United States Patent [19]

Fitzpatrick et al.

[11] **3,780,908**

[45] **Dec. 25, 1973**

[54] **BULK PACKAGE FOR INDIVIDUAL DISPENSING OF SUBSTANTIALLY WET SHEETS FROM STACKS**

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[73] Assignee: **International Playtex Corporation,** New York, N.Y.

[22] Filed: **July 28, 1972**

[21] Appl. No.: **274,134**

[52] **U.S. Cl.** **221/48,** 221/63

[51] **Int. Cl.** **A47k 10/42**

[58] **Field of Search** 221/47, 48, 55, 63, 221/33

[56] **References Cited**

UNITED STATES PATENTS

3,499,575	3/1970	Rockefeller	221/55
3,325,003	6/1967	Bilezerian	221/48 X

Primary Examiner—Stanley H. Tollberg

Attorney—Stewart J. Fried et al.

[57] **ABSTRACT**

A bulk package for individually dispensing substantially wet sheets from a stack of such sheets, comprising a container receiving the stack of wet sheets and having an openable and readily resealable cover which, when closed, forms a substantially moisture-proof seal between the container and the atmosphere; and a barrier member overlying the stack of wet sheets and interposed between the stack and the cover and having a restricting opening whose proximate surfaces frictionally engage the adjacent surfaces of the successive sheets withdrawn from the stack such that when the uppermost sheet is pulled outwardly of the package through such opening the leading surfaces of the next succeeding sheet are drawn by and in contact with the uppermost sheet through the opening into frictional contact with the surfaces proximate thereto which produce a frictional force on the next succeeding sheet sufficient to overcome the force resisting separation of the two sheets yet not so large that the force required to remove the uppermost sheet will tear either of such sheets. The surfaces proximate the sheet restricting opening thus effect separation of the sheets with the leading surfaces of the next succeeding sheet extending outwardly of the opening positioned for subsequent manual grasping and removal from the package.

9 Claims, 11 Drawing Figures

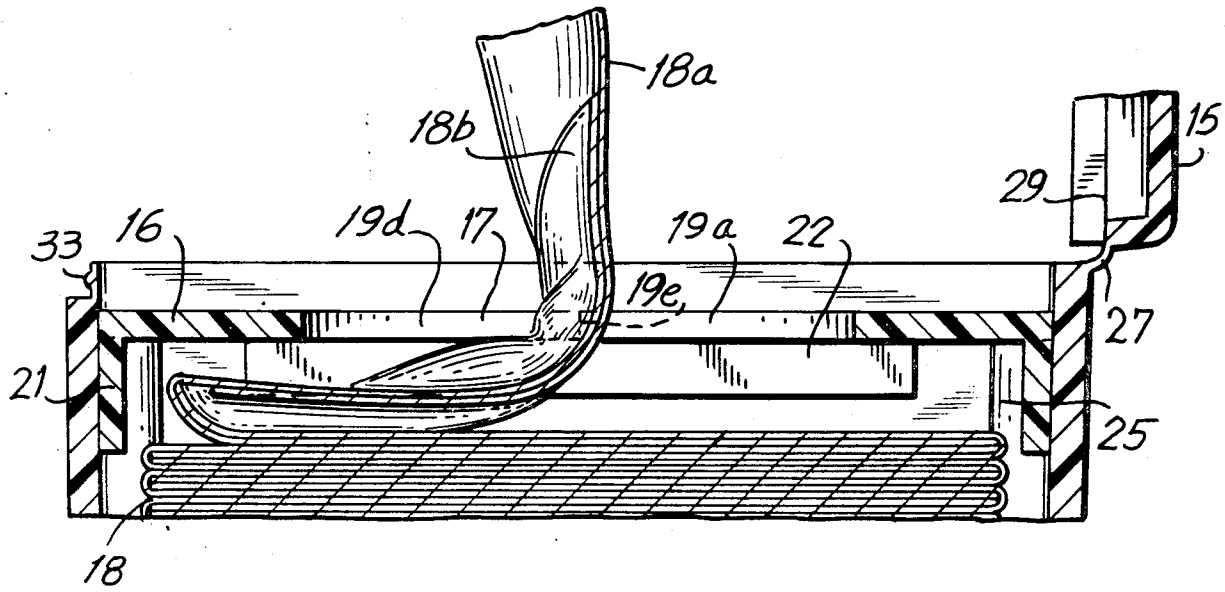


FIG. 1

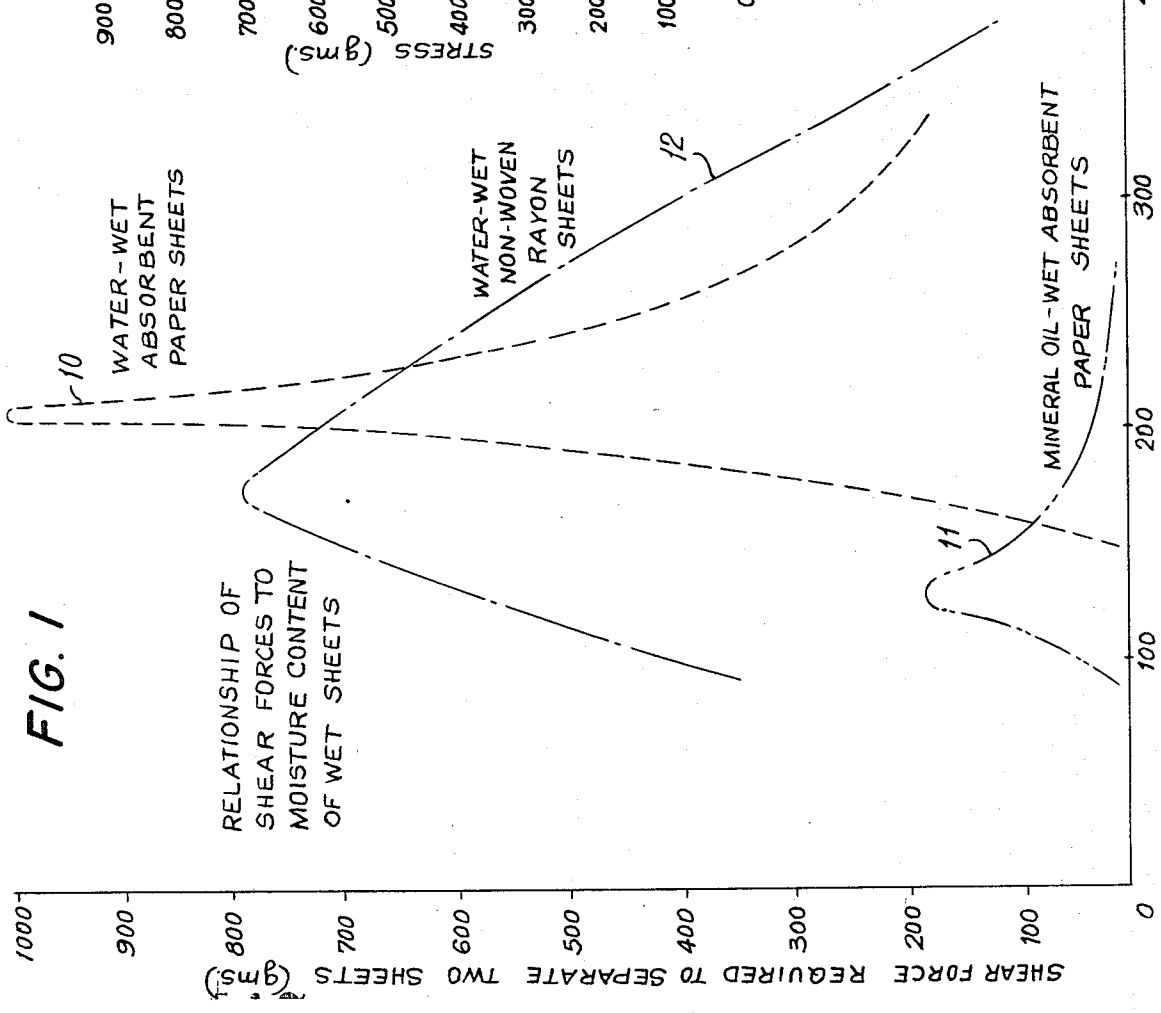
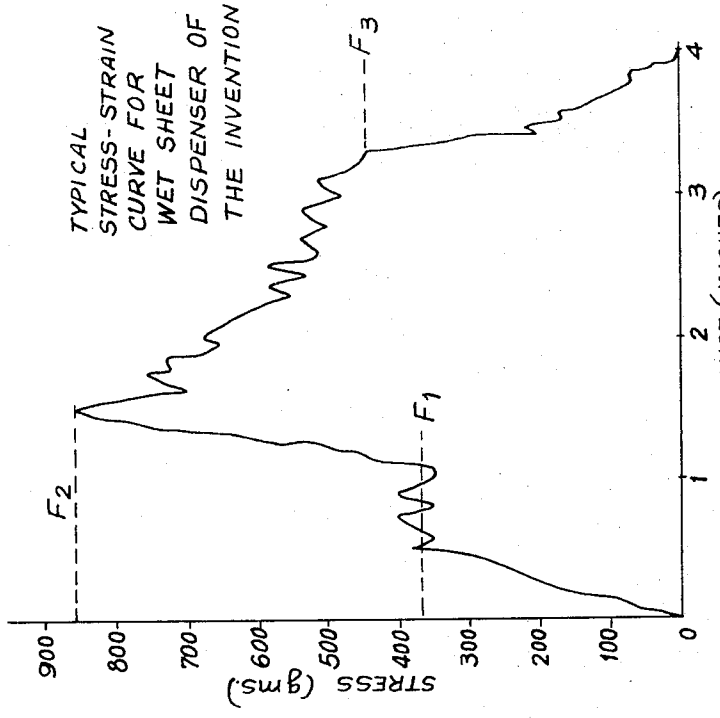

