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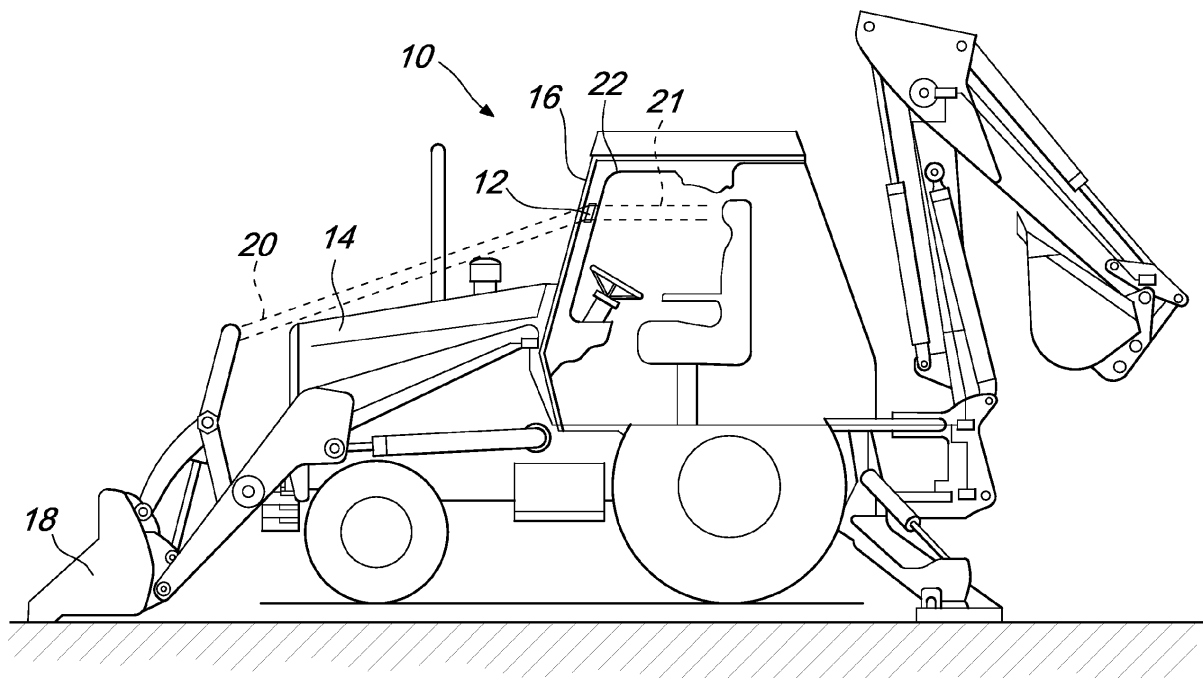
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(54) **Optical assembly for improving visibility in a vehicle**

(57) An optical assembly (10) for improving visibility in a work vehicle (14), the optical assembly comprising an aperture (16) for viewing operation of a worktool (18);

and an optical device (12) disposed at the aperture for diverting light rays (20) from a visually obstructed region to the field of view of the operator.



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Description

Technical Field

[0001] This disclosure relates generally to optical devices that deflect fields of view and in particular to an optical assembly for deflecting the field of view in a work vehicle to allow an operator to view areas that are obstructed.

Background

[0002] The field of view in a work vehicle may be obscured by the frames that bound the windscreen and window apertures and by the structures of the vehicle body. The frames of the apertures may constitute a termination or interruption in the available visibility. The structure of the vehicle body, for example the engine compartment of a construction vehicle, may also constitute a termination or interruption in the available visibility. The drive of the vehicle may in most circumstances compensate for the obstruction by altering position thereby varying the field of view through the apertures. There may be circumstances where the observer's ability to change his field of view is limited.

[0003] The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of the prior art system. The present invention seeks to provide an assembly by which the field of view through an aperture that is obscured may be deflected for a fixed viewing position.

Brief Summary of the Invention

[0004] In a first aspect, the present disclosure describes an optical assembly for improving visibility in a work vehicle, the optical assembly comprising an aperture for viewing operation of a worktool; and an optical device disposed at the aperture for diverting light rays from a visually obstructed region to the field of view of the operator.

Brief Description of the Drawings

[0005] The foregoing and other features and advantages of the present disclosure will be more fully understood from the following description of various embodiments, when read together with the accompanying drawings, in which:

Fig. 1 is side view of a work vehicle having the optical assembly according to the present invention.

