Wound treatment

Head trauma cap for emergency treatment of head wounds

An emergency head trauma bandage cap with a detachable strap system has been developed by First Responder Solutions.

Disclosed in US Patent 9,149,393, the device is placed on the cranium to cover the crown, forehead, back of the head, sides of the head around the ears, and the temples of an injured patient with minimal movement of the neck and spine.

According to the company of Carmel, California, USA, the head trauma bandage cap, which is being marketed as the Trauma Beanie Bandage, allows the head to swell from cranial pressure, but provides sufficient contact with the wound to minimize bleeding.

It is particularly suited for emergency field use, where rapid stabilization of a patient is required for transport.

In particular, the device:

- delivers minimal pressure to control bleeding;
- does not compromise cervical spine immobilization;
- allows for fast and effective application of cold packs to control intracranial/internal swelling or hot packs to prevent hypothermia in non-trauma situations;
- does not come apart during treatment and transport;
- does not require a caregiver to re-wrap the dressing.

The cap is constructed of absorbent, medical-grade materials that have a non-adherent layer positioned directly in contact with the head or skin.

It can comprise an impermeable, waterproof yet breathable film that forms the outer layer and an inner

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layer formed of a suitable soft textile, such as traditional bleached cotton gauze, or nonwoven material, such as hydroentangled and needlepunched fabrics.

The fibres can range from cotton or viscose to polyester (PES) or polypropylene (PP). A preferred material is a PES/viscose needlepunched blend in the weight range of 100–200 g.m⁻²; a blend of cotton with an elastane such as Lycra can also be considered.

Exterior pouches can optionally be fixed to the exterior of the flexible cap and structured to receive and secure hot or cold packs (the type of pack depends upon whether cold applications are required to stop further swelling, or whether hot applications are required to help prevent hypothermia in non-head trauma situations).

Figure 1 shows the head trauma bandage cap without pouches. It consists of three panels: a top (22) and two side segments (24) connected to cover the forehead/crown, sides and back of the head.

Ear observation openings (26) in the side segments allow caregivers to observe any fluid discharge from the ears.

A sterile dressing liner (not shown) is fixed to the inside of the cap. The cap and liner are constructed of a material with enough flex when placed on a patient to apply minimal pressure to the head to control bleeding without aggravating intracranial pressure.

A detachable strap system (28) with a chin cup (30) is formed by two crossing straps (32, 34) with ends (36, 38) secured with hook-and-loop strips (40, 42) fixed to the cap periphery edges.

The detachable strap system is structured to secure the cup about a patient’s chin to secure the cap to the head, and be loosened and re-attached to prevent circulation restriction and avoid aggravating intracranial pressure.

First Responder Solutions explains that traditional bandaging requires multiple strips of gauze or sterile wrappings to be wound about the patient’s head. This is often time-consuming and requires the head to be
repeatedly lifted or moved, which can aggravate or severely compromise spinal injuries. Meanwhile, inflatable compression bandages can aggravate open wounds by applying too much cranial pressure.

The flexible head trauma bandage cap described in the Patent is quickly applied over the cranium in a manner that does not compromise cervical spine immobilization. It not only controls bleeding, but also does not apply excessive pressure on the wound to restrict circulation or aggravate intracranial pressure.

If head swelling occurs, the cap’s securing straps can be loosened and re-affixed to prevent increasing intracranial pressure.

See also: US Patent 9 149 393, Head trauma bandage cap and method.

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Hydrocolloid dressings for pressure ulcer prevention

Japanese researchers report that the application of hydrocolloid dressings containing ceramide 2 can reduce the risk of pressure ulcer development in high-risk surgical patients.

In an article published in Chronic Wound Care Management and Research (6 November 2015, Vol. 2015:2, pp. 171–179), ceramide 2-containing hydrocolloid dressings were compared with polyurethane (PU) film dressings in a single-centre, randomized clinical trial.

Lead author Masushi Kohta of the Medical Engineering Laboratory of Alcare, Tokyo, explained that ceramide-2 provides the dressing with a low-friction outer layer to reduce the friction coefficient on the skin of elderly patients significantly.

