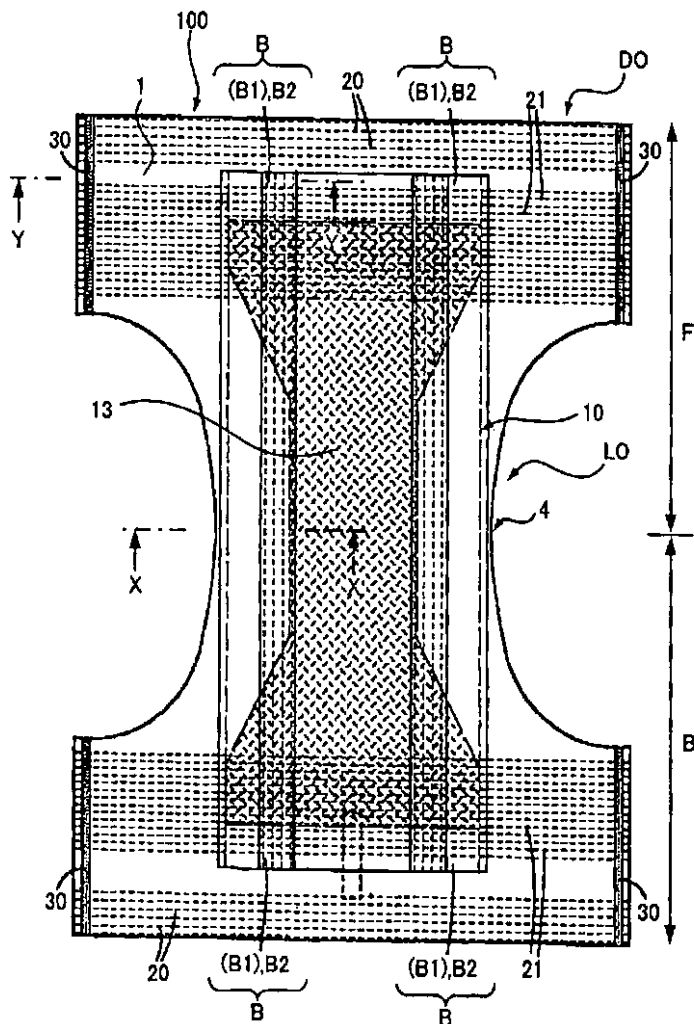


FIG.1

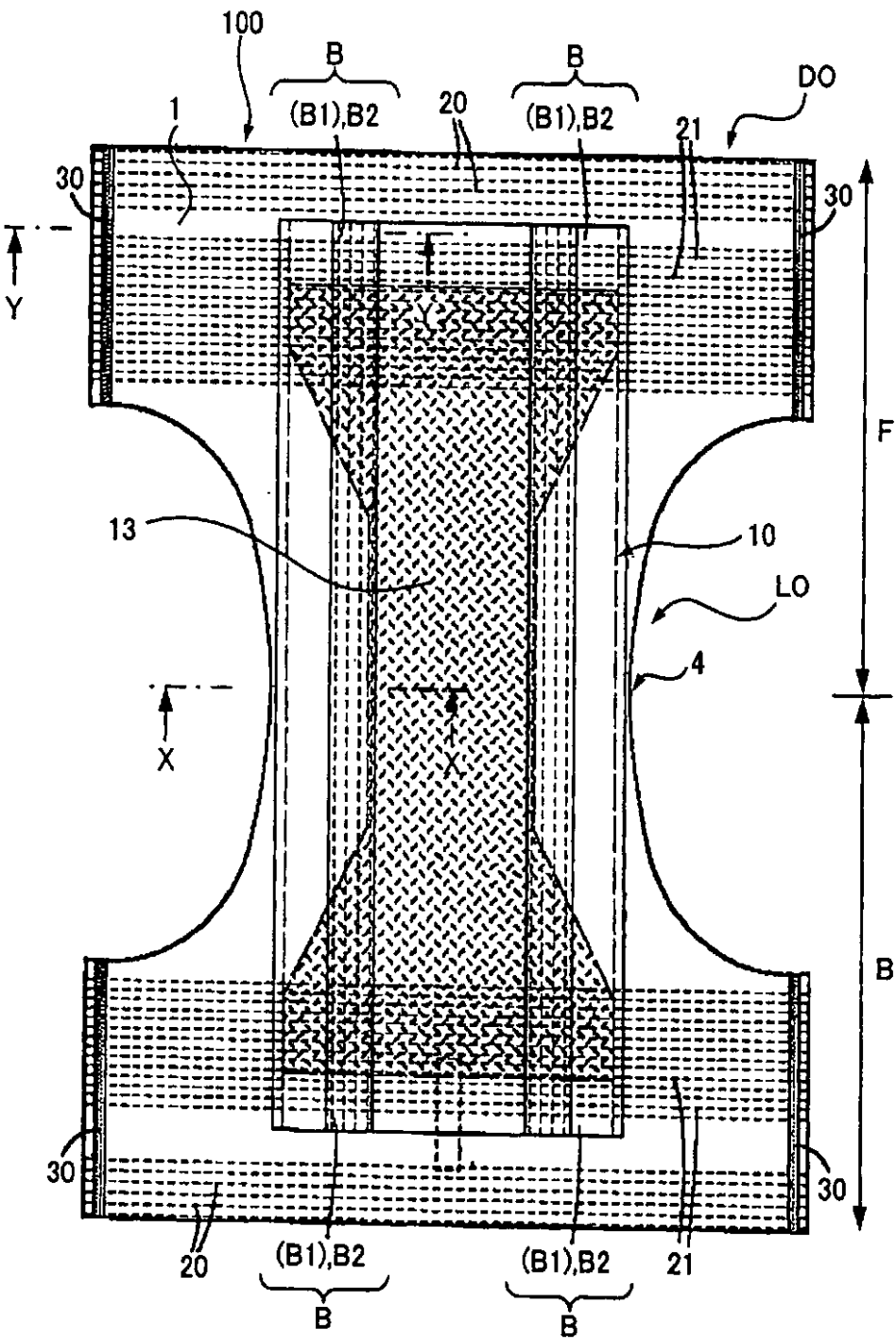


FIG.2

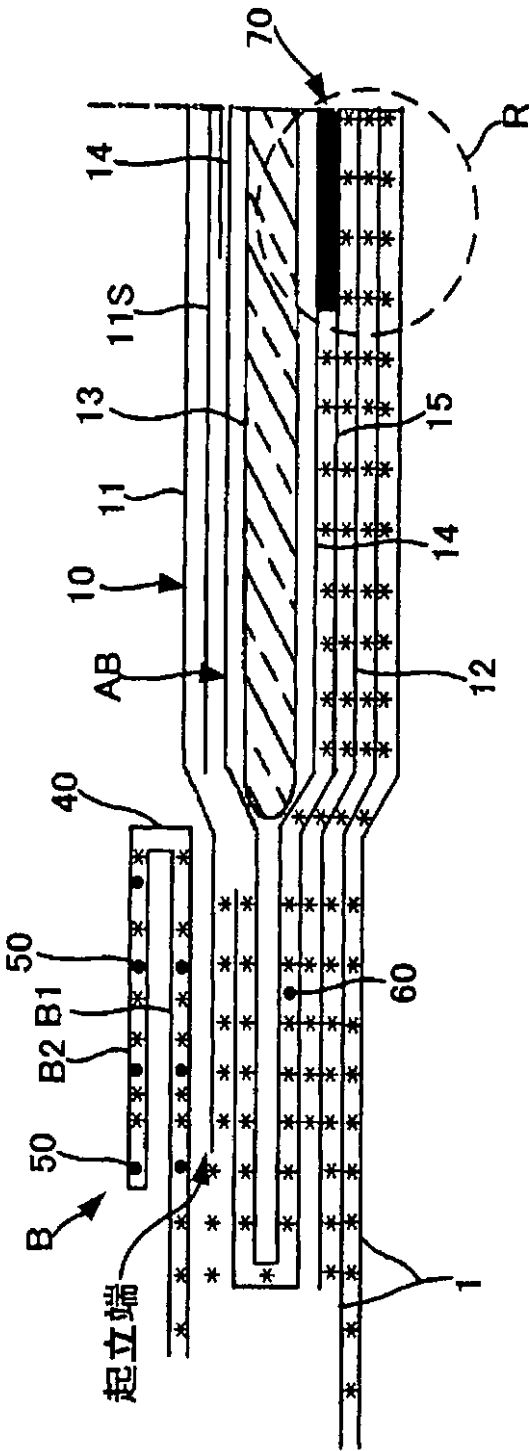


FIG.3

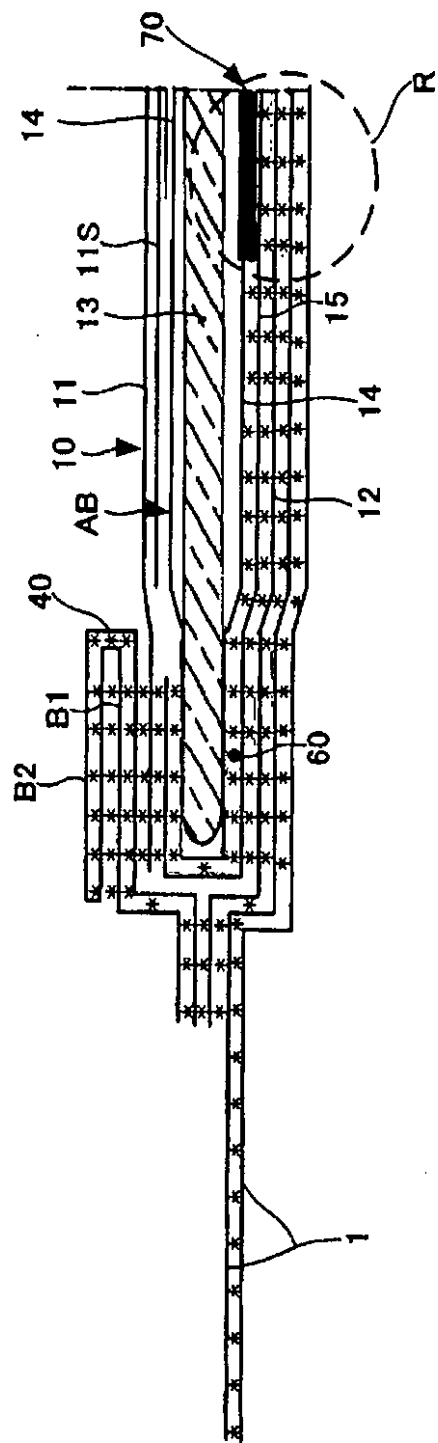


