



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/019,924	04/22/2025	7841729	EXRE_PL_729	7059

140225 7590 05/20/2025
Finn IP Law, PC
11400 W. Olympic Boulevard, 9th Floor
Los Angeles, CA 90064

EXAMINER

ENGLISH, PETER C

ART UNIT	PAPER NUMBER
----------	--------------

3993

MAIL DATE	DELIVERY MODE
-----------	---------------

05/20/2025

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

Zhong Law, LLC
51 JFK Parkway
1st Floor West
Short Hills NJ 07078

***EX PARTE* REEXAMINATION COMMUNICATION TRANSMITTAL FORM**

REEXAMINATION CONTROL NO. 90/019,924 .

PATENT UNDER REEXAMINATION 7841729 .

ART UNIT 3993 .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Order Granting Request For Ex Parte Reexamination	Control No. 90/019,924	Patent Under Reexamination 7841729	
	Examiner Peter C English	Art Unit 3993	AIA (FITF) Status No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

The request for *ex parte* reexamination filed 04/22/2025 has been considered and a determination has been made. An identification of the claims, the references relied upon, and the rationale supporting the determination are attached.

Attachments: a) ☒ PTO-892, b) ☐ PTO/SB/08, c) ☐ Other: _____

1. ☒ The request for *ex parte* reexamination is GRANTED.

RESPONSE TIMES ARE SET AS FOLLOWS:

For Patent Owner's Statement (Optional): TWO MONTHS from the mailing date of this communication (37 CFR 1.530 (b)). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).**

For Requester's Reply (optional): TWO MONTHS from the **date of service** of any timely filed Patent Owner's Statement (37 CFR 1.535). **NO EXTENSION OF THIS TIME PERIOD IS PERMITTED.** If Patent Owner does not file a timely statement under 37 CFR 1.530(b), then no reply by requester is permitted.

--	--	--

cc:Requester (if third party requester)

DECISION GRANTING *EX PARTE* REEXAMINATION

1. A substantial new question of patentability (SNQ) affecting claims 1-9 of US Patent No. 7,841,729 B2 is raised by the present request for *ex parte* reexamination.

Listing of Prior Art

2. The following is a listing of the prior art documents addressed in this decision, together with the shorthand reference for each document (listed alphabetically):

“Bourn et al.”	US Patent No. 6,238,060 B1
“Cook”	US Publication No. 2006/0007666 A1
“Crete”	US Patent No. 3,604,913
“Du Breuil”	US Publication No. 2007/0139515 A1
“Holmes et al.”	US Publication No. 2004/0211868 A1
“Kwak”	KR Publication No. 20-0316985 Y1 (with translation)
“Lin”	DE Publication No. 203 10 780 U1 (with translation)
“Negishi”	US Patent No. 4,974,138
“Numao”	JP Publication No. 2001-027776 A (with translation)
“O’Neill et al.”	EP Publication No. 0 822 409 A2
“Watson”	US Publication No. 2005/0151042 A1

Claim Construction in Examination/Reexamination

3. During examination, the pending claims are normally interpreted according to the broadest reasonable interpretation standard (hereinafter, the “BRI standard”). That is, claims are given their broadest reasonable interpretation consistent with the specification, and limitations in the specification are not read into the claims. See MPEP 2111 et seq.

4. During reexamination of an unexpired patent, claims are interpreted under the BRI standard, and limitations in the specification are not read into the claims. See MPEP 2258, subsection I.G.
5. An exception to the BRI standard occurs when the applicant acts as their own lexicographer. For this exception to apply, the applicant must clearly set forth a special definition of a claim term in the specification that differs from the plain and ordinary meaning it would otherwise possess. See MPEP 2111.01, subsection IV.
6. Another exception or special case occurs when a claim recites a means-plus-function limitation that must be interpreted in accordance with 35 USC 112 ¶ 6, or 35 USC 112(f). See MPEP 2181. According to the guidance provided by *Williamson v. Citrix Online, LLC*, 792 F.3d 1339 (Fed. Cir. 2015) (*en banc*), 35 USC 112 ¶ 6 applies when the claim term fails to recite (i) sufficiently definite structure, and/or (ii) sufficient structure for performing the claimed function.

Examiner's Claim Construction

7. The following claim limitations are construed by the examiner to aid in reexamination:

Claim Limitation:	reflector having a circular configuration to conform to the toroidal shape of said bulb (claim 1)
Examiner's Construction:	A structure capable of reflecting electromagnetic waves such as light (i.e., a reflector), which structure has a circular portion defining at least a part of the shape of the structure, wherein the circular portion is similar in shape to at least a portion of a toroidal-shaped bulb.
Examiner's Explanation:	Claim 1 requires that the reflector has "a circular configuration to conform to the toroidal shape of said bulb". The patent specification does not describe the reflector 40 as having such a circular configuration. Rather, the patent specification merely states that the reflector 40 "surrounds or encases bulb 25" (col. 2, ll. 55-56). Based on the illustration in Figs. 1-2, the reflector 40 has what appears to be a generally circular outer perimeter and a generally circular inner perimeter, i.e., it appears the reflector 40 is generally toroidal like the bulb 25. However, it is impossible to determine the exact structure and shape of the reflector 40 since (i) the patent specification is silent as to its shape, and (ii) the drawings do not show a top view, bottom view, side view or rear view of the reflector 40. Thus, the claimed reflector is broadly considered to require a circular portion defining at least a part of the shape of the reflector, wherein the circular portion is similar in shape to at least a portion of a toroid bulb.

Claim Limitation:	said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera (claim 1)
Examiner's Construction:	The bulb is capable of being placed in a specific location relative to the web camera in order to provide optimal viewing of the user through the web camera, wherein such placement in a specific location can occur (i) during manufacture of the claimed illuminator such that the bulb is specifically located relative to the web camera to serve its intended purpose, or (ii) during installation of the claimed illuminator such that the illuminator and its bulb are installed in a specific location relative to the web camera to serve their intended purpose, or (iii) during use of the claimed illuminator such that the bulb is capable of being moved relative to the web camera to serve its intended purpose.
Examiner's Explanation:	The patent specification describes a preferred embodiment in which the flexible arm 30 permits adjustment of the location of the bulb 25 relative to the web camera 20 such that the illuminator 10 can be moved from a position away from the web camera 20 (shown in Fig. 1) to an in-use position surrounding and in front of the web camera 20 (shown in Fig. 2). See col. 2, ll. 39-41, 48-51 and 64-65. The patent specification explains that, in this preferred embodiment, the ability to move the illuminator 10 allows the user to adjust how they want to be seen, with different in-use positions creating different looks and effects. See col. 3, ll. 10-14. The patent specification describes another preferred embodiment in which the user is able to position the illuminator on a flat surface (such as a table surface) relative to the web camera. See Fig. 6; col. 4, ll. 24-29. The "positionable relative to" limitation of claim 1 is not specific to any preferred embodiment. Rather, it broadly encompasses any manner or capability of positioning the bulb relative to the web camera to provide optimal viewing of the user through the camera. Thus, a preferred embodiment (such as the use of a flexible arm that allows the user to adjust the location of the bulb by moving the illuminator relative to the camera, the ability to move the illuminator to adjust how the user is seen, and the positioning of the illuminator on a flat surface relative to the camera) will not be read into claims that do not require any particulars of such a preferred embodiment.
Claim Limitation:	said arm is a flexible arm that permits said bulb to be positioned relative to the web camera (claim 4)
Examiner's Construction:	The arm is capable of bending without breaking (i.e., flexible) and allows (i.e., permits) the bulb to be placed in a specific location relative to the web camera, wherein such placement in a specific location can occur (i) during manufacture of the claimed illuminator such that the bulb is specifically located relative to the web camera, or (ii) during installation of the claimed illuminator such that the illuminator and its bulb are installed in a specific location relative to the web camera, or (iii) during use of the claimed

	illuminator such that the bulb is capable of being moved relative to the web camera
Examiner's Explanation:	As explained above with respect to the "positionable relative to" limitation of claim 1, the "positioned relative to" limitation of claim 4 is not specific to any preferred embodiment. Rather, it broadly encompasses any manner or capability of positioning the bulb relative to the web camera. While claim 4 does specify the use of a flexible arm, it does not require the arm to be used to move the bulb/illuminator relative to the camera. Instead, claim 4 only broadly requires the flexible arm to allow/permit placement of the bulb in a specific location relative to the camera.

Standard for Granting Request for Ex Parte Reexamination

8. Under 35 USC 304, the Office must determine whether an SNQ affecting any claim of the patent has been raised. Pursuant to 37 CFR 1.510(b)(1), the request must set forth in detail what the requester considers the SNQ(s) to be in view of prior patents and printed publications. The request must also point out how any questions of patentability raised are substantially different from those raised in any previous examination or review of the patent before the Office. See MPEP 2216.

9. It is not sufficient that a request for reexamination merely proposes one or more rejections of a patent's claims as a basis for reexamination. It must first be demonstrated that a patent or printed publication that is relied upon in a proposed rejection presents ***a new, non-cumulative technological teaching that was not previously considered and discussed on the record*** during the prosecution of the application that resulted in the patent for which reexamination is requested, and during the prosecution of any other prior proceeding involving the patent for which reexamination is requested. See MPEP 2216.

10. A prior art patent or printed publication raises an SNQ where there is a substantial likelihood that a reasonable examiner would consider the prior art patent or printed publication important in deciding whether or not the claim is patentable. If the prior art patents and/or publications would be considered important, then the examiner should find an SNQ ***unless the same question of patentability has already been decided*** as to the claim in (i) a final holding of invalidity by the Federal court system, (ii) a previous examination by the Office, or (iii) a previous review of the patent by the PTAB. For example, the same question of patentability may

have already been decided by the Office where the examiner finds the newly provided prior art patents or printed publications are *merely cumulative to similar prior art already fully considered* by the Office in a previous examination or review of the claim. See MPEP 2242.

11. An SNQ is not raised by prior art presented in a reexamination request if the Office has previously considered, in an earlier examination or review of the patent, the same question of patentability as to a patent claim favorable to the patent owner based on the same prior art patents or printed publications. However, in a decision to order reexamination made on or after November 2, 2002, reliance on patents and/or printed publications already cited/considered in an earlier examination or review, i.e., “old art”, does not necessarily preclude the existence of an SNQ that is based exclusively on that old art. For example, an SNQ may be based solely on old art where the old art is being *presented/viewed in a new light, or in a different way*, as compared with its use in the earlier examination or review, in view of a material new argument or interpretation presented in the request. See MPEP 2242.

12. Thus, in this case, reexamination will only be ordered if the prior art cited by the requester raises an SNQ which differs from the patentability questions decided during the original examination.

Substantial New Questions of Patentability Proposed by Requester

13. The request indicates that the third party requester considers the following SNQs to be raised by the request for *ex parte* reexamination:

- #1. An SNQ as to claims 1-7 based upon Kwak taken together with Bourn et al. and Watson. (*Request, pp. 11-22; claim chart, pp. 1-10*).
- #2. An SNQ as to claims 8 and 9 based upon Kwak taken together with Bourn et al. and Watson and further taken together with Cook (*Request, pp. 22-23; claim chart, pp. 10-12*).

Patentability Questions Addressed during Original Examination

14. Application No. 12/011,090, which later issued as US Patent No. 7,841,729 B2, was filed on 24 January 2008 with original claims 1-16. Claims 1 and 13 were independent.

15. In the Office action mailed on 27 November 2009, the previous examiner rejected (i) claims 1-10 as anticipated by Crete, (ii) claims 11 and 12 as obvious over Crete in view of Cook, and (iii) claims 13-16 as anticipated by Du Breuil.

16. In the amendment filed on 01 March 2010, applicant responded to the previous examiner's rejections by (i) amending independent claim 1 to require the bulb "having a toroidal shape" and the reflector "having a circular configuration to conform to the toroidal shape of" the bulb, (ii) canceling dependent claims 3 and 5 (which originally defined the shapes of the bulb and reflector more broadly), (iii) amending dependent claim 4 to depend from claim 1, (iv) amending independent claim 13 to require that "one of said plurality of bulbs surrounds the webcam", (v) arguing that the amendment to claim 1 defined over Crete because Crete does not disclose a bulb having a toroidal shape or a reflector having a circular shape that conforms to the toroidal shape of the bulb, and (vi) arguing that the amendment to claim 13 defined over Du Breuil because Du Breuil does not disclose an embodiment in which one of the bulbs surrounds the web camera.

17. Having determined that the claims as amended were allowable, the previous examiner issued the Notice of Allowability on 12 May 2010. The examiner's reasons for allowance read:

Claim 1 of instant application has an illuminator device for illuminating one or more users in front of a web camera and a communication terminal comprising a bulb having a toroidal shape for emitting light, a reflector having a circular configuration to conform to toroidal shape of bulb for projecting emitted light, an arm disposed between bulb and terminal for connection to terminal and bulb is positionable relative to web camera to provide optimal viewing of user through web camera.

The combination of limitations claimed is not found, taught or suggested by the prior art.

Claims 2, 4 and 6 - 12 depend directly or indirectly from claim 1, add further limitations and are allowable for the same reasons.

Claim 13 of instant application has an illuminator device for illuminating one or more users in front of a webcam and a communications terminal having a frame, a screen comprising a plurality of bulbs, plurality of bulbs are disposed in frame of terminal and one of plurality of bulbs surrounds webcam.

The combination of limitations claimed is not found, taught or suggested by the prior art.

Claim 14 -16 depend directly from claim 13, add further limitations and are allowable for the same reasons.

18. Upon allowance, claims 4-16 were renumbered in the same order as originally presented.

19. Applicant responded to the Notice of Allowability by filing an amendment under 37 CFR 1.312 on 12 August 2010. Dependent claim 2 was canceled, and minor changes were made to claims 7 and 10-13.

20. The previous examiner entered the amendment under 37 CFR 1.312. In light of the cancellation of claim 2, claims 4-16 were once again renumbered in the same order as originally presented. Thus, the patent issued with independent claims 1 and 10, and dependent claims 2-9 and 11-13.

21. Accordingly, the following claimed subject matter was found to be lacking from the prior art and, thus, was considered to be patentable during the original examination:

Patent claim 1	the bulb having a toroidal shape, and the reflector having a circular configuration to conform to the toroidal shape of the bulb
Patent claim 10	one of said plurality of bulbs surrounds the web camera

New Teachings Forming Bases of SNQs

22. The request for *ex parte* reexamination cites the teachings of Bourn et al. as the basis of asserted SNQs.

23. Bourn et al. teaches a ring-shaped illumination source 200 for illuminating an object 160 in front of a video camera 140 used in a machine-vision system 100. See Fig. 1A; col. 6, l. 27 to col. 7, l. 8. The ring-shaped illumination source 200 comprises an LED light source 230 having a row of LEDs 231 arranged in a circle (i.e., in a ring, annular or toroidal shape), and a reflector 220/221 having a circular configuration conforming to the shape of the row of LEDs 231 such that the reflector 220/221 surrounds/encases the LEDs 231. See Figs. 2A-2B; col. 7, l. 9 to col. 8, l. 46. In an alternative embodiment, Bourn et al. discloses a ring-shaped light source 236 comprising a bulb 237 in the form of a circular xenon flashtube, a circular incandescent tube, or

a circular fluorescent tube (i.e., having a toroidal shape), which is used in place of the row of LEDs 231 of the first embodiment. See Figs. 2F-2H; col. 10, ll. 10-49.

24. Thus, Bourn et al. teaches an illuminator comprising a toroidal bulb 237, and a reflector 220/221 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Bourn et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

25. This decision granting the request cites the teachings of Negishi and O'Neill et al. as the bases of SNQs.

26. Negishi teaches an illuminator (see Figs. 9-11) for illuminating an object in front of a camera C used in photography. See Figs. 9-11; col. 7, ll. 3-15. The illuminator comprises a stroboscope flash light (i.e., bulb) L having a ring or doughnut shape (i.e., having a toroidal shape), and either one reflector R (see Fig. 10) or two reflectors R, r (see Fig. 11) having a circular configuration conforming to the shape of the toroidal bulb L such that at least the reflector R surrounds/encases the bulb L. See Figs. 10-11; col. 7, ll. 16-46. The principle of Negishi's illuminator can be applied to other various lighting devices. See col. 7, ll. 47-48.

27. Thus, Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

28. O'Neill et al. teaches an illuminator for illuminating an object in front of a CCD camera 17 used in an automated measurement (i.e., machine-vision) system. See Figs. 1-4; col. 1, ll. 7-13; col. 4, l. 52 to col. 5, l. 28; col. 5, ll. 37-52. The illuminator comprises a lower light source 25 having a ring-shaped (i.e., toroidal) fluorescent lamp (i.e., bulb) 26, and a reflector 27 having a circular configuration conforming to the shape of the toroidal bulb 26 such that the reflector 27 surrounds/encases the bulb 26. See Figs. 3-5(a); col. 5, ll. 32-36; col. 6, ll. 3-28. O'Neill et al. additionally teaches that (i) the camera 17 is mounted in a vertically adjustable manner, and (ii)

the height of the lower light source 25 (i.e., the height of the toroidal bulb 26) can be adjusted (relative to the camera 17) in order to allow flexible use of the system, increase the number of pixels per view, and improve performance. See col. 1, ll. 57-58; col. 2, ll. 45-48; col. 5, ll. 24-28; col. 7, ll. 8-17.

29. Thus, O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

30. The above-discussed teachings of Bourn et al., Negishi and O'Neill et al. form the bases of SNQs raised by the present request for *ex parte* reexamination and this decision granting the request, which SNQs affect claims 1-9 of US Patent No. 7,841,729 B2.

Additional Teachings Relied Upon

31. The request for *ex parte* reexamination relies upon the teachings of Kwak, Watson and Cook to establish that certain claim limitations were known in the art at the time the invention was made. However, the reexamination request fails to establish that Kwak, Watson and Cook teach subject matter indicated/considered to be patentable during the earlier-concluded examination.

32. Kwak teaches an illuminator 40 used with a webcam 50, wherein the illuminator 40 comprises a lamp 41 and a reflector 42. See Figs. 1-3; p. 3, ll. 22-29 and 45-47.¹ However, the lamp 41 does not have a toroidal shape, and the reflector 42 does not have a circular configuration that conforms to a toroidal shape of the lamp 41.

33. Watson teaches an illuminator 22 used with a webcam 12, wherein the illuminator 22 comprises a bulb 44. See Figs. 1-4 and 6; ¶¶ 0029, 0033. The bulb 44 appears to be surrounded/encased by a reflector (see Figs. 1-4 and 6). However, the bulb 44 does not have a

¹ All citations are to the English translation.

toroidal shape, and the reflector does not have a circular configuration that conforms to a toroidal shape of the bulb 44.

34. Cook discloses a light modifier 10 for modifying the light produced by a light source 49, which is used by photographers and image makers. See Figs. 1-5; ¶¶ 0001, 0013-0014. The light modifier 10 includes a layer of fabric netting 73 that diffuses the light produced by the light source 49, wherein the fabric netting 73 is made of cotton, nylon, polyester or similar fabric. See Figs. 4 and 6; ¶ 0015.

35. This decision granting the request relies upon the teachings of Holmes et al., Lin and Numao to establish that certain claim limitations were known in the art at the time the invention was made. However, this decision does not establish that Holmes et al., Lin and Numao teach subject matter indicated/considered to be patentable during the earlier-concluded examination.

36. Holmes et al. teaches a webcam mount comprising a flexible arm 20 coupled to a base 10 that functions as a clamp to support the webcam mount on a flat surface (e.g., table) adjacent to a computer. See Figs. 1 and 3; ¶¶ 0001, 0008, 0015-0017.

37. Lin teaches an illuminator comprising a lamp (i.e., bulb) 105 coupled to one end of a flexible arm 103, with the other end of the flexible arm 103 coupled to a base 101 having a clamp 102 that clamps to an edge of an LCD of a laptop computer. See Fig. 1; ¶¶ 0003-0005.²

38. Numao teaches a photography box 10 for use by photographers. See Figs. 1-4; ¶¶ 0001, 0009.³ The photography box 10 includes a diffusion sheet 26 for diffusing the light produced by a light source 44, wherein the diffusion sheet 26 is made of linen or silk cloth. See Figs. 1-3; ¶¶ 0013, 0017.

