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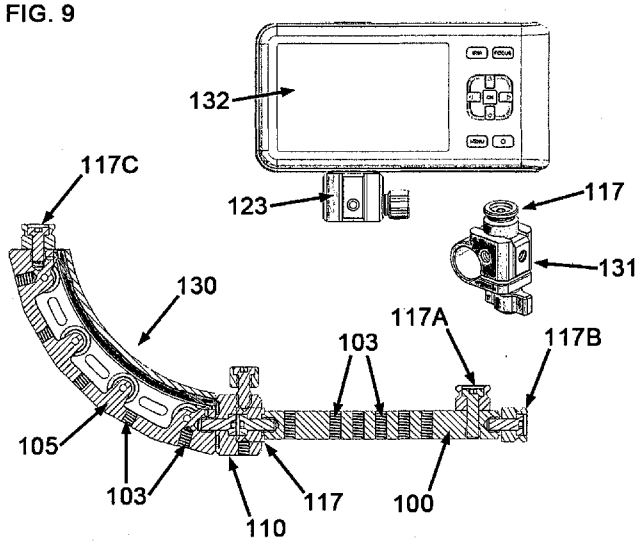
(54) **Title**: MODULAR CAMERA SUPPORT SYSTEM

FIG. 9



(57) **Abstract**: A camera support system directed at today's smaller cameras, which combines many features in a single, simplified and highly portable modular system. The light and compact system components share standardized connectivity interfaces and comprise a limited number of structural and accessory system elements, together with connectors for system elements, as well as connectors for non-system parts such as cameras and photographic accessories.

I. TITLE: "MODULAR CAMERA SUPPORT SYSTEM"

II. BACKGROUND OF THE INVENTION

1. Field of the invention

[001] Accessories for motion and stills cameras. More precisely a novel camera support system directed at today´s smaller cameras, which combines many features in a single, simplified and highly portable modular system. The light and compact system components share standardized connectivity interfaces and comprise a limited number of structural and accessory system elements, together with connectors for system elements, as well as connectors for non-system parts such as cameras and photographic accessories.

2. Description of related art

[002] Camera support tools, also called camera rigs, have been used since the first heavy, wooden stills cameras, which could not be used handheld and need to be supported by wooden tripods. Today´s tripods display a great diversity, but the camera is always fixed on an intermediate head, which allows camera movement in at least one axis. The connection with the head is through the camera´s threaded tripod socket. As direct threaded connections take some time to be made, may require tools and threads may get damaged, intermediate quick release connectors haven been developed, in all thinkable variations. The most common quick release connector standard used in stills photography is referred to as Arca Swiss, where a 1.5" dovetail plate is fixed under the camera, and a dovetail plate receiving quick release clamp is fixed on the head of the support tool. This type of connectors can support heavy camera/lens combinations.

[003] Some important recent trends in digital stills and motion photography have been:

a) Camera miniaturization: the smaller mirrorless system cameras (with inter-changeable lenses) are now sold by all major brands. This year, the first pocketable digital cinema camera ever was introduced (Blackmagic brand, 355 g without lens) as well as a first digital full frame sensor camera in compact format (Sony RX1).

b) Substitution of specialized stills and motion system cameras (cameras with interchangeable lenses) by hybrid system cameras, through convergence of high quality stills and motion (HD) capabilities in one camera, in DSLR cameras (with a mirror), mirrorless system cameras and high-end compact cameras.

c) Development of all kinds of rigs for the new generation of hybrid cameras, mainly to improve handheld use during video making (better mechanical stabilization and ergonomics) and to provide mounting points for video accessories. Apart from tripods and handheld rigs, other support appliances are now widely available for hybrid cameras, like ground or table dollies, tracks for dollies, camera sliders, steadicams and handheld or tripod-supported jibs.

[004] The typical components of a current handheld and/or body-supported rig for a DSLR or similar camera are:

a) A rig structure to attach the camera, body interfaces and accessories, often comprising:
   i. "Video" rods and rod clamps, often in standard 15 mm diameter and as double (parallel) rods with a standard 60 mm center distance.
   ii. Rectangular frames with top and bottom plates connected by handgrips, sometimes combined with video rods.
   iii. Dovetail rail structures (like Novoflex u-Fly and Bluebird), or NATO standard rails (Zacuto Z-rail, Wooden Camera).

b) Body interfaces like handgrips, chest or waist pads, and gunstocks, shoulder braces.

c) A variety of connectors for structural elements, camera and accessories, comprising:
   i. Rod clamps as sliding mounts on single or double rods, for crossed rods, etcetera.
   ii. Rail clamps as sliding mounts on rails.
   iii. Camera base plate, often with quick-release connector.
   iv. Threaded connections are often used for structural elements and accessories. The latter often go on "cheese" plates or bars, with many perforating threads (standard photography threads are ¼"-20 and 3/8"-16) or holes for screws. The Swiss Rod is a patent pending "cheese rod" that can

be combined with certain 15 mm rods in camera rigs, however the threaded part is not compatible with rod clamps.

v. In some cases, secure but expensive rosette connectors (e.g. Arri standard) provide rotationally lockable connections, e.g. for handgrips.

[005] Some disadvantages of the present camera rigs, especially for the smaller hybrid cameras, are:

a) Most camera rigs are appliances with a specific purpose such as: tripod, jib, steadicam, dolly track, cage, or a certain handheld use like gunstock, shoulder or arm-length rig. Thus, creative hobby and professional photographers may need a bulky and costly collection of support contraptions.

b) Handheld rigs are often bulky, heavy and attention calling, and over-sized and over-specified for small cameras. The use of a shoulder brace adds to bulk and as many of these rigs are front-heavy, has no clear advantage over a gunstock or chest pod, other than in special setups. Even heavy counterweights are sometimes used with small cameras, which completely defer the purpose of camera miniaturization.

c) With clamped video rod systems, even simple rigs have often many levers and knobs, making (dis)-assembling and adjustments time-consuming. Examples are the Zacuto Striker gunstock rig with about 10 different connectors, and the Varavon Sniper A9 shoulder rig with about 20 levers.

d) In the case of rod based structures, part of the elements can sometimes be used in other types of rigs. Some providers offer construction boxes with several rig options, but always limited to handheld use and often with many parts, screws, and tools, e.g. the 83-part Ikan Elements Master kit. A camera support system with a limited number of modular elements, and yet a wide range of handheld and selfsustained options, is presently not available.

e) Different kinds of connectors for system parts, for cameras, and for accessories, limit flexibility and modular set-up. A universal connector system for system parts, devices and accessories is presently not available.

[006] Therefore, a novel design for a support system was developed, directed at today's smaller cameras, which combines many features in a single, simplified and portable modular system. The light and compact system components share standardized connectivity interfaces and comprise a limited number of structural and

accessory system elements, together with connectors for system elements (element connectors), as well as connectors for non-system parts such as cameras and photographic accessories (device connectors).

[007] The standardized connectivity interfaces are based on relieved and gender interfaces. Relieved interfaces prevent involuntary rotation in one-screw connections of system components, while gender interfaces enable voluntary rotation through rotationally lockable connections. The relieved interfaces are primarily based on compatible ridges and grooves, and further on double blocks with dual compatibility, with both the ridge-based as well as the groove-based interfaces. All non-rotation reliefs have standardized measures and centrally placed threads for one-screw non-rotational connections with matching parts.

