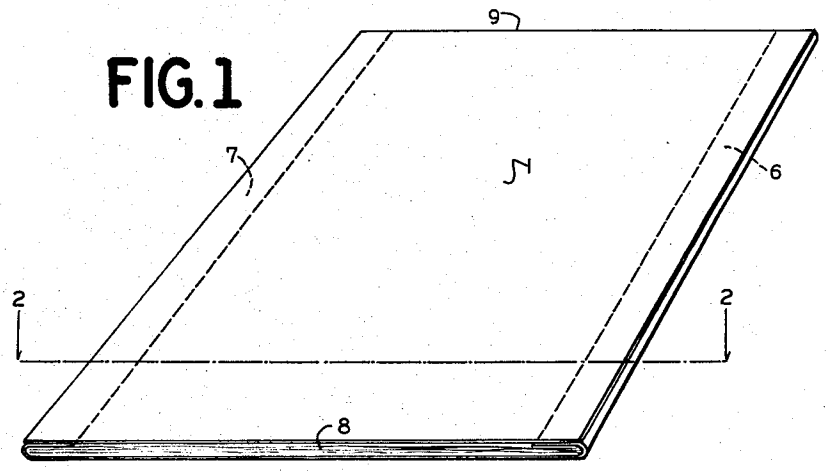
Aug. 25, 1953 W. A. HERMANSON ET AL 2,649,859

DISPOSABLE DIAPER

Filed Feb. 10, 1951

FIG. 1



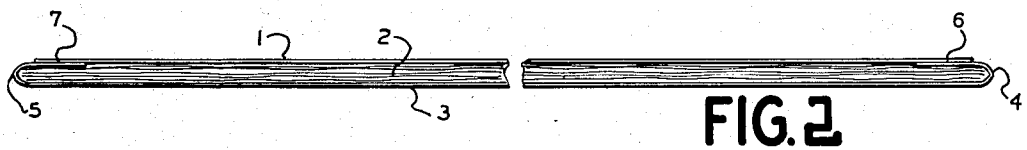


FIG. 2



FIG. 3

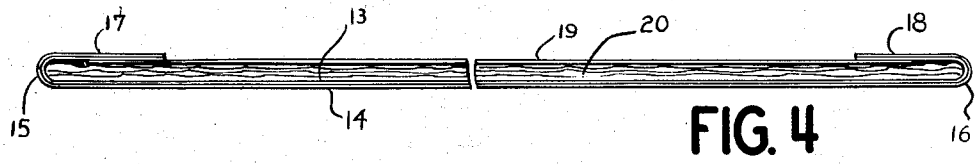


FIG. 4

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DISPOSABLE DIAPER

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Application February 10, 1951, Serial No. 210,402

10 Claims. (Cl. 128—287)

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The present invention relates to disposable diapers in which paper and plastic materials are combined together.

It has been conventional to make disposable diapers out of combinations of cellulose wadding and a backing sheet which is supposed to be water repellant with the backing sheet adhered to the cellulose by adhesive means. The customary paper used for making the backing of a so-called disposable diaper water repellant is usually a wood pulp sheet with a wax size, starch size, resin size, or a silicon film of mono-molecular thickness. The papers used average .0075 in thickness. Due to the thickness of this paper it is never soft nor completely flexible as a backing sheet. Furthermore, when the so-called diaper or pad is applied to the infant the action of the child in kicking its legs is sufficient to induce capillary action in the fibers of the sheet and leakage of the contents of the diaper takes place through the supposedly water-repellant backing. Furthermore, the thickness of the paper backing is such that the inguinal spaces are overloaded and the bulkiness of this type of backing causes excess chafing and develops erythema.

