

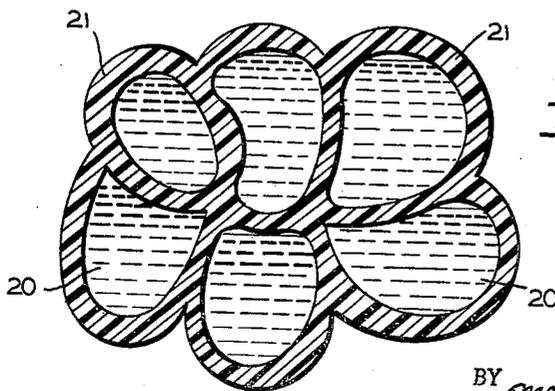
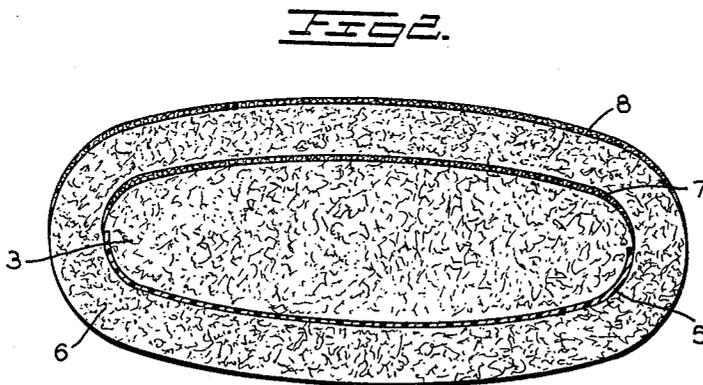
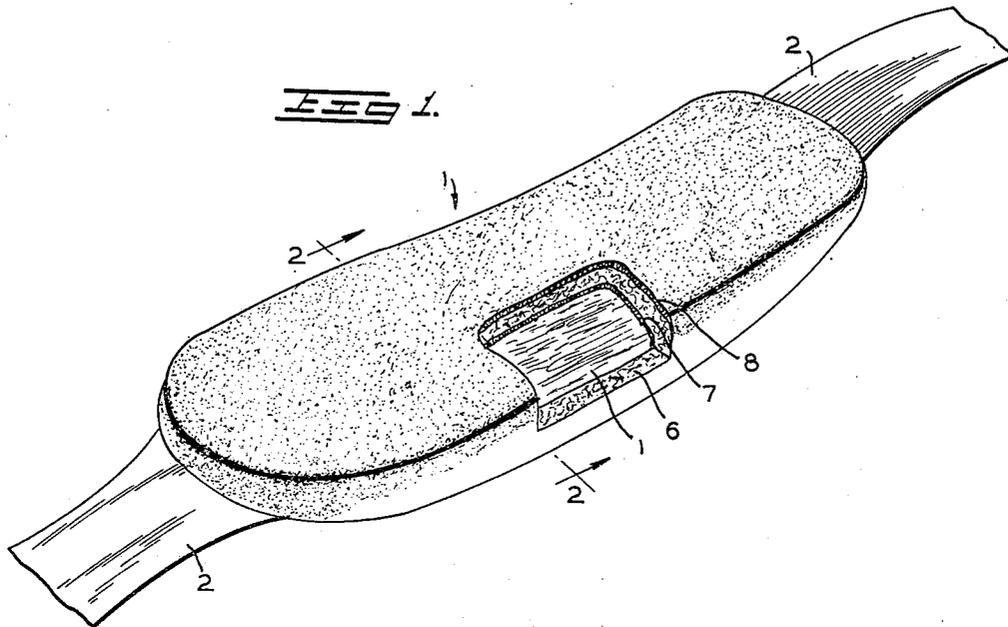
Jan. 20, 1970

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CATAMENIAL PRODUCTS HAVING A COATING OF RUPTURABLE  
MICROCAPSULES CONTAINING MEDICANTS

3,490,454

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2 Sheets-Sheet 1



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FIG 4.

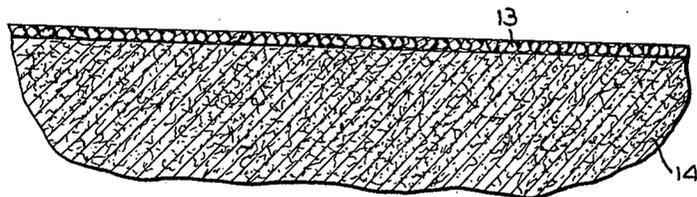


FIG 5.

