A video scope assembly (10) for mounting on a firearm (F) for imaging, displaying, and recording a user's view when the user is aiming and/or shooting the firearm at a target in a line of sight is disclosed. The video scope assembly (10) includes a housing (12) mounted on firearm (F), and housing a lens assembly (14), a display (16), and a recorder (18). The lens assembly (14) includes at least one lens operable to capture an image of the area surrounding and including the line of sight. The display (16) communicates with the lens assembly (14) and is operable to display the image captured thereby. The recorder (18) communicates with the lens assembly (14) and is operable to record the image captured thereby.
VIDEO SCOPE ASSEMBLY
BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to equipment for facilitating viewing, observing, aiming at, and shooting at targeted objects with a firearm. More specifically, the present invention concerns a video scope assembly for mounting on a firearm for imaging, displaying, and recording a user's view when the user is aiming and/or shooting the firearm at a target in a line of sight.

[0003] 2. Discussion of Prior Art

[0004] Firearms, including rifles, shotguns, handguns, etc., are typically aimed and/or shot at a target disposed in the user’s line of sight. These firearms typically include a stock, hardware (e.g., a trigger, a firing mechanism, a safety, etc.), and a barrel. Some firearms may additionally include a scope for magnifying the target disposed in the user’s line of sight.

[0005] Video cameras are used to record images and events as they happen in real time for later viewing. These video cameras typically include a lens, a display, a recorder, and a power source.

[0006] It is desirable to view, display, and record in real time the target disposed in the user’s line of sight as well as the area surrounding, but including, the user’s line of sight. For example, for training, recreation and/or entertainment purposes, it is desirable to record in real time the user’s line of sight while aiming and/or shooting at a target disposed therein for later viewing by the user, a trainer, or others. Although not prior art, certain aspects relating to a video scope are discussed in U.S. Pat. No. 6,070,355 issued to the inventor of the current application, Frederick A. Day, and is therefore submitted with the IDS for the examiner’s convenience.

[0007] Known prior art video scopes include various video camera components in combination with one or more firearm components to provide real time recording of the user’s line of sight. These prior art video scopes are problematic and have several limitations. For example, prior art video scopes are not readily and easily mounted onto typical, commercially available firearms without the need for significant reconfiguring of the existing firearm components.

SUMMARY OF THE INVENTION

[0008] The present invention provides an improved video scope assembly that does not suffer from the problems and limitations of the prior art video scopes set forth above. The inventive video scope assembly provides a compact unitarily housed assembly that is readily and easily mounted onto most commercially available firearms without requiring substantial reconfiguring of the existing components.

[0009] The video scope assembly of the present invention broadly includes a housing operable to mount on a firearm, a lens assembly associated with the housing and including at least one lens operable to capture an image of the area surrounding and including the line of sight, a display associated with the housing and communicating with the lens assembly and operable to display the image captured by said at least one lens, and a recorder associated with the housing and communicating with the lens assembly and operable to record the image captured by said at least one lens.

[0010] Other aspects and advantages of the present invention will be apparent from the following detailed description of the preferred embodiments and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0011] Preferred embodiments of the invention are described in detail below with reference to the attached drawing figures, wherein:

[0012] FIG. 1 is a side elevational view of a video scope assembly constructed in accordance with a preferred embodiment of the present invention and shown mounted on a firearm;

[0013] FIG. 2 is a side elevational view the video scope assembly shown with the firearm;

[0014] FIG. 3 is a plan view of the video scope assembly shown with the firearm;

[0015] FIG. 4 is a side elevational view of a video scope assembly constructed in accordance with an alternative embodiment of the present invention and shown in combination with a firearm having a scope (portions thereof illustrated in phantom);

[0016] FIG. 5 is a side elevational view of a video scope assembly constructed in accordance with an alternative embodiment of the present invention shown in combination with a firearm having a scope;

[0017] FIG. 6 is a fragmentary plan view of the video scope assembly illustrated in FIG. 5 and shown in combination with the firearm;

[0018] FIG. 7 is a representative illustration of a view captured by the video scope assembly illustrated in FIG. 5 as seen on the display screen;

[0019] FIG. 8 is a side elevational view of a video scope assembly constructed in accordance with an alternative embodiment of the present invention shown in combination with a firearm;