Detailed Description

[0006] This disclosure generally relates to an optical assembly **10** for diverting light passing into a work vehicle **14**. The optical assembly **10** may be suitably disposed

in the vehicle for improving visibility for the operator of the work vehicle. Optical assembly **10** may be disposed in the vehicle for improving visibility of work operations.

[0007] With reference to Fig. 1, the optical assembly **10** may improve visibility in a work vehicle **14** and may comprise an aperture **16** for viewing operation of a worktool **18** and an optical device **12** disposed at the aperture for diverting light rays **20** from a visually obstructed region to the field of view of the operator.

[0008] The aperture **16** may be located in a vehicle cabin **22**. The aperture **16** may be defined by structural frames of the vehicle **14**. The aperture **16** may be provided at the forward region of the vehicle. Light rays **20** from the front of the vehicle **14** may enter the vehicle cabin **22** through the aperture **16**.

[0009] The optical assembly **10** may comprise a windscreen disposed at the aperture **16**. The windscreen may be configured to fit in the aperture **16**. The windscreen may include a central region through which light may pass substantially without any deviation.

[0010] The optical device **12** may be coupled to the windscreen. The optical device **12** may be a separate element that may be disposed on the windscreen relative to a peripheral region. In an embodiment, the optical device **12** may be chemically mounted to the windscreen. In an embodiment, the optical device **12** may be mechanically mounted to the windscreen. The optical device **12** may be supported in a supporting device at the windscreen.

[0011] In an embodiment, the optical device **12** may be incorporated into windscreen relative to a peripheral region. The optical device **12** may form a part of the windscreen. The optical device **12** may be positioned within an opening formed in the windscreen.

[0012] In an embodiment, optical device **12** may be positioned such that light rays **20** pass through the windscreen prior to passing through the optical device **12**. In an embodiment, optical device **12** may be positioned such that light rays **20** may pass through the optical device **12** to enter the cabin **22**.

[0013] As regards the term "peripheral region", this is to be understood as the regions adjacent the frames of the aperture. With the aperture defined by frames, the "peripheral region" should be understood as referring to one side of the aperture adjacent a frame and not to all sides of the aperture. For example in a four-sided aperture, the "peripheral region" may be a region along one side thereof and not the remaining three sides of the aperture.

[0014] The optical device **12** may be disposed adjacent the upper peripheral region of the aperture. The optical device **12** may be disposed so as to divert the light from an obstructed region to the field of sight of the operator. The optical device **12** may be aligned with the seating position of the operator.

[0015] In an embodiment, a portion of the optical device **12** may be provided. The portion of the optical device **12** may be suitably dimensioned for the operator to vis-

ualize worktool 18.

[0016] The optical device 12 may be located at the upper region of the windscreen. In an embodiment, the optical device 12 may be located at the upper region of the front windscreen. In an embodiment, the optical device 12 may be located at the upper region of the rear windscreen.

[0017] Light rays 20 arriving from a visually obstructed region may be diverted through an angle by optical device 12 so that the direction of the diverted light 21 may be closer to the central region of the aperture 16. The optical device 12 may cause the light rays 20 to bend at the peripheral region. The light rays 20 may bend to become diverted light rays 21 as they pass through the optical device 12 from the visually obstructed region towards the operator.

[0018] In an embodiment, the angle through which the light rays 21 are diverted may be greater closer to the edge of the peripheral region adjacent to the frame of the aperture. In an embodiment, the angles through which the light rays 21 are diverted may preferably decreases away from the edge of the peripheral region adjacent to the frame of the aperture.

[0019] The diversion of the light rays 21 may be achieved through refraction. In an embodiment, the angle through which the light rays 21 are diverted may be greater closer to the edge of the optical device 12. In an embodiment, the angles through which the light rays 21 are diverted may preferably decreases away from the edge of the optical device 12 towards the centre.

[0020] The optical device 12 may vary the diversion of the light rays 21 over the width thereof. Optical device 12 may preferably introduce no step-change in the diversion of the light diversion rays 12 at its edge adjacent to the frame of the aperture 16.

[0021] The optical device 12 may have not have an inclination of the surfaces (that is the surfaces are substantially parallel) at a point inward from the frame of the aperture 16. The inclination of the surfaces of the optical device 12 may increase progressively towards the frame.

