July 24, 1956 H. C. RIORDAN 2,755,805

SURGICAL SPONGES AND METHODS FOR MAKING SAME

Original Filed Sept. 7, 1946

Fig. 1.

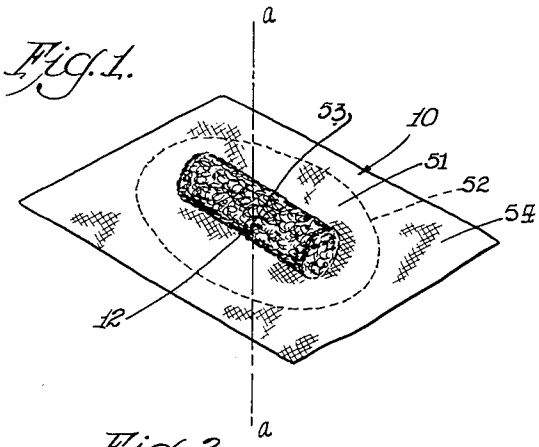


Fig. 2.

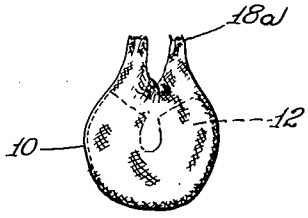


Fig. 3.

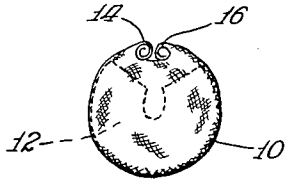


Fig. 4.

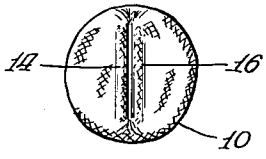


Fig. 5.

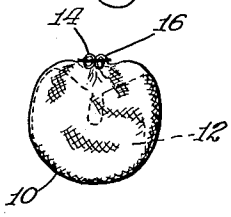


Fig. 6.

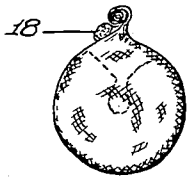


Fig. 7.

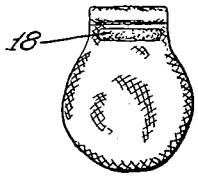
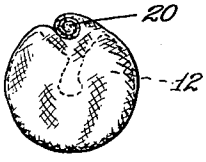


Fig. 8.



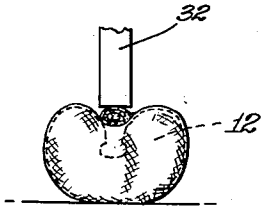


Fig. 9.

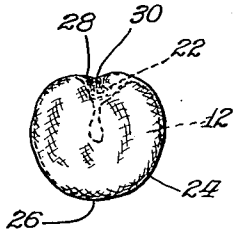


Fig. 10.

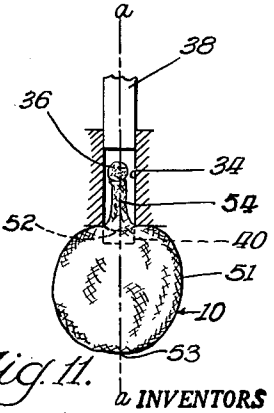


Fig. 11.

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SURGICAL SPONGES AND METHODS FOR MAKING SAME

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Continuation of abandoned application Serial No. 695,472, September 7, 1946. This application December 20, 1951, Serial No. 262,506

19 Claims. (Cl. 128—296)

This invention, which is a continuation of co-pending application Serial No. 695,472 of Howard C. Riordan and Leo Bethke, filed September 7, 1946, and now abandoned, relates to a surgical sponge and to methods of making the same.

In performing an abdominal operation it is customary under present practice to apply medication or to stanch the flow of blood by means of a sponge which is substantially flat and perhaps four by four inches square. This sponge has no exposed unselvaged, gauze edges and hence bits of gauze thread escaping from a raveling edge cannot be dropped into the incision. This quality of not losing bits of thread has brought this type of surgical sponge into wide use for abdominal work. In making this sponge, a piece of gauze, perhaps twelve by twelve inches square and having one or more unselvaged edges, has its edges turned in, and then by additional repeated foldings it is reduced to the size of four by four inches so that it consists of several thicknesses of gauze with the edges turned in.

