

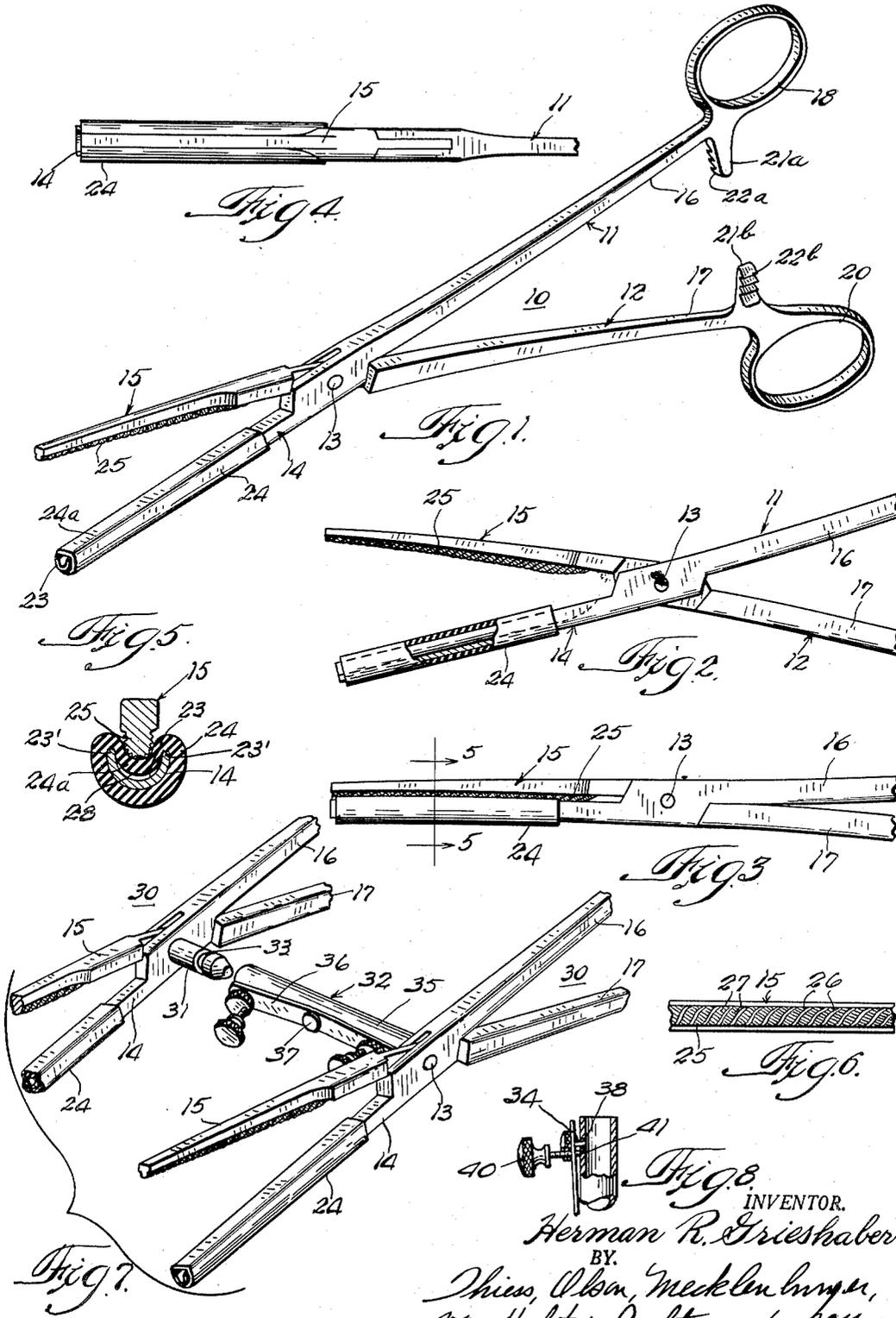
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H. R. GRIESHABER

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SURGICAL INSTRUMENT

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INVENTOR.
Herman R. Grieshaber
BY
Thies, Olson, Mecklenburger,
von Hellet, + Coltman. Attys.

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SURGICAL INSTRUMENT

Herman R. Grieshaber, Chicago, Ill.

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6 Claims. (Cl. 128—321)

This invention relates to surgical instruments and more particularly to forceps adapted primarily for use in the vascular phases of surgery.