RELATIONSHIP OF SHEAR FORCES TO MOISTURE CONTENT OF WET SHEETS
SHEAR FORCE REQUIRED TO SEPARATE TWO SHEETS (gms.)
LIQUID % BY WEIGHT
10
WATER-WET ABSORBENT PAPER SHEETS
12
WATER-WET NON-WOVEN RAYON SHEETS
11
MINERAL OIL-WET ABSORBENT PAPER SHEETS

FIG. 2


TYPICAL STRESS-STRAIN CURVE FOR WET SHEET DISPENSER OF THE INVENTION
STRESS (gms.)
DISTANCE (INCHES)
F1
F2
F3

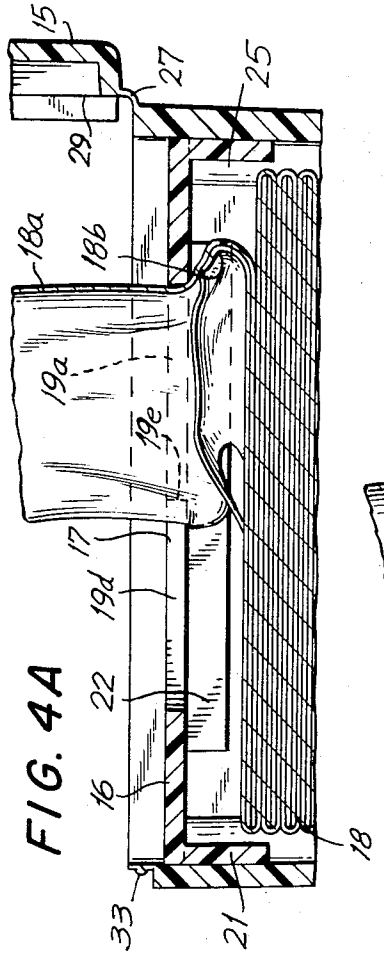


FIG. 4A

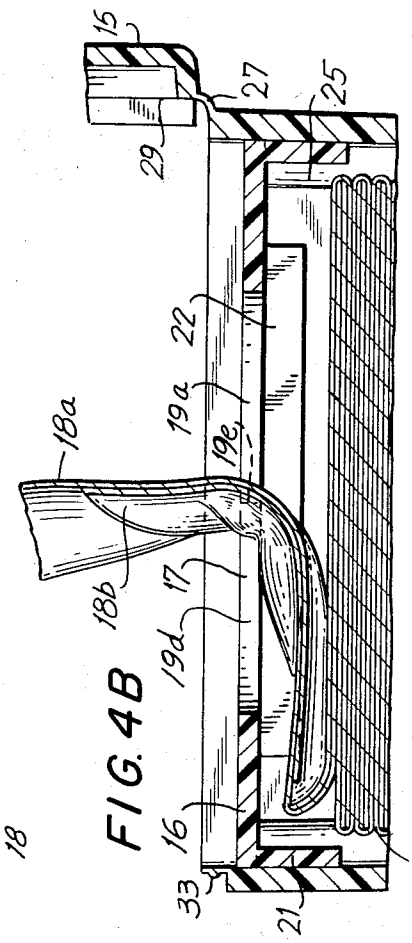


FIG. 4B

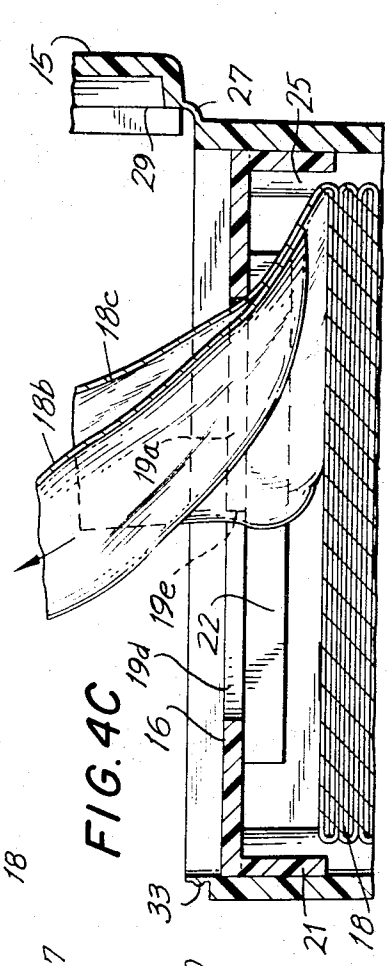


FIG. 4C

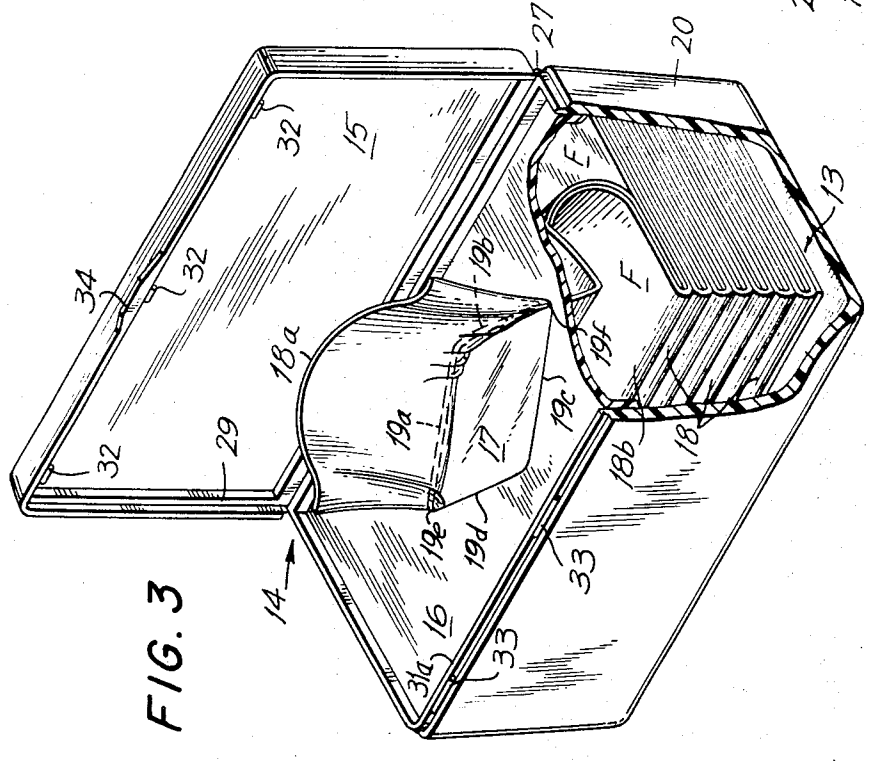


FIG. 3

FIG. 5

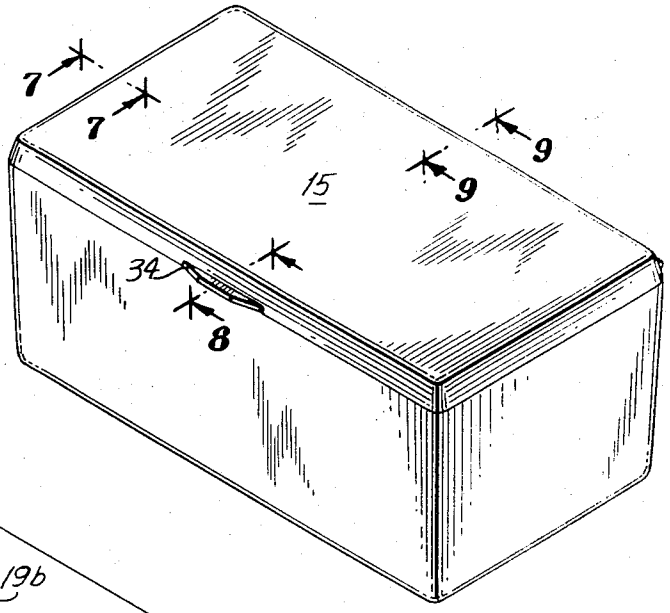


FIG. 6

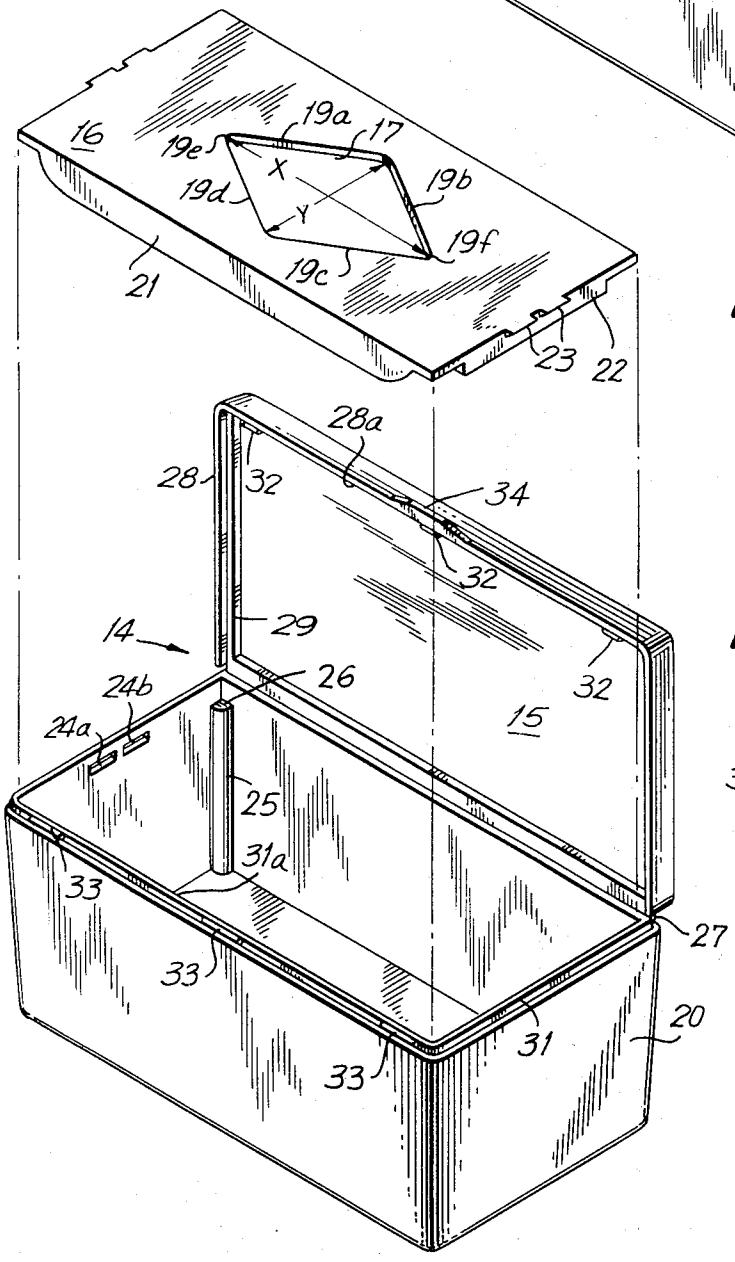


FIG. 7

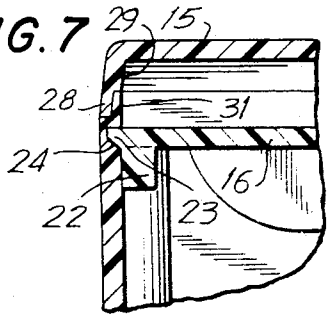