[0020] FIG. 9 is a side elevational view of a firearm having a video scope assembly integrally formed therein and constructed in accordance with an alternative embodiment of the present invention; and

[0021] FIG. 10 is a side elevational view of the firearm illustrated in FIG. 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] FIGS. 1-3 illustrate a video scope assembly 10 constructed in accordance with a preferred embodiment of the present invention and configured for mounting on a firearm F. The firearm F includes a stock S, hardware H, and a barrel B. The illustrated firearm F is a rifle, however, the principles of the present invention are applicable to any suitable firearm including rifles, shotguns, handguns, etc. The video scope assembly 10 broadly includes a housing 12, a lens assembly 14, a display 16, and a recorder 18.
The housing 12 includes an exterior wall that defines an internal electronics-housing chamber disposed between opposing open end sections. The open end sections of the housing 12 are configured so that when the housing 12 is mounted on the firearm F, the open end sections are generally axially aligned with the barrel B with one of the ends, the stock-end, adjacent the butt of the firearm F, and the opposing end, the barrel-end, adjacent the barrel B. The housing 12 is configured to house the lens assembly 14, the display 16 and the recorder 18 so that the entire video scope assembly 10 can be easily and removably coupled to most commercially available firearms. Particularly, the housing 12 is coupled to the firearm F by a base assembly including a base 20, clamp plates 22, and fasteners (not shown). The base 20 is configured to mount on the rear portion of the barrel B generally above the hardware H without interfering therewith. The base 20 is formed of two complimentary halves that fit around the barrel B and are joined by the clamp plates 22. An opening 24 is formed in one of the halves of the base 20 to allow sufficient clearance for operation of the hardware H (e.g., ejection of a spent cartridge). The base 20 includes a lipped top surface having grooves transversely aligned relative to the barrel B and operable to receive ridges formed in the bottom of the housing 12 that mirror the contour of the grooves. The clamp plates 22 fit over the lip in the top surface of the base 20 and over a similar lip formed in the bottom surface of the housing 12. The clamp plates 22 each include an aperture therein operable to receive a corresponding fastener (e.g., a bolt for each pair of opposing clamp plates 22 and a pair of corresponding nuts), for securing the clamp plates 22 in place to couple the housing 12 to the firearm F. The ridges in the housing 12 and the clamp plates 22 are configured so that they also function (without the base 20) to couple the housing 12 to a firearm already equipped with a scope mount (e.g., a Stenag-Weaver type base). The housing could be coupled to the firearm using various alternative methods, for example, the housing could include integrally formed rings operable to secure the housing to a base. It is important however, that the coupling mechanism provides for removably attaching the housing to a wide variety of commercially available firearms.

The lens assembly 14 is housed within the housing 12 so that a portion thereof extends out of the open barrel-end of the housing 12. In one manner known in the art, the lens assembly 14 includes an optical imaging and processing system comprising a lens group 26, a filter (not shown), and a converter (not shown). The lens group 26 is preferably a zoom lens including a fixed lens, a variable power lens, and a focusing lens, with the variable power and focusing lenses being moved by lens driving mechanisms (e.g., stepping motors) as is well known in the art. In this regard, a zoom switch 28 is included for selectively controlling the lens group 26 (e.g., between various degrees of wide angle and telephoto magnification). The zoom switch 28 is located on the stock S, and communicates with the lens group 26. The zoom switch 28 preferably communicates through free space transmission (e.g., a remote control type switch) with the lens group 26; however, the switch could utilize any suitable method of communication with the lens group and can be located in any suitable location accessible by the user (e.g., on the housing itself). The optical imaging system preferably is a conventional system that provides optical correction and adjustment of objects characterized by visible light radiation; however the imaging system could utilize infrared or thermal radiation characterizations of the object. The imaging system preferably includes reticle capabilities (e.g., cross hairs superimposed on a portion of the image) for facilitating the use of the video scope as a traditional variable power scope. The imaging system could be variously configured and additionally include a wide variety of options known in the art, such as auto focusing.

Once an optical image is created, the converter converts it to an electrical representation. The converter could utilize any suitable conversion system that generates an appropriate output signal (e.g., charge-coupled device, raster/scan type device, etc.); however, the output signal generated preferably includes both luminance and color components. The converter is communicatively coupled (e.g., fiber optically, coaxially, free space transmission, etc.) to the display 16.

