Dec. 11, 1934. F. W. DAVIS 1,983,969

SURGICAL CLAMP

Filed July 29, 1933

FIG. 1.

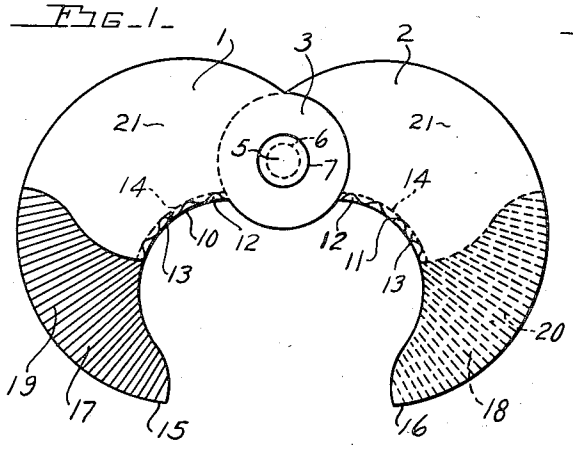


FIG. 2.

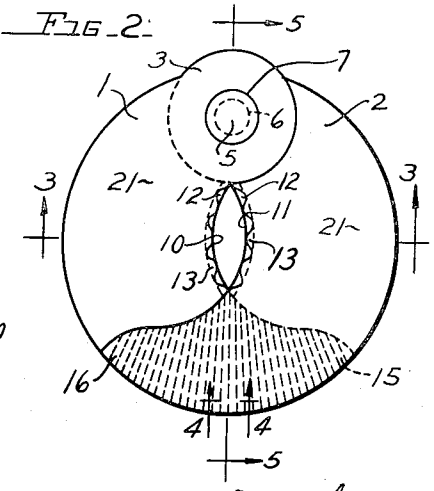


FIG. 3.

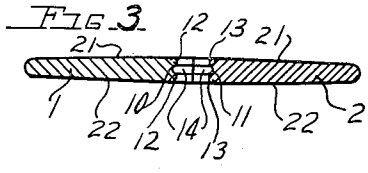


FIG. 4.

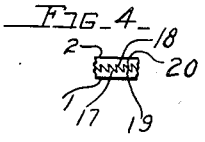


FIG. 5.

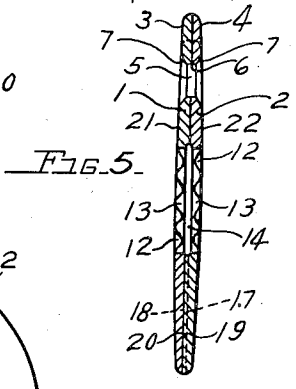


FIG. 6.

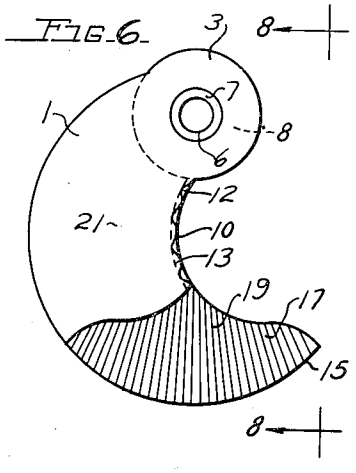


FIG. 7.

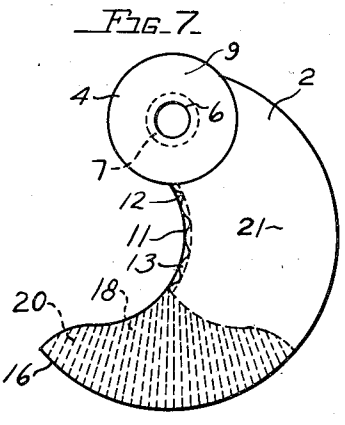


FIG. 8.

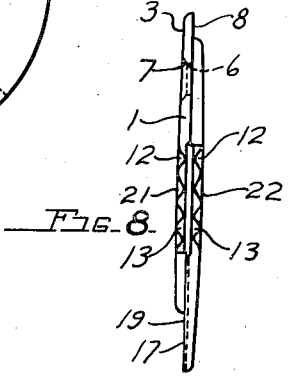


FIG. 9.

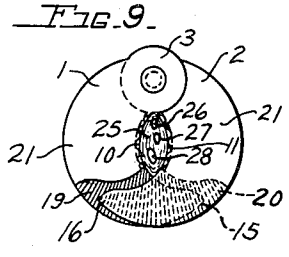
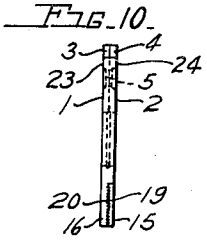


FIG. 10.