Heretofore, the difficulty in using the conventional forceps in handling and manipulating the delicate vascular tissues and members, particularly adjacent the area of the heart, without producing a traumatic effect thereon was one of the principal hazards which confronted the surgeon in performing heart surgery. By reason of the design of the jaw segments of the prior forceps, it was extremely difficult, if not impossible, to prevent tearing, rupturing, or permanent damaging of certain of the vascular members of the body when the jaw segments were moved into gripping relation therewith to effect controlling or stoppage of the blood flow through the vascular member. Furthermore, the likelihood of the prior forceps producing a traumatic effect on the vascular members, seriously handicapped the surgeon in his efforts of reconstructing and grafting the vascular members of shattered or damaged limbs. The result of this traumatic effect on the vascular tissues and members of the body caused by the use of prior forceps, was that certain heart surgery or mending of shattered limbs was deemed a hopeless effort by the most competent men of the medical profession.

A further shortcoming of the prior forceps resided in the difficulty and awkwardness experienced by the surgeon or his assistant in using an approximator to maintain two pairs of forceps at a predetermined spaced relation during the course of the operation. The connecting and disconnecting of the approximator with respect to each of the forceps was a source of the difficulty and awkwardness to the surgeon or his assistant and thereby limited to a certain degree the instances wherein the approximator and forceps could be successfully used together.

Thus it is one of the objects of this invention to provide forceps which may enable the surgeon or his assistant to readily handle or manipulate delicate vascular tissues and members without the fear of having such tissues and members torn, ruptured, severed, or permanently damaged by the forceps.

It is a further object of this invention to provide forceps which will greatly reduce the hazards associated with certain types of surgery thereby broadening the possibility of successful surgery in cases heretofore considered hopeless.

It is a still further object of this invention to provide forceps which will greatly facilitate the handling and manipulation of the most delicate vascular tissues and members, thereby reducing the time required in performing the surgery and lessening the shock to the patient's body with the result that the patient's recovery rate is materially improved.

It is a still further object of this invention to provide a forceps which includes an approximator of very lightweight that may be readily connected to or disconnected

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from the forceps thereby increasing the instances wherein the forceps and approximator may be used together.

It is a still further object of this invention to provide a forceps which is simple and compact in construction, effective in operation, and inexpensive to produce.

Further and additional objects will appear from the description, accompanying drawings, and appended claims.

In accordance with one embodiment of this invention a surgical forceps is provided comprising a pair of complementary jaw segments operatively connected together for movement into and out of gripping relation. Mounted on one of the jaw segments and in overlying relation with respect to the gripping surface thereof is a resilient pliable member, which, when the jaw segments are in gripping relation, is adapted to assume a spaced relation with respect to the gripping surface of one of the jaw segments.

For a more complete understanding of this invention, reference should now be made to the drawing wherein:

Figure 1 is a perspective view of a pair of forceps shown in a released position;

Figure 2 is a fragmentary side elevational view of a pair of forceps showing the jaw segments thereof in released position and one of the jaw segments in partial section;

Figure 3 is similar to Fig. 2 but showing the jaw segments in gripping relation;

Figure 4 is a fragmentary top plan view of a pair of forceps showing the jaw segments in gripping relation;

Figure 5 is an enlarged sectional view taken along line 5—5 of Fig. 3;

Figure 6 is a fragmentary view of the gripping surface of one of the jaw segments;

Figure 7 is a fragmentary perspective view of two pairs of forceps used in combination with an approximator and showing one pair of forceps disengaged from the approximator; and

Figure 8 is an enlarged fragmentary sectional view of the approximator shown in Fig. 7.

Referring now to the drawings and more particularly to Fig. 1, a pair of surgical forceps 10 is shown comprising two elongated members 11 and 12 pivotally connected at point 13 to form jaw segments 14 and 15 to one side of the pivotal connection 13 and handle segments 16 and 17 on the opposite side of pivotal connection 13. Each of the handle segments 16 and 17 terminates in a loop 18 or 20, respectively, which is adapted to accommodate the fingers of the surgeon or his assistant. Mounted on each of the handle segments 16 and 17 and adjacent the finger loop 18 or 20 on said segment is one of a pair of complementary locking lugs 21a and 21b, respectively, which, when the forceps is brought into gripping relation, are caused to engage one another and effect locking of the jaw segments against movement out of a gripping position. Each of the lugs 21a and 21b has the side thereof, which engages the other lug, serrated to form a plurality of teeth 22a and 22b, respectively, which are adapted to mesh with one another when the forceps is moved to its closed position. To effect unlocking of the lugs 21a and 21b, sidewise force in opposite directions is exerted on handle segments 16 and 17 until the teeth 22a and 22b become disengaged from one another whereupon the handle segments may be pivoted about point 13 to cause the jaw segments to open. The length of the handle segments 16 and 17 and their slender shape permits the looped ends of the handle segments to be moved without difficulty sidewise of one another to effect unlocking of lugs 21a and 21b.

