May 5, 1953 E. M. GREENBERG 2,637,320

OBSTETRICAL FORCEPS

Filed July 22, 1950

Fig. 1

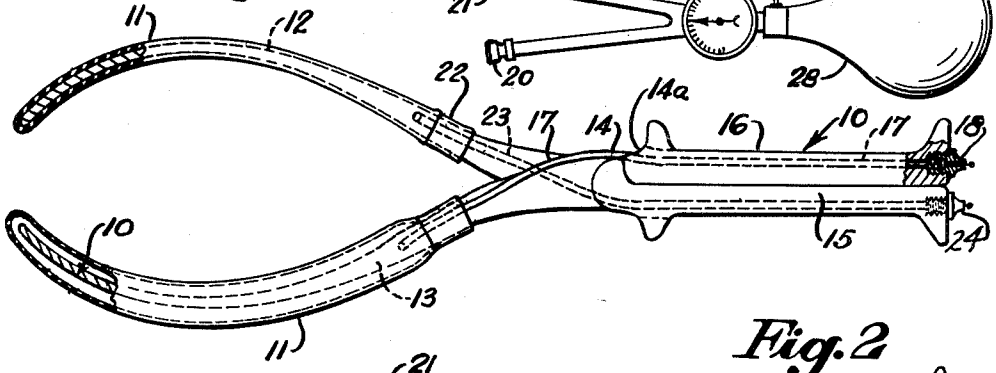
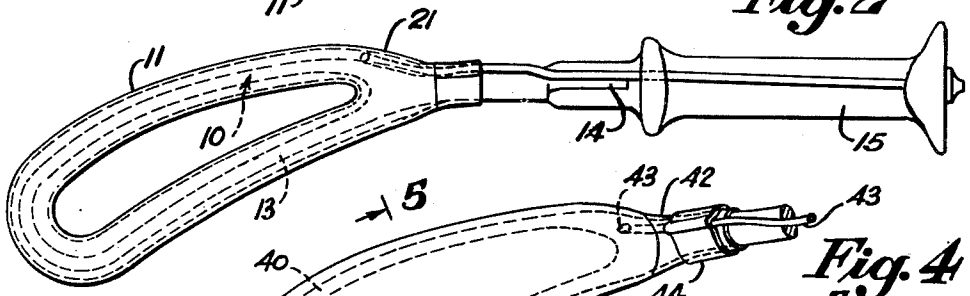


Fig. 3

Fig. 2



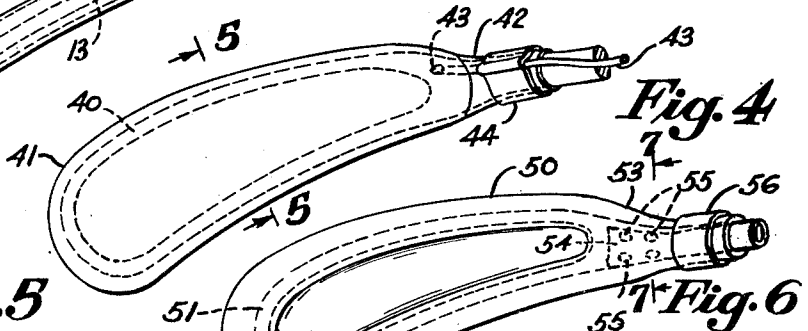


Fig. 4

Fig. 5

Fig. 6

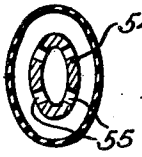


Fig. 7

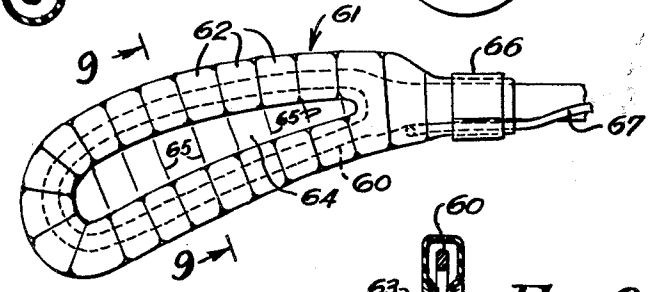


Fig. 8

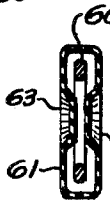


Fig. 9

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OBSTETRICAL FORCEPS

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5 Claims. (Cl. 128—323)

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This invention relates to improvements in surgical instruments and more particularly to improvements in obstetrical forceps.