INVENTOR.

Frederick W. Davis.

BY Toulmin & Toulmin,

ATTORNEYS.

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UNITED STATES PATENT OFFICE

1,983,969

SURGICAL CLAMP

Frederick W. Davis, Dayton, Ohio, assignor to The Umbiliklamp Company, Dayton, Ohio, a corporation of Ohio

Application July 29, 1933, Serial No. 682,810

10 Claims. (Cl. 128—346)

This invention relates to surgical clamps and, in particular, to that type of surgical clamp used to clamp the umbilical cord of an infant at birth.

An object of my invention is to provide a surgical clamp having adjustable parts and holding jaws.

Another object is to provide such a clamp which is particularly useful as an umbilical clamp having adjustable jaws adapting the clamp to different sizes of cords.

Another object is to provide such a clamp of such construction as to be readily attachable to the cord before severing it and without the need of threading it through the clamp.

Another object is to provide such a clamp which is sterilizable by boiling or by other intensive sterilization means.

Another object is to provide such a clamp having portions thereof adapted to perform a supporting function against the abdomen of the infant.

Another object is to provide such a clamp which requires but one hand of the operator for its manipulation.

Another object is to provide such a clamp which is free from springs and flexible loading devices, yet which has positive locking means incorporated therewith.

Another object is to provide such a clamp which is complete in itself and which requires no additional tools or accessories for its application.

Another object is to provide such a clamp which may be made of materials which are non-corrosive, of long life, non-yielding and free from the danger of harboring bacteria.

Another object is to provide such a clamp having jaws adapted to hold a bandage or pad for general surgical uses as well as for obstetrical purposes.

In the drawing:

Figure 1 is an enlarged plan view of the clamp of my invention, the arms thereof being open.

Figure 2 is a view similar to Figure 1, but with the arms of the clamp closed.

Figure 3 is a central vertical section along the line 3—3 of Figure 2.

Figure 4 is a section along the line 4—4 of Figure 2, showing the engagement of the arm serrations.

Figure 5 is a central vertical section along the line 5—5 of Figure 2.

Figure 6 is an enlarged plan view of one of the arms of the clamp.

Figure 7 is a similar plan view of the other and cooperating arm of the clamp.

Figure 8 is a side elevation of the clamp portion shown in Figure 6, viewed from the direction of the line 8—8 in Figure 6.

Figure 9 is a front view of an approximately actual size, showing the clamp as applied to an umbilical cord.

Figure 10 is a side elevation of the clamp shown in Figure 9, but with the outer surfaces flat instead of convexed.

Referring to the drawing in detail, Figure 1 shows the clamp of my invention in its open position. The clamp is composed of a pair of arms 1 and 2 respectively, having projecting ears 3 and 4 adapted to inter-engage one another through the agency of a rivet 5 in a hole 6, passing through both ears. The outwardly facing end of each hole 6 is provided with a flared portion 7 adapted to receive the correspondingly flared portion of the rivet 5 and thus countersink the opposite heads of the latter so that no portion thereof projects to any great extent above the surrounding portions of the ears 3 and 4.

From Figure 8, it will be seen that the ear 3 of the clamp arm 1 is arranged to one side of the center plane of the clamp, so that this plane substantially coincides with the lower surface 8 of the ear 3. The ear 4 of the clamp arm 2 is arranged on the opposite side of the center plane of the clamp, so that its upper surface 9 seen in Figure 7 likewise substantially coincides with this plane and consequently engages the opposing face 8 of the clamp arm 1 when the two arms are assembled.

The clamp arms 1 and 2 are approximately crescent-shaped. The inner mid-portions 10 and 11 thereof are provided with corrugations 12 (Figures 5 and 8) adapted to hold firmly the article or member which the arms 1 and 2 clamp between themselves. In their preferable form, these corrugations 12 consist of a plurality of projections 13 near each edge and a depression 14 running along the center lines. It will be understood, however, that such corrugations may be varied in many ways without departing from the spirit of my invention, since many forms of corrugation will provide the tenacious gripping effect desired.

The ends 15 and 16 of the clamp arms 1 and 2 opposite the ears 3 and 4 thereof are likewise arranged on each side of the central plane of the clamp so that their inner surfaces 17 and 18 are substantially coincident with that plane.

The inner surfaces 17 and 18 are provided with serrations 19 and 20 adapted to inter-engage with one another and hold the clamp arms in any desired position. In this way the size of the opening between the mid-portions 10 and 11 may be readily varied to suit the particular conditions encountered. Although the serrations 19 and 20 firmly hold the arms in their clamped positions (Figures 2, 4 and 9), they may be instantly disengaged and re-adjusted to a new position. These serrations 19 and 20 preferably comprise alternate ridges and grooves, these being most suitably directed toward the center axis of the rivet hole 6.