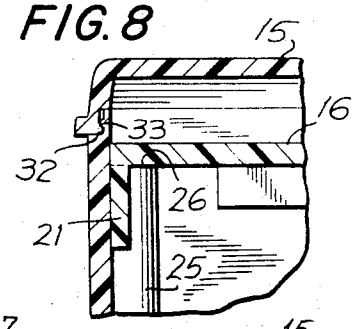


FIG. 8



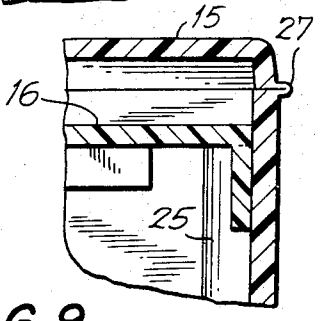


FIG. 9

BULK PACKAGE FOR INDIVIDUAL DISPENSING OF SUBSTANTIALLY WET SHEETS FROM STACKS

BACKGROUND OF THE INVENTION

This invention relates to the bulk packaging and convenient individual dispensing of substantially wet sheets, tissues or towelettes such as may be utilized for personal hygiene, for cosmetic purposes, household cleaning applications or the like. More particularly, it relates to a package for individually "popping-up" and dispensing such wet sheets, overcoming the relatively high attractive forces between the wetted sheets which tend to resist individual dispensing and produce "chaining" thereof.

