May 21, 1968 A. MISEO 3,384,088

OBSTETRICAL FORCEPS

Filed July 2, 1965 2 Sheets-Sheet 1

FIG. 1

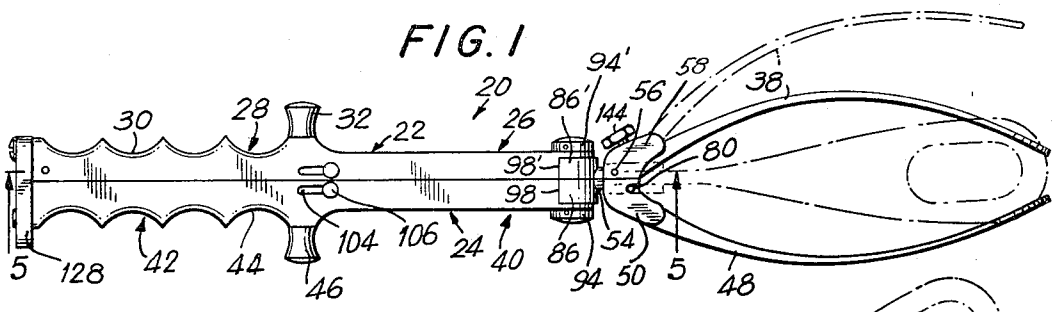


FIG. 2

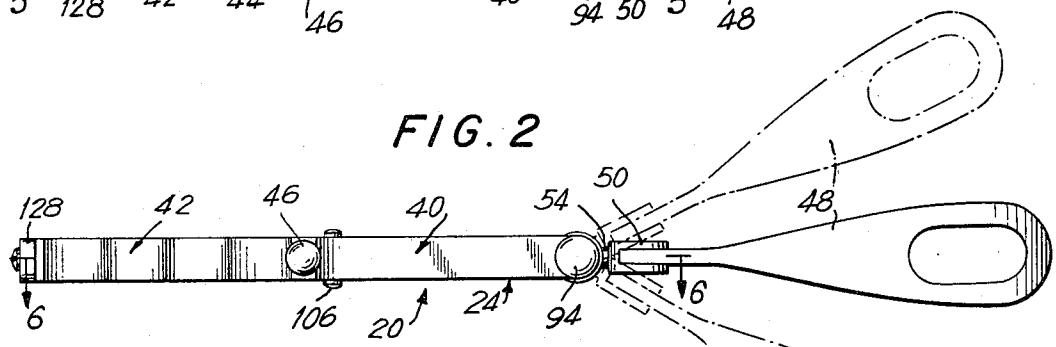


FIG. 3

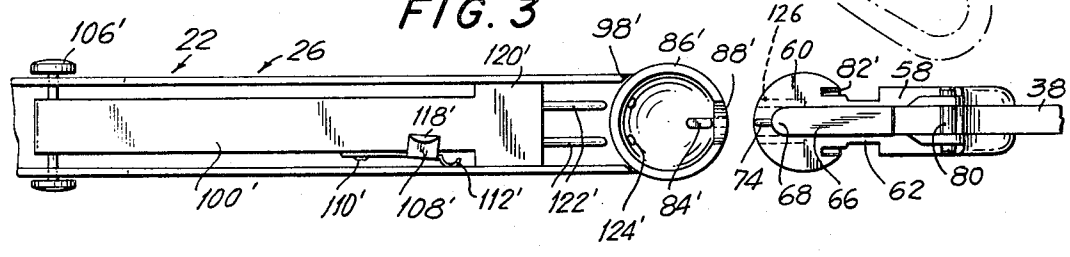
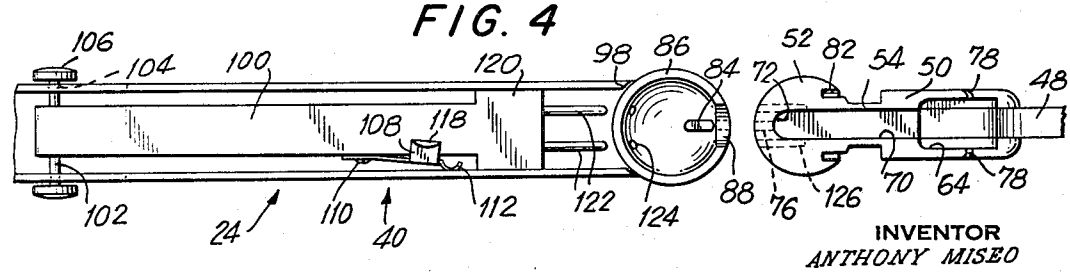


