

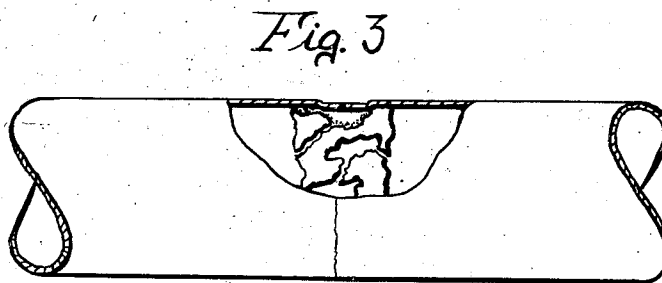
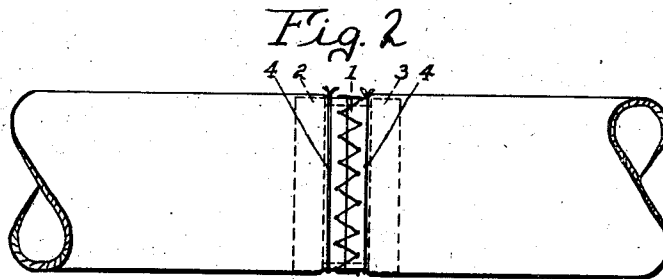
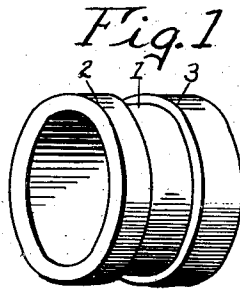
Oct. 14, 1947.

G. C. MILLER

2,428,918

ANASTOMOSIS RING

Filed Sept. 12, 1944



Inventor
Grover C. Miller
By Lyon & Lyon
Attorneys

UNITED STATES PATENT OFFICE

2,428,918

ANASTOMOSIS RING

Grover C. Miller, San Gabriel, Calif.

Application September 12, 1944, Serial No. 553,719

10 Claims. (Cl. 128—334)

1

This invention relates to anastomosis rings and more particularly to rings adapted for the joining of two or more intestines, two or more sections of the esophagus, or other canals and which is particularly useful in surgical treatment of the intestines where it is necessary to join severed or cut ends of the intestinal canal and to effect a union of the severed or cut ends of such canals. In the surgical treatment of the intestines it often becomes necessary to join severed or cut ends of the intestines. In many cases it is necessary to resort to surgery to remove a section of the intestinal canal and to then join the ends of the canal from which the section has been removed. It is desirable in such operations to effect a union of the ends of such canals so that there is no interior obstruction within the canal. It is necessary also to so hold the severed or cut ends of the canal together that the same may effect a union as by growing together.

I have discovered that I can effect such a union and reuniting of the severed ends of such canals by utilizing what I term an anastomosis ring which has the property of providing for the immediate coupling of the said canals, holding the ends in position so that they may effect a permanent union, retaining the said ends in position to effect the union for the period of time required for such healing or growing together, and which ring will then disintegrate and remove all obstructions, either internally or externally of the canal whereby a perfect and complete union is effected without leaving in position any foreign material or member.

It is therefore an object of my invention to provide an anastomosis ring which may be used for effecting a permanent union of such canals as the intestinal canals, two or more sections of the esophagus, or other similar vessels or members, and which ring has the property of acting as a coupling member to maintain the said canal elements in position for effecting a permanent union and has the further property of disintegrating under the natural conditions existing to remove all obstructions either internally or externally of such canal when the union has been completely accomplished.

Other objects and advantages of this invention it is believed will be apparent from the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a perspective view of an anastomosis ring embodying my invention.

2

Figure 2 is an elevation illustrating the manner of utilization of the ring in effecting a union between two tubular canal elements.

Figure 3 is a diagrammatic view illustrating the process of disintegration of the anastomosis ring after the union has been effected or accomplished.

In the preferred embodiment of my invention as illustrated in the accompanying drawings, I have illustrated the anastomosis ring embodying my invention as including a cylindrical section 1 having end collar sections 2 and 3 at the opposite end of the cylinder 1 and which collars are of greater diameters than the diameter of the cylinder 1.

The anastomosis ring embodying my invention is constructed of such a material as will disintegrate under the influence of water without requiring other chemical reaction to be performed to effect its disintegration. It is essential that such ring be constructed of such materials as will permit the definite determination of the time of its disintegration under the influence of water without variation due to the presence or absence of different chemical elements or without regard to the acidity or alkalinity of the liquids or fluids present at the point of utilization of such a ring. In other words, it must be possible to definitely determine the time of such disintegration so that the time of disintegration will not be variable due to the pH of the fluids or liquids utilized for effecting the disintegration. It is well recognized that in many places of application of such an anastomosis ring that the conditions of pH may vary over wide ranges.