[008] Structural system elements have multiple relieved interfaces based on ridges and/or grooves. Accessory system elements have at least one standardized connectivity interface, either of relieved or gender type. Element connectors have at least one relieved interface based on double blocks, plus a male or female gender interface. Device connectors have a conventional connector means for a device, plus a male or female gender interface.

[009] Connecting system elements and devices through element and device connectors, secure and rotationally lockable connections can be made at any standardized connectivity interface, both between system elements as well as between system elements and devices. The advantages of this unique "anything-anywhere-at-any-angle" connectivity comprise:

a) A more minimalistic and modular design than in conventional camera support systems, e.g.:
    i. The camera can be set on a rod side, a rod end or a rod clamp, but also on a grip facet or terminal, which enables different user modes while using the same system elements. Such modes are normally covered by a collection of different appliances.
    ii. System rod clamps with connector interfaces can either be set in direct or in intermediate connector linkage to system elements including system rods, thus eliminating the need for various types of clamps.
b) Increased versatility, e.g.:

i. Almost unlimited rig configurations with a choice of camera and accessory positions and angles.

ii. With very simple system accessories, the gamut of options can be increased far beyond that of conventional modular camera support systems, e.g. the transformation of a handheld rig into a tripod spider with just one small bipod connector.

iii. An element having a ridge may also engage directly with an element having a groove, through a non-rotating one-screw connection.

iv. All connections are extendable through insertion of system elements, preferably rods, between parts, devices or accessories.

v. Most standardized interfaces on system elements provide a flat surface with a perforating thread; so many devices and accessories can also be set in a direct threaded connection. Fast (dis)-assembling of system elements and devices, through the use of "quick-release" system connectors without the need for tools, makes the modular system more attractive to the user.

c) Simplicity, e.g.:

i. Very few system elements and levers or knobs.

ii. The element interfaces of element connectors of both genders match with all interfaces on all system elements.

iii. Device connectors of both genders match with element connectors of the opposite gender.

iv. The system can be designed for use with just one type of standard captive screw to secure connectors to system elements, and also for direct connections between two system elements where one has a perforating hole or thread.

III. SUMMARY OF THE INVENTION

[010] A novel modular camera support system, directed at today's smaller cameras, which combines many features in a single, simplified and highly portable modular system. The light and compact system components share standardized connectivity interfaces and comprise a limited number of structural and accessory system elements, together with connectors for system elements (element connectors),

as well as connectors for non-system parts such as cameras and photographic accessories (device connectors).

[011] The standardized connectivity interfaces are based on relieved and gender interfaces. Relieved interfaces prevent involuntary rotation in one-screw connections of system components, while gender interfaces enable voluntary rotation through rotationally lockable connections. The relieved interfaces are primarily based on compatible ridges and grooves, and further on double blocks, which have dual compatibility with both the ridge-based as well as the groove-based interfaces. All non-rotation reliefs have standardized measures and centrally placed threads for one-screw non-rotational connections with matching parts.

[012] Structural system elements have multiple standardized connectivity interfaces, normally including multiple relieved interfaces based on ridges and/or grooves. Accessory system elements have at least one standardized connectivity interface, either of relieved or gender type. Element connectors have at least one relieved interface based on double blocks, plus a male or female gender interface. Device connectors have a conventional connector means for a device, plus a male or female gender interface.

[013] The result is a minimalistic, simple and versatile modular camera support system with a fast, "anything-anywhere-at-any-angle" connectivity.

[014] In a preferred embodiment of the invention, the non-rotation reliefs on system elements and element connectors have specific measures to suit integrated use with standard 15 mm video rods and standard ¼"-20 photographic threads.

IV. BRIEF DESCRIPTION OF THE DRAWINGS

[015] With the above, the invention consists in a support cameras system, which will be more fully understood from the following description, when read in conjunction with the accompanying drawings in which:

Figures 1 to 4 show some structural system elements: Figure 1 a system rod; Figure 2 a system handgrip; Figure 3 a system rail; Figure 4 a system bipod connector.

Figure 5 shows perspective views of female and male connectors for system elements, a cross-sectional view of two engaged connectors, plus a perspective view of a female connector with additional connectivity through laterally placed relieved interfaces.

Figure 6 shows cross-sectional views of the element connector interfaces in engagement with groove-based and ridge-based relieved interfaces on system elements.

Figure 7 shows some measures of standardized non-rotation reliefs on system elements and element connectors.

Figure 8 displays perspective and cross-sectional views of female and male connectors for non-system devices and accessories.

Figure 9 shows some connectivity options in cross-sectional view of a basic rig consisting of just two structural elements, a system handgrip and a system rod, and connectors.

V. DETAILED DESCRIPTION OF THE EMBODIMENTS

[016] The modular camera support system combines many features in a single, simplified and highly portable modular system. This feat is achieved through: a special connectivity system, where all system components share standardized connectivity interfaces, either of relieved or gender type; a limited number of – light and compact - system elements; and small, versatile connectors, either with a standardized relieved interface (element connectors) or an interface for a device, and always with a rotationally lockable gender interface.

[017] Structural system elements have multiple standardized connectivity interfaces, normally including numerous relieved interfaces, and may include a system rod, handgrip, rail and bipod connector. Accessory system elements with just one interface may include a rod clamp. System elements can be combined in countless ways: where one element has a perforating thread, direct one-screw non-rotational connections can be made, but many more indirect options are available through the system connectors. Element connectors can be set at any relieved interface of any structural system element. Through the gender interface of these element connectors, rotationally lockable connections can be made with other element connectors set on

other system elements, or with device connectors set on non-system parts such as cameras and photographic accessories. Countless combinations can be made this way, however only one illustrative case is presented in Figure 9, of a multi-functional camera support based on just two system elements.

[018] Figure 1 shows a rod **100**, as an embodiment of a structural system element, having two round sides **101** and two straight top and bottom ridges **102** with multiple standardized relieved interfaces and centrally placed holes or threads **103**. The rod terminal has a square or rectangular non-rotation block **104** as relieved interfaces, in fact a short ridge, with a central thread **103**. In an alternative embodiment, the rod terminals may have integrated male gender interfaces. The rod is substantially cylindrical at cross-section thus allowing the use of rod clamps over its complete length.

[019] Figure 2 represents a perspective view of a curved system handgrip **105** (based on PCT Patent application PCT/IB2013/001279), as a structural system element having multiple standardized relieved interfaces with centrally placed threads **103** on ridges **102**, set on its facetted outer rim. The two terminal relieved interfaces also consist of a ridge **102** with central thread **103**. In an alternative embodiment, the grip terminals may have integrated male or female gender interfaces.

[020] Figure 3 shows a system rail **108** as a structural system element with a substantially rectangular profile at cross-section, having standardized relieved interfaces at top and a bottom groove **109** with centrally placed perforating holes or threads **103**. The rail may be compatible with standard NATO clamps on either of its dovetail profiles, while the lateral grooves may be used for a camera slider.