FIG.4

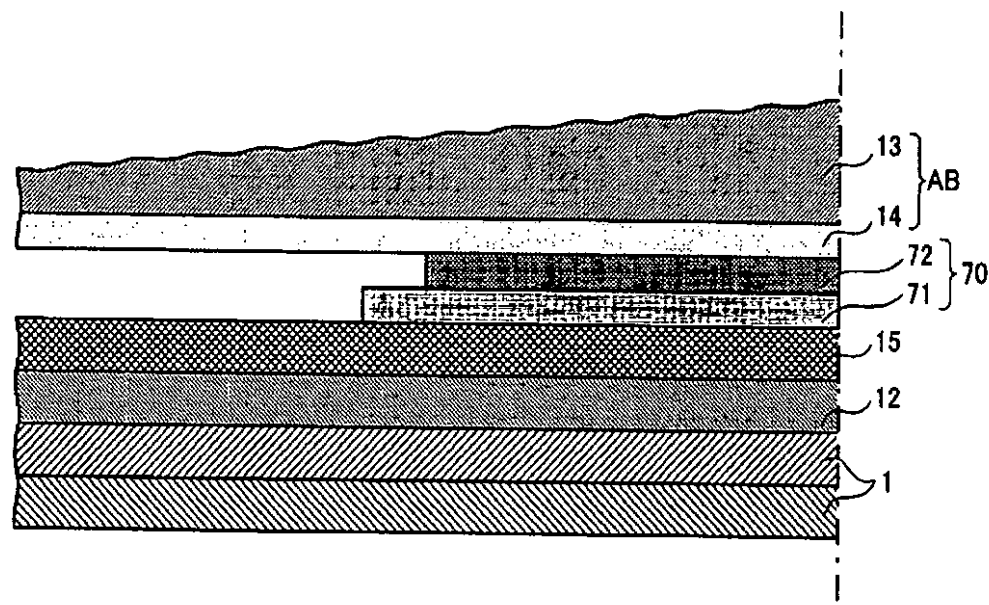


FIG.5

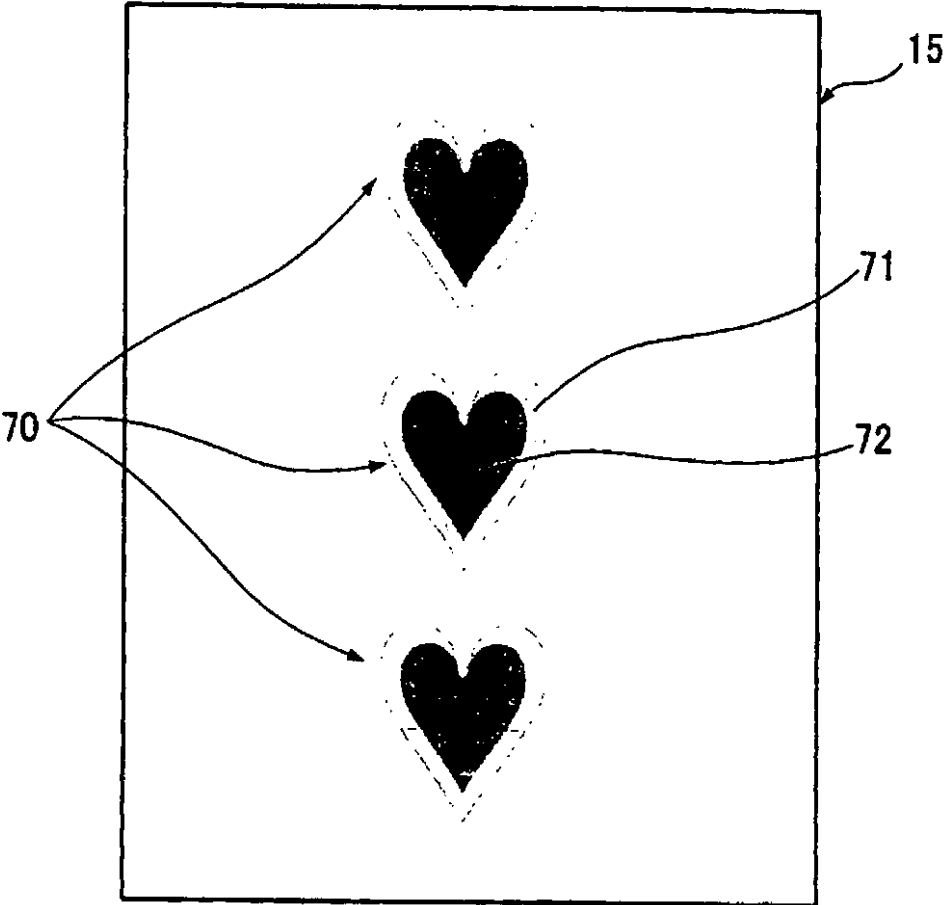


FIG.6

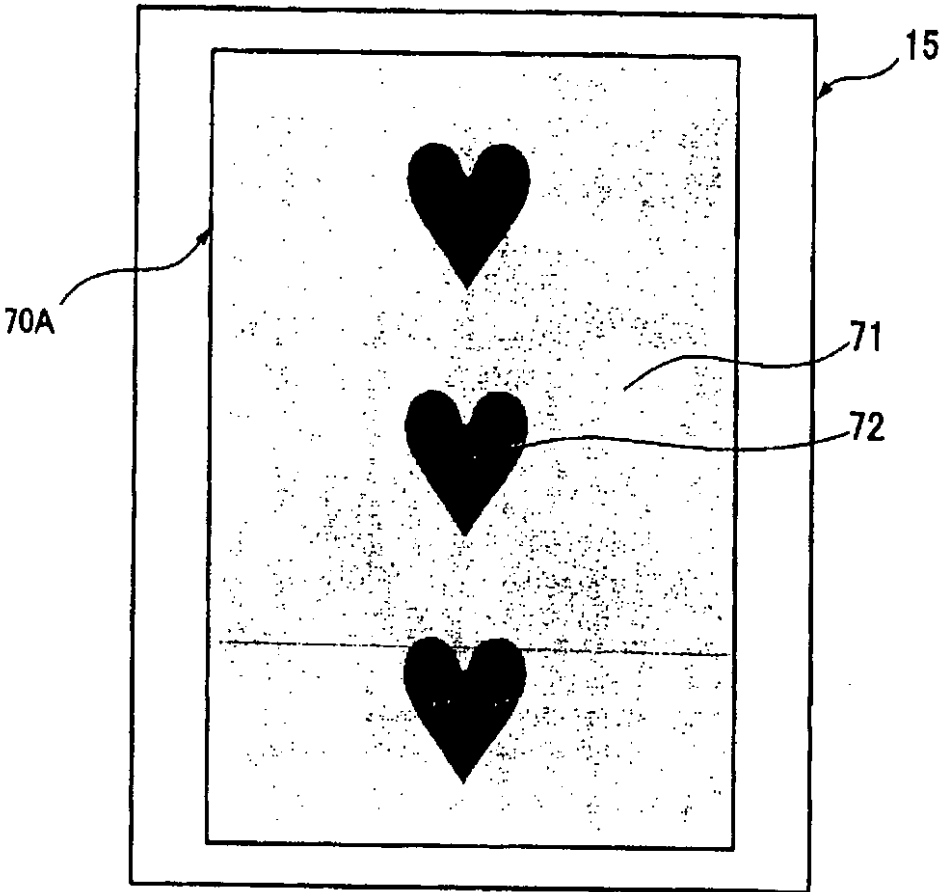


FIG.7

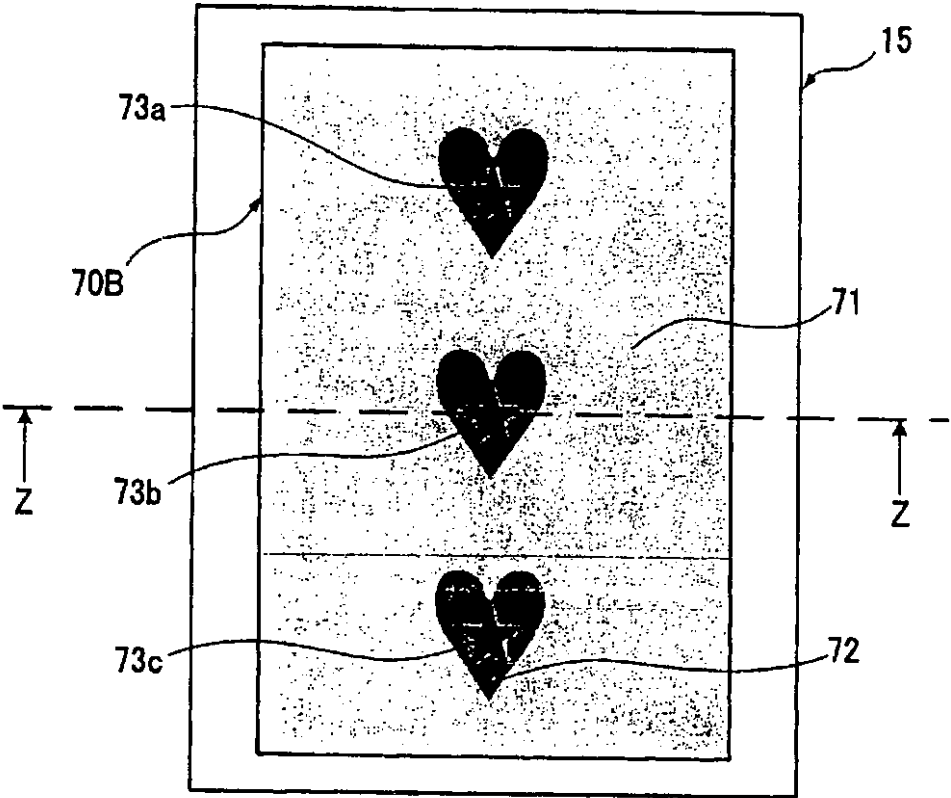
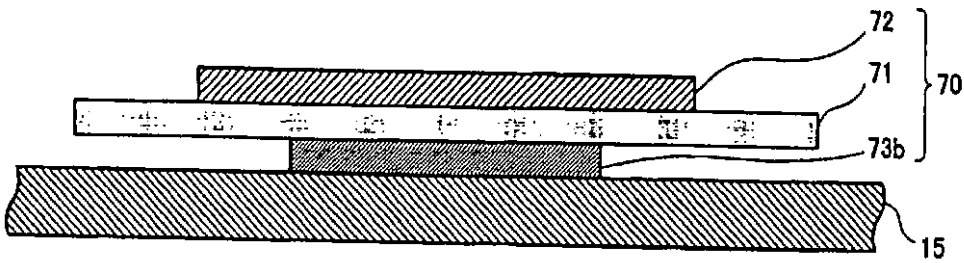


FIG.8



ABSORBENT ARTICLE

TECHNICAL FIELD

[0001] This invention relates to an absorbent article such as a disposable paper diaper, a sanitary napkin or the like, and more particularly to an absorbent article provided with an indicator means capable of identifying an excretion of body fluid such as urine or the like from an outer side.