Another disadvantage of a wood pulp sulphite backing sheet is the shortness of the fibers, which range from inpalpable dust to three millimeters in length. Since it is the purpose of an integrated baby diaper that it shall completely replace a woven cloth diaper and yet be disposable, it must be pinned at the baby's waist in the same manner as a woven diaper. The short wood pulp fibers are not long enough to hold a safety pin with that degree of safety which is necessary for the duty the diaper must perform and the disposable diapers now sold frequently break through the pins and cause considerable inconvenience by falling apart and opening.

Disposable diapers being currently marketed are also spoken of as being "disposable" in toilet bowls but the thickness of a water repellant backing paper having a caliper of .0075 makes it impossible for these diapers to be flushed down an ordinary home toilet.

It is the purpose of the present invention to produce an integrated baby diaper with a face sheet of thin, wet-strength, absorbent but permeable paper web beneath which are a group of creped, cellulose sheets with a water-proof backing film of plastic material or its equivalent which extends around the sides of the creped cellulose sheets and is adhered to them and to the top surface sheet.

It is the further purpose of this invention to

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provide a disposable diaper in which the softer bulkier creped cellulose sheets may readily be separated from a very thin backing sheet or is actually separated in parts so that the parts may be disposed of separately. In addition the backing sheet may be of such thin material, of the order of .001 inch, and be crushed into such a small volume that it will readily flush down the drain.

The invention will be more fully understood from the specification set forth below when taken in connection with the drawings illustrating an embodiment thereof in which:

Figure 1 shows in perspective view the present invention.

Figure 2 is an enlarged section taken on the line 2—2 of Figure 1;

Figure 3 is a modified section corresponding to the section of Figure 2; and,

Figure 4 is a still further modified section corresponding to the section of Figure 2.

The disposable diapers shown in the figures have a top sheet 1 which is soft, yieldable and which, as mentioned above, is treated to have wet strength and yet be both absorbent and permeable. This sheet may be of paper which is made of long vegetable fibers of high porosity such as abaca fibers or abaca and synthetic cellulose fibers blended together or synthetic cellulose fibers bonded together with wood pulp fibers. It is important that the top sheet be thin yet both soft and strong and capable of supporting pins through the same without tearing. This sheet may range from .00125 to .0015 inch in thickness. Beneath the top sheet are from four to eight creped cellulose sheets 2 which after creping should have a thickness from .002 to .004. The backing sheet 3 is preferably a plastic film such for instance as polyethylene or some other suitable plastic sheets such for instance as the vinyls or vinyl copolymers, cellulose acetate, rubber hydrochloride, or other thin films of plastic types which possess flexibility, softness and which are waterproof.

On the whole a polyethylene sheet having a thickness of from .005 to .0015 inch is suitable for this purpose. These sheets are waterproof and are folded around the sides as indicated by 4 and 5, Figure 2, of the creped sheets 2 and extend for a width of ½ to ¾ of an inch just beneath the top sheet 1 on the sides as indicated at 6 and 7 respectively.

In the preferred construction, the creped sheets 2 are sealed together along these side edges by means of the backing sheet 3. The top

sheet 1 at its sides is also sealed to the top surface of the backing sheet in the side extensions which fold underneath this sheet. The diaper, therefore, is held together as a single sheet by the side seals only. Polyethylene for this purpose is highly useful since it provides its own thermoplastic sealing means and all that is necessary to form a seal at the side edges is to run the diaper through heat sealing rolls along its sides. If desired, the whole sheet may be run through a heat sealing roll in which the lower creped sheets will be sealed to the backing sheet 3. On the whole, however, it has certain definite advantages to form the seal only along the side edges as will presently appear.

In place of using a thermoplastic, water-proof backing sheet as just described, a water-proof sheet of non-thermoplastic qualities could be used in which case it will be necessary to apply some adhesive along the side edges of the backing sheet or the side edges of the creped sheet and the underside of the top sheet to complete a seal along the side edges.