In order to provide such a ring I utilize a base which is formed of a material having a high degree of expansibility on absorption of water. I control the rate of absorption of water by this base material in two ways: (1) by the degree to which the base material is ground or disintegrated, thereby determining the surface area open to contact with the water, thus determining the rate of water absorption, and (2) by impregnating or incorporating within the ground or disintegrated base material water resistant elements which control the rate at which water reaches the base element.

There are many such compositions which may be utilized for the formation of the anastomosis rings of my invention, many examples of which are set forth in the patent granted to me August 20, 1935, No. 2,011,587, for Coating for medical compound. I prefer, however, under present conditions of availability of materials to produce the

anastomosis rings of my invention utilizing powdered or disintegrated elm bark as the expansive base element, and to incorporate within the powdered elm bark water-repelling ingredients consisting of petroleum jelly, carnauba wax and stearic acid. In this composition I include an antiseptic substance such as merthiolate so that the anastomosis ring is antiseptic. Thus the anastomosis ring is antiseptic and provides on its disintegration the release of an antiseptic substance which maintains the union sterile.

It is also desirable because of the necessity of determining the accuracy of the union between such canal elements and the progress of the union to incorporate in the anastomosis ring a material which will permit the X-ray determination of the union being effected. For this purpose I have found it desirable to incorporate in such an anastomosis ring a substance such as barium sulphate which will permit of X-ray examination. A preferred example of the composition of the anastomosis ring embodying my invention is:

Stearic acid (U. S. P.)	-----	ounces--	20
Carnauba wax	-----	do-----	7
Petroleum jelly	-----	do-----	1/4
Powdered elm bark	-----	do-----	6
Barium sulphate	-----	do-----	1
Merthiolate	-----	grains--	2
Dissolved in:			
Isopropyl alcohol	-----	drams--	1
Distilled water	-----	do-----	1

The time in which such an anastomosis ring will break or disintegrate on absorption of water is controlled by the degree of disintegration of the elm bark or by the proportions of elm bark to water-repellent elements used in making up the composition. The particular proportions hereinabove set forth and utilizing a finely powdered elm bark produce an anastomosis ring which will disintegrate on absorption of water in approximately 54 to 60 hours. By increasing the quantity of elm bark and maintaining the water-repellent material constant the time of disintegration may be shortened. By decreasing the quantity of water-repellent material to quantity of powdered elm bark, the time of disintegration may also be shortened. By increasing the quantity of water-repellent elements to the quantity of elm bark, or by decreasing the degree of disintegration of the elm bark, the time may be lengthened when the anastomosis ring will disintegrate upon absorption of water.

It will be apparent that such anastomosis rings utilized for the joining of intestines or other canal elements are utilized in a position where water or moisture is present so that these anastomosis rings will be in position to absorb water from their surroundings and will in fact attract water so that they will disintegrate practically uniformly under their varying conditions of use at the time intervals established in advance by the composition of the rings.

It is obvious that other water absorption elements may be utilized such as powdered agar and other water absorption elements as the same are set forth and described in the patent issued to me as above defined including not only those elements which disintegrate by swelling or expansion on absorption of water, but also those substances which are mechanically broken on water absorption.

It will be apparent that in the preparation of an anastomosis ring that those substances must be chosen for the base which will not produce

an irritant residue when the ring breaks down. All substances therefore of the character of elm bark, agar, cinnamon bark and the like which upon absorption of water form a relatively soft, pliable mass, are better suited for use in this preparation.

While the coating for medical compounds disclosed in the patent issued to me, No. 2,011,587, is a timed coating or so-called enteric coating for medical compositions, that coating required timing which would enable the coating to break away or liberate the medicine on periods of time ranging from a fraction of an hour to the entire time required for a substance to pass through the digestive tract which may be in the neighborhood of six hours or less. The anastomosis rings embodying the present invention must have a timing for their disintegration of several days' time in order to allow for the complete union of the tubular canal members so that they are completely united before the rings disintegrate.

I have illustrated in Figure 2 a method of utilization of the anastomosis rings embodying my invention wherein I have shown two tubular canals extended over the opposed collars of the ring suitably adhered together at their point of juncture by stitches or otherwise and wherein wrappings 4 of suitable gut or other material are passed around the ends of the tubular canals and tied so that they are depressed to the smaller diameter of the sleeve or cylinder 1, thereby holding the canal sections from endwise displacement behind the collars 2 and 3. The two ends of the canals may be joined together over the anastomosis ring by joining the ends with a purse stitch which is then drawn down by tension on the end of the material forming the purse stitch, thereby eliminating the necessity of utilizing the separate ties 4. In this case of course it will be immaterial whether the anastomosis ring has end collars or is merely a tubular sleeve. All of the material thus utilized is of a character which will disintegrate in time and it is apparent that this method of joining the intestines or other similar tubular canals leaves no obstruction within the interior of the canals after the material of which the rings are composed has disintegrated.