The display 16 is a conventional video display system that regenerates an optical image from the electrical representation thereof. The regenerated image is observed on either a firearm sight—an eyepiece-type viewfinder 30—or a video display screen 32. The viewfinder 30 is pivotally mounted to the housing 12 so that a portion thereof extends out of the open stock-end of the housing 12. The screen 32 is preferably a color liquid crystal display and is pivotally mounted on one side of the exterior wall of the housing 12. As illustrated in FIG. 3, the screen 32 pivots between an open position, wherein the screen 32 is visible by the user while aiming and/or shooting the firearm F at a target in the line of sight, and a closed position as illustrated in FIG. 2, wherein the screen 32 is adjacent the exterior wall of the housing 12. The display 16 could be variously configured and additionally include a wide variety of options known in the art.

The converter and the display 16 are communicatively coupled to the recorder 18. The converter outputs the electrical representation of the object to the recorder 18 for recording onto a recording media 34. The recorder 18 also is operable to communicate the recorded imagery to the display 16 for playback viewing thereof. The recorder 18 is housed in, and forms a portion of, the exterior wall of the housing 12 on the side opposite the screen 32. The recorder 18 includes a loading cover 36 slidably mounted to the housing 12 that slides open to allow loading and removal of the recording media 34. Included on the top surface of the housing 12 is a load/ eject switch 38, communicating with the recorder 18 to selectively control sliding of the loading cover 36. Included in the exterior wall of the housing 12 adjacent the recorder 18 is a panel of playback control buttons 40 including various buttons that control the operation of playback of the recorded imagery. The recorder 18 is a conventional video tape recorder recording unit and the recording media 34 is an 8-mm tape; however, any suitable recording unit and media could be utilized.

Removably housed in the exterior wall of the housing 12 adjacent the recorder 18 is a power source 42 in power communication with the lens assembly 14, the display 16, and the recorder 18. The power source 42 is a conventional rechargeable battery having suitable power and size requirements to power the video scope assembly 10. However, the power source could be any suitable device and include various options known in the art, such as an adapter.
to enable an AC power source in combination with a battery pack for powering the assembly and recharging the battery.

An On/Off switch 44 is included for selectively controlling power to the video scope assembly 10. As illustrated in FIG. 2, the On/Off switch 44 is located on the stock S₉ with internal wiring (not shown) connecting the switch 44 with the power source 42; however, if it is undesirable to reconfigure the stock for accepting the switch, the switch can be located in any suitable location accessible by the user (e.g., on the housing itself).

[0029] The lens assembly 14, the display 16, and the recorder 18 are components common to many commercially available video cameras and therefore it is with the ambit of the present invention to utilize any alternative configurations and options in the art for these components that are suitable for the video scope assembly. For example, an audio recording unit such as a microphone system could be utilized. In addition, prior art configurations and options for variable power scopes could also be utilized in the video scope assembly without exceeding the ambit of the present invention. As previously discussed, the video scope assembly 10 is a self-contained unit housing all of the components thereof and easily and removably mounts to the firearm F in a manner similar to that used for mounting conventional scopes. However, it is with the ambit of the present invention to utilize an existing scope to capture the image of the target in the line of sight for recording thereof. It is also within the ambit of the present invention to utilize alternative methods of mounting the video scope assembly components that do not employ a unitary housing but still require minimal, relatively easy reconfiguration of conventional firearms.

[0030] In this regard, FIG. 4 illustrates a video scope assembly 100 constructed in accordance with an alternative embodiment of the present invention and configured for mounting on a firearm F. The firearm F illustrated in FIG. 4 is similar to the firearm illustrated in FIGS. 1-3 and includes a stock S₉₁, hardware H, and a barrel B. However, the firearm F illustrated in FIG. 4 further includes a scope S₉₂. The illustrated scope S₉₂ is a conventional variable power scope including objective, erector, zoom, and ocular lens arrangements and having a reticle assembly; however, the scope could be any type of conventional scope. The video scope assembly 100 broadly includes a recorder 102 and a converter 104.