39. Accordingly, the teachings of Kwak, Watson, Cook, Holmes et al., Lin and Numao (taken individually) do not form the basis of an SNQ in this reexamination proceeding. Nevertheless, these references can be relied upon during reexamination as teaching additional

² All citations are to the English translation.

³ All citations are to the English translation.

claim limitations that were not identified during the earlier-concluded examination as lacking from the prior art.

Substantial New Questions of Patentability Raised by Requester

40. **SNQ 1:** It is agreed that consideration of Kwak taken together with Bourn et al. and Watson raises an SNQ as to claims 1-7 of US Patent No. 7,841,729 B2.

41. See the detailed discussion of the teachings of each of Kwak, Bourn et al. and Watson above.

42. As explained above, Bourn et al. teaches an illuminator comprising a toroidal bulb 237, and a reflector 220/221 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Bourn et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

43. With respect to claim 1, Kwak teaches a mounting component 30 coupled to an arm 20, with the mounting component 30 housing the lamp 41 at a predetermined position relative to the webcam 50 so that the user can be clearly viewed/imaged by the webcam 50. See Figs. 2-3; p. 3, ll. 22-29; p. 3, l. 41 to p. 4, l. 10.

44. With respect to claim 2, the reflector 42 of Kwak is positioned proximate the lamp 41 to project light towards a face of the user. Similarly, the reflector 220/221 of Bourn et al. is positioned proximate the bulb 237 (used in place of the LEDs 231 of the first embodiment) to project light towards the object 160 in front of the video camera 140.

45. With respect to claim 3, Bourn et al. teaches that the ring-shaped reflector 220/221 can be lined/plated with a reflective coating. See col. 11, ll. 16-31.

46. With respect to claim 4, Kwak teaches flexible arm 20, which permits the lamp 41 to be moved to a desired position. See Figs. 2-3; p. 3, ll. 22-29 and 39-40. Kwak's arm 20 also allows the lamp 41 to be placed in a specific location relative to the webcam 50 during installation and

use of the webcam. Watson teaches flexible arm 42, which permits the bulb 44 to be positioned relative to the web camera 12. See Figs. 1-4 and 6; ¶ 0033.

47. With respect to claim 5, the arm 20 of Kwak connects to a computer display 1 via adhesive tape 11. See Figs. 1 and 3; p. 3, ll. 22-24 and 30-33. The arm 42 of Watson connects to a laptop display monitor 62 by clips (i.e., clamps) 60. See Fig. 3; ¶ 0035.

48. With respect to claim 6, the arm 20 of Kwak can be secured at various positions along a top edge of the computer display 1 via the adhesive tape 11. The clamps 60 of Watson can be secured at various positions along a top edge of the laptop display monitor 62 and, thus, are capable of being moved along the top edge to adjust the location of the bulb.

49. With respect to claim 7, the arm 20 of Kwak has a base 10 that can be attached to any support structure/surface and, thus, can be used to support the illuminator on a flat surface adjacent to the computer display 1. See Figs. 2-3; p. 3, ll. 30-33; p. 4, ll. 26-29. The arm 42 of Watson is coupled to a base 68 and/or 70 that supports the illuminator on a flat desktop surface adjacent to a computer display. See Fig. 4; ¶ 0036.

50. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Bourn et al. and Watson important in deciding whether or not claims 1-7 are patentable. Accordingly, Kwak taken together with Bourn et al. and Watson raises an SNQ as to claims 1-7, which question has not been decided in a previous examination.

51. **SNQ 2:** It is agreed that consideration of Kwak taken together with Bourn et al. and Watson (SNQ 1) and further taken together with Cook raises an SNQ as to claims 8 and 9 of US Patent No. 7,841,729 B2.

52. See the detailed discussion of the teachings of each of Kwak, Bourn et al., Watson and Cook above.

53. As explained above, Bourn et al. teaches an illuminator comprising a toroidal bulb 237, and a reflector 220/221 having a circular portion that is similar in shape to at least a portion of

the toroidal bulb. Accordingly, Bourn et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

54. With respect to claims 8 and 9, Cook teaches the light-diffusing fabric netting 73 made of cotton, nylon, polyester or similar fabric. See Figs. 4 and 6; ¶ 0015.

55. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Bourn et al., Watson and Cook, important in deciding whether or not claims 8 and 9 are patentable. Accordingly, Kwak taken together with Bourn et al. and Watson and further taken together with Cook raises an SNQ as to claims 8 and 9, which question has not been decided in a previous examination.

Substantial New Questions of Patentability Raised by Examiner

56. In addition to the SNQs raised by the requester, the following SNQs are raised by the examiner in this decision granting the request for *ex parte* reexamination.

57. **SNQ 3:** Consideration of Kwak taken together with Negishi and O'Neill et al. raises an SNQ as to claims 1, 2 and 4 of US Patent No. 7,841,729 B2.

58. See the detailed discussion of the teachings of each of Kwak, Negishi and O'Neill et al. above.

59. As explained above:

- Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.
- O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

60. With respect to claim 1, Kwak teaches a mounting component 30 coupled to an arm 20, with the mounting component 30 housing the lamp 41 at a predetermined positioned relative to the webcam 50 so that the user can be clearly viewed/imaged by the webcam 50. See Figs. 2-3; p. 3, ll. 22-29; p. 3, l. 41 to p. 4, l. 10. Negishi teaches that (i) the toroidal bulb L is placed in a specific location relative to the camera C in order to provide optimal viewing of the person or object to be photographed by the camera, and (ii) the principle of Negishi's illuminator can be applied to other various lighting devices. O'Neill et al. teaches that (i) the toroidal bulb 26 is placed in a specific location relative to the CCD camera 17 in order to provide optimal viewing of the object to be imaged by the camera, (ii) the camera 17 is mounted in a vertically adjustable manner, and (iii) the height of the lower light source 25 (i.e., the height of the toroidal bulb 26) can be adjusted (relative to the camera 17) in order to allow flexible use of the system, increase the number of pixels per view, and improve performance.

61. With respect to claim 2, the reflector 42 of Kwak is positioned proximate the lamp 41 to project light towards a face of the user. Similarly, the reflectors R, r of Negishi are positioned proximate the toroidal bulb L to project light towards the person or object to be photographed by the camera C. Likewise, the reflector 27 of O'Neill et al. is positioned proximate the toroidal bulb 26 to project light towards the object to be imaged by the CCD camera 17.

62. With respect to claim 4, Kwak teaches flexible arm 20, which permits the lamp 41 to be moved to a desired position. See Figs. 2-3; p. 3, ll. 22-29 and 39-40. Kwak's arm 20 also allows the lamp 41 to be placed in a specific location relative to the webcam 50 during installation and use of the webcam.

63. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Negishi and O'Neill et al. important in deciding whether or not claims 1, 2 and 4 are patentable. Accordingly, Kwak taken together with Negishi and O'Neill et al. raises an SNQ as to claims 1, 2 and 4, which question has not been decided in a previous examination.

64. **SNQ 4:** Consideration of Kwak taken together with Negishi and O'Neill et al. (SNQ 3) and further taken together with Bourn et al. raises an SNQ as to claim 3 of US Patent No. 7,841,729 B2.

65. See the detailed discussion of the teachings of each of Kwak, Negishi, O'Neill et al. and Bourn et al. above.

66. As explained above:

- Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.
- O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

67. With respect to claim 3, Bourn et al. teaches that the ring-shaped reflector 220/221 can be lined/plated with a reflective coating. See col. 11, ll. 16-31.

68. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Negishi, O'Neill et al. and Bourn et al. important in deciding whether or not claim 3 is patentable. Accordingly, Kwak taken together with Negishi and O'Neill et al. and further taken together with Bourn et al. raises an SNQ as to claim 3, which question has not been decided in a previous examination.

69. **SNQ 5:** Consideration of Kwak taken together with Negishi and O'Neill et al. (SNQ 3) and further taken together with Lin and Watson raises an SNQ as to claims 5 and 6 of US Patent No. 7,841,729 B2.

70. See the detailed discussion of the teachings of each of Kwak, Negishi, O'Neill et al., Lin and Watson above.

71. As explained above:

- Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.
- O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

72. With respect to claim 5, the arm 20 of Kwak connects to a computer display 1 via adhesive tape 11. See Figs. 1 and 3; p. 3, ll. 22-24 and 30-33. The arm 103 of Lin connects to an edge of an LCD of a laptop computer by clamp 102. See Fig. 1; ¶¶ 0003-0005. The arm 42 of Watson connects to a laptop display monitor 62 by clips (i.e., clamps) 60. See Fig. 3; ¶ 0035.

73. With respect to claim 6, the arm 20 of Kwak can be secured at various positions along a top edge of the computer display 1 via the adhesive tape 11. The clamp 102 of Lin can be secured at various positions along an edge of the laptop display and, thus, is capable of being moved along the edge to adjust the location of the bulb. The clamps 60 of Watson can be secured at various positions along a top edge of the laptop display monitor 62 and, thus, are capable of being moved along the top edge to adjust the location of the bulb.

74. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Negishi, O'Neill et al., Lin and Watson important in deciding whether or not claims 5 and 6 are patentable. Accordingly, Kwak taken together with Negishi and O'Neill et al. and further taken together with Lin and Watson raises an SNQ as to claims 5 and 6, which question has not been decided in a previous examination.

75. **SNQ 6:** Consideration of Kwak taken together with Negishi and O'Neill et al. (SNQ 3) and further taken together with Holmes et al. and Watson raises an SNQ as to claim 7 of US Patent No. 7,841,729 B2.

76. See the detailed discussion of the teachings of each of Kwak, Negishi, O'Neill et al., Holmes et al. and Watson above.

77. As explained above:

- Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.
- O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

78. With respect to claim 7, the arm 20 of Kwak has a base 10 that can be attached to any position and, thus, can be used to support the illuminator on a flat surface adjacent to the computer display 1. See Figs. 2-3; p. 3, ll. 30-33; p. 4, ll. 26-29. The arm 20 of Holmes et al. is coupled to a base 10 that functions as a clamp to support the webcam mount on a flat surface (e.g., table) adjacent to a computer. See Figs. 1 and 3; ¶¶ 0001, 0008, 0015-0017. The arm 42 of Watson is coupled to a base 68 and/or 70 that supports the illuminator on a flat desktop surface adjacent to a computer display. See Fig. 4; ¶ 0036.

79. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Negishi, O'Neill et al., Holmes et al. and Watson important in deciding whether or not claim 7 is patentable. Accordingly, Kwak taken together with Negishi and O'Neill et al. and further taken together with Holmes et al. and Watson raises an SNQ as to claim 7, which question has not been decided in a previous examination.

80. **SNQ 7:** Consideration of Kwak taken together with Negishi and O'Neill et al. (SNQ 3) and further taken together with Cook raises an SNQ as to claim 8 of US Patent No. 7,841,729 B2.

81. See the detailed discussion of the teachings of each of Kwak, Negishi, O'Neill et al. and Cook above.

82. As explained above:

- Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.
- O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

83. With respect to claim 8, Cook teaches the light-diffusing fabric netting 73 made of cotton, nylon, polyester or similar fabric. See Figs. 4 and 6; ¶ 0015.

84. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Negishi, O'Neill et al. and Cook important in deciding whether or not claim 8 is patentable. Accordingly, Kwak taken together with Negishi and O'Neill et al. and further taken together with Cook raises an SNQ as to claim 8, which question has not been decided in a previous examination.

85. **SNQ 8:** Consideration of Kwak taken together with Negishi, O'Neill et al. and Cook (SNQ 7) and further taken together with Numao raises an SNQ as to claim 9 of US Patent No. 7,841,729 B2.

86. See the detailed discussion of the teachings of each of Kwak, Negishi, O'Neill et al., Cook and Numao above.

87. As explained above:

- Negishi teaches an illuminator comprising a toroidal bulb L, and at least one reflector R, r having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, Negishi teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.
- O'Neill et al. teaches an illuminator comprising a toroidal bulb 26, and a reflector 27 having a circular portion that is similar in shape to at least a portion of the toroidal bulb. Accordingly, O'Neill et al. teaches subject matter of patent claim 1 that was considered to be patentable during the earlier-concluded examination.

88. With respect to claim 9, Cook teaches the light-diffusing fabric netting 73 made of cotton, nylon, polyester or similar fabric. See Figs. 4 and 6; ¶ 0015. Numao teaches the diffusion sheet 26 made of linen or silk cloth. See Figs. 1-3; ¶¶ 0013, 0017.

89. For these reasons, there is a substantial likelihood that a reasonable examiner would consider the teachings of Kwak, Negishi, O'Neill et al., Cook and Numao important in deciding whether or not claim 9 is patentable. Accordingly, Kwak taken together with Negishi, O'Neill et al. and Cook and further taken together with Numao raises an SNQ as to claim 9, which question has not been decided in a previous examination.

Conclusion

90. For the reasons given above, the present request for *ex parte* reexamination raises a substantial new question of patentability (SNQ) affecting claims 1-9 of US Patent No. 7,841,729 B2. Accordingly, claims 1-9 will be reexamined.

Not All Claims Reexamined

91. Since requester did not request reexamination of claims 10-13 and did not assert the existence of a substantial new question of patentability (SNQ) for such claims (see 35 U.S.C. § 302; see also 37 CFR 1.510b and 1.515), such claims will not be reexamined. This matter was squarely addressed in *Sony Computer Entertainment America Inc., et al. v. Jon W. Dudas*, Civil

Action No. 1:05CV1447 (E.D.Va. May 22, 2006), Slip Copy, 2006 WL 1472462. The District Court upheld the Office's discretion to not reexamine claims in a reexamination proceeding other than those claims for which reexamination had specifically been requested. The Court stated:

“To be sure, a party may seek, and the PTO may grant...review of each and every claim of a patent. Moreover, while the PTO in its discretion may review claims for which...review was not requested, nothing in the statute compels it to do so. To ensure that the PTO considers a claim for...review, [the statute] requires that the party seeking reexamination demonstrate why the PTO should reexamine each and every claim for which it seeks review. Here, it is undisputed that **Sony** did not seek review of every claim under the '213 and '333 patents. Accordingly, **Sony** cannot now claim that the PTO wrongly failed to reexamine claims for which **Sony** never requested review, and its argument that AIPA compels a contrary result is unpersuasive.”

35 USC 325(d)

92. A review of the post grant history for the instant patent indicates that there have been no other Office post grant challenges made to the patent (Reexamination Proceedings or Inter Partes Review, Post Grant Review, Covered Business Method trials). Accordingly, a discretionary denial of reexamination pursuant to 35 USC 325(d) is not applicable.

Remarks

93. Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to “an applicant” and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 305 requires that *ex parte* reexamination proceedings “will be conducted with special dispatch” (37 CFR 1.550(a)). Extensions of time in *ex parte* reexamination proceedings are provided for in 37 CFR 1.550(c).

94. All correspondence relating to this *ex parte* reexamination proceeding should be directed:
By Patent Center⁴: Registered users may submit via the Patent Center at:
<https://patentcenter.uspto.gov/>

⁴ Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

By Mail to: Mail Stop *Ex Parte* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Attn: Central Reexamination Unit

By hand: Customer Service Window
Knox Building
501 Dulany Street
Alexandria, VA 22314

95. Any proposed amendment filed in this reexamination proceeding must be made in accordance with 37 CFR 1.530(d)-(j) and comply with the formal requirements of 37 CFR 1.52(a) and (b). See MPEP 2250.

96. Any document filed by either the patent owner or third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.550(f) and MPEP 2266.03.

97. The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a) to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP 2207, 2282 and 2286.

98. Any inquiry concerning this communication or earlier communications from the Reexamination Examiner should be directed to Peter English whose telephone number is (571)272-6671. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:00 pm EST). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eileen Lillis, can be reached at 571-272-6928.

99. For general information regarding reexamination proceedings please call the Central Reexamination Unit at 571-272-7705. For guidance on reexamination practice and procedure please call the Office of Patent Legal Administration at 571-272-7703.

/PETER C ENGLISH/
Reexamination Specialist, Art Unit 3993

Conferees:
/GLENN K DAWSON/
Reexamination Specialist, Art Unit 3993

/EILEEN D LILLIS/
SPRS, Art Unit 3993

<i>Notice of References Cited</i>	Application/Control No. 90/019,924		Applicant(s)/Patent Under Reexamination 7841729	
	Examiner Peter C English		Art Unit 3993	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Name	CPC Classification	US Classification
*	A	US-3604913-A	1971-09-14	Crete	G03B15/06	362/8
*	B	US-4974138-A	1990-11-27	Negishi	G02B19/0047	362/346
*	C	US-6238060-B1	2001-05-29	Bourn et al.	G01N21/9036	362/3
*	D	US-20040211868-A1	2004-10-28	Holmes et al.	F16M13/022	248/231.71
*	E	US-20050151042-A1	2005-07-14	Watson	F16M11/40	348/E7.079
*	F	US-20060007666-A1	2006-01-12	Cook	G03B15/02	362/16
*	G	US-20070139515-A1	2007-06-21	Du Breuil	H04N7/142	348/E7.079
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Country	Name	CPC Classification
	N	EP-0822409-A2	1998-02-04	EP	O'Neill et al.	
	O	JP-2001027776-A	2001-01-30	JP	Numao	
*	P	KR-200316985-Y1	2003-06-19	KR	Kwak	
	Q	DE-20310780-U1	2004-01-29	DE	Lin	
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title, Date, Publisher, Edition or Volume, Pertinent Pages
	U	English translation of JP-2001027776-A retrieved from EPO's Espacenet website.
	V	English translation of DE-20310780-U1 retrieved from EPO's Espacenet website.
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in YYYY-MM-DD format are publication dates. Classifications may be US or foreign.

