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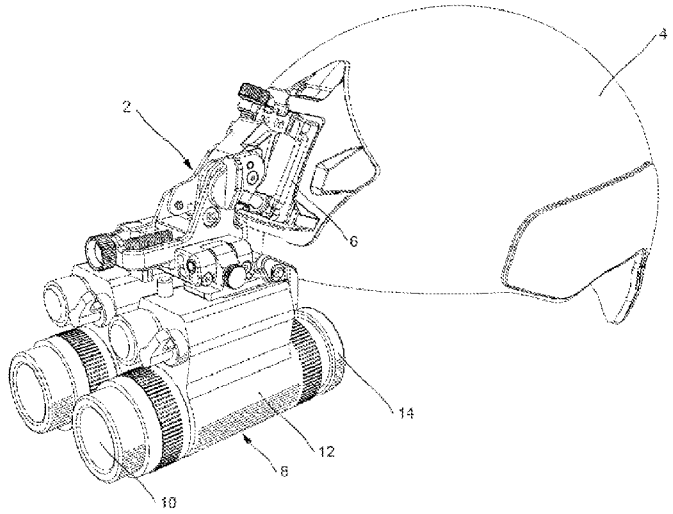

Figure 1

(57) **Abstract:** The present invention relates to mounting assemblies for optical devices, including enhanced night vision goggles (ENVG), and more particularly to a multi-adjustable and multi-stowable mount for a single or dual enhanced night vision goggles (ENVG). The mounting assemblies can include a quick release system for detachment of the optical device from the mount.

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HELMET MOUNT FOR NIGHT VISION DEVICE

TECHNICAL FIELD

[0001] The present invention relates to mounting assemblies for optical devices, including enhanced night vision goggles (ENVG), and more particularly to a multi-adjustable and multi-stowable mount for a single or dual ENVG. The mounting assemblies can include a quick release system for detachment of the optical device from the mount.

BACKGROUND ART

[0002] Night vision devices are commonly used by military personnel for conducting operations in low light and night conditions. These night vision devices typically include image intensifier tubes and associated optics that convert infrared and near infrared light into viewable images.

[0003] Assemblies for mounting night vision goggles to a helmet or other headpieces are well known in the art. The mounting assemblies allow a user's hands to remain free while viewing a scene through the night vision goggles. Prior art mounting assemblies typically include one or more of the following features: positional adjustment of the night vision goggles between an in-use and flip-up stowed position; tilt angle adjustment of the night vision goggles relative to the user's eyes; focal adjustment (eye relief adjustment) of the location of the night vision goggles relative to the user's eyes; and semi-automatic shutdown of the attached ENVG.

[0004] Preferred assemblies for mounting night vision goggles to a helmet provide for the goggles to be attached to the helmet in a manner that allows a user to view a scene through the goggles without having to hold the goggles. Some of the prior mounting assemblies are removably attached to a helmet so that when a night vision device is not needed, such as in well-lit surroundings, the mounting assembly may be detached from the helmet.

[0005] One such mounting assembly for removably attaching a night vision device to a helmet includes a locking plate which lockingly receives the mounting assembly and is releasable by actuation of a push-button release mechanism. When using a helmet with such a mounting assembly, however, a user is at risk of injury if an impact to the night vision device and/or the helmet occurs.

[0006] For example, if a user wearing a helmet with such a mounting assembly were running and inadvertently crashed or otherwise entangled the night vision device with an

external object, such as a tree branch or a line, the user's head and/or neck would likely be impacted or torqued in reaction to the external force being applied to the night vision device.

[0007] Accordingly, a need exists for an improved mounting assembly for attaching a night vision device to a helmet, which includes a multi-directional breakaway connection to the helmet, such that when a relatively large external force is applied to the night vision device, the mounting assembly breaks away from the helmet rather than transmitting the external force to the head and/or neck of the user.

[0008] It can be conceived that an external force applied from above the user may differ from an external force applied from below; for example, a falling tree branch would have a much higher force than catching on a line but both are able to damage the ENVG and user. An example of a prior art mounting assembly for night vision devices can be seen in U.S. Pat No. 6,457,179 to Prendergast. Prendergast discloses a breakaway latch assembly that allows an ENVG to be removed if a certain predetermined force is applied to the mount. This force is the same in any direction and the latch will only breakaway as a result of a force applied from below the ENVG. It would be desirable for the connection between the helmet mount and the ENVG to have differing predetermined disconnection thresholds, in multiple directions, to provide for breakaway of the connection under different forces dependent on the direction of the force.

[0009] Furthermore it would be desirable if this disconnection feature could be manually disengaged. In certain circumstances it may be preferred for the ENVG not to disconnect from the helmet such as during close combat.

[0010] Prior mounting assemblies typically include interocular adjustment of the location of the night vision goggles relative to the user's eyes. However, prior mounting assemblies require the user to manually adjust the ENVG each time when returning from the stowed position to the in-use position. It is desirable for the interocular adjustment to be automatically retained such that the ENVG is in the personal adjusted position automatically when returned to the in-use position. Such automation would require the user to only set the interocular location once for any ENVG, while still allowing the transfer of mounting units between soldiers in combat without the need for tools to re-adjust. This may be required should the need arise for a redistribution of key equipment to key personnel in the field, following an event such as failure, loss or damage.

[0011] Known mounting assemblies adjust the interocular position through use of a tensioned rotatable pivot arm. The interocular position is set by the user rotating the entire

ENVG around the pivot. While these systems offer good large adjustability, small adjustment is often required to position the ENVG correctly relative to the user's eyes. It would be desirable to have the ability to adjust the interocular position with small finite adjustments so that the correct position can be found with ease.

[0012] A further example of a prior art mounting assembly for night vision devices can be seen in U.S. Patent No. 5,914,816 to Crawford *et al*. Crawford discloses a flip-up helmet mount for night vision goggles that provides a semi-automatic shutdown feature.

[0013] Prior art devices having a semi-automatic shutdown feature can be limited in their operational aspects because, amongst other reasons, the user is required to manually activate and de-activate the shutdown feature by moving a magnet assembly into place. Such mechanisms are susceptible to jamming and breakage while being unable to be easily accessed for maintenance purposes. The delay caused between the operator positioning the ENVG to the stowed position, and the manual activation of the shutdown feature is obviously undesirable since the phosphor yellow/green light emitted from the night vision device would then be visible to possibly hostile personnel in front of the operator. The time required to redeploy the ENVG to the in-use position and then de-activate the shutdown feature would similarly cause a delay in the use of the ENVG. This is a considerable disadvantage when transitioning between well-lit and dark environments.

[0014] Known mounting assemblies also typically have a removable carriage that detaches from the main assembly. The ENVG is mounted to the removable carriage such that the ENVG can be removed from the helmet when not in use for extensive periods of time and stored more securely. The main assembly can remain attached to the helmet block for quick reattachment of the ENVG. The carriage assembly is usually slidably connected to the main assembly in a double dovetail interface, wherein a pair of parallel ridges in the carriage slidably engage a pair of recesses in the main assembly.

[0015] Night vision devices and helmet mounts are often manufactured by different manufacturers. So that the parts will fit together, they are manufactured to certain specifications but can have dimension variations of up to about 0.25 mm. The fit of a carriage assembly into the main assembly is difficult with such variances. The fit should not be too loose, as noise from jiggling contact between the assemblies (for instance, when the user is in motion) should be avoided, as excessive noise would draw unwanted attention to the operator of the ENVG. Moreover, jiggling of the attached ENVG in the mount makes it more difficult to see clearly through the goggles. Conversely, the fit of the goggles should not be so tight that it is difficult

for the carriage assembly to be connected with the main assembly, or disconnected therefrom. A snug fit between assemblies is therefore desired with a minimum amount of force required to connect the carriage assembly and main assembly.

[0016] Prior mounting assemblies with a slidable dovetail interface between the carriage assembly and the main assembly are known to be difficult to align. This is due to several factors including the small tolerances required between the parts to minimise the movement when assembled. The parts are also hard to align and engage as the dovetail interface is positioned outside the users viewing angle and is done unsighted. It would therefore be desirable if the alignment between the carriage assembly and the main assembly was improved such that it could be aligned quickly and easily, unsighted, and using only one hand.

[0017] It will be clearly understood that, if a prior art publication is referred to herein, this reference does not constitute an admission that the publication forms part of the common general knowledge in the art in Australia or in any other country.

SUMMARY OF INVENTION

[0018] The present invention is directed to a helmet mounting assembly for optical devices, including enhanced night vision goggles, which may at least partially overcome at least one of the abovementioned disadvantages or provide the consumer with a useful or commercial choice. More particularly, the helmet mounting assembly according to the present invention is designed to allow for a multi-directional calibrated breakaway connection, automatic shut off of an attached ENVG when stowed, and automatic activation of an ENVG when returned to the in-use position.

[0019] With the foregoing in view, the present invention in one form, resides broadly in a flip-up helmet mount for an optical device comprising: (i) a helmet block adapted to secure the flip-up helmet mount to a helmet; (ii) a bracket member coupled to the helmet block; (iii) a carriage chassis coupled to the bracket member, wherein the carriage chassis is adapted to receive an optical device and comprises an automatic shutoff mechanism; and (iv) a hinged pivot assembly associated with the carriage chassis.

[0020] In a preferred embodiment, the helmet block is secured into a receiving socket on the bracket member. The calibrated multi-directional breakaway means coupling the bracket member to the helmet block can comprise any suitable means that enables the optical device to be readily detached from the helmet when the optical device and/or helmet mount is subjected to an excessive external force in any direction. The detachment ensures that the external force is

not transmitted to the head and/or neck of a user.

[0021] In a preferred embodiment, the calibrated multi-directional breakaway means includes at least two adjustable clips on the helmet block that couple into corresponding sockets on the bracket member to form at least two adjustable clip assemblies. During use, the at least two adjustable clip assemblies move independently of each other. Preferably, each clip assembly comprises an independent spring behind each clip which allows the clip to move back towards the centre of the helmet block against the spring force. To couple the clips on the helmet block into corresponding sockets on the bracket member, the sockets each comprise an internal ridge for engagement of a clip within the socket. In this embodiment, when a clip is received into a socket on the bracket member, the spring behind the clip is biased to the original position thereby pushing the clip firmly into the socket. The clip will thus be under spring pressure when engaged in a socket.

[0022] As each clip assembly has an independent spring, the spring pressure on each spring can be adjusted (calibrated) independently. Further, each spring can be adjusted (calibrated) to withstand a particular external force dependent on the direction of the external force. Thus, the external force required to separate the helmet block from the bracket member can be different, dependent on the direction of the applied external force.

[0023] In a further embodiment, the bracket member can additionally comprise a slideable lever to engage a plurality of notches on the helmet block. Engagement of the notches prevents the clip assemblies from being separated, thus overriding the breakaway means between the helmet block and the bracket member. The slideable lever can be moved manually by the user to disengage from the notches on the helmet block, thereby re-enabling the breakaway means.

[0024] In a preferred embodiment, the carriage chassis is removably secured into a receiving socket on the bracket member, thereby providing for quick separation of the carriage chassis from the bracket member and thus rapid removal of the optical device from the helmet. In one embodiment, the carriage chassis includes a moveable dovetail clip assembly that couples into a corresponding receiving socket on the bracket member. Preferably, the moveable dovetail clip assembly comprises a fixed dovetail ledge and a slideable dovetail clip. Even more preferably, the moveable dovetail clip assembly moves independently from the carriage chassis and can be actuated by the user with a single hand. Preferably, the moveable dovetail clip assembly contains a spring behind the slideable dovetail clip allowing the moveable dovetail clip assembly to move back towards the centre of the carriage chassis against the spring force. When the moveable dovetail clip assembly is received into the socket on the bracket member, the spring is

biased to the original position thereby pushing the slideable dovetail clip firmly into the corresponding socket on the bracket member. The dovetail clip assembly will therefore always be under spring pressure while in the receiving socket on the bracket member with the slideable dovetail clip and the fixed dovetail ledge spread at least some distance apart. As the dovetail clip assembly is under spring pressure there should be little or no movement.

[0025] Preferably, the optical device is selected from the group consisting of a night vision goggle (NVG), an enhanced night vision goggle (ENVG), an opto-electronic device, a sighting device, a targeting device, a thermal imaging device, an infrared imaging device, a short-wave infrared imaging device, and a helmet-mounted display screen. In particularly preferred embodiments, the optical device is an NVG or an ENVG.

[0026] In a further embodiment, the mount comprises an automatic shutdown assembly for automatically shutting down an NVG or ENVG when it is not in the in-use position.

[0027] Preferably, the automatic shutdown assembly comprises a magnet module that pivots externally allowing easy access for maintenance. Particularly preferably, the magnet module is hinged externally to move in response to movement between the in-use and stowed position. The position of the magnet module is such that it comes to rest on a magnetic switching area of an attached ENVG. The ENVG preferably further comprises a mode selection switch, wherein the modes that can be selected comprise 'on' or 'off', with 'on' corresponding to enabling automatic shutdown, and 'off' corresponding to disabling automatic shutdown. Thus, the magnet module operates to automatically shutdown the night vision device whenever it is not in the in-use position, and the appropriate switch selection ('on') is made on the ENVG. In a further preferred embodiment, the magnet module is pivotable away from an ENVG under the influence of gravity.

[0028] The external position of the magnet module combined with the ability to pivot away from the ENVG under gravity produces a reliable automatic shutdown assembly that can be easily maintained in the field.

[0029] The helmet mounting assembly of the present invention can further comprise a position adjustment assembly within the carriage chassis. Preferably, the position adjustment assembly enables the position of an ENVG to be adjusted relative to a user's eyes.

[0030] In a particularly preferred embodiment, the position adjustment assembly within the carriage chassis comprises a hinged pivot assembly for adjusting the interocular distance. The hinged pivot assembly enables an ENVG to be rotated out of line of sight of the user and into the

stowed position when not required. Preferably, the hinged pivot assembly includes an adjustment bar that passes through the hinged pivot assembly. The adjustment bar protrudes beyond the hinged pivot assembly and is stopped against the carriage chassis when the ENVG is in the in-use position. The distance that the bar protrudes beyond the pivot assembly controls the rotation angle of the pivot assembly in relation to the carriage chassis and therefore the interocular distance of the attached ENVG.

[0031] In a preferred embodiment, the adjustment bar utilises a screw with a receiving thread in the pivot assembly. By rotating the adjustment bar, the protruding distance can be increased or decreased finitely. This adjustment can be done easily with one hand in a controlled manner. Adjusting the protruding distance sets the pivot assembly rotation position and thus the attached ENVG interocular distance. It can be conceived that alternative mechanisms such as a geared or ratchet pin could be used to adjust the protruding distance of the adjustment assembly.

[0032] In a particularly preferred embodiment, the adjustment bar retains its position in relation to the pivot assembly such that the protruding distance remains constant when rotated between the in-use and stowed position. The pivot assembly therefore returns to the exact same position after being rotated into the stowed position. When returning the ENVG from the stowed position to the in-use position, no interocular adjustment is required.

[0033] In a further embodiment, the hinged pivot assembly associated with the carriage chassis is an indexed pivot hinge assembly for securing the position of the carriage chassis in relation to the bracket member. The indexed pivot hinge assembly allows the carriage chassis to be secured in either the in-use or stowed positions such that it will not move under normal use in the field. However, the carriage chassis can be adjusted between the stowed and in-use positions by overcoming the securing feature of the indexed pivot hinge assembly. The force required to overcome the securing feature of the indexed pivot hinge assembly is predetermined such that it can be completed by a single-handed operation regardless of operator hand dominance. This is particularly important in a combat environment when a user is required to keep a master hand on their firearm at all times.

[0034] The indexed pivot hinge assembly can further comprise hard stops at both the in-use and stowed positions. The hard stops provide user feedback that the desired position (either in-use or stowed) has been achieved. Furthermore, the hard stops ensure the carriage chassis is held firmly in position with relation to the bracket member allowing the calibrated multi-directional breakaway mechanism to function. The hard stops also reduce over-travel of the carriage chassis in relation to the bracket member.

[0035] In a particularly preferred embodiment, the indexed pivot hinge assembly is sealed from the external environment. Sealing from the external environment ensures that dirt, dust, water and other external particulate matter does not enter the mechanism, thereby safeguarding the reliability and longevity of the indexed pivot hinge assembly. Advantageously, sealing from the external environment reduces maintenance and servicing of the indexed pivot hinge assembly.

[0036] Over the life of an ENVG mount, a small amount of wear can occur between surfaces of different parts which move against each other under tension. The issue of wear is particularly relevant to the carriage chassis, bracket member and indexed pivot hinge assembly due to movement of the ENVG mount between the in-use and stowed positions. Over time, and with increased wear, the tolerances between the surfaces increases resulting in loose mechanisms that can be noisy and not operate correctly. In a further embodiment, the indexed pivot hinge assembly includes a spring or tensioner arrangement that automatically adjusts to changes in tolerances between parts, thus ensuring the mechanism remains at its optimum setting. The spring or tensioner arrangement is pre-loaded such that after automatically adjusting to tolerance changes, the spring tension remains within a pre-determined acceptable range. This ensures the force to overcome the indexed pivot hinge assembly such that the carriage chassis can be moved between in-use and stowed positions remains constant over the life of the ENVG.

[0037] In an alternative embodiment, the indexed pivot hinge assembly includes a release push button which when actuated, releases the carriage chassis from a locked position, either in-use or stowed, and allows rotation between the in-use and stowed positions.

[0038] In a further alternative embodiment, the indexed pivot hinge assembly includes a cable or pull shaft which when actuated, releases the carriage chassis from a locked position, either in-use or stowed, and allows rotation between the in-use and stowed positions.

[0039] The indexed pivot hinge assembly can include a torsional spring which rotates the carriage chassis towards the stowed position when the release push button, or the cable or pull shaft, is actuated. Rotating the carriage chassis slightly from a locked in-use position allows the user to actuate the release push button or cable or pull shaft and continue moving the carriage chassis towards the stowed position with one hand. The user can thus complete the change of position of the carriage chassis from in-use to stowed, ambidextrously with a single hand while keeping their master hand free to remain on a weapon or other control. Alternative spring arrangements for providing force on the carriage chassis to bias it towards the stowed position include an elastomer or compression spring hinge.

[0040] In a further embodiment, the carriage chassis is removably secured into a receiving socket on the bracket member through a dovetail clip that includes a side mounted locking assembly. Positioning the locking assembly on the side of a dovetail clip reduces the height of the carriage chassis in the Z-axis (the Z-height). Reducing the Z-height places the ENVG closer to the user's head when the mounting assembly is in the stowed position and significantly reduces the perceived weight of the ENVG. Positioning the ENVG closer to the user's head also reduces the risk of the ENVG catching on overhanging obstacles and damaging either the user or the ENVG.