FIG. 4



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OBSTETRICAL FORCEPS

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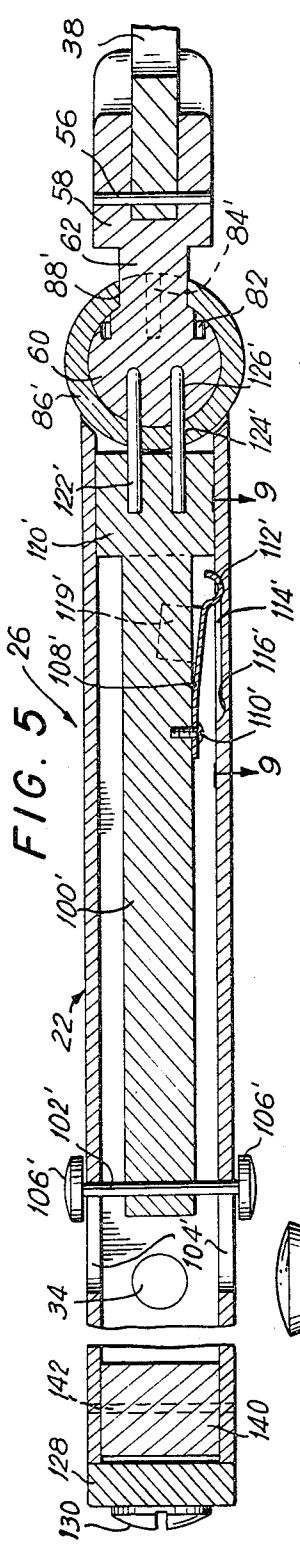