Reexamination 	Application/Control No. 90/019,924	Applicant(s)/Patent Under Reexamination 7841729
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☒ Third Party
Zhong Law, LLC 51 JFK Parkway 1st Floor West Short Hills NJ 07078

LITIGATION REVIEW ☒	/PE/ (examiner initials)	13 May 2025 (date)
Case Name	Director Initials	
NONE		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
NONE	N/A

--	--

<i>Search Notes</i> 	Application/Control No. 90/019,924	Applicant(s)/Patent Under Reexamination 7841729
	Examiner Peter C English	Art Unit 3993

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Reviewed IFW for PAT 7,841,729	05/13/2025	/PE/
Used PDP and P-TACTS to search for other post-grant proceedings for PAT 7,841,729 - none found	05/13/2025	/PE/
Used Westlaw to search for litigation involving PAT 7,841,729	05/13/2025	/PE/
PE2E SEARCH - Prior Art (see printout)	05/14/2025	/PE/

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

--	--



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 7059

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
90/019,924	04/22/2025	362	3993	EXRE_PI_729		
RULE						
APPLICANTS Splashlight Studios (PO), Residence Not Provided; Zhong Law, LLC, Short Hills,, NJ; INVENTORS 7841729, Residence Not Provided; Zhong Law, LLC, Residence Not Provided; Henry Geddes, Delray Beach,, FL;						
** CONTINUING DATA ***** This application is a REX of 12/011,090 01/24/2008 PAT 7841729 which claims benefit of 60/897,600 01/26/2007 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /Peter C English/ Acknowledged Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS 13	INDEPENDENT CLAIMS 1
ADDRESS						
Finn IP Law, PC 11400 W. Olympic Boulevard, 9th Floor Los Angeles, CA 90064 UNITED STATES						
TITLE						
WEBCAM ILLUMINATOR DEVICE						
FILING FEE RECEIVED 0.00	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees		
				☐ 1.16 Fees (Filing)		
				☐ 1.17 Fees (Processing Ext. of time)		
				☐ 1.18 Fees (Issue)		
				☐ Other _____		
			☐ Credit			

(51)Int.Cl.⁷

識別記号

F I

テーマコード*(参考)

G 0 3 B 15/06

G 0 3 B 15/06

3 K 0 6 0

F 2 1 S 10/00

15/02

Z

G 0 3 B 15/02

F 2 1 P 5/00

B

// F 2 1 W 131: 406

審査請求 未請求 請求項の数1 O L (全 7 頁)

(21)出願番号

特願平11-199159

(22)出願日

平成11年7月13日(1999.7.13)

(71)出願人 597015645

沼尾 隆

東京都新宿区中落合3丁目24番11-101号

(72)発明者 沼 尾 隆

東京都新宿区中落合3丁目24番11-101号

(74)代理人 100081994

弁理士 鈴木 俊一郎 (外2名)

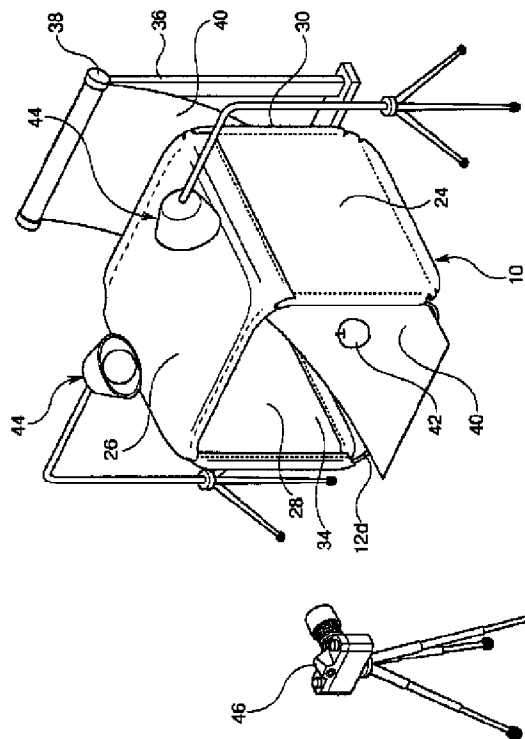
Fターム(参考) 3K060 AA04 AA05 CA05 CD00 EA01

(54)【発明の名称】 撮影用システムボックス

(57)【要約】

【課題】 スタジオなどにおいて、人物、静物などの写真撮影を行う際に、被写体に適切なライティングを行うために、ディフューザーなどの配置、ならびにバック紙として機能する部材を簡単に所定位置に配置できるとともに、撮影終了後にこれらを簡単に撤去可能で、運搬の際にも嵩張らない拡開設営ならびに折り畳み収納自在に構成された撮影用システムボックスを提供する。

【解決手段】 多面体を構成するフレーム枠部材と、フレーム枠部材の少なくとも後方側面部を除いた側面部に張設した光を反射する側方反射シート部材と、フレーム枠部材の上面部に張設した照明光を透過拡散可能な上部拡散シート部材とを備え、フレーム枠部材が、折曲可能で且つ元の形状に伸張復帰自在な部材からなり、撮影システムボックスが拡開設営ならびに折り畳み収納自在に構成されている。



【特許請求の範囲】

【請求項1】 多面体を構成するフレーム枠部材と、前記フレーム枠部材の側面部に張設した光を反射する側方反射シート部材と、前記フレーム枠部材の上面部に張設した照明光を透過拡散可能な上部拡散シート部材とを備え、前記フレーム枠部材が、折曲可能で且つ元の形状に伸張復帰自在な部材からなり、撮影システムボックスを拡開設営ならびに折り畳み収納自在に構成されていることを特徴とする撮影用システムボックス。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、スタジオなどにおいて、写真撮影の際に、被写体に適切なライティングを行うために使用する撮影用システムボックスに関する。

【0002】

【従来の技術】 従来、写真スタジオなどで、人物、静物などの被写体を撮影する場合には、被写体に照射する光のトーンを和らげ、均一に照明光をあてるために、以下のような撮影セットの設営準備をするのが一般的である。すなわち、図8に示したように、スタジオ内に固定したロール104から黒ケント紙などのバック紙106を床108まで垂れ下がるように張設し、その上に被写体102が配置される。そして、その両側部には、白レフ板などの反射板110、112を配置するとともに、その上面に乳白フィルム、トレーシングペーパーなどの光を透過して拡散するディフューザー114を設置し、その上方に照明116、118を配置して、このディフューザー114を介して、被写体102上に均一な拡散光を照射して、撮影用カメラ120にて撮影するようにしている。

【発明が解決しようとする課題】 しかしながら、撮影の度に、このように、バック紙106、反射板110、112、ならびにディフューザー114を所定の位置に設置し、また、撮影が終了する度にこれを撤去しなければならず、煩雑で手間のかかる作業が必要で、設営のための時間あるいはスタッフを多数必要とし、コストが高くなることにもつながっていた。

【0003】 本発明は、このような現状に鑑みて、写真スタジオなどで、人物、静物を撮影する場合に、従来の反射板、ディフューザー、ならびにバック紙と機能する部材を簡単に所定位置に配置できるとともに、撮影終了後にこれらを簡単に撤去可能で、運搬の際にも嵩張らない拡開設営ならびに折り畳み収納自在に構成された撮影用システムボックスを提供することを目的とする。

【0004】

【課題を解決するための手段】 本発明は、前述したような従来技術における課題および目的を達成するために発明なされたものであって、本発明の撮影用システムボックスは、多面体を構成するフレーム枠部材と、前記フレ

ーム枠部材の側面部に張設した光を反射する側方反射シート部材と、前記フレーム枠部材の上面部に張設した照明光を透過拡散可能な上部拡散シート部材とを備え、前記フレーム枠部材が、折曲可能で且つ元の形状に伸張復帰自在な部材からなり、撮影システムボックスが拡開設営ならびに折り畳み収納自在に構成されていることを特徴とする。

【0005】 このように構成されることによって、本発明の撮影用システムボックスは、コンパクトに折り畳み収納した状態から、撮影に使用する際に、拡げることによってフレーム枠部材が自動的に拡開して、元の形状に伸張復帰して多面体が構成される。これにより、側面部に光を反射する側方反射シート部材が位置し、上面部に照明光を透過拡散可能な上部拡散シート部材がセットされた状態となり、その内部に撮影空間が形成される。

【0006】 そして、底部前方のフレーム枠部材から立ち上がって、後方上部のフレーム枠部材に至るバックシート部材を後方側面部を介して張設配置することもできる。このバックシート部材の上面に人物、静物などの被写体を配置し、上部拡散シート部材の外側上方から、照明光を照射することにより、上部拡散シート部材を透過した照明光が、柔らかい光となるとともに、撮影空間内部において均一に拡散され、また、側部の側方反射シート部材によって反射され、被写体全面に照明光が均一に拡散照射されて、極めて良好な撮影状態が維持された撮影セットが設営されることになる。

【0007】 一方、撮影が終了した後は、バックシート部材を取り除き、フレーム枠部材を折り畳むだけで、簡単に撮影用システムボックス全体をコンパクトに収納することができる。

【0008】

【発明の実施の形態】 以下、本発明の実施の形態（実施例）を図面に基づいてより詳細に説明する。図1は、本発明の撮影用システムボックスの第1の実施例の分解斜視図、図2は、図1の撮影用システムボックスの拡開した状態を説明する斜視図、図3は、本発明の撮影用システムボックスの使用状態を説明する概略斜視図、図4は、本発明の撮影用システムボックスの収納方法を説明する概略図である。

【0009】 図1～図4において、10は、全体で本発明の撮影用システムボックスを示している。図1に示したように、撮影用システムボックス10は、4つの略矩形状のフレーム枠部材12、14、16、18からなるフレーム枠部材20を備えており、これにより六面体を構成するようになっている。

【0010】 すなわち、フレーム枠部材20は、前方の側面部に配置した前方フレーム枠部材12と、一対の左右側面部に配置した側方フレーム枠部材14、16と、後方の側面部に配置した後方フレーム枠部材18とから構成されている。そして、左右の側方フレーム枠部材1

4、16にはそれぞれ、左右の側方反射シート部材22、24が取着されている。

【0011】具体的には、これらの側方反射シート部材22、24は、図1に示したように、略矩形状の側方反射シート部材本体22a、24aを有し、その4辺にそれぞれ縫い代部22b～22e、24b～24eが形成されている。そして、左側の側方反射シート部材22では、図1の①で示したように、上部縫い代部22bが、左側の側方フレーム枠部材14の上部フレーム14bを包むように外方より折り返して縫いつけられる。また、前部縫い代部22cが、左側の側方フレーム枠部材14の前方フレーム14cと前方フレーム枠部材12の左側フレーム12cとを包むように外方より折り返して縫いつけられる。下部縫い代部22dが、左側の側方フレーム枠部材14の下方フレーム14dを包むように外方より折り返して縫いつけられる。さらに、後部縫い代部22eが、左側の側方フレーム枠部材14の後方フレーム14eと後方フレーム枠部材18の左側フレーム18eとを包むように外方より折り返して縫いつけられる。

【0012】一方、右側の側方反射シート部材24では、図1の②で示したように、上部縫い代部24bが、右側の側方フレーム枠部材16の上部フレーム16bを包むように外方より折り返して縫いつけられる。また、前部縫い代部24cが、右側の側方フレーム枠部材16の前方フレーム16eと前方フレーム枠部材12の右側フレーム12eとを包むように外方より折り返して縫いつけられる。下部縫い代部24dが、右側の側方フレーム枠部材16の下方フレーム16dを包むように外方より折り返して縫いつけられる。さらに、後部縫い代部24eが、右側の側方フレーム枠部材16の後方フレーム16cと後方フレーム枠部材18の右側フレーム18cとを包むように外方より折り返して縫いつけられる。

【0013】さらに、フレーム枠部材12、14、16、18からなるフレーム枠部材20から構成される六面体の上面の位置には、上部拡散シート部材26が、これらのフレーム枠部材に取着されている。すなわち、上部拡散シート部材26は、図1に示したように、略矩形状の側方反射シート部材本体26aを有し、その4辺にそれぞれ縫い代部26b～26eが形成されているとともに、四隅に縫い代部26f～26iが形成されている。

【0014】そして、図1の③で示したように、前方縫い代部26bが、前方フレーム枠部材12の上部フレーム12bを包むように外方より折り返して縫いつけられる。また、後部縫い代部26eが、後方フレーム枠部材18の上部フレーム18bを包むように外方より折り返して縫いつけられる。そして、左側縫い代部26cが、左側の側方フレーム枠部材14の上部フレーム14bを外方より越えて、左側の側方反射シート部材22の上部縫い代部22b近傍に縫いつけられる。同様にして、右

側縫い代部26cが、右側の側方フレーム枠部材16の上部フレーム16bを外方より越えて、右側の側方反射シート部材24の上部縫い代部22b近傍に縫いつけられる。さらに、四隅に形成した縫い代部26f～26iをそれぞれ、フレーム枠部材20の、フレーム枠部材12、14、16、18の接合部上部に縫いつける。

【0015】このようにして、図1及び図2に示したように、前面に前面開口部28が、後面に後面開口部30が、底面に底面開口部32を有し、内部に撮影空間34が形成されることになる。ところで、左右側面部の側方反射シート部材22、24は、その側方反射シート部材本体22a、24aの内面が、光を均一に反射する反射面となっている。また、これらの側方反射シート部材22、24の外側面は、遮光性を有するように構成されている。

【0016】このような反射面を形成する方法としては、特に限定されるものではなく、例えば、側方反射シート部材22、24の内面に、銀を蒸着したもの、または、不織布などの白布を貼着したもの、側方反射シート部材22、24自体をこれらの白布としたもの、さらに、側方反射シート部材22、24自体を、反射フィルムで構成するなど種々の方法が採用可能である。

【0017】なお、これら側方反射シート部材22、24を通常のシート部材として、その内面に上記したような反射材膜を脱着自在に取着するようにしても勿論構わない。また、上部拡散シート部材26は、その上方から照明光を照射した際に、照明光を透過するとともに拡散可能な部材から構成されている。このような部材としては、特に限定されるものではなく、例えば、麻布、絹布などのシート部材、合成樹脂ビーズ粒子を含有した拡散フィルムなど種々のものが採用可能である。

【0018】さらに、フレーム枠部材20を構成するフレーム枠部材12、14、16、18は、折曲可能で且つ元の形状に伸張復帰自在な部材から構成される。このような材料としては、特に限定されるものではなく、ある程度バネ性を有する、例えば、スチール線材、ワイヤー材、プラスチック線材などが採用可能である。また、上記実施例では、縫い代部を設けてフレーム枠部材20を覆うように縫いつけたが、勿論シート部材22、24、26が合成樹脂などでできている場合には、溶着で取着するようにすることも勿論可能である。

【0019】なお、上記実施例では、前方フレーム枠部材12の下方フレーム12dならびに後方フレーム枠部材18の下方フレーム18dが、シート材で被覆されていないことになるが、このままでもよいが、シートがこれらの下方フレーム12d、18dが露出することによって、破損しないように、図示しないが、被覆することも可能である。

【0020】このようにフレーム枠部材20を構成することによって、撮影に使用する際に、拡げることによ

てフレーム枠部材20が自動的に拡開して、元の形状に伸張復帰して多面体が構成される。一方、撮影が終了した後は、フレーム枠部材を折り畳むだけで、簡単に撮影用システムボックス全体をコンパクトに収納することができる。

【0021】このように構成される撮影用システムボックス10の使用方法について、図3および図4に基づいて説明する。まず、図4(a)～(d)のように、予め折り畳んでコンパクトに収納した状態の撮影用システムボックスを、撮影の準備の際に、図4(d)→図4(a)のように、拡げることによってフレーム枠部材20のフレーム枠部材12、14、16、18が自動的に拡開して、元の形状に伸張復帰して、六面体が構成される。これにより、側面部に光を反射する側方反射シート部材22、24が位置し、上面部に照明光を透過拡散可能な上部拡散シート部材26がセットされた状態となり、図2に示したように、前面に前面開口部28が、後面に後面開口部30が、底面に底面開口部32を有し、内部に撮影空間34が形成されることになる。

【0022】そして、図3に示したように、バック布ロール架台36に配置したバック布ロール38から、バックシート部材40を繰り出して、前方フレーム枠部材12の底部前方の下方フレーム12dから立ち上がって、後方上部の後方フレーム枠部材18の上部フレーム18bに至るように、後面開口部30を介してバックシート部材40を張設して配置する。

【0023】このバックシート部材40の上面に人物、静物などの被写体42を配置するとともに、上部拡散シート部材26の外側上方より、照明スタンド44から照明光を照射する。これにより、上部拡散シート部材26を透過した照明光が、撮影空間34内にて柔らかい光となるとともに、撮影空間34内部において均一に拡散され、また、側部の側方反射シート部材22、24の反射面によって反射され、被写体42の全面に照明光が均一に拡散照射され、極めて良好な撮影状態が維持された撮影セットが設営されることになる。そして、前面開口部28を介して、撮影用カメラ46にて撮影を開始する。

【0024】一方、撮影が終了した後は、バックシート部材40を取り除き、フレーム枠部材20を、図4(a)～(d)のように、折り畳むだけで、簡単に撮影用システムボックス10全体をコンパクトに収納することができる。図5は、本発明の撮影用システムボックスの第2の実施例を示す斜視図である。図1に示した実施例の撮影用システムボックスと同様な構成部材には、同じ参照番号を付してその詳細な説明を省略する。

【0025】この実施例では、六面体の前方面に配置した前方フレーム枠部材12に、左右側面部の側方反射シート部材22、24と同様に、光を均一に反射する反射面を有する反射シートからなる前方カバーシート部材50を取着してある。このカバーシート部材50は、上部

フレーム12bの上方部54より下方に垂下するように取着した脱着自在な覆い部材56と、同様に、フレーム枠部材12の下方フレーム12dから上方に延びるように取着した被い部材56'とから構成されている。これらの被い部材56の間には、中間に開口用の隙間54が形成されており、この隙間54を介して写真機によって内部を撮影できる。また、この前方カバーシート部材50(56、56')が、撮影空間内において前方へ向かう光を反射して、撮影空間内に前方から光りをあてることになるので、さらに良好な撮影環境を保持できるようになっている。

【0026】このように前方フレーム枠部材12の上下に被い部材56、56'を設ける代わりに、図6に示したように、左右に被い部材56、56'を設けてもよいことは勿論である。図7は、本発明の撮影用システムボックスの第3の実施例を示す斜視図である。図1に示した実施例の撮影用システムボックスと同様な構成部材には、同じ参照番号を付してその詳細な説明を省略する。

【0027】この実施例のように、バックシート部材60が、前方フレーム枠部材12の底部前方の下方フレーム12dから立ち上がって、後方上部の後方フレーム枠部材18の上部フレーム18bに至るように、予め張設するように取着してもよい。このように構成することによって、撮影する際には、撮影用システムボックス10を拡開するだけで、側面部に光を反射する側方反射シート部材22、24が位置し、上面部に照明光を透過拡散可能な上部拡散シート部材26が位置し、その内部に撮影空間34が形成されるとともに、底部前方のフレーム枠部材12dから立ち上がって、後方上部の上部フレーム18bに至るバックシート部材が、後方側面部を介して張設されセットされた状態となる。

【0028】また、撮影が終了した後は、フレーム枠部材を折り畳むだけで、簡単に撮影用システムボックス全体をコンパクトに収納することができる。以上、本発明の撮影用システムボックスの実施例について説明したが、本発明は何らこれらに限定されるものでない。例えば、上記実施例では、フレーム枠部材で六面体を形成したが、8面体などの多面体を構成することも、長方形、台形で多面体を構成することも勿論可能である。また、上記実施例では、側方反射シート部材22、24、ならびに上部拡散シート部材26をそれぞれの縫い代部を折り返して縫製して、フレーム枠部材20のフレーム枠部材12、14、16、18に取着したが、別途フレーム枠部材の形状に合わせた接合布を用意して、これにより、各シート部材を各フレーム枠部材12、14、16、18に取着することも可能であるなど種々の変更が可能である。

【0029】

【発明の効果】本発明の撮影用システムボックスによれば、コンパクトに折り畳み収納した状態から、撮影に使

用する際に、拡げることによってフレーム枠部材が自動的に拡開して、元の形状に伸張復帰して多面体が構成される。これにより、側面部に光を反射する側方反射シート部材が位置し、上面部に照明光を透過拡散可能な上部拡散シート部材がセットされた状態となり、その内部に撮影空間が形成される。

【0030】そして、底部前方のフレーム枠部材から立ち上がって、後方上部のフレーム枠部材に至るバックシート部材を後方側面部を介して張設配置できる。このバックシート部材の上面に人物、静物などの被写体を配置するとともに、上部拡散シート部材の外側上方より、照明光を照射することにより、上部拡散シート部材を透過した照明光が、柔らかい光となるとともに、撮影空間内部において均一に拡散され、また、側部の側方反射シート部材によって反射され、被写体全面に照明光が均一に拡散照射され、極めて良好な撮影状態が維持された撮影セットが設営されることになる。

【0031】一方、撮影が終了した後は、バックシート部材を取り除き、フレーム枠部材を折り畳むだけで、簡単に撮影用システムボックス全体をコンパクトに収納することができる。従って、本発明によれば、写真スタジオなどで、人物、静物を撮影する場合に、従来のような反射板、ディフューザー、ならびにバック紙などの機能をもった撮影ボックスを、を簡単に所定位置に配置できるとともに、撮影終了後にこれらを簡単に撤去可能で、運搬の際にも嵩張らない拡開設営ならびに折り畳み収納自在に構成された極めて便利な撮影用システムボックスを提供することができる。