[021] Figure 4 offers two perspective views of a bipod connector **106**, a structural system element consisting of a bi-angled plate for use in bi-, tri- or quadropod spiders, where the two outer parts are set at certain angles (e.g. 15, 22.5 or 30°) to the central part. The three outer facets have ridges **102** with threads **103**. Two legs can be connected to the two outer facets, forming a bipod with the same leg angles as the outer parts.

[022] The inner central facet **107** has two grooves **109** in crossed position. The transversal groove allows among others a crossed position on a handgrip facet, for a tripod spider with two legs set on the bipod connector and one on an angled grip facet; or as quadropod spider, either with two legs on a centrally placed bipod connector and

two on each side of it, or with four legs on two bipod connectors. When not in use, the longitudinal groove on facet **107** allows the bipod connector to be fixed in lined position on a handgrip facet.

[023] By connecting a central or lateral outer ridge of one connector to the inner transversal groove of another connector, two bipod connectors can also be combined in a direct, one-screw non-rotational X- or T-connection for respectively an independent quadro- or tripod spider. On such a spider, the grooves on central facet **107** of the upper connector provide connectivity for the blocks of element connectors of any genders, or for a ridge of any other system element.

[024] The first row of Figure 5 shows a female element connector **110** having a relieved interface **111** with two non-rotation blocks **112** and a centrally placed thread or hole **120** for a captive screw **113**. Optionally, double sockets **112A** may be added to this interface for compatibility with system components having double blocks. The gender interface **115** for the male element connector has a receiving chamber **115A** with a laterally placed fixing screw **116.**

[025] The second row of Figure 5 shows a male element connector **117**, having a relieved interface **118** for a system element with double non-rotation blocks **119**. The centrally placed thread or hole **120** for a (captive) screw **113** integrates a socket **120A**, which may receive the head of a connecting screw to prevent interference with the gender interface.

[026] The part of the male connector that engages with the gender interface of a female element or device connector consists of a stud **121**. The stud **121** may have a tangential groove **122**, which receives the fixing screw of the female connector. The groove may have multiple sockets for the point of the fixing screw, to enhance locking when the point of the fixing screw coincides with one of said sockets. A clamping mechanism without grooves may also be used but is more prone to accidents. The engaging part of the male connector may either be made out of soft metal (e.g. brass) or preferably of hard metal but with a groove for the point fixing screw to prevent the connectors from coming apart.

[027] The left figure on the third row of Figure 5 shows the female element connector **110** and male element connector **117** in full gender engagement, with the

point of the fixing screw **116** set in a slightly eccentric position in the groove **122** of the male connector. The fixing screw **116** may have a groove **116A** for a tether.

[028] As shown, the length of the male connector is equal to the depth of receiving chamber **115A** so the wider interface **115** of the female connector will be in contact with the element where the male connector is set, which provides lateral stabilization. However, in other embodiments the male connector may be longer or attached to a larger body. The hole or thread **120** of both connectors integrates a socket **120A**, which receives the head of the connecting screws to prevent interference with the gender interface.

[029] When male or female connectors have a plain, non-threaded hole for a connecting screw, the connector can only be set to the element with an inner screw from the connector side. In the preferred embodiment of a threaded hole, a captive screw can either be set from the connector side as shown, or from the perforating hole or thread of a system element.

[030] The right figure on the third row of Figure 5 shows a perspective view of a female connector **110A**, which may either be of the system or device type, having four additional lateral ridges **102** set at 90° angles, each one with a thread **103**. On one of the ridges, a male system connector **117**, secured by screw **113**, offers a connection option for system or non-system elements through respectively any female system or device connector. Direct threaded connections are also possible, while in some cases the lateral ridges can be used as interface for system elements with grooves. A normal gender connection is still possible.

[031] The first row of Fig. 6 shows two cross-sectional views of the relieved interface of a female element connector **110** with its double blocks **112** in full engagement with groove **109** on system rail **108**, as well as in full engagement with ridge **102** on system rod **100**, in both cases secured by screw **113**.

[032] The second row of Figure 6 shows two cross-sectional views of the relieved interface of a male element connector **117** with its double blocks **119** in full engagement with groove **109** on a system rail 108, as well as in full engagement with ridge **102** on system rod **100**, in both cases secured by (captive) screw **113**.

[033] The first row of Figure 7 shows critical measures of relieved interfaces on ridges, grooves, and double non-rotation blocks and sockets, where:

a) G is the standard width of a rectangular groove **109** on a system element **108A**, or of a groove with wedge-profile on a system element **108B**.
b) R is the standard width of a rectangular ridge **102** on a system element **100A**, or of a groove with wedge-profile on a system element **100B**.
c) T1 and T2 are the lateral tolerances on each side of engaged elements with rectangular reliefs.

[034] The relation between the width of the rectangular groove and rectangular ridge is G = R + T, where T = T1 + T2, and as narrow as technically feasible. To eliminate the lateral tolerance between a ridge and a groove completely, a wedge-shape can be used instead, as shown on system elements **100B** y **108B** with respectively a wedge-shaped ridge **102B** and wedge-shaped groove **109B**, where the walls have a deviation **114** of a few degrees.

[035] As shown on the second row of Figure 7, the value G apart of the standard groove **109** on the system rail **108** also applies to the length of sockets **112A** on the element interfaces of female connector **110**, or of sockets on other system components. The value R of the ridge also applies to:

a) The width and/or length of terminal block **104** on the system rod **100.**
b) The length of blocks **112** on the relieved interface of a female connector **110**.
c) The length of blocks **119** on the relieved interface of a male system connector **117**.

[036] Besides, OB is the maximum outer length of the largest version of two blocks, OS is the minimum outer length of two sockets, where OS > OB so the system components with blocks may engage with others having sockets. Furthermore, D1 is the diameter of the engaging part of a male element or of a male device connector, while D2 the diameter of the system rod.

[037] The compatibility relationships between the standardized connectivity interfaces are given in Table 1. None of the relieved interfaces is compatible with the gender interfaces. Double blocks are compatible with all relieves except double blocks, while double sockets are only compatible with double blocks. The distribution of standardized connectivity interfaces over the components of the system is given in Table 2. The system elements may carry ridges and/or grooves.

