May 5, 1970 L. W. BLAKE 3,509,882

PARALLEL JAW SPRING CLIP AND APPLICATOR

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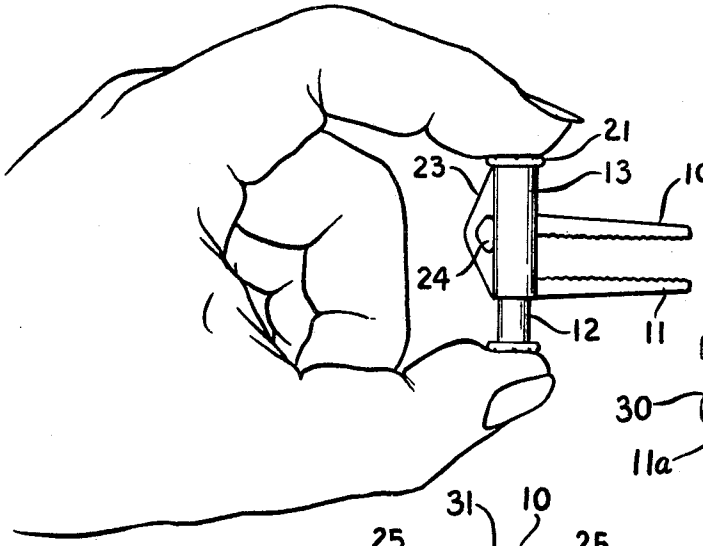