The jaw segments 14 and 15 which constitute a part of elongated members 11 and 12, respectively, are adapted to grip, without any traumatic effect, the vascular tissues

or members of the body during surgery to either completely stop or control the flow of blood of the patient within the vicinity of the area of the body being operated on. Jaw segment 14 has the gripping surface 23 thereof substantially concave in shape which is adapted to accommodate jaw segment 15 when the latter is moved into gripping relation. A substantial portion of jaw segment 14 is snugly embraced by a resilient sleeve 24 which is detachably mounted thereon and is preferably formed of a latex or rubber material. A portion 24a of the sleeve 24 is disposed in overlying spaced relation with respect to the concave gripping surface 23 of jaw segment 14 and is adapted to be engaged by the gripping surface of the other jaw segment 15. The gripping surface of jaw segment 15 is provided with a centrally aligned elongated bead 25. The periphery of the head 25 is provided with a plurality of spaced helical grooves 26 and has the portions 27 of the periphery, disposed between the grooves 26, provided with a plurality of minute cross grooves or teeth which are disposed transverse with respect to helical grooves 26. The effect of the toothed or grooved periphery of bead 25 is that it prevents slipping or relative movement of the vascular tissues or members with respect to the jaw segments 14 and 15 once they are gripped thereby. The cross sectional size of the bead 25 is substantially less than the cross sectional size of the concave surface 23 of segment 14. Thus, when the jaw segments 14 and 15 are moved into gripping relation with respect to one another, as seen in Fig. 5, no part of the periphery of bead 25 is in contact with concave surface 23, even when the sleeve 24 is removed from segment 14. The effect of this clearance between jaw segments 14 and 15 is that the vascular member engaged by the jaw segments is caused to envelop the periphery of bead 25. The portion 24a of sleeve 24, when contacted by bead 25, is flexed downwardly successively more as a greater number of the serrations of the lugs 21a and 21b become meshed with one another. As noted in Fig. 5, an air pocket 28 is formed between flexed portion 24a of sleeve 24 and the concave surface 23 of segment 14 and functions as a pneumatic cushion for the vascular tissue or member being gripped by the jaw segments and prevents the vascular tissue or member being permanently damaged by the jaw segments. The sleeve 24 is of sufficient thickness and resilience that when the jaw segments are in a fully closed position with respect to one another, the edges 23' of concave surface 23 are spaced from the adjacent peripheral portions of the bead 25 a distance equal or greater than the thickness of the sleeve material so that the vascular tissue or member when being gripped will be cushioned by the sleeve material.

A modified form of forceps 30 is shown in Fig. 7, which is substantially the same as that shown in Fig. 1, except that a lug or protuberance 31 is formed at the pivotal connection 13 and extends therefrom in an axial direction with respect to the pivotal axis of the forceps. The lug 31 is adapted to be encompassed by the open end of an approximator 32. The distal end of the lug 31 is provided, in this instance, with an annular groove 33 which provides a seat for a pintle 34 mounted on the approximator 32 adjacent the open end thereof. The approximator 32, in this instance, is formed of lightweight, preferably metallic material and comprises a cylindrical body member 35 having the opposite ends thereof adapted to receive the lugs formed on the two pairs of forceps 30. Mounted on the outer periphery of body member 35 is a leaf spring 36 which is riveted at approximately its center to said member 35. A pintle 34 is affixed to each of the free ends of the spring 36 and is adapted to extend through an aperture 38 formed in the body member adjacent the open end thereof, see Fig. 8. The tip of the pintle 34 is normally urged into seating engagement with the groove 33, formed on the lug 31, by leaf spring 36. To effect disengagement of the pintle 34 with respect to groove 33, a releasing screw 40 is threadably mounted

on each end of the leaf spring 36 adjacent the pintle. The concealed end 41 of the screw 40 is adapted to abut the outer periphery of member 35 and cause the free end of the spring 36 to be flexed outwardly therefrom. When the screw 40 is threaded a sufficient amount in one direction, the tip of pintle 34 will be withdrawn from groove 33 thereby permitting the lug 31 to be withdrawn axially from the end of member 35. Upon the screw 40 being threaded in the opposite direction, the spring 36 will once again take effect and cause the tip of the pintle 34 to project through the opening 38. Thus, the lug 31 may subsequently be brought into automatic locking relation with the approximator by merely inserting the lug 31 into one end of the approximator until the pintle 34 snaps into seating engagement with groove 33. The length of the approximator 32 may be greater or less than that shown to meet the circumstances of the particular surgery being performed. Furthermore, if so desired, the lug 31 may have a facet formed on the periphery thereof, which would cooperate with a like facet formed on the interior of the approximator, whereby the lug could not rotate relative to the approximator, when in assembled relation therewith.