The trial was conducted at an acute care hospital in Ibaraki, Japan, in the first half of 2014 and compared PU dressings (Opsite from Smith & Nephew, Tegaderm from 3M and Multifix from Alcare) with a ceramide 2-containing hydrocolloid dressing (Remois Pad from Alcare).

The principal conclusion was that, compared with film dressings, applying hydrocolloid dressings containing ceramide 2 reduces the risk of pressure ulcer development in surgical patients who are at a high risk.

The results suggest that the ceramide 2-containing hydrocolloid dressing may have a positive effect owing to the high water-holding ability of the hydrocolloid layer in contact with the skin, which results in creating an occlusive environment at the intervention sites during surgery. It is further suggested that the dressing may be successful in reducing the friction and shear, and in keeping the water-holding capacity of the skin.
surface, which results in a reduction in pressure ulcer formation during the intra-operative period.

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Multilayer dressing with conductive regions

An improved wound dressing that enables electrical stimulation of the wound has been developed by Mölnlycke Health Care.

According to the company of Gothenburg, Sweden, the device outlined in US Patent 9 161 859 also functions as a conventional wound dressing and enables easy attachment of transcutaneous electrical nerve stimulation (TENS) electrodes.

The wound dressing (1) includes:

• a wound pad (2) of absorbent material;
• a backing layer (3) covering the wound pad;
• an adhesive layer (4) for attaching the dressing to skin.

The backing layer is composed of a first plastic film (5) with a hole (6) and a second, conductive plastic film (7) fixed to the first plastic film along the edge of the hole.

The plastic material in the backing layer is preferably polyurethane (PU), but other plastic materials, such as polyester (PES) or polyethylene (PE), can also be used, explains Mölnlycke Health Care.

The filler in the conductive plastic film is preferably carbon black, but other carbonaceous substances can be used, such as carbon fibres and carbon nanotubes.

It is also possible to use other conductive fillers, such as silver-coated glass, nickel-coated graphite or metal fillers.

The electrode of TENS devices can be directly attached to this conductive region (i.e. the outside of the conductive film) without the need for intermediate contact components.

When the electrical stimulation of the wound has been performed, the electrode is removed from the conductive plastic film and the wound dressing will then function as a conventional wound dressing.

See also: US Patent 9 161 859, Multilayer wound dressing with conductive regions.

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Figure 2:

Sectional view of a wound dressing that enables electrical stimulation of the wound, developed by Mölnlycke Health Care of Gothenburg, Sweden.
Cellulose ethyl sulphonate-based absorbent material for dressings

Absorbent materials based on cellulose ethyl sulphonate have been developed by Speciality Fibres & Materials (SFM). The materials featured in US Patent 9 144 625 will be useful in the manufacture of advanced wound care dressings, says the company of Coventry, UK.

In particular, they are said to exhibit excellent absorption and retention of fluid while maintaining their integrity sufficiently to be removed from the wound site in one piece, without irrigation, and with minimum pain and shedding.

Further, as with carboxymethyl cellulose (CMC), absorption of fluid is virtually instantaneous since ionic exchange is not required for the fibres to become gellable, says SFM.

Preferably, the water-insoluble cellulose ethyl sulphonate is in the form of fibres 20–50 mm in length and with a linear density of 0.9–3.0 dtex.

For use as an absorbent advanced wound dressing, the fibres of the absorbent material most preferably have an absorbency of at least 10 g.g⁻¹ of 0.9% saline solution.

Alkalization and etherification can be carried out as a single step in which the alkali (e.g. a 47% sodium hydroxide solution) and alkenyl sulphonate and chloromethylsulphonate are added at the same time in one reaction vessel (a “one-pot” process).

Alternatively, they can be carried out in two separate reaction steps.

Fibrous celluloses with a high degree of crystallinity that are particularly suitable include cotton or regenerated cellulose fibres, such as lyocell.

Reinforcing fibres and/or antimicrobial agents are optionally applied to the cellulose ethyl sulphonate.

