

Nov. 2, 1971

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INTEGRAL CLAMPING INSTRUMENTS FOR MEDICAL AND
SURGICAL APPLICATIONS

3,616,497

Filed June 24, 1970

2 Sheets-Sheet 1

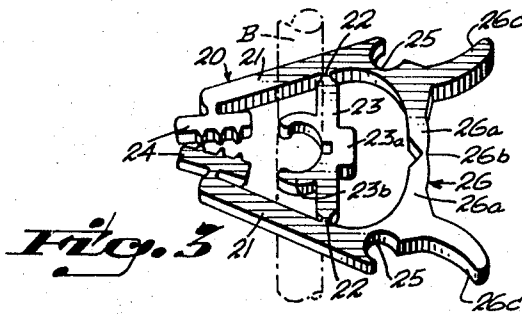


Fig. 3

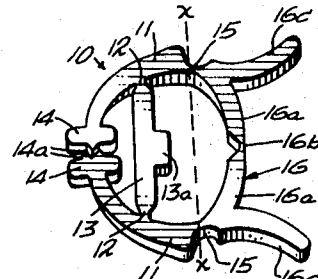


Fig. 1

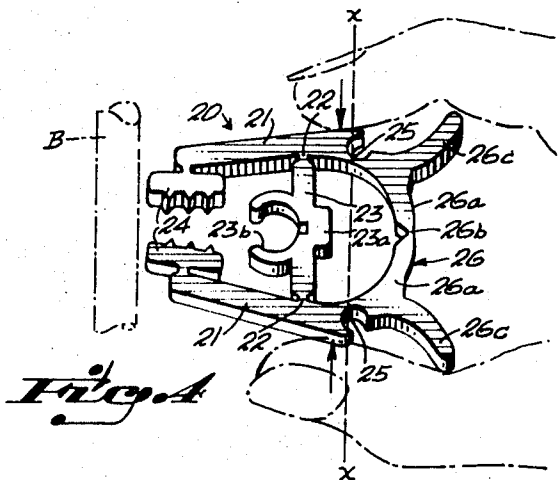


Fig. 4

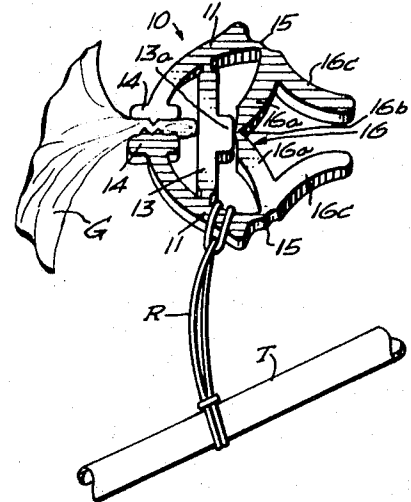


Fig. 2

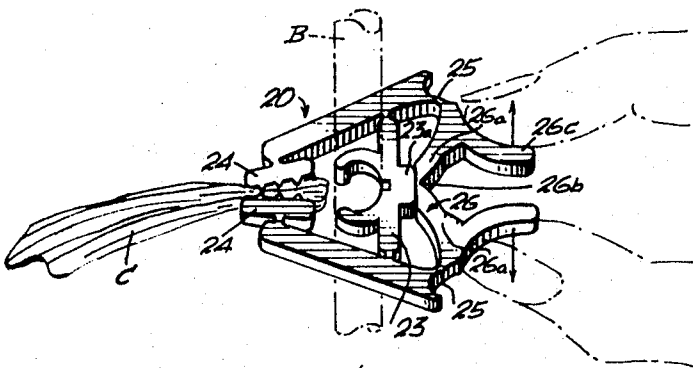


Fig. 5

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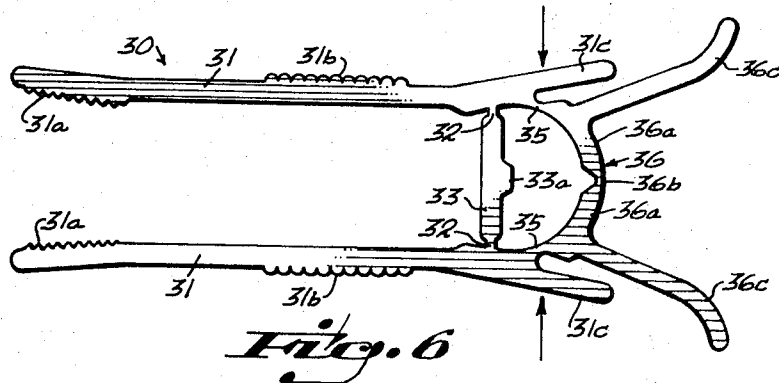