These ridges and grooves are preferably arranged to have a ratchet effect (Figure 4) so that they slide readily past one another in one direction, as in closing the arms 1 and 2, but interlock with one another firmly against motion in the opposite direction—that of opening the arms. The latter, however, may be readily opened by grasping the arms, one in each hand, forcing them away from one another, thus lifting the serrations out of engagement with one another. In this position, the arms 1 and 2 may be moved open. On releasing the arms, the natural spring of the clamp will cause the serrations to re-engage one another. To close the clamp, however, the latter may be held in the fingers of one hand and the two arms moved toward one another by the mere pressure of the fingers alone.

The outer surfaces 21 and 22 of the clamp are preferably slightly convex (Figure 5). It will be understood, however, that these surfaces may be made flat without exceeding the scope of my invention, as shown at 23 and 24 in Figure 10.

In its preferred form, the clamp is arranged with the ears on the opposite sides of the central plane from the arms (Figure 8), although these may be arranged on the same sides thereof without exceeding the scope of the invention.

In the use of my clamp for general medical and surgical purposes, a bandage, a pad, or supporting member may be clamped between the clamp arms 1 and 2 and locked firmly in place by the inter-engagement of the serrations thereon. A long portion of cloth such as gauze or flannel, for example, may be provided at one location with a pad of cotton, gauze or other suitable material. The gauze may be then drawn backward to enclose the pad, the neck portion behind the latter being then gripped by the clamp, thus engaging the pad within the cloth band. The ends of the band may then be tied around the portion of the body to which the pad is to be applied, and the clamp then serves not only to hold the pad but also to provide a supporting backing for the pad.

In its use for obstetrical purposes, my clamp is first carefully sterilized, preferably in boiling water. The clamp is constructed of materials which are not injured by high sterilization temperatures, and consequently may be absolutely freed from any living bacteria which might otherwise escape the action of a sterilizing agent which was not so heated. This possibility of sterilization by heat is an important feature of my invention and renders its use free from the dangers of infection, which have previously accompanied the use of such clamps.

In actual use the arms of the sterilized clamp are separated, as shown in Figure 1. As soon as the infant is born, the open clamp is slipped quickly around the umbilical cord 25 (Figure 9) at a point adjacent the infant's abdomen. The arms are then forced tightly together so that the mid-portions 10 and 11 of the clamp tightly constrict the cord and the inter-engaging serrations 19 and 20 firmly lock the arms in place. The roughened compression surfaces 12 of the mid-portions 10 and 11 then firmly engage the cord 25, and constrict its two arteries 26 and 27 and its vein 28 so that no blood can escape therefrom. At the time of this operation or subsequently, a gauze pad may be placed between the clamp and the skin of the abdomen.

The umbilical cord may now be severed in the usual way, but one such severance being necessary, since the cord is not threaded through the clamp. In this way any hemorrhage is prevented, which might occur during such threading operations. It is preferable, however, to place a second clamp around the cord, spaced apart from the first clamp, and to make the severance between the two clamps. In this way hemorrhage from the cord is prevented in both directions, a matter which is important if the delivery includes twin births. The projecting stump of the cord and the clamp may then be covered with a surgical dressing to protect the same from infection and to assist the early healing thereof. The usual band is then placed around the infant's abdomen.

With the use of my clamp in the above way, it is found that the stump of the cord separates in a very few days. Any tendency of the navel to bulge and any possibility of a hernia thereof is prevented by the supporting action of the clamp, an action which is further assisted by the convex surfaces of the clamp. After the clamp has been removed in the healing of the navel, the clamp may be sewn in the abdomen band and in this way still performs its supporting function. A similar supporting function may be performed by a pad clamped between the arms of my clamp in the manner previously described. In the above case, my clamp exerts a compressing or constricting action and simultaneously a supporting action without producing any pull between the stump and the abdomen. This pull has a tendency to produce the hernia above referred to.

In the use of my clamp, there are no springs to fail, nothing corrosive to injure the skin of the infant, and no external tools or accessories are required to engage or release it.

The clamp is of very simple construction and is easily made in large quantities at a low cost of production. The form of the clamp readily lends itself to production by die casting, thus further reducing the cost of manufacture.

It will be understood that the central opening between the arms of the clamp may be adjusted to any size encountered in practice. It is found that the sizes of cords vary between wide limits, the smallest being those of prematurely born infants. My clamp as readily adapts itself to successful use with small cords as with large ones, and its constricting and compressing function is not dependent upon the action of springs or resilient compressing materials, hence does not vary with the size of the cord being clamped. On the contrary, the constricting effect produced by my clamp may be controlled by the physician, the sensitiveness of whose fingers will readily obtain the desired compressing effect.