FIG. 5

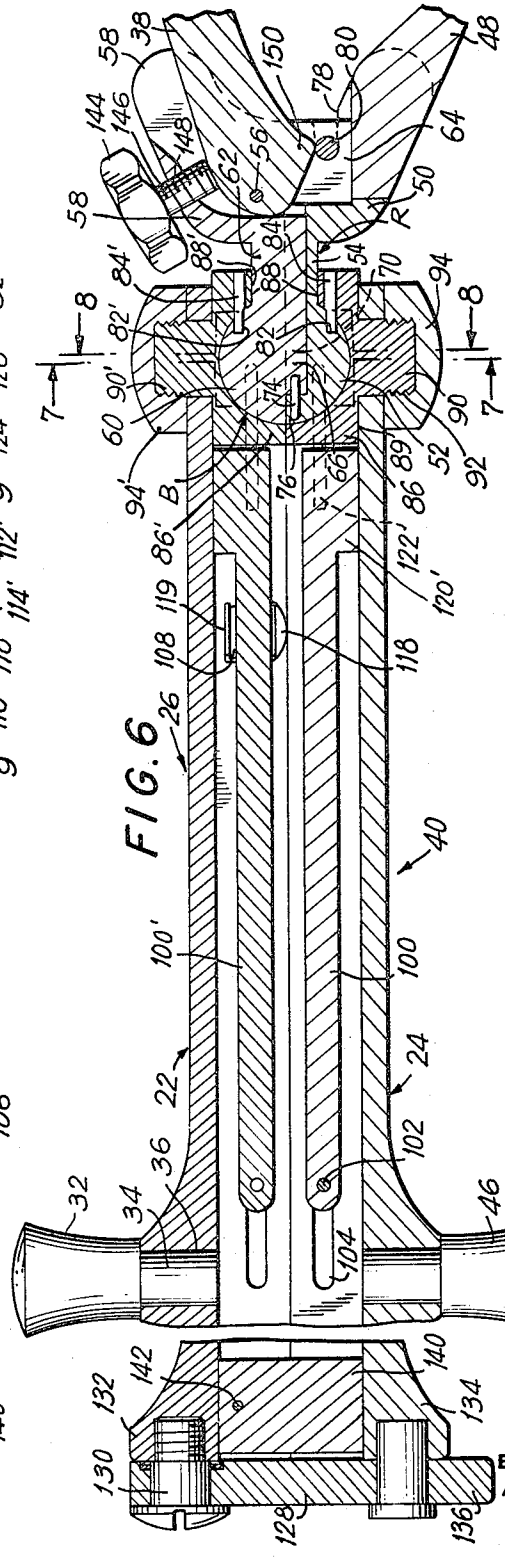

FIG. 6

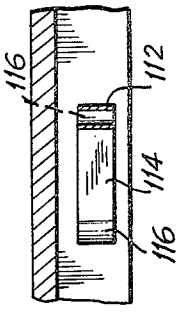

FIG. 9

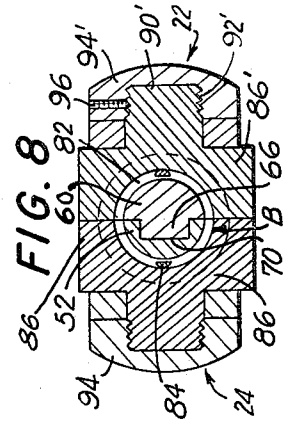

FIG. 8

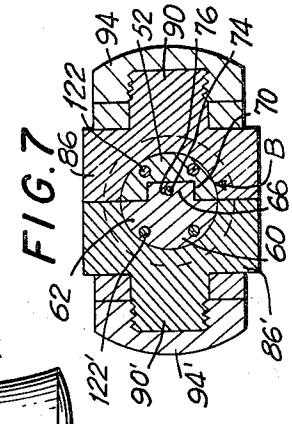

FIG. 7

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United States Patent Office 3,384,088 Patented May 21, 1968

3,384,088

OBSTETRICAL FORCEPS

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Filed July 2, 1965, Ser. No. 469,209
7 Claims. (Cl. 128—323)

ABSTRACT OF THE DISCLOSURE

An obstetrical forceps composed of two branches. Each branch includes an elongated handle and a curved blade. Each blade has a hemispherical coupling. The two hemispherical couplings are interengageable to form a ball. Each handle has a socket. The two sockets are interengageable by joining the handles in order to form a cage in which the ball rotates. The sockets are mounted on the handles for rotation about an axis perpendicular to the length of the handles. The ball is constrained for rotation about one axis with respect to the socket. The blades thereby swivel with respect to the handle. Each socket has a passageway. Each coupling has a passageway which can be rotated into alignment with a socket passageway. Each handle has a longitudinally reciprocatable pin, said passageways being mutually aligned with the pin only when the two blades are in a straight line position relative to the handles, so that the pins then can be thrust into the passageways to prevent rotation of both the ball and the sockets and thus render the blades immobile. When the pins are withdrawn from the passageways the blades are freed for swivelling movement. Locking means releasably holds the pins in either of their two positions.

This invention relates to obstetrical forceps.

In my United States Letters Patent No. 2,639,712 granted May 26, 1953 for "Obstetrical Forceps," I disclosed an obstetrical forceps having a universal joint between the blades and the handles of the forceps. These forceps permit the blades to rotate during traction and to turn with the head of the child as it descends through the birth canal. This eliminated the necessity during an instrument delivery of removing conventional rigid forceps after a partial descent in the birth canal, rotation of the forceps through 180° and reinsertion of the forceps for the remaining passage through the birth canal. Such reinsertion was a delicate and time-consuming operation and there was always the risk of infection and injury to the baby's head.

