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Schulte et al.

[11] **3,882,855**

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[54] **RETRACTOR FOR SOFT TISSUE FOR EXAMPLE BRAIN TISSUE**

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[52] **U.S. Cl.** **128/20**

[51] **Int. Cl.** **A61b 17/02**

[58] **Field of Search** 128/20

[56] **References Cited**

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[57] **ABSTRACT**

A retractor for tissue comprising a deformable metal blade having a pair of opposite faces and a peripheral edge bounding and interconnecting the faces. A sheath comprising a flexible material which is non-adherent to brain tissue, such as silicon elastomer, includes a cover portion that covers at least part of the blade, having an exposed bearing face for bearing against soft tissue, such as brain tissue, and a flexible skirt portion extending from the said cover portion and projecting beyond the peripheral edge. The sheath may be reinforced by a mesh and have an irregular surface, if desired.

12 Claims, 4 Drawing Figures

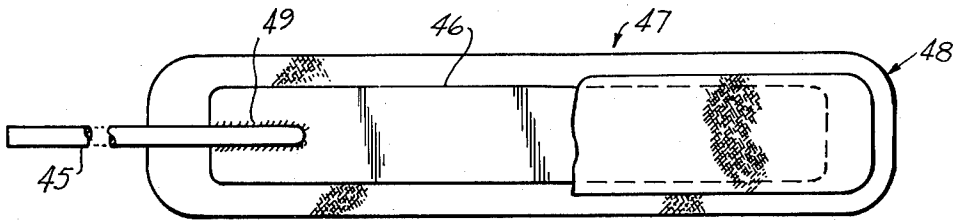


FIG. 1

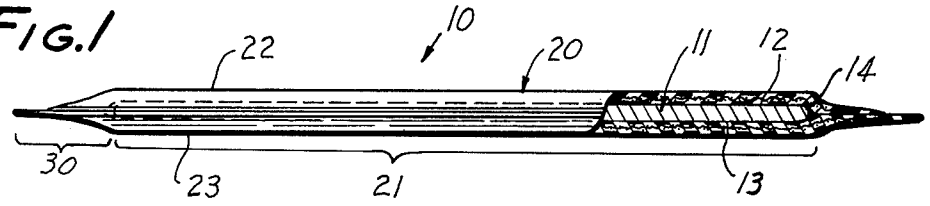


FIG. 2

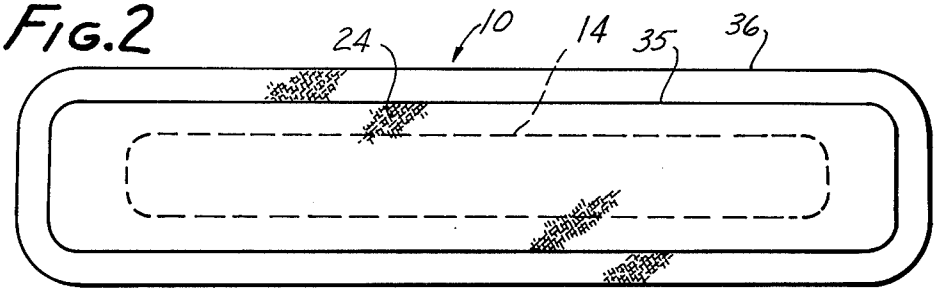


FIG. 3

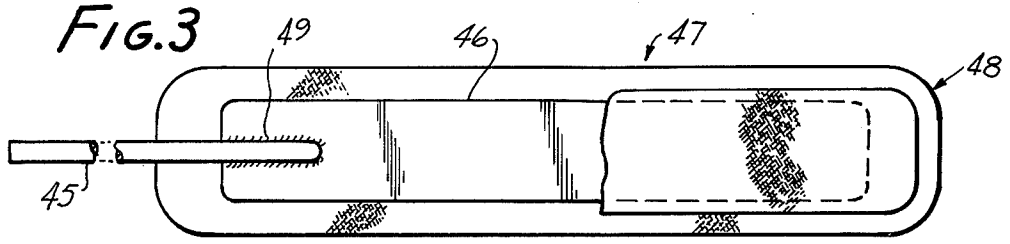
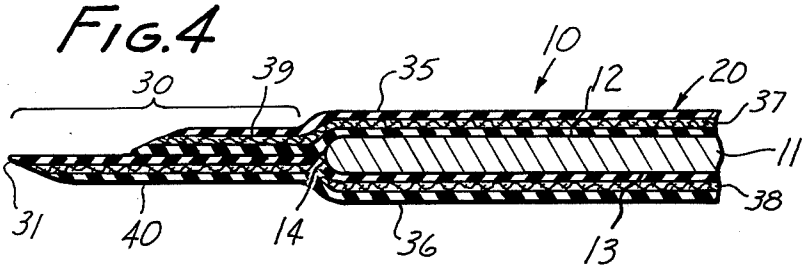


FIG. 4



RETRACTOR FOR SOFT TISSUE FOR EXAMPLE BRAIN TISSUE

This invention relates to a retractor for tissue. Among other uses, it is useful in the process of dissecting the brain during surgery on the brain.

