ENHANCED VISIBILITY CARTRIDGE WITH IMPROVED RETAINER

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ABSTRACT
A substantially translucent cartridge is provided for retaining surgical clips, such as those used in surgical ligating procedures. The cartridge includes a polymeric composition base and a separable polymeric composition clip retainer supported by the base wherein the polymeric composition of the base and retainer includes a particulate, light diffusing material for imparting a substantially translucent optical effect for rendering, surgical clips visible within the cartridge. The polymeric composition may further include a radiopaque additive for rendering the cartridge imageable during radiographing.
ENHANCED VISIBILITY CARTRIDGE WITH IMPROVED RETAINER

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/635,361, filed Dec. 10, 2004; the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present subject matter generally relates to the storage and subsequent extraction of clips, particularly surgical ligating clips, in preparation for use of the clips in a surgical procedure such as hemostasis. More particularly, the present invention relates to an enhanced visibility cartridge adapted for retaining clips in an improved manner.

BACKGROUND ART

[0003] Many surgical procedures require vessels or other tissues of the human body to be ligated during the surgical process. For example, many surgical procedures require cutting blood vessels (e.g., veins or arteries), and these blood vessels may require ligation to reduce bleeding. In some instances, a surgeon may wish to ligate the vessel temporarily to reduce blood flow to the surgical site during the surgical procedure. In other instances, a surgeon may wish to permanently ligate a vessel. Ligation of vessels or other tissues can be performed by closing the vessel with a ligating clip, or by suturing the vessel with surgical thread. The use of surgical thread for ligation requires complex manipulations of the needle and suture material to form the knots required to secure the vessel. Such complex manipulations are time-consuming and difficult to perform, particularly in endoscopic surgical procedures, which are characterized by limited space and visibility. By contrast, ligating clips are relatively easy and quick to apply. Accordingly, the use of ligating clips in endoscopic as well as open surgical procedures has grown dramatically.

[0004] Various types of hemostatic and aneurysm clips are used in surgery for ligating blood vessels or other tissues to stop the flow of blood. Such clips have also been used for interrupting or occluding ducts and vessels in particular surgeries such as sterilization procedures. Typically, a clip is applied to the vessel or other tissue by using a dedicated mechanical instrument commonly referred to as a surgical clip applicator, ligating clip applicator, or hemostatic clip applicator. The clip is permanently left in place after application to the tissue.

Ligating clips can be classified according to their geometric configuration (e.g., symmetric clips or asymmetric clips), and according to the material from which they are manufactured (e.g., metal clips or polymeric clips). Symmetric clips are generally “C,” “U,” or “V” shaped and thus are substantially symmetrical about a central, longitudinal axis extending between the legs of the clip. Symmetric clips are usually constructed from metals such as stainless steel, titanium, tantalum, or alloys thereof. An example of one such clip is disclosed in U.S. Pat. No. 5,509,920 to Phillips et al. By means of a dedicated clip applicator, the metal clip is permanently deformed over the vessel. Asymmetric clips are usually constructed of polymeric material.

[0005] Because clips of the type just described are small and several clips are often used in a surgical procedure, clip holding devices are employed to store and retain multiple clips between the time of their manufacture and/or packaging and ultimate use in a surgical procedure. Numerous clip cartridges have been developed, some of which strive to prevent the clips from becoming unduly loosened or even completely dislodged during shipment and handling. Clip cartridges are intended for use with “manual” clip applicators.

[0006] As used herein, the term “automatic” denotes the kind of clip applicators that retain a plurality of hemostatic clips adjacent to the jaws of a clip applicator in a way such that a new clip is automatically fed to the jaws after the previous clip has been crimped into place. An example of an applicator that dispenses a plurality of clips for sequential application is disclosed in U.S. Pat. No. 4,509,518 to McGarry et al.

[0007] By contrast, the term “manual” denotes the kind of clip applicators that receive one clip at a time between the jaws, and which have to be reloaded manually after the previous clip has been crimped. These manual instruments usually have a forces-type design and the reloading operation is generally accomplished by inserting the jaws of the applicator into a clip holder or cartridge and engaging or grasping a clip contained therein. The jaws of the clip applicer generally have longitudinal grooves to receive the clip legs and can have end-dams at the distal end of each groove to limit distal movement of the clip. The clip is secured in the jaws by the natural resiliency of the clip legs and by the end-dams if they are present. An example of a forces-type applicator having conformal jaws used to grip and maintain alignment of the clip during deformation is disclosed in U.S. Pat. No. 3,326,216 to Wood.