【図面の簡単な説明】

【図1】図1は、本発明の撮影用システムボックスの第1の実施例の分解斜視図である。

【図2】図2は、図1の撮影用システムボックスの拡開した状態を説明する斜視図である。

【図3】図3は、本発明の撮影用システムボックスの使用状態を説明する概略斜視図である。

【図4】図4は、本発明の撮影用システムボックスの収納方法を説明する概略図である。

【図5】図5は、本発明の撮影用システムボックスの第2の実施例を示す斜視図である。

【図6】図6は、本発明の撮影用システムボックスの図5の別の実施例を示す斜視図である。

【図7】図7は、本発明の撮影用システムボックスの第3の実施例を示す斜視図である。

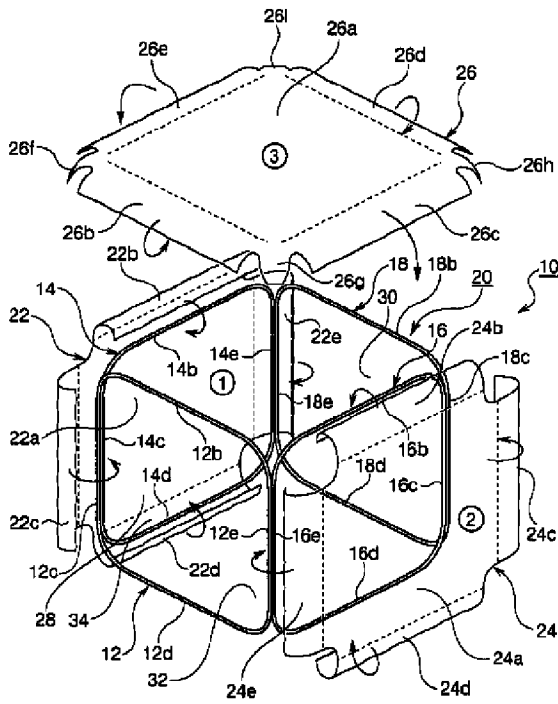
【図8】図8は、従来の撮影の際のセットの状態を説明

する斜視図である。

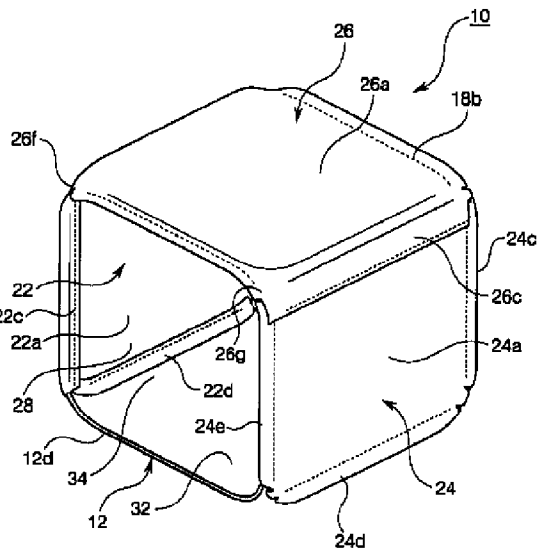
【符号の説明】

- 10 撮影用システムボックス
- 12 フレーム枠部材
- 12d フレーム枠部材
- 12d 下方フレーム
- 12c 左側フレーム
- 12b 上部フレーム
- 12 前方フレーム枠部材
- 14 側方フレーム枠部材
- 14b 上部フレーム
- 14c 前方フレーム
- 14d 下方フレーム
- 16 側方フレーム枠部材
- 16b 上部フレーム
- 16c 後方フレーム
- 16d 下方フレーム
- 18 後方フレーム枠部材
- 18b 上部フレーム
- 18c 右側フレーム
- 20 フレーム枠部材
- 22 側方反射シート部材
- 22a 側方反射シート部材本体
- 22b～22d 縫い代部
- 24 側方反射シート部材
- 24b～24d 縫い代部
- 26 上部拡散シート部材
- 26a 側方反射シート部材本体
- 26b、26c 縫い代部
- 28 前面開口部
- 30 後面開口部
- 32 底面開口部
- 34 撮影空間
- 36 バック布ロール架台
- 38 バック布ロール
- 40 バックシート部材
- 42 被写体
- 44 照明スタンド
- 46 撮影用カメラ
- 50 前方カバーシート部材
- 52 前方カバー布周囲部材
- 56 扉部材
- 60 バックシート部材

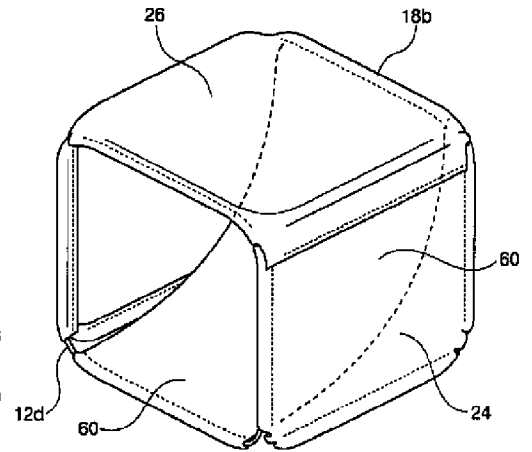
【图 1】



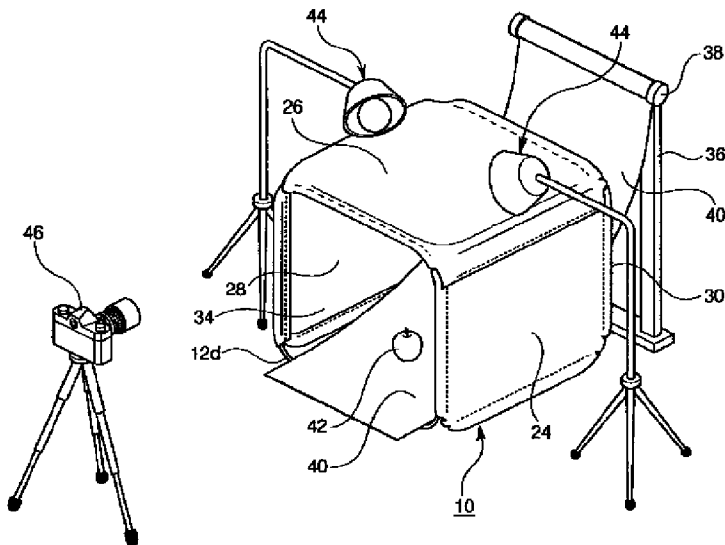
【图 2】



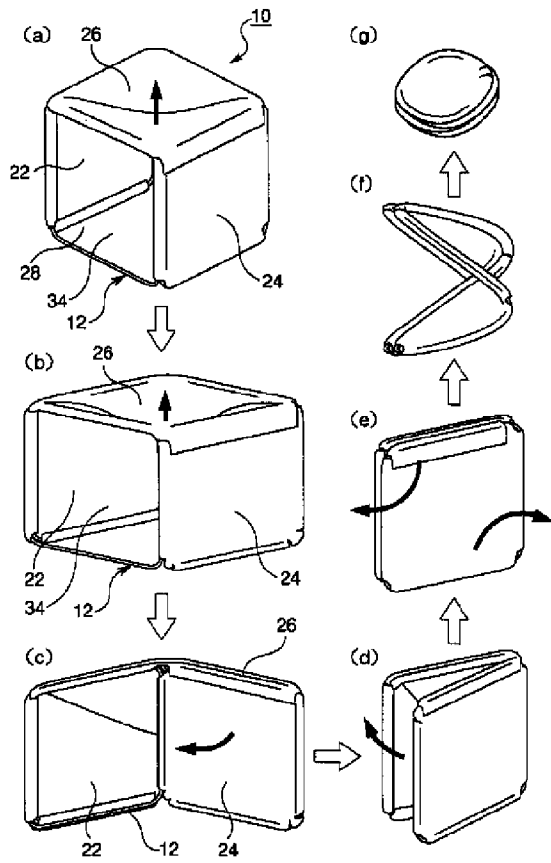
【图 7】



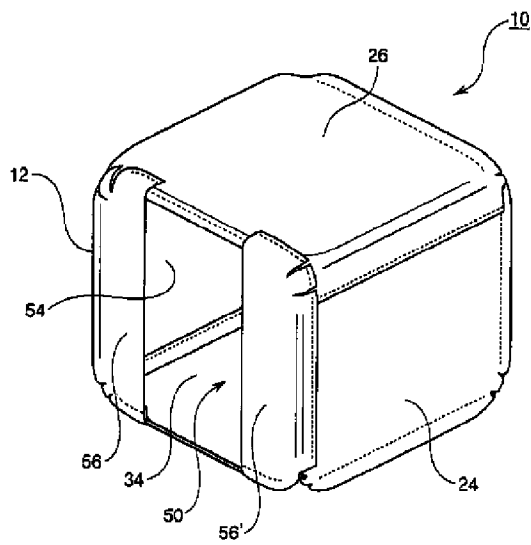
【图 3】



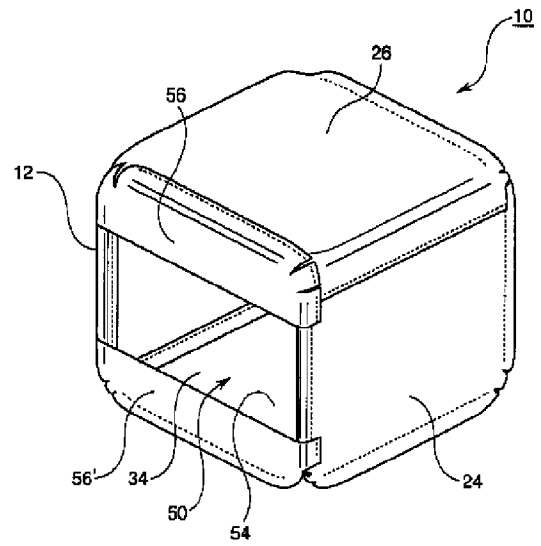
【图4】



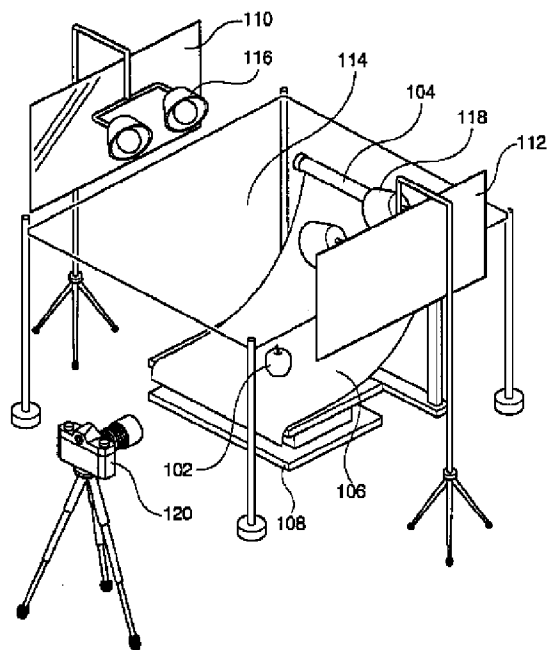
【图6】



【图5】



【图8】



PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	"7841729".pn.	(USPAT)	ADJ	ON	ON	2025/05/08 08:54 AM
L2	4	("3604913" "20060007666" "20070121343" "20070139515").pn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/08 08:56 AM
L3	2	("20050151042" OR "6238060").pn.	(US-PGPUB; USPAT)	ADJ	ON	ON	2025/05/08 08:58 AM
L4	2	KR200316985\$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/08 09:00 AM
L5	1	"49334948".fmid.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/08 09:00 AM
L6	8	((US-7841729-B2 OR US-3604913-A OR US-6238060-B1).did. AND USPT.dbnm.) OR ((US-20070139515-A1 OR US-20070121343-A1 OR US-20060007666-A1 OR US-20050151042-A1).did. AND PGPB.dbnm.) OR ((KR-200316985-Y1).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/08 11:38 AM
L7	7	("4974138" "5179474" "5457492" "5745176" "5825495" "5828449" "6084631").pn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/08 11:46 AM
L8	13	((US-7841729-B2 OR US-3604913-A OR US-6238060-B1 OR US-5828449-A OR US-5457492-A OR US-5179474-A OR US-4974138-A OR US-	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT;	ADJ	ON	ON	2025/05/08 01:55 PM

L9	12	5825495-A).did. AND USPT.dbnm.) OR ((US-20070139515-A1 OR US-20070121343-A1 OR US-20060007666-A1 OR US-20050151042-A1).did. AND PGPB.dbnm.) OR ((KR-200316985-Y1).did. AND FTDB.dbnm.)	IBM_TDB)				
		8 AND reflect\$4	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/08 01:56 PM
L10	13	((US-7841729-B2 OR US-3604913-A OR US-6238060-B1 OR US-5828449-A OR US-5457492-A OR US-5179474-A OR US-4974138-A OR US-5825495-A).did. AND USPT.dbnm.) OR ((US-20070139515-A1 OR US-20070121343-A1 OR US-20060007666-A1 OR US-20050151042-A1).did. AND PGPB.dbnm.) OR ((KR-200316985-Y1).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 10:56 AM
L11	42	(Artificial Intelligence) More like doc: KR-200316985-Y1 Text: (KR-200316985-Y1 OR KR-20050036745-A OR CN-1667492-A OR US-7751092-B2 OR EP-1524836-A1 OR KR-100587862-B1 OR CN-108322627-A OR JP-2005143091-A OR JP-H11146241-A OR US-20050088528-A1 OR US-20050054227-A1 OR KR-20050056795-A OR JP-H1184491-A OR JP-2020073985-A OR US-20050140813-A1 OR FR-2642535-A1 OR JP-S6159973-A OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 10:56 AM

L12	40	EP-1524836-B1 OR CN-108989622-B OR JP-2004186774-A).did. (Artificial Intelligence) More like doc: US-20050151042-A1 Text: (US-3575098-A OR US- 3863882-A OR US- 4210784-A OR US- 4341452-A OR US- 4398815-A OR US- 4475226-A OR US- 5184160-A OR US- 5921523-A OR US- 5833186-A OR US- 5677669-A OR US- 6487298-B1 OR US- 6316706-B1 OR CA- 2454751-A1 OR US- 20050151042-A1 OR US-5929903-A OR EP- 1241517-B1 OR US- 9413930-B2 OR CN- 110365874-B OR US- 11089232-B2 OR JP- 6755995-B2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:03 AM
L13	64	("2005/0151042").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:10 AM
L14	39	(Artificial Intelligence) More like doc: US-7631979-B1 Text: (US-6260984-B1 OR US-6273581-B1 OR US-20040218089-A1 OR CA-2454751-A1 OR US-7631979-B1 OR US-20090310329-A1 OR US-D1058882-S OR US-20130194775- A1 OR CA-2385646-C OR US-9818314-B2 OR US-D1023378-S OR US-6634763-B1 OR EP-0491717-B1 OR US-20030012012-A1 OR US-5722754-A OR WO-2014105101-A2 OR CA-3182907-A1 OR WO-2021226697-A1 OR US-11543119-B2 OR US-6767107- B1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:13 AM
L15	23	("4258387" "5010412"	(US-PGPUB; USPAT;	ADJ	ON	ON	2025/05/12

		"5379201" "5475441" "5684530" "6273581" "6344874" "D455855" "6435692" "6646672" "6877878" "6979093" "7225414" "20030227770" "20040140459" "20040218089" "20050151042" "20050207170" "20060095297" "20060181862" "20070081094" "20070103918" "20070138360").pn. AND (PGPB USPT USOC).dbnm.	USOCR)				11:13 AM
L16	46	("4258387" "5010412" "5379201" "5475441" "5684530" "6273581" "6344874" "D455855" "6435692" "6646672" "6877878" "6979093" "7225414" "20030227770" "20040140459" "20040218089" "20050151042" "20050207170" "20060095297" "20060181862" "20070081094" "20070103918" "20070138360").pn. OR ("7631979").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:13 AM
L17	36	(Artificial Intelligence) More like doc: US-9071740-B1 Text: (US-6441854-B2 OR US-6271752-B1 OR US-D433432-S OR US- D426249-S OR US- 20020056794-A1 OR US-7253840-B2 OR US-20030210340-A1 OR US-20040211868- A1 OR KR-100965876- B1 OR CA-2454751-A1 OR JP-2005236513-A OR TW-I236285-B OR US-7126816-B2 OR TW-M256458-U OR US-20050247845-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:15 AM

L18	72	OR US-20060109375-A1 OR US-20060109613-A1 OR US-20060282866-A1 OR US-20070001087-A1 OR US-8401869-B2).did. ("20020186317" "20040211868" "20050151042" "20050230583" "20060109375" "20060109613" "20060282866" "20070001087" "20070222888" "20080186150" "20080291260").pn. OR ("9071740").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:15 AM
L19	38	(Artificial Intelligence) More like doc: US-20030227770-A1 Text: (US-1027634-A OR US-1692394-A OR US-3322944-A OR US-4432042-A OR FR-2572163-A1 OR US-4598340-A OR US-5379201-A OR US-5695271-A OR US-6186636-B1 OR US-6575593-B2 OR US-6680844-B2 OR US-20020014960-A1 OR US-20030227770-A1 OR US-20040264170-A1 OR US-20120008312-A1 OR US-20010028562-A1 OR US-7004596-B2 OR US-20020057566-A1 OR US-7938563-B2 OR AU-3890101-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:34 AM
L20	18	("2003/0227770").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:34 AM
L21	37	(Artificial Intelligence) More like doc: US-20050207170-A1 Text: (US-6575593-B2 OR US-6666563-B2 OR US-20040047152-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	ADJ	ON	ON	2025/05/12 11:35 AM

		OR US-20050007778-A1 OR US-20050207170-A1 OR US-10551043-B1 OR JP-20120515423-A5 OR US-20080030977-A1 OR US-20200170370-A1 OR US-9739468-B2 OR KR-20090000227-U OR US-5408764-A OR US-4321657-A OR CA-2631244-A1 OR JP-2512528-Y2 OR WO-2023273830-A1 OR CA-2124107-C OR TW-M320644-U OR US-7527392-B2 OR US-7429118-B1).did.	IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L22	7	("2005/0207170").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:35 AM
L23	38	(Artificial Intelligence) More like doc: US-20060181862-A1 Text: (US-4043662-A OR GB-2123539-B OR US-4816854-A OR US-4777566-A OR US-5010412-A OR JP-H03223972-A OR US-5226708-A OR US-5440385-A OR US-5311409-A OR US-5580163-A OR US-5713661-A OR US-5739639-A OR JP-H10206942-A OR US-6022124-A OR US-6528954-B1 OR FI-106770-B OR US-6454437-B1 OR US-6246184-B1 OR US-6556067-B2 OR US-7202613-B2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:37 AM
L24	8	("2006/0181862").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:37 AM
L25	37	(Artificial Intelligence) More like doc: US-5010412-A Text: (US-3737722-A OR US-3800204-A OR US-4164008-A OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	ADJ	ON	ON	2025/05/12 11:39 AM

		4161018-A OR US-4211955-A OR JP-S556687-A OR US-4264845-A OR US-4459645-A OR US-4677533-A OR US-4882498-A OR US-5010412-A OR US-20070247528-A1 OR US-7898593-B2 OR US-4647795-A OR KR-970071111-A OR JP-2006319996-A OR US-3327219-A OR FR-2474688-A1 OR US-5223932-A OR JP-H05266687-A).did.	IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L26	128	("3737722" "3800204" "4161018" "4164008" "4211955" "4264845" "4298869" "4459645" "4677533" "4882498").pn. OR ("5010412").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:40 AM
L27	41	(Artificial Intelligence) More like doc: US-5379201-A Text: (US-2329556-A OR US-2561744-A OR US-2597662-A OR US-4432042-A OR US-4626965-A OR US-4893222-A OR US-4949230-A OR US-5130907-A OR US-5165779-A OR US-5117339-A OR WO-9201193-A1 OR US-5077643-A OR US-5122941-A OR US-5035392-A OR US-5183325-A OR US-5055977-A OR US-5192046-A OR US-5379201-A OR WO-2013026490-A1 OR US-20080123262-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:41 AM
L28	110	("2329556" "2561744" "2597662" "4432042" "4626965" "4893222" "4949230" "5035392" "5055977" "5077643" "5091832" "5117339"	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:41 AM