For instance, sheath/core bicomponent fibres (preferably a polypropylene (PP) core/polyethylene (PE) sheath) can be blended or bonded to the cellulose ethyl sulphonate.

Antimicrobial agents applied to the cellulose ethyl sulphonate fibres and absorbent articles can include silver (1.5–2.0 wt%) and/or polyhexamethylene biguanide (0.5–0.7 wt%).

The company explains that wound dressings based on fibres of alginic acid or its salts have good overall absorbency of wound fluid, but suffer from slow absorption owing to the need to exchange multivalent ions binding the fibrous structure together with sodium ions present in wound fluid.

As a result, the mechanical strength of the gelled fibres is compromised, and it is not routinely possible to remove a saturated dressing in one piece.

Meanwhile, the advantage of CMC fibres over alginate-type dressings is that absorption of fluid is virtually instantaneous since no ionic exchange is required to render the fibres gellable.

Further, those fibres based on a highly crystalline cellulose, such as lyocell, tend to retain a higher level of mechanical strength and can be removed from the wound site in one piece.

However, the absorptive capacity of CMC fibre material is dependent on the pH of the wound fluid, reducing dramatically at acidic pH. The company says this is a serious drawback since chronic wound fluid pH can range between 4 and 8, depending on the state of healing.

However, the instantly gelling, absorptive dressing materials described in the Patent continue to absorb to a good level at reduced pH.

They will be particularly useful for wounds with moderate-to-high levels of exudates, and for flat or cavity wounds of this type; typical examples include pressure sores and leg ulcers.

The materials may also be desirable for use in the personal care sector, including disposable sanitary articles, such as diapers and training pants, feminine hygiene products and incontinence products.
Conformable dressing with self-supporting substrate

A conformable medical dressing (10) that includes a self-supporting substrate (12) has been developed by 3M of St Paul, Minnesota, USA.

The device is said to be more effectively supported and/or more conformable for application to irregular-shaped surfaces, particularly those associated with a joint, such as a knee, ankle or elbow, and especially in wound therapy applications, such as negative-pressure therapy.

Described in US Patent 9 168 180, the medical dressing also includes a backing layer (14) that extends to the perimeter of the dressing.

The backing layer is typically thin and flexible, and either transparent or translucent, allowing the wound and/or surrounding skin to be viewed through it.

Suitable backing materials include nonwoven fibrous webs, woven fibrous webs, knitted fabrics and films. Preferred backing materials are translucent or transparent polymeric films with a high moisture vapour transmission rate, including polyurethanes (PUs, e.g. Estane), polyether polyesters (e.g. Hytrel), polyether amides (e.g. Pegax) and polyolefins (e.g. Engage).

The backing layer further comprises an adhesive layer (17) on all or part of the surface that faces the wound during use.

The self-supporting substrate is a thermoplastic polymer, preferably polyethylene (PE).

The substrate, which can be in the form of a nonwoven material or polymeric film, is applied to the backing layer on the top surface facing away from the wound; it can also be translucent or transparent.

The self-supporting substrate also includes an adhesive layer (21) that facilitates attachment to the backing layer. This can be a layer of adhesive or an adhesive composite, such as an adhesive/polyethylene/adhesive composite.

The self-supporting substrate comprises a first planar surface (11), a side wall (22) and a flange (44). The flange comprises a second planar surface that is generally parallel to the first planar surface; the side wall is continuous in a circular or oval pattern.

The planar surface and side wall form a cavity (25) enclosed within the profile of the self-supporting substrate that projects from the backing layer. The
flange provides a planar surface that is used to attach the substrate to the backing layer.

The medical dressing typically includes a release liner (24) that remains attached to the dressing until it is applied.

A corrugated portion, which is typically formed from ridges and grooves, on the planar surface of the self-supporting substrate aids in the conformability of the dressing when applied to a patient.

As the planar surface of the substrate is bent or rotated to conform to the wound surface, such as a knee, the corrugated portion expands to allow the substrate to conform to the wound surface without flattening against it or otherwise compressing the wound surface and/or any intervening elements (e.g. a foam or wound packing material) in the cavity of the substrate.