[0008] Many types of clip cartridges currently available contain a plurality of longitudinally spaced clip retaining chambers. A single clip is retained in each chamber by a variety of means, and is removed from its chamber by a forces-type clip applicator that is inserted into the selected clip chamber and secured to the clip sufficiently to overcome whatever clip retention means is utilized, thereby enabling the clip to be removed from the clip chamber.

[0009] Various mechanisms are known by which clips can be retained within the chambers of clip cartridges. In all instances, a desirable goal of such cartridges is to minimize the forces required to load the clip into the applicator and to remove it from the cartridge while maximizing the security with which the clip is held in the cartridge and, subsequently, the clip jaws prior to use. With respect to metallic clips, friction between the clip and the side walls of its individual chamber is often sufficient to retain the clip. The clip cartridges are generally made of molded plastic material, such that the walls of each clip chamber are somewhat resilient and able to be pushed away from each other when the clip applicer jaws are inserted into the chamber to retrieve the clip. An example of a cartridge holding the clips in their respective clip chambers by means of frictional engagement with the side walls of each chamber is shown in U.S. Pat. No. 4,076,120 to Carroll et al.

[0010] In some prior art clip cartridges designed for metallic clips, each individual clip chamber is provided with a central post generally conforming to the shape of the open clip although being slightly larger so that when the clip is pushed onto the central post, frictional contact between the
legs of the clip and the central post retains the clip within its chamber. Cartridges of this type are shown in U.S. Pat. Nos. 3,270,745; 3,326,216; 3,363,628; 3,439,522; and 3,439,523, all issued to Wood.

[0012] Prior art cartridges are also known that retain clips in a partially straightened state by maintaining each clip under tension within its chamber, through the interaction between the central post in the chamber and the central part of the clip and protrusions extending into each chamber toward the central post (from the ends). The clip is retained by having its central hinge part pushed upward by the central post and its ends pushed downwardly by the protrusions. Such a cartridge is shown in U.S. Pat. No. 3,713,533 to Reimers and U.S. Pat. No. 4,146,130 to Samuels et al.

[0013] U.S. Pat. No. 4,696,396 to Samuels discloses another type of cartridge that has a plurality of ribs extending from each side wall of each clip chamber inwardly toward the clip to retain the clip by frictional engagement with the ribs. The aforementioned U.S. Pat. No. 4,146,130 to Samuels, et al. shows an alternative embodiment for the situation where clips are intended to be loosely maintained in the cartridge without frictional engagement between the clips and the chamber, the clips in such an event being retained in each cartridge by a covering tape which can be easily severed by the operator as desired.

[0014] While these prior art cartridges for metal and polymeric clips have been used with adequate results, there are several disadvantages to the composition and structural design of the cartridges that limits their functionality during use.

[0015] First, due to the small size of the surgical clips being contained within the cartridge and the visible light opaqueness of the prior art cartridge material, it has in the past been difficult for surgeons to accurately determine how many clips remain within the cartridge, especially under lighting conditions present in modern day surgical operating rooms. Therefore, it would be advantageous to provide an improved clip cartridge that would allow the surgeon to quickly determine the number of clips remaining in a cartridge just by visually assessing the cartridge body.

[0016] Second, as with any small surgical instrument used in an operation procedure, there exists a likelihood that the clip cartridge may be accidentally dropped into a patient’s body cavity during the procedure and left in place. Therefore, it would be advantageous to provide an improved clip cartridge that would be imageable through radiographic techniques so that the presence of a cartridge left in the body cavity of a patient can be readily detected.

[0017] Finally, the retainer mechanism structure of many prior art cartridges has been designed to act merely as a place holder for the clip during transport and preparation for use by the surgeon. These retainers have not functioned well if the cartridge is dropped or otherwise agitated, leading to premature release of the clips from the cartridge. Therefore, it would be advantageous to provide an improved clip cartridge that incorporates a novel structural design that functions not only to statically retain the clips but also as a shock absorber to dynamically retain the clip if the cartridge is agitated.