L29	38	"5122941" "5130907" "5165779" "5183325" "5192046").pn. OR ("5379201").urpn. AND (PGPB USPT USOC).dbnm. (Artificial Intelligence) More like doc: US-6273581-B1 Text: (US-4091246-A OR US- 4959810-A OR DE- 59006945-D1 OR US- 4949230-A OR JP- 2598568-B2 OR US- 5055977-A OR US- 5539801-A OR CA- 2174831-C OR CN- 2247830-Y OR US- 5868487-A OR US- 6074228-A OR US- 6273581-B1 OR US- 6354713-B1 OR US- 6361182-B1 OR WO- 0196782-A1 OR US- 20010050849-A1 OR US-6533431-B2 OR US-6767107-B1 OR US-20030012012-A1 OR RU-2004103273- A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:42 AM
L30	33	("4949230" "5055977" "5091832" "5117339" "5119239" "5130907" "5165779" "5325280" "5868487" "6186636").pn. OR ("6273581").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:42 AM
L31	39	(Artificial Intelligence) More like doc: US-6435692-B1 Text: (JP-2525699-Y2 OR US-5122941-A OR US- 5183325-A OR US- 5136477-A OR US- 5122937-A OR DE- 4202776-A1 OR US- 5247314-A OR US- 5379201-A OR US- 5615945-A OR FR- 2754588-A3 OR US- 6435692-B1 OR US- 6481866-B2 OR US- 6505949-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:43 AM

L32	22	6318873-B1 OR US-6851819-B2 OR US-6561669-B2 OR US-20010026445-A1 OR US-6422715-B2 OR US-6186636-B1 OR US-20020067609-A1).did. ("4312507" "5091832" "5122937" "5122941" "5136477" "5172974" "5183325" "5203622" "5379201" "5486986" "5590950" "5615945" "5707137" "5803572" "5868487" "5899553" "6273581").pn. OR ("6435692").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:43 AM
L33	44	(Artificial Intelligence) More like doc: US-6979093-B2 Text: (US-5592066-A OR JP-3762853-B2 OR JP-2004153571-A OR US-20050128747-A1 OR US-6979093-B2 OR KR-20150025382-A OR US-7379117-B2 OR KR-20100004340-U OR US-7385641-B2 OR KR-101502227-B1 OR JP-H11284560-A OR KR-20040026297-A OR JP-2005093277-A OR US-D350726-S OR KR-20090109023-A OR IT-201900006610-A1 OR JP-2005189406-A OR US-5977747-A OR CN-1629715-A OR FR-2822325-A3).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 11:44 AM
L34	7	("5592066" "20040085745").pn. OR ("6979093").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 11:44 AM
L35	93	("2205860" "4052607" "4446506" "4490776" "4504888" "4616293" "4807089" "5023756" "5023757" "5154503").pn. OR ("5311409").urpn. AND	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 03:59 PM

L36	1	(PGPB USPT USOC).dbnm. 35 AND (silk OR muslin)	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 03:59 PM
L37	38	(fabric near7 diffus\$3) SAME (silk OR muslin)	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:01 PM
L38	73	(fabric WITH diffus\$3) SAME (silk OR muslin)	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:01 PM
L39	35	38 NOT 37	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:11 PM
L40	565	diffus\$3 near7 (silk OR muslin)	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:16 PM
L41	313932	diffus\$3 WITH (light OR illumination OR luminaire OR bulb)	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:17 PM
L42	30180	diffus\$3 SAME camera	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:17 PM
L43	13	40 AND 41 AND 42	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/12 04:17 PM
L44	3638	diffus\$3 near7 (silk OR muslin)	(FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/12 04:20 PM
L45	1464076	diffus\$3 WITH (light OR illumination OR luminaire OR bulb)	(FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/12 04:20 PM
L46	122365	diffus\$3 SAME camera	(FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/12 04:20 PM
L47	67	44 AND 45 AND 46	(FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/12 04:21 PM
L48	49	((US-7841729-B2 OR US-3604913-A OR US-6238060-B1 OR US-5828449-A OR US-5457492-A OR US-5179474-A OR US-4974138-A OR US-5825495-A OR US-7631979-B1 OR US-9071740-B1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/12 04:42 PM

		5010412-A OR US- 5379201-A OR US- 6273581-B1 OR US- 6435692-B1 OR US- 6979093-B2 OR US- 5722754-A OR US- 6575593-B2 OR US- 6974223-B2 OR US- 5311409-A OR US- 4677533-A OR US- 6040895-A OR US- 7136582-B2 OR US- 6711006-B2 OR US- 6799861-B2).did. AND USPT.dbnm.) OR ((US- 20070139515-A1 OR US-20070121343-A1 OR US-20060007666- A1 OR US- 20050151042-A1 OR US-20040211868-A1 OR US-20050230583- A1 OR US- 20060282866-A1 OR US-20070001087-A1 OR US-20030227770- A1 OR US- 20040218089-A1 OR US-20050207170-A1 OR US-20060181862- A1 OR US- 20070103918-A1 OR US-20020014960-A1 OR US-20080079906- A1).did. AND PGPB.dbnm.) OR ((KR- 200316985-Y1 OR JP- H03223972-A OR JP- H0465200-A OR JP- H05280946-A OR JP- 2001027776-A).did. AND FTDB.dbnm.) OR ((US-20010043468-A1 OR US-20010048409- A1 OR EP-1072884- A2).did. AND DWPI.dbnm.) OR ((US- 1633315-A OR US- 1510049-A).did. AND USOC.dbnm.)					
L49	7	48 AND (silk OR muslin)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/12 04:43 PM

L50	711985	(ring OR annular OR torus OR toroid\$4) near5 (light OR illumination OR luminaire OR bulb)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:38 AM
L51	70408	50 SAME camera	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:38 AM
L52	56826	50 SAME sensor	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:38 AM
L53	1325025	camera WITH (adjust\$4 OR reposition\$4 OR (re-position\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:39 AM
L54	3817902	sensor WITH (adjust\$4 OR reposition\$4 OR (re-position\$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:39 AM
L55	25995	51 AND 53	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:40 AM
L56	16242	52 AND 54	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:41 AM
L57	1820	50 SAME ((computer OR laptop OR tablet) near5 (display OR screen OR touchscreen))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:42 AM

L58	381	55 AND 57	JPO; DERWENT) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:42 AM
L59	155	56 AND 57	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:42 AM
L60	2997	50 SAME ((machine vision) OR (vision near3 inspect\$3))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:44 AM
L61	743	55 AND 60	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:44 AM
L62	123	56 AND 60	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:44 AM
L63	691	61 NOT 58	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:44 AM
L64	88	59 NOT (58 OR 61)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:45 AM
L65	36	62 NOT (58 OR 59 OR 61)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:45 AM

L66	36	58 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	SU, WO); FPRS; EPO; JPO; DERWENT) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:48 AM
L67	33	63 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:48 AM
L68	16	64 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:48 AM
L69	10	65 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 07:48 AM
L70	19475	50 SAME (webcam\$4 OR (web camera) OR (computer near3 camera) OR (video camera) OR videocamera OR CCD)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:27 AM
L71	6788	70 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:27 AM
L72	144525	50 SAME reflect\$3	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:28 AM
L73	7323	70 AND 72	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR,	ADJ	ON	ON	2025/05/13 08:28 AM

L74	3549	73 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:28 AM
L75	3699629	(light OR illumination OR luminaire OR bulb) near5 (adjust\$4 OR reposition\$4 OR (re- position\$4) OR move OR moving OR movable OR moveable)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:30 AM
L76	3262	73 AND 75	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:30 AM
L77	1510	76 AND (@pd<"20070126" OR @prad<"20070126" OR @ad<"20070126")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:31 AM
L78	139	77 AND ((computer OR laptop OR tablet) near5 (display OR screen OR touchscreen))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:46 AM
L79	61	77 AND ((machine vision) OR (vision near3 inspect\$3))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 08:46 AM
L80	55	((US-7841729-B2 OR US-3604913-A OR US- 6238060-B1 OR US- 5828449-A OR US- 5457492-A OR US- 5179474-A OR US- 4974138-A OR US- 5825495-A OR US- 7631979-B1 OR US- 9071740-B1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/13 09:40 AM

L81	0	5010412-A OR US-5379201-A OR US-6273581-B1 OR US-6435692-B1 OR US-6979093-B2 OR US-5722754-A OR US-6575593-B2 OR US-6974223-B2 OR US-5311409-A OR US-4677533-A OR US-6040895-A OR US-7136582-B2 OR US-6711006-B2 OR US-6799861-B2).did. AND USPT.dbnm.) OR ((US-20070139515-A1 OR US-20070121343-A1 OR US-20060007666-A1 OR US-20050151042-A1 OR US-20040211868-A1 OR US-20050230583-A1 OR US-20060282866-A1 OR US-20070001087-A1 OR US-20030227770-A1 OR US-20040218089-A1 OR US-20050207170-A1 OR US-20060181862-A1 OR US-20070103918-A1 OR US-20020014960-A1 OR US-20080079906-A1 OR US-20080174691-A1).did. AND PGPB.dbnm.) OR ((KR-200316985-Y1 OR JP-H03223972-A OR JP-H0465200-A OR JP-H05280946-A OR JP-2001027776-A OR CN-1084808-A OR GB-2316168-A OR JP-WO2003010525-A1 OR JP-2002310626-A OR EP-0822409-A2).did. AND FTDB.dbnm.) OR ((US-20010043468-A1 OR US-20010048409-A1 OR EP-1072884-A2).did. AND DWPI.dbnm.) OR ((US-1633315-A OR US-1510049-A).did. AND USOC.dbnm.)					
L81	0	80 AND ((liner OR	(US-PGPUB; USPAT;	ADJ	ON	ON	2025/05/13

		lining) near3 reflect\$6)	USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)				03:27 PM
L82	3	80 AND ((film OR paint) near3 reflect\$6)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 03:27 PM
L83	0	80 AND ((liner OR lining) WITH reflect\$6)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 03:27 PM
L84	6	80 AND (coat\$3 near3 reflect\$6)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/13 03:29 PM
L85	3	DE20310780\$.did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT)	ADJ	ON	ON	2025/05/14 08:12 AM
L86	43	(Artificial Intelligence) More like doc: DE-20310780-U1 Text: (DE-20310780-U1 OR JP-2005050729-A OR JP-2008204739-A OR CN-104976593-A OR JP-H03167711-A OR CN-102454946-A OR TW-M392910-U OR CN-204242995-U OR JP-H06131908-A OR KR-100874760-B1 OR CN-101122379-A OR TW-200836431-A OR TW-M362938-U OR WO-0123802-A1 OR CN-117108966-A OR JP-4635623-B2 OR JP-H06168614-A OR CN-102454946-B OR JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/14 08:13 AM

L87	31	H02227907-A OR CN-101901730-A).did. ("5103384" "5379201" "5619395" "5855343" "6222501" "6239841" "6481681" "6591001").pn. OR ("6711006").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:22 AM
L88	68	("1208344").pn. OR ("5855343").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:23 AM
L89	43	(Artificial Intelligence) More like doc: US-5855343-A Text: (US-1208344-A OR US-5855343-A OR US-20220117104-A1 OR JP-2005085260-A OR US-20050206615-A1 OR US-8499940-B2 OR WO-2008083170-A2 OR WO-2023018495-A1 OR US-5307209-A OR JP-5275497-B2 OR US-6795717-B1 OR JP-2012182838-A OR JP-2014011485-A OR US-10051751-B2 OR US-20080198324-A1 OR US-20120086913-A1 OR KR-20240120597-A OR US-7406257-B2 OR CN-105164600-B OR NL-2007427-C2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/14 08:23 AM
L90	44	("5260731" "5855343").pn. OR ("6239841").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:24 AM
L91	45	(Artificial Intelligence) More like doc: US-6239841-B1 Text: (US-5260731-A OR US-5855343-A OR US-6239841-B1 OR CN-213705328-U OR CN-100537158-C OR CN-1810465-A OR JP-2009159505-A OR CN-112996245-A OR CN-221677000-U OR JP-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	ADJ	ON	ON	2025/05/14 08:24 AM

		2017037219-A OR CN-210241010-U OR US-20200044430-A1 OR TW-200934355-A OR TW-201218918-A OR JP-S6343916-B2 OR TW-I323649-B OR CN-216556328-U OR US-20250081362-A1 OR JP-H0710991-U OR JP-3723558-B2).did.	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L92	38	("2532209" "2584955" "3091421" "5322255" "5619395" "5768163" "5855343" "6239841" "6323902").pn. OR ("6481681").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:24 AM
L93	41	(Artificial Intelligence) More like doc: US-6481681-B1 Text: (US-2584955-A OR US-2532209-A OR US-3091421-A OR GB-2253992-A OR US-5619395-A OR US-5768163-A OR US-5855343-A OR JP-H10301718-A OR JP-2000020163-A OR US-6239841-B1 OR US-6481681-B1 OR US-10415273-B2 OR US-8770536-B2 OR US-20130094899-A1 OR US-4637632-A OR US-20170362858-A1 OR US-9448584-B2 OR GB-2578832-A OR US-20140310440-A1 OR US-20030102187-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/14 08:24 AM
L94	40	(Artificial Intelligence) More like doc: US-6711006-B2 Text: (US-5103384-A OR US-5379201-A OR US-5619395-A OR JP-H10136241-A OR US-5855343-A OR JP-H11153832-A OR JP-H11284882-A OR US-6222501-B1 OR JP-3212952-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	ADJ	ON	ON	2025/05/14 08:26 AM

		6239841-B1 OR US-6481681-B1 OR US-20030147206-A1 OR US-6711006-B2 OR CN-1152999-C OR CN-213334014-U OR TW-M531545-U OR WO-2019097879-A1 OR CN-102722219-A OR TW-I608171-B OR JP-2017033635-A).did.	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L95	30	("6431507" "6481681" "6579017" "6601999").pn. OR ("6679463").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:34 AM
L96	42	(Artificial Intelligence) More like doc: US-6679463-B1 Text: (US-6431507-B2 OR US-6481681-B1 OR US-6579017-B2 OR US-6601999-B1 OR US-6679463-B1 OR CN-108529209-B OR CN-221035103-U OR JP-2006237340-A OR WO-2016035053-A1 OR US-20170281236-A1 OR TW-202100298-A OR JP-2024058484-A OR JP-S5930383-U OR CN-204647747-U OR EP-3188677-A1 OR CN-114193354-A OR CN-114227580-A OR TW-M573676-U OR CN-101163567-B OR CN-210061182-U).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/14 08:34 AM
L97	25	("5880783" "6141052" "6239841" "6587151" "6686956").pn. OR ("6947093").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:46 AM
L98	37	(Artificial Intelligence) More like doc: US-6947093-B2 Text: (US-6141052-A OR US-5880783-A OR US-6587151-B1 OR US-6686956-B1 OR US-6239841-B1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	ADJ	ON	ON	2025/05/14 08:46 AM

		20200389603-A1 OR US-20170244885-A1 OR WO-2019128234- A1 OR KR-200209661- Y1 OR EP-3211878-A1 OR CN-218850869-U OR US-4893143-A OR EP-3734963-B1 OR US-20210072486-A1 OR US-11397373-B2 OR EP-3734963-A1 OR US-11525973-B2 OR US-11272123-B2 OR US-11099461-B2 OR US-20040130655- A1).did.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L99	20	("6118653" "6141052" "6239841" "6323902" "6587151" "6731340").pn. OR ("6970202").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2025/05/14 08:46 AM
L100	38	(Artificial Intelligence) More like doc: US-6970202-B1 Text: (US-6141052-A OR JP- H10301718-A OR KR- 100278358-B1 OR US- 6587151-B1 OR US- 6731340-B1 OR US- 6239841-B1 OR US- 6970202-B1 OR EP- 0019243-B1 OR DE- 2919170-A1 OR US- 20070120034-A1 OR US-20240106271-A1 OR US-5927673-A OR TW-M470493-U OR US-6935605-B2 OR WO-2012097277-A2 OR US-20160028428- A1 OR US-11513425- B1 OR US- 20140036430-A1 OR CA-2627131-A1 OR US-10278299-B2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2025/05/14 08:46 AM
L101	65	((US-7841729-B2 OR US-3604913-A OR US- 6238060-B1 OR US- 5828449-A OR US- 5457492-A OR US- 5179474-A OR US- 4974138-A OR US- 5825495-A OR US- 7631979-B1 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	ADJ	ON	ON	2025/05/14 09:10 AM

		9071740-B1 OR US- 5010412-A OR US- 5379201-A OR US- 6273581-B1 OR US- 6435692-B1 OR US- 6979093-B2 OR US- 5722754-A OR US- 6575593-B2 OR US- 6974223-B2 OR US- 5311409-A OR US- 4677533-A OR US- 6040895-A OR US- 7136582-B2 OR US- 6711006-B2 OR US- 6799861-B2 OR US- 5855343-A OR US- 6239841-B1 OR US- 6481681-B1 OR US- 6679463-B1 OR US- 6738094-B1 OR US- 6947093-B2).did. AND USPT.dbnm.) OR ((US- 20070139515-A1 OR US-20070121343-A1 OR US-20060007666- A1 OR US- 20050151042-A1 OR US-20040211868-A1 OR US-20050230583- A1 OR US- 20060282866-A1 OR US-20070001087-A1 OR US-20030227770- A1 OR US- 20040218089-A1 OR US-20050207170-A1 OR US-20060181862- A1 OR US- 20070103918-A1 OR US-20020014960-A1 OR US-20080079906- A1 OR US- 20080174691-A1).did. AND PGPB.dbnm.) OR ((KR-200316985-Y1 OR JP-H03223972-A OR JP-H0465200-A OR JP- H05280946-A OR JP- 2001027776-A OR CN- 1084808-A OR GB- 2316168-A OR JP- WO2003010525-A1 OR JP-2002310626-A OR EP-0822409-A2 OR DE-20310780-U1 OR JP-H10136241-A OR JP-H11153832-A OR JP-H11284882-A).did.	MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
--	--	---	--	--	--	--	--

		AND FTDB.dbnm.) OR ((US-20010043468-A1 OR US-20010048409-A1 OR EP-1072884-A2).did. AND DWPI.dbnm.) OR ((US-1633315-A OR US-1510049-A).did. AND USOC.dbnm.)					
--	--	--	--	--	--	--	--

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.02.1998 Bulletin 1998/06

(51) Int Cl.⁶: **G01N 21/88**

(21) Application number: **97650032.2**

(22) Date of filing: **01.08.1997**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

• **Mahon, James**
Dublin 9 (IE)
• **Conlon, Peter**
Ballsbridge, Dublin 4 (IE)

(30) Priority: **02.08.1996 IE 960563**

(71) Applicant: **M.V. Research Limited**
Dublin 2 (IE)

(74) Representative: **Weldon, Michael James**
Michael Weldon & Co.,
11 South Mall
Cork (IE)

(72) Inventors:
• **O'Neill, Sean Michael**
Dublin 9 (IE)

(54) **A measurement system**

(57) A measurement system (1) has robotic system (3) mounted over a base plate (2) which provides a vertical height reference. In the optical head (8), a CCD camera (17) is adjustable to be pre-set in height. The optical head (8) also has an upper light source (18) comprising LEDs and a lower light source (25) comprising a white fluorescent lamp (26) for lateral component illumination. An air flow system (45) directs cooling air in a swirling motion around the tube. An image analysis computer (10) automatically performs various tests to co-ordinate optical and mechanical operation.

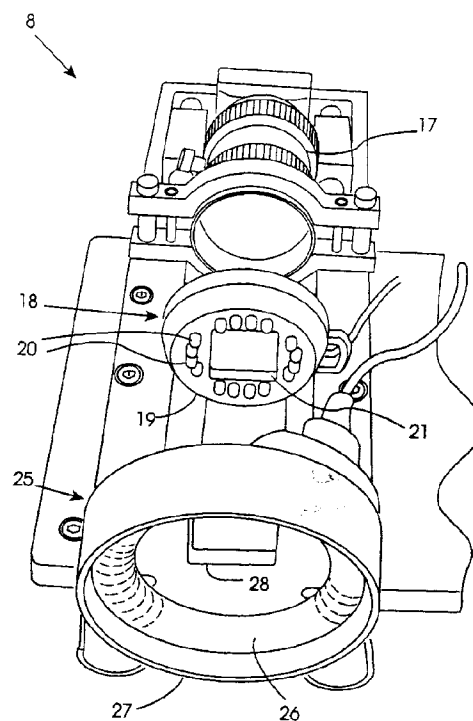


Fig. 4

Description

INTRODUCTION

Field of the Invention

The invention relates to a measurement system, and more particularly to a system for identifying components on an electronic circuit board and measuring their locations. Such systems generally comprise a support for supporting the circuit board and a robotic system which drives an optical head having a camera connected to an image processor.