These existing abdominal sponges are inefficient because the surgeon places his forceps near the mid point of the flat surface of the sponge and dabs the spot where blood is flowing with the comparatively limited area of the sponge actually grasped by the forceps. The corners of these square sponges are used little if at all. Where the sponge is used to apply liquid medication, the entire sponge may be dipped in the medication. Most of this medication is wasted because only the medication in that part of the sponge immediately adjacent to the holding forceps will be applied to the body. Some medications are expensive and wasting them is costly.

These last recited objections to the abdominal square sponge are equally applicable to such sponges when used for tonsillectomies, rectal and vaginal work, and preparing a skin area for an operation. A ball or globular sponge has been developed which has a gauze wrapper and an absorbent cotton core. These sponges are illustrated in United States Patent No. 2,400,250. These globular sponges are characterized by tails which have raveling edges because they are made from gauze squares having unselvaged edges. These globular sponges have been on the market for some years and are recommended for and being accepted for tonsillectomies, rectal and vaginal operations, and skin preparation work. In such operations, the danger resulting from a loose thread (if there is any danger at all) is small when compared to the danger of a loose thread in an abdominal operation. These globular sponges are very efficient because they bring a comparatively large absorptive volume of gauze and cotton close to the point of the body to be stanched or medicated, and secondly, as an incident to this first advantage, they are not wasteful of costly medication.

The object of the present invention is to provide a globular surgical sponge having no exposed raveling edges although made with gauze swatches having unselvaged edges. This sponge will be usable in abdominal operations. It will also constitute an improvement of applicant Riordan's existing type of globular sponge for conceivably a loose thread segment left in the mouth during a tonsillectomy might get into the lungs. From a commercial standpoint, it is applicant's ultimate intention to replace the existing tail-type globular sponge with this new tailless globular sponge which will be usable both for abdominal work and for the other group of operations such as tonsillectomies.

Applicant here discloses several methods of making this tailless, globular surgical sponge, one using a staple or stitching to effect the closure and the other using a liquid fast-drying adhesive. The presently preferred form is the tailless, globular surgical sponge held in assembled relationship by an adhesive. This invention is illustrated in one sheet of drawings wherein:

Fig. 1 is a perspective view of a cotton core lying on a gauze swatch;

Fig. 2 shows the gauze swatch drawn around the cotton core;

Fig. 3 shows one type of rolling operation for the free ends of the swatch;

Fig. 4 is a top view of the sponge shown in Fig. 3;

Fig. 5 shows a staple or stitching in place;

Fig. 6 and Fig. 7 show side and face views of a globular sponge at the moment after an adhesive was applied;

Fig. 8 shows the tails rolled into the adhesive;

Fig. 9 illustrates a plunger forcing the tails between the adjacent ends of the core;

Fig. 10 shows a completed sponge; and,

Fig. 11 shows an alternative method of fixing the ends of the swatch with adhesive.

Continuing to refer to the drawings in Fig. 1, the numeral **10** identifies a substantially square swatch of gauze or similar porous sheet-like element upon which is laid a cylindrical section **12** of compressible or resilient filling material such as absorbent cotton rope, this constituting the first step in making applicant's improved globular surgical sponge. In Fig. 2, the perimetric edge portions including the corners of the swatch **10** have been drawn upwardly around the section of the cotton rope or filling material giving the latter the configuration indicated by the dotted line **12** and forming a jacket for the sponge from the fabric swatch. This constitutes step two. See the Mott Patent No. 2,400,250, which discloses a machine that will perform these two steps.

In Fig. 3, the edges and the corners of the swatch **10** have been contiguously assembled into two somewhat parallel rolls **14** and **16** for closing the jacket, see also Fig. 4. It will be understood that the ends indicated by the numeral **18** in Fig. 2 are very irregular and that in the rolling process the object is to turn all of the edges inwardly. When this has been done, the fifth step is to stitch, see Fig. 5, through the rolls **14** and **16**, thereby flattening them out. This stitching constitutes one form of means permanently associated with the contiguously assembled edge portions for retaining them assembled and inwardly of the jacket. When tension resulting from holding the gauze for the stitching step is released, the cotton rope of heterogeneously arranged fibers tends to expand and fill the gauze so as to produce a firm, attractive, globular surgical sponge.