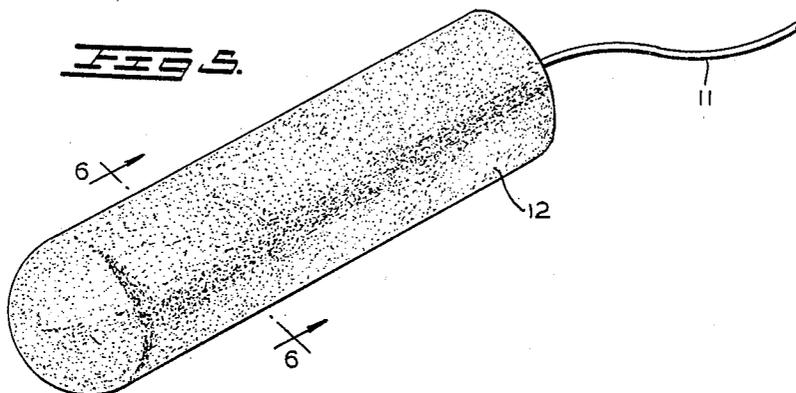
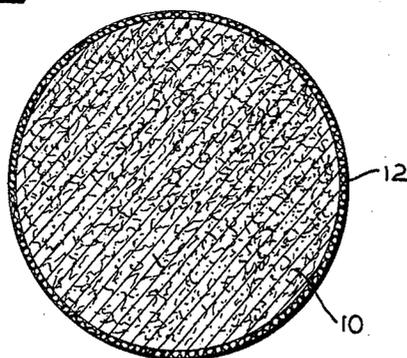


FIG 6.



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**CATAMENIAL PRODUCTS HAVING A COATING OF RUPTURABLE MICROCAPSULES CONTAINING MEDICANTS**

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9 Claims

**ABSTRACT OF THE DISCLOSURE**

An absorbent catamenial device which has an absorbent portion, a fluid-permeable wrapper, and at least one layer of a multiplicity of discrete rupturable capsules containing chemical materials, such as deodorants, antibacteriostats, germicides, fungicides, spermicides, biostatic agents, and decoloring agents, the layer being preferably on the exterior surface of the wrapper and the capsules being rupturable by friction or chemical means.

This invention relates to catamenial absorbent bandages in general and more particularly to catamenial devices for use during the menstrual period, the catamenials being associated with a multiplicity of discrete microcapsules containing materials which serve to combat the disadvantageous aspects of the menstrual discharge.

The menstrual period which must be endured by women in the normal course of their lives has been one of the major problems associated with feminine hygiene and a great deal of effort and expense has been put forth in attempts to provide effective means for the control of menstrual fluid. As a result of these efforts, the catamenial devices commonly described as sanitary or feminine napkins or pads or the tampon type have become a necessary part of feminine hygiene and have been progressively improved both as a result of consumer demand and the highly competitive nature of the market. However, while substantial improvements in design have been made, and are still continuing, it is generally recognized that results still fall short of obtaining what might be defined as the ideal product.

An optimum catamenial would ideally incorporate such characteristics as softness, retention of form during use, efficient liquid absorption, ability to mask or prevent the undesirable odors associated with the menstrual discharge, the ability to medicate so as to effectively maintain or restore the normal ecological balance of the vagina, prevent putrefactive activities of microbial growth, be non-irritating and non-toxic and yet be obtainable and safely used without a medical prescription. These latter characteristics are of special importance in such products. Although a great many products on the commercial market purport to be the ultimate in catamenial devices, it is generally accepted that none have been produced heretofore which are capable of achieving all the advantages of the ideal catamenial. The present competitive nature of the market is ample evidence of such a conclusion.

One of the primary and most popular products which has been urged as being a satisfactory solution to the problem is the so-called absorbent type which is comprised of multiple layers of absorbent elements and is based merely on the concept of having sufficient absorbent materials present to absorb all the fluid emitted. Obviously, this type of product does not serve to obviate any odors associated with the discharge and further fails to provide materials to combat microbial growth and the like.

It has also been proposed to incorporate within this type of absorbent catamenial one or more coatings or im-

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pregnations of various chemical materials to perform these needed functions. However, this technique has not been entirely successful as means have not yet been devised for ensuring that the correct chemical ingredient will be available at the time and place when needed. It is thus to be appreciated that major problems are still present in the catamenial art which have not been satisfactorily solved.