Prior Art Discussion

EP 634892 (Citizen) describes a system which has a light source comprising a plurality of LEDs and a light shielding arrangement. WO 91/12489 (ABOS) describes a system having a light transmission arrangement which is specific to a particular type of component being measured. While these systems appear to be quite effective for particular applications, they appear to be limited in their range of applications. US 5302836 (Siu, B) describes a system which has multiple rings of illumination focused towards their axes. It appears that it would be difficult to control and drive such an arrangement in a high-speed real-time manufacturing environment.

Objects of the Invention

One object is to improve the "optical chain" signal from the components to the processor to allow accurate and repeatable measurements in a robust system suitable for a manufacturing environment.

Another object is to provide a simpler measurement system, leading to lower cost and simpler maintenance.

SUMMARY OF THE INVENTION

According to the invention, there is provided a measurement system comprising:-

a robotic system mounted on a base;

an optical head driven by the robotic system and comprising a light source and a camera;

an image analysis computer connected to the optical head and comprising means for capturing circuit board images and using the images to measure component locations;

characterised in that,

the camera is mounted on the optical head in a vertically adjustable manner; and

the light source means comprises:-

an upper set of light emitting diodes mounted in a ring arrangement for near-on-axis illumination, and means for switching said light emitting diodes,

a lower annular fluorescent lamp, and

means for cooling air under the fluorescent lamp.

By providing two light sources optimum illumination may be achieved. For example, the LEDs may be switched on for fiducial measurement and off for component measurement. The fluorescent lamp provides comprehensive lateral and diffuse illumination for component measurement. By cooling the air under the lamp, heat shimmer distortion is avoided in a very simple manner and the benefits of a fluorescent lamp may be availed of.

In one embodiment, the fluorescent lamp is of white colour and has a higher intensity than the light emitting diodes. This is particularly effective for component measurement.

Preferably, the light source further comprises a reflector surrounding the fluorescent lamp at its upper side and its outer periphery to provide additional diffuse illumination. This allows the fluorescent lamp provide both direct (mainly lateral) illumination and diffuse illumination arising from reflection.

In one embodiment, the cooling means comprises means for directing cooling air in a swirling motion around the fluorescent tube. This is a simple and effective way of avoiding heat shimmer. The air directing means may comprise air ducts within the reflector and having at least two mutually complementary air outlets. This arrangement is simple as it results in few parts. The outlets are preferably located at approximately the central vertical position of the lamp.

In one embodiment, the fluorescent lamp is operated at a frequency of 23 to 40 kHz. This avoids image intensity "beat", leading to high accuracy and stability.

Preferably, the robotic system comprises means for adjusting vertical position of the optical head. In one embodiment, the optical head comprises means for adjusting vertical position of the fluorescent lamp, and said adjustment means comprises a snap-fitting connector. These arrangements allow versatility to the extent of providing for pre-reflow or post-reflow component measurement.

Preferably, the camera has a tele-centric gauging capacity.

In one embodiment, the optical head comprises means for rapid switching of the LEDs. This allows fast operation by minimising delay between fiducial and component measurement.

In another embodiment, the image analysis compu-

ter comprises a frame grabber with a pixel jitter value of less than 5 ns.

Preferably, the system comprises a support frame having a mass in excess of 1000 kg, and the robotic system base plate is point mounted onto horizontally milled upper surfaces of the frame. This is a very important feature as it ensures stability and level positioning of the robotic system.

In one embodiment, the image analysis computer is programmed to perform repeatability tests comprising the steps of:-

for each of a plurality of optical head acceleration values performing a plurality of component measurements and recording time duration and a standard deviation of the measured location;

plotting responses of said standard deviation and time versus acceleration; and

determining an optimum optical head acceleration value based on both of said plots analyses in conjunction with each other.

This provides for repeatability and optimum acceleration in a very simple manner

In one embodiment, the image analysis computer comprises means for performing automatic scaling by:-

directing movement of a reference target to the optical head field of view;

directing robotic movement of the target with an accuracy of less than ± 5.0 microns over the working area and determining the corresponding movement in the image as a number of pixels; and

determining a correlating relationship between the robotic and image movements and using said relationship to determine and store a fresh scaling factor.

Preferably, the image analysis computer comprises means for storing in a database a flag indicating components which are larger than the field of view, and for capturing images of pads in rows of such components when they are identified and subsequently merging the associated measurements to generate a composite measurement.

In one embodiment, the image analysis computer comprises means for directing a second pass for components which are identified in a database as potentially having different identification colours, the second pass being initiated according to comparisons with grey scale thresholds on the first pass and being limited to a pre-defined area of the component.

In a further embodiment, the computer performs initial view allocation, and in a second pass eliminates sin-

gle-component views of the component in another view, where possible.

Ideally, the computer stores a computer aided design circuit board layout, displays the layout, and adjusts component colours according to measured parameter trends.

In one embodiment, the computer applies a colour-coding scheme to each parameter tracked.

DESCRIPTION OF THE INVENTION

Brief Description of the Drawings

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying drawings, in which:-

Fig. 1 is a front view of a measurement system of the invention;

Fig. 2 is a more detailed and side perspective view of the system;

Fig. 3 is a side view showing an optical head of the system;

Fig. 4 is a perspective view from underneath of the optical head;

Fig. 5(a) is a diagrammatic cross-sectional front view of a lower light source, and Figs. 5(b) and 5(c) are plan views according to the arrows (i) - (i) and (ii) - (ii) of Fig. 5(a) respectively.

Fig. 6 is a flow diagram illustrating the manner in which the system performs automated repeatability tests;

Figs. 7 and 8 are diagrams illustrating operation of the system to perform automated repeatability tests;

Fig 9 is a flow diagram illustrating the manner in which the system performs automatic scaling; and

Fig. 10 is a flow diagram illustrating the manner in which the system monitors large components.

Detailed Description of the Preferred Embodiments

Referring to the drawings, and initially to Figs. 1 to 4, there is illustrated a measurement system of the invention indicated generally by the numeral 1. The system 1 comprises a base plate 2 having a machined upper flat surface which provides a base reference for the system. A robotic system 3 is mounted over the base plate 2 on a pair of rails 4 mounted on risers 5, in turn

mounted on the base plate 2. The height of the risers is carefully selected as this height provides the base height for the robotic system and the optical head which it drives. In more detail, the robotic system 3 comprises a longitudinal drive 6 and a transverse drive 7, both of the linear motor system type.

An optical head 8 is mounted on the robotic system and is connected to display screens 9 via an image analysis computer 10. The computer 10 has a frame grabber with a jitter value of less than 5 ns. In addition to performing image analysis, the computer 10 also performs motor control and digital input/output functions. Conveyor rails 11 are mounted above the base plate 2 and beneath the optical head 8 and these are for conveying printed circuit boards (PCB's) 12 underneath the optical head for measurement of components on the board. The apparatus also comprises a keyboard 13 on sliding rails, as shown in Fig. 1.

The base plate 2 is point mounted on a heavy support frame 14 which houses the computer 10. The frame 14 has a mass in excess of 1000 kg, and the plate 2 is bolted at six upper surfaces which have been machined in a single pass to ensure that they are level.

The optical head 8 is mounted on a support block 15 having a pair of vertical bars 16 onto which a camera 17 is mounted. The camera 17 is of the CCD type and has a tele-centric gauging lens. It is mounted on the bars 16 in a manner which allows vertical pre-setting.

The optical head also comprises, beneath the camera 17, an upper light source 18 comprising a support 19 supporting a ring of red light emitting diodes (LEDs) 20 around an aperture 21. The optical head 8 also comprises a lower light source 25 comprising a ring-shaped white fluorescent lamp 26 mounted in a reflective housing 27. The housing 27 has an aperture 28 which is larger than the maximum field of view of the camera 17.

The system 1 is suitable for use before or after reflow in a surface mount technology (SMT) manufacturing process so that trends in the placement operations can be determined from the measurement results. The system 1 initially measures the position of fiducials on the printed circuit (PCB) using the near on-axis illumination of the LEDs 20. The system 1 then measures each component's position relative to the fiducial coordinates and identifies the components. Due to a combination of optical and drive features, the system achieves very high accuracy and excellent repeatability in making measurements at production rates to provide real-time statistical trends of the manufacturing process. This is invaluable to the manufacturer as the trend information allows a preventative maintenance program to be implemented for the placement machines in the process.

Referring now to Fig. 5, the manner in which a component being measured is illuminated is now described. The upper light source 18 generates a near-on-axis red light beam A directed vertically through the aperture 28. The beam A is relatively weak and is useful primarily for identifying fiducials at the beginning of a measurement

process. Thus, the LEDs 20 are rapidly switched for fiducial measurement before component measurement.

As is clear from Fig. 5(a), the fluorescent lamp 26 is close to the level of the PCB, extends in a circle having a larger diameter than the field of view, and is surrounded by a reflective housing which extends downwardly. Because of this arrangement light rays B both impinge laterally on the target and also provide diffuse illumination by reflecting from the reflector surfaces. In this drawing, an SMT component 41 having leads 42 is within the field of view. An important aspect of the lighting arrangement is that the light rays B impinge on the sides of the component 41, namely at the leads 42 and some of them reflect upwardly within the field of view to be captured by the camera 17. This puts a large degree of emphasis on the sides of the components, and more particularly the leads 42. As these are the most important parts of the components for measurement purposes, this optical emphasis reduces the complexity of image analysis which is required and therefore allows a faster response time for real-time measurement to be achieved. Because white light is emitted by the lamp 26, the computer 10 may capture and display colour or monochrome images for analysis. Another important aspect of the lower light source 25 is that high-frequency (the frequency level being 23-40 kHz) fluorescent lighting is used so that image capture "beat" is avoided. These advantages stem largely from use of a fluorescent lamp. However, such a type of lamp has previously been dismissed as a viable option as it results in heat shimmer distortion. In the invention, this problem has been overcome by use of an air flow system illustrated in Figs. 5 (a), 5(b), and 5(c). As illustrated, an internal duct 45 having an inlet 45(a) at the rear extends forwardly from the inlet, laterally in both directions across the top plate of the housing 27, and then downwardly to outlets 45(b). As is clear from Fig. 5(c), the configuration of the outlets 45(b) is such that the air pumped through the duct 45 exits at the outlets 45(b) and flows with a swirling motion inside the housing 27 and around the lamp 26. For clarity, the lamp is not illustrated in Fig. 5(c). It has been found that the air flow system is a very simple, effective, and inexpensive way preventing heat shimmer. It thus allows use of a fluorescent lamp so that the system can avail of the advantages of high frequency, high intensity, and low lamp cost.

Referring again to Figs. 1 to 4 the optical axis of the system is configured so that it is parallel to the z vertical axis of the robotic system 3, but offset in one direction by a predetermined amount. Further, the risers 5 are of a specific height to ensure that the focal plane of the camera 17 is centred around the point of inspection. As shown most clearly in Fig. 3, the optical head 8 is mounted onto the support block 15 by bolts. Thus, the vertical position of the optical head can be adjusted by removing the bolts and reinserting them in different tapped holes with the head 8 at a higher level. This simple adjustment allows use of the system for post-reflow component

measurement. For such measurement, the head is adjusted to a higher level, and so the light beams are at a larger angle to horizontal. At the post-reflow stage, the solder has formed a solidified solder fillet against the component, which reflects such light away, thus causing darkness at the solder image location and therefore improving definition and discrimination.

Height of the lower light source 18 may alternatively be adjusted by connecting the reflector housing 27 to an upstanding carrier which slides relative to the support block. The carrier may be configured for snap-fitting engagement at pre-set positions.

These features allow very flexible use of the system 1. For example, by substituting the optical head with one having a different camera and adjusting height the number of pixels per view can be dramatically increased per improved performance where required.

Another aspect of the manner in which optical and mechanical drive features are combined to achieve high accuracy and excellent repeatability is the fact that the system 1 carries out repeatability tests, as described in the flow diagram of Fig. 6. In this drawing, a method 50 is illustrated which has the initial step 51 of measuring the location of a particular target on the X and Y axes and monitoring the time taken to make the measurement. As indicated by the decision step 52, step 51 is repeated n (in this case, 3) times, after which in step 53 the computer 10 computes X and Y standard deviations XRR and YRR and an aggregate measurement time. In step 54, the computer 10 stores a value for the standard deviation for the particular robotic system optical head acceleration values, and also stores the value for the aggregate measuring time for the acceleration values. The following is an example of a table which is stored.

Acceleration ($\mu\text{m}/\text{ms}^2$)					
X	Y	n	Time (ms)	XRR	YRR
2.0	1.0	3	280	6	7
3.0	1.5	3	230	6	8
4.0	2.0	3	215	8	9
5.0	2.5	3	205	9	10
6.0	3.0	3	200	11	15

As indicated by the steps 55 and 56, these tests are repeated m times and after each test the computer adjusts the motor control settings to increase the acceleration to a new, incremented value before the next test is carried out. After steps 51 to 54 have been carried out m (in this case, 5) times, tables of values corresponding to the graphs shown in Figs. 7 and 8 are developed. The former graph plots a vertical axis parameter being six times the standard deviation for the measured location against acceleration on the horizontal axis. It is desirable to use an acceleration which gives the best combination of low RR values and time. In the latter diagram,

there is a gradual reduction in the measurement time until an acceleration level of approximately $4 \mu\text{m}/\text{ms}^2$ is reached. The interrupted line between the two graphs indicates a possible optimum acceleration level to achieve a narrow standard deviation with a low measurement time for optimum results. This acceleration level is determined in steps 57 and 58 by the computer 10.

The system 1 also combines optical and mechanical drive features in an automatic scaling process 70 shown in Fig. 9. In this process, in step 71 a glass calibration plate is mounted beneath the optical head 8 and in step 72, the robotic system 3 moves the plate to cause a precision fiducial reference mark on the plate to be located within the field of view. In step 73, the robotic system 3 moves the fiducial a total of Nmm with an accuracy of $\pm 5.0 \times 10^{-6}$ m over the working area on the X axis. This level of mechanical drive accuracy is achieved by use of a linear motor drive system and accurate machining of the base plate, risers and rails. In step 74, the computer 10 determines the number of image pixels ("pixel distance") which the fiducial mark traverses during this physical motion, using sub-pixel measurement algorithms. As indicated by the decision step 55, the steps 73 and 74 are repeated n times and in step 76 the physical distances of the robotic system and the "pixel distances" are averaged. In step 77, the computer 10 stores an automatic scaling factor correlating these two distances. Then, as indicated generally by the steps 78, it repeats steps similar to steps 71 to 77 for the Y axis. This automatic scaling is achieved because the robotic system employed is accurate to one micron repeatability and ± 5.0 micron accuracy over the working area and use of highly accurate sub-pixel algorithms in conjunction with the optimum lighting head configuration.

The manner in which the system 1 deals with components which are larger than the field of view is illustrated by the process 90 in Fig. 10. In this process, in step 91 the computer 10 recognises a component by virtue of its measured location and by cross-reference to a database indicating such large components by a data record flag. These latter steps are indicated by the step 92 and as indicated by the decision step 93 are repeated for each component identified. Where a large component is identified, in step 94 the computer breaks the component into four sub-components or "row" of pads and then inspects each pad in isolation. A row naming scheme is used by the computer 10. For example, the component may be called u200 and the system would break it into four rows of pads, one from each side. The component is now named u500ne12, u200en10, u200sw12 and u200ws10. Each of these rows of pads is measured in isolation and the results are then merged back together to yield a measurement for the whole component. An important aspect of this process is the fact that the step 94 of capturing the pad images involves tracking of offsets for each measurement, the

offset levels being stored in the database. Once the offsets have been correctly retrieved by the computer 10, it is a relatively simple operation to merge the measurements. Thus, while the process 90 may at first appear complex, it may be carried out in real-time with a fast response time.

Another aspect of operation of the system 1 is that the computer 10 differentiates tantalum capacitor components, the colour of which may change without notification. This is achieved by using two grey scale thresholds, a high one for the yellow examples and a low one for the black examples. If the image is above the high threshold, a full measurement result set is generated. If it fails the high threshold test, the central area only is tested against the low threshold and if it is below this, the component is considered to be present, but no X and Y information is generated. This effectively means that multiple image analysis algorithms are employed to cater for a situation where there are two potential solutions.

In controlling the fields of view, the computer performs initial view allocation in which the components are sorted in top to bottom and left to right order. Starting at the top left, a view is "hung" on the first components, and all components that fit within that view are allocated to it in a non-optimal fashion. These components are flagged as unavailable. The search continues with the next component, "hanging" another view and allocating as many components to it as possible and continuing until all of the views are allocated. To eliminate anomalous results arising from single components allocated to views, the computer 10 uses a compactor algorithm in the second pass. This looks at all single component views and checks if the component lies within another view. If it does, it is allocated to that view and the initial view is deleted. In this way, about 5% of the views can be deleted with a corresponding improvement in performance.

For display of captured images, the computer 10 generates a graphical display for ease of viewing of measurement information on a production line. This caters for the fact that there may be as many as 2000 X and 2000 Y measurement data sets for each pcb 12 being measured. The system computes mean X and Y offsets from nominal position and standard deviation of X and Y offsets for each component. Using the mean and standard deviation, and also using known process widths, the system calculates Cp (potential process capability index), K (correction factor), and CpK (process capability index) for each component in real-time. CAD data for the circuit board layout which was previously stored is employed to display a map of the board. By selecting one parameter, the CAD layout map for the circuit board is colour-coded so that the characteristics of individual components become explicit. There is one colour code for each parameter. This display technique gives the operator instant feedback on the manufacturing process.

The invention is not limited to the embodiments hereinbefore described, but may be varied in construction and detail. For example, the air flow system may comprise external tubes connected to the reflector housing. It is not essential that a telecentric gauging lens be used.

Claims

1. A measurement system (1) comprising:-

a robotic system (3) mounted on a base;

an optical head (8) driven by the robotic system and comprising a light source and a camera;

an image analysis computer (10) connected to the optical head and comprising means for capturing circuit board images and using the images to measure component locations;

characterised in that,

the camera (17) is mounted on the optical head in a vertically adjustable manner; and

the light source means comprises:-

an upper set of light emitting diodes (20) mounted in a ring arrangement for near-on-axis illumination, and means for switching said light emitting diodes,

a lower annular fluorescent lamp (26), and

means (45) for cooling air under the fluorescent lamp.

2. A measurement system as claimed in claim 1, wherein the fluorescent lamp is of white colour and has a higher intensity than the light emitting diodes, and preferably the light source further comprises a reflector (27) surrounding the fluorescent lamp (26) at its upper side and its outer periphery to provide additional diffuse illumination.

3. A measurement system as claimed in claims 1 or 2, wherein the cooling means comprises means (45, 45(b)) for directing cooling air in a swirling motion (c) around the fluorescent tube.

4. A measurement system as claimed in claim 3, wherein said air directing means comprises air ducts (45) within the reflector and having at least two mutually complementary air outlets (45(b)).

5. A measurement system as claimed in any preceding

ing claim, wherein the fluorescent lamp is operated at a frequency of 23 to 40 kHz.