[0041] Preferably, the side mounted locking assembly includes a locking mechanism that provides positive feedback once the carriage chassis is fully engaged. In this embodiment, the side mounted locking assembly includes a carriage lock lever that must first be depressed in order to start to assemble the carriage chassis and engage the locking mechanism. Once the carriage chassis is located on the bracket member the lock lever will not return to the locked position unless the dovetail is correctly seated. This ensures the user cannot inadvertently half engage the carriage chassis. It also highlights to the user if the carriage chassis and attached ENVG are not engaged and locked securely to the bracket member.

[0042] It is particularly preferred for the dovetail clip to comprise a tapered cut-out on its sidewalls. The tapered cut-out acts to take up lateral slack or play between the dovetail clip and the receiving socket of the bracket member. Specifically, the tapered cut-out automatically self-tightens the carriage chassis to the bracket member and reduces unwanted vibrations and movement of the ENVG in relation to the user.

[0043] Any of the features described herein can be combined in any combination with any one or more of the other features described herein within the scope of the invention.

[0044] The reference to any prior art in this specification is not, and should not be taken as an acknowledgement or any form of suggestion that the prior art forms part of the common general knowledge.

BRIEF DESCRIPTION OF DRAWINGS

[0045] The invention may take form in various components and arrangements of components, and in various steps and arrangement of steps. The drawings are only for purposes of illustrating preferred embodiments and are not to be construed as limiting the invention.

[0046] Preferred features, embodiments and variations of the invention may be discerned

from the following Detailed Description which provides sufficient information for those skilled in the art to perform the invention. The Detailed Description is not to be regarded as limiting the scope of the preceding Summary of the Invention in any way. The Detailed Description will make reference to a number of drawings as follows:

[0047] FIG. **1** is a perspective schematic view of a helmet with an associated ENVG device using a helmet mount system according to an embodiment of the invention wherein the ENVG is in the in-use position.

[0048] FIG. **2** is an enlarged view of the helmet mount system shown in FIG. **1** wherein the ENVG's are not shown and the system is in the in-use position.

[0049] FIG. **3** is an exploded perspective view of the helmet mount system shown in FIG. **2** wherein the ENVG's are not shown and the system is in the in-use position.

[0050] FIG. **4** is a perspective schematic view of a helmet mount system in the stowed position.

[0051] FIG. **5** is a schematic side view of a helmet mount system in the in-use position.

[0052] FIG. **6** is a schematic side view of a helmet mount system in the stowed position.

[0053] FIG. **7** is a perspective schematic view taken generally from the rear and side of a helmet mount system in the stowed position.

[0054] FIG. **8** is a perspective schematic view taken generally from the rear and side of a helmet mount system in the in-use position.

[0055] FIG. **9** is a perspective schematic view of an automatic shutdown assembly according to an embodiment of the invention.

[0056] FIG. **10** is a schematic exploded perspective view of an automatic shutdown assembly according to an embodiment of the invention.

[0057] FIG. **11** is a perspective schematic view of a helmet and an attached helmet block.

[0058] FIG. **12** is a perspective schematic view of a helmet block according to an embodiment of the invention.

[0059] FIG. **13** is a schematic exploded perspective view of the helmet block shown in Fig.

12.

[0060] FIG. **14** is a schematic exploded perspective view of a helmet block and bracket member according to one embodiment of the invention.

[0061] FIG. **15** is a schematic sectional side view of a helmet block according to one embodiment of the invention, cut along its central axis.

[0062] FIG. **16** is a schematic front view of a helmet block.

[0063] FIG. **17** is a perspective schematic view of a bracket member according to one embodiment of the invention.

[0064] FIG. **18** is a schematic front view of a bracket member.

[0065] FIG. **19** is a schematic sectional side view of a bracket member.

[0066] FIG. **20** is a schematic side view of a helmet block, bracket member and carriage chassis.

[0067] FIG. **21** is a schematic exploded side view of a helmet block, bracket member and carriage chassis.

[0068] FIG. **22** is a perspective schematic view of a helmet block, bracket member and carriage chassis with a slideable breakaway lever in the locked position.

[0069] FIG. **23** is a perspective schematic view of a helmet block, bracket member and carriage chassis with a slideable breakaway lever in the unlocked position.

[0070] FIG. **24** is a perspective schematic view of a hinged pivot assembly.

[0071] FIG. **25** is a schematic exploded perspective view of a hinged pivot assembly.

[0072] FIG. **26** is a perspective schematic view of a helmet mount system with attached ENVG in the in-use position.

[0073] FIG. **27** is a perspective schematic view of a helmet mount system with attached ENVG in the stowed position.

[0074] FIG. **28A** is a schematic sectional side view of a carriage chassis cut along its central axis.

[0075] FIG. **28B** is a schematic sectional side view of a carriage chassis cut along its central axis.

[0076] FIG. **29** is a perspective schematic view of a bracket member and carriage chassis.

[0077] FIG. **30** is a perspective schematic view of a carriage chassis.

[0078] FIG. **31** is a schematic exploded perspective view of a carriage chassis.

[0079] FIG. **32** is a schematic sectional side view of a carriage chassis cut along its central axis.

[0080] FIG. **33** is a perspective schematic view of an indexed pivot hinge assembly according to one embodiment of the invention.

[0081] FIG. **34** is a schematic exploded perspective view of an indexed pivot hinge assembly according to one embodiment of the invention.

[0082] FIG. **35** is a schematic sectional side view of an indexed pivot hinge assembly according to one embodiment of the invention cut along its central axis.

[0083] FIG. **36** is a schematic exploded perspective view of an indexed pivot hinge assembly according to one embodiment of the invention.

[0084] FIG. **37** is a schematic sectional side view of an indexed pivot hinge assembly according to one embodiment of the invention cut along its central axis.

[0085] FIG. **38** is a schematic exploded perspective view of an indexed pivot hinge assembly according to one embodiment of the invention.

[0086] FIG. **39** is a schematic sectional side view of an indexed pivot hinge assembly according to one embodiment of the invention cut along its central axis.

[0087] FIG. **40** is a perspective schematic view of a carriage chassis according to one embodiment of the invention.

[0088] FIG. **41** is schematic exploded perspective view of a carriage chassis according to one embodiment of the invention.

[0089] FIG. **42** is a schematic sectional side view of a carriage chassis according to one embodiment of the invention cut along its central axis.

[0090] FIG. **43** is a schematic exploded perspective view of a hinged pivot assembly according to one embodiment of the invention.

[0091] FIG. **44** is a schematic exploded perspective view of an indexed pivot hinge assembly according to an alternative embodiment of the invention.

[0092] FIG. **45** is a schematic sectional side view of an indexed pivot hinge assembly according to one embodiment of the invention cut along its central axis.

[0093] FIG. **46** is a perspective schematic view of an indexed pivot hinge assembly according to one embodiment of the invention.

DESCRIPTION OF EMBODIMENTS

[0094] Referring now to **FIG. 1**, **2**, **3** and **4**, an embodiment of a flip-up helmet mount **2** according to the present invention is shown. The flip-up helmet mount **2** is shown in use with a standard composite helmet with a Visual Augmentation System (VAS) shroud **4**. The flip-up helmet mount **2** is attached to the helmet **4** by a helmet block **6**. A pair of enhanced night vision goggles (ENVG) **8** are secured to the helmet **4** by use of the flip-up helmet mount **2**. Each ENVG **8** shown in **FIG. 1** is a device that includes a single objective lens **10**, a housing **12**, and an eye piece **14**. The ENVG **8** may be attached individually to the helmet mount **2** by a carriage chassis **16**, which is mounted to a bracket member **18**. To use the ENVG **8**, the operator places it in the position depicted in **FIG. 1** and looks into the eye pieces **14** to see an enhanced image representative of the low-level light from a night scene which has entered the objective lens **10**.

[0095] As shown in **FIG. 1,** the ENVG **8** is positioned to be in front of the operator's eyes so that the operator may look through the eye pieces **14** of the ENVG **8**. This position is referred to as the "in-use" position. However, the flip-up helmet mount **2** also allows the operator to rotate the carriage chassis **16** around the carriage chassis pivot shaft **20**, and bracket member **18** around the bracket member pivot shaft **22,** allowing the operator to stow the ENVG **8** completely above the line of sight of the operator, to permit normal, unobstructed vision as depicted in **FIG. 4**. This position is referred to as the "stowed" position.

[0096] **Automatic Shut Down Assembly**

[0097] Additionally, the flip-up helmet mount **2** provides for automatic shutdown of the ENVG **8** when in the stowed position. More particularly, the flip-up helmet mount **2** provides for reliable, and essentially jam proof, automatic shutdown of the night vision device **8**.

Furthermore, the flip-up helmet mount **2** provides for maintenance and servicing of the automatic shutdown assembly in the field.

[0098] As is well known in the art, the night vision goggle **8** includes a power supply in the form of a battery pack (not shown) internal to the housing **12**. A power supply circuit provides power to an image intensifier tube (not shown), which supplies an intensified image in phosphor yellow/green light of the scene viewed by the objective lens **10** to the eye pieces **14**.

[0099] Referring now to **FIG. 4, 5, 6, 7, 8, 9** and **10**, the power supply circuit also includes a magnetically-responsive switch **24** (**FIG. 5**). The magnetically-responsive switch **24** maintains electrical power supply to the ENVG **8** once it is turned on by the user only so long as a magnetic field of sufficient strength is supplied to the magnetically-responsive switch **24**. An automatic shutdown assembly is essential when using a flip-up helmet mount **2**, since, as best seen in **FIG. 4**, should the user forget to turn off the night vision goggle before moving it to the stowed position, the phosphor yellow/green light emitted from the eye pieces **14** would be visible to possibly hostile personnel in front of the user. The phosphor yellow/green light would appear as a pair of small spot lights and may be visible at great distances at night, indicating the position of the user of the night vision goggle to those in front of the user.

[00100] Accordingly, the flip-up helmet mount **2** includes an automatic shutdown assembly to provide the necessary magnetic flux to the magnetically-responsive switch **24** when the night vision device **8** is in the in-use position, while at the same time ensuring that the magnetic field is removed from the magnetically-responsive switch **24** when the night vision goggle **8** is pivoted to the stowed position. The automatic shutdown assembly includes a magnet module **26** hinged from the carriage chassis **16**. The magnet module **26** is located at a rear section of the automatic shutdown assembly, immediately above the magnetically-responsive switch **24** of the night vision goggle **8**. The magnet module **26** has a vertically extending block **30**, as can be seen in **FIG. 9**. Positioned within the vertically extending block **30** is a bar magnet member **28**. The bar magnet member **28** provides sufficient magnetic flux to the magnetically-responsive switch **24** to keep the ENVG **8** turned on so long as the bar magnet member **28** is in, or immediately adjacent to, the face of the magnetically-responsive switch **24**. As can be seen from **FIG. 8**, the bar magnet member **28** is in this position when the night vision goggle **8** is in the in-use position. By way of contrast as can be seen from **FIG. 4** and **7**, however, when the user flips-up the ENVG **8** into the stowed position, gravity acts on the magnet module **26** to pivot the magnet module **26** and encased bar magnet member **28** away from the magnetically-responsive switch **24** through the pivot axis. The bar magnet member **28** is sufficiently far enough from the magnetically-

responsive switch **24** when it is in the stowed position that the ENVG **8** is automatically turned off.

[00101] One of the advantages of the automatic shutdown assembly provided for in the flip-up helmet mount **2** is that it is more reliable than the assemblies provided for in the prior art. This reliability of the shutdown assembly is due in part to the accessibility of the hinged magnet module **26**. The operator can visually and physically inspect that the magnet module **26** is moving freely in relation to the carriage chassis **16** in the field.

[00102] When using the flip-up helmet mount **2**, the operator first secures the helmet block assembly **6** to the helmet **4** and then secures the carriage chassis **16** to the bracket member **18**. Once the flip-up mount **2** is secured to the helmet **4**, the ENVG **8** may be secured to the carriage chassis **16** and adjusted into its in-use position, as seen in **FIG. 1**. When positioned in this manner, the magnet module **26** is positioned to maintain the ENVG **8** turned on once the operator switches it on. In this position, the operator is able to adjust the tilt and focus of the goggle **8** using a single hand, allowing the operator to optimize the viewing conditions of the goggle **8** without occupying both the user's hands during the adjustment process. When the operator flips the goggle **8** up to its stowed position, the goggle **8** is automatically turned off, as explained above.

[00103] **Dual Force Breakaway**

[00104] Additionally, the flip-up helmet mount **2** includes a breakaway connection to the helmet **4**, such that when a relatively large external force is applied to the ENVG **8**, the mounting assembly breaks away from the helmet **4** rather than transmitting the external force to the head and/or neck of the user.

[00105] **FIG. 3** shows a helmet block assembly **6** comprising a helmet block connector **32** and a breakaway connector **34** for attaching an ENVG **8** to a helmet **4** according to one embodiment of the present invention. The helmet block connector **32** may be integrally attached to, removably attached to, or fixedly attached to a helmet mounting surface **36**, as seen in **FIG. 11.** Alternatively, the helmet block connector **32** can be integrally formed with the helmet mounting surface **36**. As used herein, the phrase 'a breakaway connection' is used to refer to a removable connection which may be disengaged upon the exertion of at least a predetermined amount of force without requiring the actuation of a release mechanism.

[00106] The ENVG **8** may be removable or fixedly attached to the carriage chassis **16**. As described in detail below, bracket member **18** is removably attached to the helmet **4** by use of the

helmet block connector **32**. Preferably, the bracket member **18** includes mechanisms allowing for vertical adjustments, tilt adjustments, rotational adjustments and focal adjustments of the ENVG **8** relative to the helmet **4**.

[00107] In one embodiment as shown in **FIG. 3**, the helmet block assembly **6** is coupled to the bracket member **18** by a breakaway connector **34**. Referring now to **FIG. 11**, **12**, **13**, 14, **15** and **16**, the breakaway connector **34** includes an upper clip block **38** and lower clip block **40** which slide vertically with respect to an interface plate **42**. The upper clip block **38** and lower clip block **40** are supported by upper springs **44** and lower springs **46** respectively. The upper clip block **38** and lower clip block **40** are spring-biased to extend outwards from the centre of the helmet block assembly **6** and into the opening of the bracket member receiving plate **48**, and are movably received within a channel **50** in the bracket member receiving plate **48** upon a force which exceeds the spring-bias. To insert the upper clip block **38** and lower clip block **40**, the leading edge of one of the clip blocks is inserted into the corresponding upper indentation **52** or lower indentation **54** of the receiving plate **48**, and the opposite end of the helmet block is rotated towards and pressed against the breakaway connector **34** until the clip block is inserted into the indentation in the receiving plate **48**. Once the clip block **38** or **40** has moved past the receiving plate **48**, the spring-bias of the clip block **38** or **40** allows the clip lock **38** or **40** to snap back into its original position to capture the breakaway connector **34** within the opening channel **50** of the bracket member receiving plate **48.**

[00108] The upper clip block **38** is spring-biased by the upper springs **44**. These are independent from the lower springs **46** such that the spring tension for the upper clip block **38** and lower clip block **40** can be different. As such, the exertion required to disengage the upper clip block **38** and the lower clip block **40** can be individually set.

[00109] In the embodiment shown in **FIG. 17**, **18**, **19**, **20** and **21**, the breakaway connector **34** can be disengaged by depressing the breakaway lever **56** and removing the ability for the helmet block assembly **6** to separate from the bracket member **18** beyond the predetermined breakaway force. The breakaway lever **56** is a slideable plate captured by the bracket member **18** that includes two perpendicular lockout hooks **58** that extend beyond the bracket member **18**. The lockout hooks **58** are received in corresponding lockout grooves **60** in the helmet block assembly **6**. When the breakaway lever **56** is depressed, the lockout hooks **58** slide over a lockout ledge **62** in the lockout groove **60** holding the bracket member **18** and helmet block assembly **6** together. When the breakaway lever **56** is pushed outwards from the centre of the helmet block **6**, the lockout hooks **58** are free from the lockout ledge **62** in the helmet block **6** such that the bracket

member **18** can be removed from the helmet block **6** once enough force is placed on the mount that exceeds the upper spring **44** and lower spring **46** force as described above. Preferably the length of the lockout hook **58** is such that the interfacing surfaces between the lockout hook **58** and the lockout ledge **62** provide sufficient interference.

[00110] Tool-less Interocular Adjustment Memory Lock

[00111] The flip-up helmet assembly **6** also allows for interocular adjustment of the location of the ENVG **8** relative to the user's eyes. As shown in **FIG. 24**, **25**, **26** and **27**, the carriage chassis **16** includes a hinged pivot assembly **64** that rotates centrally around the carriage chassis pivot shaft **20**. The ENVG **8** is attached to an attachment shoe **68** that is part of the hinged pivot assembly **64**. An operator is able to attach the ENVG **8** to the attachment shoe **68** and rotate the hinged pivot assembly **64** to stow the ENVG **8** completely above the line of sight of the operator, to permit normal, unobstructed vision. As best shown in **FIG. 28A**, the hinged pivot assembly **64** comprises a hinge block **70** and an adjustment bar screw **72**. The adjustment bar screw **72** extends through a threaded opening **74** in the hinge block **70** and extends beyond the hinge block **70** by a protruding distance **76**. The adjustment bar screw **72** includes a larger tactile cylinder **78**, central to the adjustment bar screw axis at the outmost part of the adjustment bar screw **72**. The larger tactile cylinder **78** is large enough such that it can be gripped by the operator's fingers and rotated without the use of any tools. Rotating the adjustment bar screw **72** engages the adjustment bar screw thread **80** with the threaded opening **74** in the hinge block **70** and moves the adjustment bar screw **72** towards and away from the carriage assembly central axis. The innermost end of the adjustment bar screw **82** rests against the memory lock block face **84** in the carriage chassis **16** when the hinge block **70** is rotated to the in-use position. By rotating the adjustment bar screw **72** to increase the protruding distance **76** of the innermost end of the adjustment bar screw **82**, the hinge block **70** is rotated away from the central axis when the innermost end of the adjustment bar screw **82** rests against the memory lock block face **84**. This increases the distance between the eyepieces **14** of the attached ENVG **8** and thus increases the interocular distance.

[00112] The adjustment bar screw **72** retains its position within the threaded opening **74** in the hinge block **70** until the larger tactile cylinder **78** is rotated. Thus, the protruding distance **76** remains unchanged when the operator rotates the hinge block **70** and attached ENVG **8** into the stowed position. When the operator rotates the hinge block **70** and attached ENVG **8** back into the in-use position, the innermost end of the adjustment bar screw **82** rests against the memory lock block face **84** in exactly the same position as was previously set.

[00113] In an alternative embodiment as shown in **FIG. 28B**, the adjustment bar screw **72** extends through a threaded opening in the carriage chassis **16** extending towards the hinge block by a protruding distance **76**. Rotating the adjustment bar screw **72** engages the adjustment bar screw thread **80** with the threaded opening **74** in the carriage chassis **16** and moves the adjustment bar screw **72** towards and away from the carriage chassis **16** central axis. The outermost end of the adjustment bar screw **82** rests against the memory lock block face **84** in the hinge block **70** when it is rotated to the in-use position.