BACKGROUND ART

[0002] A quality giving amenity to wearer and giving usability to user is required for an absorbent article such as a disposable paper diaper, a sanitary napkin or the like. In order to obtain the amenity, a water vapor permeable film is generally employed in this field, and there is a tendency that the level of water vapor permeability becomes higher and higher from year to year. Further, in order to improve the usability, an indicator means informing the user (for example, a mother) of the excretion of the body fluid of the wearer (for example, a nursing) is in heavy usage, and there has been developed a water content indicator which quickly responds with a small amount of water content as the indicator means.

[0003] Previously, as the water content indicator provided in the absorbent article as mentioned above, there has been generally known an absorbent article in which a display element constituted by a water based ink or paint discolored by the water content is directly applied to an inner surface (that is, a skin contact surface) side of a base material sheet constituted by an unpigmented hydrophilic paper (refer, for example, to Japanese Unexamined Patent Publication No. 9-299401), or an absorbent article in which a hydrophilic composition discolored by a change of pH on the basis of the water content is directly applied to an inner surface of a liquid impermeable back sheet (refer, for example, to Japanese Unexamined Patent Publication No. 2003-210522).

[0004] However, in the conventional absorbent article provided with the water content indicator mentioned above, for example, in the case that it is stored in a warehouse at a time of transporting, or in the case that it is displayed at the store or the like, it has been a problem that the absorbent article is exposed to the outside air and the outside light, and the water content indicator is already reacted and discolored before being used. If the water content indicator is reacted and discolored before being used as mentioned above, it is hard to identify from outer side whether or not the excretion of body fluid is actually executed. Further, in the case that a small amount of body fluid is excreted, it is more harder to identify the excretion.

[0005] This invention has been made under the circumstances as described above, and its object is to provide an absorbent article which removed the defect of the absorbent article as mentioned above, which prevent the function from decreasing even if it is exposed to the outside air and the outside light in the transportation or the storage or the like, which provided with a high sensitive water content indicator which can immediately identify the excretion from the outer side even if it is a small amount of body fluid, further which give an amenity to a wearer and give a usability to a user.

DISCLOSURE OF THE INVENTION

[0006] The above object of this invention is attained by providing an absorbent article structured by integrally form-

ing at least a liquid permeable top sheet, an absorbent, a water vapor permeable waterproof sheet, and a liquid impermeable back sheet in this order, characterized in that a water content indicator is provided on an inner surface of the water vapor permeable waterproof sheet, the water content indicator being constituted by a hydrophilic resin coating layer and an information mark provided on an inner surface of the hydrophilic resin coating layer.

[0007] The above object of this invention is more effectively attained by providing an absorbent article characterized in that the water vapor permeable waterproof sheet is constituted by a sheet material in which a water vapor permeability on the basis of JIS Z-0208 method of test is 700 g/m²/24 h or more.

[0008] The above object of this invention is more effectively attained by providing an absorbent article characterized in that the hydrophilic resin coating layer constituting the water content indicator and the information mark are formed in approximately same shape.

[0009] Moreover, the above object of this invention is effectively attained by providing an absorbent article characterized in that a print surface by a general ink is provided at a position corresponding to the information mark between the water vapor permeable waterproof sheet and the hydrophilic resin coating layer.

EFFECT OF THIS INVENTION

[0010] As mentioned above, the absorbent article of this invention is provided with the water content indicator constituted by the hydrophilic resin coating layer having a moisture resistance on the inner surface of the waterproof sheet having the high water vapor permeability, and the information mark formed on the inner surface of the hydrophilic resin coating layer. Therefore, according to the absorbent article of this invention, a stuffy state is not generated even if the wearer has the absorbent article on, owing to the water vapor permeable waterproof sheet having the high water vapor permeability, whereby it is possible to give the amenity to the wearer. Further, since the provided water content indicator has the moisture resistance, the function of the water content indicator is not deteriorated by the humidity of the outside air. Furthermore, since the water content indicator has the high sensitivity, there can be provided with the absorbent article having a very high usability for the user, that the water content indicator is rapidly reacted and changed by the body fluid even if the amount of excretion of the body fluid is extremely small, whereby it is possible to immediately inform the user of the excretion.