The preferred method of making applicant's globular surgical sponge follows the same steps as illustrated in Figs. 1 and 2. The next step is to start to roll the edges of the tails in one direction, as illustrated in Fig. 6, or to turn them inwardly toward the sponge core. At this point, a quantity of adhesive **18** is positioned on that portion of the swatch which is about to be rolled up, see also Fig. 7. The roll is then continued to approximately the extent indicated in Fig. 8. Gauze is loosely woven and the globule of adhesive penetrates through the various

thicknesses of the roll **20**. The final step is to push the roll into the surgical sponge and hold it there for a moment. Upon release, the surgical sponge holds its shape as illustrated in Fig. 10 with the corners and edges of the gauze **22** actually inside the periphery **24** of the sponge. There are no loose edges and a surgeon can even pick the sponge up at the point **26** and apply the closure area **28** to the wound and get substantially good results.

There is one control which is important and that is the adhesive control. The viscosity must be right and the quantity must be right because the adhesive dries hard and is, of course, not wanted on any part of the surface of the sponge. Applicant advises doctors to pick up this globular surgical sponge adjacent indentation **30** in Fig. 10 because it may not be practical to control the adhesive or the springing out of a little gauze having adhesive on it when the pressure member such as **32** in Fig. 9 is withdrawn.

Applicant has experimented with a device for simply pushing the ends **18***a* of Fig. 2 into the gauze. Thus, in Fig. 11, the ends of the gauze have been inserted into a tube **34**. A drop of adhesive **36** is dropped onto the ends and a plunger **38** moves downwardly into position **40**. This eliminates the rolling step. In Fig. 1 the initially thin body **10** of liquid absorbing material is divisible into a first portion **51** substantially conforming to a disc and having a perimeter **52** (represented by a dotted line). The geometric center **53** of this first portion **51** is intersected by an axis *a*—*a* lying perpendicularly to the plane of the thin body **10**, and the remainder **54** of the thin body **10** projects from the perimeter of the portion **51** radially of the center **53** during the flat condition of such body. Referring again to Fig. 11 it can be seen that attendant to gathering the remainder **54** of the thin body **10** into a stem-like formation projecting into the bore **34**, the first body portion **51** is shaped into a sack of bulbous contour forming the exterior of the sponge while the geometric center **53** coincides with the axis *a*—*a* at the lower end of this sponge. Meanwhile, the portion **51** of the body **10** has its perimeter **52** constricted about the axis *a*—*a* at the opposite end of the sponge to close the sack. Subsequent to downward movement of plunger **38** to position **40** the remainder **54** of the thin body **10** will continue to be accumulated into a mass symmetrically about the axis *a*—*a* while projecting inwardly of the sack contour from the upper end of the sponge. Upon hardening, the adhesive becomes fastening means also symmetrically about the axis *a*—*a* and disposed inwardly of the sack contour for holding the sack closed.

The surgical sponge as shown in the drawings is spherical or ovoid. The shape is not critical. It would seem feasible to use a cylindrical core of cotton rope wrapped in gauze so that there were no exposed unselvaged edges, and held in assembled relationship by stitching or an adhesive.

The adhesive used is collodion. After the sponges have been made, they are sterilized and short of storing the sponges for several months there is no danger of a bacterial growth appearing in the hardened collodion. Applicant will indicate on the packages that the sponges are to be used on or before a given date, or else resterilized. Applicant uses the collodion in a syrupy form and on drying, it remains some what plastic. The drying is quite rapid, that is to say measured in terms of seconds and not in terms of minutes. The period of drying can be varied by treating the deposited drop of collodion by air or other hardening means.