It is believed therefore that an improved surgical forceps has been provided which is simple and compact in construction, may be readily sterilized, and will not tear, rupture, sever, or permanently damage the vascular tissues or members gripped thereby. Furthermore a forceps and approximator combination has been provided which permits ready assembly and disassembly of the parts by the surgeon or his assistants during the course of the operation.

While a particular embodiment of this invention is shown above, it will be understood, of course, that the invention is not to be limited thereto, since many modifications may be made, and it is contemplated, therefore, by the appended claims, to cover any such modifications as fall within the true spirit and scope of this invention.

I claim:

1. Surgical forceps comprising a pair of complementary jaw segments operatively connected to one another for movement into and out of gripping relation; a portion of one of said segments being nested within and partially encompassed by a portion of said other segment, when said segments are in gripping relation, and a resilient pliable member mounted on the encompassing jaw segment and in spaced overlying relation with the gripping surface thereof; said segments having the gripping surfaces thereof in spaced relation with respect to one another when said jaw segments are in gripping relation.

2. Surgical forceps comprising a pair of complementary jaw segments operatively connected to one another for movement into and out of gripping relation, one of said jaw segments being provided with a coarse protruding gripping surface, which is adapted to be partially encompassed by and in spaced relation with the other jaw segment, when said segments are in gripping relation, and a resilient pliable member detachably mounted on said other jaw segment and in spaced overlying relation with respect to the gripping surface thereof; said member being flexed by said coarse gripping surface in a direction toward the gripping surface of said other segment, when said segments are in gripping relation.

3. Surgical forceps comprising a pair of elongated elements pivotally connected together to form a pair of complementary jaw segments movable into and out of gripping relation upon pivotal movement of said elements, the gripping surface of one jaw segment being protuberant and adapted to be partially encompassed by the gripping surface of said other jaw segment when said segments are in gripping relation, a stud extending transversely from the pivotal connection for said elements, an elongated approximator piece having one end thereof detachably connected to said stud and extending transversely from said elements when in connected relation with said stud and having the other end thereof

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for detachably connecting to a stud formed on another like forceps, and a resilient pliable member mounted on the jaw segment having the encompassing gripping surface and in overlying relation with respect to said surface; said member being flexed by said segment having the protruding gripping surface when said jaw segments are in gripping relation.

4. Surgical forceps comprising a pair of jaw segments operatively connected together for movement into and out of gripping relation, the gripping surface of one of said jaw segments being provided with an elongated rib and the gripping surface of the other jaw segment being provided with an elongated recessed portion for accommodating in spaced relation said rib, when said jaw segments are in gripping relation, and a resilient pliable member mounted on the jaw segment having the recessed gripping surface portion and in overlying relation with respect to said recessed portion, said member being flexed by said rib and remaining in spaced relation with respect to said recessed portion when said jaw segments are in gripping relation.

5. Surgical forceps comprising a pair of jaw segments operatively connected together for movement into and out of gripping relation, the gripping surface of one of said jaw segments being provided with a protruding elongated substantially rectilinear rib having the periphery thereof provided with a plurality of helical grooves and the gripping surface of said other jaw segment being substantially concave and adapted to accommodate in spaced relation said rib when said jaw segments are in

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gripping relation, and a resilient pliable sleeve detachably embracing the jaw segment having the concave gripping surface, said sleeve having a portion thereof disposed in spaced overlying relation with respect to said concave gripping surface, said overlying sleeve portion being engaged and flexed by said rib and remaining in spaced relation with respect to said concave surface, when said jaw segments are in gripping relation.

6. Surgical forceps comprising a pair of complementary jaw segments operatively connected to one another for movement into and out of gripping relation, the gripping surface of one jaw segment having a substantially concaved portion and the gripping surface of the other jaw segment having a substantially convex portion, and a resilient pliable member mounted on the jaw segment having the concaved surface portion and being in spaced overlying relation with respect to said concaved portion, said member being flexed by said convex surface portion and remaining in spaced relation with respect to said concaved portion, when said segments are in gripping relation.

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