In the following specification and in the claims appended hereto, all references to "wet" or "substantially wet" sheets are intended to refer to sheet materials so wetted by an aqueous or other desired treatment medium that when they are wiped across a surface it is streaked by the liquid medium. The "wet" sheets employed in accordance herewith are believed to possess sufficient moisture contents (aqueous or otherwise) to form surface films thereon. It is postulated that the surface tension of these films produces the substantial forces between the wet sheets preventing sequential dispensing of the individual sheets employing conventional means.

On the other hand, the wet sheets dispensed from the bulk package hereof are not loaded with moisture contents exceeding their holding capacities by more than a small quantity, i.e., ideally the amount of free liquid in the package, if any, should not exceed about 10 percent by volume of the container. In one preferred embodiment, employing aqueous treatment media and a selected absorbent paper toweling stock, the wet sheets hereof may typically have liquid contents of from about 80 to 500 percent, preferably about 100–400 percent, of their total weight. Materials thus wetted have a softer feel than their dry counterparts and can transfer sufficient liquid to wet other surfaces to effect the desired cleansing or like functions.

As further used herein, the term "sheets" will be understood to comprehend liquid-holding papers or similar sheet materials composed, for example, of paper, rayon or other cellulosics, nylons, polyesters, polyolefins, vinyl polymers, polyurethanes and the like, or mixtures of the aforesaid or similar materials. Such sheets may comprise creped, flat, woven or non-woven materials and may be provided in the form of single or multiply tissues, towelettes, or the like.

Wetted tissues, towelettes or the like have, in recent years, achieved substantial consumer acceptance. By and large, products of this nature have taken the form of individual units, each sheet being folded into a compact shape and sealed within an impermeable foil or plastic package (see, for example, Williams U.S. Pat. No. 3,057,467 granted on Oct. 9, 1962). To permit use, the outer package must be opened, and the individual sheet removed and unfolded. For a number of reasons, including the relatively substantial cost of such individually wrapped wet sheets and the relative inconvenience of removing and unfolding the sheets from the individual packages, these individual unit packages have not been widely adopted for many purposes for which they might otherwise be suitable.

The need for more convenient commercial forms of pre-wetted tissues or towelettes has not been ignored, a number of prior workers having proposed products for the bulk packaging and individual dispensing of such wet sheets. Bulk packages so proposed have utilized either rolls of wet sheets defined, for example, by perforations in a suitable web stock, or stacks of wetted sheets pre-folded to facilitate dispensing. Roll dispensers for this purpose are disclosed, for example, in Cordis U.S. Pats. Nos. 3,310,353 and 3,365,522 granted Mar. 21, 1967 and Feb. 13, 1968, respectively. Such dispensers provide for pre-wetting the web constituting the successive sheets to be dispensed, pulling the web from the outer periphery of the roll from which it is supplied, and shearing the successive sheets from the web by means of associated cutting edges.

Sheets dispensed from such roll dispensers may, as indicated by Cordis, require longitudinal and/or transverse reinforcing strips to impart sufficient strength to the wetted sheets; in the absence of such reinforcements the wet sheets may not be cleanly sheared and may rather tear unevenly. Moreover, the necessity to rotate the supply roll during dispensing may lead (particularly when the roll itself is wetted) either to tearing of the web or require the use of a paper so strong as to resist sheet separation and impose possible chaining problems.

French Pat. No. 2,061,000 published on June 18, 1971 describes another roll dispenser for the individual dispensing of wet sheets. The product described in this patent incorporates a continuous perforated roll disposed within a cylindrical container, the individual sheets being unwound or uncoiled from the center of the roll, being pulled lengthwise of the container in a rope-like web, and being torn at the perforations as they are withdrawn through a small slit in an end wall of the container. It has been found that individual sheets may not uniformly separate from one another employing this type of bulk dispenser. To the contrary, in some instances deleterious chaining of a number of the wet sheets occurs resulting in dispensing of a coiled or twisted "rope," while in others sheets catch in the dispensing slit, and tear. Further, it is relatively difficult to thread the leading edges of the inside of the roll through the slitted end wall of the container without twisting and possibly snarling the same.

Moreover, it is necessary to provide a large axial free space within the roll-type dispenser of the French patent in order to facilitate uncoiling and feeding of the wet sheet web therethrough. In addition to thus imposing increased product dimensions, the presence of such a dead space permits collapse of the walls of the wet roll during shipment or storage and may necessitate reshaping the roll to permit uncoiling and withdrawal of the rope-like web for ultimate use.

The roll-type dispensers described in the Cordis patents and in the aforesaid French patent suffer from the further disadvantage that, unlike products incorporating stacks of the wet sheets to be successively dispensed, a group of sheets may not be separated from the roll for separate dispensing. Stacks, on the other hand, may be readily sub-divided and groups of the wet sheets comprising the same used for travel packs or the like.

In view of these apparent advantages products for successively dispensing wet sheets from a stack of such sheets have also been proposed in the art. One such de-

vice is illustrated as a further embodiment (FIG. 4) in the aforesaid Cordis patents. In that dispenser the stack of sheets is maintained within a chamber supported on a spring-loaded follower plate and biased in the opposing direction by a pair of finger-like depressors mounted on the dispenser cover. Upon successive opening and closing of the cover the pressure exerted on the stack by the depressor fingers is varied for the purpose of facilitating manually grasping and withdrawing the successive sheets from the stack.

The Cordis stack dispenser is, however, relatively complex mechanically, involving the application of a number of independent forces produced by the spring-loaded follower and the separate depressor fingers. When the pressures produced by these members are sufficient to separate sheets at the top of a full stack, they may not be sufficient to effect separation between the last few sheets in the stack. On the other hand, when the pressures are adequate to effect separation between sheets at the bottom of a stack, they may be so great as to tear the sheets or even prevent dispensing of the first several sheets of such a stack. Yet further, the application of such pressures limits the liquid contents of the sheets dispensed, the follower plate and the depressor fingers tending to squeeze the liquid from the sheets.

Moreover, the individual sheets of the Cordis stacks are not separated from one another to facilitate independent and successive dispensing thereof. To the contrary, since the individual sheets do not "pop-up" in sequence, the wet sheets may stick together, necessitating substantial manual dexterity to avoid grasping two or more sheets simultaneously. Also, the pressures applied to the Cordis stack of wet tissues coupled with the apparent tilting of the follower plate supporting the same may result in the escape of substantial amounts of liquid from the stack to the base of the dispenser housing. The presence of such free liquid plus the notch opening permanently provided in the container pose substantial limitations on both the useful life and the portability of the Cordis product.