I claim:

1. A generally bulbous surgical sponge comprising a moisture pervious swatch having a single perimetric edge gathered about a compressible body of absorbent textile filler material to form a sack within which said filler material is confined, edges of said swatch being collected into a neck turned inwardly of said compressible body and forming with said compressible body a firm absorbent content substantially filling the sack to present a generally bulbous absorbent sponge, and fastening means retaining said neck in its inwardly turned position.

2. A globular surgical sponge comprising a resiliently yieldable and absorbent core of textile fibers and a piece of pervious absorbent sheet material having a single perimetric edge gathered about the core to form a sack-like cover confining the core, marginal portions of said sheet material being gathered into a neck, said neck being tucked inwardly and extending between and in contiguous relation with opposed portions of said resiliently yieldable core, said core forming a firm absorbent content substantially filling the cover to present a generally globular absorbent sponge, and means comprising said opposed resiliently yieldable core portions cooperating with the contiguous extended neck portions for holding said neck tucked inwardly to retain said cover in core-confining relation to said core.

3. A generally bulbous surgical sponge comprising a resiliently yieldable and absorbent core of textile fibers having a recess in its periphery and a piece of pervious absorbent sheet material having a single perimetric edge gathered about the core to form a sack-like cover presenting a constricted mouth within which said core is confined, marginal portions of said sheet material being tucked through said mouth into the recess in said core, said core forming a firm, absorbent content substantially filling the cover to present a generally bulbous absorbent sponge and means comprising recess-defining portions of said resiliently yieldable core cooperating with the portion of said sheet material tucked into said recess to retain said cover in core-confining relation to said core.

4. In a surgical sponge having an axis intersecting opposite ends thereof, an integral piece of initially flat liquid-pervious material having a central portion bounded by a circumscribing portion, said central portion constituting one end of the sponge and being disposed in the form of a sack of bulbous contour, sections of said circumscribing portion adjacent said central portion being gathered together in close proximity with the axis at the opposite end of the sponge to effect closing of the sack, the remainder of said circumscribing portion of said piece being disposed inwardly of said bulbous contour, and means also substantially completely inwardly of said bulbous contour permanently retaining said gathered sections in the inwardly disposed position.

5. A jacketed surgical sponge having an axis intersecting opposite ends thereof, comprising a compressible core of liquid-absorbing filling material, and a thin piece of initially flat liquid-pervious material having a central portion bounded by a circumscribing portion, said central portion being disposed in the form of a jacket enclosing said core and being of bulbous contour, a part of said central portion coinciding with and constituting one of said ends of the sponge, the sections of said circumscribing portion adjacent said central portion being gathered in close proximity with said axis at the opposite end of the sponge to effect closing of the jacket, said gathered circumscribing portion being disposed inwardly of said bulbous contour, and means also substantially completely inwardly of said bulbous contour permanently retaining said gathered sections in the inwardly disposed position.

6. A globular jacketed surgical sponge having diametrically opposite ends, said sponge comprising a core of yieldable liquid-absorbing filling material, a piece of initially flat flexible liquid-pervious sheet material having a central portion registering with one of said ends and disposed about said core to form a bulbous smooth-surfaced enclosing jacket of the sponge, said piece of sheet material also having marginal portions assembled contiguously in their entirety at the opposite end to close said jacket, said marginal portions being disposed inwardly of the bulbous contour of the jacket, and means disposed inwardly of said bulbous contour in permanent association with

the assembled marginal portions for retaining them assembled in such inward disposition.

7. A surgical sponge having an axis intersecting opposite ends thereof, comprising a thin body of initially flat liquid-absorbing material having a first portion substantially conforming to a disc with a geometric center and from the perimeter of which the remainder of such body projects radially of said center during the flat condition of such body, said first portion being disposed in the form of a sack of bulbous contour forming the exterior of the sponge and with the center of such portion coinciding with said axis at one end of the sponge, said perimeter of said first body portion being constricted about said axis at the opposite end of the sponge to close the sack, said remainder of the body being accumulated into a mass substantially symmetrically about said axis and projecting inwardly of the sack contour from said opposite end of the sponge, and fastening means also substantially symmetrically about said axis at said other end of the sponge and disposed inwardly of the sack contour for holding the sack closed.