Fig. 1

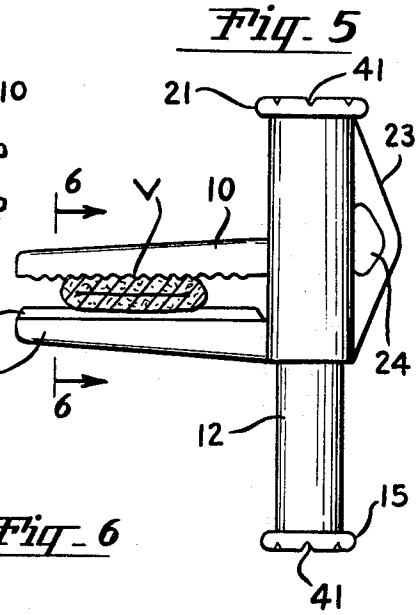



Fig. 5

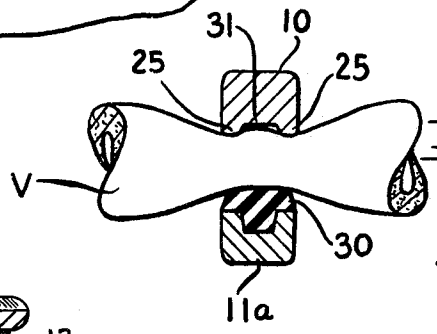



Fig. 6

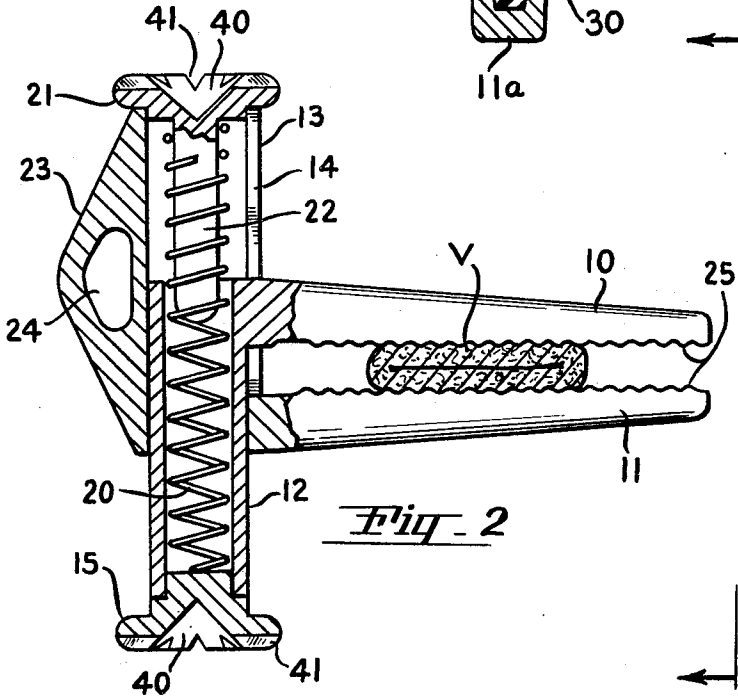



Fig. 2

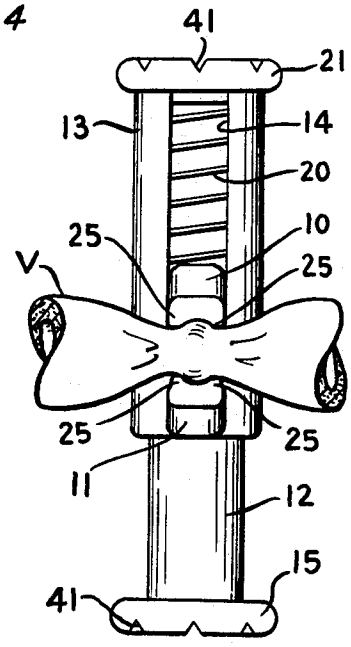



Fig. 4

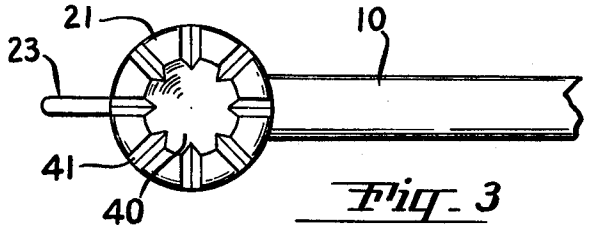



Fig. 3

INVENTOR.
LAWRENCE W. BLAKE
BY
Lee R. Schermerhorn
Attorney

May 5, 1970 L. W. BLAKE 3,509,882

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Fig. 7

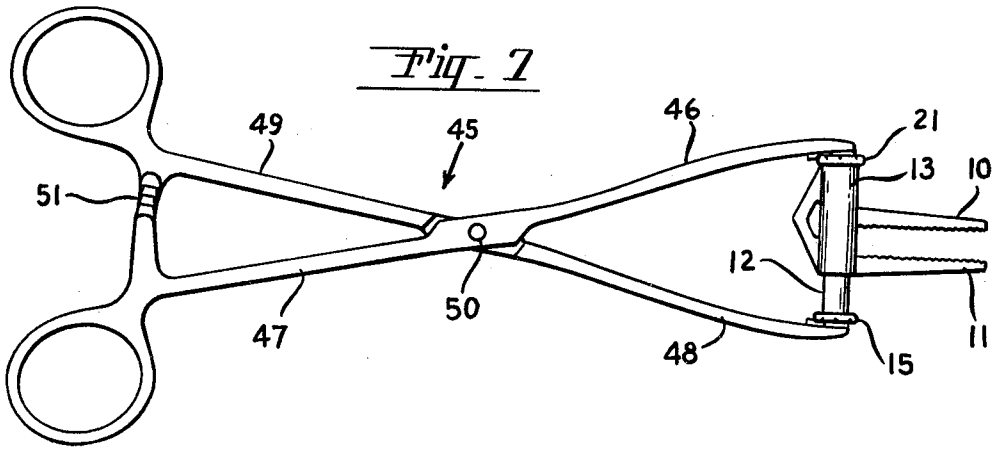
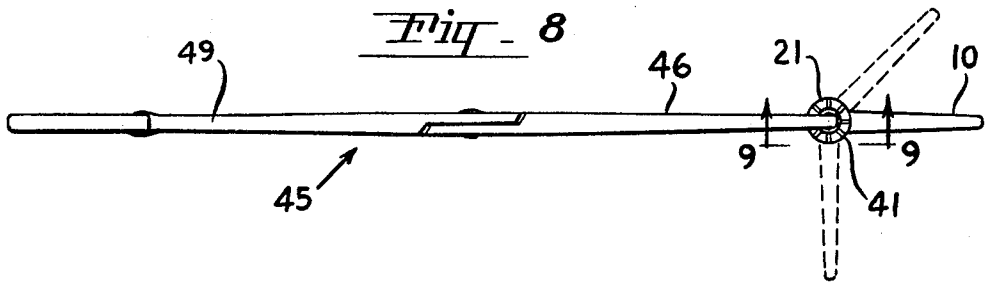