It is the principal object of my present invention to provide an improved construction in obstetrical forceps having an articulated universal joint between the blades and handles, wherein the blades are free to swivel about two perpendicular axes with respect to the handles in one operative position of the forceps and are lockable so that the blades are held in a rigid straight-line position relative to the handles in another operative position of the forceps.

It is another object of my invention to provide an improved obstetrical forceps of the character described, wherein the components thereof are readily separable and are fashioned for ease in cleaning and sterilization.

It is another object of my invention to provide an improved obstetrical forceps of the character described, wherein the blades thereof are locked through manipulation of two button slides on the handles of the forceps, said button slides being operable by a flick of the operator's thumb while his hand is grasping said handles.

It is yet a further object of my invention to provide an improved obstetrical forceps of the character described, wherein separate means is provided to lock in straight-line position each of the blades of said forceps, the forceps being separable into two branches whereby when the

branches are disunited, each blade can be locked in rigid position with respect to its associated handle.

It is another object of my invention to provide an improved obstetrical forceps of the character described, wherein one of the two blades is hinged to vary the spacing between the blades so as to accommodate infants' heads of various sizes, which is characterized by the inclusion of easily manipulable stop means for determining the maximum distance between said blades and for turning the hinged blade toward the fixed blade when so desired.

It is still another object of my invention to provide an improved obstetrical forceps of the character described whose components are few in number and simple in manufacture, which can be marketed at a reasonable price in view of the use to which the forceps will be put, and which will be of great benefit in instrument deliveries.

Other objects my invention in part will be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the obstetrical forceps hereinafter described and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention:

FIG. 1 is a top view of my improved obstetrical forceps, the same being constructed in accordance with the present invention;

FIG. 2 is a side view thereof;

FIG. 3 is an enlarged fragmentary view of the end of the interior of a branch of the forceps which carries a blade that is hinged to its swivel mount, the blade being illustrated separated from its associated handle;

FIG. 4 is a view similar to FIG. 3 but illustrating the branch of the forceps carrying a blade that is fixed to its swivel mount;

FIGS. 5 and 6 are enlarged fragmentary sectional views of the forceps taken substantially along the lines, respectively, **5—5** and **6—6** of, respectively, FIGS. 1 and 2;

FIGS. 7 and 8 are enlarged transverse sectional views of my forceps taken substantially along the lines, respectively, **7—7** and **8—8** of FIG. 6; and

FIG. 9 is an enlarged sectional view of a portion of my forceps taken substantially along the line **9—9** of FIG. 5.

Referring now in detail to the drawings, the reference numeral **20** denotes an improved obstetrical forceps embodying my present invention. The forceps includes a pair of detachably engageable branches, to wit, a first branch **22** and a second branch **24**. The first named branch **22** is shown in FIGS. 1, 3, 5 and 6, and the second named branch **24** is shown in FIGS. 1, 2, 4 and 6.

The first branch **22** includes a shank **26** having a handle **28** which has a scalloped portion **30** and which has an outwardly protruding non-rotatable knob **32** located about midway between the ends of the shank, said scalloped portion and said knob facilitating the grasping and manipulation of the branch. The knob **32** has a shaft **34** force-fitted into a bore **36** in said branch.

The interior of the shank **26** is of U-shaped inwardly opening transverse cross-section thereby to receive and mount other elements of the forceps. The branch **22** also carries a hinged blade **38** of conventional forceps contour which is attached to the shank by the articulated universal joint (swivel) to be described.

The second branch **24** also comprises a shank **40** including a handle **42**. The handle includes a scalloped portion **44** and an outwardly extending knob **46**, the same being fashioned so that the exterior figuration of the branches are substantially mirror images of one another (see FIG. 1). The knob **46** is fixed to the shank **40** in the same way as the knob **32** is fixed to the shank **26**.

The shank 40 carries a fixed blade 48 of substantially the same contour as the hinged blade 38, the fixed blade 48 being connected to its associated shank 40 by said articulated universal joint. The interior of the shank 40 is likewise of U-shaped inwardly opening cross-section to receive and mount other elements of the forceps.