DISCLOSURE OF THE INVENTION

[0018] According to one embodiment of the present subject matter, a substantially translucent cartridge for retaining a plurality of biocompatible surgical clips formed from any suitable material including metals and polymeric compositions, each clip having a pair of legs extending from a hinge point to form a substantially symmetrical shape and adapted to be removed from the cartridge by a clip applier, comprises a polymeric composition base and a separable polymeric composition clip retainer supported by the base wherein the polymeric composition of the base and retainer comprises a particulate, light diffusing material for imparting a substantially translucent optical effect for rendering surgical clips visible within the cartridge. The polymeric composition may also optionally include a radiopaque additive for rendering the cartridge imageable during radiographing. The base has a base longitudinal axis and comprises a plurality of axially spaced-apart walls extending along the base and transversely disposed in relation to the base axis, the walls defining a plurality of axially spaced-apart clip compartments therebetween wherein each compartment comprises first and second lateral openings. The base further comprises a plurality of clip hinge support members, each clip hinge support member disposed within a respective compartment and adapted to prevent downward motion of a surgical clip by supporting the clip adjacent its hinge point. The clip retainer comprises a plurality of opposing pairs of first and second resilient tabs, wherein each tab extends from a proximal end secured to the clip retainer to a free distal end which extends into a corresponding compartment through a corresponding lateral opening. Further, each tab terminates at the distal end with a groove having diverging sides extending outwardly therefrom and further comprises a slot positioned between the diverging sides and extending inwardly toward the tab proximal end.

[0019] According to another embodiment of the present subject matter, a cartridge for retaining a plurality of surgical clips, each clip having a pair of legs extending from a hinge point to form a substantially symmetrical shape and adapted to be removed from the cartridge by a clip applier, comprises a polymeric composition base and a separable polymeric composition clip retainer. The polymeric composition may optionally include a radiopaque additive for rendering the cartridge imageable during radiographing or may optionally include a particulate, light diffusing material for rendering surgical clips visible within the cartridge. The base has a base longitudinal axis and comprises a plurality of axially spaced-apart walls extending along the base and transversely disposed in relation to the base axis, the walls defining a plurality of axially spaced-apart clip compartments therebetween wherein each compartment comprises first and second lateral openings. The base further comprises a plurality of clip hinge support members, each clip hinge support member disposed within a respective compartment and adapted to prevent downward motion of a surgical clip by supporting the clip adjacent its hinge point. The clip retainer comprises a plurality of opposing pairs of first and second resilient tabs, wherein each tab extends from a proximal end secured to the clip retainer to a free distal end which extends into a corresponding compartment through a corresponding lateral opening. Further, each tab terminates at the distal end with a groove having diverging sides extending outwardly therefrom and further comprises a slot positioned between the diverging sides and extending inwardly toward the tab proximal end.

[0020] According to an additional aspect of the present subject matter, a method is provided for loading a selected surgical clip into a surgical clip applier. Preferably, the clip is of the type that comprises a first leg, a second leg, and a
hinge point joining the first and second legs. The clip applier is preferably of the type that comprises a pair of opposing first and second jaws adapted to engage the first and second legs of the clip. According to the method, a substantially translucent clip cartridge is provided. The clip cartridge comprises a polymeric composition base and a separable polymeric composition clip retainer wherein the polymeric composition of the base and retainer comprises a particular, light diffusing material for imparting a substantially translucent optical effect for rendering surgical clips visible within the cartridge. The polymeric composition of the base and retainer may optionally include a radiopaque additive for rendering the cartridge imageable during radiographing. The method further includes viewing the clip cartridge to ascertain the location of the clip in the clip cartridge. The clip applier is then inserted into one of the plurality of compartments to engage a selected clip. At this point, the selected clip is removed from the cartridge.

[0021] Therefore, it is an object of the present subject matter to provide an enhanced visibility cartridge adapted for retaining clips in an improved manner, such clips having a pair of legs extending from a hinge point to form a substantially symmetrical shape and adapted to be removed from the cartridge by a clip applier.