Fig. 8



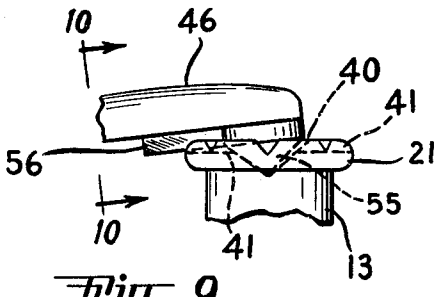




Fig. 9

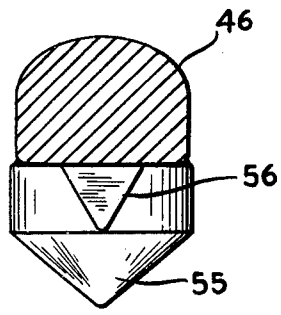



Fig. 10

INVENTOR.
LAWRENCE W. BLAKE
BY
Lee R. Schermerhorn
Attorney

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# PARALLEL JAW SPRING CLIP AND APPLICATOR

Lawrence W. Blake, Huntington Beach, Calif., assignor, by mesne assignments, to American Hospital Supply Corporation, Evanston, Ill., a corporation of Illinois

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Int. Cl. A61b 17/12
U.S. Cl. 128—325 14 Claims

## ABSTRACT OF THE DISCLOSURE

A disposable, parallel jaw, spring closing-pinch opening surgical clip having either toothed hard jaws or soft jaws or one of each. A scissors-type applicator is provided, having means to hold a clip in a plurality of angular positions relative to the applicator.

## BACKGROUND OF THE INVENTION

This invention relates to an improved parallel jaw spring clip for surgical use and an applicator for placing the clip on a vessel or tissue.

In many surgical operations a considerable number of spring clips is required to occlude severed blood vessels and for other purposes. The most common type of spring clip has smooth surfaced swinging jaws which are parallel when closed upon themselves but which are not parallel in the partially spread position they assume on a blood vessel. The lack of parallelism of the jaws sometimes makes it difficult to completely occlude the vessel to stop bleeding. Also, the lack of parallelism and the smooth, hard surfaces of the jaws creates a tendency for the clips to slip off the vessels or other tissue.

Parallel jaw clamps designed for other purposes are not adaptable to surgical use because of their size, weight and cost. Surgical clips must be small and light in weight. It is also highly desirable that they be sufficiently inexpensive to be used as disposable items. Sterilization is costly and in the case of parallel jaw mechanisms, complete cleaning and sterilization cannot be accomplished without taking the clips apart. The taking apart and re-assembling of a large number of clips after an operation is obviously to be avoided.

## SUMMARY OF THE INVENTION

The present clip accomplishes complete occlusion of a vessel, is light in weight, secure in its attachment to a vessel or other tissue and inexpensive to manufacture. It has two jaws which remain in parallelism throughout their opening and closing movements. The jaws are mounted on two telescoping members which are spring closed and pinch opened. One or both of the jaws may be a toothed hard jaw or one or both of the jaws may be equipped with a resilient soft jaw element, both types of jaws providing complete occlusion of blood vessels and secure retention thereon. Since the clips are disposable, there is no problem of cleaning and sterilizing the jaw mechanisms and more reliable sterility is achieved.