6. A measurement system as claimed in any preceding claim, wherein the robotic system comprises means (15) for adjusting vertical position of the optical head. 5
7. A measurement system as claimed in any preceding claim, wherein the system comprises a support frame having a mass in excess of 1000 kg, and a robotic system base plate is point mounted onto horizontally milled upper surfaces of the frame. 10
8. A measurement system as claimed in any preceding claim, wherein the image analysis computer (10) is programmed to perform automated repeatability tests comprising the steps of:- 15
 - for each of a plurality of optical head acceleration values, performing a plurality of component measurements (51) and recording time duration and a standard deviation of the measured location; 20
 - plotting (54) responses of said standard deviation and time versus acceleration; and 25
 - determining (58) an optimum optical head acceleration value based on both of said plots analysed in conjunction with each other. 30
9. A measurement system as claimed in any preceding claim, wherein the image analysis computer comprises means for performing automatic scaling by:- 35
 - directing movement of a reference target to the optical field of view; 40
 - directing robotic movement of the target with an accuracy of less than +/-5.0 microns over the working area and determining the corresponding movement in the image as a number of pixels; and 45
 - determining a correlating relationship between the robotic and image movements and using said relationship to determine and store a fresh scaling factor. 50
10. A measurement system as claimed in any preceding claim, wherein the image analysis computer comprises means for storing in a database a flag indicating components which are larger than the field of view, and for capturing images of pads in rows of such components when they are identified and subsequently merging the associated meas-

urements to generate a composite measurement.

11. A measurement system as claimed in any preceding claim, wherein the image analysis computer comprises means for directing a second pass for components which are identified in a database as potentially having different identification colours, the second pass being initiated according to comparisons with grey scale thresholds on the first pass and being limited to a pre-defined area of the component. 5
12. A measurement system as claimed in any preceding claim, wherein the computer performs initial view allocation and in a second pass eliminates single-component views of the component in another view. 10
13. A measurement system as claimed in claim 1, wherein the computer stores a computer aided design circuit board layout, displays the layout, and adjusts component colours according to measured parameter trends. 15

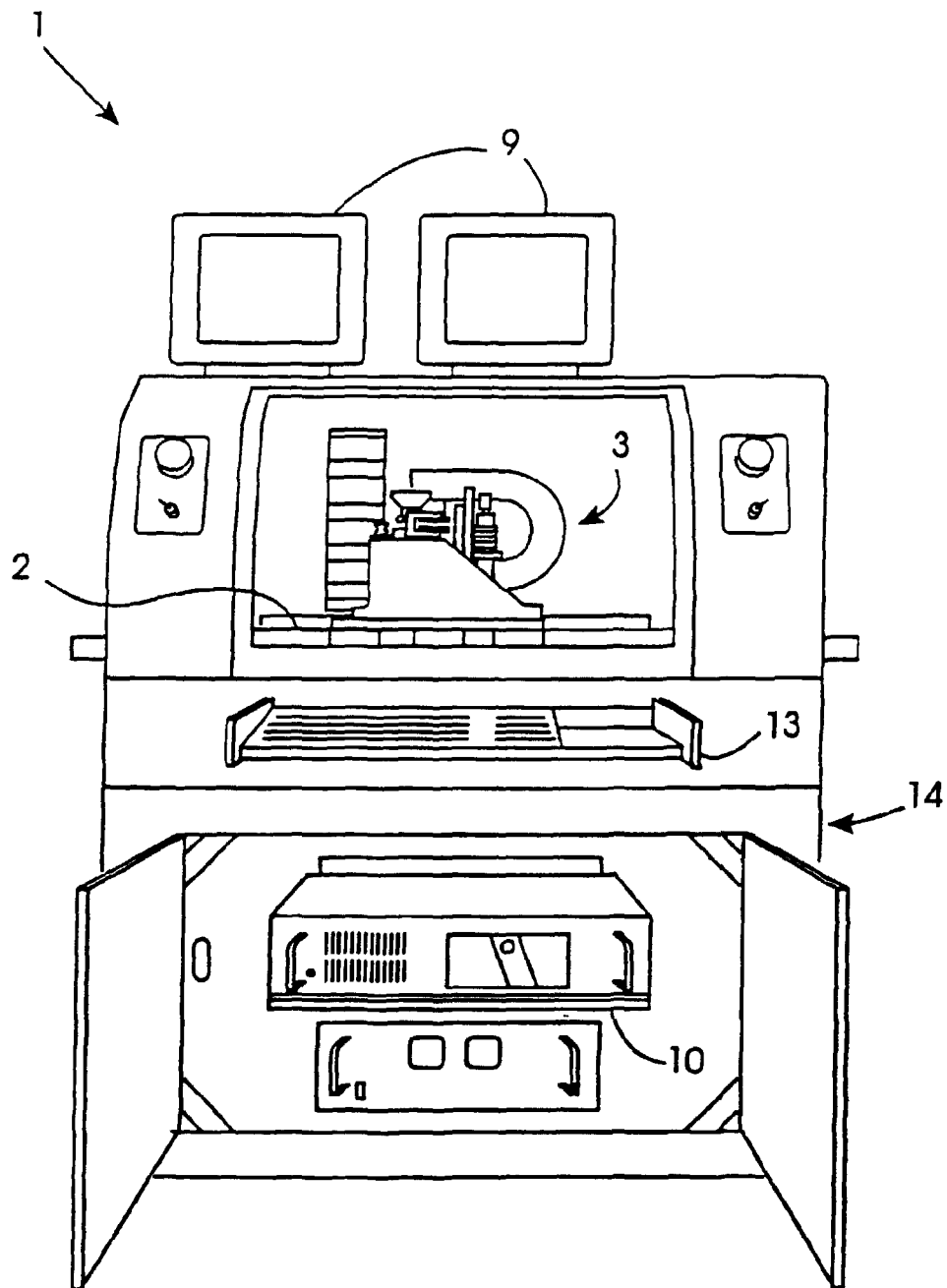
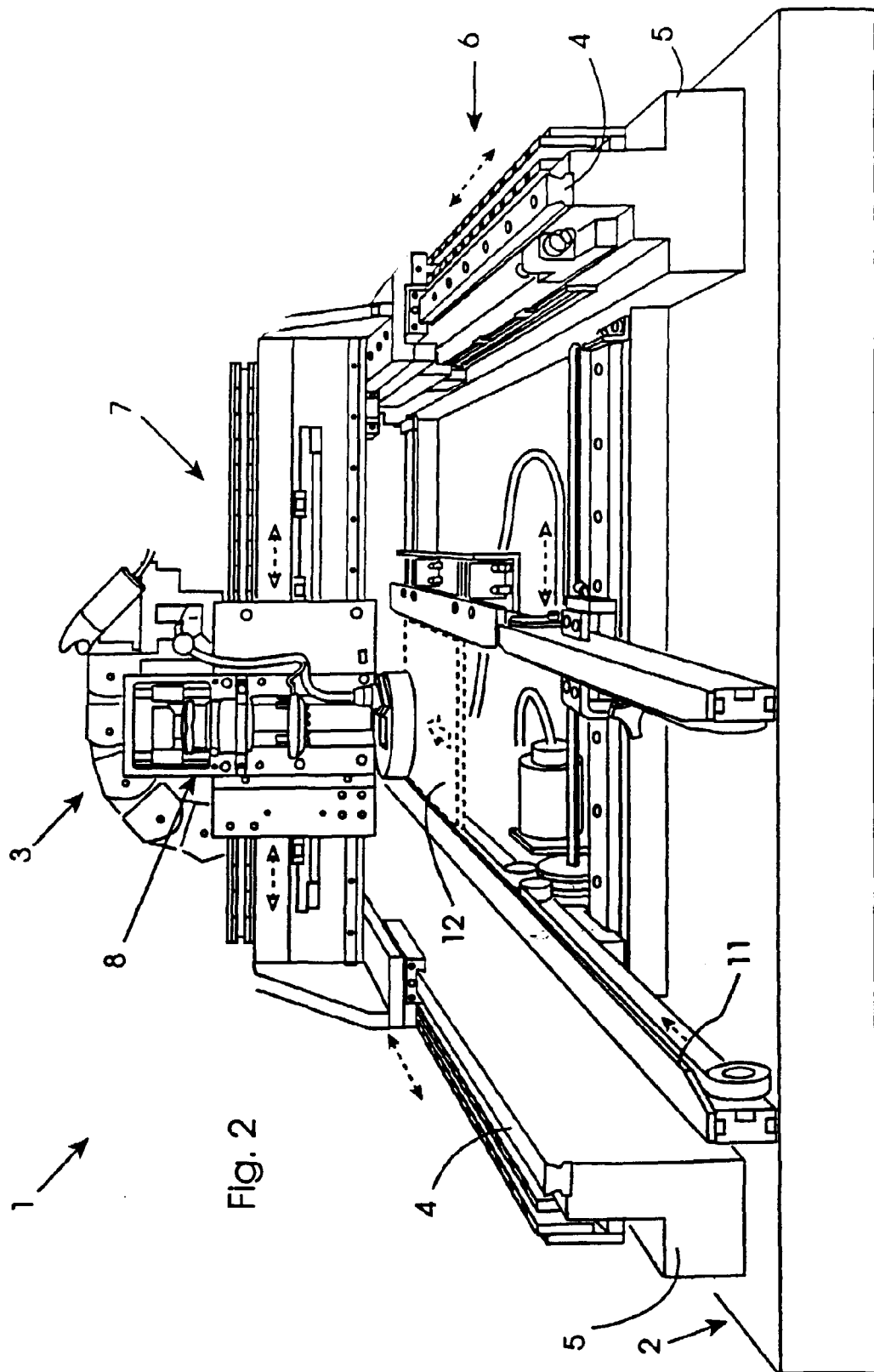


Fig. 1



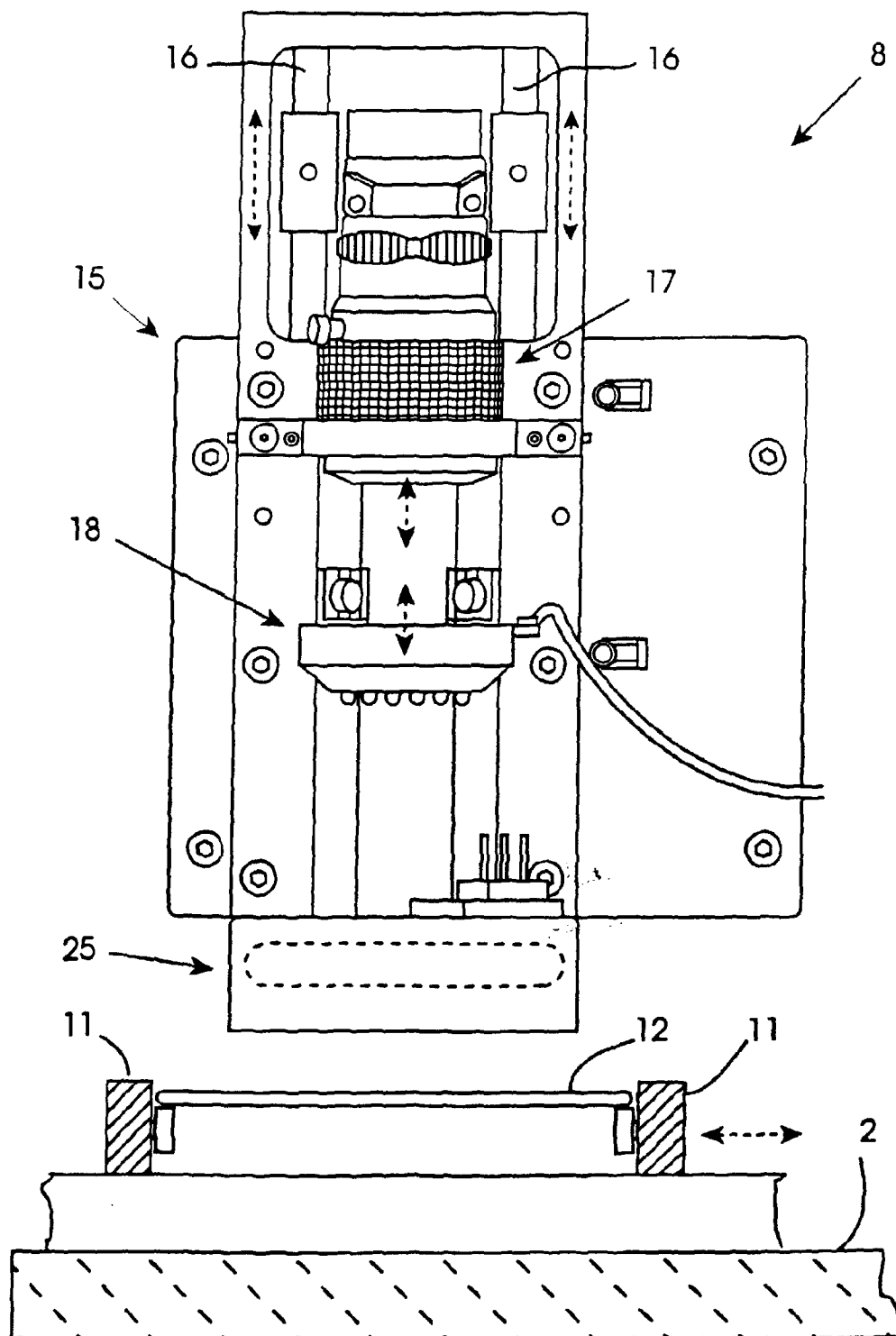


Fig. 3

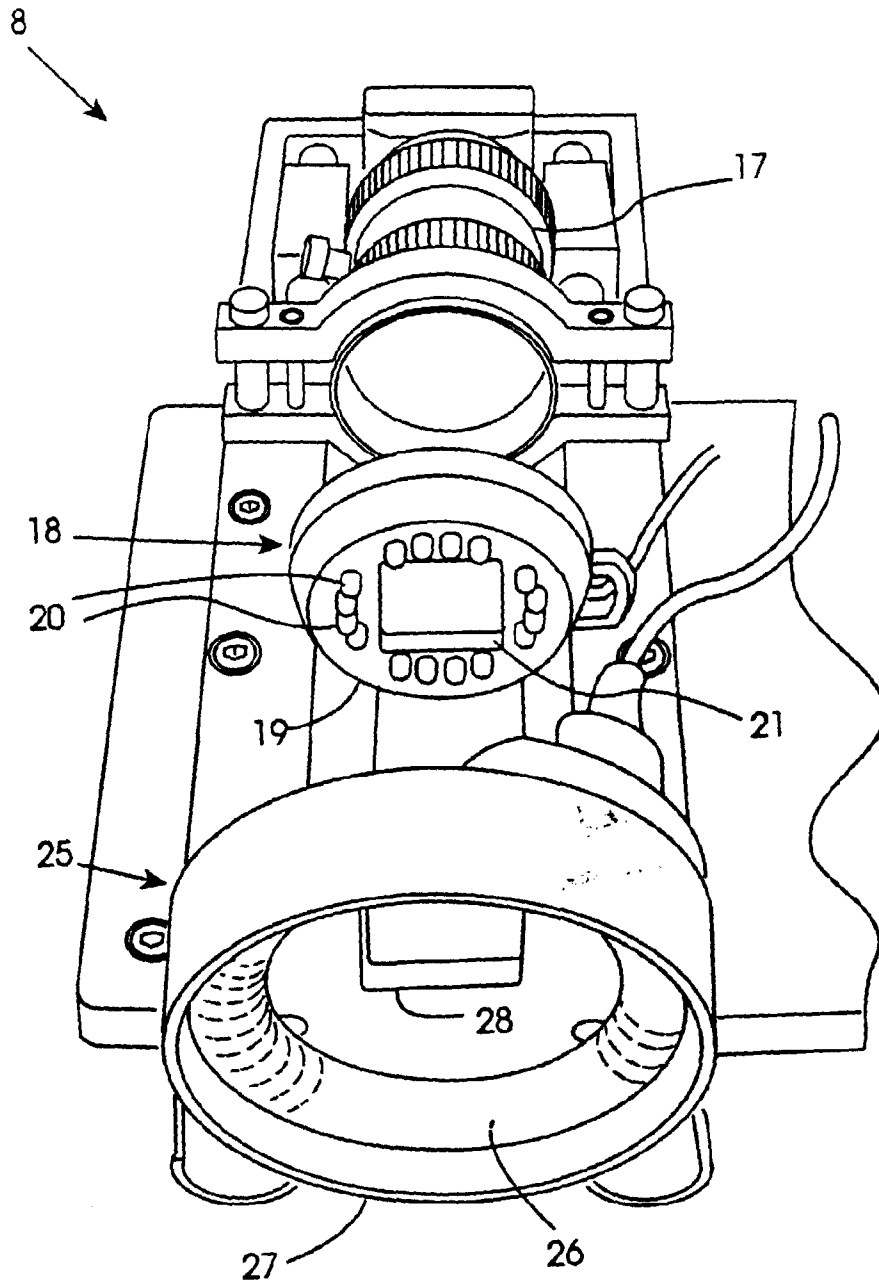


Fig. 4

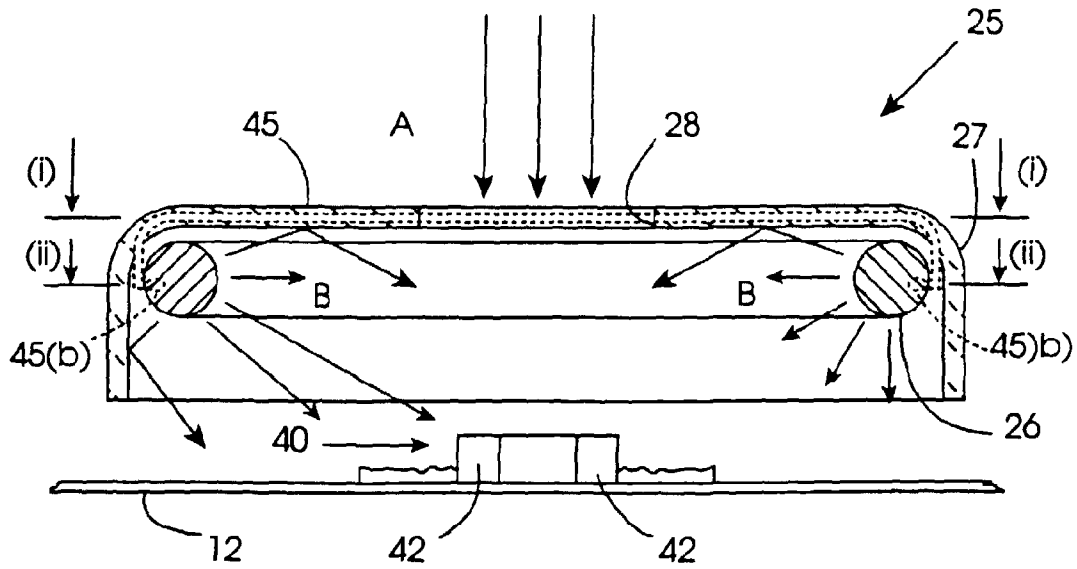


Fig. 5 (a)

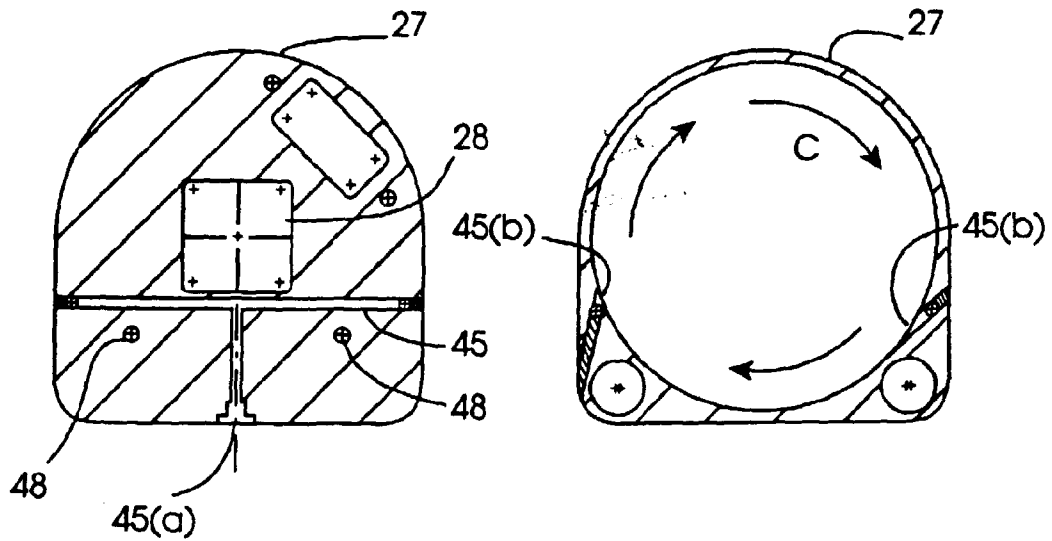


Fig. 5 (b)