The shanks have their confronting surfaces linear and complementarily shaped so that the two shanks can be readily abutted over their entire lengths.

The fixed blade 48 has a base 50 to which a hemispherical coupling 52 is rigidly secured by a semicylindrical stub rod 54. The axis of symmetry of said rod is coincident with a major diameter of the coupling 52 and the rod and coupling have truncated faces which are coplanar.

The hinged blade 38 is pivotally carried by a pivot pin 56 mounted on a base, e.g., between the arms of a yoke 58, to which another hemispherical coupling 60 is rigidly secured by another semicylindrical stub rod 62. The rod 54 and the coupling 52 are substantially of the same external shapes and dimensions as the rod 62 and the coupling 60 and said rods and couplings have their truncated confronting faces of complementary shape so that when these parts are placed face to face, the couplings form a ball B (FIG. 6) connected by a cylindrical rod R to the bases of the two blades.

The base 50 of the blade 48 is formed with a cavity 64 to accommodate and permit the pivot end of the blade 38 to rotate without interference and to receive the arms of the yoke 58.

Means is provided to detachably engage the hemispherical couplings 52, 60 and their associated stub rods, respectively, 54, 62. To this end, the truncated faces of one of the couplings 60, its associated rod 62 and the yoke 58 have as an integral part thereof an elongated key 66 (FIGS. 3, 7 and 8) of uniform rectangular transverse cross section with a rounded end 68 distant from the blade 38. The length of said key extends in a direction parallel to the central axis of the associated branch 22.

The truncated faces of the other coupling 52, its associated rod 54 and the base 50 have formed therein an elongated groove 70 (FIGS. 4, 7 and 8) with a rounded end 72, said groove being configured to snugly receive the key 66 and so that the faces of the couplings, stub rods and base and yoke meet face to face.

The rounded end 68 of the key 66 carries a guide pin 74 (FIG. 6) and the rounded end of the groove 70 contains a small bore 76 to receive said pin.

The base 50 of the fixed blade 48 includes a pair of transversely registered open ended slots 78 each disposed on a different side of said blade. Between the arms of the yoke 58 is fixed a guide shaft 80 the ends of which can be received by the slots 78.

To engage the couplings 52, 60, the key 66 of the hinged blade 38 is located in the groove 70 with the round end of the key spaced from the round end of the slot and then these parts are slid relative to one another until positioned so that the guide pin 74 is in the bore 76, while simultaneously the guide shaft 80 is received by the slots 78 of the fixed blade 48.

Each coupling 52, 60 is provided with a narrow-mouthed but deep groove 82, the depth of the groove running parallel to the axis of the stub rod 54. The grooves sweep through semicircles of the same radius that, when the couplings are interengaged, jointly define a full continuous circle having an axis coincident with the axis of the ball B parallel to the key 66. Said continuous annular groove circumscribes the ball about a circle smaller than a great circle, this smaller circle being in a plane perpendicular to the longitudinal axis of the rod R. The groove 82 is located on the hemisphere of the ball B closest to the blades 38, 48.

Each coupling is similarly mounted in its associated shank and accordingly the mounting structure for only one of the hemispherical couplings, i.e., the coupling 52, will be described in detail. The components of the other mounting for the other coupling 60 are denoted by the same reference numerals primed.

The coupling 52 has a key pin 84 (FIGS. 4 and 6) slidably received in its semicircular groove 82, the key pins, 84, 84' being diametrically opposed. The coupling 52 is situated in a hemispherical socket 86, the two sockets 86, 86' being alike, contacting and facing one another and defining a spherical cage to slidably rotatably receive the ball B. The key pins 84, 84' are rigidly secured to the sockets 86, 86', each one to a different socket, with the pins having their lengths parallel to the longitudinal axis of the key 66 and with the bases of the pins fixed to the sockets near the rods 54, 62 with the pins situated to be received in the grooves 82, 82' so as to limit rotation of the ball B relative to the sockets 86, 86' to about an axis coincident with the central axis with the rod R. The socket 86 has an open semicircular neck 88 proximate to the blade 48, the necks 88, 88' allowing passage of the juxtaposed stub rods 54, 62.