Table 1. Compatibility of standardized connectivity interfaces					
	Relieved interfaces				Gender interfaces
Interfaces	ridge	groove	blocks	sockets	
ridge	-	+	+	-	-
groove	+	-	+	-	-
blocks	+	+	-	+	-
sockets	-	-	+	-	-
gender	-	-	-	-	+
+ : compatible - : non-compatible					

Table 2. Distribution of standardized connectivity interfaces over system components					
	Relieved interfaces				Gender interfaces
System components	ridge	grooves	blocks	sockets	
structural system elements	+	+	o	o	o
accessory system elements	o	o	o	o	o
element connectors	o	o	+	o	+
device connectors	-	-	-	o	+
+ : obligatory o : optional - : doesn't apply					

[038] In a preferred embodiment based on video rods with 15 mm standard diameter and the standard photographic screw with ¼"-20 thread and head diameter of about 9.4 mm, the specific measures are:

a) G = 9.6 + 0.3 / - 0.1 mm
b) R = 9.5 + 0.3 / - 0.1 mm
c) D1 = D2 = 15.0 + 0.0 / - 0.2 mm

[039] In this embodiment, the male element and device connectors have the same diameter as standard 15 mm video rods, which permit an in-line connection on the rod terminals without blocking the clamps for those rods. In some cases, these male connectors may provide a base for a 15 mm rod clamp. Besides, the 15 mm diameter is

just sufficient to contain respectively: a central perforating hole or thread **120** for a standard photographic ¼"-20 screw **113**; an internal socket **120A** for the head of such a screw; the tangential groove **122** for the fixing screw **116** of the female connectors. Note that within the 15 mm diameter of the male connector, the values mentioned above for G, R and T are the only possible measures for forming solid-enough non-rotation blocks with narrow tolerances for engagement with both the standard ridges as well as the standard grooves of the system elements. To withstand the forces generated by the parts connected and also by the fixing screw pressing in the groove, the male connectors should preferably be made out of hard metal.

[040] The first row of Figure 8 shows two perspective views of a female version **123** of a device connector (for non-system devices and accessories), with a conventional threaded device interface **124** with washer **125**. The interface **115** for a male (system or device) connector has a receiving chamber **115A** with a laterally placed fixing screw **116**, which are identical to those of the female system connector **110.**

[041] The second row of Figure 8 shows two perspective views of a male version **126** of a device connector, with a conventional threaded interface **127** with washer **128** for a device. The interface for a female system connector (element or device) consists of a stud **121** with a tangential groove **122**, which are identical to those of the male system connector **117**. Male device connectors may also have a female thread for connection to certain devices.

[042] The third row of Figure 8 shows cross-sectional views of a female device connector **123** and a male connector **126**.

[043] Figure 9 shows a basic rig configuration **130** in a lateral cross-sectional view, consisting of just two small system elements, handgrip **105** and rod **100**, connected by a female element connector **110** on the grip and male element connector **117** on the rod, with both connectors in a one-screw non-rotational connection to the elements. Both the grip and the rod have numerous relieved interfaces with threads **103**. Three more male element connectors **117A**, **117B** and **117C** are connected to selected interfaces on the system elements of the rig, each representing an alternative connection point for the female device connector **123** of camera **132**. The user modes of the rig can be varied quickly by:

a) using different connection points and rotational angles for the camera;
b) by changing the rotational angle between the system elements;
c) by varying the axis of connection between system elements (e.g. lined/crossed);
d) by changing the position of the rig as a whole;
e) by connecting the rig to a support, directly or through rod clamp.

[044] The use of the quick-release system connectors allows fast mode changes. With just the simple rig **130**, many user modes become available. If necessary, the rotational angles of the handgrip or camera can be adjusted to the user's needs. Modes where the grip and rod are in lined position (as shown) include:

a) Camera connected to **117A**:
   i. "Armlength" mode for use with camera screen, with the right hand supporting the camera grip. A second grip can easily be attached.
   ii. To go from landscape to portrait mode, turn the rig 90° to the left or right.
   iii. Body-supported mode with the grip as gunstock.
b) Camera connected to **117B**:
   i. "Lorgnette" for use with camera viewfinder at the eye (rig turned up 90°).
   ii. "Stunt bar" mode for low points of view (rig turned down 90°).
c) Camera connected to **117C**:
   i. Body-supported mode with some body pad (not shown) at the rod end.
d) With the grip connected to a support, the camera can be rotated through the rod (tilt head function), while its element connector allows panning. Through combined rotation, the camera position may be changed from landscape to portrait orientation.
e) When the rig 130 is placed on a support through its rod 100 set in a rod clamp 131 (an accessory system element with a standardized connectivity interface), the tilt angle of a camera placed on the rod can be controlled through the grip. With the rod set free-rotating in the clamp, push, pull and reveal slides can be made by making the rig describe an arc, while the camera is kept aimed on the subject.

[045] On a handgrip used as under-grip, the rod **100** (in horizontal position) may be connected transversely to the top grip terminal (through male element connector **117A** on the rod, and female element connector **110** on the top grip terminal). This way, a front heavy camera can be set back on the rod for balancing (one of the male

connectors should be moved to the desired camera position on the rod). When the handgrip is used as top handle, the same balancing method can be applied.

CLAIMS

What is claim is:

1. A modular camera support system comprising multiple system components, where said system components share standardized connectivity interfaces which comprise relieved interfaces and gender interfaces,

and where said relieved interfaces are primarily based on a ridge or a groove with matching, standardized widths and a centrally placed hole or thread for a connecting screw, and where said relieved interfaces are further based on double blocks which are substantially identical, substantially rectangular and set symmetrically and parallel around a connectivity hole or thread for a connecting screw, and where the distance between said blocks is equal to the standard width of said groove, and where the length of each block is equal to the standard width of said ridge, making said relieved interface based on double blocks mutually compatible with said relieved interfaces based on a ridge as well as on a groove,

and where said gender interfaces allow rotationally lockable connections between system components having interfaces of opposite gender,

and where said system comprises at least:

i. two structural system elements, where each of said structural elements has multiple standardized connectivity interfaces, and where at least one of said interfaces is a relieved interface based on a ridge or a groove,
ii. a male and a female element connector, where each of said connectors has at least one relieved interface based on double blocks, and further has a gender interface,
iii. a connector means to connect said camera to a structural system element.

2. A modular support system according to claim 1, where the connector means for a camera comprises a male or a female device connector, and where said device connector has a connector means for said device and further has a gender interface, and where said device connector engages with a gender interface of opposite gender on a system component.

3. A modular support system according to claim 1, where the centrally set connectivity hole or thread on the relieved interface of element connector of both genders is a

perforating hole set between the gender interface and the element interface of said element connector,

and where said perforating hole has a terminal socket placed at the side of the gender interface, where said socket may completely receive the head of an internally placed connecting screw.

4. A modular support system according to claims 1-3, where the perforating hole on the relieved interface of element connectors of both genders further has a thread for a connecting screw.

5. A modular camera support system according to claim 1, where the specific measures of the reliefs on said relieved interfaces are:

i. width of a groove is 9.6 + 0.3 / - 0.1 mm
ii. width of a ridge is 9.5 + 0.3 / - 0.1 mm.

6. A modular support system according to claims 1-5, where a female element and/or device connector has an additional relieved interface.

7. A modular support system according to claims 1-6, where a relieved interface on a system component is based on or is combined with double sockets, and where said double sockets allow a matching, one-screw, non-rotation connection with a system component having double blocks.

8. A modular support system according to claim 1, where the structural system elements comprise a system rod with a substantially cylindrical form, said rod comprising relieved interfaces at a longitudinally set ridge and/or groove with centrally placed connectivity holes and/or threads, and where the width of said ridge or groove is equal to the standard width of a ridge, respectively a groove.

9. A modular support system according to claims 1-8, where the system rod further has a relieved interface on its terminal, where said relief is based on one rectangular non-rotation block or socket with a central connectivity thread, and where the width and/or length of said block or socket is equal to the standard width of a ridge, respectively a groove.