[0022] An object of the present subject matter having been stated hereinabove, and which is addressed in whole or in part by the present subject matter, other objects will become evident as the description proceeds when taken in connection with the accompanying drawings as best described hereinbelow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 is a perspective view of one example of a plurality of substantially symmetrical shaped clips suitable for use in conjunction with the clip cartridge of the present subject matter;

[0024] FIG. 2 is a perspective view of an assembled clip cartridge provided in accordance with the present subject matter with a plurality of clips loaded therein;

[0025] FIG. 3 is an exploded perspective view of the clip cartridge shown in FIG. 2;

[0026] FIG. 4 is an enlarged perspective view of the clip retainer tabs provided with the clip cartridge shown in FIG. 2;

[0027] FIG. 5 is a perspective view of a clip cartridge provided in accordance with the present subject matter, showing a clip applier being inserted into a compartment thereof and engaging a clip loaded in one of the compartments of the clip cartridge; and

[0028] FIG. 6 is another perspective view of the clip cartridge shown in FIG. 5, showing the clip being extracted from a compartment of the clip cartridge.

DETAILED DESCRIPTION

[0029] Referring now to FIG. 1, one example is illustrated of a substantially symmetrical surgical clip, generally designated 100, that is suitable for use in conjunction with the cartridge described herein. Clip 100 and others of similar design are particularly useful as hemostatic clips that can be latched around a vessel or other type of tissue to ligate the vessel and thereby stop or reduce the flow of fluid through the vessel. Clip 100 can be constructed from any suitable biocompatible material, including certain metals and polymeric compositions. Clip 100 is substantially symmetrical and is generally “C”, “U”, or “V” shaped. The body of clip 100 comprises a first leg 102 and second leg 104, first and second legs 102, 104 being joined at their proximal ends by an integral hinge section 106.

[0030] Referring now to FIG. 2, a preferred embodiment of an assembled clip cartridge, generally designated 200, is provided in accordance with the present subject matter. As will be described in further detail, below, clip cartridge 200 is designed with a plurality of substantially identical clip chambers, each adapted for storing one clip 100, which preferably has a substantially symmetrical design as described above and illustrated in FIG. 1. FIG. 2 illustrates clip cartridge 200 of the present embodiment as adapted for storing six clips 100, although other embodiments can be provided that store more or less clips 100. If desired, an adhesive backing (not shown) can be provided on the underside of clip cartridge 200 to facilitate securing clip cartridge 200 to a tray or other supporting component during use.

[0031] As will be described structurally in more detail below with reference to FIGS. 2 and 3, clip cartridge 200 comprises a base portion, generally designated 210, and a separable clip retainer element, generally designated 250. Preferably, base 210 and retainer 250 are constructed from a polymeric composition. This polymeric composition can include polypropylene, nylon, polyethylene terephthalate (PET), polybutylene terephthalate (PBT), polyoxymethylene, and acrylonitrile butadiene styrene (ABS) or other types of compositions known to those of skill in the art.

[0032] In order to provide an improved clip cartridge that would allow a surgeon to quickly determine the number of clips remaining in a cartridge by visually assessing the cartridge body, one embodiment of cartridge 200 of the present subject matter is designed to be substantially translucent. The substantially translucent optical effect provided to cartridge 200 in accordance with the present subject matter is achieved by mixing very small quantities of light diffusing particles, having an average maximum particle size of about 0.1 to about 200 microns, with a thermoplastic polymer prior to molding or extruding the mixture. The particulate, light diffusing material can be present in the amount of 0.01% to 15% by weight of the composition mixture. The light diffusing particles can be in any form, such as powders, fibers, whiskers, plateltes, flakes, agglomerates, agglomerates or mixtures of these. Suitable particles include, but are not limited to, naturally occurring calcium carbonates, including reagent-grade calcium carbonate, ground chalk, ground limestone, ground marble and ground dolomite; ground or fiber calcium sulfates; silicates, such as glass fibers, glass flakes, solid and hollow glass spheres, aluminum silicate, synthetic calcium silicate and zirconium silicate; talc; kaolin; mica flakes, plateltes and pearls; natural silicas, such as sand, quartz, quartzite, perlite, tripoli and diatomaceous earth; fumed silicas; titantes, such as barium titante; sulfates, such as barium sulfate; sulfides, such as zinc sulfide and molybdenum sulfide; metallic oxides, such as aluminum oxide, zinc oxide, beryllium oxide, magnesium oxide, zirconium oxide; antimony oxide; titanium dioxide and aluminum hydroxide; aluminum diboride flakes; inor-
ganic fibers, such as wollastonite, basalt, boron, boron nitrides and ceramic; single crystal fibers (i.e. whiskers), such as those of alumina trihydrate; short fibers, such as those of aluminum silicate with aluminum and magnesium oxides and calcium sulfate hemihydrate; organic flating agents, such as wood flour and starch; and mixtures of any of the foregoing.