Integral with and extending outwardly from each socket 86 is a pivot post 90 (FIG. 6) whose outer end is threaded for engagement in a tapped bore 92 of a cap 94 where it is held by a set screw 96 (FIG. 8). The proximate end of the shank 40 is formed with an opening which rotatably passes the pivot post 90 and the socket 86 has a flat exterior face 89, distant from the opposed socket 86', which rotatably abuts the flat interior face of the shank 40, the cap 94 being on the exterior of the shank and the socket 86 being on the interior of the shank. The end of the shank 40 is formed to prevent interference with the rotative movement of the sockets 86, 86' about the axis of the registered posts 90.

The hemispherical couplings 52, 60 are free to rotate about the axis of the pivot posts 90, 90', such rotation being accompanied by corresponding rotation of the caps 94, 94' and the sockets 86, 86', the key pins 84, 84' linking the ball B to the sockets for this purpose. The aforesaid rotation is limited only by the abutment of the rod R against the edges of the notches 98, 98' (FIG. 1) on the proximate ends of the shanks. Rotative movement of blades with their respective couplings about the axis of the pivot posts 90, 90' is illustrated by dot and dash lines in FIG. 2.

As noted above the blades are also free to rotate about the central axis of the rod R. This axis of rotation passes perpendicularly through the axis of the pivot posts and rotation is unlimited in either direction. Said rotation is enabled by the rotation of the ball B in the sockets 86, 86', the key pins 84, 84' sliding in the grooves, 82' as said ball rotates.

Separate means is included to positively lock each of the sockets and its associated hemispherical coupling, and thus its blade, rigid in straight-line position. Such positive lock when engaged will prevent accidental turning of the ball B about any axis, even when during use the parts of the forceps are coated with body fluids that might permit a friction lock to slip. Each of said locking means is alike and accordingly only the one for the coupling 52 will be described, the parts of the other one for the coupling 60 being denoted by the same reference numerals primed.

Each of said means include an elongated bar 100 mounted for free sliding movement within a hollow portion of the shank 40 which is adjacent the socket 86. Except for a head, later described, the bar is somewhat narrower than the inside of the shank 40 so that it is spaced from the walls thereof as shown in FIG. 4. The end of the bar 100 distant from the socket includes a transverse bore in which a shaft 102 is fixed and centered. The ends of the shaft from the bar protrude, pass through two elongated aligned slots 104 in opposed walls of the U-shaped shank and terminate in slide buttons 106. The buttons are located on the exterior of the shank.

The other end of the bar 100 is guided in its sliding movement by a spring clip 108 one end of the base of

which is firmly secured, as by a small screw **110**, to an intermediate outwardly facing surface of the bar **100**. The spring clip **108** is so configured in repose that the free end **112** thereof is spaced further than the nearby surface of the wall of the shank **40**. Said free end **112** of the clip is formed with an outwardly protruding cross rib that rides in an elongated track **114** (FIGS. 5 and 9) formed on the interior face of an adjacent wall of the shank **40** (see FIG. 9). The rib is flexed inwardly upon insertion of the bar into the shank so that it presses against the base of the track **114**. Said track **114** has two transverse detent grooves **116**, one formed adjacent each end of the track. The free end **112** of the clip drops into one of these detents at the terminus of the movement of the bar **100** in either direction thereby setting the proper limits of movement for said bar.

Located between the ends of the spring clip and in one piece therewith is a retroverted fingernail catch **118** by which said spring clip may be sprung out of the groove **114** towards the bar **100**. The catches **118**, **118'** are exposed when the branches are disengaged (FIGS. 3 and 4) and the spring clip also includes in one piece therewith a small retaining plate **119** (FIG. 5), said plate being located on the side of the bar opposed to the catch **118**.