It is accordingly one object of the present invention to provide a catamenial device of universal application which will overcome and satisfactorily mitigate the attendant disadvantages now borne by the catamenials known to the art.

It is a further object of the present invention to provide an improved catamenial device which is effective in selectively solving and combating the various problems associated with menstrual discharge.

A still further object of the invention is to provide catamenial devices of the absorbent type having associated therewith a multiplicity of microencapsulated and chemical materials which serve to effectively control the several disadvantages encountered during the menstrual period.

An even further object of the invention resides in the provision of catamenial materials of the feminine napkin or tampon type which have coated or impregnated thereon a multiplicity of discrete rupturable microcapsules containing controlled amounts of chemically active materials, which capsules, when ruptured, act in association with the absorbent characteristics of the basic catamenial to provide optimum control of all disadvantageous aspects of the menstrual discharge.

Other objects and advantages of the present invention will become more apparent as the description thereof proceeds.

In accordance with the objects and advantages set forth hereinabove, there is provided by this invention a catamenial construction for use during the menstrual period, which construction comprises an absorbent dressing having applied thereto a multiplicity of microscopic discrete rupturable capsules, said capsules comprising liquid droplets encapsulated within an outer shell, each of said droplets containing one or more chemical materials capable of aiding in the control of menstrual discharge.

Reference is now made to the drawings accompanying this invention wherein:

FIGURE 1 is an isometric view of a catamenial napkin according to the invention illustrating one embodiment of construction of a feminine napkin containing an absorbent material and showing the microcapsules coated thereon;

FIGURE 2 represents a sectional view of the napkin of FIGURE 1 as seen along lines 2—2 thereof and showing the actual layers of construction and the capsules thereof;

FIGURE 3 represents a greatly magnified cross-section of a cluster of microcapsules;

FIGURE 4 illustrates a greatly enlarged diagrammatical showing of a napkin constructed in accordance with this invention, partly in section, and showing a profusion of the microcapsules adhered to the an absorbent catamenial base;

FIGURE 5 represents a perspective view in section of a tampon type of catamenial dressing constructed in accordance with this invention; and

FIGURE 6 represents a sectional view of the tampon type napkin of FIGURE 5 showing the microcapsules adhered thereto.

According to the present invention, it has now been discovered that an improved catamenial device for use during the menstrual period may be provided by coating or impregnating absorbent dressings of the feminine napkin or tampon type with a multiplicity of discrete rupturable microcapsules containing chemical agents which, when the capsules are ruptured, are released to effectively

mask or prevent odors, absorb fluids, combat infection, etc. in association with the absorbing qualities of the napkin or tampon.

As mentioned, the catamenial may basically comprise either the feminine napkin or pad type or the tampon type, which is adapted to be inserted into the vagina. The actual construction is not particularly critical although certain minimal criteria should be obviously observed to ensure proper fit and design in combination with the requirement that certain absorbent qualities be present.

One type of feminine napkin which has been found particularly satisfactory is the pad type of generally rectangular configuration and including an elongated core of absorbent fibrous material covered with a fluid permeable wrapper whose ends extend beyond the ends of the core to provide tabs for securing the napkin in position on the body of the wearer.

A particularly preferred type of feminine napkin is of the construction shown in FIGURE 1 which comprises an absorbent portion designated generally as 1 having a shape generally approximating the shape of the exterior surface of the female pubic area to which it is to be applied, thereby providing a semblance of comfort to the wearer. Tabs 2 are provided at the ends of this construction for securing the napkin in position on the body of the wearer.

The interior construction of the absorbent portion is such as to provide an elongated core 3 of absorbent fibers, such as comminuted wood pulp fibers, disposed in the center and preferably extending substantially the entire length of the napkin. Other fibers may of course be employed as the core material so long as they exhibit some absorbent qualities. Such other core materials include cotton linters, rag waste, absorbent cotton and the like.

As seen most clearly in FIGURE 2, the absorbent core 3 is provided along its bottom or exterior portion 4 with a water repellant film or layer 5 which serves to aid in containing the discharged fluid within the absorbent core 3. The core and film are then wrapped in a layer of material 6, such as creped tissue, which serves to distribute the fluid along and within the entire length of the absorbent core to thus effectively utilize the entire core area. According to this invention, each layer of the dressing is provided with layers of encapsulated microscopic capsules 7 and 8 along the upper layers thereof.

Other types of absorbent sanitary napkins may also be employed according to this invention such as those wherein a woven web of absorbent material is folded into an integral structure of a desired width of the finished napkin. The resulting product is thus composed of multiple layers of fibrous materials which can act as their own envelope or can be encased within one or more layers of water repellant material.