8. A surgical sponge comprising a porous sheet-like element having a single perimetric edge and having its central portion bulged to form a sack of substantially smooth contour, the single edge of such element being drawn together to completely close such sack, a body of textile fibers disposed in the sack, the drawn edge of the element being projected inwardly of the bulged central portion as accommodated by the compressible filling material, and means permanently associated with said drawn edge for retaining it drawn and projected inwardly.

9. A surgical sponge comprising a core of textile fibers, a thin piece of moisture pervious material having a single perimetric edge, said piece of material being disposed in the form of a sack having a substantially smooth contour and enclosing the filling material, a portion of said piece bordering said edge being gathered together to form a neck of the sack, said neck being disposed inwardly of the sack, and means permanently associated with said neck and also disposed inwardly of the sack for retaining said neck in such inward disposition.

10. A jacketed surgical sponge comprising a preformed core of yieldable filling material, a piece of initially flat fabric disposed about said core to form a bulbous smooth-surfaced enclosing jacket of the sponge, said fabric piece having a single perimetric edge with portions assembled contiguously to close said jacket, said assembled edge portions being disposed inwardly of the jacket, and means disposed inwardly of said jacket in permanent association with the assembled edge portions for retaining them assembled inwardly of the bulbous contour of said jacket.

11. The combination set forth in claim 10 wherein said means permanently associated with the assembled edge portions constitutes stitching.

12. The combination set forth in claim 10 wherein there is an adhesive substance constituting said means permanently associated with said assembled edge portions.

13. A jacketed surgical sponge comprising an elongated core of yieldable filling material doubled upon itself to place its ends in proximity to form a recess therebetween, a sheet-like porous element having a single perimetric edge and disposed about said core to form an enclosing jacket of the sponge, said porous element having portions adjacent said edge assembled contiguously to close said jacket and projected inwardly of the jacket into said recess so as to avoid substantial exposure exteriorly of the jacket, and means permanently associated with the contiguously assembled edge portions for retaining them assembled within said recess.

14. The method of making a surgical sponge, comprising the steps of placing a first body of textile fibers in a second body formed of the central portion of a moisture pervious swatch having a single perimetric edge, collecting such edge of the swatch into a neck turned inwardly of said first body, and fastening such neck in its inwardly turned position.

15. The method of making a surgical sponge, comprising the steps of placing a body of textile fibers in a pocket formed of the central portion of a moisture pervious swatch having a single perimetric edge, collecting such edge of the swatch into a neck turned inwardly of said body, and fastening such neck in its inwardly turned position.

16. The method of making a surgical sponge including a sheet-like porous element having a single perimetric edge, comprising the steps of gathering portions of said sheet-like element coextensively adjacent said edge together to form a pocket of such element, assembling a body of compressible filling material in such pocket, projecting the gathered edge portions inwardly of the pocket to completely close the same, and adhesively joining said edge portions for permanently retaining them in their inwardly-projected relation.

17. The method of making a surgical sponge which comprises the steps of wrapping a yieldable body of filling material in a swatch having a single perimetric edge in such a manner that said edge of the swatch is gathered in a bunch at one side thereof, of applying an adhesive to the bunch, and of pressing the bunch against a contiguous part of the swatch so that the adhesive may act as a fastening agent to hold the swatch in assembled relationship to the absorbent material.

18. The method of making a surgical sponge which comprises the steps of wrapping an elongated body of filling material in a sheet-like element having a single unselvaged perimetric edge in such a manner that the material is doubled upon itself to place its ends adjacent each other, and the edges of the element are gathered in a bunch on the side of the said ends, of applying an adhesive to said bunch, and of tucking said edges inwardly so that the adhesive holds them adjacent the body ends.

19. The method of making a surgical sponge which comprises the steps of wrapping an elongated body of filling material in a fabric swatch having a single unselvaged perimetric edge in such a manner that the body is bent into a semi-circular shape with its ends adjacent each other, and the edges of the swatch are gathered in a bunch on the side of the said ends, of tucking the unselvaged edges of the swatch inwardly and adjacent said ends, and of securing the swatch edges in said inwardly tucked relationship.

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