[0022] The optical device 12 may be a negative lens. The optical device 12 may be a cylindrical negative lens.

[0023] In an embodiment, the optical device 12 may be mounted to the vehicle frame in the vehicle cabin 22. A supporting body may be mounted to the vehicle frame to hold the optical device 12 in position.

[0024] The optical device 12 may be a Fresnel lens. A side of the Fresnel lens may be a plane, smooth flat front face and a serrated rear face comprising a plurality of prism-like facets. The facets may be separated. The Fresnel lens may have a pattern defined by the serrated rear surface.

[0025] At least a portion of a Fresnel lens may be disposed at the aperture 16. The portion of the Fresnel lens that diverts the light rays 20 downwards may be positioned at the top of the windscreen. The portion of the Fresnel lens may be positioned at the top centre of the windscreen.

[0026] A whole Fresnel lens may be positioned on the windscreen. The operator may use a selected portion of the Fresnel lens to obtain the desired view of the worktool 18.

[0027] The Fresnel lens may be disposed in a fixed relative positional relationship with respect to a peripheral region of the aperture 16. The Fresnel lens may be disposed in other areas, for example at window apertures.

[0028] The skilled person would appreciate that foregoing embodiments may be modified or combined to obtain the optical assembly 10 of the present disclosure.

Industrial Applicability

[0029] This disclosure describes an optical assembly 10 for improving visibility for an operator of a work vehicle. In particular, the optical assembly 10 may improve visibility of the fork tips and/ or stabiliser feet from the cabin of Backhoe Loader.

[0030] The optical assembly 10 may be used where components and structures of the vehicle frames, that are positioned or dimensioned according to work requirements, may obstruct visibility of the operator. Obstruction to the field of view may occur particularly at the forward region of the vehicle. As an example, the forward region of the work vehicle may have the engine compartment. The forward viewing region may be restricted between the upper frame of the windscreen aperture and the upper portion of the engine compartment.

[0031] The operator of the work vehicle may partially overcome the obstruction by repositioning his field of view. However, any repositioning may require time and may not fully compensate for the obstruction.

[0032] Improvement in visibility may be achieved by disposing the optical device 12 in the vehicle cabin. The optical assembly 10 may divert light passing through an aperture provided in the vehicle cabin. The optical assembly 10 may divert light at a peripheral region of the aperture.

[0033] The optical assembly 10 may include the application of the optical device 12 to the vehicle windscreen at a region where light from an obstructed region may be diverted to the field of view of the operator. Through the optical assembly 10 it may be possible for the operator to effectively to have a field of view in which the obscuration effect vehicle components or structures may be compensated and, in some cases, eliminated.

[0034] Accordingly, this disclosure includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the disclosure unless otherwise indicated herein.