From the above description, it will be noticed that the ends of the sheet, that is the end 8 and the end 9 (Figure 1) are open, that is, they are not bound. By permitting the ends of the sheets to remain open and sealing the sheets only at their sides, when the diaper is to be disposed of, the top sheet 1 and creped sheets 2 may be grasped at the end 8 or 9 and the complete sheet 1 with the inner creped sheets 2 may be torn from the backing sheet 3 and readily disposed of in the toilet bowl.

The water-proof backing sheet which is a very thin film may separately be disposed of in the same way since this sheet will crumble into a very small volume.

Where the backing sheet is a thermoplastic heat sealing film sufficient heat may be applied for a long enough period to seal the creped sheets forming the center of the pad along these side margins together. This may be done without impairing the backing sheet since most of the heat seal may be effected by the turned in top margin of the backing sheet.

The construction as described above is the preferred construction in the present invention since it provides a cheap, disposable diaper. If desired, the backing sheet may be made a composite sheet such as shown in Figure 3 comprising a plastic, waterproof film 10 laminated together with a sheet 11 of the same type as the sheet 1 in Figure 1 or laminated together with a thin creped absorbent cellulosic sheet. This laminated sheet may be folded up around the sides and under but preferably over the top soft sheet 12 which also is the same type of material as the sheet 1. The plastic film sheet 10 will, therefore, extend over the sheet 12 on the edges and the edges may be sealed together, therefore, similarly as in the construction in Figure 2 by applying the heating rollers to the side edges in the same way as has been described.

One of the chief advantages in the construction as described is that the waterproof backing element extends around the sides and, therefore, provides a seal against leakage along the side edges of the diaper.

The diaper in Figure 3 may also be readily torn apart so that the easily disintegrating cellulose sheets can be disposed of separately from the backing sheet which should normally be crushed to a smaller volume in disposal.

A thermoplastic seal may be made by the

thermoplastic backing sheet of the side edges of the creped sheets and these may be sealed to the face sheet along the sides to the edges or margin of the top face sheet. If desired the creped sheets may be sealed along these sides only to face sheet and not to the back sheet so that in disposing of the diaper it will be necessary only to grasp the top sheet and tear it away from the backing sheet, the creped sheets clinging to the face sheets will stay with it as it is torn free.

An advantage of the construction shown in Figure 3 is that when the plastic film is laminated to a sheet of the type described, a very thin film may be used. This film may be in the range of .0005 inch which is the limiting thinness of plastic film which could otherwise be used.

Where it is desired to have the creped sheets cling to the top face sheet, an adhesive may be used at the edges of the creped sheets in the construction shown in Figure 3 or in the construction shown in Figure 2 more pressure may be applied to the top rollers at the margins 6 and 7 to make the plastic film partly penetrate the margins of the creped sheets and spread a seal at the sides of the top sheet 1 with the edges of the creped sheets.

In the construction of Figure 4, the plastic film 13 and the soft thin sheet 14 which may be the same sheet as in Figure 3 are laminated, cast or pressed together and applied at the bottom, around the sides 15 and 16 and over the top marginal edges 17 and 18 respectively of the top sheet 19 which may be of the same structure and texture as the sheet 14. Instead of extending the sheet 19 to the very side edges of the enclosed creped sheets 20, it stops short of the side edges of the creped sheets and permits the thermoplastic film 13 on its turned in margin to come directly in contact with the creped sheets 20 and form a seal for the edges of the creped sheets when heat is applied in this region. At the same time a further thermoplastic seal may be made along the margins between the top sheet 19, the turned over margins 17 and 18 and the creped sheets beneath the same.

Having now described our invention, we claim:

1. An integrated disposable diaper comprising a top surfacing web substantially of vegetable fibers, having wet strength to a high degree, permeability and absorptivity, and having a caliper not in excess of .0015 inch, a number of creped cellulose thin plies and a water-proof backing sheet having a caliper not in excess of .004 inch, heat sealed to the surfacing web.