10. A modular support system according to claim 1, where the structural system elements comprise a system rail with a substantially rectangular form at cross-section,

said rail having relieved interfaces at a longitudinally set groove and/or ridge, with centrally placed connectivity holes and/or threads.

11. A modular support system according to claim 1, where the structural system elements comprise a curved system handgrip, said handgrip comprising multiple, ridge-based or groove-based relieved interfaces on its outer rim facets and terminals.

12. A modular support system according to claim 1, where the structural system elements comprise a bipod connector consisting of a symmetrical bi-angled plate where the two outer parts of said bipod connector are set at a certain angle to the central part, and where the inner and outer facet of said central part have matching relieved interfaces.

13. A modular support system according to claim 1, where a standardized connectivity interface on a structural system element is a relieved interface based on double blocks.

14. A modular support system according to claims 1-13, where a standardized connectivity interface on a structural system element is a gender interface.

15. A modular support system according to claims 1-14, where said system further comprises accessory system elements which have at least one standardized connectivity interface, either of relieved or gender type.

16. A modular camera support system according to claim 1, where the relieved interfaces have a substantially rectangular profile at cross-section.

17. A modular camera support system according to claim 1, where the relieved interfaces have a substantially wedge-shaped profile at cross-section.

FIG. 1

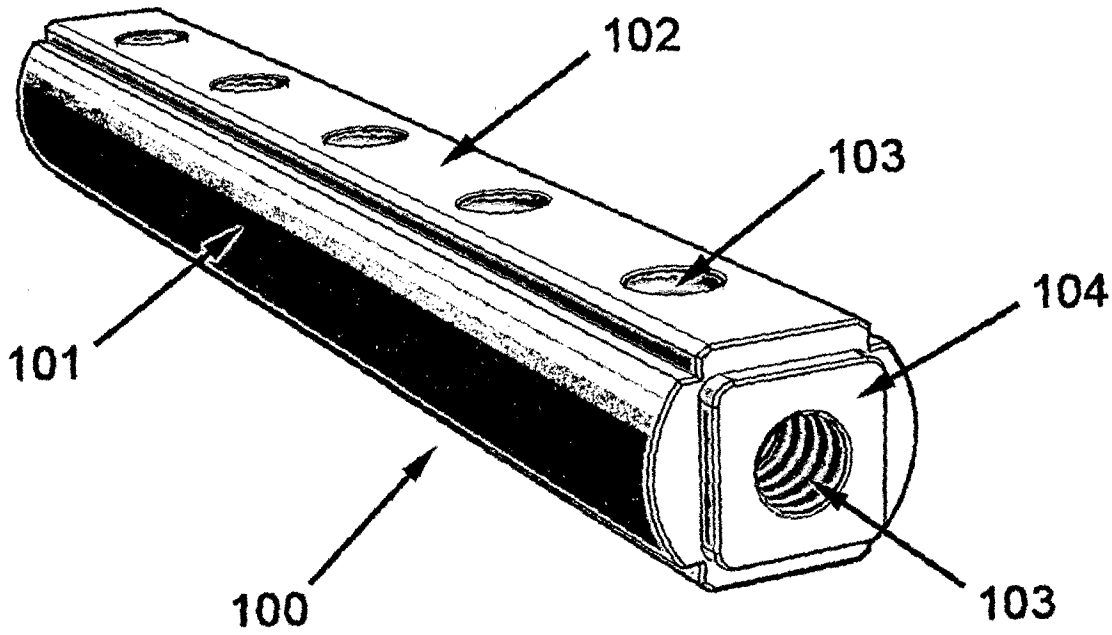


FIG. 2

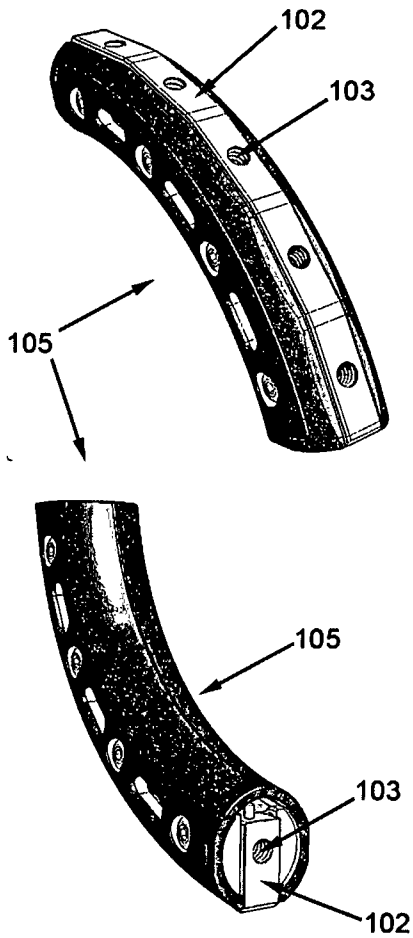


FIG. 3

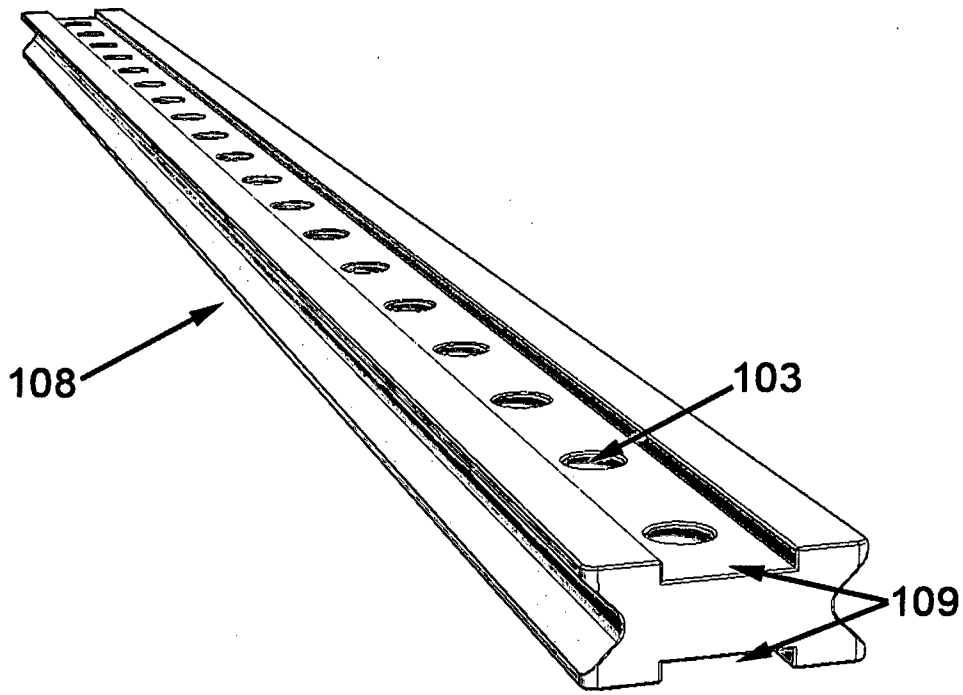


FIG. 4

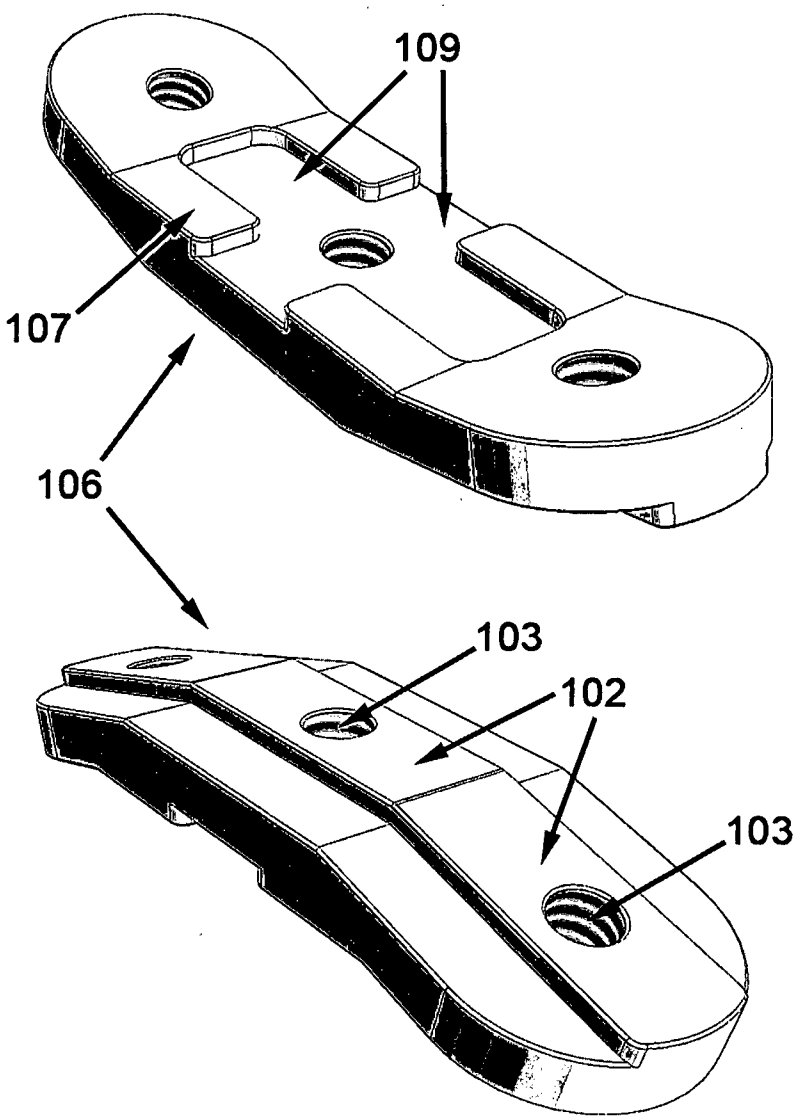


FIG. 5

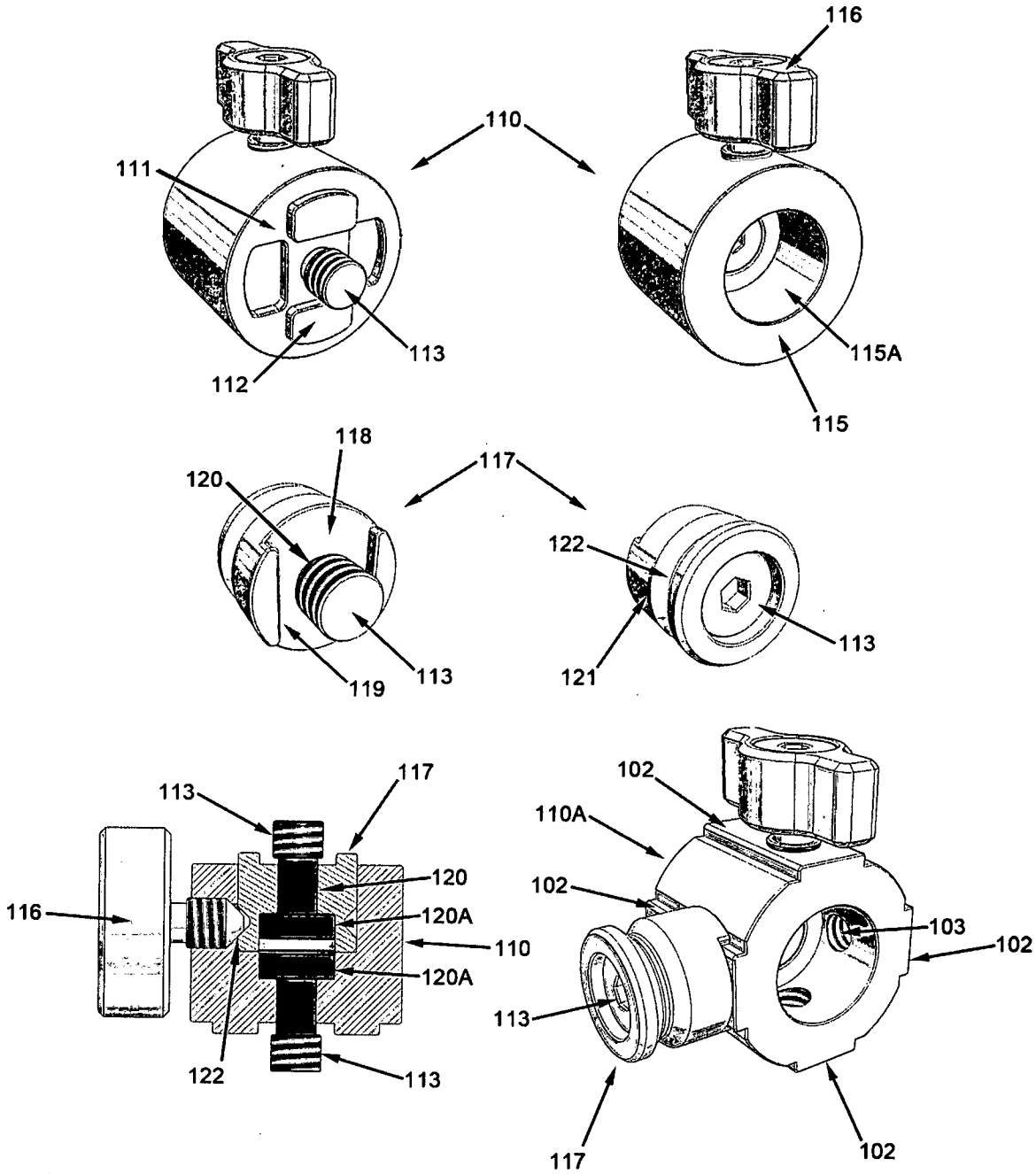

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FIG. 6

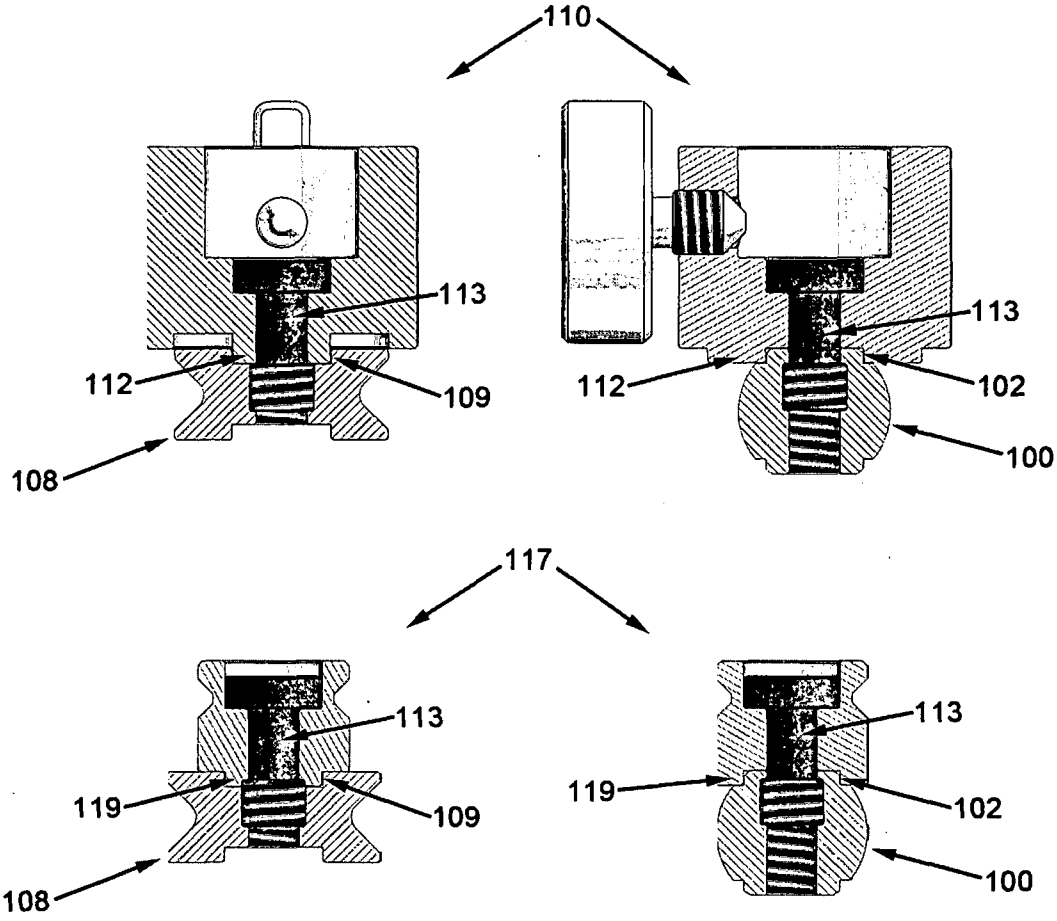
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FIG. 7

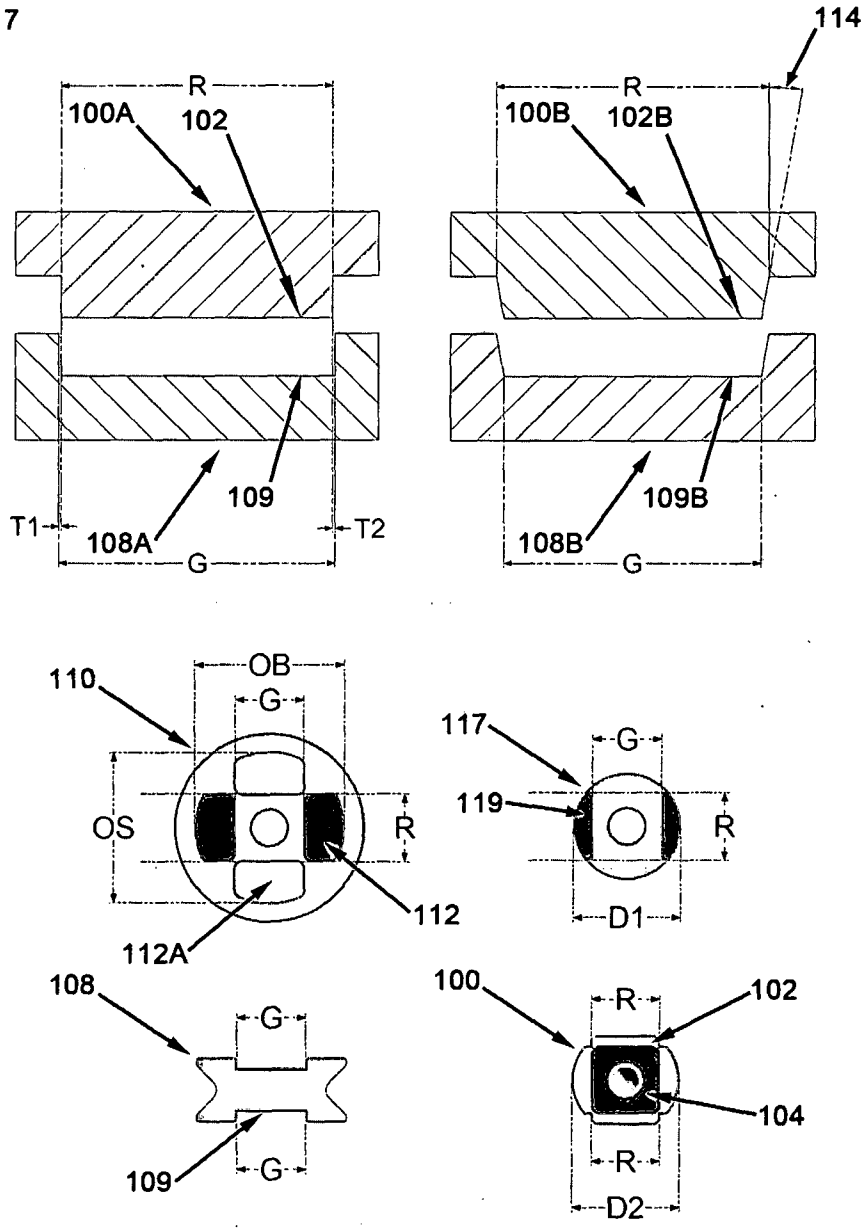
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FIG. 8