The bar **100** may be swung away from the shank **40** by first urging the catch **118** towards the bar **100** so that the free end **112** of the spring clip **108** is moved out of the track **114** and then rotating the bar **100** with the shaft **102** in the slots **104**. By swinging the bar **100** away from the shank **40**, cleaning and sterilization of the shank is facilitated.

The bar **100** has an enlarged T-head **120** adjacent the socket **86**, the sides of the head slidably engaging the inner surfaces of the walls of the U-shaped shank **40**. Said head carries a pair of like parallel forwardly protruding locking pins **122** having rounded tips. Each socket, e.g. the socket **86**, at a location opposed to the neck **88** of the socket has two small through passageways **124** spaced apart the same distance as the space between the locking pins **122**. The passageways **124** are so located that when their axes are parallel with the elongated axis of the shank **40**, they are positioned to slidably pass the pins **122**. (See FIGS. 3 and 4.)

Each hemispherical coupling, e.g. the coupling **52**, has two passageways **126** located therein on a portion thereof distant from the stub rod **54**, the passageways **126** being spaced apart the same distance as the spacing between the passageways **124** in the socket **86** and so positioned that they can be registered with said passageways **124** upon rotation of the ball B in the sockets **86**, **86'**.

To lock each of the blades in a rigid straight-line position, its associated socket **86** is rotated so that the passageways **124** face and are in registry with the locking pins **122** and the hemispherical coupling **52** is rotated so that the passageways **126** are in registry with the passageways **124**. Then, by pressure of the thumb and index finger of the operator on the buttons **106**, the bar **100** is forced to slide within the shank **40** and towards the socket **86**. Consequently, the locking pins **122** enter the socket through the passageways **124** thereby preventing rotation of the socket on its pivot post **90** and the locking pins **122** also enter the passageways **126** in the hemispherical coupling **52**, thereby preventing rotation of the coupling relative to its associated socket **86**. Thereby, the base of each blade is locked in a rigid straight-line position relative to its shank **40**. It will be appreciated that if the branches are disengaged, manipulation of the aforesaid locking means will prevent movement of the base of the associated blade. If this is the fixed blade **48**, of course the entire blade would be made immobile. If this is the hinged blade **38**, the yoke of said blade is immobilized. The blade **38** itself is left to rotate about the pivot pin **56**. If the branches are interengaged, the forward disposition of even one of the buttons will lock both bases, since when the branches are interengaged the complete ball B is formed by the couplings. When the slide buttons are moved away from the sockets, the blades are free to rotate about the two perpendicular axes previously described.

Means is provided to interconnect the ends of the shanks distant from the sockets and to prevent relative sliding movement of the two branches when they are engaged. Said means include an elongated latch **128** (FIGS. 1 and 6) pivoted on one end thereof as by a shouldered screw **130** to a heel **132** of one of the branches **22**. The heel **134** of the other branch **24** carries a projecting headed pin **136** for engagement by a notch **138** on the end of the latch **128** distant from the screw **130**. A transversely elongated heel block **140** is secured adjacent the heel **132** of one of the shanks **26**, as by a pin **142**, and has a projecting portion snugly slidably fitting into the interior of the other shank **40**. When the pin **136** is engaged by the notch **138** of the latch **128**, and the projecting portion of the heel block **140** is fitted into the end of the shank **40**, the two branches **22**, **24** are locked against relative movement.

Means is provided for fixing the maximum distance between the hinged blade **38** and the fixed blade **48**. Said means also enables an operator to rotate the hinged blade **38** towards the fixed blade **48**. The means includes a knob **144** fixed to the outer tip of a threaded shaft **146**. The shaft **146** is screwed into a tapped bore **148** in the yoke **58** of the hinged blade **38**. The inner tip of the shaft **146** abuts, so as to limit movement of, the pivoted end of the blade **38** and is located so that advancement or retreat of said tip by appropriate rotation of the knob **144** rotates the hinged blade **38** on its pivot pin **56**, respectively, towards and away from the fixed blade **48** (see FIG. 6). FIG. 1 illustrates in dot-and-dash lines a position of the blade **38** distant from the blade **48** and in solid lines a position of the hinged blade **38** nearer the blade **48**. The hinged blade **38** is limited in its movement toward the fixed blade **48** by abutment of an integral projection **150** against the shaft **80**.