Fig. 6

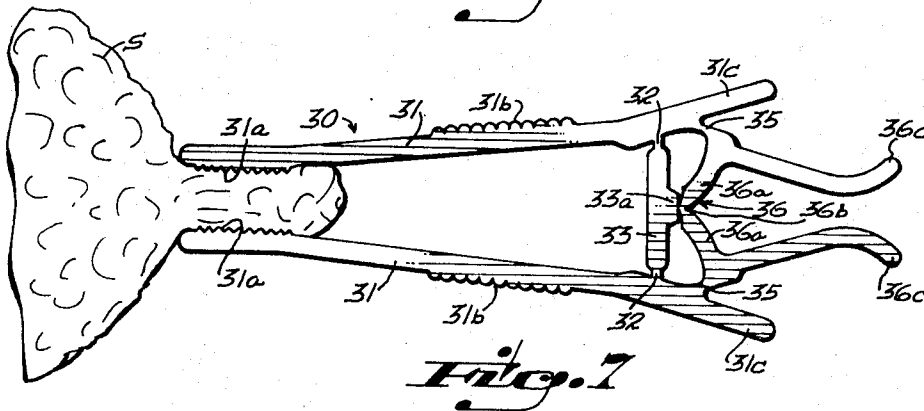


Fig. 7

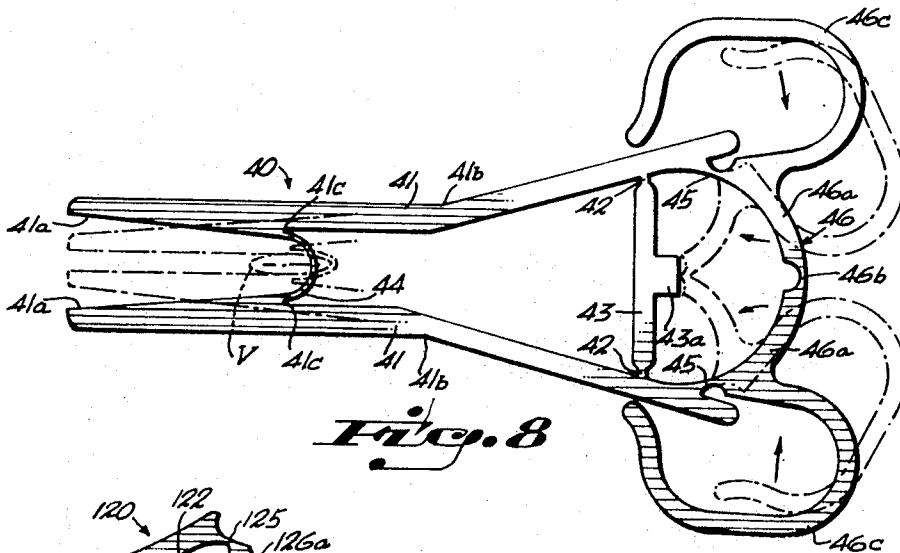


Fig. 8

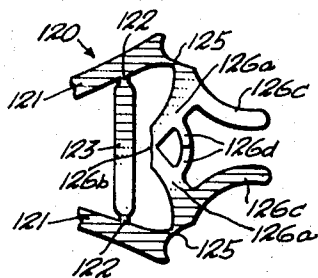


Fig. 9

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**INTEGRAL CLAMPING INSTRUMENTS FOR
MEDICAL AND SURGICAL APPLICATIONS**
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U.S. Cl. 24—81 HS 11 Claims

ABSTRACT OF THE DISCLOSURE

An integral clamping instrument, molded of elastomeric material, has a pair of arms, each being pivotally mounted at a midportion thereof to opposite ends of a rigid bar which acts as a fulcrum. On one end the arms carry opposing jaws and the other ends are hinged to a spreader comprising two hinged half sections which are adapted to snap across a straight-line maximum length condition between a first angular relaxed position, wherein the other arm ends are free to move toward each other for opening the jaws, to a second angular locked position, wherein said other arm ends are retained in a spread apart condition closing the jaws. Finger manipulatable members extend from the spreader half sections and are located for gripping between thumb and forefinger to effect the snapping from the first to the second position. Different instruments in the form of retainer clips, sponge forceps or hemostats are readily fashioned by varying the size and configuration of the arms, jaws and finger manipulatable members.