[0033] It is also envisioned that cartridge 200 of the present subject matter may include a radiopaque additive in order to provide that cartridge 200 would be imageable through radiographic techniques so that the unintentional presence of cartridge 200 in the body cavity of a patient can be readily detected. The radiopaque additive is preferably present in the polymeric composition in the amount from about 1.0% to 5.0% and can consist of ceramic material, such as tungsten carbide or tungsten boride; metallic material, such as metal (for example, platinum, tantalum, iridium, tungsten, rhenium, gold, and stainless steel), conductive ink, or a heavy metal salt such as barium sulfate; or combinations thereof although other materials could be utilized. Most preferably, the radiopaque additive is barium sulfate present in the amount of 2.0% by weight.

[0034] Referring to FIG. 3, the structure of clip cartridge 200 will now be described. Clip cartridge 200 comprises a base portion 210 which can include base recesses 212 formed in base portion 210 along a longitudinal base axis BA during the fabrication of clip cartridge 200 to reduce the amount of structural material needed. First and second axial end walls 214 and 215, and first and second side walls 216 and 217 extend upwardly from the perimeter of a base floor 218 of base portion 210. Posts 219 extend upwardly from base floor 218 to facilitate the mounting of clip retaining element 250 which is described in detail below. As will become evident from the description below, clip cartridge 200 is designed to enable symmetrical clips 100 to be loaded in only one orientation, with all clips 100 being loaded in that same orientation. Accordingly, as shown in FIG. 3, the first and second legs 102, 104 of each clip 100 will always extend in a downward direction within clip cartridge 200 when clips 100 are stored therein.

[0035] Referring further to FIG. 3, a plurality of transverse, axially spaced clip compartment walls 222 extend upwardly from base floor 218 and are spaced apart along base axis BA of clip cartridge 200. The two transverse walls nearest to the axial ends of clip cartridge 200 (i.e., the first and seventh transverse walls in the specific example illustrated), are designated as outermost transverse walls 222A and 222B, respectively. Each pair of adjacent spaced-apart transverse walls 222 (including outermost transverse walls 222A and 222B) define a respective clip compartment 226 therebetween. As shown in FIG. 3, each transverse wall 222 is substantially symmetrical about base axis BA and each transverse wall 222 can be tapered outwardly from base axis BA to reduce cartridge mass and improve the accessibility of clips 100.

[0036] Referring further to FIG. 3, each transverse wall 222 comprises a pair of oppositely facing transverse wall surfaces that define the boundaries of each compartment 226. For simplicity, wall surfaces facing to the rear in FIG. 3 are labeled as 223A and those facing to the front are identified as 223B. To define a given clip compartment 226, wall surface 223A of one transverse wall 222 faces to the rear of base portion 210, and wall surface 223B of next adjacent rearward transverse wall 222 faces forwardly to the front of base portion 210. The oppositely facing transverse wall surfaces 223A, 223B associated with each clip compartment 226 define a pair of lateral openings, generally designated 228A and 228B into clip compartment 226 with one opening defined on each side of base axis BA of clip cartridge 200. As described below, portions of clip retaining element 250 extend into each clip compartment 226 through lateral openings 228A and 228B.