[00114] **Carriage Clip**

[00115] In the embodiment as shown in **FIG. 29**, the carriage chassis **16**, is removable from the bracket member **18** for storage purposes. As shown in **FIG. 29, 30 and 31**, the carriage chassis **16** includes a fixed dovetail ledge **86** at the end closest to the user's face. The carriage chassis **16** includes a slidable dovetail clip **88** which slides horizontally with respect to the carriage chassis **16**. The slidable dovetail clip **88** is supported by a compression spring **90**. The slidable dovetail clip **88** is spring-biased to extend outwards from the fixed dovetail ledge **86** end of the carriage chassis **16** and into the opening of the bracket member receiving plate **92**, and is movably received within a channel of a receiving dovetail ledge **94** in the carriage chassis. The slidable dovetail clip **88** includes a block that extends from the centre of the carriage chassis **16** creating a slidable dovetail lever **96** that can be depressed by the operator to compress the compression spring **90** and slide the slidable dovetail clip **88** back towards the centre of the carriage chassis **16**. The slidable dovetail clip **88** also includes a slidable dovetail ledge **98** that extends beyond the receiving dovetail ledge **94** in the bracket member receiving plate **92** in the carriage chassis **16**.

[00116] To insert the carriage chassis **16** into the bracket member **18**, the fixed dovetail ledge **86** is inserted into the indentation **100** of the bracket member receiving plate **92**. With the slidable dovetail lever **96** depressed, the opposite end of the carriage chassis **16** is rotated upwards and pressed against the bracket member **18**. The spring-bias of the slidable dovetail clip **88** allows the slidable dovetail clip **88** to slide back into its original location, positioning the slidable dovetail ledge **98** above the receiving dovetail ledge **94** within the bracket member receiving plate **92**. With the slidable dovetail ledge **98** above the receiving dovetail ledge **94** the parts are secured together and cannot be separated without the slidable dovetail lever **96** being depressed and the slidable dovetail ledge **98** being rotated out of the bracket member receiving plate **92.** The spring-bias of the slidable dovetail clip **88** ensures a tight fit between the slidable dovetail clip **88** and the bracket member receiving plate **92** as well as the fixed dovetail ledge **86**

and the indentation **100** of the bracket member receiving plate **92**. With a tight fit between the carriage chassis **16** and the bracket member **18**, the attached ENVG **8** is held still and noise and vibration are significantly reduced if not eradicated.

[00117] Indexed Pivot Hinge

[00118] Referring now to **FIG. 33**, **34** and **35**, there is shown an embodiment of an indexed pivot hinge assembly **102**. In use, the indexed pivot hinge assembly **102** connects the carriage chassis **16** to a bracket member **18** (as shown, for example, in **FIG. 2**), allowing the ENVG **8** to be moved between in-use and stowed positions. The indexed pivot hinge assembly **102** includes an outer casing **104** that is received in a carriage chassis hinge locator recess **106**. The outer casing **104** encases a bearing keyway **108,** ball bearings **110**, pressure plate **112** and a spring or tensioner **114**.

[00119] The outer casing **104** is capped at one end with a casing cap **116** which is retained by a casing cap thread **118** to secure all internal components. When the casing cap **116** is tightened it forms a seal between the casing cap sealing face **120** and the outer casing sealing face **122**. The bearing keyway **108** protrudes through a casing hole **124** in the outer casing **104**. The outer case **104** includes an internal sealing face **126** which seals against a bushing **128** trapped between the bearing keyway **108** and the outer casing **104**. The sealing at both the casing hole **124** and casing cap **116** ends of the indexed pivot hinge assembly **102** prevents dirt, dust, water and external particulate matter from entering the indexed pivot hinge assembly **102**.

[00120] The bearing keyway **108** includes a number of bearing recesses **129**, which accept a number of ball bearings **110**. A pressure plate **112** is pushed against the ball bearings **110** through a spring or tensioner **114** which is pre-loaded against the casing cap **116.** In a preferred embodiment, the pressure plate **112** includes a pressure plate central boss **130** which fits inside a the spring or tensioner receiving hole **132** to ensure the spring or tensioner **114** remains central and pushes evenly against the pressure plate **112**.

[00121] The pressure plate **112** includes several pressure plate ball bearing receiving holes **134** to locate the ball bearings **110.** The pressure plate **112** is pushed under force from the spring or tensioner **114** against the ball bearings **110** with the shape of the pressure plate ball bearing receiving holes **134** ensuring the ball bearings **110** cannot easily move. The pressure plate **112** includes several sets of pressure plate ball bearing receiving holes **134** that align with the ball bearings **110** and are located to position the carriage chassis **16** in either the in-use or stowed positions relative to the bracket member **18**.

[00122] In use, rotation of the carriage chassis **16** with a force greater than a predetermined force, results in rotation of the ball bearings **110** against the pressure plate ball bearing receiving holes **134** such that they push the pressure plate **112** away against the spring or tensioner **114** and are no longer retained in the pressure plate ball bearing receiving holes **134**. Once the ball bearings **110** are out of the pressure plate ball bearing receiving holes **134**, the indexed pivot hinge assembly **102** is free to rotate until the ball bearings **110** locate again in the pressure plate ball bearing receiving holes **134**, which correspond with the either the stowed or in-use positions. As the ball bearings **110** locate into the pressure plate ball bearing receiving holes **134**, the pressure plate **112** applies force from the spring or tensioner **114** ensuring the ball bearings **110** are held firmly in place and the carriage chassis **16** is secured in either the stowed or in-use position.

[00123] The pressure plate **112** includes a locking pin receiving hole **136** in which a locking pin **138** locates. The locking pin **138** extends through the outer casing **104** through a locking pin slot **140** and ensures the pressure plate **112** does not rotate relative to the outer casing **104**. Securing the pressure plate **112** to the outer casing **104** allows the bearing keyway **108** to rotate when a force greater than a predetermined force is applied to the carriage chassis **16**.

[00124] The bearing recesses **129** in the bearing keyway **108** are shaped such that the outer face of the walls surrounding the ball bearings **110** are removed. Removal of this outer face allows the ball bearings **110** to be positioned away from the central axis as much as possible and run on the inside of the outer casing **104**. The pressure plate ball bearing receiving holes **134** are correspondingly placed away from the central axis to align with the ball bearings **110**. The further the ball bearings **110** and ball bearing receiving holes **134** are positioned away from the central axis the more force is required to overcome the pressure plate **112** and spring or tensioner **114**.

[00125] In an alternative embodiment shown in **FIG. 36** and **37**, the ball bearings **110** are replaced by bearing shafts **168** in the bearing keyway **108**. The bearing shafts **168** locate into the pressure plate ball bearing receiving holes **134**. A release push button **170** includes an actuation shaft **172** which passes through the bearing keyway **108** and stops short of the pressure plate front surface **174**. An actuation shaft spring **176** is located behind the release push button **170** forcing the release push button **170** and associated actuation shaft **172** away from the pressure plate front surface **174** at all times. When the release push button **170** is depressed by a user, the actuation shaft spring **176** is overcome and the actuation shaft **172** pushes against the pressure plate **112** such that the bearing shafts **168** are no longer located in the pressure plate ball bearing

receiving holes **134**. With the bearing shafts **168** no longer engaged in the pressure plate ball bearing receiving holes **134**, the carriage chassis **16** (not shown) is then free to rotate in relation to the bracket chassis **18** (not shown) allowing the user to move the ENVG **8** (not shown) between the in-use and stowed positions as required.

[00126] The indexed pivot hinge assembly **102** includes a torsional spring **178** positioned around the bearing keyway **108** and inside the outer casing **104**. The torsional spring short end **180** locates in a bearing keyway spring slot **182**. The torsional spring long end **184** locates in an outer casing slot **186**. The torsional spring **178** is positioned such that the bearing keyway **108** is tensioned to return towards the stowed position. When a user depresses the release push button **170** and releases the bearing shafts **168** from the pressure plate ball bearing receiving holes **134**, the torsional spring **178** rotates the bearing keyway **108** toward the stowed position. The user can then release the release push button **170** and continue moving the carriage chassis **16** (not shown) and attached ENVG **8** (not shown) to the stowed position until the bearing shafts **168** are located in the pressure plate ball bearing receiving holes **134** that align with the stowed position. The initial movement of the bearing keyway **108** provided by the torsional spring **178** when the release push button **170** is depressed, allows movement from the in-use position to the stowed position as a result of a single handed operation.

[00127] In a further alternative embodiment shown in **FIG. 38** and **39**, a cable or pull shaft **188** is attached to the pressure plate **112**. The cable or pull shaft **188** passes through the spring or tensioner **114** and exits the casing cap **116**. The cable or pull shaft **188** can be positioned on the casing cap external face **190** or can be routed to the side or back of the helmet **4** (not shown). When a user pulls on the cable or pull shaft **188**, the pressure plate **112** is moved towards the casing cap **116** which compresses the spring or tensioner **114** and disengages the bearing shafts **168** from the pressure plate ball bearing receiving holes **134** allowing the bearing keyway **108** to rotate between the in-use and stowed positions.

[00128] In a further alternative embodiment shown in **FIG. 43**, **44**, **45** and **46**, the outer casing **104** connects to the carriage chassis **16** through the carriage chassis hinge locator recess **106** and to the bracket member **18** through a bracket member hinge locator recess **200**.

[00129] The indexed pivot hinge **102** includes an outer casing **104**, inner casing **192**, ball bearings **110** and a spring or tensioner **114**. The outer casing **104** pivots around the inner casing **192**, allowing the ENVG **8** to be moved between in-use and stowed positions.

[00130] The inner casing **104** comprises of an inner casing shaft **194**, spring or tensioner

receiving holes **132** and a index pin or stop **196**. The index pin or stop could be conceived as a separate part, screwed or fixed to the inner casing shaft **194** or as past of the inner casing **192**.

[00131] The outer casing **104** comprises of one or more sets of index ball bearing receiving holes **202** and an index pin slot **198**. The index pin or stop **196** is received in the index pin slot **198** and restricts the rotation of the outer casing **104** to within the index pin slot limits.

[00132] Spring or tensioners **114** and ball bearings **110** are held within the spring or tensioner receiving holes **132** within the inner casing **192.** The ball bearings **110** locate in the index ball bearing receiving holes **202** on the outer casing **104.** The index ball bearing receiving holes **202** are located to position the carriage chassis **16** in either the in-use or stowed positions relative to the bracket member **18**.

[00133] In use, rotation of the carriage chassis **16** with a force greater than a predetermined force, results in rotation of the ball bearings **110** against the outer casing **104** and compression against the spring or tensioner **114**. Once the ball bearings **110** have rotated out of the index ball bearing receiving holes **202**, the outer casing **104** is free to rotate around the inner casing **192** until the ball bearings **110** locate again in the index ball bearing receiving holes **202**, which correspond with the either the stowed or in-use positions. As the ball bearings **110** locate into the index ball bearing receiving holes **202**, the spring or tensioner **114** applies force to the ball bearings **110** ensuring the ball bearings **110** are held firmly in place within the index ball bearing receiving holes **202** and the carriage chassis **16** is secured in either the stowed or in-use position.

[00134] Side Dovetail Lock

[00135] Turning now to **FIG. 40**, **41** and **42**, there is shown an embodiment wherein the carriage chassis **16** includes a notched slidable dovetail clip **142** that is received in the carriage dovetail receiver **144**. The ENVG **8** are secured to the notched slidable dovetail clip **142** through locating holes **146**. The notched slidable dovetail clip **142** includes cut-out recesses **148** on the sides of the notched slidable dovetail clip **142**.

[00136] The carriage dovetail receiver **144** includes a release recess **150** and hole cut-out **152** in which a locking ball **154** is located. The carriage chassis **16** also includes a slide carriage release lever **156** which sits into a release recess **150**. The locking ball **154** is held captive at one end of the hole cut-out **152** by the slide carriage release lever **156**. At the opposing end, the release recess **150** is shaped such that the locking ball **154** is captive and cannot escape but is free to move within the release recess **150**.

[00137] The slide carriage release lever **156** includes a slide block **158** which fits in the base of the release recess **150**. The release recess **150** is sized such that the slide block **158** is able to move front to back with respect to the user. The slide block **158** includes a spring recess **160** in which a slide compression spring **162** is located. The slide compression spring **162** pushes up against one end of the release recess **150** and forces the slide carriage release lever **156** away from the user. The slide block **158** includes an angled sliding plate **164**, which rests up against the locking ball **154**. The angled sliding plate **164** is shaped such that when the slide carriage release lever **156** is at rest and positioned away from the user, the locking ball **154** is pressed firmly into the hole cut-out **152**. The locking ball **154** protrudes into the carriage dovetail receiver void **166** where the notched slidable dovetail clip **142** locates. When the notched slidable dovetail clip **142** is inserted into the carriage dovetail receiver void **166**, the locking ball **154** interferes with the notched slidable dovetail clip **142**, preventing the notched slidable dovetail clip **142** from being inserted.

[00138] The angled sliding plate **164** is shaped such that when the slide carriage release lever **156** is depressed and positioned towards the user, the locking ball **154** is able to move within the hole cut-out **152** away from the central axis. When the notched slidable dovetail clip **142** is inserted into the carriage dovetail receiver void **166**, the locking ball **154** can be pushed back into the hole cut-out **152** and the notched slidable dovetail clip **142** can be fully located into the carriage dovetail receiver void **166**.

[00139] When the notched slidable dovetail clip **142** is fully inserted into the carriage dovetail receiver void **166**, the cut-out recesses **148** align with the hole cut-out **152**. As the slide carriage release lever **156** is released, the slide compression spring **162** forces the slide block **158** away from the user. The angled sliding plate **164** is shaped such that as the slide carriage release lever **156** is moved away from the user, the locking ball **154** is pushed further into the hole cut-out **152** towards the centre of the mount until it protrudes into the carriage dovetail receiver void **166** and cut-out recesses **148** of the notched slideable dovetail clip **142**.

[00140] The cut-out recesses **148** include a tapered face **167** at either end, such that as the angled sliding plate **164** presses against the locking ball **154** which in turn presses against the cut-out recess tapered face **167,** the notched slidable dovetail clip **142** is forced further into the carriage dovetail receiver void **166**. Forcing the notched slidable dovetail clip **142** further into the carriage dovetail receiver void **166** removes any slack or play that may occur between parts and ensures the attached ENVG **8** are held as firmly as possible.

[00141] While various embodiments of this invention have been shown and described, it

would be apparent to those skilled in the art that many more modifications are possible without departing from the inventive concept herein. For example, although the clip block assemblies have been illustrated with three springs supporting each clip block, it should be realized that the number or shape of these springs could easily be changed to effect the spring tension. The style of locking mechanism could also be easily changed to a rotating latch or various other mechanisms that attach the bracket member to the helmet block assembly. It is, therefore, to be understood that within the scope of the appended claims, this invention may be practiced otherwise than as specifically described.

[00142] In the present specification and claims (if any), the word 'comprising' and its derivatives including 'comprises' and 'comprise' include each of the stated integers but does not exclude the inclusion of one or more further integers.

[00143] Reference throughout this specification to 'one embodiment' or 'an embodiment' means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearance of the phrases 'in one embodiment' or 'in an embodiment' in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more combinations.

[00144] In compliance with the statute, the invention has been described in language more or less specific to structural or methodical features. It is to be understood that the invention is not limited to specific features shown or described since the means herein described comprises preferred forms of putting the invention into effect. The invention is, therefore, claimed in any of its forms or modifications within the proper scope of the appended claims (if any) appropriately interpreted by those skilled in the art.

CLAIMS

1. A flip-up helmet mount for an optical device comprising:

(i) a helmet block adapted to secure the flip-up helmet mount to a helmet;

(ii) a bracket member coupled to the helmet block;

(iii) a carriage chassis coupled to the bracket member, wherein the carriage chassis is adapted to receive an optical device and comprises an automatic shutoff mechanism; and

(iv) a hinged pivot assembly associated with the carriage chassis,

wherein the bracket member provides for rotational coupling between the carriage chassis and the helmet block, and wherein the hinged pivot assembly enables the optical device to be moved from a stowed position to an in-use position without interocular adjustment.

2. A flip-up helmet mount for an optical device comprising:

(i) a helmet block adapted to secure the flip-up helmet mount to a helmet;

(ii) a bracket member coupled to the helmet block; and

(iii) a carriage chassis coupled to the bracket member through a hinged pivot assembly,

wherein the hinged pivot assembly is an indexed hinged pivot assembly that provides for rotational coupling between the carriage chassis and the helmet block, the carriage chassis is adapted to receive an optical device by a dovetail coupling, and wherein the indexed hinged pivot assembly enables the optical device to be moved from a stowed position to an in-use position without interocular adjustment.

3. The flip-up helmet mount of claim 1 or claim 2, wherein the bracket member is coupled to the helmet block via a helmet block adapter comprising at least one spring device, and wherein the at least one spring device provides for the helmet block adaptor to couple to the bracket member via spring force.

4. The flip-up helmet mount of claim 3, wherein the at least one spring device engages with a coupling feature on the bracket member.

5. The flip-up helmet mount of claim 1 or claim 2, wherein the bracket member comprises at least one spring device, and wherein the at least one spring device provides for the bracket member to couple to the helmet block via spring force.

6. The flip-up helmet mount of claim 5, wherein the at least one spring device engages with a coupling feature on the helmet block.

7. The flip-up helmet mount of any one of claims 3 to 6, wherein the at least one spring device can be tensioned to change the spring force coupling the bracket member and the helmet block.

8. The flip-up helmet mount of claim 7, wherein tensioning of the at least one spring device adjusts the force required to uncouple the bracket member and the helmet block, thereby providing a multi-directional breakaway system.

9. The flip-up helmet mount of any one of claims 1 to 8, further comprising a locking mechanism to secure the bracket member to the helmet block.

10. The flip-up helmet mount of claim 9, wherein the locking mechanism overrides the spring force tension of the at least one spring device, thereby preventing separation of the bracket member and the helmet block and overriding the multi-directional breakaway system.

11. The flip-up helmet mount of any one of claims 1 to 10, wherein the optical device is selected from the group consisting of a night vision goggle (NVG), an enhanced night vision goggle (ENVG), an opto-electronic device, a sighting device, a targeting device, a thermal imaging device, an infrared imaging device, a short-wave infrared imaging device, and a helmet-mounted display screen.

12. A flip-up helmet mount for an optical device comprising:

(i) a helmet block adapted to secure the flip-up helmet mount to a helmet;

(ii) a bracket member coupled to the helmet block by a calibrated multi-directional breakaway means;

(iii) a carriage chassis coupled to the bracket member, wherein the carriage chassis is adapted to receive an optical device and comprises an automatic shutoff mechanism; and

(iv) a hinged pivot assembly associated with the carriage chassis,

wherein the bracket member provides for rotational coupling between the carriage chassis and the helmet block, and wherein the hinged pivot assembly enables the optical device to be moved from a stowed position to an in-use position without interocular adjustment.