BACKGROUND OF THE INVENTION

(1) Field of the invention

The invention relates to snap-action clip means having opposing jaws, molded as integral structures of elastomeric plastic material, and having finger manipulatable means, the jaws serving in various medical applications and particularly, with structural modifications, providing disposable surgical hemostats and sponge forceps.

(2) Description of the prior art

The ordinary safety pin now in use in many applications in hospital and sick rooms requires time consuming care and dexterity to avoid pin pricks to the patients as well as to the attendants. Hemostats and sponge forceps are high priced quality items which require repeated use to justify their cost and, consequently, need to be sterilized in preparation for each subsequent use. This invention satisfies the need for an inexpensive, easy to operate, all purpose clip and, particularly, a device to replace the safety pin in many of its current uses in hospitals and nurseries and for a dependable hemostat and forceps supplied in a sterile package ready for use and at so low a cost as to economically justify the discarding thereof after a single use to avoid the need for repeated sterilization on the premises.

The constructions herein disclosed are improvements on my prior clip as described in U.S. Pat. No. 3,292,223.

SUMMARY OF THE INVENTION

Among the objects of the invention is to provide a single, unitary, integral structure molded of elastomeric material incorporating a snap-action gripping means having opposing jaws which may be formed in various sizes and configurations, each to satisfy a different requirement, such as, that of a retainer clip, a hemostat, or a sponge forceps, which instruments shall be economical to manufacture in quantity production as unitary struc-

tures by modern molding methods requiring no assembly and which shall be easy and practical to operate and dependable to use.

Each instrument comprises a rigid bar acting as a fulcrum for a pair of pivot arms attached at midportions thereof to opposite ends of the bar by integral hinges. One end of each pivot arm is formed with a jaw positioned to oppose and engage the jaw of the other arm. The other ends of the pivot arms are hingedly connected to opposite ends of a spreader which comprises two hinged sections adapted to snap from a first angular relation, across a straight-line maximum length condition, to a second angular relation. The hinge of the spreader when in the first angular relation is positioned away from the bar and is free to move farther away, thereby effectively shortening the spreader by its sections assuming a more acute angle at the hinge. In this condition finger pressure exerted to bring the ends of the arms adjacent the spreader toward each other will cause the arms to pivot at their bar attachments and open the jaws. The hinge of the spreader when in the second angular relation is disposed to abut a midportion of the rigid bar to lock the spreader in a predetermined effective length which serves to urge the arm ends at the spreader apart, bringing the jaws together into locked engagement. A pair of finger manipulatable members, one extending from each of the spreader sections, is located for gripping between thumb and forefinger to effect the snapping of the spreader sections from first to second angular relation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a retainer clip with the spreader of the snap-action means shown in relaxed position and the jaws open.

FIG. 2 is a perspective view of the retainer clip shown in FIG. 1 illustrating one of its medical uses in attaching a section of a feeding tube to a patient's garment, the spreader of the snap-action means being shown in jaw locking position.

FIG. 3 is a perspective view of a modified larger side retainer clip having the rigid bar formed with a resilient C-grip for mounting the clip to a cylindrical structure, such as, a vertical bar of a hospital bed, indicated in broken lines.

FIG. 4 is a perspective view of the retainer clip in FIG. 3 shown with the pivot arms being gripped between thumb and forefinger and urged toward each other to open the jaws.

FIG. 5 is a perspective view of the retainer clip in FIGS. 3 and 4 with the jaws closed and gripping a fabric, the thumb and forefinger being shown positioned on the finger grip members of the spreader to effect snapping the latter from jaw open to jaw closed position.

FIG. 6 is a side view of another modification of the invention, in the form of a sponge forceps, the spreader of the snap-action means being shown in relaxed position with the blades open.

FIG. 7 is a side view of the forceps of FIG. 6 with the spreader in blade locking position, the blades being shown gripping a sponge.

FIG. 8 is a side view of still another modification of the invention in the form of a hemostat, the spreader of the snap-action means being shown in full lines in relaxed position with the blades open, and in broken lines the spreader is indicated in locked position with the blades compressing a blood vessel therebetween, and

FIG. 9 is a fragmentary side view of a clip similar to, and in the position of, that in FIG. 5, but showing a modified form of limiting means for retaining the spreader in a jaw locking expanded position.