The dressing can also comprise an absorbent material to absorb fluids, including liquids, entering the sealed environment. Examples of suitable absorbent materials include hydrophilic foams, woven materials, nonwoven materials and combinations of these, and they can be made of, for instance, cotton or viscose.

See also: US Patent 9 168 180, Conformable medical dressing with self supporting substrate.

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Distribution contract for self-adaptive dressing

OSN ovative Systems of Santa Clara, California, USA, is now selling the Enluxtra Any Wound functionally self-adaptive wound dressing in the USA through ROI (Resource Optimization & Innovation), an integrated supply chain organization in the health care sector.

The dressing is based on superabsorbent polymer technology and inactive bio-inert components. It is said to be the only self-regulating superabsorbent fibre dressing with adaptive absorbency and a built-in adaptive hydration function.

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Fibres

Meraklon bicomponent fibres for hygiene applications

European polypropylene (PP) staple fibre supplier Beaulieu Fibres International (BFI) has extended its Meraklon range with the introduction of polyolefin bicomponent fibres that combine softness and strength for nonwovens.

The new fibres are based on a PP core and polyethylene (PE) sheath. The PE sheath offers excellent softness in the nonwoven, while high strength and thermal stability are ensured by the solid PP core, says the company of W ielsbeke, Bel gum.

In addition, PE’s low melting temperature (130°C) supports low bonding temperatures during processing. The first customer trials have confirmed the good performance of the fibre, says BFI.

The combination of properties makes the bicomponent fibres ideal for hygiene topsheets where softness for direct skin contact is required, the company adds. They can also be used as bonding fibres in filters, insulation materials and other technical applications.

Further, it is possible to tailor the performance through different finishes, such as permanent hydrophilic and hydrophobic, and other well-being features and additives, including ultra-soft and titanium dioxide.

Meraklon bicomponent fibres are designed for carded air-through processes and are available globally in 1.2–
8.9 dtex. They are produced at the Meraklon plant in Terni, Italy.

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Hygiene

Absorbent article makes menstrual discharge less visible

An absorbent article, such as a sanitary napkin (1), that makes the colour of menstrual blood or vaginal discharge less visible is disclosed in US Patent 9 125 769 by Unicharm.

In practice, the colour of the blood or discharge absorbed by the absorbent layer can be effectively concealed by the colour of the coloured lower layer, says the company of Tokyo, Japan.

The absorbent core can comprise, for instance, a fluffed pulp or an airlaid nonwoven fabric and a super-absorbent polymer.

The colour of the absorbent core is generally a yellow-tinged white colour or a light yellow colour, and has a b* value of 1–12 and an L* value of 90 or more in the International Commission on Illumination (CIE) L*a*b* colour system, where L* indicates the brightness of the colour and a* and b* indicate the tint of the colour.

The liquid-permeable surface material (2) is typically a nonwoven fabric formed by an air-through method using a carded web and comprising a wide range of fibre types, such as a high-density polyethylene (PE)/polyethylene terephthalate (PET) core-sheath bicomponent fibre.

The surface material is slightly coloured light blue through which the absorbent core is visible. More specifically, the colour of the surface material has an L* value of 88 or more, an a* value of 0–0.3 and a b* value of -8–0.

Unicharm notes that if the L* value is less than 88, the blue colour of the surface material becomes too dark and the absorbent core viewed through the surface material looks darkish.

Further, if the a* value is less than 0, the colour of the surface material becomes greenish, whereas if it exceeds 0.3 it becomes purplish. In both cases, the clean feeling of the absorbent core is somewhat lessened.

Further, if the b* value is less than -8, the blue colour of the surface material becomes too deep and the colour of the absorbent core viewed through the surface material sometimes looks darkish, whereas if the b* value exceeds 0, the colour of the surface material is tinged with yellow so that the yellow tint of the absorbent core is reinforced.