[0011] In this case, the moisture resistance in this invention means that the water vapor permeability, which the waterproof sheet essentially has, lower by coating the resin on the waterproof sheet, in the case that the water vapor permeability is measured on the basis of JIS Z-0208 method of test. In accordance with experiment of this inventor, if PVA resin of 10 μ m is coated on the waterproof sheet which the water vapor permeability is 9000 g/m²/24 h, it appears that the water vapor permeability lower to 1500 g/m²/24 h. As described later, it is preferable that the water vapor permeable waterproof sheet is constituted by a sheet material in which the water vapor permeability on the basis of JIS Z-0208 method of test is 700 g/m²/24 h or more, particularly 7000 g/m²/24 h or more. Further, in accordance with this

absorbent article on the basis of the structure mentioned above, there is obtained a pronounced effect that the water content indicator is reacted and changed for an extremely short time within 10 second, even in the case that a small amount, for example, 10 cc of urine is excreted.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is an expansion plan view of a disposable paper diaper in accordance with a first embodiment of this invention.

[0013] FIG. 2 is a sectional view taken along the line X-X of FIG. 1.

[0014] FIG. 3 is a sectional view taken along the line Y-Y of FIG. 1.

[0015] FIG. 4 is an enlarged cross sectional view of the main portion of the first embodiment.

[0016] FIG. 5 is a plan view of the main portion of the first embodiment.

[0017] FIG. 6 is a plan view of the main portion of the second embodiment in accordance with this invention.

[0018] FIG. 7 is a plan view of the main portion of the third embodiment in accordance with this invention.

[0019] FIG. 8 is a sectional view taken along the line Z-Z of FIG. 7.

BEST MODE OF CARRYING OUT THE INVENTION

[0020] A description will be in detail given below of contents of this invention by exemplifying a case that an absorbent article is constituted by a disposable paper diaper. In this case, it is needless to say that this invention is not necessarily limited to this example, but that variations maybe made without departing from the scope of claims.

[0021] FIG. 1 shows a first embodiment of this invention, and it is a plan view in the case of expanding a pants type disposable paper diaper (hereinafter, refer to as "present paper diaper") 100 and viewing it from a front face side, FIG. 2 is a sectional view taken along the line X-X of FIG. 1, and FIG. 3 is a sectional view taken along the line Y-Y of FIG. 1.

[0022] The present paper diaper 100 is formed by adhering and fixing an absorbent main body 10 integrated by adhering a rectangular liquid permeable top sheet 11, an absorbing element AB formed by covering a sand glass-shaped absorbent 13 with a crepe paper 14, a rectangular water vapor permeable waterproof sheet 15, and a liquid impermeable back sheet 12 by a hot melt adhesive agent or the like in this order (reference sign * in the drawing denotes an adhered portion) to a front face side of a flexible outline sheet 1. In this case, a liquid permeable second sheet 11S is interposed between the liquid permeable top sheet 11 and the absorbing element AB. In this case, for the purpose of increasing a fitting property around a hipline and preventing a body fluid from leaking out from a longitudinal direction, a waist elastic stretchable member 20 and a hipline elastic stretchable member 21 are provided, and in order to prevent body fluid from leaking out from a leg line opening portion LO, there is formed a rising cuff B (this rising cuff B is constituted by a rising portion B1 and a flat surface contact

portion B2) for around a leg protruding to a front face side by a rising sheet 40 continuously provided in a width direction and elastic stretchable members 50 and 60.

[0023] The outline sheet 1 provided with the absorbent main body 10 is structured such that a front body side F and a back body side B are folded around a crotch portion 4 in a post-process of production, and both side edge portions 30 in a longitudinal direction are adhered by means of an ultrasonic sealing, a thermal welding or the like. Accordingly, a waistline opening portion DO and a legline opening portion LO are formed, whereby the pants type disposable paper diaper 100 is completed (a completion drawing is not illustrated).

[0024] In this case, the outline sheet 1 is formed by laminating two transparent to semitransparent laminated unwoven fabric cloths or the like having an air permeability and a water repellent. Further, since the top sheet 11 directly touches with a skin of a wearer, the top sheet 11 preferably employs an unwoven fabric cloths, a porous plastic sheet or the like having a pleasant feel. The absorbent 13 may employ any material as far as it can absorb and hold body fluid, in general, it preferably employs a material in which an absorbent main body obtained by mixing an absorbable polymer to a cotton-like pulp and the absorbent main body is formed in a sand glass shape having certain degree of thickness and rigidity. The absorbing element AB is obtained by covering an entire of an outer peripheral surface of the absorbent main body with a crepe paper 14 having a flexibility and a liquid permeability. The water vapor permeable waterproof sheet 15 mentioned below is provided together with the liquid impermeable back sheet 12 in such a manner as to cover both side portions of a surface wrapping from a back face to a front face side of the absorbing element AB.

[0025] The back sheet 12 employs a sheet material having at least a water shielding property such as the transparent to semitransparent polyethylene, polypropylene or the like, and additionally it employs a laminated unwoven fabric cloths obtained by laminating the unwoven fabric cloths on the polyethylene sheet or the like. Further, a filamentous elastic rubber constituted by a styrene family rubber, an olefin family rubber, an urethane family rubber, a polyurethane, apolystyrene or the like is preferably employed as a raw material of the elastic stretchable members 20, 21, 50 and 60 for the respective intended uses mentioned above.

[0026] A micro porous sheet or the like is preferably employed for the water vapor permeable waterproof sheet 15 used in the present paper diaper 100, from the point of view of preventing leakage of body fluid and a stuffy state. The micro porous sheet is obtained by melting and kneading an inorganic filler into a material having water shielding property and water vapor permeability, for example, an olefin resin such as a polyethylene, a polypropylene or the like so as to form a sheet, and thereafter centrifuging in a uniaxial or biaxial direction. Further, it is possible to employ a material obtained by directly coating an acryl resin, a polyurethane resin or the like on a base material such as an unwoven fabric cloths or the like.