[0037] Referring further to FIG. 3, each clip compartment 226 of clip cartridge 200 includes a clip supporting element 232 in the form of a saddle or post to prevent downward motion of clip 100 by supporting clip 100 adjacent its hinge point 106. Each clip supporting element 232 is preferably formed between the medial portion of corresponding adjacent transverse walls 222 and along base axis BA. Clip supporting element 232 preferably extends from base floor 218. As alternatives, clip support element 232 could be joined between adjacent transverse walls 222 without being supported by base floor 218, or element 232 could be supported by base floor 218 without being joined to adjacent transverse walls 222.

[0038] Referring now to FIGS. 3 and 4, clip cartridge 200 further comprises a separable clip retainer element 250. Clip retainer element 250 generally includes a box-like outer frame structure including a retainer floor 252 and end walls 253A, 253B and side walls 254A, 254B. An aperture 255 is preferably formed at each corner of floor 252 for receiving a corresponding post 219 of cartridge base 210 and being mounted to clip cartridge base 210.

[0039] A series of opposing pairs of resilient fingers or tabs 262A, 262B are attached at proximal ends 262A, 262B to side walls 254A, 254B, respectively, and extend inwardly toward each other with distal ends 262A", 262B" respectively. Each pair of tabs 262A, 262B is spaced apart from adjacent pairs of tabs 262A, 262B along the lengthwise axis of clip retainer element 250. Preferably, tab distal ends 262A", 262B" each comprises a groove, generally designated G (see FIG. 4), having diverging sides G1, G2 extending outwardly therefrom toward the outermost point of tab distal ends 262A", 262B". In an alternative embodiment of the present subject matter, tab distal ends 262A", 262B" further comprise a slot, generally designated S, extending inwardly toward tab proximal ends 262A, 262B. Slot S acts as a shock absorber wherein diverging sides G1, G2 of groove G statically retain clip 100 in place during normal use and transport and slot S allows for absorption of energy in the situation where clip 100 is agitated. Slot S allows for better dynamic retention of clip 100 when cartridge 200 is in a position where premature release of clip 100 was previously caused by the dropping or other agitation of cartridge 200 (as seen in prior art cartridges).

[0040] As shown in FIGS. 2 and 3, once clips 100 have been loaded into respective clip compartments 226 prior to sealing and packaging clip cartridge 200, clip retainer element 250 is mounted onto and into engagement with clip cartridge base 210. To secure clip retainer element 250 on clip cartridge base 210, each aperture 255 fits onto each corresponding post 219 projecting upwardly from clip cartridge base 210. In the mounted position of clip retaining element 250, each pair of tabs 262A, 262B extends
into each corresponding clip compartment 226 from corresponding opposing lateral openings 228A, 228B thereof. Diverging sides G1, G2 of tab groove G of each tab 262A, 262B contacts a respective first or second leg 102, 104 of clip 100. In this manner, clips 100 are prevented from undue movement within clip compartments 226 (with additional shock absorbency provided by slot S as discussed above), which is primarily important during handling and shipping of a packaged clip cartridge 200.

[0041] Referring now to FIGS. 5 and 6, a method by which clips 100 can be seen and extracted from clip cartridge 200 will now be described. When first provided with a substantially translucent cartridge as described in more detail above, a surgeon is able to view the cartridge at substantially any angle to ascertain the number and location of clips 100, within cartridge 200. A representative manual forceps-type clip applicer, generally designated 300, is shown in position to engage a clip 100 in a chosen clip compartment 226. Applicer 300 has a pair of jaws 302, 304 at its distal tip, which are provided with grooves 306, 308, respectively, on opposing inside surfaces thereof and corresponding end-dams 310, 312, respectively. It should be understood that virtually any clip applicer will be suitable for use with cartridge 200 provided it is operable with the particular clip loaded into the cartridge. Consequently, the subject matter described herein provides a clip cartridge usable with applicers having end-dams as well as applicers not having end-dams.

[0042] As clip jaws 302, 304 are first introduced into compartment 226, distal ends 262A", 262B" of tabs 262A, 262B assist in centering the applicer over clip 100. When fully seared within compartment 226, end-dams 310, 312 of jaws 302, 304 will pass beyond the ends of the clip legs 102, 104 and because of the inherent resiliency in the clip, clip legs 102, 104 will expand slightly into grooves 306, 308. Finally, once jaws 302, 304 have successfully engaged clip legs 102, 104, jaws 302, 304 are pulled out of clip compartment 226 with clip 100 fully engaged therein, so as to allow clip 100 to be removed from clip cartridge 200 in preparation for use in a desired surgical procedure.