Figure 4:

Front view of a sanitary napkin that makes the colour of menstrual blood or vaginal discharge less visible, disclosed by Unicharm of Tokyo, Japan.
The nonwoven fabric can be coloured during or after production; alternatively, a coloured fibre or coloured binder can be used.

See also: US Patent 9125769, Absorbent article.

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Suominen launches nonwoven for hygiene market

Nonwovens supplier Suominen has launched Fibrella Move for the hygiene market. The material is said to use state-of-the-art forming, bonding and finishing technologies to improve fluid acquisition and management for feminine care and other absorbent hygiene applications.

According to the company of Helsinki, Finland, Fibrella Move enhances wearer comfort and body fit, while at the same time gives convertors a nonwoven that processes easily on high-speed converting lines and is compatible with other components.

Global Hygiene Product Manager Marjo Kuisma commented: “This uniquely designed fit-for-purpose structure delivers tailored stiffness, high loft and outstanding softness. Our new product range is a perfect example of how to differentiate with spunlaced technology.”

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Absorbent article gives perception of depth

An absorbent article (10), such as a panty liner or sanitary napkin, that gives a perception of depth is disclosed in US Patent 9132047 by Procter & Gamble.

The device employs multi-toned printing to create a signal that provides a perception of depth when the article is viewed from its top or viewing surface (28) of the topsheet (25).

By creating such a perception of depth within the absorbent article, a user is reassured prior to and during use that fluid will be drawn deep inside the product and away from the body, explains the company of Cincinnati, Ohio, USA.

The viewing surface of the absorbent article preferably comprises a coloured portion (40) and a non-coloured portion (50).

The coloured portion has a first shade (42) that is positioned within the second shade (44), which is different, either in lightness, darkness and/or colour, from the first shade.

The colour of the first and second shades of the coloured and non-coloured portions are measured by reflectance spectrophotometer, with L* a* and b* values measured from the viewing surface of the topsheet, Procter & Gamble explains.

Based on ASTM D2244-99 “Standard Test Method for Calculation of Color Differences from Instrumentally

Figure 5:
Perspective drawing of an absorbent article that gives a perception of depth, developed by Procter & Gamble of Cincinnati, Ohio, USA.
Measured Color Coordinates”, the difference in colour (i.e. $\Delta E^*$):

- between the first shade and the second shade is at least 3.5;
- between the first shade and the non-coloured portion is at least 6;
- between the second shade and the non-coloured portion is at least 3.5.

The multi-shades operate to create a perception of depth within the absorbent article for a user looking upon the viewing surface of the topsheet.

See also: US Patent 9 132 047, Absorbent article.


SCA launches premium diaper

SCA has launched a new diaper called Libero Touch, which involved hundreds of children and their parents in the development and testing, after two years of product research at its innovation centre in Gothenburg, Sweden.

According to Global Brand Innovation Manager Linus Clausen, Libero Touch contains a new, soft and ductile material that provides a better fit and movement around the waist, hips and legs, preventing leakage and keeping the baby dry for a long period of time.

Global Technical Innovation Manager Maria Holmberg explained that the diaper core consists of superabsorbents that can capture and encapsulate up to 60 times their own weight.

Further, the inner liner is said to be exceptionally soft and the outside composed of a breathable material with a cotton-like feel.

“In a blind test Libero Touch achieved outstanding results with eight out of 10 parents agreeing that our product was softer than the competitor’s product,” said Holmberg.

The Libero Touch range has also been dermatologically tested to guarantee it is soft and gentle to the baby’s skin. As with all Libero diapers, the Touch assortment also bears the Nordic Ecolabel, which guarantees the products meet stringent environmental and climate criteria.

The new diapers are available in all the Nordic countries; other markets will follow later.

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New nonwoven brand for lightweight components

Spunlaced nonwoven fabric producer Jacob Holm Group has announced a new brand for its lightweight hygiene components. With basis weights as low as 15 g.m$^{-2}$, SoftLite fabrics are said to cater to the need for lighter and softer hygiene products.

They can be used for ultra-light and soft diaper stretch ears, topsheets and backsheets in baby care, feminine care and adult incontinence applications.