It is also contemplated that the sanitary napkins of the invention may be constructed of non-woven fabrics. A typical construction of this type would comprise an absorbent core covered with a permeable, open, non-woven fabric which is generally considered softer and smoother than materials such as gauze. This construction may also be employed in combination with a water repellant liner as in the napkin shown in FIGURE 1.

The use of the so-called tampon-type catamenial dressing as the basic component is also considered to be within the scope of the present invention and a suitable catamenial of this type is illustrated in FIGURES 5 and 6. The tampon generally comprises a cylindrical body 10 formed of a tightly compressed fibrous material such as absorbent cotton, which may be heat treated over its surface to produce an ironing effect whereby the surface fibers are pressed into a smooth, relatively stiff skin. This ironing process is designed to impart sufficient rigidity to the body to make it self-sustaining. The cylindrical body is also generally provided with a rounded entrant end and, at its opposite end, is provided with a pull string 17 for removal. According to the construction of this invention, the tampon is further coated or impregnated with

a layer of unencapsulated microcapsules along the outer surface thereof, designated as 12 in the drawings, as more clearly described hereinafter. Other types and designs of tampons are of course also considered to be employable in forming the products of the present invention as no limitations are to be placed on the particular construction of the basic catamenial device.

According to the present invention, the above-described catamenial constructions are provided on their surfaces and at the interstices between layers, such as the area surrounding the absorbent core, with a multiplicity of intra-reactive discrete microcapsules containing appropriate chemical reactants which are releasable and become active when the capsule is ruptured.

The rupturable capsules may be generally described as minute encapsulated clusters of smaller individual microcapsules, each individual capsule consisting of a core of substantially water-insoluble material surrounded by its own polymer encapsulating shell, and each cluster of such capsules itself as a whole, being contained in a shell of polymer encapsulating material. A magnified cross-section of a cluster of discrete rupturable capsules is illustrated in the accompanying drawing in FIGURE 3 wherein reference numeral 20 denotes the minute capsules which are encapsulated within wall 21. The core material in each capsule in a cluster may be solid, liquid, liquids adsorbed on or in solids, or solid material dispersed in a liquid. The clusters each may include capsules containing the same kind of core material, or may include capsules having different core materials. When the capsules in a cluster contain different kinds of core materials, such materials may be in liquid or solid form, or both. That is to say, the capsules individually may contain either liquid or solid material, or both liquid and solid material, or the capsules collected in a cluster may be of these various kinds, so that a cluster may contain capsules having only liquid material, only solid material, solid material dispersed in a liquid, or mixtures of any of such capsules. It is to be understood that capsules which contain liquid at one temperature may have their contents solidified by cooling if the core material is of that nature; or, if of a heat solidifiable type, solidified by heat, and, conversely, in capsules that originally contained solid core material, the cores may become liquid when raised to a temperature above their melting point.

If a cluster of capsules have heterogeneous core materials, some, or all, of the core materials may be in a liquid or solid state, depending upon the prevailing temperature. In some instances the core material of a capsule may be a liquid having dissolved therein a solid, which solid stays in solution until the temperature surrounding the capsule drops to a point where the dissolved solid becomes insoluble in the liquid and precipitates as a separate phase to provide a core material which is a liquid having dispersed therein a newly-formed solid material. Similarly, if the core material is a solution of two or more liquids, they may be caused to separate by temperature changes. Such solubility conditions may or may not be reversible depending on the core material characteristics.

The walled-clusters of individual capsules make it possible to protect and isolate the necessarily different chemical materials that are provided to control the menstrual discharge and which must be isolated before their end use. The materials in the individual capsule cores and the individual capsules themselves are protected against contact with the materials in the cores of adjoining capsules by the capsule walls, and the materials in the cores of the individual capsules of a cluster are protected against contact with, or escape to, the surrounding environment outside the cluster shell, both by the individual capsule walls and by the wall material surrounding each of the capsule clusters as a whole.

In practice, the core materials of the individual capsules of a cluster are exposed for use by removal of the

cluster wall and of the individual capsule walls, which removal may be brought about by physical fracture such as pressure, chemical solution, chemical reaction, heat, or equivalent effective means. On removal of the capsule and cluster walls, the chemical agent becomes available to act against the menstrual discharge.