An applicator is provided for holding the clip open and placing it on a vessel or tissue. The clip and applicator have interengaging parts to hold the clip fixedly in a selected position relative to the applicator.

Objects of the invention are to provide an improved surgical clip, to provide a clip which subjects a vessel to minimum torque and distortion for occlusion, to provide a clip having parallel jaw movement, to provide a parallel jaw spring clip which is compact, light in weight and well balanced, to provide a clip which is spring closed and pinch opened, to provide a clip having either hard or soft jaws or a combination of hard and soft jaws, to provide



a good quality clip of the type described which may be inexpensively constructed of plastic parts and used as a disposable item and to provide an applicator which will hold the clip in a plurality of selected positions.

The invention will be better understood and the foregoing and other objects and advantages will become apparent from the following description of certain preferred embodiments illustrated in the accompanying drawings. Various changes may be made, however, in the details of construction and arrangement of parts and certain features may be used without others. All such modifications within the scope of the appended claims are included in the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation view showing a hard jaw clip embodying the principles of the invention, pinched to open position;

FIG. 2 is an enlarged view with parts in section, showing the clip in closed position on a blood vessel;

FIG. 3 is a fragmentary top plan view of the clip;

FIG. 4 is a view on the line **4—4** in FIG. 2;

FIG. 5 is a side elevation view of a clip having one hard jaw and one soft jaw;

FIG. 6 is a view on the line **6—6** in FIG. 5;

FIG. 7 is an elevation view showing a clip in the grasp of an applicator;

FIG. 8 is a plan view of FIG. 7;

FIG. 9 is an enlarged view on the line **9—9** in FIG. 8; and

FIG. 10 is an enlarged view on the line **10—10** in FIG. 9.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 2, the opposed jaws **10** and **11** are molded integrally with the inner ends of two telescoping members **12** and **13** respectively. Member **12** may be referred to as a plunger and member **13** a barrel for the plunger. The hollow plunger **12** is received within the barrel **13** and the latter is provided with a longitudinal slot **14** through which the jaw **10** projects in parallelism with jaw **11**. Slot **14** prevents the two jaws from rotating out of alignment with each other and the sliding fit between the plunger **12** and barrel **13** prevents the outer ends of the jaws from spreading apart on a clamped object.

A cap **15** is secured in the lower end of plunger **12** after the plunger has been inserted in the upper end of the barrel as shown. The parts **10, 11, 12, 13** and **15** are preferably made of a suitable plastic.

A metal compression spring **20** is contained within the plunger and barrel and seated on cap **15**. A plastic cap **21** having a spring guide pin **22** is secured in the upper end of barrel **13**. The upper end of spring **20** seats against cap **21** to urge the jaws **10** and **11** toward closed position. The jaws are separated by pinching the caps **15** and **21** as shown in FIG. 1. The caps form pinch grips for convenient grasp between the fingers. Barrel **13** is preferably equipped with a projection **23** having an opening **24** for tying the clip to a support, if desired.

FIG. 2 illustrates how a vessel V is completely occluded by the parallel action of the jaws **10** and **11**. When conventional clip jaws open with a pivotal movement, they are not in parallelism in clamped position on a vessel whereby one side of the vessel may be damaged by pinching it excessively hard in order to completely occlude the opposite side of the lumen. With the present parallel jaw arrangement, occlusive pressur is minimized and it is unfiform across the vessel with minimum distortion to the vessel.

Teeth **25** tend to resist slippage of the jaws on the vessel. The parallel relation of the jaws in clamped position produces no forces tending to cause the clip to slip off the vessel. When the jaws are not parallel in clamped position, a wedging action results, producing a component of force on the vessel in a direction away from the vertex of the angle between the jaws. Thus, the present clip is not only inherently stable on a clamped object but it is afforded means of positive retention through teeth **25**.