Another bulk package for dispensing stacked wet sheets is disclosed in Rockefeller U.S. Pat. No. 3,499,575 granted on Mar. 10, 1970. In the dispenser embodiment described in this patent, non-interleaved sheets are dispensed from a stack placed within a tray having a supporting ridge so disposed that the edge of each succeeding sheet may be grasped after removal of the prior sheet. Like Cordis, Rockefeller has sought to rely on the application of a distorting force (the supporting ridge) to facilitate the separation of the leading edges only of each successive sheet. Moreover, also like Cordis the Rockefeller dispenser does not provide individual sheets which "pop-up" upon removal of the prior sheet, thus hampering ready manual grasping of each individual wet sheet to be successively dispensed.

The Rockefeller type dispenser enables the user to grasp only the leading edge of each succeeding sheet; at certain wetness ranges other areas of adjacent sheets adhere to one another with dispensing of more than one sheet at a time. In addition, as the wet sheets are removed from the Rockefeller stack the user must insert his fingers into the container to attempt to separate each successive individual sheet. It may be seen that increasing dexterity is thus required, particularly in the removal of the last several sheets from the stack.

The bulk packaging in stack form of dry sheets or tissues is, of course, also known. Sheets so packaged may be inter-folded so as to successively "pop-up" upon dispensing of each prior sheet or tissue. Dry tissue dispensers of this type are legion in the patent art and are embodied in most commercial cleaning or facial tissue dispensers.

It should be noted that while prior workers have recognized the need for the bulk packaging and individual dispensing of wetted sheets and suggested several products for this purpose, they have avoided adopting the expedients previously utilized in the dry tissue art for individually dispensing dry sheets or tissues. Indeed, the very failure of those in the wet sheet dispensing art to attempt to utilize techniques employed for dispensing dry tissues is indicative of the distinct problems encountered in the bulk packaging and individual dispensing of wet sheets as distinguished from dry sheets. This is the case since the liquid films formed between inter-folded wet sheets create substantial adhesion between the adjacent sheets while, on the other hand, dry inter-folded sheets may be readily separated from one another by the force of gravity alone. Hence, chaining of adjacent sheets is a major problem in the individual dispensing of wetted sheets but is insignificant in regard to the dispensing of dry sheets.

Further, the use of dispensing or control elements or inserts to insure and maintain "pop-up" of each successive tissue withdrawn from a dry tissue dispenser is consistent with the preceding explanation regarding the gravity separation of dry tissues. The basic purpose of such inserts is to increase the frictional engagement between successive tissues withdrawn from the dispenser in order that the first such tissue draws the next tissue with it through the container opening and prevents the latter from falling back into the container or carton. With wet tissues, on the other hand, there is no need to increase adhesion between the successive wet sheets to insure "pop-up;" to the contrary, the problem is to overcome adhesion between the successive sheets to facilitate sequential dispensing thereof, without tearing any of the individual sheets. Hence, dispensing individual wet sheets from a stack presents markedly distinct problems from those encountered in dispensing dry sheets from similar stacks.

The dispensing of tissues or other sheets which have been merely impregnated with an aromatic or other odoriferous material presents the same problems associated with the dispensing of dry sheets, as distinguished from wet sheets as defined herein. One example of a previously proposed product for the bulk packaging and individual dispensing of tissues which have been so impregnated with an aromatic or medicated material is described in Bilezerian U.S. Pat. No. 3,325,003 granted June 13, 1967. It has been found, however, that sheets or tissues impregnated in the manner described in the Bilezerian patent contain less than about 20 percent moisture by weight and act like dry tissues, individual inter-folded sheets separating readily, without chaining, due to the weight of the individual sheets alone.

In duplicating the Bilezerian work, stacks of inter-folded paper sheets of an absorbent paper toweling stock were impregnated with spirits of turpentine, nutmeg oil, oil of eucalyptus, oil of cedar wood, or spirits of ammonia, and the thus impregnated materials were wrapped in impervious sheets, aluminum foil and poly-

ethylene being chosen as illustrative, in the manner disclosed in the patent. After wrapping, the resulting packs were allowed to equilibrate for four days to permit the respective impregnants to penetrate the individual sheets. The packs were then opened and the top sheet pulled from each stack. In each instance the several sheets were substantially dry upon opening the pack. Further, in each instance save one the top sheet separated immediately without chaining. In the one exception (employing spirits of ammonia as the impregnating material), the first few sheets of the stacks stuck slightly together, probably due to hydrogen bonding between the sheets as they dried.

On the other hand, when a stack of the same towelettes was impregnated with about 200 percent by weight of an aqueous medium and packaged and stored as aforesaid, the substantially wet sheets remaining in the pack could not be separated by gravity alone, the sheets chaining when it was attempted to lift the top sheet only of the inter-folded stack.

It may thus be seen that the materials described in the Bilezerian patent operate in the same manner as the dry tissue stacks previously known in the art, and are not subject to the chaining problem involved in the individual, sequential dispensing of wet sheets from stacks incorporating the same.

The distinct forces affecting the individual dispensing of stacked wet sheets as contrasted with dry sheets are illustrated in FIG. 1 of the attached drawings. That figure shows three plots of the shear forces required to separate different sheets from stacks as a function of the moisture contents of the respective sheets. The forces plotted correspond to the surface tension forces postulated between the respective sheets of the test stacks.

In the experimental work recorded in FIG. 1, sheets of first, an absorbent, high wet strength paper toweling stock and second, a non-woven, random laid cellulosic material were impregnated with water or mineral oil at varying moisture levels. Pairs of the several sheets inter-folded about their respective center lines (in a single or "V" fold) were placed in an Instron tester and the shear forces required to separate the sheets were determined at the various moisture levels. The shear forces were then plotted against the moisture contents.

As shown in FIG. 1, the forces required to shear two water-wetted sheets of the absorbent paper toweling (curve **10**) increased fro virtually zero at water contents of up to about 140 percent to a maximum of about 1000 grams at about 200 percent and remained above 250 grams at water contents of up to about 300 percent. Impregnation of the same sheet material with mineral oil (curve **11**) increased slippage between the respective sheets and thus decreased the required shearing forces. Nevertheless, wetting of the sheets increased the force necessary to effect shear (and thus to overcome chaining) from virtually zero at about 80 percent mineral oil content to about 200 grams at about 125 percent mineral oil. Finally, similar results were obtained employing the water-wetted non-woven cellulosic sheets (curve **12**). In this instance, it was not possible to obtain zero shear force readings since, due to the poor wettability of such sheets, it was necessary to maintain the sheets under pressure at low moisture levels in order to spread the water across the sheet surfaces.

In each instance it may be seen that the shear force necessary to separate the wetted sheets, whether composed of toweling stock or the non-woven cellulosic fabric and whether wetted with water or with mineral oil, increased rapidly and markedly as the sheet liquid content was increased, reached a maximum, and decreased as the liquid content became so great that excess liquid formed layers or pools between the wetted sheets. From the curves plotted it is apparent that the forces between successive sheets of a bulk packaged stack differ in kind when the sheets are substantially wet rather than dry.

It is among the objects of the present invention to provide for the improved bulk packaging and individual dispensing of such wet, stacked sheets, which packaging is both simple and economical and which may be utilized for the successive dispensing of the individual wet sheets without chaining, notwithstanding the substantial adhesive forces created between the sheets within the stack. Other objects and advantages of the invention will be apparent from the following description of preferred forms thereof.