It is an object of the instant invention to provide obstetrical forceps that will minimize injury to mother and child.

Another object is to so design the improvements for the forceps that existing equipment can be readily converted to the improved design.

Other objects of the instant invention will become apaprent in the course of the following specification.

In the attainment of these objectives, the improved obstetrical forceps are made in four embodiments. In the first embodiment, the blades of known forceps are coated with a layer of any suitable material such as liquid latex, sponge or foam rubber, or any type of rubber applied by dipping, adhesion with cement, or plating with the anode process. After the blades are coated and the coat dried, air in introduced between the coat and the steel of the blades to inflate either or both blades at the will of the obstetrician. In the second embodiment, an inflatable rubber sleeve is removably fitted over the steel skeleton of each blade, the open neck of each sleeve over the shank of the blade being removably closed by a sealing ring slidable on the shank. An elongated tube with one end fastened in the neck of the sleeve is extended rearwardly through the sealing ring and hollow handle of each blade to a compressed air source. The third embodiment is like the second except that the shank of each blade is hollow formed to provide a continuous passageway for compressed air through the hollow handle to outlets between the hollow of the shank and the inside of the sleeve. The fourth embodiment is also like the second except that the rim of the sleeve around the blade is provided with a plurality of unit air cells interconnected to a compressed air source, the cells providing a degree of controlled inflation preventing bizarre ballooning.

The invention will appear more clearly when considered in conjunction with the accompanying drawings showing by way of example the preferred embodiments of the inventive idea.

In the drawings:

Figures 1, 2, and 3 show the first embodiment of the improved obstetrical forceps constructed with an inflatable rubber layer around the steel skeleton of each blade in accordance with the principles of this invention, and in which:

Figure 1 is a top view of the improved forceps;

Figure 2 is a side view of the forceps shown in Figure 1; and

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Figure 3 is a top view of the mechanism for introducing air between the steel skeleton and rubber layer of the forcep blades shown in Figure 1.

Figures 4 and 5 show the second embodiment of the improved forceps constructed with a removable rubber sleeve over the steel skeleton of each blade and having an attached air tube for inflating or deflating the sleeve and in which:

Figure 4 is a fragmentary side view of one blade of the improved forceps; and

Figure 5 is a sectional view along 5—5 of Figure 4 but on an enlarged scale.

Figures 6 and 7 show the third embodiment of the improved forceps constructed with hollow shanks for the introduction of air into a rubber sleeve removably fitted over each blade and shank and in which:

Figure 6 is a fragmentary side view of one blade of the improved forceps; and

Figure 7 is a sectional view along 7—7 of Figure 6, enlarged.

Figures 8 and 9 show the fourth embodiment of the improved forceps in which the removable rubber sleeve is characterized by being formed of a plurality of unit cells disposed around the periphery of each blade, and in which:

Figure 8 is a fragmentary side view of one blade of the improved forceps; and

Figure 9 is a sectional view along 9—9 of Figure 8.

Referring now in greater detail to the first embodiment of the improved forceps shown in Figures 1, 2, and 3, where like reference numerals indicate like parts, reference numeral 10 indicates the steel skeleton of known forceps, and 11 the inflatable rubber layer or cover over the blades of the forceps.

The steel skeleton 10 of the forceps is of the usual type having the fenestrated or closed blades 12 and 13, the blades being interlocking at 14. The blade 12 is actuated by the integrally formed handle member 15 and the blade 13 by the handle member 16. Usually, the handle members are hollow formed.

Through the hollow handle member 16, a tube 17 is inserted and is brought out of the end of the handle through an opening 14*a* formed therein and thence over the top of the shank of the blade 13, and through a seal 22 to terminate under the later described rubber layer 11. A similar tube 23 is inserted through the other hollow handle 15 in a like manner but, of course, the tube 23 will be on the opposite side of the forceps from the previously mentioned tube 17. The tubes are made of any suitable material and

are so placed that there is no interference with the locking or unlocking or opening or closing of the blades.