The forceps are used by the practitioner in accordance with good medical practice. Each of the branches may be separately utilized, and in this instance alignment of the ball passageways **126** with the socket passageways **124** and movement of the locking pins **122** therein by sliding movement of the buttons **106** immobilizes the associated base of the blade. The branches can be interengaged in the manner previously described. In this condition, with the locking pins inserted into the passageways of the hemispherical couplings and the passageways of the sockets, the bases of both blades are immobilized. By operating the locking means so that said locking pins are moved to a position distanct from said passageways, the blades are free to experience rotation about the mentioned two perpendicular axes. The outside stop **146** for the hinged blade can be set as desired and the hinged blade can be rotated toward the fixed blade as necessary.

It thus will be seen that I have provided an improved instrument which achieves all the objects of my invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described by invention, I claim as new and useful and desire to secure by Letters Patent:

1. In an obstetrical forceps comprising two branches, each branch including an elongated handle and a blade, each blade including a hemispherical coupling, means for detachably engaging the couplings to form a ball, each handle having a socket, means for joining the sockets to form a cage in which the ball is rotatable, and means for rotatably mounting the sockets for rotation relative to the handles about an axis perpendicular to the lengths of

the handles: that improvement comprising a passageway in a socket and a passageway in a coupling rotatable into alignment with said first named passageway, a longitudinally reciprocable laterally non-shiftable pin, said passageways being aligned with the pin only when the blades are in a straight line position relative to the handles, and releasable positive locking means in one operative position locating said pin in said passageways to prevent rotation of said ball and socket and to retain the blades immobile in said in line position and in another operative position withdrawing said pin from said passageways whereby to free the blades for swivelling movement.

2. The improvement in obstetrical forceps as set forth in claim 1 wherein the pin and passageways are located eccentrically with respect to the cage and coupling.

3. The improvement in obstetrical forceps as set forth in claim 1 wherein there is a locking means, a pin and passageways included in each of the branches.

4. The improvement in obstetrical forceps as set forth in claim 3 wherein each releasable positive locking means includes an exposed member located on the exterior of the handle and mounted for manually manipulatable limited sliding movement thereon and an elongated bar fixed on one end to the member and on the other end carrying the pin, said member having one limit of movement corresponding to the one operative position and a second limit of movement corresponding to another position.

5. The improvement in obstetrical forceps as set forth in claim 4 wherein means is provided to mount the bar for pivotal movement away from its associated branch for ease in cleaning and sterilization thereof.

6. In an obstetrical forceps comprising two branches, each branch including an elongated handle and a blade, an articulated universal joint captively attaching each blade to its associated handle for swiveling movement relative thereto about a pair of perpendicular axes, said joint including two sockets forming a spherical cage, means rotatably mounting the cage on a handle for rotary movement about a transverse axis and hemisphere attached to each blade, said hemispheres forming a ball seated in the cage, and means detachably interengaging the branches: that improvement comprising means for restricting rotation of the hemispheres in the cage about the axis perpendicular to the axis of rotation of the cage relative to the handle, said rotation limiting means comprising a pin rigidly secured to the socket and extending from its base to its tip in a direction parallel to the axis of rotation of the hemisphere relative to the cage, said pin being disposed eccentrically with respect to said axis of rotation, and a semicircular groove on the surface of said hemisphere, said groove lying on a circle having a diameter less than that of a great circle, said groove opening toward the blade and slidably receiving the pin.

7. The improvement in obstetrical forceps as set forth in claim 6 wherein the hemisphere associated with each branch has a like semicircular groove and the socket associated with each branch as a like pin, said grooves having their ends registered to conjointly define a continuous circular groove in which both pins are slidable.

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