SUMMARY OF THE INVENTION

In accordance herewith, there is provided a bulk package for individually dispensing substantially wet sheets from a stack of such sheets, comprising the stack of sheets; and a container receiving the stack and having a cover incorporating means for forming a substantially moisture-proof seal between the container and the atmosphere, and a barrier overlying the stack of wet sheets and having a sheet restricting opening therein through which the wet sheets may be individually and successively removed when the container is opened. Frictionally engaging means proximate the opening contact the adjacent surfaces of the successive sheets withdrawn from the stack such that when the first sheet adjacent the barrier (at any point in depleting the stack) is pulled outwardly of the package the leading surfaces of the next succeeding sheet (the second sheet) are drawn by and in contact with the first sheet through the opening into contact with the frictionally engaging means. The latter produces a frictional force on the second sheet sufficient to overcome the force resisting separation of the two sheets yet not so large that the force required to remove the first sheet will tear either of such sheets, and the frictionally engaging means effects separation of the two sheets with the leading surfaces of the second sheet extending outwardly of the opening positioned for subsequent manual grasping and removal from the package.

There is thus provided a relatively simple yet efficient structure for removably and replaceably storing and individually and sequentially dispensing the successive wet sheets in "pop-up" fashion without chaining. The successive sheets are dispensed in form for easy manual grasping and are ready for use as removed from the package without having to be unfolded or untwisted, as in the case of previously disclosed wet sheet dispensers. Operation of the dispenser is such that, in fact, at least about ½ inch, and preferably at least about one inch, of each successive wet sheet is presented through the restricting opening in the barrier for readily accessible individual manual grasping and removal. Further, by interposing the barrier between the manually graspable portion of the uppermost sheet and the succeeding wet sheets in the stack, easy manual grasping of a single wet

sheet is assured as contrasted with the substantial manual dexterity required to dispense individual wet sheets from the prior art stack dispensers.

Surprisingly, wet sheets removed from the dispenser hereof not only retain their liquid contents but, it has been found, actually possess increasing liquid contents down through the stacks from which they are dispensed. The dispenser may, moreover, be provided in any suitable size or configuration for industrial, home, purse or pocket use. If desired, portions of the stacks of wetted sheets used in such dispensers may be removed therefrom for use in smaller bulk dispensers, e.g., for pocket or travel packs. Refill stacks of wet sheets mounted, for example, in a tub-like enclosure and sealed within moisture impermeable, removable foil packaging, may be readily adapted for use with any of the indicated dispensers for repeated and prolonged use.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more fully understood when considered in connection with the preferred embodiments described hereinafter in connection with the accompanying drawings in which:

FIG. **1**, as indicated hereinabove, is a graph illustrating the relationship of the adhesive forces between successive stacked inter-folded sheets as a function of the moisture contents thereof;

FIG. **2** is a stress-strain curve diagrammatically illustrating the typical forces acting on a pair of wet sheets successively dispensed from a preferred embodiment of the bulk package of the present invention;

FIG. **3** is a perspective view of the preferred embodiment of the invention, showing the dispenser insert in assembled relation with the leading edges of a topmost wet sheet extending through the restricting opening thereof, and the walls of the container being partially cut away to show the stack of wet sheets therein;

FIGS. **4A-4C** show, in partial, diagrammatic cross-section, three sequential stages of the removal of two successive wet sheets from the stack incorporated in the bulk package illustrated;

FIG. **5** is a further perspective view of the preferred bulk package embodiment, with the cover shown in its closed position;

FIG. **6** is a perspective view similar to FIG. **3** but showing the container with the stack of wet sheets removed, and the dispenser insert in exploded relation to indicate the internal structure of the container; and

FIGS. **7**, **8** and **9** are partial vertical sections taken along the lines **7—7**, **8—8** and **9—9**, respectively, in FIG. **5**, showing details of the dispenser insert, cover and hinge constructions.

PREFERRED EMBODIMENTS OF THE INVENTION

Referring to the drawings, and with initial reference to FIGS. **3** and **4** in particular, the preferred embodiment of the bulk package illustrated comprises a stack **13** of substantially wet sheets removably and replaceably stored in and dispensed from a container shown generally at **14.** The container incorporates a cover **15** and has a barrier member or dispenser insert **16** overlying the stack and disposed between the stack and the cover. As discussed more fully below, sheet restricting opening **17** is defined in the insert **16,** the individual edges of which opening and the surfaces proximate thereto provide frictionally engaging means effecting separation of the substantially wet sheets and facilitating "pop-up" of each successive sheet as it is withdrawn from container **14.**

The individual sheets **18** within stack **13** may, as indicated hereinabove, comprise any suitable sheet material capable of absorbing and/or adsorbing the bulk of the liquid impregnant utilized. The choice of the particular sheet material is related to the configuration and dimensions of the restricting opening **17** through which the sheets are successively removed from the bulk package, the composition of the impregnant, and the desired end use of the product. The liquid composition will, of course, also depend on the particular purpose for which the wetted sheets are to be used and may include water, mineral oil (for a baby lotion, for example), detergents or soaps, perfumes, surfactants, deodorants, or any other ingredients to be utilized for the particular cleansing, cosmetic or like application involved. When, for example, it is desired to market the dispenser as a source of vaginal cleansing towelettes, the wet sheets may suitably be constituted of an absorbent paper toweling stock having a wet tensile strength of at least about 0.5 lb./inch, preferably at least about 1.0 to 1.5 lbs./inch, of width in the direction of dispensing, impregnated with a substantially aqueous medium incorporating deodorants, bacterial and mold growth inhibitors, perfumes and the like, in minor proportions.

The stack **13** comprises a plurality of sheets **18,** the faces F of which are arranged in substantial parallelism. Preferably, the individual sheets are inter-folded or interleaved with one another, the use of alternating "V" folds about the center lines of the respective inter-folded sheets being illustrated in the preferred form (FIGS. **3** and **4**). Alternatively, the sheets may be otherwise inter-leaved (e.g., in a double or "Z" fold) in order that withdrawal of any sheet from container **14** through opening **17** draws the leading edges of the succeeding sheet through such opening. In yet a further embodiment, the stack of sheets may comprise a continuous zigzag strip so perforated that the individual sheets separate upon being withdrawn through the restricting opening. From the preceding it should be apparent that the particular manner of inter-folding or inter-leaving the successive wet sheets within the bulk package hereof is not a critical element of the present invention and may be varied as desired.

The sheet restricting opening **17** in insert **16** is juxtaposed with the face F of the uppermost sheet **18*a*** of the stack, disposed substantially parallel to such face and the corresponding faces or extended portions of the other sheets in the stack. The opening is so designed that when the uppermost sheet is pulled outwardly of the dispenser the leading surfaces of the next succeeding sheet are drawn by and in contact with the first sheet through the opening into frictional contact with one or more of the substantially unyielding (i.e., frictionally engaging) edges and corners defined by the walls of the insert (**19*a–f*** of the generally diamond-shaped cut-out forming the sheet restricting opening in the preferred embodiment shown). These surfaces provide frictionally engaging means which produce a frictional force on the next succeeding sheet sufficient to overcome the force resisting separation of the two sheets yet not so large that the force required to remove the first sheet will tear either such sheet, and effect separation of the successive sheets with the leading

surfaces of the second sheet extending outwardly of opening **17** positioned for subsequent manual grasping and removal from the package. It may be seen from the preceding that the leading surfaces of each successive sheet thus "pop-up" extending outwardly of the container for ready grasping, it not being necessary for the user to insert his fingers into the container (as required, for example, in use of the Cordis and Rockefeller stack dispensers referred to hereinabove) to remove the sheets from the stack.