[0027] In this case, in accordance with an experiment by this inventor, taking into consideration amount of sweating of the wearer, a sheet material in which a water vapor permeability on the basis of JIS Z-0208 method of test is 700

g/m²/24 h or more is preferable for the water vapor permeable waterproof sheet 15, and in order to keep a comfortable environment particularly after a violent movement or passing urine, a sheet material in which the water vapor permeability is 7000 g/m²/24 h or more is most preferable.

[0028] In the present paper diaper 100, on an inner surface of the water vapor permeable waterproof sheet 15, a water content indicator 70 informing of an excretion of body fluid is provided at least near a center line of the absorbent 13 in a range of being covered by the absorbent 13. The water content indicator 70 is shown by a black cross section in FIGS. 2 and 3. The water content indicator 70 is constituted by a hydrophilic resin coating layer 71 and an information mark 72 provided on an inner surface of the hydrophilic resin coating layer 71, as shown in FIG. 4 by enlarging a cross section of a main portion (a portion shown by a dotted line circle R in FIGS. 2 and 3).

[0029] The hydrophilic resin coating layer 71 is formed by coating a coating liquid of hydrophilic resin, for example, CMC, PVA, PEO, poly acrylic sodium or the like on an inner surface of the waterproof film 15 at a thickness of about 1 to 20 μ m in accordance with a known coating system, for example, a gravure coater or the like. The hydrophilic resin mentioned above is further desirable such that a weather resistance is increased by adding an ultraviolet absorbers such as salicylic acid family, benzophenone family, benzotriazole family, cyanoacrylate family, or the like, ultraviolet scattering agent such as zinc oxide, titanium oxide or the like, light stabilizer such as hindered amine family or the like, antioxidant such as ascorbic acid or the like to the hydrophilic resin coating layer 71. In this case, if the layer thickness is too large, the portion, which is thick, is undesirably becomes hard and feels unpleasant.

[0030] The information mark 72 is formed by coating a known coating liquid for water content indicator on the inner surface of the hydrophilic resin coating layer 71 at a thickness between 1 and 20 μ m by a known coating machine in the same manner as mentioned above. The known coating liquid for water content indicator is constituted, for example, by an erasing ink colored from an achromatic color to a specific color of a coloration chemical compound on the basis of a molecular contact by one kind or more electron donating coloration chemical compound selected from crystal violet lactone, malachite green lactone or the like with electron accepting property developed color chemical compound corresponding to organic acid or organic acid salt such as citric acid, itaconic acid, salicylic acid, zincsalicylate or the like, and decolorized only by an attachment of the water, a water soluble ink using a food color such as a blue No. 1 or the like, a hot melt adhesive agent composition formed so as to include an indicator such as promophenol blue, methyl red or the like discolored in response to a change of pH control component and pH. In this case, if the thickness of the information mark 72 is too small, it is hard to be viewed from the outer side. On the contrary, if the thickness is too large, the amount of the coating liquid is increased, and a manufacturing cost is increased. Accordingly, it is preferable to set the thickness in the range mentioned above.

[0031] FIG. 5 is a plan view showing a flat surface shape of the water content indicator 70 constituted by the hydrophilic resin coating layer 71 and the information mark 72.

[0032] As illustrated, the flat surface shape of the water content indicator 70 shows a state in which the information

mark 72 is formed on the inner surface of the hydrophilic resin coating layer 71 of a heart-shaped pattern arranged at even intervals in a longitudinal direction of the center portion of the water vapor permeable waterproof sheet 15 in such a manner as to be included within the heart-shaped pattern and have approximately the same shape. When viewing the water content indicator 70 structured as mentioned above from the outer side via transparent to semi-transparent back sheet 12 and the outline sheet 1, it appears such that the design is applied to the present paper diaper 100, and there is an advantage that a beauty is given to the viewer.

[0033] Further, if the outer shape of the hydrophilic resin coating layer 71 is brought into line with the outer shape of the information mark 72 as mentioned above, it is possible to minimize used amount of the hydrophilic resin coating liquid forming the hydrophilic resin coating layer 71, whereby it is possible to reduce the manufacturing cost of the present paper diaper 100.

[0034] In this case, the information mark 72 is not limited to the heart-shaped pattern as mentioned above, but can be appropriately selected in correspondence to the purpose from the conventionally known various patterns, for example, letter, mark, design, a combination thereof or the like.

[0035] In accordance with the present paper diaper 100 provided with the water content indicator 70 as mentioned above, if the body fluid, for example, the urine is excreted to the surface of the liquid permeable top sheet 11, urine is diffused and moved so as to be absorbed within the absorbing element AB. However, at this time, if urine acts on the water content indicator 70 adjacent to the absorbing element AB although it is at a trace quantity, the information mark 72 is immediately discolored to decolorized in response to the water content included in this urine. Accordingly, the user can immediately recognize the change of the information mark 72 from the outer side via the transparent to semi-transparent back sheet 12 and the outline sheet 1.

[0036] In this case, in accordance with an experiment by this inventor, it is confirmed that the water content indicator 70 is reacted and discolored for a short time within ten second with respect to an extremely small amount of urine, for example, 10 cc urine. In this case, the water content indicator 70 is provided in the present paper diaper 100 having the absorbent 13 formed by uniformly mixing the pulp and the SAP in such a manner that respective weights come to 200 g/m² and 150 g/m².