13. A flip-up helmet mount for an optical device comprising:

(i) a helmet block adapted to secure the flip-up helmet mount to a helmet;

(ii) a bracket member coupled to the helmet block by a calibrated multi-directional breakaway means; and

(iii) a carriage chassis coupled to the bracket member through a hinged pivot assembly,

wherein the hinged pivot assembly is an indexed hinged pivot assembly that provides for rotational coupling between the carriage chassis and the helmet block, the carriage chassis is adapted to receive an optical device by a dovetail coupling, and wherein the indexed hinged pivot assembly enables the optical device to be moved from a stowed position to an in-use position without interocular adjustment.

14. The flip-up helmet mount of claim 12 or claim 13, wherein the calibrated multi-directional breakaway means comprises at least one spring device, and wherein the at least one spring device provides for the helmet block to couple to the bracket member via spring force.

15. The flip-up helmet mount of claim 14, wherein the at least one spring device is associated with the helmet block and engages with a coupling feature on the bracket member.

16. The flip-up helmet mount of claim 14, wherein the at least one spring device is associated with the bracket member and engages with a coupling feature on the helmet block.

17. The flip-up helmet mount of any one of claims 14 to 16, wherein the at least one spring device can be tensioned to change the spring force coupling the bracket member and the helmet block.

18. The flip-up helmet mount of claim 17, wherein tensioning of the at least one spring device adjusts the force required to uncouple the bracket member and the helmet block.

19. The flip-up helmet mount of any one of claims 12 to 17, further comprising a locking mechanism to secure the bracket member to the helmet block.

20. The flip-up helmet mount of claim 19, wherein the locking mechanism overrides the spring force tension of the at least one spring device, thereby preventing separation of the bracket member and overriding the multi-directional breakaway system.

21. The flip-up helmet mount of any one of claims 13 to 20, wherein the optical device is selected from the group consisting of a night vision goggle (NVG), an enhanced night vision goggle (ENVG), an opto-electronic device, a sighting device, a targeting device, a thermal imaging device, an infrared imaging device, a short-wave infrared imaging device, and a helmet-mounted display screen.

22. The flip-up helmet mount of any one of claims 1 to 21, wherein the hinged pivot

assembly comprises an adjustment bar that passes through the hinged pivot assembly.

23. The flip-up helmet mount of claim 22, wherein the adjustment bar protrudes beyond the hinged pivot assembly and is stopped against the carriage chassis when the optical device is in the in-use position.

24. The flip-up helmet mount of claim 23, wherein the adjustment bar comprises a screw and the hinged pivot assembly comprises a receiving thread for the screw.

25. The flip-up helmet mount of claim 1 or claim 12, wherein the carriage chassis is adapted to receive an optical device via a dovetail coupling.

26. The flip-up helmet mount of claim 25, wherein the dovetail coupling comprises a fixed dovetail ledge on the carriage chassis and an associated slidable dovetail clip.

27. The flip-up helmet mount of claim 25, wherein the dovetail coupling comprises a notched slidable dovetail clip and the carriage chassis has a receiving slot with at least one ball bearing, such that in use, the at least one ball bearing is positioned in a notch of the slidable dovetail clip, thus securing the dovetail clip in the receiving slot of the carriage chassis.

28. The flip-up helmet mount of claim 2 or claim 13, wherein the dovetail coupling comprises a fixed dovetail ledge on the carriage chassis and an associated slidable dovetail clip.

29. The flip-up helmet mount of claim 2 or claim 13, wherein the dovetail coupling comprises a notched slidable dovetail clip and the carriage chassis has a receiving slot with at least one ball bearing, such that in use, the at least one ball bearing is positioned in a notch of the slidable dovetail clip, thus securing the dovetail clip in the receiving slot of the carriage chassis.

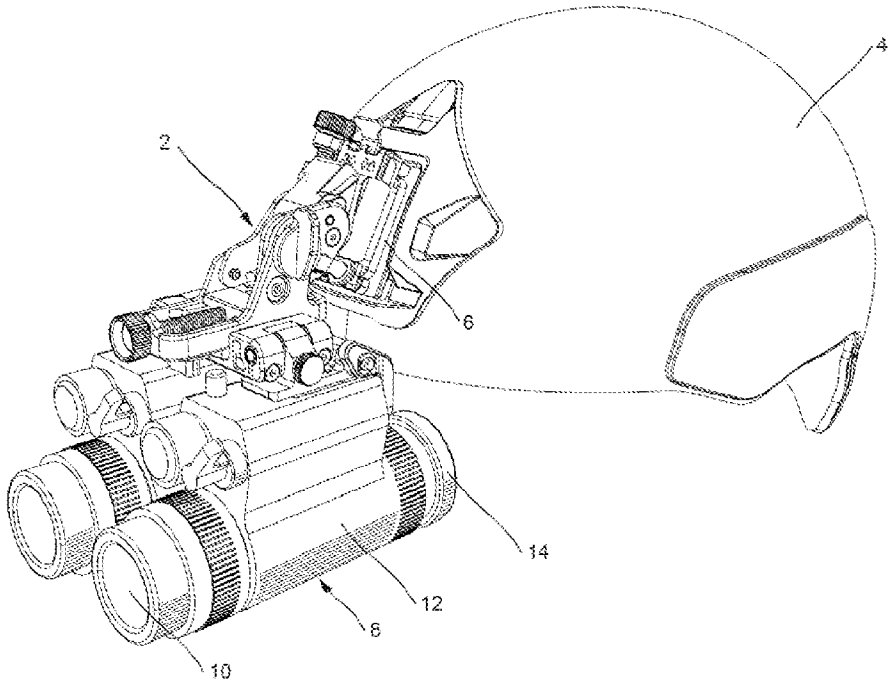


Figure 1

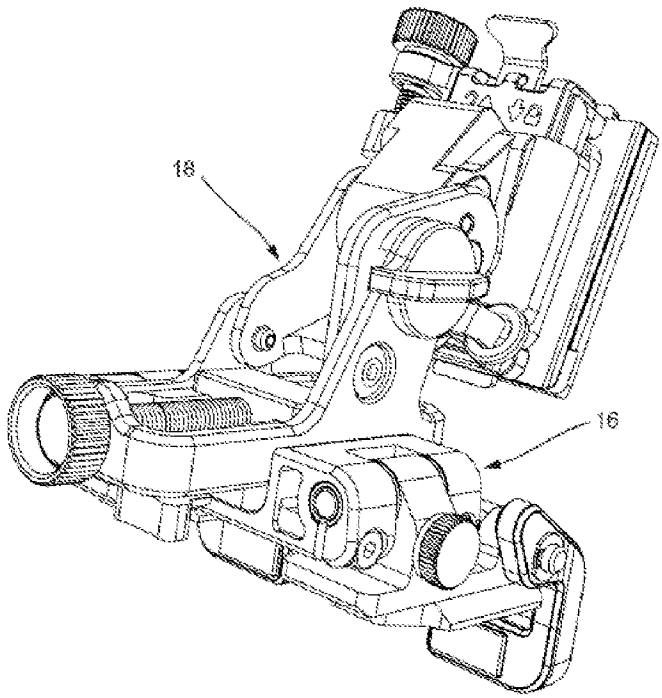


Figure 2

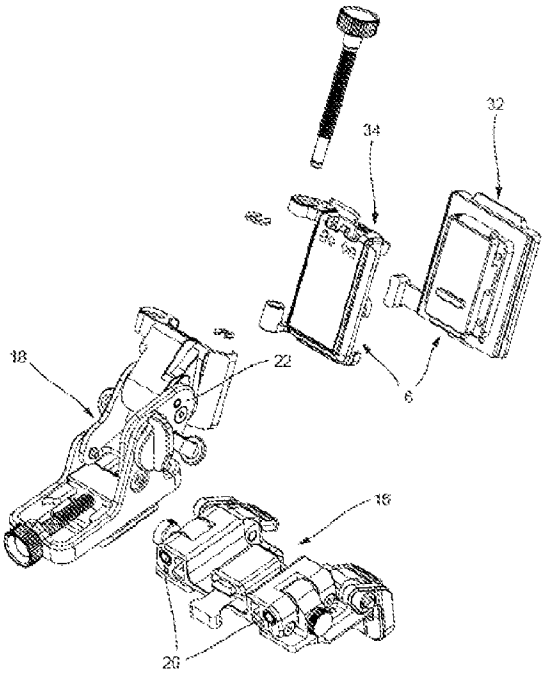


Figure 3

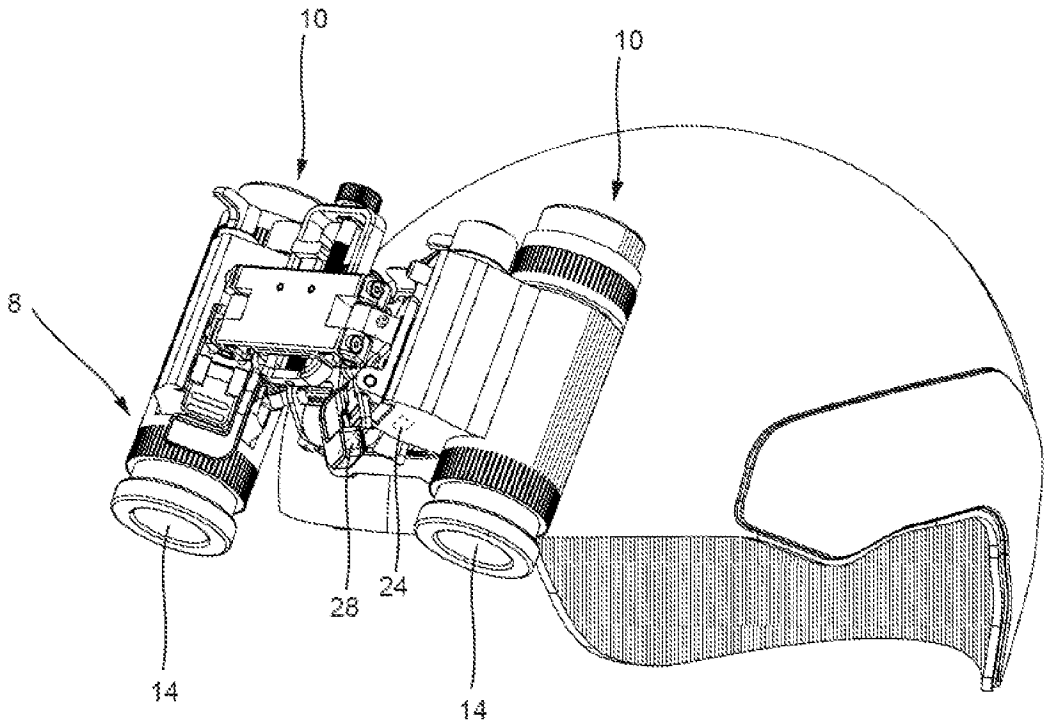


Figure 4

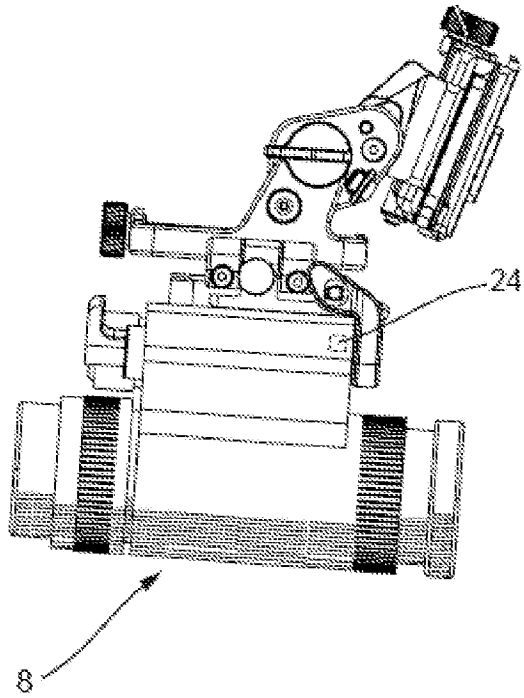
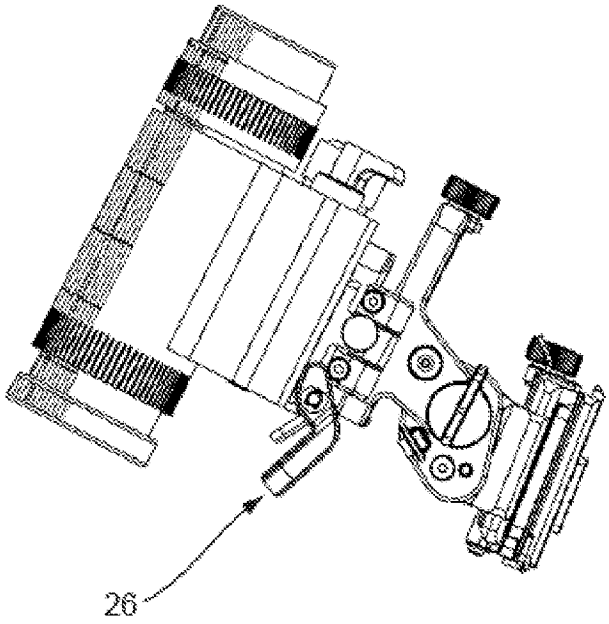


Figure 5



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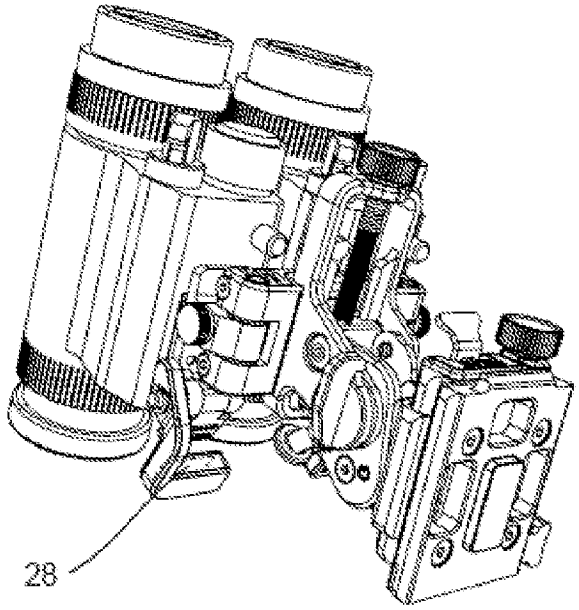


Figure 7

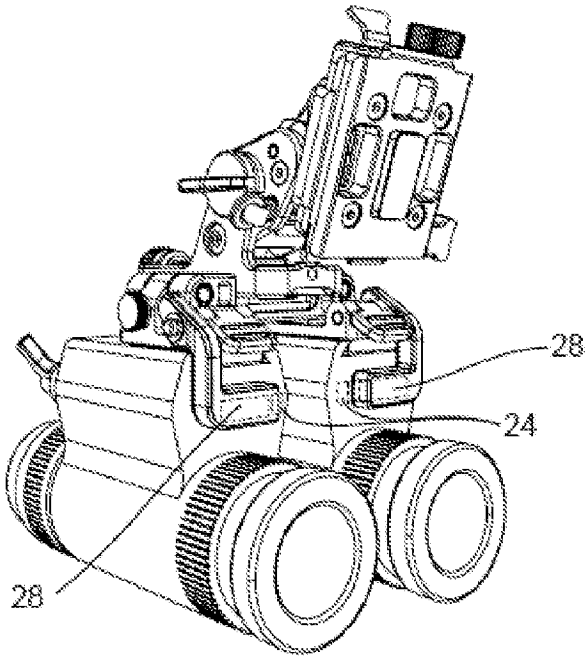
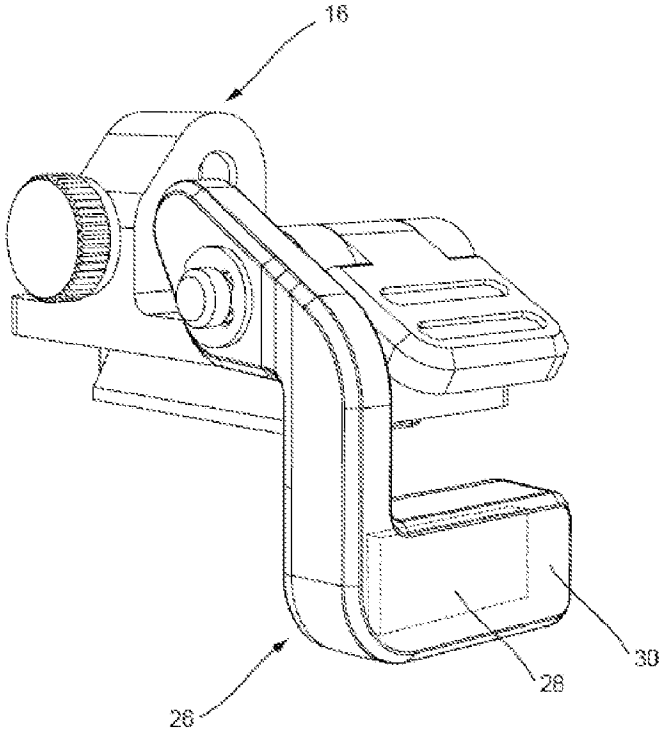


Figure 8



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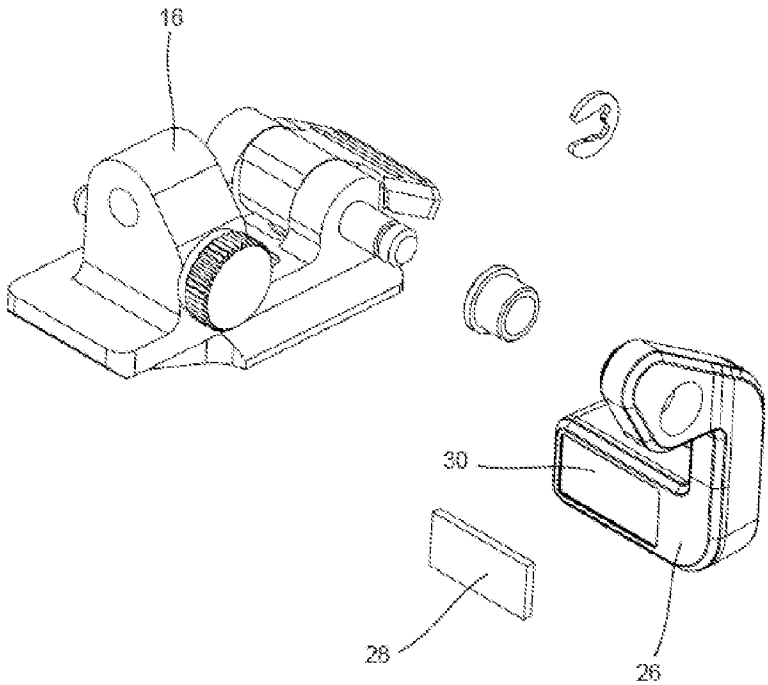