In Figure 3 I have illustrated diagrammatically the process of disintegration where I have shown the ring fractured and broken into small segments. This process of disintegration of course occurs after the required amount of moisture has been absorbed by the base substance. In the case of the intestinal tract, this disintegrated material will be discharged through the intestines. In other cases the material being soft and of an antiseptic nature, will cause no complications.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. An anastomosis ring for use in the surgical joining of tubular canal members comprising a base and a substantially water expansible material incorporated therewith, the base material being acted upon by water absorption to expand the expansible material and break the ring independently of chemical reaction, and the base material having incorporated therein a material to determine the rate at which the water is absorbed by the water expansible material.

2. An anastomosis ring for surgical joining of

5

tubular canals formed as a cylinder having collars at its opposed ends and said cylinders and collars being formed of a water expansible base material and a substantially water insoluble material for controlling the rate of absorption of the water by the base material, whereby the time of absorption by the base material of a quantity of water sufficient to disrupt the ring is controlled independently of chemical reaction.

3. An anastomosis ring for a surgical joining of tubular canals which comprises a cylinder member adapted to be inserted within the ends of the tubular canals and over which the tubular canals are secured together and to the cylinder, the said cylinder being formed of a water expansible base material incorporated within a water repellent material such as stearic acid, a wax and petroleum jelly whereby the rate of absorption of the water by the water-absorbing material is controlled, and which ring breaks up when it has absorbed moisture independently of chemical reaction.

4. An anastomosis ring for surgical joiner of tubular canals of the intestinal tract which comprises a cylinder consisting of a water expansible substance and a substantially water insoluble material which retards the rate of absorption of water by the water-absorbing material, and which has incorporated therein an antiseptic material and over which ring the ends of the tubular canal are positioned, secured together and held, said ring disrupting or fracturing under the influence of moisture absorbed thereby independently of chemical reaction and acting to release the antiseptic substance on such disruption.

5. An anastomosis ring for the joiner of tubular canals of the digestive tract, comprising a sleeve over which the ends of the tubular canal are adapted to be positioned and held, the sleeve being composed of a water-absorbing base material and mixed with a water-repellent material in proportions to control the time when the base material will absorb sufficient water to rupture the sleeve, and the sleeve being disrupted under the influence of moisture independently of chemical reaction.

6. An anastomosis ring for the joiner of tubular canals of the digestive tract, comprising a sleeve over which the ends of the tubular canal are adapted to be positioned and held, the sleeve being composed of a water-absorbing base material and mixed with a water-repellent material in proportions to control the time when the base material will absorb sufficient water to rupture the sleeve, the sleeve being disrupted under the influence of moisture independently of chemical reaction, the said sleeve having incorporated therein a material which enables the position and condition of the ring to be determined by X-ray prior to its disruption.

7. An anastomosis ring for the joiner of tubular canals of the digestive tract, comprising a sleeve over which the ends of the tubular canal are adapted to be positioned and held, the sleeve

6

being composed of a water-absorbing base material and mixed with a water-repellent material in proportions to control the time when the base material will absorb sufficient water to rupture the sleeve, the sleeve being disrupted under the influence of moisture independently of chemical reaction, the said sleeve having incorporated therein a material which enables the position and condition of the ring to be determined by X-ray prior to its disruption, and the ring having incorporated therein an antiseptic substance which is released upon disruption of the ring.

8. An anastomosis ring for surgical joining of tubular canals comprising a cast tubular member adapted to be inserted within the ends of the tubular canal and over which the tubular canals are secured together, the said cylindrical member including a base material composed of stearic acid, carnauba wax, petroleum jelly, powdered elm bark, barium sulphate and merthiolate, the elm bark being expansible on absorption of water by the base material to fracture the base material, and the petroleum jelly, wax and stearic acid being determinative of the rate at which water is absorbed by the base material, and thereby determining the time when the cylindrical member will break away from the tubular canals.

9. An anastomosis ring for surgical joiner of tubular members comprising a sleeve over which the tubular members are positioned and secured, and the sleeve being composed of a base material having incorporated therein an agent for altering the physical structure thereof after a predetermined time, said material being acted upon by moisture to fracture the sleeve independently of chemical reaction.

10. An anastomosis ring for surgical joining of tubular canals which comprises a sleeve adapted to be inserted within the ends of the tubular canals and over which the tubular canals are secured together and to the sleeve, the said sleeve being cast of a fusible base material incorporating a water expansible agent, and a water repellent material acting to control the rate of absorption of the water by the water-absorbing material whereby the rate of absorption of the water by the water absorbent material is determined to fix the time at which the sleeve will break down upon water absorption independently of chemical reaction.

GROVER C. MILLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,072,302	Herrmann et al. -----	Mar. 2, 1937
1,470,707	Bates -----	Oct. 16, 1923
2,127,903	Bowen -----	Aug. 23, 1938
2,011,587	Miller -----	Aug. 20, 1935