The mechanism of operation of the dispenser may be more fully understood in the light of the several stages involved in sequentially dispensing three successive wet sheets therefrom, which stages are illustrated in FIGS. **4***A*–**4***C* and the approximate stress-strain relationship characteristic of which is plotted in FIG. **2.** Initially, the stack **13** is impregnated with the desired treatment liquid, either prior to placing the stack within the container, or directly within the container.

Preferably, employing an absorbent paper toweling stock for the wetted sheets, water as the treatment liquid, and utilizing an inter-folded stack of "V"-folded sheets as illustrative, the uppermost wet sheet **18**a is withdrawn from container **14** by drawing the leading edges thereof through the sheet restricting opening **17,** the adjacent surfaces of the wet sheet frictionally engaging edges **19***a* and *b* and corners **19***e* and *f* adjacent the opening as the sheet is drawn therethrough. As wet sheet **18***a* is drawn from the container it pulls with it the inter-folded leading portion of the succeeding sheet **18***b* (FIGS. **4**A and B). The leading edges of sheet **18***b* are thus drawn through the sheet restricting opening (FIG. **4**B), ultimately engaging the opposite edges **19***c* and *d* and corners **19***e* and *f* adjacent the opening. As the withdrawal of sheet **18***a* is completed, the frictional drag exerted on sheet **18***b* by these edges and corners effects separation of the two sheets and facilitates independent removal of sheet **18***a* from the container without chaining.

When sheet **18***b* is similarly manually drawn from the container it pulls the leading surfaces of sheet **18***c* through the opening (FIG. **4**C). The frictional drag imposed on sheet **18***c* by edges **19***a* and *b* and corners **19***e* and *f* facilitates separation and removal of sheet **18***b* without chaining with the succeeding sheet **18***c*. Sheet **18***c* may thereafter be withdrawn and the operation repeated to effect withdrawal, separation and removal of each succeeding wet sheet in the manner shown in the successive stages of FIG. **4.**

The forces required to thus sequentially withdraw the wet sheets from the dispenser are plotted by way of illustration in FIG. **2.** Initially, as the first sheet **18***a* is drawn through the dispenser insert (see also FIG. **4**A) the force required for withdrawal increases rapidly to a first force F_1 (the force required to remove a single sheet through opening **17**) which may, typically, be of the order of 350–400 grams. As the second wet sheet **18***b* approaches opening **17** the withdrawal force starts to rise rapidly, the second sheet doubling back or curling on itself (see FIG. **4**B) as it is drawn through the opening in frictional engagement with edges **19***c* and *d* and corners **19***e* and *f*. This second force F_2 (the force required to pull the two sheets simultaneously through opening **17** without tearing the sheets or pulling insert **16** out of the container) reaches a maximum just as sheet **18***b* is most tightly doubled back on itself. Employing the preferred system described herein, the maximum force is about 850 grams; F_2 may, however, vary from as low as about 500 grams to as much as about 1100 grams in the same system, depending upon the spacing of the uppermost sheet in the stack from insert **16** (and, consequently, the amount and degree of resistance created by curling of each succeeding sheet on itself).

The removal force necessary then drops off as sheet **18**b is uncoiled and both sheets **18***a* and **18***b* pass simultaneously through the sheet restricting opening **17** until that point at which the first wet sheet is dispensed. Just prior to that point, the removal force F_3 (the force exerted at the point sheet **18***a* is sheared from sheet **18***b*) must exceed the frictional force between the respective sheets (that force tending to produce chaining within the system).

A preferred embodiment of the container structure is illustrated in FIGS. **1–9.** Such embodiment is more fully described and claimed in copending application Ser. No. filed concurrently herewith in the names of Robert F. Tilp, Willian E. Fitzpatrick, Robert B. Cubitt and William A. Behlert, and entitled "Bulk Package Incorporating Removable Insert for Individual Dispensing of Substantially Wet Sheets from Stacks." In the preferred embodiment the container **14** may conveniently be provided in the form of a box-shaped member prepared, for example, by molding or vacuum forming of a suitable plastic, e.g., polypropylene, or from a similar substantially moisture resistant and impermeable material. Desirably, both the cover **15** and the dispenser insert **16** of the preferred embodiment comprise a similar material.

As more fully disclosed in the aforesaid copending application, the insert is firmly and yet removably mounted in order that withdrawal of the successive sheets through the restricting opening will not dislodge the insert although it may be removed from the container by the user when it is desired to obtain access to the interior thereof, e.g., for removal or replacement of all or a portion of the stack of wet sheets therefrom. The insert has a tray-like configuration incorporating rigidifying front and rear elongated ribs **21** and corresponding elongated side ribs **22.** A pair of detents **23** is provided integrally with each side rib **22,** the respective detents having tapering cross-sections (see FIG. **7**) adapted to be received in and frictionally engage corresponding recesses **24** in the adjacent container walls. By so engaging the container the insert is firmly and yet removably mounted therein and may be so retained notwithstanding the fact that the removal forces manually exerted on the wet sheets act on the insert as well.

Molded columns or posts **25** are additionally formed integrally with and along the edges of the adjoining wall sections of container **14**; the plural posts, four of which are provided in the disclosed embodiment, terminate in upper surfaces or ledges **26** which define a substantially horizontal supporting surface for the dispenser insert **16.** The insert is positioned, resting on posts **25** and interlocked with the container housing by means of the mating detents and recesses **23** and **24** at the opposite side surfaces thereof. It is thus mounted in fixed relation above the stack **13** of wet sheets; when it is desired to remove or replace the stack, the insert need merely be snapped out of position, a new stack of sheets inserted, and the insert thereafter re-positioned.

The cover **15** is secured to the body of the **5–14** by means of a flexible plastic hinge element **27.** The use

of such 274,135 hinge is preferred since it provides a relatively simple, integral linkage William securing the cover to the container in such a manner that a substantially moisture-proof or impervious seal may be readily and efficiently created therebetween upon closing the cover.

The cover itself includes circumferentially-extending wall portions **28** having interior shoulder elements **29** extending along all but the hinged side thereof. The shouldered wall portions **28** cooperate with and engage upstanding wall elements **31** formed integrally with the container body.

A plurality of detents **32** (three are shown in FIG. **6**) are formed integrally along the front wall portion **28***a* of cover **15**, adapted to fit over and cooperatively engage mating detents **33** formed on the corresponding front wall element **31**a of the container body. By pressing the cover into engagement with the container with the detents **32** of the cover extending below and frictionally engaging the detents **33** of the container walls (FIG. **7**), the respective wall sections **28** and **31** provide a substantially moisture-impervious sealing means (FIG. **8**) when cover **15** is closed. A further external ridge **34** may also be provided extending along the outer, front edge of cover **15** to facilitate manual opening of the cover.