3 DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring in detail to FIGS. 1 and 2 of the drawing, 10 generally denotes a retainer clip, one of the instruments constructed to embody the invention, molded as an integral unit, as for example, by injection molding methods, of a suitable elastomeric plastic resin, such as, linear polyethylene, polypropylene, or the like material having tough foldable tear resistant properties satisfying the requirements for an integral hinge or pivot.

As seen in FIG. 1, retainer clip 10 comprises a pair of pivot arms 11 pivotally attached at a midportion thereof by relatively thin bendable webs 12 to opposite ends of rigid bar 13. One end of each of the pivot arms 11 is formed as a jaw 14 having a toothed surface 14a opposing that of the other jaw 14 and arranged to mesh therewith. The other end of each of the pivot arms 11 connects by another relatively thin bendable web 15 to a spreader 16 extending therebetween. An integral intermediate hinge 16b divides spreader 16 into half sections 16a which are sized and shaped to have an effective length greater than the distance between webs 15 along straight-line $x-x$ extending therebetween.

Half sections 16a are molded for disposition in a relaxed condition to define an interior acute angle at hinge 16b as shown in FIG. 1 and for bending at opposite webs 15 and intermediate hinge 16b to snap across line $x-x$ to assume an interior obtuse angle as seen in FIG. 2, which is controlled in size by engagement with boss 13a formed on rigid bar 13. While it is to be understood that clip 10 can be manipulated by exerting pressure directly on spreader 16 in the region of hinge 16b to move the latter toward and away from bar 13, to facilitate holding and operating clip 10, spreader half sections 16a may be formed with curved rearwardly extending toggle levers 16c which cooperate with each other to provide grasping surfaces for the thumb and forefinger.

Clip 20, shown in FIGS. 3, 4 and 5, is similar to clip 10 in comprising arms 21 which are pivoted by webs 22 to bar 23, are terminated at one end in opposing jaws 24, and are connected at the other end by bendable webs 25 to spreader 26 which has half sections 26a divided by intermediate hinge 26b. Clip 20 is seen to be larger in size than clip 10 and is proportioned to provide a resilient C-grip 23b integrally formed on rigid bar 23 to receive a suitable support means through jaws 24 for attachment of clip 20 thereto, here shown as a bar B, indicated in broken lines, which may be part of a bed guard rail to which clip 20 secures the bed cover C.

The practical utility and operation of the invention will now be apparent. Referring to FIGS. 4 and 5, clip 20 serves to illustrate the manual operation of retainer clips, it being understood that clip 10 will function in a similar manner. Thus, when grasped at the ends of arms 21 adjacent webs 15 between the thumb and forefinger and pressure applied, as indicated by the arrows in FIG. 4, arms 21 pivot at webs 22 and separate jaws 24. Spreader 26 offers little or no resistance to this movement, being free to bend at hinges 25 and at intermediate hinge 26b to assume a configuration having a smaller interior angle formed by half sections 26a at hinge 26b. This manipulation may be used to initially mount clip 20 onto a supporting structure by separating jaws 24 sufficiently to permit a support, such as guard rail B, to pass therebetween and to be resiliently engaged by C-grip 23b which is conveniently located in alignment with the opening between the jaws.

Having spread jaws 24 in the manner hereinbefore described or utilizing the normal separation which jaws 24 assume by virtue of their disposition when spreader 26 is in its relaxed position shown in FIG. 3, bed cover C or any other object to be secured by clip 20 is then brought between jaws 24 and the thumb and forefinger is slipped rearwardly to grasp toggle levers 26c of spreader 26 therebetween. Finger pressure is then simply applied to

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bring levers 26c toward each other whereby half sections 26a, pivoting at hinges 25 and intermediate hinge 26b, increase the effective length of spreader 26 to a maximum when hinge 26b coincides with straight line $x-x$ drawn through hinges 25 as indicated in FIG. 4. At this point jaws 24 have been brought to tightly close and arms 21 are resiliently deformed, that is, outwardly sprung, to a predetermined degree. As soon as hinge 26b passes through line $x-x$, half sections 26a, now also being urged forwardly by the resiliency of deformed arms 21, snap into the position shown in FIG. 5. In this jaw locking position, half sections 26a, being prevented from further forward movement by engagement of hinge 26b with boss 23a, spread arms 21 apart at hinges 25 sufficiently to retain, that is, to lock jaws 24 in closed position against the resiliency of a slight deformation of arms 21. Any force applied to separate jaws 24 meets resistance by being transmitted through arms 21 to half sections 26a which are retained against forward movement at hinge 26b by abutment of the latter with boss 23a. In molding clip 20, the abutment surface of boss 23a is located to coact with the size and configuration of half sections 26b and arms 21 for applying the desired compressive and deformative force to arms 21 for retention of jaws 24 in closed position.