The usual method of protecting the brain when using brain retractors is by padding the area with cottonoid paddies. The use of such cottonoids poses significant problems. Among these is their tendency to adhere to the brain tissue and cause bruising of the underlying brain. Also, because cottonoids do not slide, it is necessary to use numerous of them during a dissection, thereby forming a wad beneath the retractor which can obscure the area which must be visualized. Moving a retractor under these circumstances is complicated by the necessity of concurrently readjusting the position of these paddies. It is not infrequent that the edge of a cottonoid paddy used to protect the leading edge of the retractor may obscure the surgeon's vision, particularly when working in a small area, and this is a hazardous situation. Additionally, cottonoid paddies constitute a substantial hazard when the surgeon is working with a drill, because they tend to adhere to its rotating tip, and can then be whipped about, damaging the surrounding tissues.

The foregoing problems and objections have been overcome by this invention. This invention utilizes a deformable metal blade with a sheath enveloping at least the part of it which contacts the tissue. The sheath is made of a flexible material which is not adherent to brain tissue. A flexible skirt portion of the sheath projects beyond the peripheral edge of the metal blade. Silicone elastomer, Kel-F, teflon, mylar, and polyethylene are examples. When suitably wetted, a retractor covered with any of these materials can readily be moved along the surface of brain tissue without damaging it. Similarly, when a drill is used adjacent to such materials, the materials will not adhere to the whirling tip of the drill and will not be moved in such a manner as to damage surrounding tissue.

The invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is an edge view, partly in cutaway cross-section, of the presently preferred embodiment of the invention;

FIG. 2 is a top view of FIG. 1;

FIG. 3 is a top view of an alternate embodiment of the invention with part of one of its cover portions and skirt portion removed for purposes of illustration; and

FIG. 4 is an enlarged view of a portion of FIG. 1.

The presently preferred embodiment of the invention is shown in FIG. 1 wherein a retractor **10** for brain tissue is shown which includes a deformable metal plate **11** having a pair of opposite faces **12, 13** and a peripheral edge **14** which bounds and interconnects faces **12** and **13.** By "deformable" is meant an inherently shape-retaining metal blade which is sufficiently malleable that it can be bent to any shape desired by the surgeon. An annealed iron plate is an example.

A sheath **20** envelops at least that part of the blade which is intended to make contact with brain tissue. In most practical embodiments, the entire plate will be enveloped. The sheath includes a cover portion **21** which is defined as that portion of the sheath which makes contact with the parts of the opposite faces of the plate which are covered by the sheath. The cover portion

provides exposed bearing faces **22, 23.** In the preferred embodiment of the invention, as schematically shown in FIGS. **2** and **3** by surface shading, the entire bearing surfaces are irregular in surface contour. The irregularities may be formed by depressions such as pits **24** in a regular pattern.

The sheath also includes a flexible skirt portion **30** which extends from the cover portion. The skirt portion and cover portion are preferably integral. The skirt portion projects beyond the peripheral edge of the plate. As best shown in FIG. **4,** it is thicker adjacent to the peripheral edge than it is at its free edge **31.** It may be said to be "feathered" at its edge.

While the sheath may be formed by dipping the metal plate into an uncured silicone elastomer, and then curing it to the illustrated shape, with or without using a mold, it may more readily be constructed from a pair of sheets **35, 36,** comprising a material such as silicone elastomer, within which there are embedded respective reinforced mesh reinforcements **37, 38,** preferably of woven dacron thread. The shape of this weave will cause the pits in the bearing surface already described when the coating of the silicone elastomer over the mesh is suitably thin. The mesh reinforcement is optional. Sheets of material without reinforcement may be used instead.

The sheets include extensions **39, 40** which project beyond the peripheral edge. They are joined beyond the peripheral edge by adhesives or the like to form the skirt portion. Sheet **36** projects farther from the peripheral edge than sheet **35.** By this means, the thickness of the skirt portion is greater adjacent to the peripheral edge than it is at the free edge **31** of the skirt, at least by the difference of thickness of one of the sheets.

The sheets are shown tapered at their edges, which accentuates the difference in thickness, and makes the edges more flexible. Instead of a tapered edge as illustrated, the edges may be cut square as by a shear. The objective of flexibility will still be attained. In the drawings, especially in FIG. **4,** the thickness of the sheath has been exaggerated compared to the thickness of the metal plate. In practice, the metal plate may be on the order of 0.020 inch thick, while the sheets **35** and **36** may each be on the order of approximately 0.005 inch. The free edge of sheet **36** may project approximately 3mm beyond the peripheral edge, and the free edge of sheet **35** approximately 1.5mm beyond the peripheral edge. The thickness of the sheath adjacent to the peripheral edge will therefore be about 0.010 inch, and at the free edge about 0.005 inch (and less if tapered as shown).