The embodiment shown in FIGS. 5 and 6 is the same as the embodiment just described except that the lower jaw **11***a* is equipped with a rubber soft jaw element **30**. Teeth **25** on the upper jaw are arranged along opposite sides of the jaw leaving a hollow or channel **31** extending between the two rows of teeth. Soft jaw element **30** deflects the vessel into channel **31** to aid in accomplishing complete occlusion of the vesel with minimum jaw pressure as shown in FIG. 6. However, the upper jaw **10** may also be equipped with a soft jaw element **30** to provide a clip having two soft jaws, if desired.

End caps **15** and **21** are provided with conical depressions **40** and radial notches **41** to cooperate with the clip applicator **45** as shown in FIGS. 7 to 9. Applicator **45** is a scissors-type clamp having a jaw **46** integral with a handle portion **47** and a jaw **48** integral with a handle portion **49**. These two members are pivotally connected together at **50** and the handle portions are equipped with a conventional ratchet locking device **51**.

Each jaw member **46** and **48** has at its extremity a conical projection **55** to fit a conical depression **40** and a wedge-shaped fin **56** radial to the projection **55** to engage a notch **41**. Thus, the clip may be held in any one of a number of discreet angular positions relative to the applicator as shown in broken lines in FIG. 8. The engagement of fins **56** in notches **41** prevents rotation of the clip in the applicator. Ratchet **51** holds the clip in open position as shown in FIG. 7 until the clip has been applied to a vessel and the ratchet released by the operator.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

**1.** A spring close-pinch open clip comprising a barrel having a radial jaw on one end thereof, said barrel having a longitudinal slot extending from its opposite end to said jaw, a hollow plunger in said barrel having a radial jaw on one end of the plunger slidable in said slot, spring seats in the opposite ends of said barrel and plunger, and a compression spring in said barrel and plunger seated on said seats.

**2.** A clip as defined in claim **1**, said spring seats comprising caps secured on said opposite ends of said barrel and plunger.

**3.** A clip as defined in claim **1** including an apertured extension on one side of said barrel.

**4.** A clip as defined in claim **1**, at least one of said jaws having teeth to grip a clamped object.

**5.** A clip as defined in claim **1**, at least one of said jaws having a soft, compressible clamping surface.



**6.** A clip as defined in claim **4**, both of said jaws having teeth.

**7.** A clip as defined in claim **4**, the other jaw having a soft, compressible clamping surface.

**8.** A clip as defined in claim **2**, said caps having means engageable by an applicator and arranged to prevent relative rotation between the clip and applicator.

**9.** A clip as defined in claim **8**, said means comprising an external conical depression in each cap and radial notches intersecting said depression.

**10.** A spring close-pinch open clip comprising a pair of telescoping members, a pair of parallel jaws on the respective members, a spring interconnecting said members to close said jaws against each other, and a pair of pinch grips on the respective members for opening the jaws, said pinch grips having means engageable by an applicator and arranged to prevent relative rotation between the clip and applicator, said means comprising oppositely directed conical depressions in said pinch grips and radial notches intersecting said depressions.

**11.** A clip as defined in claim **10** including an applicator having a pair of jaws, and a clip engaging means on said jaws arranged to fit said means on said pinch grips to prevent said relative rotation.

**12.** A jaw clip and applicator, said clip having a pair of pinch grips for adjusting its jaws, said applicator having a pair of jaws, interengaging means on said pinch grips and applicator jaws to hold the clip between said applicator jaws and prevent relative rotation between the clip and applicator, said interengaging means comprising conical depressions in said pinch grips and radial notches intersecting said depressions, conical projections on said applicator jaws arranged to enter said depressions, and radial fins on said projections arranged to enter said notches.

**13.** A jaw clip and applicator as defined in claim **12** including ratchet means on said applicator arranged to lock its jaws in adjusted position.

**14.** A clip applicator comprising a pair of pivotally connected jaws, a pair of opposed conical projections on said jaws, radial fins on said projections, a pair of handle members for operating said jaws, and ratchet locking means on said handle members.


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LAWRENCE W. TRAPP, Primary Examiner

U.S. Cl. X.R.

29—227; 128—346