[0031] The recorder 102 is housed in the butt of the stock S₉₂. The stock S₉₂ can either be reconfigured to accept the recorder 102 or a new butt section housing the recorder 102 can be interchanged for the existing butt section. The recorder 102 is similar to the recorder 18 of the video scope assembly 10, and therefore will not be further described in detail. The recorder 102, however, is not connected to a dedicated display and therefore must either be linked to a display for playback viewing or the recording media must be inserted into a separate device for playback viewing.

[0032] The recorder 102 is communicatively coupled (e.g., fiber optically, coaxially, etc.) to the converter 104 by an external cable 106. The converter 104 is housed in a connector operative to communicatively couple the converter 104 to the scope S₉₂. The converter 104 is similar to the converter of the video scope assembly 10 discussed above and converts the image captured by the scope S₉₂ into an electronic representation and outputs the representation to the recorder 102.

[0033] The video scope assembly 100 includes a power source 108 (similar to the previously discussed power source 42) removably housed within the butt section of the stock S₉₂ and in power communication with the recorder 102 and the converter 104. The butt section includes an end wall 110 that pivots relative to the butt section to allow access to the power source 108 for loading and removal thereof.

[0034] It is within the ambit of the present invention to utilize multiple lenses housed in spaced apart locations, for example, in order to capture two images while still maintaining the traditional image viewed through a conventional scope. Such an arrangement, for example, could provide a view of a magnified target in the line of sight through the scope and an image of the area surrounding the line of sight viewed through a separate display. These images could be superimposed for recording and later viewing. In this regard, FIGS. 5-7 illustrate a video scope assembly 200 constructed in accordance with an alternative embodiment of the present invention and configured for mounting on a firearm F. The firearm F illustrated in FIG. 5 is similar to the firearm illustrated in FIG. 4 and includes a scope S₉₃, in addition to a stock S₉₅, hardware H, and a barrel B. The video scope assembly 200 broadly includes a lens assembly 202, a display 204, a recorder 206, and a converter 208.

[0035] The video scope assembly 200 is similar to the video scope assembly 100 previously described; however, the assembly 200 additionally includes the lens assembly 202 and the display 204. The lens assembly 202 and the display 204 are unitarily housed in a camera device mounted adjacent the front end of the stock S₉₅, in general alignment with, and just below the barrel B. The lens assembly 202 is operable to capture an image surrounding, but including, the line of sight as viewed through the scope S₉₃. The lens assembly 202 operates in a manner similar to the lens assembly 14 previously discussed, and preferably includes auto focusing capabilities; however, the lens assembly 202 could be configured in any suitable manner.

[0036] The display 204 includes a screen that pivots into and out of a viewing position as illustrated in FIG. 6, wherein the screen is visible by the user while aiming and or shooting the firearm F. The display 204 is a simplified version of the display 16 described above, and does not include the eyepiece viewfinder. The display is communicatively coupled to the scope S₉₃ and the lens assembly 202 in order to provide a view 210 of the magnified target in the line of sight superimposed on the image of the surrounding area. A representative illustration of the view 210 is shown in FIG. 7. The recorder 206 is communicatively coupled to the lens assembly 202, the display 204, and the converter 208 so that this view can be recorded for later playback viewing.

[0037] The various components of the video scope assembly of the present invention, and the relationships thereof, could be variously designed, configured, utilized, etc., to accommodate a wide variety of uses in many different applications. For example, FIG. 8 illustrates a video scope assembly 300 constructed in accordance with an alternative embodiment of the present invention and configured for mounting on a firearm F wherein the firearm F is a shotgun.
The video scope assembly 300 includes a lens assembly 302, a display 304, and a recorder 306. The assembly 300 can be used to record images of the area surrounding the line of sight for later playback viewing. Additionally, the assembly 300 can be used as a shotgun scope. The display 304 pivots into a viewing position (shown in solid lines on FIG. 8) wherein the user can view the image displayed thereon while the user is aiming the firearm F. The user can zoom the lens assembly 302, by using a switch 308, to magnify a target captured thereby.