The material of the sheath must be non-adherent to brain tissue, and in thin sections sufficiently flexible as not to cut or tear soft tissue, such as brain tissue, and to bend to spread the force exerted by the surgeon over a substantial area. This, of course, excludes unyielding metal surfaces which do not deflect to spread the applied force. Many materials have the property of non-adherence and inherent flexibility. An elastomer seems to provide this property better than most other substances, and the preferred elastomer is medical grade silicone elastomer. The hardness of the elastomer is selected relative to the dimensions of the skirt portion so the skirt portion is unlikely to damage the brain tissue. Generally, it will be sufficiently rigid to tend to return to its original shape, but not so unyielding as to bruise or to cut the tissue. The dacron mesh reinforcement re-

sists tearing of the sheath and provides the surface irregularity already mentioned.

In addition to elastomers, other sterilizable materials may also be used which are non-adherent to brain tissue, and flexible in the dimensions used, and will not bruise or cut the tissue. Other suitable materials are the fluorinated hydrocarbons known as teflon, mylar and Kel-F, and polyethylene. Therefore, the material may advantageously be one selected from the group consisting of silicone elastomer, polyethylene, mylar, teflon and Kel-F.

FIG. 3 shows an attachment rod **45** attached to the metal plate **46** of retractor **47,** and projecting beyond its sheath **48.** This rod is attached to the plate by weld **49.** In use, it can be attached to a mounting means to hold the retractor in place. The retractor of FIG. **1** is intended to be hand-held, and the retractor of FIG. **3** is intended to be held by an implement. The invention is suited for use in both ways. The retractor of FIG. **3** is identical to that of FIG. **1,** except for the attachment rod. Part of one of the sheets has been removed in FIG. **3** to illustrate the attachment of the rod to the plate. It is, of course, provided in the complete device.

In use, the padded retractor is wetted and used with a thin strip of material which will not adhere to brain tissue, such as silicone elastomer. A wetted strip of this material is placed as far forward as possible toward the area to be exposed, and the retractor of the invention is then used to elevate the brain, after which tension may be released and the retractor slid forwardly, using the strip as a fulcrum. When the desired dissection has been completed, a retractor provided with means such as shown in FIG. **3** may be substituted for the hand-held retractor to hold it in place during the remainder of the operation.

Of major importance to this invention is the fact that the material of the sheath does not include fibrous portions which can adhere to and abrade tissue of the brain, nor will it adhere to or be grabbed by a rotating driill tip. It is readily sterilizable. The flexible skirt portion enables the retractor readily to be moved into restricted areas, and to bend to avoid bruising the brain tissue. The metal blade provides adequate support for the sheath.

The size of the metal blade is variable. In an example such as FIG. **3,** a blade ½ inch wide by 2½ inches long is suitable, while in a device according to FIG. **2,** one as long as 7 inches and approximately ⅝ inch wide may be utilized. The material may be soft malleable iron, or any other suitably deformable metal.

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

We claim:

1. A retractor for tissue comprising: a deformable metal blade having a pair of opposite faces and a peripheral edge bounding and interconnecting said faces; and a sheath enveloping at least a part of said blade, said sheath comprising a cover portion covering at least said part of both faces of said blade and having an exposed bearing face for bearing against brain tissue, and a skirt portion extending from said cover portion and projecting to a free edge beyond said peripheral edge, said portions comprising a material which is non-adherent to brain tissue the skirt being thinner adjacent to its free edge than it is adjacent to the peripheral edge of the blade and being sufficiently flexible as to bend upon contact with soft tissue such as brain tissue without cutting, tearing, or bruising said tissue.

2. A retractor according to claim **1** in which the bearing face is irregular in surface contour.

3. A retractor according to claim **1** in which the material is one selected from the group consisting of silicone elastomer, polyethylene, mylar, teflon and Kel-F.

4. A retractor according to claim **1** in which the material is silicone elastomer.

5. A retractor according to claim **4** in which the cover portion includes a mesh reinforcement which is contained within said silicone elastomer.

6. A retractor according to claim **5** in which the mesh is dacron.

7. A retractor according to claim **1** in which the sheath comprises a pair of sheets of silicone elastomer, each overlaying a said part of a respective face, and including an extension that projects beyond said peripheral edge, said extensions being joined together to form said skirt portion.

8. A retractor according to claim **7** in which the extension of one layer projects farther beyond the peripheral edge than the extension of the other layer, whereby the skirt is thicker adjacent to the peripheral edge than at the free edge of the skirt.

9. A retractor according to claim **8** in which the bearing face is irregular in surface contour.

10. A retractor according to claim **7** in which the cover portion includes a mesh reinforcement which is contained within said silicone elastomer.

11. A retractor according to claim **10** in which the mesh reinforcement extends into the skirt portion.

12. A retractor according to claim **11** in which the bearing face is irregular in surface contour.

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