With the tubes positioned in the manner described, the blades as well as the shanks, well down over the ends of the tubes, are treated with a known fixation solution and then dipped in or treated with rubber in a liquid state which will adhere to the treated surfaces of the blades. When the rubber layer is set, a seal **22** of any suitable material is placed around the end of the rubber layer intermediate the interlocking means **14** and the end of the tube, on each blade and over the tube.

The ends **18** and **24** of the tubes **17** and **23**, respectively, protruding from the opposite end of the handle, are then attached to two branches **21** and **20** of the "Y-member" **25** (Fig. 3) and the bulb **28** to the other branch. With the valve **27** in the bulb in the open position, by actuating the bulb air will be forced through the tubes **17** and **23** and between the rubber layers superposed on the steel skeletons. The air pressure, aided by "picking up," or "pinching," if necessary, will cause the rubber layers or film to separate from the treated seal except around the seal and expand as the air pressure is increased. As the air pressure is relieved, the rubber layers will again contract to form an envelope completely enclosing the skeleton of the forceps. In Figure 1, the rubber layer **11** around the blade **12** is shown in the contracted position and around the blade **13** in the expanded position.

In operation, the obstetrician has with subject device a tool with cushioned surfaces on both the maternal and fetal sides, which will decrease the hazards of injury to both mother and child. On the other hand, in those situations where required, the obstetrician can inflate either one or the other blade. The magnitude of inflation is always under control by means of known spring valves placed in the ends **18** and **24** of the tubes. Both the "Y-member" **25** and the bulb **28** can be quickly detached and moved out of the way. After repeated use, the rubber layer may become worn, but it can be readily stripped from the blades and the blades recovered.

If desired, the same basic principle could be used to make the maternal sides of the blades separately inflatable from the fetal sides by preventing the rubber layer around the outer and inner peripheries of the blades from separating from the steel along the line of division between the maternal and fetal sides which can be done by cementing the rubber layer into a narrow groove made in the periphery of the blade along the line of division. Such construction would require a separate tube or similar means for injecting air into either or both sides of each blade.

In the second embodiment of the improved forceps shown in Figures 4 and 5, reference numeral **40** indicates the steel skeleton of one of the fenestrated blades, and **41** a removable and inflatable rubber sleeve or cover around the blade.

The steel skeleton **40** of the blade is like the steel skeletons of the blades of the first embodiment. The sleeve **41**, made of any type of rubber including foam rubber, is designed to be slipped over the outer end of the blade and has an open and constricted neck **42** which is fitted around the shank of the blade, the shank having an upwardly and outwardly directed inclined surface. Coacting with the inclined surface, is a sealing ring **44** slidable on the shank and coacting with the neck **42** of the sleeve in a sealing operation. The inner surface of the ring **44** may be corrugated to provide a thorough seal.

Permanently attached in the neck **42** of the sleeve **41** and through the ring **44** is an elongated tube **43** designed to be passed longitudinally through the handle member for attachment to the air compressing mechanism **25**.

The operation with the inflatable and detachable rubber sleeve **41** is the same as that described for the first embodiment. The attachment of the sleeve **41** is naturally a much more simple operation than the forming of the rubber layer of the first embodiment. In many types of forceps, it will be necessary only to drill an opening in the end of the handle at the interlocking area for the insertion of the elongated tube **43**. Of course, in all types of forceps, the sealing ring **44** will have to be added, but that is a relatively simple and inexpensive operation.

The third embodiment of the improved forceps is like the second except that the rubber sleeve or cover **50** is designed to be fitted over a hollow blade **51**, hollow at least in the shank **53**, the shank being usually thicker than the blade itself. To make the shank or the shank and the blade hollow necessitates a relatively thick blade and shank. The hollow portion **54** may be continued on through the hollow handle which obviates the need for the tubes described in the first two embodiments. A series of air vents **55** forming passageways between the hollow of the shank and the outer surface of the steel skeleton provides a means for introducing compressed air into the sleeve **50**. The sealing ring **56** which may have an inner corrugated surface is similar to the sealing ring of the second embodiment.