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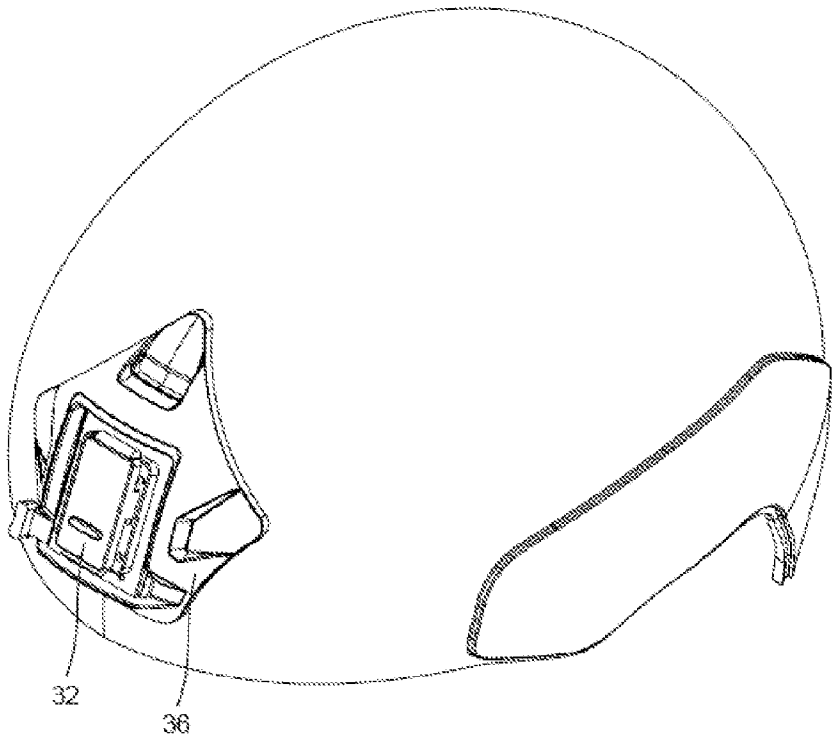
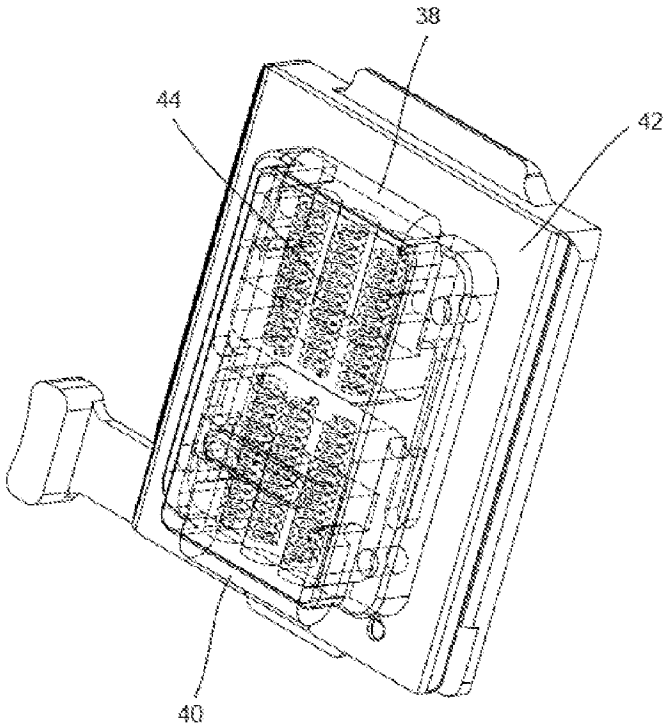


Figure 11



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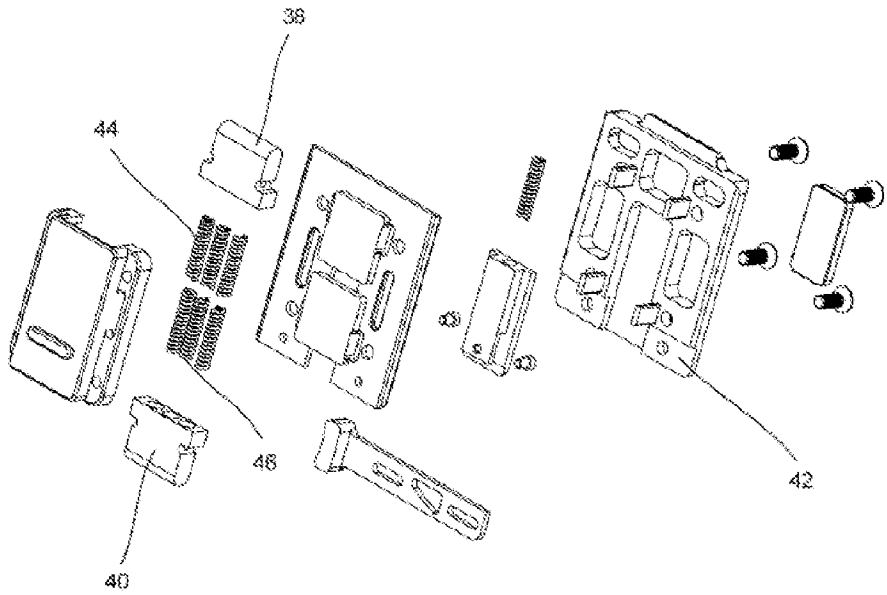
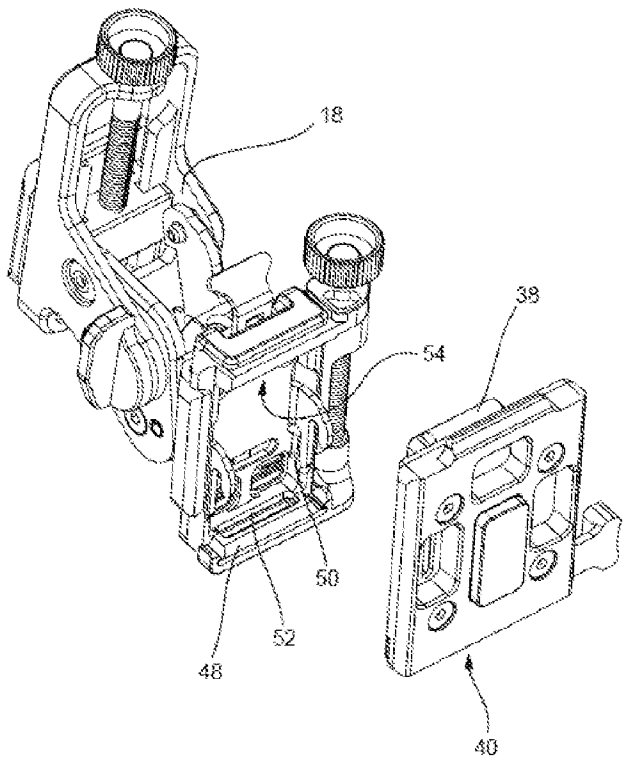


Figure 13



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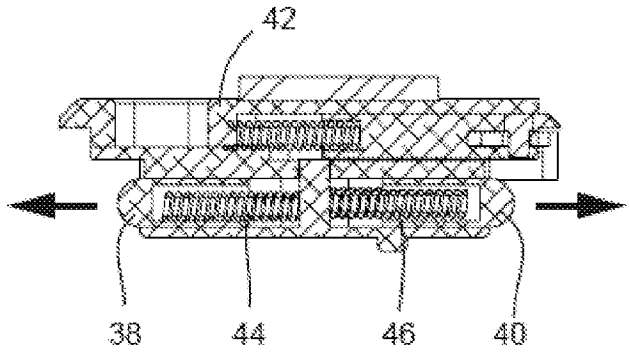

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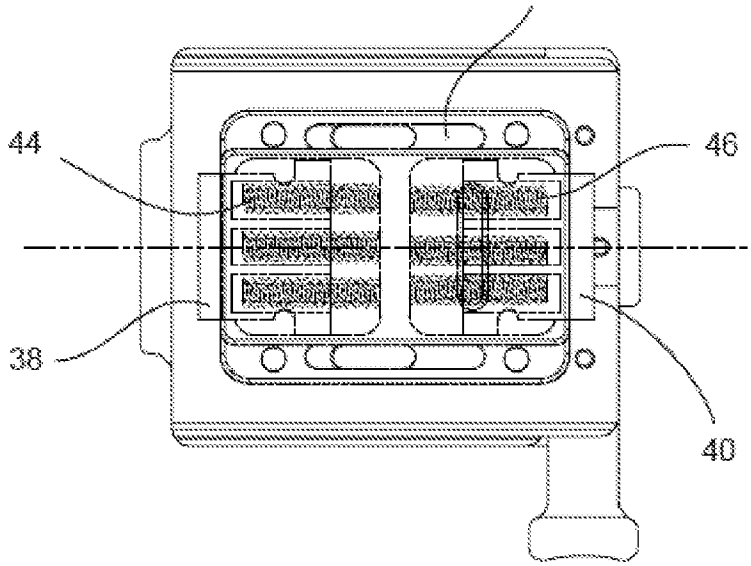

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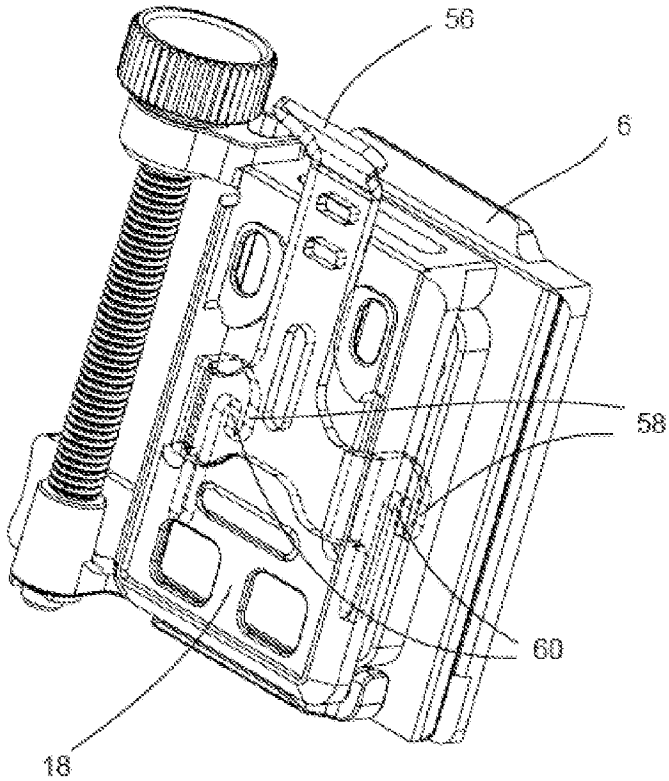

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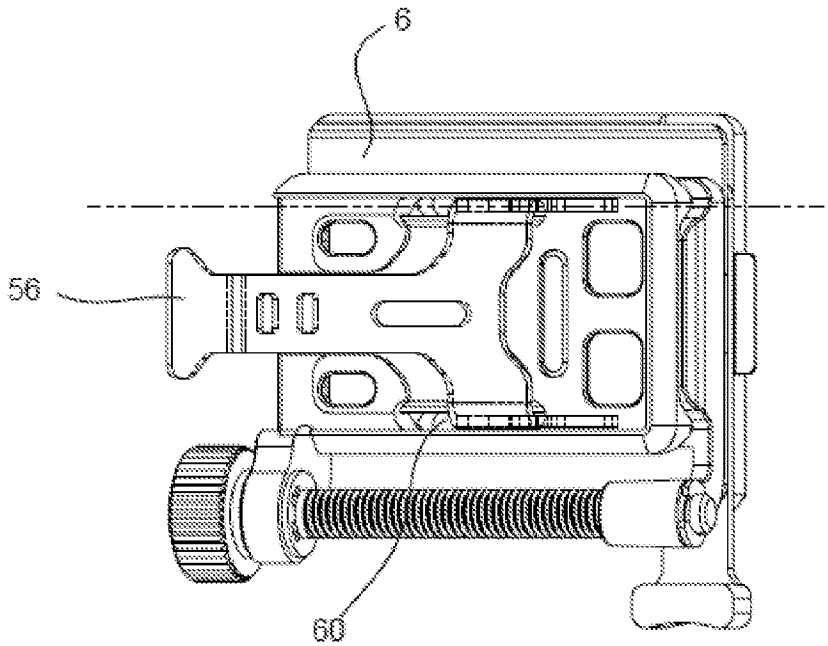

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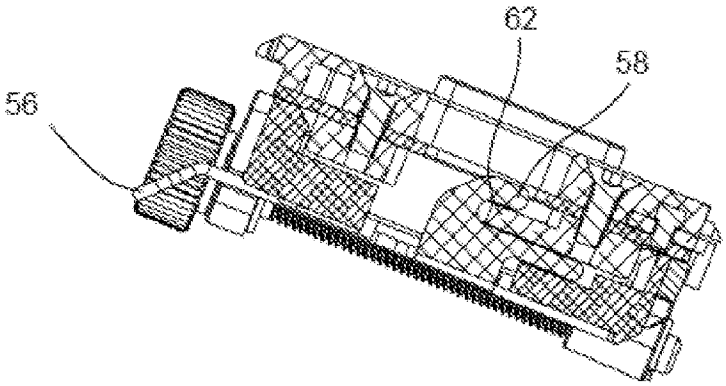

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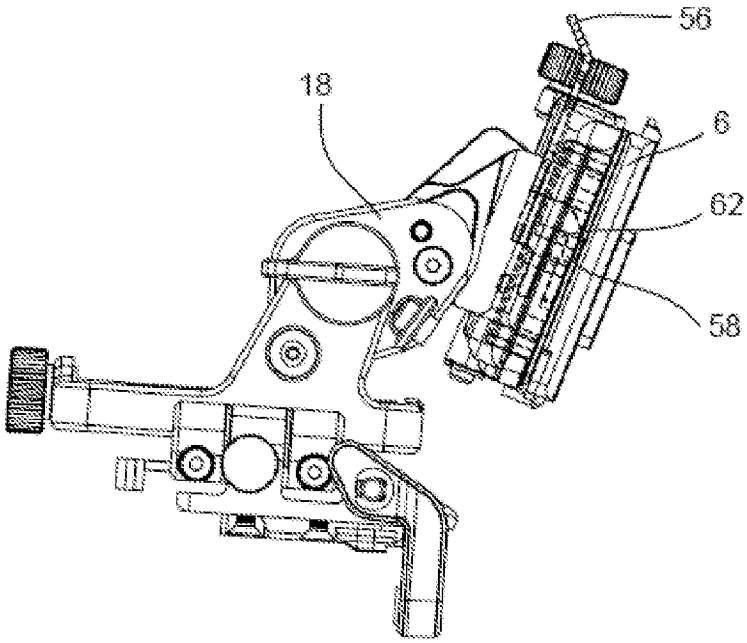

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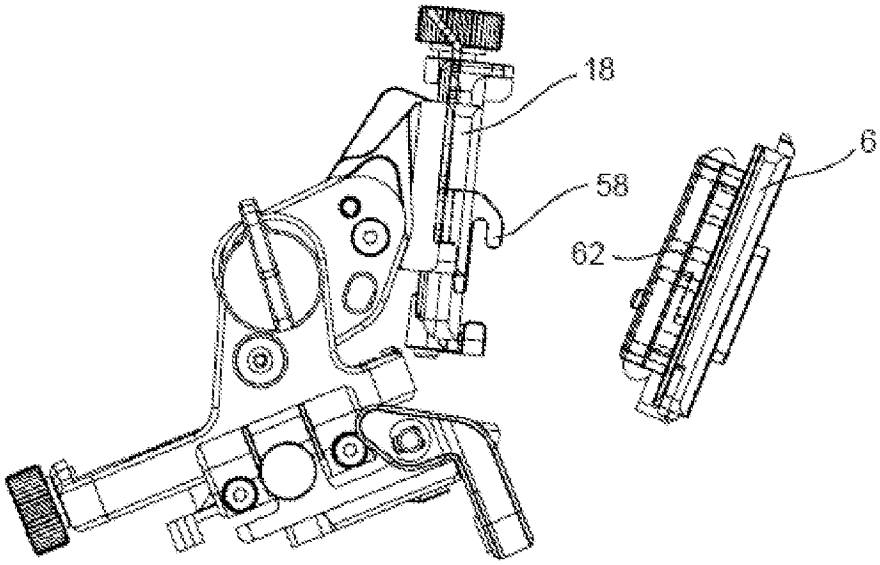

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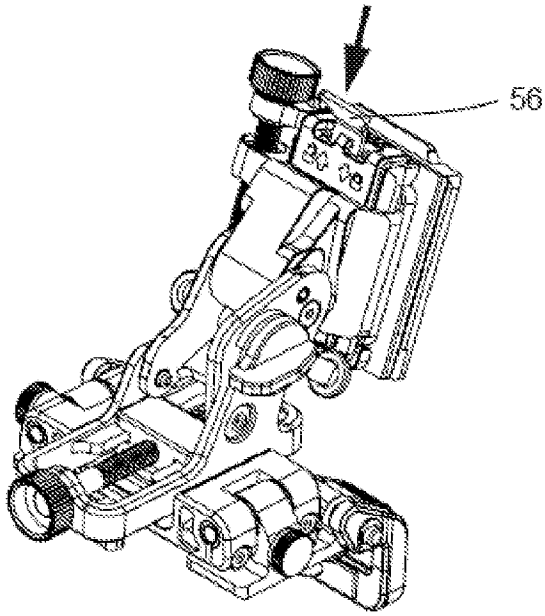

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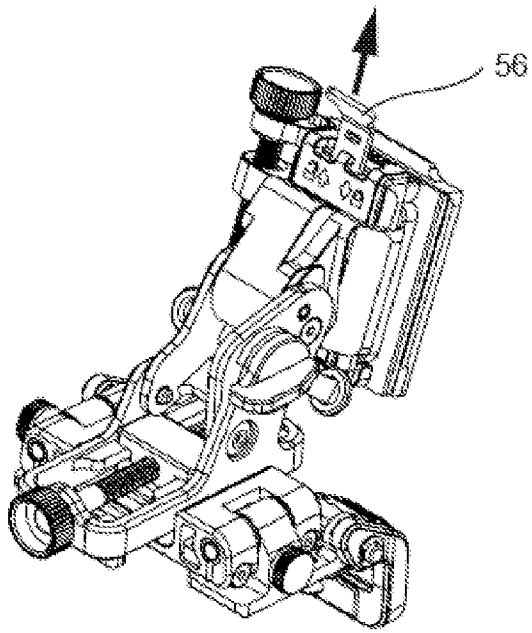