[0043] It will be understood that various details of the subject matter may be changed without departing from the scope of the subject matter. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the subject matter is defined by the claims as set forth hereinafter.

What is claimed is:

1. A substantially translucent cartridge for retaining a plurality of surgical clips, each clip having a pair of legs extending from a hinge point to form a substantially symmetrical shape and adapted to be removed from the cartridge by a clip applicer, the substantially translucent cartridge comprising:

(a) a polymeric composition base having a base longitudinal axis and comprising:

(i) a plurality of axially spaced-apart walls extending along the base and transversely disposed in relation to the base axis, the walls defining a plurality of axially spaced-apart clip compartments therebetween wherein each compartment comprises laterally opposing first and second openings; and

(ii) a plurality of clip hinge support members, each clip hinge support member disposed within a respective compartment and adapted to prevent downward motion of a surgical clip by supporting the clip adjacent its hinge point;

(b) a polymeric composition clip retainer supported by the base and comprising a plurality of opposing pairs of first and second resilient tabs, wherein each tab extends from a proximal end secured to the clip retainer to a free distal end which extends into a corresponding compartment through a corresponding lateral opening, and further wherein each tab terminates at the distal end with a groove having diverging sides extending outwardly therefrom; and

(c) wherein the polymeric composition of the base and retainer comprises a particulate, light diffusing material for imparting a substantially translucent optical effect for rendering surgical clips visible within the cartridge.

2. The cartridge of claim 1 wherein the polymeric composition of the base and retainer is selected from the group consisting of polypropylene, nylon, polyethylene terephthalate (PET), polyethylene terephthalate (PBT), polyoxyethylene, and acrylonitrile butadiene styrene (ABS).

3. The cartridge of claim 1 wherein the particulate, light diffusing material is present in the amount of about 0.01% to 15% by weight.

4. The cartridge of claim 3 wherein the particulate, light diffusing material comprises an average maximum particle size of about 0.1 microns to about 200 microns.

5. The cartridge of claim 3 wherein the particulate, light diffusing material is selected from the group consisting of calcium sulfates, talc, silicates, kaolin, silicas, mica flakes, mica platelets, mica pearls, tita-nates, metal sulfates, metal carbonates, sulfides, metal oxides, borides, wollastonite, basalt, boron, ceramics, single crystal fibers, boron nitrides, naturally occurring carbonates, and mixtures thereof.

6. The cartridge of claim 1 wherein the polymeric composition of the base and retainer further comprises a radiopaque additive being present in the amount from about 1.0% to 5.0% by weight for rendering the cartridge imageable during radiographing.

7. The cartridge of claim 6 wherein the radiopaque additive is barium sulfate.

8. The cartridge of claim 6 wherein the radiopaque additive is present in the amount of 2.0% by weight.

9. The cartridge of claim 1 wherein the distal end of each clip retainer tab further comprises a slot positioned between the diverging sides and extending inwardly toward the tab proximal end.

10. The cartridge of claim 1 further comprising a surgical clip disposed in at least one of the compartments and supported by the corresponding clip hinge support member.

11. The cartridge of claim 10 wherein the surgical clip is a metal surgical clip.

12. The cartridge of claim 10 for use with a forceps-type clip applicer having a pair of jaws for receiving the clip, wherein each jaw has a groove for receiving a clip leg and the groove abuts a distal end for limiting distal movement of an end of the clip leg received in the groove.

13. A cartridge for retaining a plurality of surgical clips, each clip having a pair of legs extending from a hinge point
to form a substantially symmetrical shape and adapted to be removed from the cartridge by a clip applier, the cartridge comprising:

(a) a polymeric composition base having a base longitudinal axis and comprising:

(i) a plurality of axially spaced-apart walls extending along the base and transversely disposed in relation to the base axis, the walls defining a plurality of axially spaced-apart clip compartments therebetween wherein each compartment comprises laterally opposing first and second openings; and

(ii) a plurality of clip hinge support members, each clip hinge support member disposed within a respective compartment and adapted to prevent downward motion of a surgical clip by supporting the clip adjacent its hinge point; and

(b) a separable polymeric composition clip retainer supported by the base and comprising a plurality of opposing pairs of first and second resilient tabs, wherein each tab extends from a proximal end secured to the clip retainer to a free distal end which extends into a corresponding compartment through a corresponding lateral opening, and further wherein each tab terminates at the distal end with a groove having diverging sides extending outwardly therefrom and further comprising a slot positioned between the diverging sides and extending inwardly toward the tab proximal end.