To release jaws 24, a finger snapping action between toggle levers 26c exerts a separating force indicated by the arrows in FIG. 5 which outwardly springs arms 21 to said predetermined degree so that hinge 26b passes through line $x-x$ and is free to snap back to the relaxed position shown in FIG. 3.

FIG. 2 illustrates one of the many uses for clip 10 in a hospital room as a safety pin substitute. Clip 10 may be connected in a simple manner, as by looped ends of a rubber band R, to an intravenous feeding or other delivery tube T and then used to hold tube T in a desired position by snapping clip 10 onto a patient's garment G. Where required, several clips 10 may be used along the length of tube T.

Another of the instruments constructed to embody the invention is shown in FIGS. 6 and 7 as sponge forceps 30, molded as an integral structure of an elastomeric plastic resin to comprise a rigid bar 33 to the opposite ends of which blades 31 are pivoted by integral webs 32 and a spreader 36 attached at opposite ends thereof to blades 31 by hinges 35. Blades 31, being relatively elongated with respect to arms 11 and 21 of clips 10 and 20, respectively, to which they are homologous, are formed with toothed or serrated opposing surfaces 31a adjacent the free ends thereof, with corrugated or knurled exterior surface portions 31b between the free ends and webs 32, and with finger gripping extensions 31c projecting rearwardly beyond hinges 35. Spreader 36 is formed in half sections 36a connected by intermediate hinge 36b and have toggle levers 36c which may be elongated with respect to levers 16c and 26c of clips 10 and 20, respectively, to project beyond blade extensions 31c for comfortable holding, when so desired, between the thumb's first joint and the forefinger's second joint.

Forceps 30 are particularly versatile, being capable of serving as a blade lockable instrument as well as a pair of resilient pincers. When used to take advantage of the blade locking feature, forceps 30 operate in a manner similar to that hereinbefore described for clip 20. An object, such as sponge S, may be grasped between toothed surfaces 31a of blades 31 and manual pressure applied urging toggle levers 36c toward each other to snap spreader 36 from the relaxed position shown in FIG. 6 to the blade locking position shown in FIG. 7 wherein hinge 36b engages boss 33a. To aid in grasping such object prior to snapping the toggle levers 36c to the locked position, the separation between toothed surfaces 31a may be increased by applying manual pressure to rearward projections 31c of blades 31 in a manner comparable to that shown in FIG. 4 with respect to clip 20.

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When used as pincers, forceps 30, with spreader 36 in the relaxed blade open position shown in FIG. 6, is gripped by thumb and forefinger on blade exterior surface portions 31b so that application of finger pressure brings together toothed surfaces 31a of blades 31. In so doing, spreader 36 is resiliently expanded by increasing the interior angle at hinge 36b, and forceps 30, by virtue of the resiliency at webs 32 and hinges 35 and 36, upon release of the finger pressure will return to their normal position shown in FIG. 6 wherein blades 31 are open.

Still another of the instruments constructed to embody the invention is shown in FIG. 8 as hemostat 40 which also is molded as an integral structure to comprise a pair of blades 41 pivoted by integral webs 42 to opposite ends of rigid bar 43 and a spreader 46 attached at opposite ends thereof to blades 41 by hinges 45. Blades 41 are elongated and terminate in opposing jaw surfaces 41a which may be disposed in angular relation with respect to the hinged end portions of blades 41. Intermediate bends 41b in blades 41 cooperate with the angular disposition of surfaces 41a so that the latter will meet in substantially parallel abutment when blades 41 are closed. In order to facilitate locating a blood vessel V between opposing jaw surfaces 41a, the latter on their inner ends terminate in a shoulder 41c from which a flexible tie strip 44 extends therebetween. Spreader 46 is formed in half sections 46a connected by intermediate hinge 46b and each half section 46a has a toggle lever extending as a finger loop 46c.