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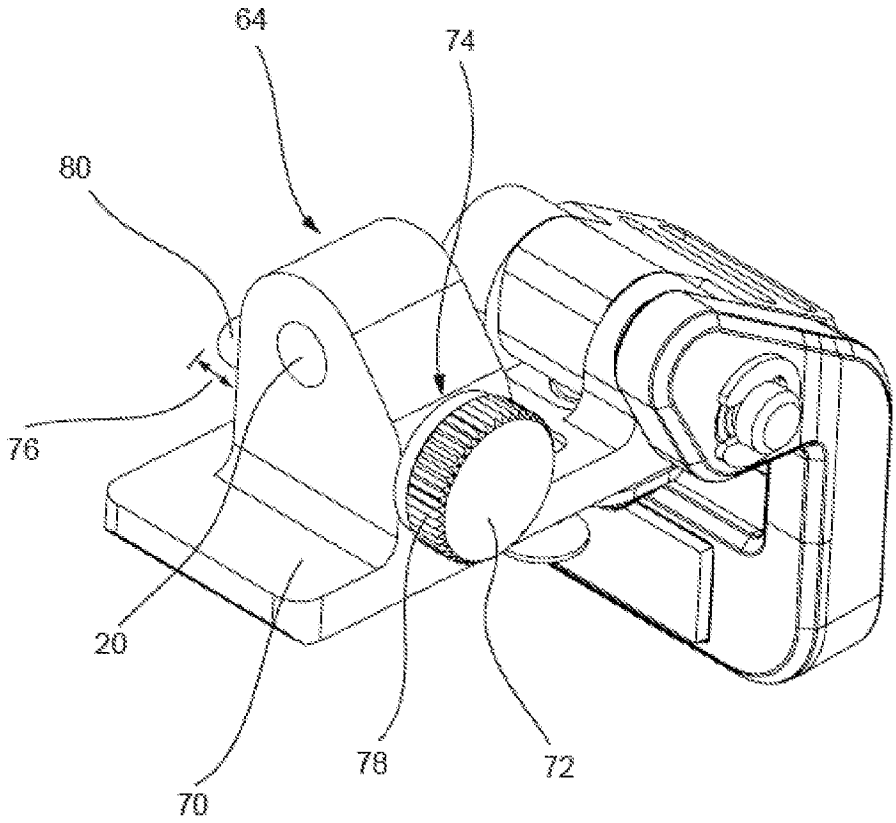

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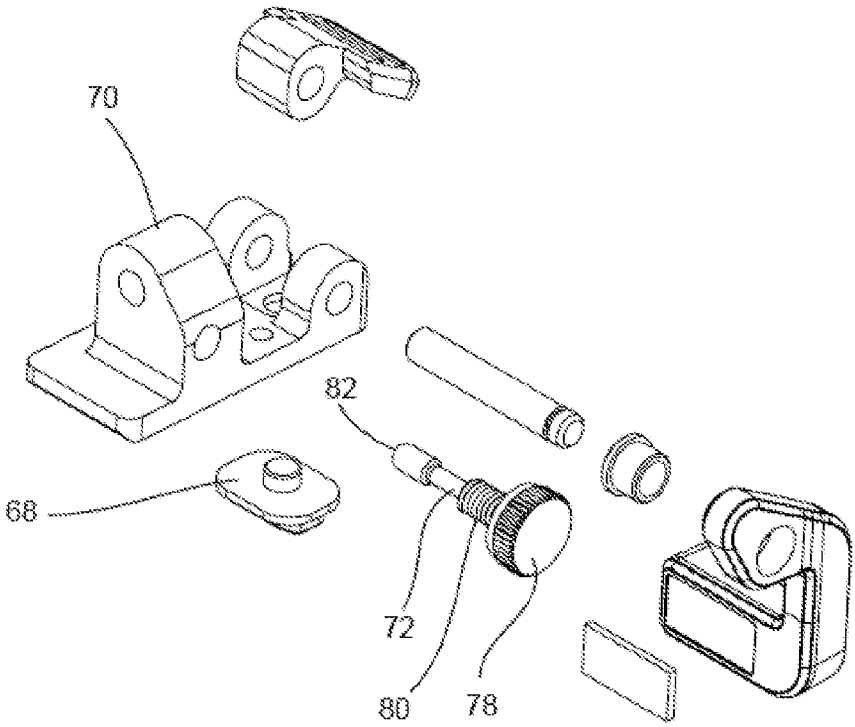

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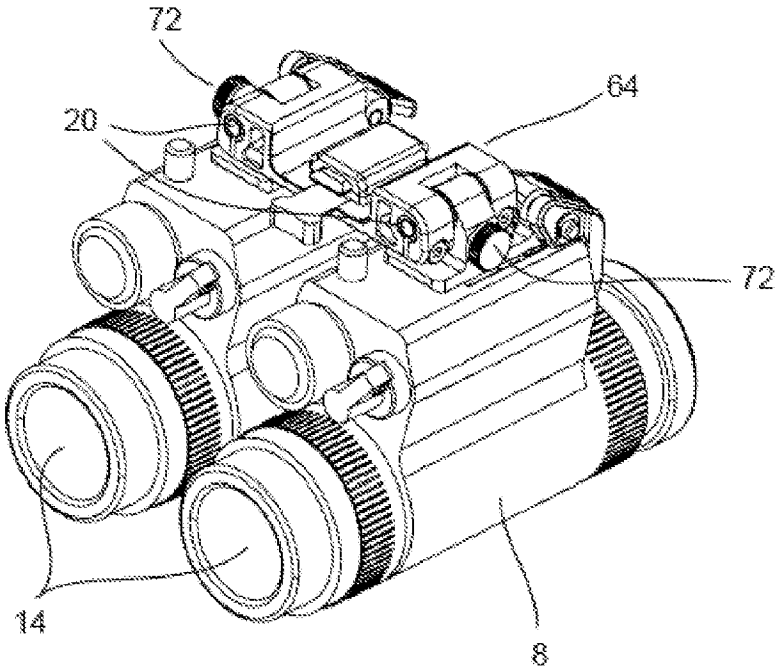

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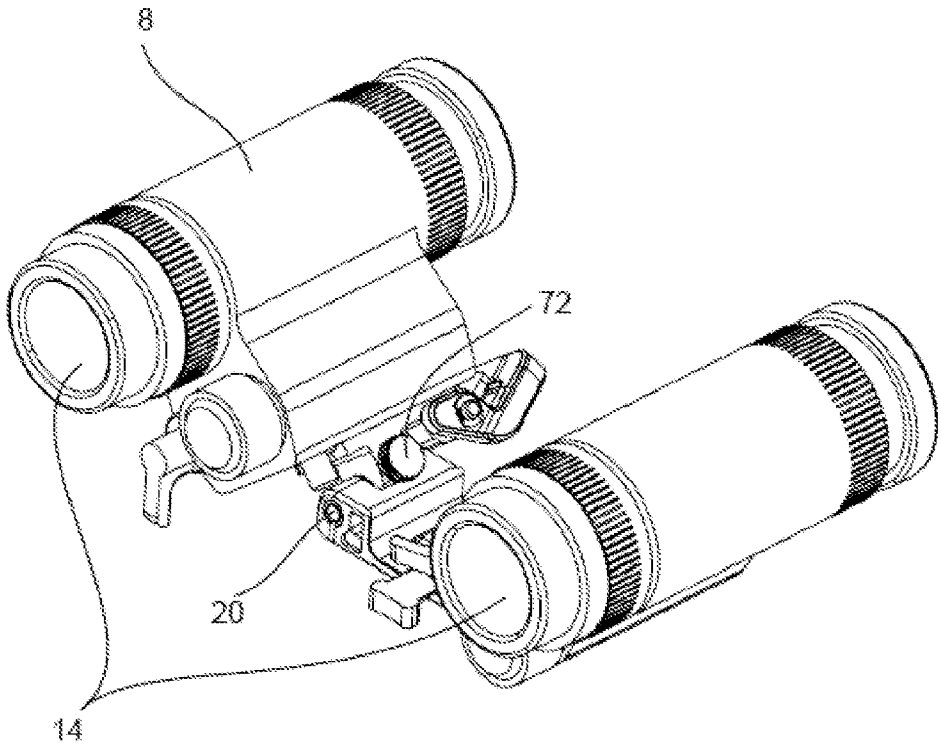

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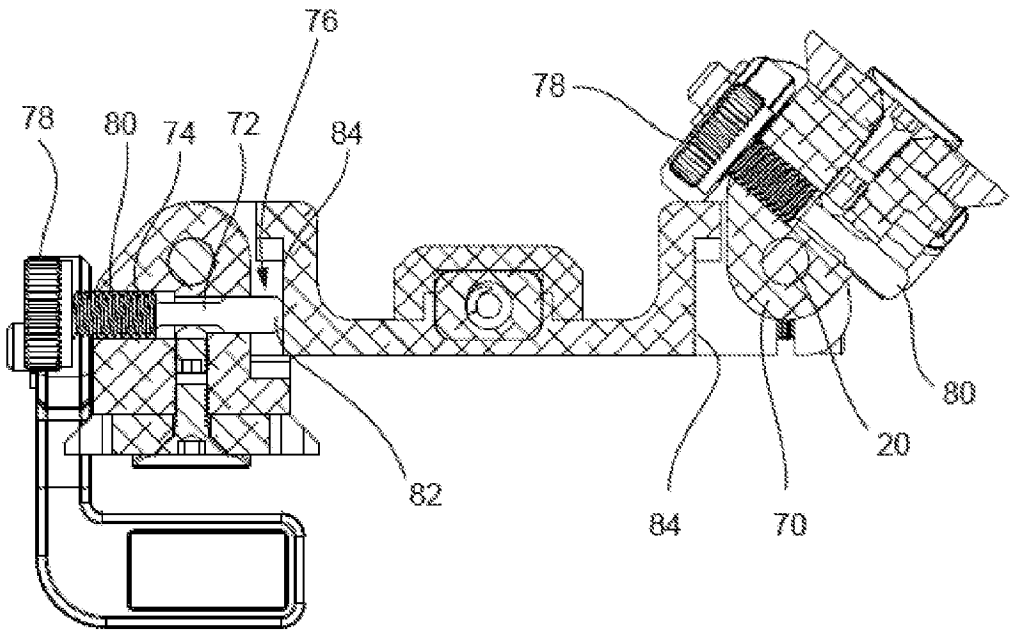


Figure 28A

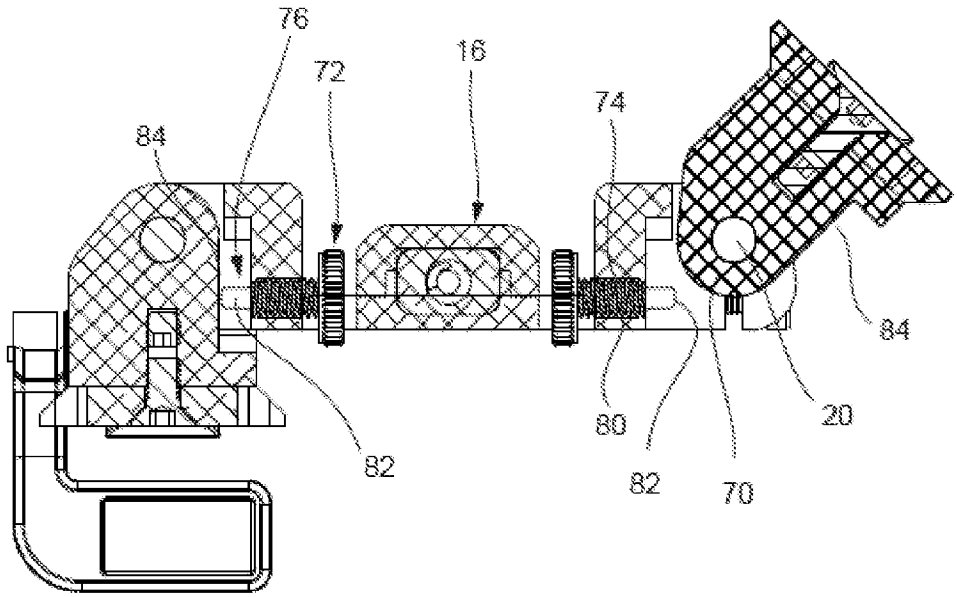


Figure 28B

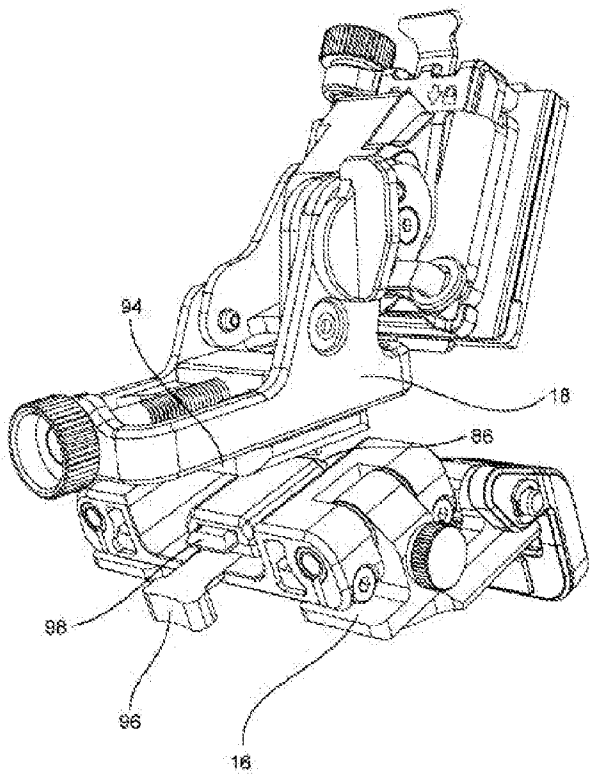
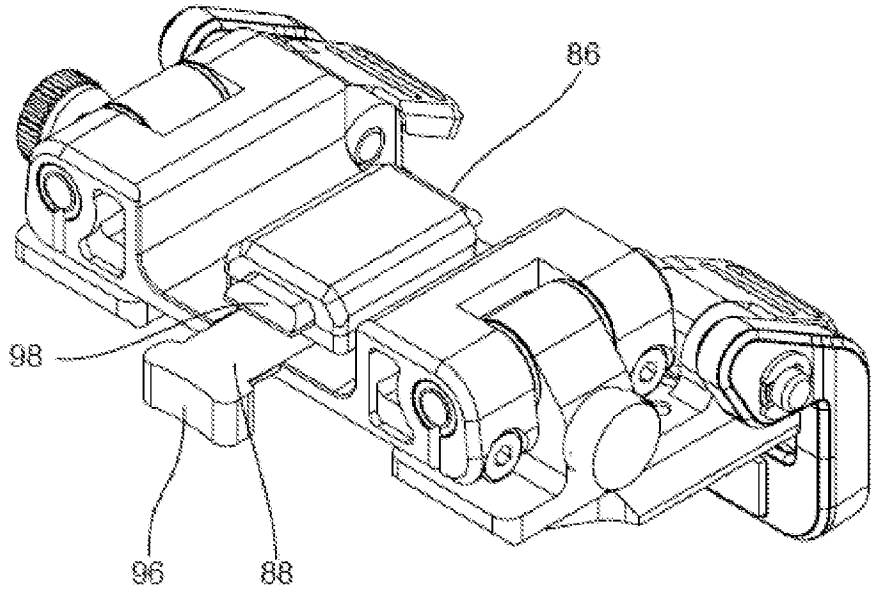


Figure 29



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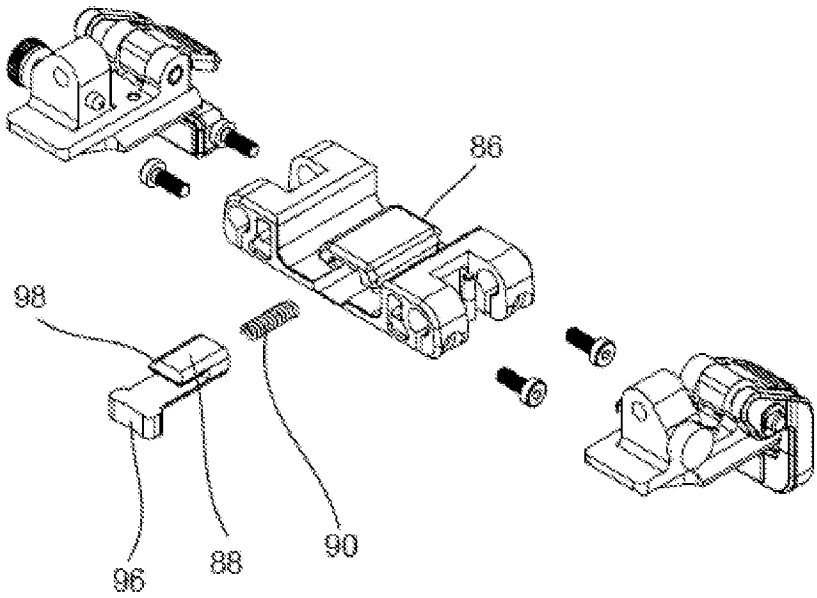