[0038] It is within the ambit of the present invention to incorporate the various components of the video scope assembly into the original manufacture of a firearm rather than add them to or reconfigure an existing firearm. In this regard, FIGS. 9 and 10 illustrate a firearm 400 constructed in accordance with an alternative embodiment of the present invention and configured for aiming and/or shooting a target in a line of sight. The firearm 400 broadly includes a uni-body 402, a barrel 404 coupled to the uni-body 402, and a video scope assembly 406 integrally formed in the uni-body 402.

[0039] The uni-body 402 includes a firearm butt, integrally formed therein and having a pivotally coupled access panel 408, and conventional firearm hardware 410 (e.g., a firing mechanism, a trigger, etc.) housed within the uni-body 402. The uni-body 402 is preferably formed of a durable, weatherproof material such as molded plastic, but could be formed of any material suitable to support the integral construction of the uni-body.

[0040] The video scope assembly 406 is similar to the video scope assembly 10 previously detailed and includes substantially similar components. However, the video scope assembly 406 is integrally formed in the uni-body 402. The removable components (not shown), including a recording media and a power source, are housed in the firearm butt and accessible through the access panel 408. The integral, uni-body configuration provides for a durable, weatherproof construction, for example, there are no external wires, the components are less susceptible to being bumped off or out of alignment, etc., and therefore the video scope assembly 406 reduces the need for periodic procedures normally associated with prior art scopes such as re-sighting. The various components of the firearm 400, including the video scope assembly 406, could be variously designed, configured, and utilized so long as the firearm retains its integral, uni-body configuration.

[0041] The preferred forms of the invention described above are to be used as illustration only, and should not be utilized in a limiting sense in interpreting the scope of the present invention. Obvious modifications to the exemplary embodiments, as hereinabove set forth, could be readily made by those skilled in the art without departing from the spirit of the present invention.

[0042] The inventor hereby states his intent to rely on the Doctrine of Equivalents to determine and assess the reasonably fair scope of the present invention as pertains to any apparatus not materially departing from but outside the literal scope of the invention as set forth in the following claims.

1. A video scope assembly for mounting on a firearm, wherein the firearm includes a barrel and is used by a person for aiming and/or shooting at a target in a line of sight, the assembly comprising:
   a housing operable to mount on the firearm;
   a lens assembly associated with the housing and including at least one lens operable to capture an image of the area surrounding and including the line of sight;
   a display associated with the housing and communicating with the lens assembly and operable to display the image captured by said at least one lens; and
   a recorder associated with the housing and communicating with the lens assembly and operable to record the image captured by said at least one lens.
2. The video scope assembly as claimed in claim 1, said housing being removably coupled to the firearm.
3. The video scope assembly as claimed in claim 2, said lens, display, and recorder being unitarily contained within the housing.
4. The video scope assembly as claimed in claim 1, said lens assembly including an additional lens operable to magnify the target in the line of sight.
5. The video scope assembly as claimed in claim 4, said additional lens being in communication with the display so that the magnified target in the line of sight is displayed thereon.
6. The video scope assembly as claimed in claim 4, said additional lens being in communication with the recorder so that the magnified target in the line of sight is recorded thereon.
7. The video scope assembly as claimed in claim 5, said display being operable to display the magnified target in the line of sight superimposed on the image captured by said at least one lens.
8. The video scope assembly as claimed in claim 6, said recorder being operable to record the magnified target in the line of sight superimposed on the image captured by said at least one lens.
9. The video scope assembly as claimed in claim 4 further comprising:
   a firearm sight associated with the housing and communicating with said additional lens so that the person may view the magnified target in the line of sight through the firearm sight when the person is using the firearm.
10. The video scope assembly as claimed in claim 1, said display being pivotally coupled to the housing and pivotable into and out of a viewing position wherein the image displayed thereon is visible to the person while the person is using the firearm.
11. The video scope assembly as claimed in claim 1, said at least one lens operable to zoom into and out of a telephoto position wherein the image captured thereby is magnified.
12. The video scope assembly as claimed in claim 11 further comprising:
   a switch mechanism in communication with said at least one lens and operable to selectively control the zooming of said at least one lens.
13. A video scope assembly for mounting on a firearm, wherein the firearm includes a barrel and a stock and is used by a person for aiming and/or shooting at a target in a line of sight, the assembly comprising:

a lens assembly operable to mount on the firearm and including at least one lens operable to capture an image of the area surrounding and including the line of sight; and

a recorder housed in the stock and communicating with the lens assembly and operable to record the image captured by said at least one lens.