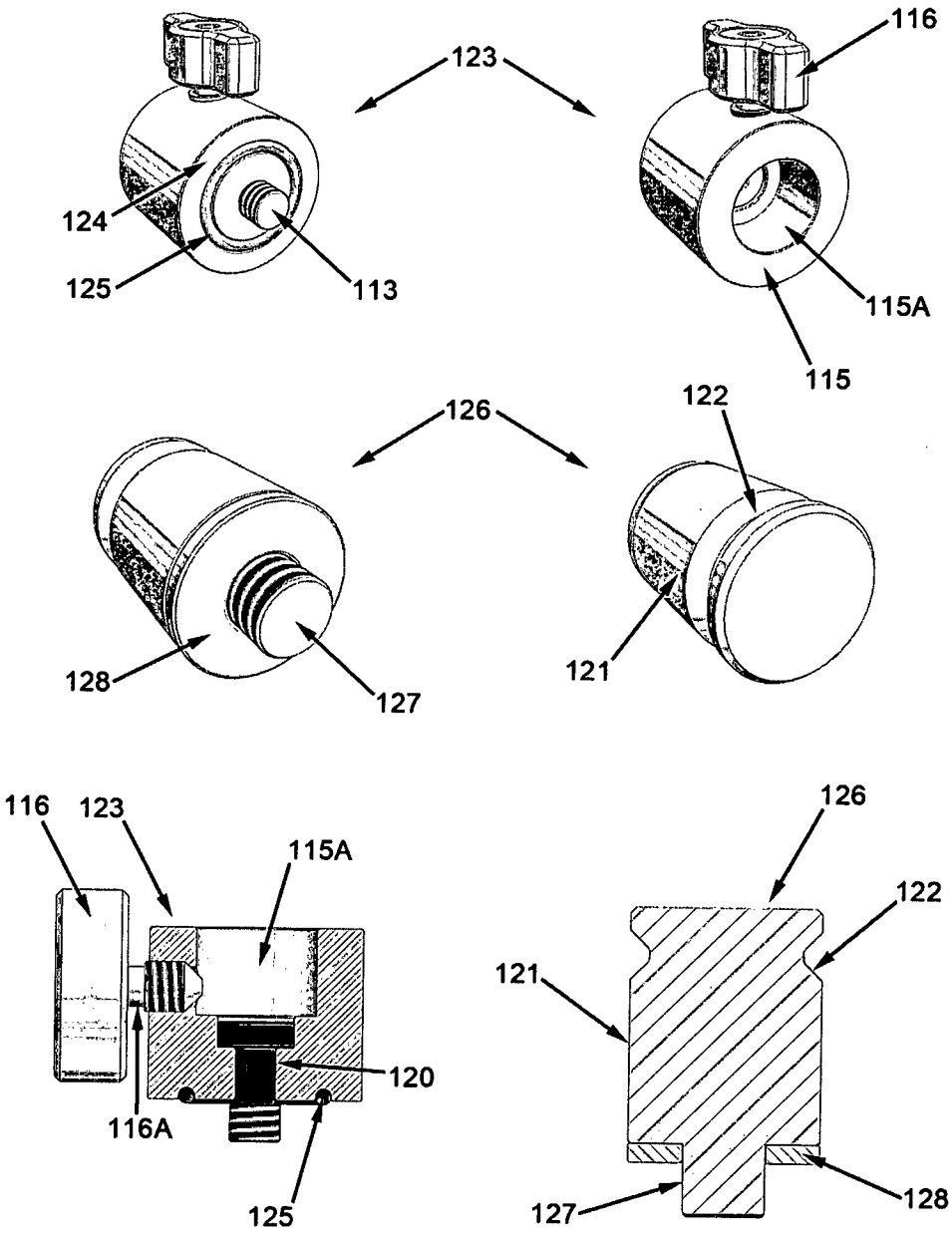
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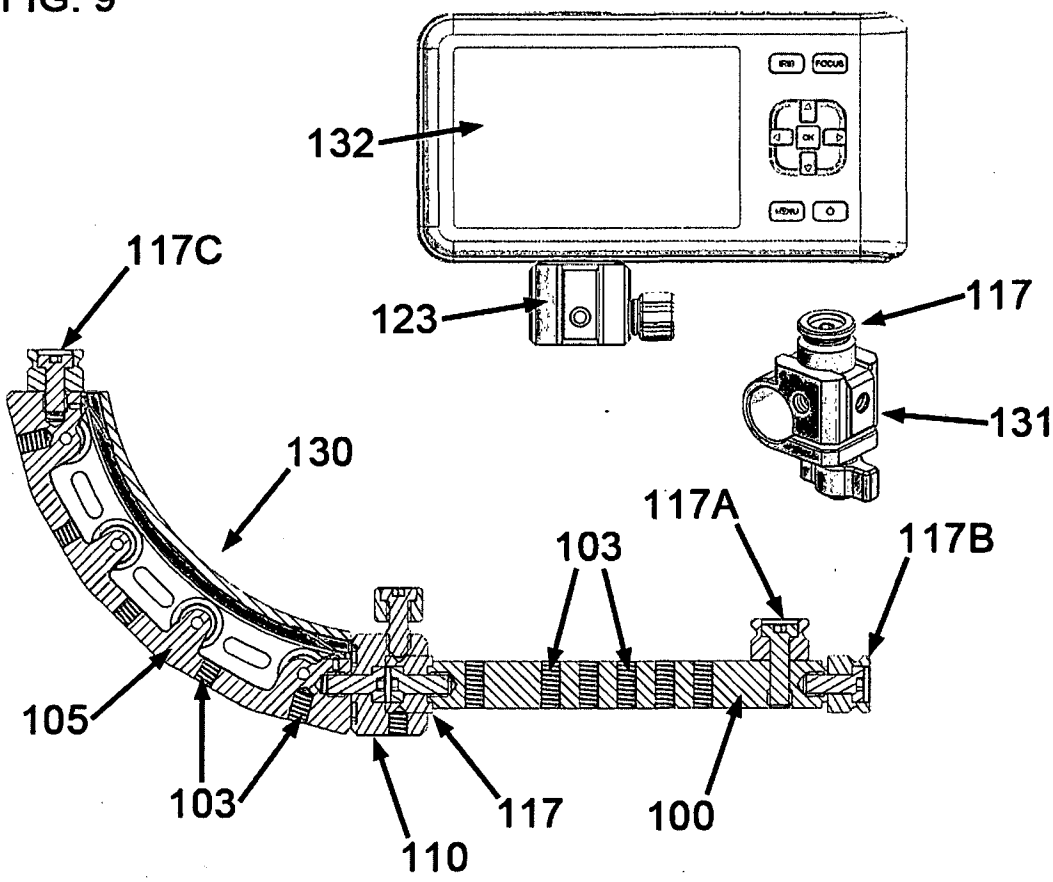
FIG. 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/002306

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16M11/04 F16M13/00 F16M13/02 F16M13/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16M G03B A45F A45C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2 470 769 A1 (SAUVE DANIEL [CA]) 11 December 2005 (2005-12-11) page 8, line 21 - page 10, line 4 page 11, line 15 - page 12, line 15; figures 1,4-6	1-17
X	DE 203 17 693 U1 (GEOMED MEDIZIN TECHNIK GMBH & [DE]) 24 March 2005 (2005-03-24) paragraph [0029] - paragraph [0042]; figures 1-7	1-17
X	WO 2010/078575 A1 (TIFFEN COMPANY LLC [US]) 8 July 2010 (2010-07-08) paragraph [0038] - paragraph [0040]; figures 1,2,4	1-17

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2014	25/07/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Afanasiev, Andrey

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2013/002306

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 2470769 A1	11-12-2005	NONE	
DE 20317693 U1	24-03-2005	NONE	
WO 2010078575 A1	08-07-2010	AU 2010203242 A1	08-07-2010
		CA 2738507 A1	08-07-2010
		CN 102165240 A	24-08-2011
		EP 2373918 A1	12-10-2011
		JP 2012514723 A	28-06-2012
		KR 20110111277 A	10-10-2011
		US 2010172642 A1	08-07-2010
		US 2011170851 A1	14-07-2011
		WO 2010078575 A1	08-07-2010