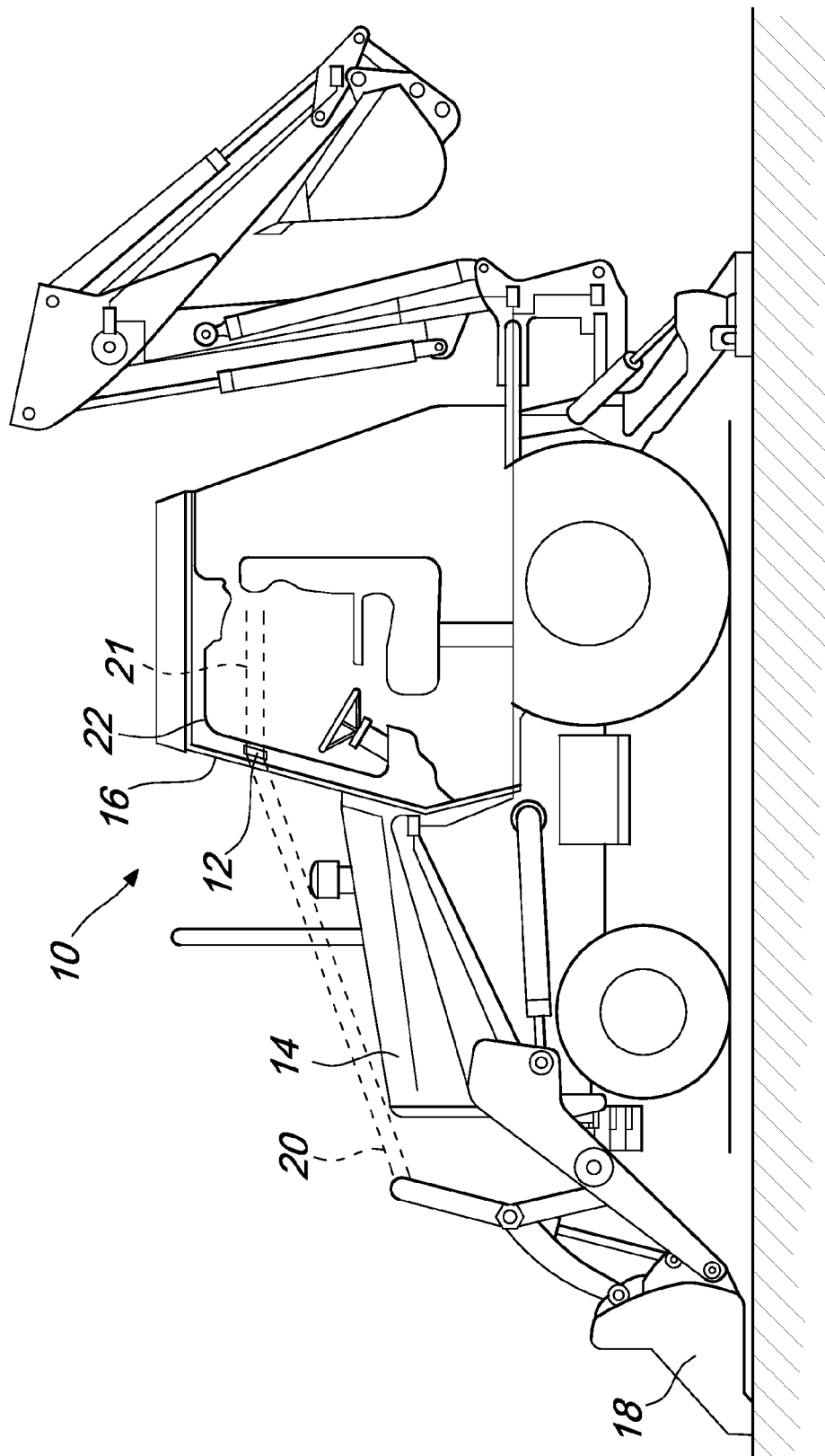
[0035] Where technical features mentioned in any claim are followed by reference signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, neither

the reference signs nor their absence have any limiting effect on the technical features as described above or on the scope of any claim elements.

[0036] One skilled in the art will realise the disclosure may be embodied in other specific forms without departing from the disclosure or essential characteristics thereof. The foregoing embodiments are therefore to be considered in all respects illustrative rather than limiting of the disclosure described herein. Scope of the invention is thus indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.

Claims

1. An optical assembly (10) for improving visibility in a work vehicle (14), the optical assembly (10) comprising:
 - an aperture (16) for viewing operation of a work-tool (18); and
 - an optical device (12) disposed at the aperture (16) for diverting light rays (20) from a visually obstructed region to the field of view of the operator.
2. The optical assembly (10) of claim 1 wherein the aperture (16) is located in the vehicle cabin (22).
3. The optical assembly (10) of claim 2 wherein a wind-screen is disposed at the aperture (16).
4. The optical assembly (10) of claim 3 wherein the optical device (12) is coupled to the windscreen.
5. The optical assembly (10) of claim 3 wherein the optical device (12) is coupled to vehicle frame in the vehicle cabin (22).
6. The optical assembly (10) of any one of preceding claims wherein the optical device (12) is a Fresnel lens.
7. The optical assembly (10) of claim 6 wherein the Fresnel lens has a specific pattern formed by a serrated rear edge to form diverted light rays (21).
8. The optical assembly (10) of claim 6 or 7 wherein the Fresnel lens is disposed in a fixed position relative to a peripheral region of the aperture (16).
9. A work vehicle having the optical assembly of any one of the preceding claims.





EUROPEAN SEARCH REPORT

Application Number
EP 12 18 7982

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B60R E02F B66F
Place of search		Date of completion of the search	Examiner
Berlin		11 February 2013	Wilson, Mark
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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