The encapsulation of the discrete entities of core materials is carried out by use of an aqueous liquid medium containing dissolved therein capsule wall-forming materials and materials which form around each cluster of capsules. The clusters of capsules so-made are completed in the aqueous medium and may be used as a liquid dispersion in the medium, or the residual aqueous medium, together with any undeposited wall-forming material, may be removed, in part or altogether, by filtering, decanting, centrifuging, evaporation, or other commonly used separation means, to obtain the clusters as a concentrated liquid dispersion thereof, or as dry particles, each of which particles may consist of one or more of the walled clusters. Thus, it is apparent that a multiplicity of means are available for forming the microcapsules for use in the invention.

According to the concepts embodied in the present invention, the core materials which are encapsulated for use on the catamenial devices may be generally described as deodorants, antibacteriostats, germicides, fungicides, decoloring agents, etc., or any material considered to be of value in obviating the several disadvantages associated with menstrual discharge.

The presence of such core materials would therefore be available for use during any stage of the menstrual discharge such as to aid in absorbing the fluid, masking or preventing the odors associated therewith, inhibiting the growth of fungi and bacteria so as to prevent possible infection and serving to decolorize the fluid. As pointed out above, the capsules are adapted to be releasable by pressure, by the presence of heat such as body heat, chemical reaction with the menstrual fluid, or equivalent releasing mechanisms. Thus, release of the appropriate combatant may be controlled so as to be available at the required time during the menstrual period.

One process for making the walled clusters of minute capsules for use on the catamenials of this invention requires the formation of an oil-in-water emulsion in which the dispersed phase units each become the nucleus of a capsule and the continuous phase is an aqueous solution or sol of wall-forming colloid materials. These wall-forming materials are caused to separate out as complex colloid-rich phases, in steps, by the phenomenon of coacervation induced by changing the conditions of the emulsion, the colloid-rich phase which first separates out depositing on the individual nuclei as seed points to form rudimentary minute capsules with colloid-rich liquid walls. The second phase separation deposits as complex colloid-rich liquid walls about clusters of the capsules. The colloid material finally is gelled to form capsules and clusters of capsules with solid walls. The mixture may be made for example by forming an aqueous sol of one colloid, emulsifying the selected oil therein, and mixing the emulsion with an aqueous sol of another colloid, or the two sols may be made and mixed and the oil emulsified therein.

The coacervation is caused by dilution and/or by adjusting the pH of the mixture the latter method being employed in the specific embodiment of this invention. The gellable colloid materials used in the sols must be ionizable and exist in the mixture with opposite electric charges. This may be brought about by selection of the colloid materials or by adjusting the pH of the sol mixture in which the oil droplets are dispersed in the event one or both of the colloids are amphoteric. In the process of coacervation, the complex colloid material deposits around the oil droplets to thereby form a separating wall for the capsules.

If desired, after the gelation, any further steps of

hardening the gelled material; separating the hardened gelled material from the remaining liquid; drying it; and comminuting it to the desired particle size, may be employed, these further steps obviously varying with the materials and ingredients employed and the end results desired.

Either one or both of the colloid materials should be gellable and used in such concentration that the coacervate complex colloid material is gellable. The process steps, down to the gelation step, are carried out with the ingredients at a temperature above the gel point of the colloid materials used, and gelation is brought about by cooling.

If desired, after hardening and drying where necessary, the agglomerate mass of capsules may be comminuted to form fine granules of any desired size. The capsules, being minute, and tending in the agglomerate form to cleave between the capsules, are not destroyed to any great extent by comminution of the mass.

The droplets of oil disposed in the capsules of the product are centrally located in the capsule and are protected from contact with the surrounding environment by a thick self-supporting tough shell-like film of the colloid materials. The encapsulating complex colloid material may be hardened if desired and water-insolubilized to a point where the capsules are highly resistant to heat and moisture or one of these conditions may be attained so that the capsules are rupturable under one or more of these conditions. The encapsulating film of a capsule may contain one or more droplets of oil, the droplets in the latter case maintaining their identity by persistence of the emulsion interface film.

The oil or oils used herein, include any water-non-miscible fluid suitable for making oil-in-water emulsions. Included among the oils are those that occur naturally, such as olive oil; corn oil; coconut oil; castor oil; fish oils; animal oils such as sperm oil; essential vegetable oils; mineral oils such as petroleum lubricating oil; kerosene; and xylene; and synthetic oils such as chlorinated diphenyl, methyl salicylate, etc. The oils contain dissolved or dispersed materials therein such as those generally specified above as being effective to control the odors of menstrual discharge. The dispersed materials should be sufficiently fine to be colloidal in size for use in the capsules of the invention.