2. An integrated disposable diaper comprising a top surfacing web substantially of abaca fibers, synthetic fibers, and wood fiber having wet strength to a high degree, permeability and absorptivity, and having a caliper not in excess of .0015 inch, a number of creped cellulose thin plies and a water-proof backing sheet having a caliper not in excess of .004 inch, heat sealed to the surfacing web.

3. An integrated disposable diaper comprising a top surfacing web substantially of synthetic fibers, and wood fibers having wet strength to a high degree, permeability and absorptivity, and having a caliper not in excess of .0015 inch, a number of creped cellulose thin plies and a water-proof backing sheet having a caliper not in excess of .004 inch, heat sealed to the surfacing web.

4. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability

and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped cellulose thin plies and a thin backing sheet, thermo-plastic water-proof material extending around the sides of the creped cellulose plies and under the margin of the top surfacing web, said thermo-plastic material sealing together along the side margins of the diaper the top surfacing web and the creped cellulose thin plies together to the backing sheet.

5. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped cellulose thin plies and a thin backing sheet, thermo-plastic water-proof material extending around the sides of the creped cellulose plies and under the margin of the top surfacing web, said thermo-plastic material sealing together along the side margins of the diaper the top surfacing web and the creped cellulose thin plies together to the backing sheet, said backing sheet having a caliper being of not more than .004 inch in thickness.

6. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped cellulose thin plies and thin backing sheet, thermo-plastic water-proof material extending around the sides of the creped cellulose plies and under the margin of the top surfacing web, the marginal edge of the thermo-plastic sheet under the surfacing web serving as a seal for sealing together the surfacing web and the thermoplastic marginal edge as well as the creped sheets lying adjacent to said marginal edge.

7. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped, cellulose, thin plies and a thin backing sheet having a caliper not in excess of .004 comprising an outer sheet of the same material as the top surface web and an inner sheet of thermo-plastic film, the two sheets being coextensive with the side margins thereof, extending around the creped cellulose thin plies and over the top surfacing sheet along the side margins in contact with the surfacing sheet serving as a thermoplastic seal for the top surfacing sheet to the margin of the backing sheet and to the cellulose webs.

8. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped, cellulose, thin plies and a thin backing sheet having a caliper not in excess of .004 comprising an outer sheet of the same material as

the top surfacing web and an inner sheet of thermo-plastic film, the two sheets being coextensive, with the side margins thereof, extending around the creped cellulose thin plies and over the top surfacing sheet along the side margin thereof, said thermo-plastic sheet along the side margin in contact with the surfacing sheet serving as a thermo-plastic seal for the top surfacing sheet to the margin of the backing sheet and to the cellulose webs, said top surfacing sheet being shorter in width than the creped cellulose thin plies allowing a margin along the sides of the creped sheets wherein the creped sheets come in contact with the margin of the thermo-plastic sheet whereby a direct seal is obtained between the thermoplastic sheet and said creped sheets.

9. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped, cellulose, thin plies and a thin backing sheet having a caliper not in excess of .004 comprising an outer thin creped absorbent cellulose sheet and a film on the inside surface thereof of thermo-plastic material, said backing sheet extending around the sides and over the top side margins of said creped cellulose plies, said top surfacing web lying under the backing sheet along said top side margins, said film acting to heat seal the top surfacing and the cellulose plies to the backing sheet.

10. A disposable diaper comprising a top surfacing web substantially of vegetable fibers having a high degree of wet strength, permeability and absorptivity and having a caliper not substantially in excess of .0015 inch, a plurality of creped, cellulose, thin plies and a thin backing sheet having a caliper not in excess of .004 comprising an outer thin creped absorbent cellulose sheet and a film on the inside surface thereof of thermo-plastic material, said backing sheet extending around the sides and over the top side margins of said creped cellulose plies, said top surfacing web lying under the backing sheet along said top side margins, said film acting to heat seal the top surfacing and the cellulose plies to the backing sheet and means adhering together the creped cellulose plies with the top surface sheet.

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