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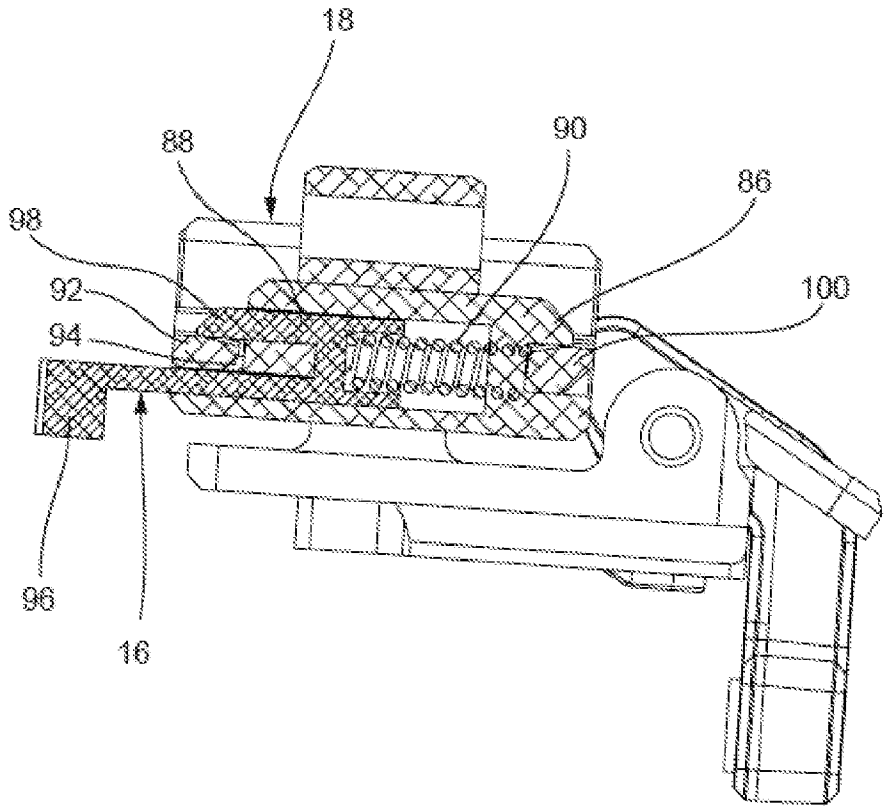
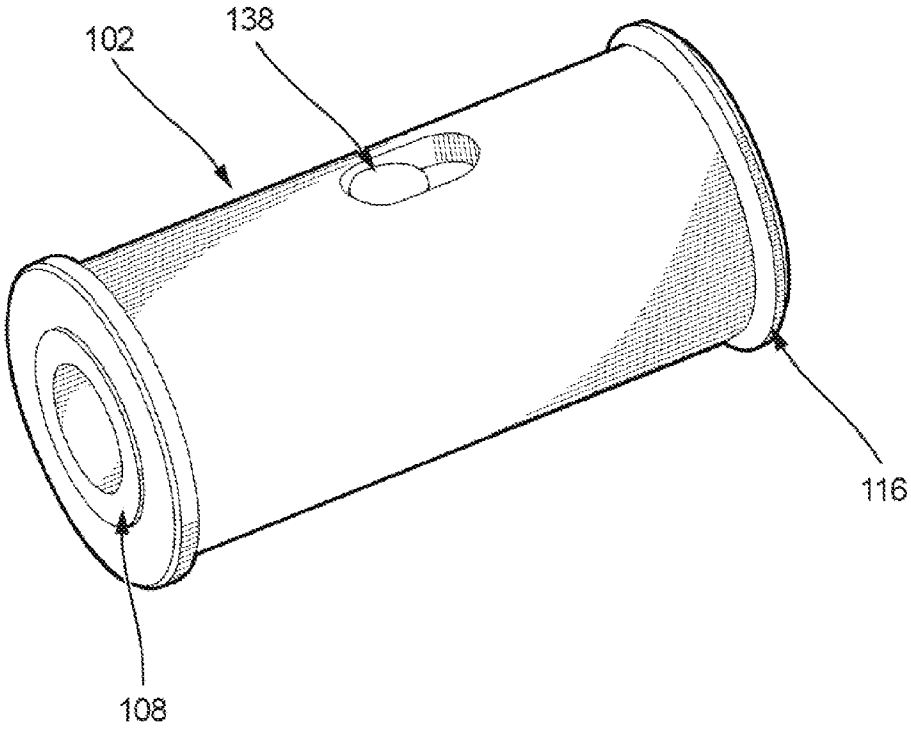


Figure 32



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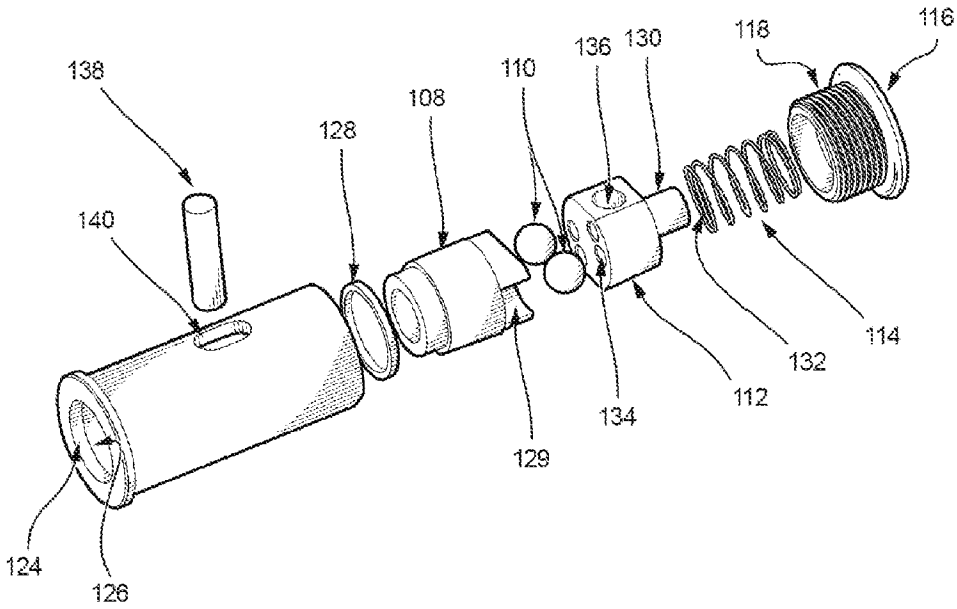

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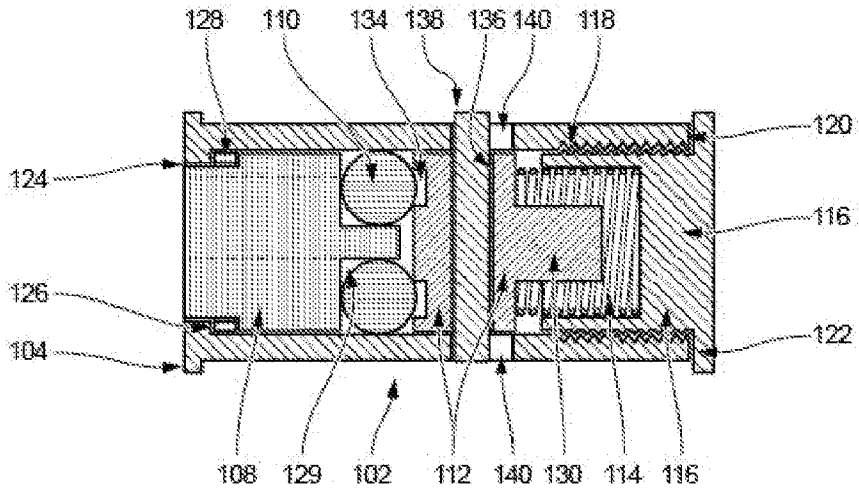

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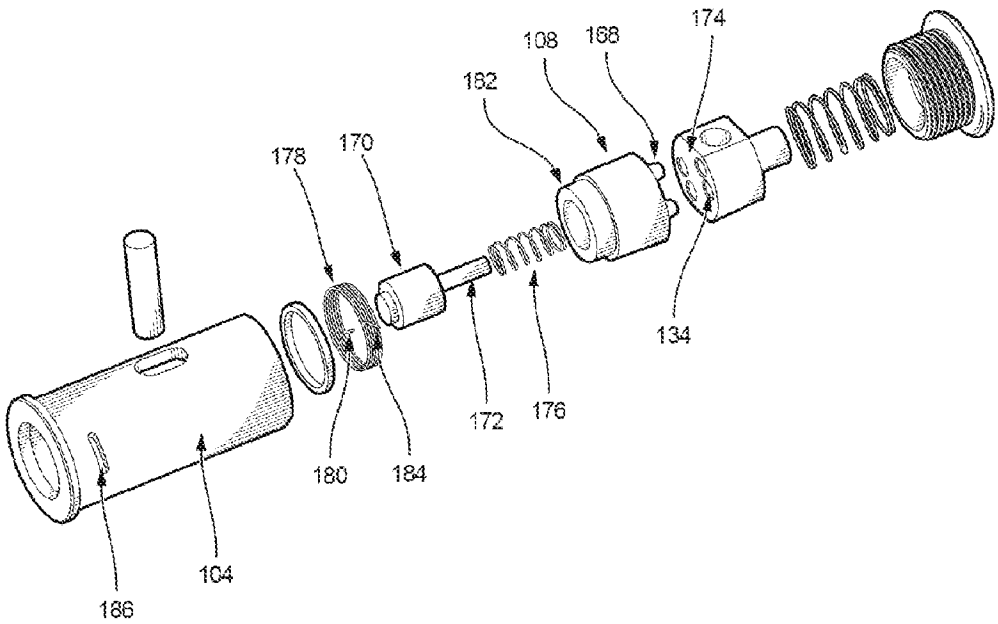

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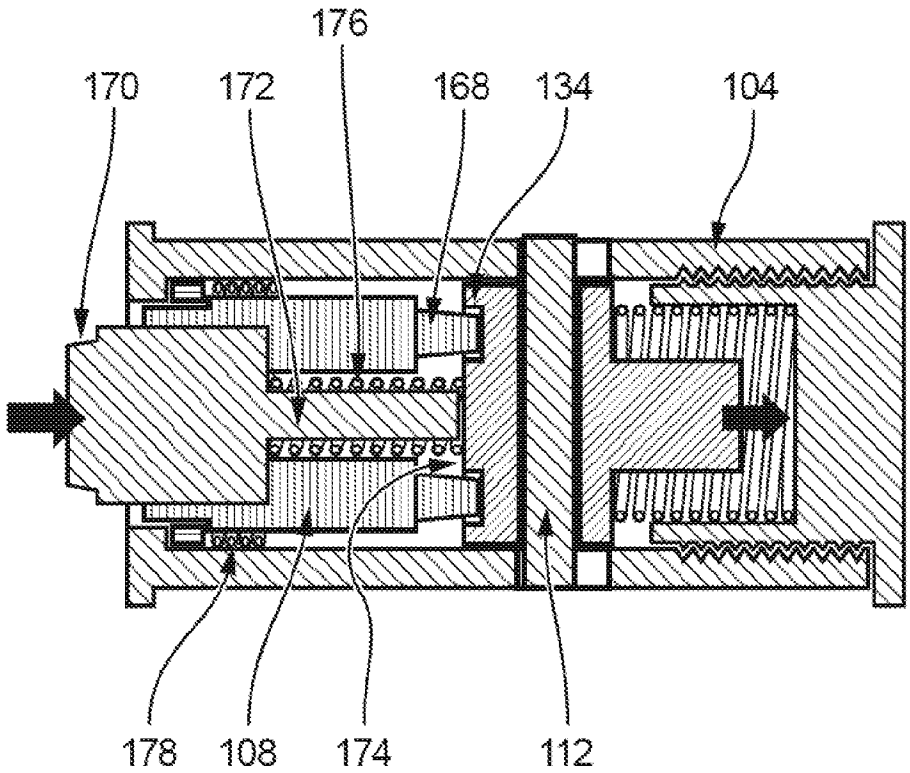

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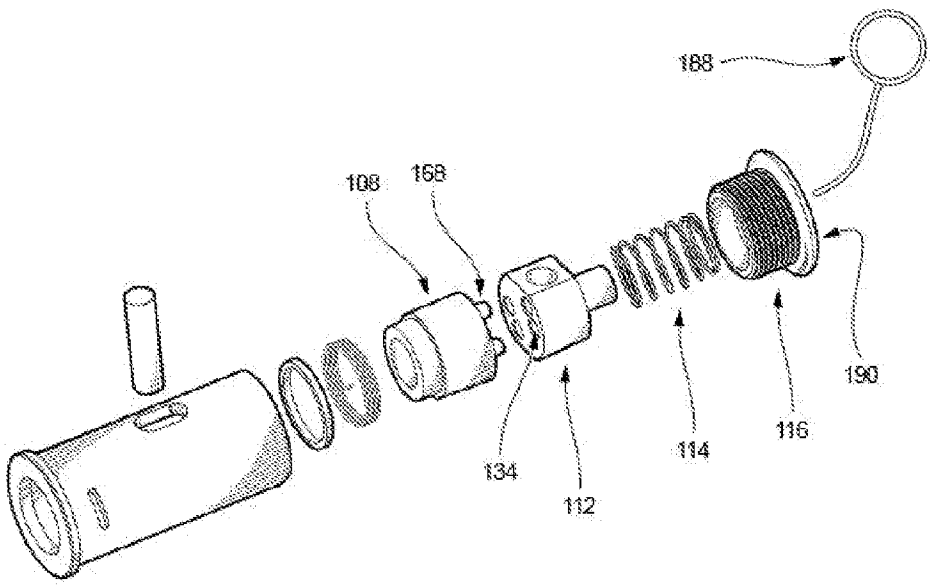

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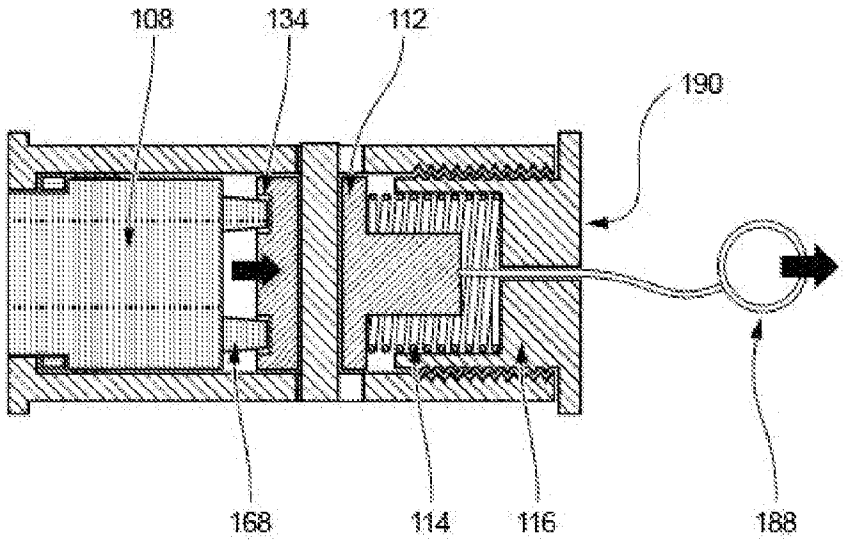

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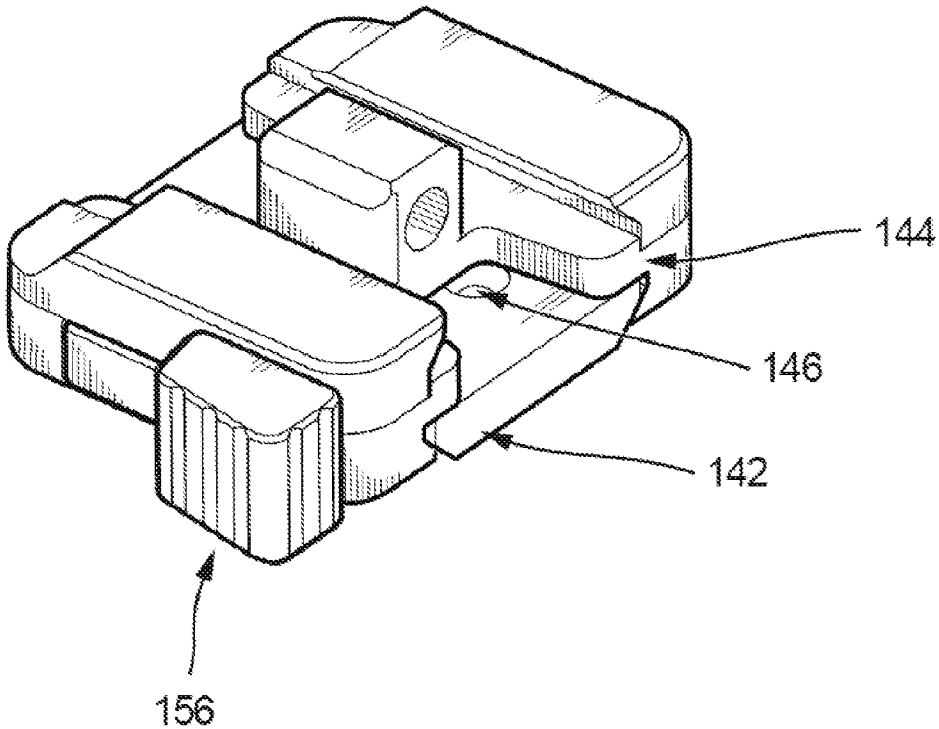


Figure 40

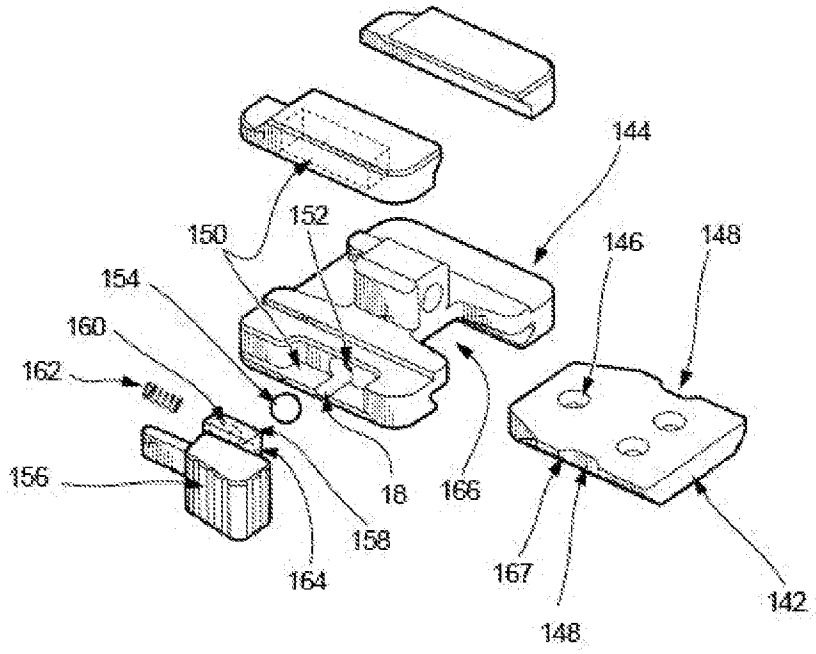
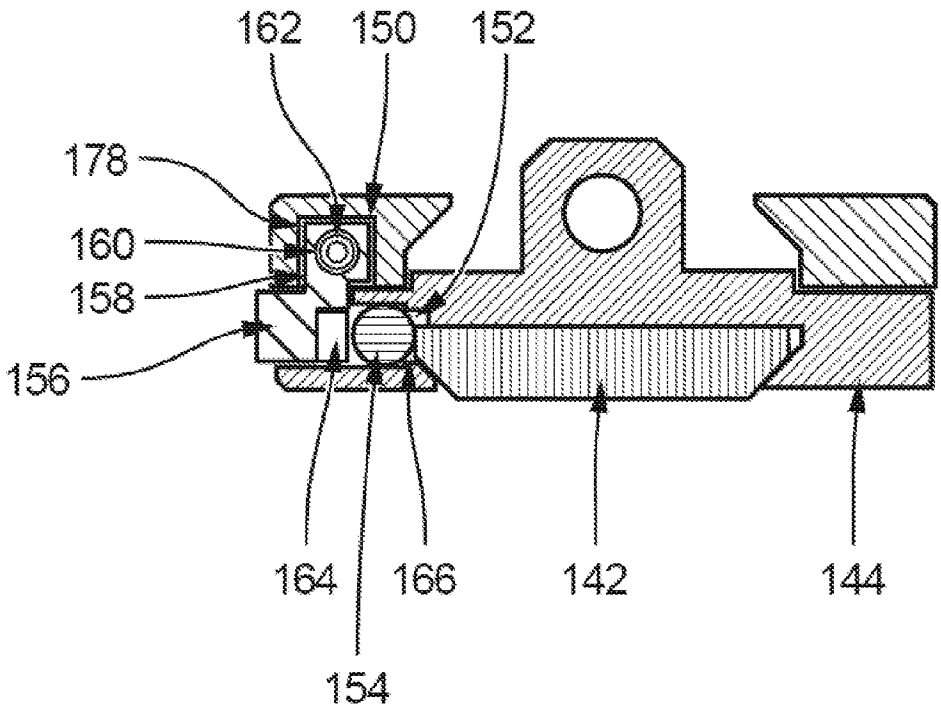