The ionizable hydrophilic colloid materials employed in forming the droplets of the present invention include substances such as gelatin; albumen; alginates, such as sodium alginate; casein; agar-agar; starch; pectins; carboxymethylcellulose; Irish moss; gum arabic and the like.

It has been found necessary in order that coacervation will occur that the two kinds of colloid ions, as they exist in the mixture before coacervation, have different electric charges. Some kinds of hydrophilic colloid ions in aqueous sols are negatively charged, regardless of the pH of the sol; some kinds are positively charged, regardless of the pH of the sol; and some are amphoteric, having an iso-electric point above which they are negatively charged and below which they are positively charged. The electric charge characteristics of a hydrophilic colloid under consideration may be determined by electrophoresis for example. In the event that one or both of the colloids used are amphoteric, the pH of the sols may be so adjusted that the colloid ions of the two kinds are of different electric charge. Amphoteric hydrophilic colloids of the same iso-electric point generally cannot be used.

The material which forms the walls of the individual capsules and the encapsulating walls of the clusters of capsules should be of a wall-forming nature, and soluble in water or organic solvent, which solution will constitute the medium in which the encapsulation of the core materials and the formation of encapsulated clusters of the capsules take place. The wall-former may be organic or inorganic in nature and be of natural or synthetic in

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The encapsulating materials, besides being of film-forming nature, should have the property which permits them to act as a barrier for the core materials to be used, and permits of the capsular material being exposed by removal of the encapsulating wall material, by one or more of the noted treatments of fracture such as by pressure, chemical dissolution or solution, heat, or equivalent means, or combinations thereof. The walled capsules and walled clusters may purposely be made micro-porous in a degree, by special drying techniques, to allow escape of the core materials by liquid leakage or evaporation. Such special micro-porosity can be controlled by adjusting the porosity for example.

Inasmuch as the walled-clusters of capsules, which are the subject matter of this invention are to be used in one embodiment in the treatment of living organisms, the encapsulating material for such use should be non-toxic and safe for use in the vaginal area. This is the only criticality which must be placed on the selection of the encapsulating materials aside from the obvious qualification that they satisfactorily form the capsule walls.

Encapsulating wall-forming materials, which meet these general requirements, may be chosen from the natural film-forming materials, such as gelatin, gum arabic, Chondrus, zein and soy bean protein, which substances are ordinarily solid at room temperature (about 20 degrees centigrade), but other film-forming materials, such as polyvinylmethylether maleic anhydride and polyethylene maleic anhydride copolymers, acrylate and methacrylate resins, alkyl resins, cellulose derivatives, isobutylene resins, styrene resins, and polymerizable water soluble equivalents may be used. The wall-forming encapsulating materials chosen may also be used in various combinations as desired or in combination with other non-toxic ingredients such as plasticizers.

After formation of the capsule clusters containing the above generally described medicaments and agents, a portion thereof is coated or impregnated on the desired surface of the catamenial to form the products of this invention. A preferred manner for carrying out this phase of the method is to remove enough solvent from the mixture in order to make a fluid coating, applying it to the catamenial surface by any conventional manner and allowing the solvent to evaporate whereupon the microcapsule coated product remains.

An exemplary illustration of the resulting product is shown in section in FIGURE 4 of the accompanying drawing, wherein there may be seen a cluster of microscopic capsules 13 adhered to a catamenial substrate 14. The clusters of microcapsules may also be deposited on intermediate layers of the catamenial, such as illustrated in the sectional portion of the napkin of FIGURE 1 and designated by reference numeral 7. In fact, a plurality of the microcapsules deposited on each layer of the catamenial bandage represents a preferred aspect of the invention.

It is to be appreciated from the nature of the present invention that the diagrammatic showing of clusters of the microscopic capsules and their association with, or disposition on, the various catamenial devices, must be considered as idealistic representations only, as the clusters of liquid-containing capsules cannot be exactly reproduced in a drawing. As a practical matter, the clusters are not perfect spheres, nor are the contained capsules perfect spheres, as forces pushing them together would tend to distort them. In fact, the capsules in a cluster are probably packed as close as space will permit with the polymeric material of the cluster walls penetrating into the interstitial spaces between each capsule. Moreover, as the capsules are microscopic in size, it would not be possible to depict the capsules as they actually appear on the catamenials.