In one particularly preferred embodiment of the bulk package of the invention, container **14** may be about 5 inches long by about 2½ inches deep by about 2 inches high. The dispenser insert may have a thickness of about 1/16 inch and incorporates a diamond-shaped restricting opening therein having somewhat rounded corners, the length of each leg of the diamond being about 1⅜ inches, and the major and minor axes X and Y of the diamond (FIG. **6**) being about 2½ and 1-½ inches long, respectively. The wet sheets may comprise the above-identified absorbent paper toweling stock having a wet tensile strength in the dispensing direction of from about 1.5 to 3.0 lbs./inch of width. They may be rectangular in shape, about 4-½ inches by 4-½ inches and inter-folded about their respective center lines, and may be arranged in a stack of about 100 such sheets, approximately 1-½ inches high. The sheets may be wetted by charging the container, with the stack therein, with a substantially aqueous solution containing minor amounts of emollients, detergents, bacterial and mold growth inhibitors, perfume additives and the like, as indicated hereinabove.

The noted structures, dimensions and compositions are given to illustrate specific details of a preferred embodiment of the invention described hereinabove and shown in the attached drawings, and are not intended as limiting. Thus, for example, the container **14** may be modified to incorporate a separate cover which need not be hinged to the container in the manner of cover **15** but which may merely engage the container by means of interlocking detents, rims or the like to form the desired substantially moisture-proof seal, and be readily and entirely removable therefrom. Secondly, in lieu of the removable insert of the aforesaid copending application, the barrier member may be permanently mounted and all or a portion of the stack of wet sheets removed or replaced through an appropriate opening in the base or a side wall of the container.

Since these and other changes may be made in the preferred embodiment of the bulk package and dispenser hereof without departing from the scope of the invention, and since the invention is not restricted to the mechanisms postulated hereinabove, it is intended that the preceding description should be construed as illustrative and not in a limiting sense.

What is claimed is:

1. A bulk package for individually dispensing substantially wet sheets from a stack of such sheets, which comprises

a. a stack of the wet sheets;

b. means for temporarily interconnecting the successive sheets within said stack producing a sheet-to-sheet force resisting separation of successive sheets and effecting removal of successive sheets outwardly from the package upon withdrawal of each preceding sheet therefrom; and

c. a container receiving the stack of wet sheets and having

i a cover having means for forming a substantially moisture-proof seal between the container and the atmosphere; and

ii a barrier overlying the stack of wet sheets and having a sheet restricting opening therein through which the wet sheets may be individually and successively removed when the cover is opened and including frictionally engaging means proximate said opening for contacting the adjacent surfaces of the successive sheets withdrawn from the stack such that when the sheet adjacent the barrier is pulled outwardly of the package the leading surfaces of the next succeeding sheet are drawn by and in contact with the sheet adjacent the barrier through the opening into contact with said frictionally engaging means which means produce a frictional force on the next succeeding sheet sufficient to overcome said sheet-to-sheet force resisting separation of the two sheets yet not so large that the force required to remove the sheet adjacent the barrier will tear either of such sheets, and

said frictionally engaging means effecting separation of the sheets with the leading surfaces of the next succeeding sheet extending outwardly of the opening positioned for subsequent manual grasping and removal from the package.

2. The bulk package of claim **1**, wherein the barrier opening is juxtaposed with the face of the uppermost sheet in the stack.

3. A bulk package for individually dispensing substantially wet sheets from a stack of such sheets, which comprises

a. a stack of a plurality of individual wet sheets, the successive sheets of which are interfolded with one another to define a temporary inter-engaging means producing a sheet-to-sheet force resisting separation of successive sheets and effecting removal of successive sheets outwardly from the package upon withdrawal of each preceding sheet therefrom; and

b. a container receiving the stack of wet sheets and having

i a cover having means for forming a substantially moisture-proof seal between the container and the atmosphere; and

ii a barrier overlying the stack of wet sheets and having a sheet restricting opening therein through which the wet sheets may be individually and successively removed when the cover is

opened and including frictionally engaging means proximate said opening for contacting the adjacent surfaces of the successive sheets withdrawn from the stack such that when the sheet adjacent the barrier is pulled outwardly of the package the leading surfaces of the next succeeding sheet are drawn by and in contact with the sheet adjacent the barrier through the opening into contact with said frictionally engaging means which means produce a frictional force on the next succeeding sheet sufficient to overcome said sheet-to-sheet force resisting separation of the two sheets yet not so large that the force required to remove the sheet adjacent the barrier will tear either of such sheets, and

said frictionally engaging means effecting separation of the sheets with the leading surfaces of the next succeeding sheet extending outwardly of the opening positioned for subsequent manual grasping and removal from the package.

4. A bulk package for individually dispensing substantially wet sheets from a stack of such sheets, which comprises

a. a stack of wet sheets, the successive sheets being connected to one another by a line of weakness to define a temporary interconnecting means producing a sheet-to-sheet force resisting separation of successive sheets and effecting removal of successive sheets outwardly from the package upon withdrawal of each preceding sheet therefrom; and

b. **2** container receiving the stack of wet sheets and having

i a cover having means for forming a substantially moisture-proof seal between the container and the admosphere; and

ii a barrier overlying the stack of wet sheets and having a sheet restricting opening therein through which the wet sheets may be individually and successively removed when the cover is opened and including frictionally engaging means proximate said opening for contacting the adjacent surfaces of the successive sheets withdrawn from the stack such that when the sheet adjacent the barrier is pulled outwardly of the package the leading surfaces of the next succeeding sheet are drawn by and in contact with the sheet adjacent the barrier through the opening into contact with said frictionally engaging means which means produce a frictional force on the next succeeding sheet sufficient to overcome said sheet-to-sheet force resisting separation of the two sheets yet not so large that the force required to remove the sheet adjacent the barrier will tear either of such sheets, and

said frictionally engaging means effecting separation of the sheets with the leading surfaces of the next succeeding sheet extending outwardly of the opening positioned for subsequent manual grasping and removal from the package.

5. The bulk package of claim **1**, wherein the barrier comprises a substantially rigid member having an opening which is restricted with respect to the dimension of the sheets presented thereto as the sheets are successively withdrawn therethrough.

6. The bulk package of claim **1**, wherein the wet sheets in the stack have an average moisture content of at least 80 percent of their total weight.

7. A bulk package for individually dispensing substantially wet sheets, which have an average moisture content of from 100 percent to 400 percent by weight thereof, from a stack of such sheets, which comprises:

a. a stack of individual inter-folded wet sheets; and

b. a substantially moisture resistant and impermeable container receiving the stack of wet sheets and having

i a cover having means for forming a moisture-proof seal between the container and the atmosphere, and

ii a substantially rigid barrier member overlying the stack of wet sheets and having an opening which is restricted with respect to the dimension of the sheets presented thereto as the sheets are successively withdrawn therethrough, the opening being disposed in overlying relation with respect to the faces of the respective superposed wet sheets in the stack, and including frictionally engaging means proximate said opening for contacting the adjacent surfaces of the successive sheets withdrawn from the stack such that when the sheet adjacent the barrier is pulled outwardly of the package the leading surfaces of the next succeeding sheet are drawn by and in contact with the sheet adjacent the barrier through the opening into contact with said frictionally engaging means which means produce a frictional force on the next succeeding sheet sufficient to overcome the force resisting separation of the two sheets yet not so large that the force required to remove the sheet adjacent the barrier will tear either of such sheets, and

said frictionally engaging means effecting separation of the said sheets with the leading surfaces of the next succeeding sheet extending outwardly of the opening positioned for subsequent manual grasping and removal from the package.

8. The bulk package of claim **7**, wherein the wet sheets are constituted of an absorbent cellulosic material and said sheets are wetted with an aqueous medium.

9. The bulk package of claim **7**, wherein said container is formed of a plastic.

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