The operation with the removable and inflatable rubber sleeve **50** which can be made from foam rubber, lined on the inside or outside or both, or without lining is the same as that described ante for the first two embodiments.

In the fourth embodiment of the improved forceps shown in Figures 8 and 9, reference numeral **60** indicates the fenestrated skeleton of one blade, and **61** the removable and inflatable rubber sleeve or cover over the skeleton.

The fenestrated skeleton **60** is identical with similar members of the first three embodiments already described.

The removable and inflatable rubber sleeve **61** is similar to the sleeves of the second and third embodiments already described except that around the outer periphery of the fenestrated blade are spaced and interconnected unit air cells **62** held together on both sides of the blade by the spaced parallel side members **63** and **64** on which may be formed the spaced ribs **65** to distribute the inflationary effect more evenly and to prevent bizarre ballooning formations.

The sealing ring **66** is slidably disposed over the free end of the sleeve as in the second embodiment where provision is made for the tube **67** conducting the air from the compressed air source **25** (Fig. 3) into the sleeve. The sealing ring may be composed of two hinged valves held together with a ring unit.

Operation with the sleeve **61** of the fourth embodiment is the same as that described ante for the first embodiment.

In order to provide an anti-friction surface on any sleeve or even on the inflatable rubber layer of the first embodiment, the outer surface may be corrugated in any desired manner.

It will be understood that the invention is not limited to the exact disclosure herein described

but may lend itself to a variety of expressions within the scope of the appended claims.

What is claimed is:

1. In obstetrical forceps having interlocking coacting blades actuated by hollow handle members integrally formed with the shanks of the blades; an inflatable rubber sleeve removably disposed over each blade, the sleeve having a constricted neck coacting with the shank of the blade, a tube for each sleeve removably disposed through the hollow handle of the blade, the end of the tube adjacent the interlocking means being secured in the neck of the sleeve, and means removably sealing the neck of the sleeve around the tube and shank.

2. In obstetrical forceps having interlocking coacting blades actuated by handle members integrally formed with the shanks of the blades; an inflatable sleeve for each blade, the inner end of each sleeve terminating in a constricted neck over the shank of the blade, means for sealing the neck of each sleeve to the shank, and means under each sleeve for varying the inflation thereof.

3. In obstetrical forceps having fenestrated blades actuated about interlocking means by hollow handle members integrally formed with the shanks of the blades; a tube disposed through each hollow handle member, each tube having a passageway formed therethrough and one end of each tube terminating on the shank of the blade actuated by the handle member thereof, a rubber layer disposed around the rim of each fenestrated blade and extended inwardly over the contiguous surface portion of the shank thereof and the end of the tube on the shank, a seal disposed around the inner end extremity of said rubber layer, the seal being adapted to leave the passageway through the tube open and the rubber layer being adapted for separation from said blade and shank forwardly of said seal, and fluid means through the passageway of said tube for varying the inflation of said rubber layer.

4. In obstetrical forceps having two coacting blades actuated about interlocking means by handle members integrally formed with the shanks of the blades, each handle and shank being hollow and forming a continuous passageway therethrough; the improvements comprising a tube disposed through the hollow handle of each blade, the end of the tube communicating with the hollow interior of the shank of the blade, the hollow shank further having at least one transverse opening formed therethrough, said opening forming a passageway intermediate the interior of the hollow shank and the atmosphere, an inflatable rubber sleeve with open and constricted neck removably disposed over each blade and the contiguous surface portion of the shank thereof, and means for removably sealing the neck of each sleeve to the shank of the blade intermediate said transverse opening and the handle member thereof.

5. In obstetrical forceps having two coacting blades actuated about interlocking means by handle members integrally formed with the shanks of the blades; an inflatable rubber sleeve with open and constricted neck removably disposed over each blade, the outer periphery of each sleeve comprising a plurality of spaced and interconnected unit air cells, a side member disposed over each side of said cells, and means for introducing air under pressure into each sleeve through the constricted neck thereof to vary the inflation of said cells.

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