14. The cartridge of claim 13 wherein the polymeric composition of the base and retainer is selected from the group consisting of polypropylene, nylon, polyethylene terephthalate (PET), polybutylene terephthalate (PBT), polyoxymethylene, and acrylonitrile butadiene styrene (ABS).

15. The cartridge of claim 13 wherein the polymeric composition of the base and retainer further comprises a radiopaque additive being present in the amount from about 1.0% to 5.0% by weight for rendering the cartridge imageable during radiographing.

16. The cartridge of claim 15 wherein the radiopaque additive is barium sulfate.

17. The cartridge of claim 15 wherein the radiopaque additive is present in the amount of 2.0% by weight.

18. The cartridge of claim 15 wherein the polymeric composition of the base and retainer further comprises a particulate, light diffusing material for imparting a substantially translucent optical effect for rendering surgical clips visible within the cartridge.

19. The cartridge of claim 18 wherein the particulate, light diffusing material is present in the amount of about 0.01% to 15% by weight.

20. The cartridge of claim 18 wherein the particulate, light diffusing material comprises an average maximum particle size of about 0.1 microns to about 200 microns.

21. The cartridge of claim 18 wherein the particulate, light diffusing material is selected from the group consisting of calcium sulfates, talc, silicates, kaolin, silicas, mica flakes, mica platelets, mica pearls, titinates, metal sulfates, metal carbonates, sulfides, metal oxides, borides, wollastonite, basalt, boron, ceramics, single crystal fibers, boron nitrides, naturally occurring calcium carbonates, and mixtures thereof.

22. The cartridge of claim 13 further comprising a surgical clip disposed in at least one of the compartments and supported by the corresponding clip hinge support member.

23. The cartridge of claim 22 wherein the surgical clip is a metal surgical clip.

24. The cartridge of claim 13 adapted for use with a forceps-type clip applier having a pair of jaws for receiving the clip, each jaw having a groove for receiving a clip leg, the groove abutting a distal end-dam for limiting distal movement of an end of the clip leg received in the groove.

25. A method for loading a selected surgical clip into a surgical clip applier, wherein the clip comprises a first leg, a second leg, and a hinge point joining the first and second legs, and wherein the clip applier comprises a pair of opposing first and second jaws adapted to engage the first and second legs of the clip, the method comprising the steps of:

(a) providing a substantially translucent clip cartridge comprising:

(i) a polymeric composition base including a plurality of compartments and a plurality of clip hinge support members, each clip hinge support member disposed in a corresponding compartment and adapted to prevent downward motion of a clip by supporting the clip adjacent its hinge point;

(ii) a polymeric composition clip retainer supported by the base and comprising a plurality of opposing pairs of first and second resilient tabs, wherein each tab extends from a proximal end secured to the clip retainer to a distal end which extends into a corresponding compartment, and further wherein each tab terminates at the distal end with a groove having diverging sides extending outwardly therefrom;

(iii) wherein the polymeric composition of the base and retainer comprises a particulate, light diffusing material for imparting a substantially translucent optical effect for rendering surgical clips visible within the cartridge;

(b) viewing the clip cartridge to ascertain the location of the clips in the clip cartridge;

(c) inserting a clip applier into a selected one of the plurality of compartments to engage a selected clip; and

(d) removing the selected clip from the cartridge.

26. The method of claim 25 including providing a slot positioned between the diverging sides of the tab groove of each resilient tab and extending inwardly toward the tab proximal end.

27. The method of claim 25 including providing a radiopaque additive to the polymeric composition of the base and retainer for rendering the cartridge imageable during radiographing.

28. The method of claim 25 including providing metal surgical clips in the clip cartridge.