In use, hemostat 40, supplied in a sterile package and in the normal blade open, spreader relaxed position shown in full lines in FIG. 8, is grasped by the surgeon with thumb and forefinger extending through loops 46c and manipulated to bring blood vessel V between opposing jaw surfaces 41a or until further downward movement is checked by engagement of blood vessel V with tie strip 44. Now, loops 46c are brought toward each other to snap spreader 46 in the direction shown by arrows to the blade locked position wherein hinge 46b engages boss 43a and blades 41, being spread apart at hinges 45, pivot at webs 42 to bring opposing jaw surfaces 41a together clamping blood vessel V therebetween as indicated in broken lines in FIG. 8. Hemostat 40 will remain in blood vessel clamping position until loops 46c and spreader 46 are returned to their relaxed position by moving loops 46c apart.

It is to be understood that any suitable means may be utilized to serve the purpose of bosses 13a, 23a, 33a, and 43a in limiting the forward bending of spreaders 16, 26, 36, and 46, respectively, and thereby control the spreading of the respective arms 11, 21 and blades 31, 41 to exert a closing tension on the opposite ends thereof. To this end, FIG. 9 shows the spreader end of a clip 120 having a pair of arms 121 pivoted by webs 122 to rigid bar 123 and spreader half sections 126a hinged together at 126b and connected to arms 121 by webs 125. In addition to toggle lever 126c, each spreader half section 126a is integrally formed with an arcuate stub 126d extending toward the other to be brought into abutment for limiting forward motion of the half sections 126a when the latter are snapped into jaw locking position shown in FIG. 9.

The improved integrally formed, corrosion proof, self-locking instruments herein disclosed are seen to achieve the several objects of the invention and to be well adapted to meet conditions of practical use. As various possible embodiments might be made of this invention, and as various changes might be made in the disclosed constructions, as for example, in the size and configuration of the jaws and of the pivotable arms or blades in adapting the spreader action for other specific uses for clips, clamps, clothes pins, forceps and the like, it is to be understood that all matters herein set forth or shown in the accom-

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panying drawing are to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A clamping instrument comprising a rigid bar acting as a fulcrum, a pair of arms attached at a midportion thereof to opposite ends of the bar by integral pivots, one end of the arms being formed with opposing jaws adapted to close when the opposite ends of the arms are spread apart, and an intermediately hinged spreader extending between and attached to said arm opposite ends by integral hinges, said spreader being adapted to snap from a relatively shortened position for opening the jaws, to a relatively lengthened position for retaining said other arm ends in said spread apart condition closing the jaws.

2. The clamping instrument defined in claim 1 in which said spreader when in said shortened position is free to further shorten for further opening of said jaws, and means for positively locking the spreader against shortening when in said lengthened position.

3. The clamping instrument defined in claim 2 in which said arms extend rearwardly beyond said integral hinges forming finger manipulatable means for spreading said jaws when said spreader is in said shortened position.

4. The clamping instrument defined in claim 2 in which said locking means includes a boss integrally formed on a midportion of said rigid bar and extending rearwardly for abutment by said spreader intermediate hinge.

5. The clamping instrument defined in claim 2 in which said locking means includes a pair of integral stubs extending rearwardly toward each other from said spreader on opposite sides of said intermediate hinge and adapted to abut each other when said spreader is snapped to said lengthened position.

6. The clamping instrument defined in claim 1 in which a pair of toggle levers are integrally formed to extend rearwardly from said spreader for grasping between the thumb and forefinger and having finger pressure applied thereto to snap the spreader from said jaw open position to said jaw closing position.

7. The clamping instrument defined in claim 6 in which said toggle levers are elongated, curved and shaped as finger loops.

8. The clamping instrument defined in claim 6 in which said arms are elongated to provide hemostat blades which taper toward each other from said pivot to a midportion thereof, and are bent thereat to bring the jaws into substantially parallel relation.

9. The clamping instrument defined in claim 8 including a flexible tie strip integrally formed and extending between a rearward end of said jaws for limiting the depth of insertion of said hemostat.

10. The clamping instrument defined in claim 1 in which a C-grip is integrally formed on said rigid bar facing said jaws for mounting the instrument on a supporting structure.

11. The clamping instrument defined in claim 1 in which said arms between the pivots and jaws are elongated to provide a pair of forceps blades having finger pressure applying exterior surface portions for resiliently bringing the jaws together while said spreader expands in length.

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U.S. Cl. X.R.

24—255 A; 128—346