The materials which are intended to be encapsulated for deposition on the catamenials, comprise in general materials which are effective to serve as deodorants, anti-

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septics, antibacteriostats, germicides, fungicides, absorptive agents, decoloring agents and the like. Materials which perform these functions are well known in the art and will be mentioned only briefly hereinbelow. The only criticality which may be placed on the various chemical agents is that they be considered safe for use in the vaginal area and effective for the intended use.

As deodorant materials for use in the present invention, there may be mentioned the quaternary ammonium compounds, halogenerated diphenylmethanes, e.g. 2,2'-dihydroxy-3,5,6,3',5',6' - hexachlorodiphenylmethane, organic mercury compounds, phenol derivatives, and water soluble betadiketone metal salts of polyvalent metals, e.g. copper acetyl acetone and 2,4-heptanedione zirconate, as well as zirconium salts of hydroxy aliphatic acids. Also oxygen liberating agents such as perborates, peroxides, hypochlorites (e.g. calcium hypochlorite) zinc sulphocarbonate, mixtures of sodium acetate and sodium bisulfate. As absorptive agents there may be mentioned gels of aluminum or silicic dioxide hydrates, salts of polyvalent metals such as aluminum, zinc, tin and zirconium as well as complex salts of these metals, e.g. trisodium dialuminum pentahydroxychlorolactate and the like.

According to preferred aspects of this invention, there may also be encapsulated the following materials for deposition on the catamenial devices: germicidal agents such as quaternary ammonium salts, e.g. benzalkonium chloride (high molecular alkyl-dimethyl-benzyl-ammonium chloride); paratertiary - octylphenyl - diethoxy-dimethyl - benzyl ammonium chloride; lauryl - dimethyl-benzyl ammonium chloride; lauryl-pyridinium iodine; and these quaternary compounds in admixture with zinc peroxide, the lauryl ester of glycine hydrochloride and the like. Antibacteriostatic agents such as diisoalkylaryloxy ethoxyethyl-dimethyl-benzyl ammonium chlorides; e.g. diisobutyl cresoxyethoxyethyl dimethyl benzyl ammonium chloride; alkyl-dimethyl benzyl ammonium halides, amino acids, etc.

There may also be employed various antiseptic agents (e.g. acriflavine), biostatic agents (e.g. glyceryl triacetate); fungicidal agents such as dibromopentachlorocyclohexane, decoloring agents and spermicides as desired.

After treating the catamenial surface or surfaces with the appropriate chemical materials contained in the microcapsules, the product is dried and packaged for use.

In the case of a coated or impregnated napkin, the user merely applies it in the usual manner at the beginning of menstruation, the act of application serving to rupture certain of the capsules which will immediately operate to mask any odors and aid in dissolution and absorption. It is of course to be appreciated that the coated or impregnated tampon is also to be applied in the usual manner.

As noted, the coatings or impregnations may be carried out so as to have pressure rupturable capsules particularly containing deodorant, decolorant and liquid absorbent in order that these materials can immediately become active. Also to be provided on the catamenial are capsules which will be ruptured by friction generated during the wearing process as well as capsules which will be ruptured by heat generated in the menstrual area and by reaction with ingredients contained in the menstrual discharge. There may also be included capsules which are rupturable under acidic conditions as it has been found that the chemical reactivity of the fluid would be conducive to release of such encapsulated materials.

The following example describes the production of a catamenial napkin according to the method of the invention and is to be considered as exemplary only.

#### EXAMPLE

This example contemplates the deposition on the catamenial of two kinds of chemical materials, i.e., a deodorant and an antibacteriostatic agent. Thus two mix-

tures or emulsions have to be prepared. These emulsions were prepared as follows:

First, 8.5 grams of corn oil having dissolved therein 1.5 grams of a deodorant (calcium hypochloritetetrahydrate) is emulsified into an aqueous solution of 25 grams of high quality pigskin gelatin and 225 milliliters of water at a temperature of about 45° C. and adjusted to a pH 9. Secondly, 1.5 grams of diisobutyl cresoxy ethoxydimethyl benzyl ammonium chloride, an antibacteriostatic agent, was dispersed in 8.5 grams of corn oil and the dispersion emulsified in a solution of 25 grams of pigskin gelatin and 225 milliliters of water at about 45° C. and adjusted to pH 9. Thereafter the two emulsions were mixed together and continuously agitated. To this agitated mixture was then added 55.5 grams of gum arabic dissolved in 500 milliliters of water and having a temperature of 45° C. and pH of 9.