Figure 41



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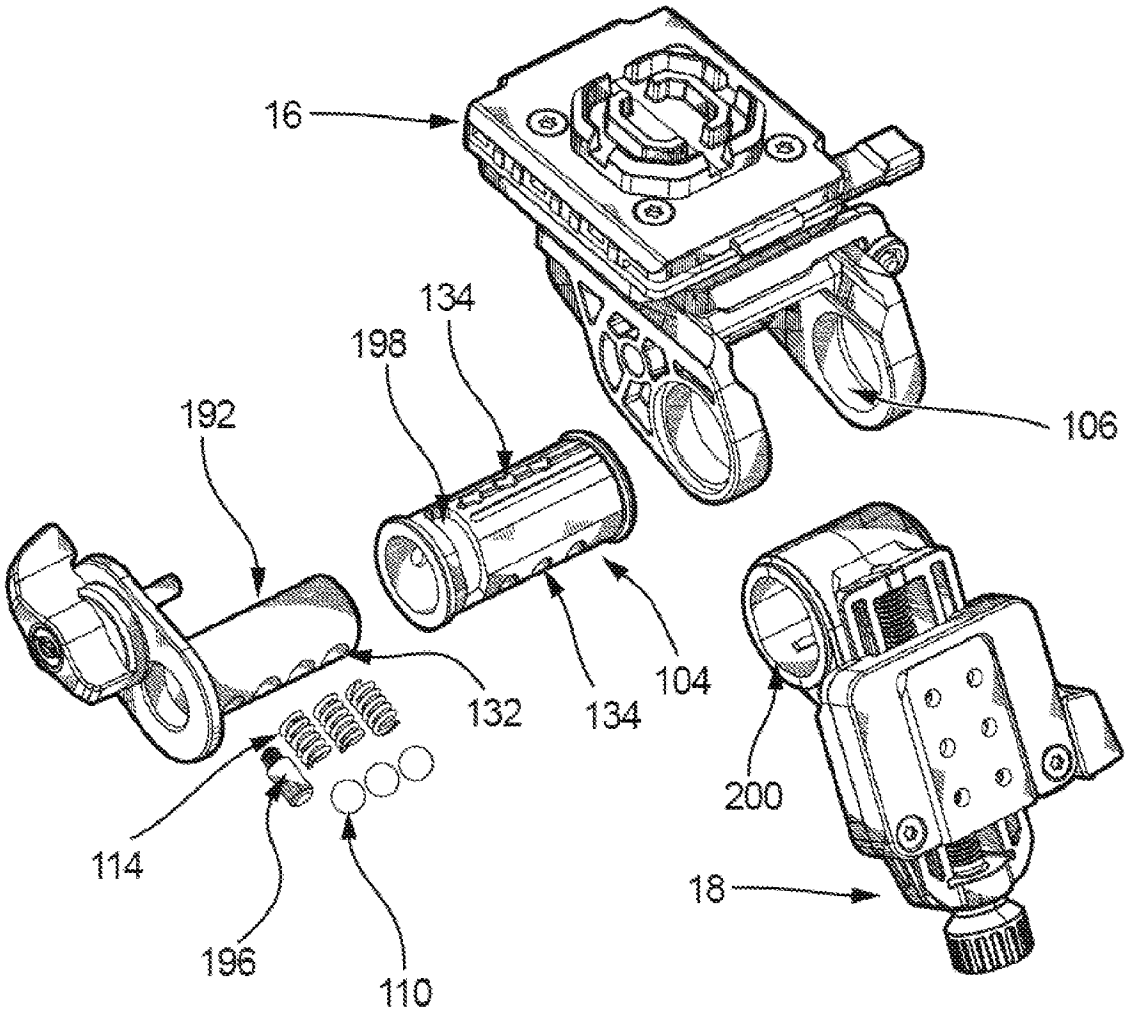

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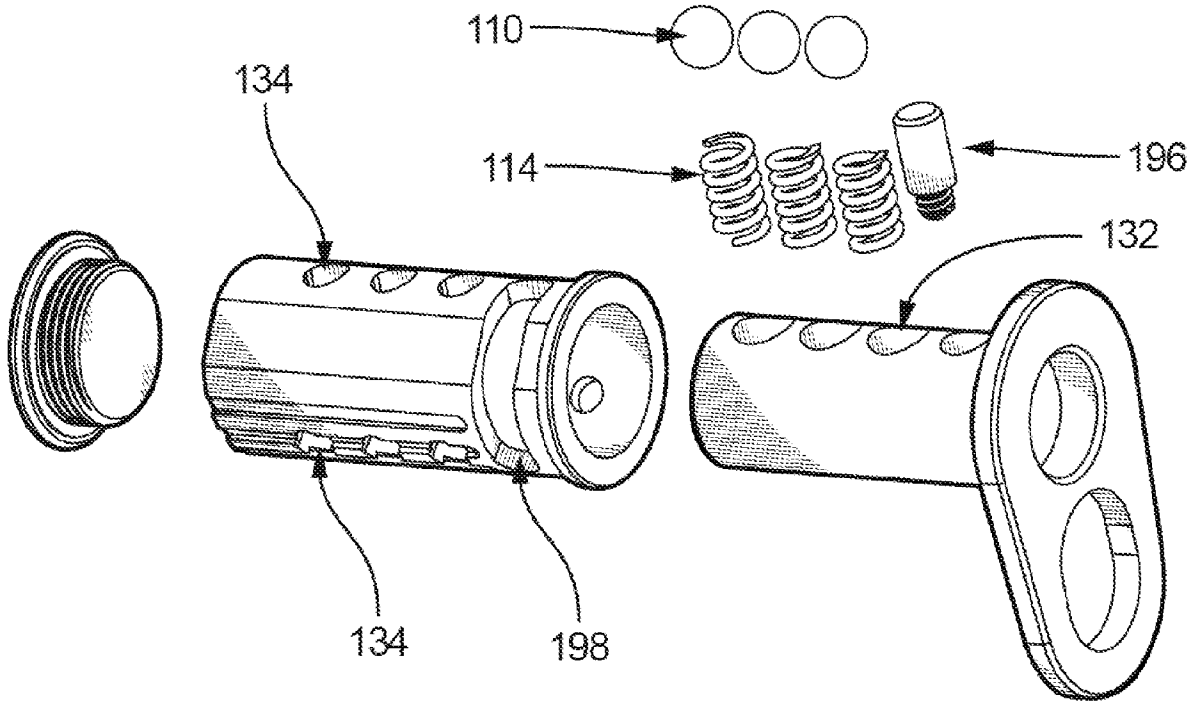

Figure 44

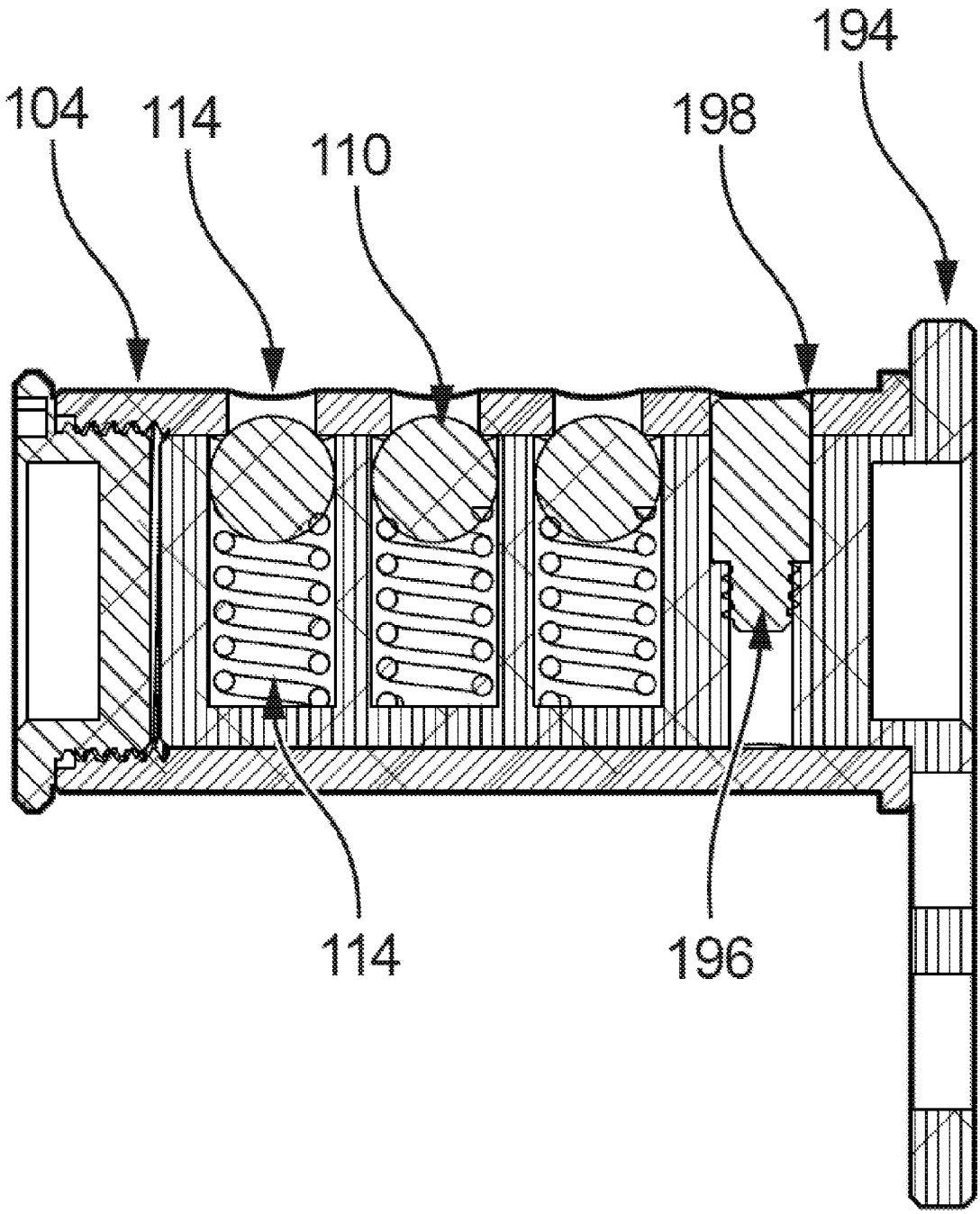

Figure 45

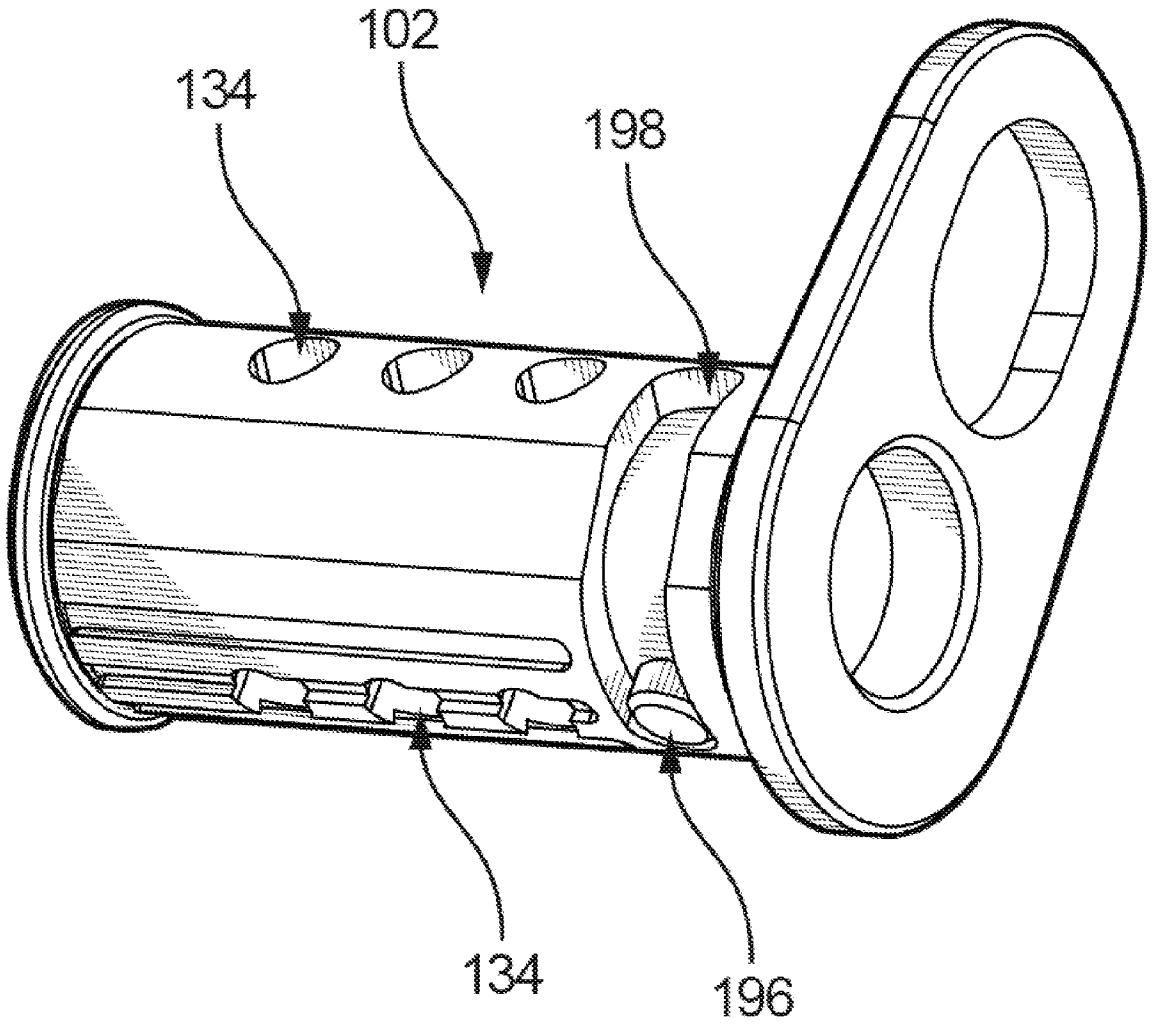

Figure 46

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2018/051403

A. CLASSIFICATION OF SUBJECT MATTER

A42B 3/04 (2006.01) G02B 23/12 (2006.01)

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)

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)

EPODOC, WPIAP, PATENW: CPC, IPC: A42B3/042, G02B23/125 and keywords: flip_up, rotate, pivot, hinge, mount, couple, join, attach, bracket, breakaway, dovetail, spring, coil, automatic, shutdown and other like terms.

Espacenet/Auspat: Applicant/Inventor name searched.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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 March 2019	18 March 2019
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Vineet Naidu AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61262832841

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2018/051403**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0120979 A1 (PRENDERGAST) 05 September 2002 Figures, PAR 0022,0088, 0074 - 0075, 0104 - 0107, 0115, 0146 - 0156	1 - 29
X	US 2014/0327962 A1 (WILCOX INDUSRIES CORP) 06 November 2014 Figures, PAR 0001, 0016 - 0018, 0025.	1 - 29
X	US 2015/0002930 A1 (WILCOX INDUSRIES CORP) 01 January 2015 Figures, PAR 0002, 0020, 0021, 0028 - 0030, claim 13	1 - 29
A	US 2004/0244099 A1 (PRENDERGAST) 09 December 2004	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2018/051403

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:

because they relate to subject matter not required to be searched by this Authority, namely:

the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including

2. ☐ Claims Nos.:

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos:

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Supplemental Box

Continuation of: **Box III**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

• Claims 1, 3 - 11, 22 - 29 (when appended to claim 1) is directed to a flip-up helmet mount for an optical device. The feature of a certain combination of an automatic shutoff mechanism is specific to this group of claims.

•Claims 2 - 11, 22 - 29 (when appended to claim 2) is directed to a flip-up helmet mount for an optical device. The feature of a certain combination of an indexed hinged pivot assembly and dovetail coupling is specific to this group of claims.

•Claims 12, 14 - 29 (when appended to claim 12) is directed to a flip-up helmet mount for an optical device. The feature of a certain combination " a breakaway means and automatic shutoff mechanism" is specific to this group of claims.

•Claims 13 - 29 (when appended to claim 13) is directed to a flip-up helmet mount for an optical device. The feature of a certain combination " a breakaway means, an indexed hinged pivot assembly and dovetail coupling" is specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship.

The only feature common to all of the claimed inventions and which provides a technical relationship among them is " a certain combination of a bracket member coupled to a helmet block, carriage chassis coupled to bracket member, a hinged pivot assembly associated with the carriage chassis, wherein the bracket member provides for rotational coupling between the carriage chassis and the helmet block, and wherein the hinged pivot assembly enables the optical device to be moved from a stowed position to an in-use position without interocular adjustment

However this feature does not make a contribution over the prior art because it is disclosed in D1 - D3 (see figures)

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied a *posteriori*.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2018/051403**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2002/0120979 A1	05 September 2002	US 2002120979 A1	05 Sep 2002
		US 6457179 B1	01 Oct 2002
US 2014/0327962 A1	06 November 2014	US 2014327962 A1	06 Nov 2014
		US 10162168 B2	25 Dec 2018
		AU 2014202000 A1	20 Nov 2014
		AU 2014202000 B2	19 Jul 2018
		GB 2514481 A	26 Nov 2014
		GB 2514481 B	28 Feb 2018
		GB 2551941 A	03 Jan 2018
US 2015/0002930 A1	01 January 2015	US 2015002930 A1	01 Jan 2015
		US 9709792 B2	18 Jul 2017
		AU 2013242851 A1	22 Jan 2015
		AU 2013242851 B2	18 Oct 2018
		US 2017184835 A1	29 Jun 2017
US 2004/0244099 A1	09 December 2004	US 2004244099 A1	09 Dec 2004
		US 6957449 B2	25 Oct 2005
		AU 2004227885 A1	21 Oct 2004
		CA 2520120 A1	21 Oct 2004
		GB 2415358 A	28 Dec 2005
		GB 2415358 B	03 Jan 2007
		WO 2004090580 A2	21 Oct 2004

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.