14. The video scope assembly as claimed in claim 13 further comprising:

a scope mounted on the firearm and operable to magnify the target in the line of sight,

said scope being communicatively coupled with the recorder so that the magnified target is recorded therein.

15. The video scope assembly as claimed in claim 14, said recorder being operable to record the magnified target so that the magnified target is superimposed on the image captured by said at least one lens.

16. The video scope assembly as claimed in claim 15 further comprising:

a display coupled to the firearm and communicating with said at least one lens,

said display being operable to display the image captured by said at least one lens.

17. The video scope assembly as claimed in claim 16, said display being in communication with the scope and operable to display the magnified target superimposed on the image captured by said at least one lens.

18. The video scope assembly as claimed in claim 17, said display being pivotally coupled to the firearm and pivotable into and out of a viewing position wherein the magnified target and the image displayed thereon are visible to the person while the person is using the firearm.

19. The video scope assembly as claimed in claim 13 further comprising:

a display coupled to the firearm and communicating with said at least one lens,

said display being operable to display the image captured by said at least one lens.

20. The video scope assembly as claimed in claim 19, said display being pivotally coupled to the firearm and pivotable into and out of a viewing position wherein the image displayed thereon is visible to the person while the person is using the firearm.

21. A video scope assembly for mounting on a firearm, wherein the firearm includes a barrel, a stock, and a scope that provides a magnified view of a target in a line of sight and the firearm is used by a person for aiming and/or shooting at a target in the line of sight, the assembly comprising:

a recorder coupled to the firearm and communicating with the scope, said recorder being operable to record the magnified view of the target provided by the scope.

22. The video scope assembly as claimed in claim 21 further comprising:

a lens assembly operable to mount on the firearm and including at least one lens operable to capture an image of the area surrounding and including the line of sight.

23. The video scope assembly as claimed in claim 22 further comprising:

a display coupled to the firearm and communicating with said at least one lens,

said display being operable to display the image captured by said at least one lens.

24. The video scope assembly as claimed in claim 23, said display being in communication with the scope and operable to display the magnified view of the target provided by the scope superimposed on the image captured by said at least one lens.

25. A video scope assembly for facilitating aiming and/or shooting at a target in a line of sight, the assembly comprising:

a firearm including a barrel and operable to be used by a person for aiming and/or shooting at the target in the line of sight;

a housing operable to mount on the barrel of the firearm;

a lens assembly associated with the housing and including at least one lens operable to capture an image of the area surrounding and including the line of sight;

a display associated with the housing and communicating with the lens assembly and operable to display the image captured by said at least one lens; and

a recorder associated with the housing and communicat-

26. A video scope assembly for facilitating aiming and/or shooting at a target in a line of sight, the assembly comprising:

a firearm including a stock and being operable to be used by a person for aiming and/or shooting at the target in the line of sight;

a lens assembly operable to mount on the firearm and including at least one lens operable to capture an image of the area surrounding and including the line of sight; and

a recorder housed in the stock and communicating with the lens assembly and operable to record the image captured by said at least one lens.

27. A video scope assembly for facilitating aiming and/or shooting at a target in a line of sight, the assembly comprising:

a firearm including a scope that provides a magnified view of the target in the line of sight,

said firearm being operable to be used by a person for aiming and/or shooting at the target in the line of sight;

a recorder coupled to the firearm and communicating with the scope, said recorder being operable to record the magnified view of the target provided by the scope.
28. A firearm for aiming and/or shooting at a target in a line of sight, the firearm comprising:

- a uni-body operable to house firearm hardware and including a firearm butt integrally formed therein;
- a barrel coupled to the uni-body; and
- a video scope assembly integrally formed in the uni-body and including a lens assembly, a display, and a recorder.

29. The firearm as claimed in claim 28, said lens assembly including at least one lens operable to capture an image of the area surrounding and including the line of sight.

30. The firearm as claimed in claim 29, said display being in communication with the lens assembly and operable to display the image captured by said at least one lens.

31. The firearm as claimed in claim 30, said recorder being in communication with the lens assembly and operable to record the image captured by said at least one lens.