Key features include excellent stretch and recovery, ultimate softness at required strength, skin sensitivity and fabrics can be engineered for optimal fluid management, according to Business Development Manager Heidi van den Hul.

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Business news

SCA divests business in South East Asia, Taiwan and South Korea

Hygiene and forest products group SCA is integrating its business in South East Asia, Taiwan and South
Korea into Chinese hygiene company Vinda, in which SCA is the majority shareholder.

As part of the transaction, SCA and Vinda have signed an agreement regarding the exclusive licence to market and sell the SCA brands Tena (incontinence products), Tork (away-from-home tissue), Tempo (consumer tissue), Libero (baby diapers) and Libresse (feminine care) in South East Asia, Taiwan and South Korea.

As a result, Vinda will hold the rights to these product brands in these Asian markets.

Vinda will also acquire the Drypers, Dr.P, Sealer, Prokids, EQ Dry and Control Plus brands in these markets, while SCA will continue to provide innovation and technical support for the business.

SCA has been a shareholder in Vinda since 2007, became its majority shareholder in late 2013, and has consolidated Vinda financials since the first quarter of 2014, when SCA divested its hygiene business in China (mainland China, Hong Kong and Macau) for integration with Vinda.

SCA’s hygiene business in South East Asia, Taiwan and South Korea had net sales of approximately SEK2.2 billion (US$308 million) in 2014. The business has around 1600 employees and three personal care production sites in Malaysia and Taiwan. The purchase consideration amounts to HK$2.8 billion (US$347 million) on a debt-free basis.

The agreement is subject to approval by the independent shareholders of Vinda, which is listed on the Hong Kong Stock Exchange. Closing of the transaction is expected during the first quarter of 2016.

See also: Medical Textiles, October 2015, page 10; October 2014, page 11; September 2014, page 11.

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Events

Inaugural Hygienix event attracts more than 600 delegates

More than 600 industry delegates from the absorbent hygiene and personal care markets attended the inaugural Hygienix event in St Petersburg, Florida, USA, at the end of October 2015.

Organized by INDA, the Association of the Nonwoven Fabrics Industry, the conference combined the Vision and Insight events, following INDA’s acquisition of the latter.

Among the highlights of Hygienix was the presentation of the Visionary Award to Sienabena of Pittsburgh, Pennsylvania, USA, for BabyBackups, a diaper extender made of superabsorbent materials that adheres to the existing diaper to contain messy baby diaper “explosions”.

The other finalists for the award were Always Discreet Bladder Protection from Procter & Gamble and X-Top Pouch for Men from McAirlaid’s.

Some of the key issues addressed at the conference included destigmatizing incontinence, odour control, fluffless cores, adhesive application techniques and sustainability in the hygiene market.

INDA said planning is now underway for the second Hygienix to be held on 24–26 October 2016 in Orlando, Florida, USA.

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Filtration

Electrospun nonwoven filter membranes for haemodialysis

Electrospinning technology and new non-antibody proteins are being used by a researcher at the UK’s University of Leeds to develop improved nonwoven filter membranes for use in haemodialysis.

Speaking in November 2015 in Leeds at the Nonwovens Innovation Academy, organized by EDANA, the international association serving the nonwovens and related industries, PhD student Birthe Lang explained that existing polysulphone hollow fibre membranes can lead to insufficient toxin removal and have a limited surface area for binder application.

In the project undertaken at the University, an electrospun polysulphone nonwoven was combined with its Adhiron protein binder (part of the Affimer technology platform developed at Leeds) to produce a filter membrane with specific affinity for uremic toxins.

An initial adsorption trial failed to show that membranes functionalized with Adhiron binder could successfully remove a model target protein (modified green fluorescent protein – mGFP) from solution.

However, when the binder was immobilized on the surface of the electrospun polysulphone membrane using linker technology, mGFP was specifically bound onto the functionalized membrane.

Lang concluded that these new blood filtration membranes could provide more efficient toxin removal and reduce healthcare costs.

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