[0037] Further, as mentioned above, since the hydrophilic resin coating layer 71 constituting the water content indicator 70 has an excellent property in terms of the moisture resistance, the water content indicator 70 is neither reacted nor discolored even if the present paper diaper 100 is exposed to the outside air over the long term, and it is possible to maintain the function long.

[0038] Further, in the present paper diaper 100, since the water vapor permeable waterproof sheet 15 employs the sheet material having the excellent water vapor permeability in which the water vapor permeability on the basis of JIS Z-0208 method of test is 700 g/m²/24 h or more, most preferably 7000 g/m²/24 h or more, the stuffy state is not generated in the crotch portion even if the wearer wears it for

a long time. Further, since it feels pleasant, it is possible to apply the comfortable feeling to the wearer.

[0039] In this case, the present paper diaper 100 in accordance with the first embodiment of this invention described above is provided with the second sheet 11S and the outline sheet 1, however, these sheet members are not always necessary, but can be omitted in accordance with configuration, purpose, application or the like of the absorbent article.

[0040] Further, as the system for forming the hydrophilic resin coating layer on the inner surface of the water vapor permeable waterproof sheet, or the system for forming the information mark on the inner surface of the hydrophilic resin coating layer, it is possible to employ in addition to the gravure printing, offline printing system, for example, flexographic printing or the like, or inline printing system on the basis of ink jet, hot melt or the like.

[0041] FIG. 6 shows a main portion of a second embodiment in accordance with this invention, and in particular, it is a plan view of a water content indicator 70A in accordance with a modified embodiment of the water content indicator 70 provided in the present paper diaper 100.

[0042] As illustrated, the water content indicator 70A is structured such that the hydrophilic resin coating layer 71 is formed in a rectangular shape over an approximately entire surface of the water vapor permeable waterproof sheet 15, and the information marks 72 having the same shape and thickness as mentioned above are provided in the inner surface thereof. In the case that the hydrophilic resin coating layer 71 is set wider as mentioned above, and the information mark 72 is provided on the hydrophilic resin coating layer 71, it is possible to obtain the same effect as mentioned above, apart from cost problems, and there can be also obtained an advantage that marks of various forms can be set in large numbers.

[0043] In the same way, FIG. 7 shows a main portion of a third embodiment in accordance with this invention, and in particular, it is a plan view of a water content indicator 70B in accordance with a modified embodiment of the water content indicator 70A, and FIG. 8 is a sectional view taken along the line Z-Z of FIG. 7.

[0044] As illustrated, the water content indicator 70B is common to the water content indicator 70A in the point of the structure constituted by the hydrophilic resin coating layer 71 and the information mark 72 having the same shape and thickness, however, as shown in FIG. 8, it is different from the water content indicator 70A in point of printed surfaces 73a, 73b and 73c which are provided between the water vapor permeable waterproof sheet 15 and the hydrophilic resin coating layer 71 at positions corresponding to the arranged positions of the respective information marks 72 by a general ink, that is, an ink which is not discolored

even if it is brought into contact with the water content by the same printing system mentioned above. These printed surfaces 73a, 73b and 73c are formed by same color ink to different color inks each to each. In this case, since a capability of the ink is lowered if different inks are mixed, the mixed ink is not preferable.

[0045] Further, in this embodiment, a flat surface shape of the printed surfaces 73a, 73b and 73c are mark of star-shaped, however, the mark can be optionally changed as mentioned above.

[0046] In accordance with the water content indicator 70B mentioned above, in spite that each of the information marks 72 is discolored to decolored if the excreted urine is brought into contact with the water content indicator 70B, the printed surfaces 73a, 73b and 73c are not changed. Accordingly, in the case of viewing from the outer side, only the printed surfaces 73a, 73b and 73c remain, and the pattern of the print appears to be changed between after and before passing urine, whereby it is possible to instantaneously and securely inform the user of the excretion.

INDUSTRIAL APPLICABILITY

[0047] It goes without saying that this invention is not limited to the pants type disposable paper diaper, but can be widely applied to the other absorbent articles such as the sanitary napkin, the urine remaining pad and the like in addition to a tape type disposable paper diaper.

What is claimed is:

- 1. An absorbent article structured by integrally forming at least a liquid permeable top sheet, an absorbent, a water vapor permeable waterproof sheet, and a liquid impermeable back sheet in this order, characterized in that a water content indicator is provided on an inner surface of the water vapor permeable waterproof sheet, the water content indicator being constituted by a hydrophilic resin coating layer and an information mark provided on an inner surface of the hydrophilic resin coating layer.
- 2. An absorbent article as set forth in claim 1, characterized in that the water vapor permeable waterproof sheet is constituted by a sheet material in which a water vapor permeability on the basis of JIS Z-0208 method of test is 700 g/m²/24 h or more.
- 3. An absorbent article as set forth in claim 1, characterized in that the hydrophilic resin coating layer constituting the water content indicator and the information mark are formed in approximately same shape.
- 4. An absorbent article as set forth in of claim 1, characterized in that a print surface by a general ink is provided at a position corresponding to the information mark between the water vapor permeable waterproof sheet and the hydrophilic resin coating layer.

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