The resulting mixture was then diluted under constant agitation with 3800 ml. of water at 45° C. and pH 9, whereupon, 32 grams of a 5% by weight aqueous solution of polyvinylmethyl ether/maleic anhydride copolymer was added. With continuous agitation, the pH of this coacervatable mixture was then lowered to 6.0 by the drop-by-drop addition of a 20% by weight aqueous solution of acetic acid.

At this point the capsule droplets containing the deodorant and antibacteriostatic agent start to form and cluster into small units. Thereafter, the drop-by-drop addition of the 20% aqueous acetic acid solution was continued until the pH was reduced to 4.2 which caused coacervate deposition of the fractions of the polymeric material which did not deposit around the capsules at pH 6.0. The latter deposition of polymer occurred as a dense liquid wall around the cluster units individually to form encapsulated cluster units.

The walled cluster units were then cooled to gel the deposited wall materials. After cooling, the excess liquid was removed by evaporation until a pasty-like semi-liquid was obtained.

Thin layers of this semi-liquid were then coated onto the surface of a sanitary napkin and on the absorbent core thereof. The coatings were then dried by evaporation of the solvent. Inspection of the surfaces of the napkin revealed the presence of a multiplicity of minute clusters of bubbles thereon.

The coated napkin was thereupon subjected to the application of carefully applied pressure whereby the breakage of the minute bubbles on the surface could be microscopically detected and the presence of a released oil detected. On further application of pressure, the presence of an oily substance on the surface of the absorbent core could be detected.

Additional napkins were prepared employing coatings of the previously prepared pasty liquid and dried as before. These napkins were then submitted for clinical testing whereupon it was reported that effective control of the menstrual discharge was achieved while simultaneously providing comfort and ease of application to the wearer. The tested napkins were particularly effective in obviating the characteristic odor associated with the menstrual period.

Having described the invention in specific detail and indicated the manner in which it may be carried into practice, it will be readily apparent to those skilled in the art that innumerable variations, applications, modifications and extensions of the basic principles involved may be made without departing from its spirit or scope.

What is claimed is:

1. An absorbent catamenial device comprising an absorbent portion having a fluid-permeable wrapper, and having adhered to said absorbent portion at least one layer of a multiplicity of discrete rupturable microcapsules containing chemical materials capable of aiding in the control of the fluid associated with the menstrual discharge, said microcapsules comprising minute encapsulated clusters of smaller individual microcapsules, the clusters being contained in shells of polymeric encapsulating materials.

2. An absorbent catamenial device according to claim 1 wherein said layer of multiplicity of discrete rupturable microcapsules is disposed in approximately parallel alignment to said fluid-permeable wrapper.

3. An absorbent catamenial device according to claim 2 wherein said microcapsule layer is on the exterior surface of said permeable wrapper.

4. The device of claim 1 wherein said microcapsules are rupturable by means selected from the group consisting of friction, pressure, chemical solution, chemical reaction and heat.

5. The device of claim 4 in which said microcapsules in said layer contain the same chemical material.

6. The device of claim 4 in which said microcapsule layer contains different chemical materials selected from the group consisting of deodorants, antibacteriostats, germicides, spermicides, fungicides, biostatic agents and decoloring agents.

7. An absorbent tampon-type catamenial device comprising an elongated core of absorbent material substantially cylindrical in form having a rounded end and a pull string and having adhered thereto a multiplicity of discrete rupturable microcapsules containing chemical materials capable of aiding in the control of the fluid associated with the menstrual discharge, said microcapsules comprising minute encapsulated clusters of smaller individual microcapsules, the clusters being contained in shells of polymeric encapsulating materials.

8. The device of claim 7 wherein said microcapsules are rupturable by means selected from the group consisting of friction, pressure, chemical solution, chemical reaction and heat.

9. The device of claim 8 in which said microcapsule layer contains different chemical materials selected from the group consisting of deodorants, antibacteriostats, germicides, spermicides, fungicides, biostatic agents and decoloring agents.

#### References Cited

##### UNITED STATES PATENTS

2,739,593	3/1956	McLaughlin	128—270
2,800,457	7/1957	Green	252—316
2,940,449	6/1960	Thomson	128—290
2,969,330	1/1961	Brynko	167—83
3,116,732	1/1964	Cahill	128—260
3,137,631	6/1964	Soloway	167—84
3,265,629	8/1966	Jensen	167—83
3,340,875	9/1967	Dudley et al.	128—290
3,381,688	5/1968	Satas	128—296

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117—143; 128—260, 290; 424—28