It will be understood that I desire to compre-

hend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A surgical clamp comprising a pair of semi-circular, overlapping and interlocking arms pivotally engaging one another at one end thereof, said arms having inter-engaging serrated locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position, said serrations being composed of alternate ridges and grooves, said semi-circular arms forming an area between them in which is located the material to be clamped, the outline of the area remaining the same but varying in size longitudinally and laterally, said outline comprising a pair of intersecting arcs defining a space of varying width and length but having sides of constant curvature and the ends of the space terminating in sharp points.

2. A surgical clamp comprising a pair of arms pivotally engaging one another at one end thereof, said arms having inter-engaging serrated locking portions at their opposite ends, said serrations being composed of alternate ridges and grooves directed radially toward the axis of said pivotal connection.

3. A surgical clamp comprising a pair of semi-circular, overlapping and interlockinlg arms pivotally engaging one another at one end thereof, said arms having inter-engaging locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position and roughened compression surfaces along their mid-portions, said semi-circular arms forming an area between them in which is located the material to be clamped, the outline of the area remaining the same but varying in size longitudinally and laterally, said outline comprising a pair of intersecting arcs defining a space of varying width and length but having sides of constant curvature and the ends of the space terminating in sharp points.

4. A surgical clamp comprising a pair of arms pivotally engaging one another at one end thereof, said arms having inter-engaging locking portions at their opposite ends and roughened compression surfaces along their mid-portions, said roughened compression surfaces being arranged along arcuate facing edge portions of said clamp.

5. A surgical clamp comprising a pair of arms pivotally engaging one another at one end thereof, said arms having inter-engaging locking portions at their opposite ends and roughened compression surfaces along their mid-portions, said roughened compression surfaces being arranged along arcuate facing edge portions of said clamp and comprising alternate projections and depressions.

6. A surgical clamp comprising a pair of semi-circular, overlapping and interlocking arms pivotally engaging one another at one end thereof, said arms having inter-engaging locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position and roughened compression surfaces along their mid-portions, said roughened compression surfaces comprising alternate projections and depressions, said semi-circular arms forming an area between them in which is located the material to be clamped, the outline of the area remaining the same but varying in size longitudinally and laterally, said outline comprising a pair of intersecting arcs defining a space of varying width and length but having sides of constant curvature and the ends of the space terminating in sharp points.

7. A surgical clamp comprising a pair of semi-circular, overlapping and interlocking arms pivotally engaging one another at one end thereof, said arms having inter-engaging locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position and roughened compression surfaces along their mid-portions, said roughened compression surfaces comprising alternate projections and depressions arranged near the outer surfaces of said clamp, said semi-circular arms forming an area between them in which is located the material to be clamped, the outline of the area remaining the same but varying in size longitudinally and laterally, said outline comprising a pair of intersecting arcs defining a space of varying width and length but having sides of constant curvature and the ends of the space terminating in sharp points.

8. A surgical clamp comprising a pair of arms pivotally engaging one another at one end thereof, said arms having inter-engaging locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position and roughened compression surfaces along their mid-portions, said roughened compression surfaces comprising alternate projections and depressions arranged near the outer surfaces of said clamp and having a longitudinal roughened portion therebetween.

9. A surgical clamp comprising a pair of semi-circular, overlapping and interlocking arms pivotally engaging one another at one end thereof, said arms having inter-engaging serrated locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position, said serrations being angled to provide a ratchet slippage in one direction and a ratchet locking in the opposite direction, said semi-circular arms forming an area between them in which is located the material to be clamped, the outline of the area remaining the same but varying in size longitudinally and laterally, said outline comprising a pair of intersecting arcs defining a space of varying width and length but having sides of constant curvature and the ends of the space terminating in sharp points.

10. A surgical clamp comprising a pair of semi-circular, overlapping and interlocking arms pivotally engaging one another at one end thereof, said arms having inter-engaging serrated locking portions comprising multiple serrations on each arm at their opposite ends to lock said arms in position, said serrations being composed of alternate ridges and grooves so angled as to provide a ratchet slippage in one direction and a ratchet locking in the opposite direction, said semi-circular arms forming an area between them in which is located the material to be clamped, the outline of the area remaining the same but varying in size longitudinally and laterally, said outline comprising a pair of intersecting arcs defining a space of varying width and length but having sides of constant curvature and the ends of the space terminating in sharp points.

FREDERICK W. DAVIS.