Fig. 5 (c)

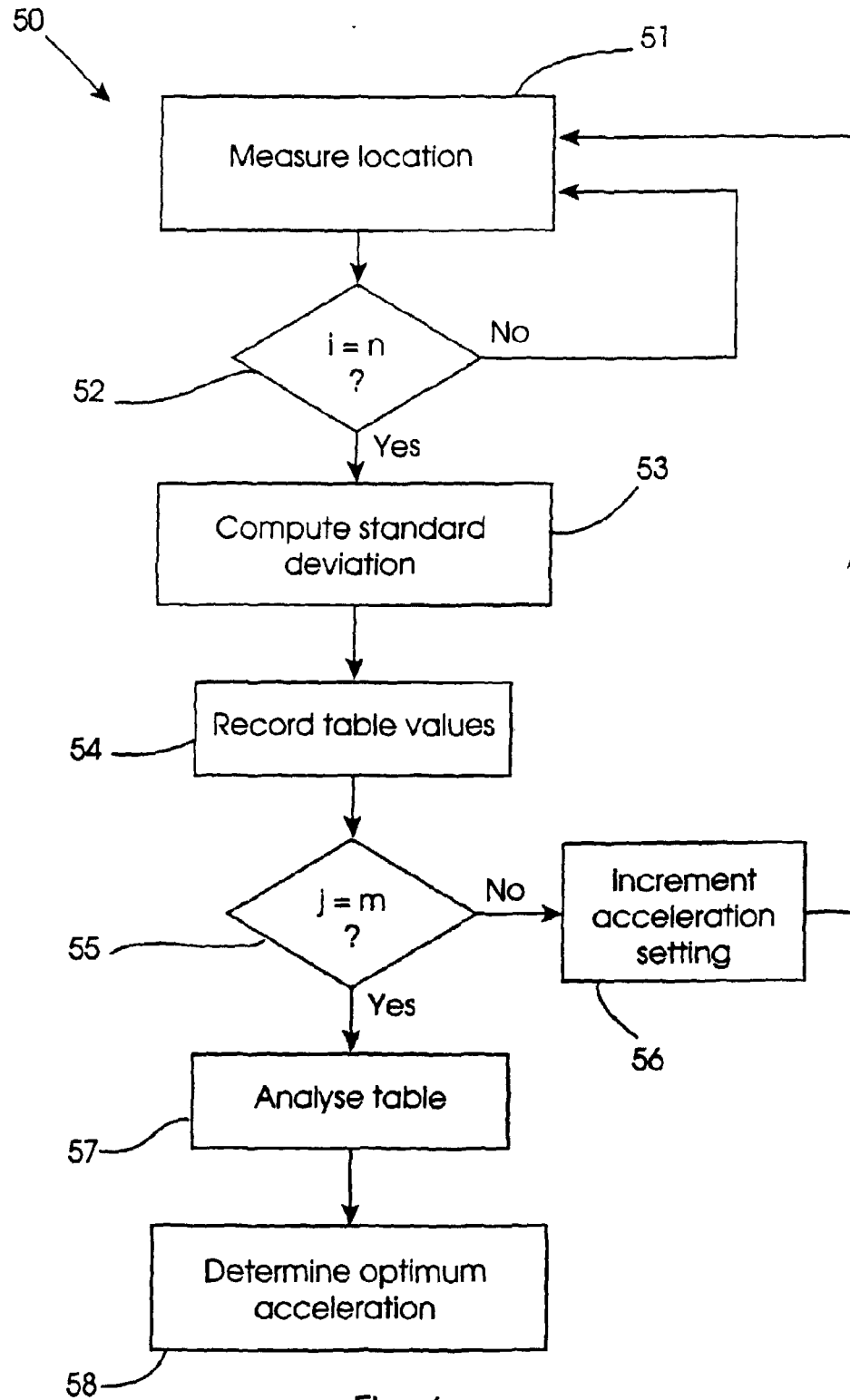
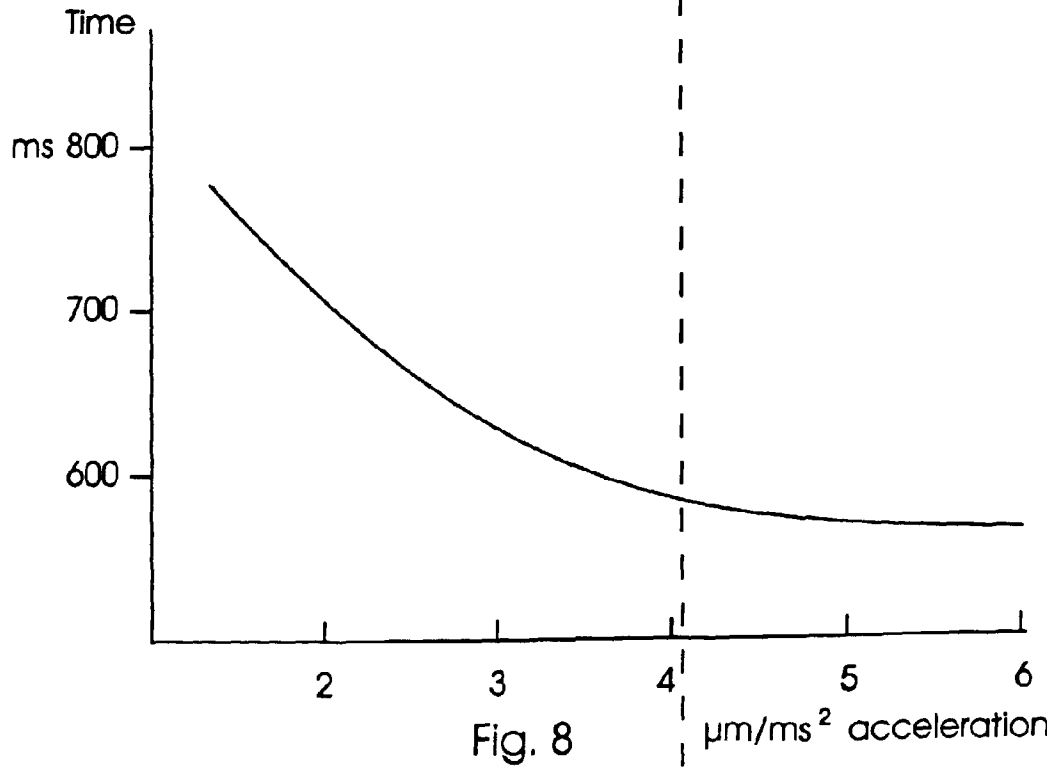
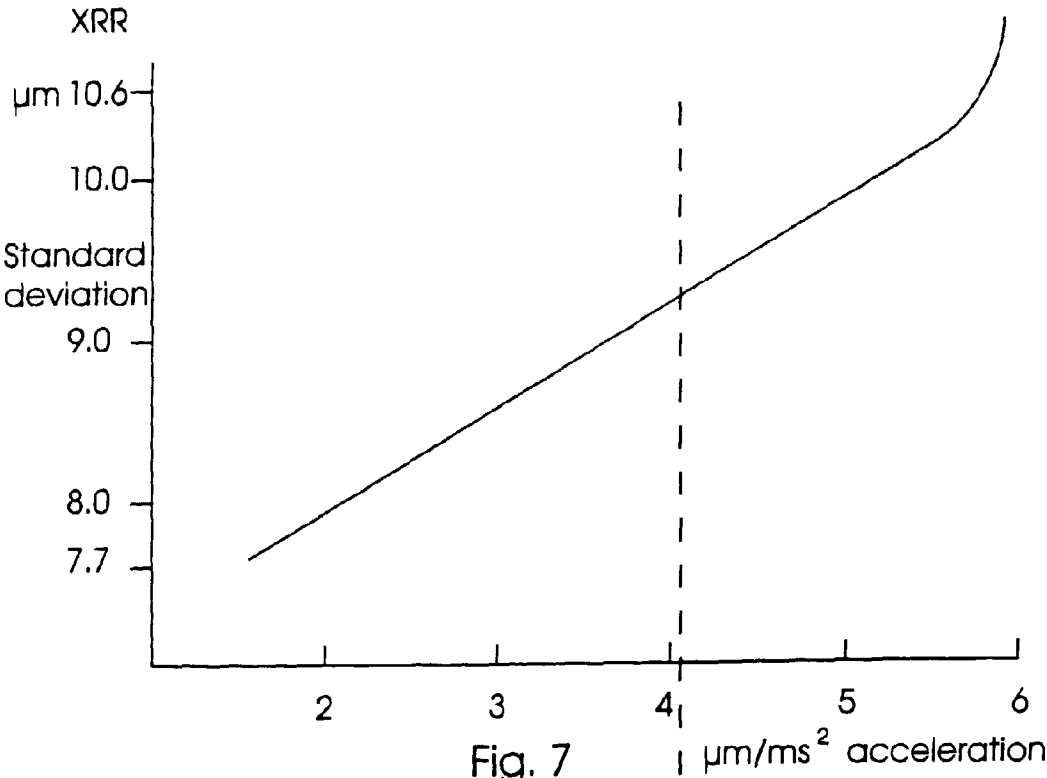


Fig. 6



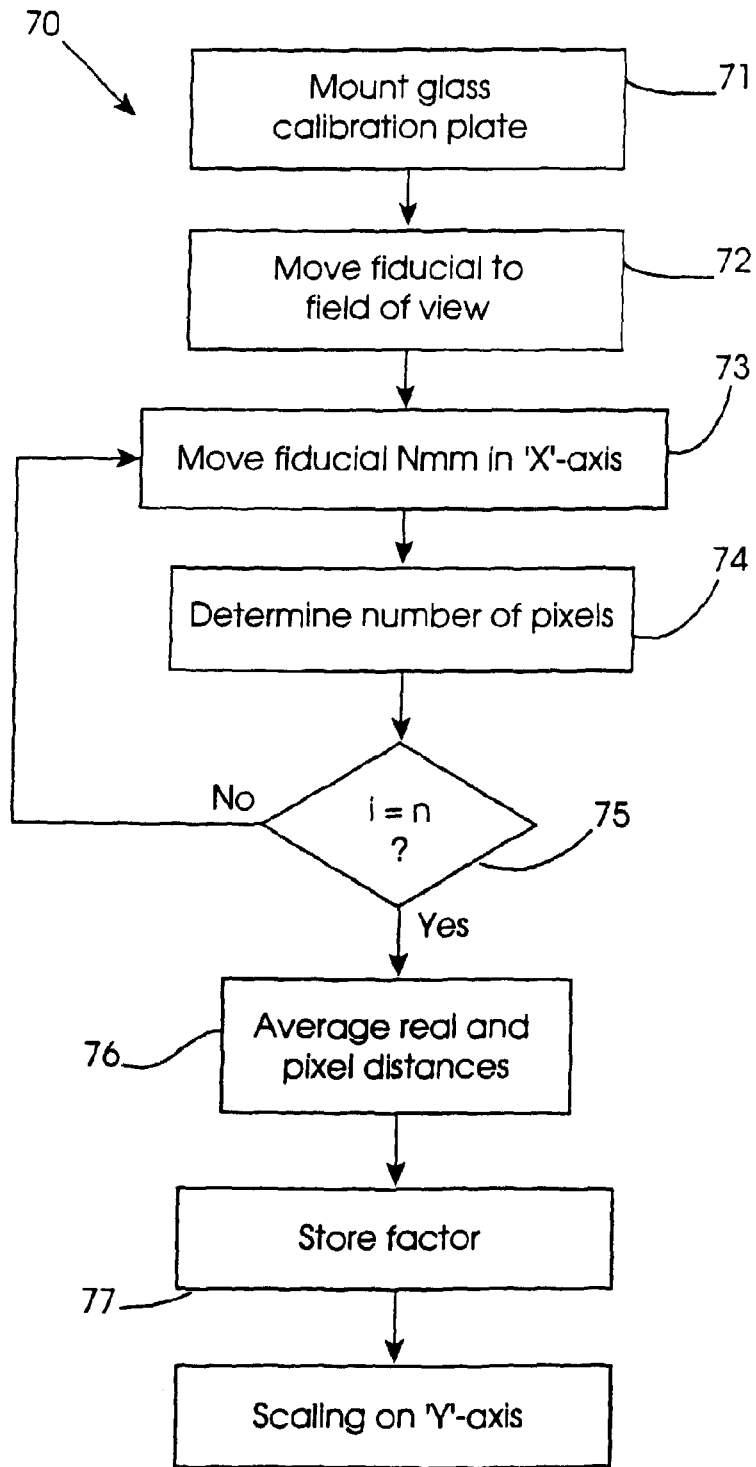


Fig. 9

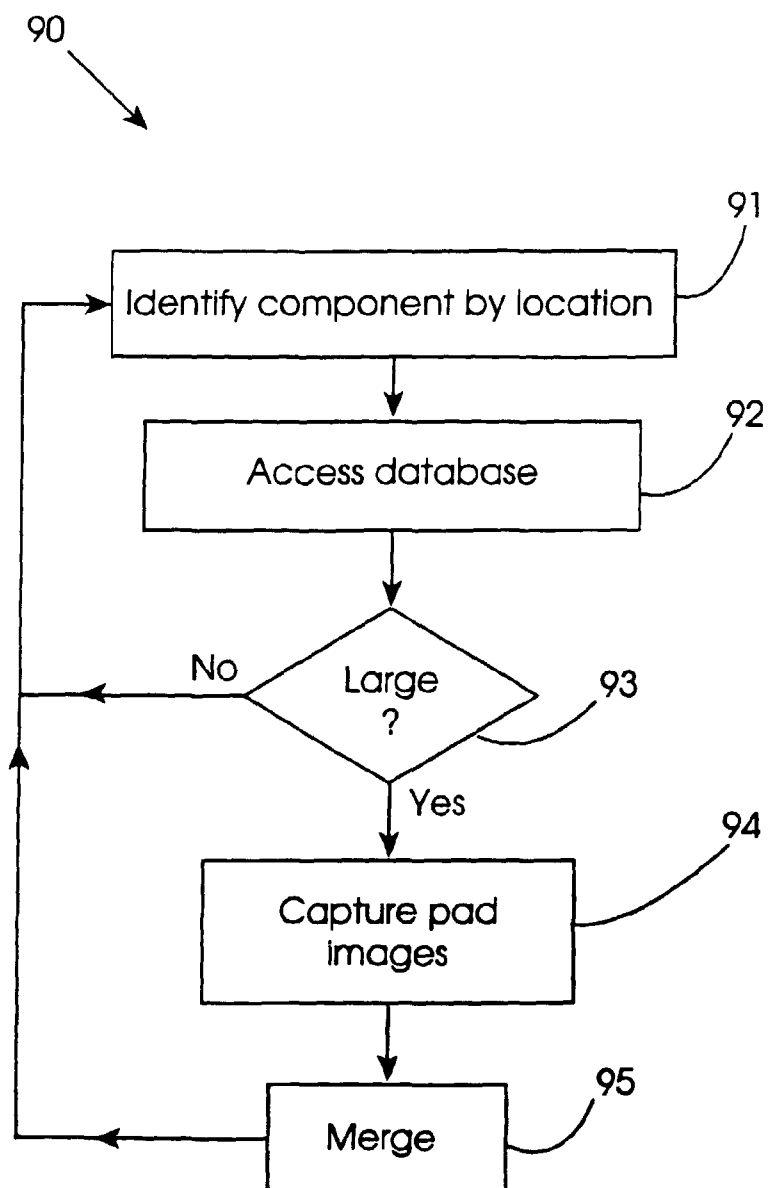


Fig.10



(19)
Bundesrepublik Deutschland
Deutsches Patent- und Markenamt

(10) **DE 203 10 780 U1** 2004.01.29

(12)

Gebrauchsmusterschrift

(22) Anmeldetag: **14.07.2003**

(47) Eintragungstag: **18.12.2003**

(43) Bekanntmachung im Patentblatt: **29.01.2004**

(51) Int Cl.⁷: **F21V 23/00**
F21V 21/088, F21V 23/06

(71) Name und Wohnsitz des Inhabers:
Lin, Jack, Lu Chu Shiang, Taoyuan, TW

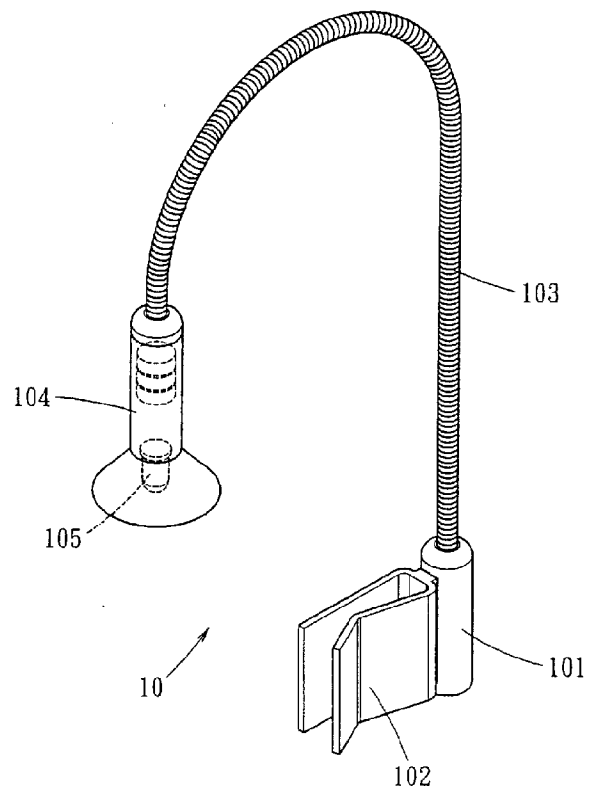
(74) Name und Wohnsitz des Vertreters:
TER MEER STEINMEISTER & Partner GbR
Patentanwälte, 81679 München

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Bezeichnung: **Lampenkonstruktion für ein elektrisches Gerät**

(57) Hauptanspruch: Lampenkonstruktion für ein elektrisches Gerät, mit:

- einem Halteabschnitt mit mindestens einem Klemmelement und einem flexiblen Rohr mit einem an dessen oberem Ende angebrachten Adapter; und
- einem Buchsenabschnitt, der schwenkbar mit dem Adapter verbunden ist und zwei getrennte Leiter mit einer Anzahl von daran positionierten Beleuchtungselementen aufweist, von denen jedes über zwei Stiftbeine verfügt, die jeweils elektrisch mit den Leitern verbunden sind.



Beschreibung**HINTERGRUND DER ERFINDUNG**

[0001] Die Erfindung betrifft allgemein eine Lampenkonstruktion für ein elektrisches Gerät, und spezieller betrifft sie eine Lampenkonstruktion zur Verwendung in einem tragbaren elektrischen Gerät wie einem Laptopcomputer, um für ausreichende Beleuchtung zu sorgen.

[0002] Durch das Fortschreiten der Technik ist es gut bekannt, dass ein tragbares elektrisches Gerät wie ein Laptopcomputer das Leben der Menschen erleichtert. Ein tragbares elektrisches Gerät ist wegen seiner Tragbarkeit zur Benutzung zu jeder Zeit und an jedem Ort geeignet. Jedoch besteht in der Praxis ein Problem dahingehend, das tragbare elektrische Gerät im Dunkeln oder einer Umgebung mit wenig Licht zu benutzen, weswegen eine herkömmliche Lampeneinrichtung vorhanden ist, die für zusätzliche Beleuchtung sorgt.

[0003] Die **Fig. 1** ist eine perspektivische Ansicht einer herkömmlichen Lampenkonstruktion zur Verwendung in einem Laptopcomputer (nicht dargestellt). Sie kann für eine zusätzliche Beleuchtung für den Benutzer zum Bedienen des Laptopcomputers sorgen.

[0004] Die herkömmliche Lampeneinrichtung **10** verfügt über eine Basis **101** mit einem Klemmelement **102** auf einer Seite für Klemmbefestigung am LCD des Laptopcomputers. An der Basis **101** ist ein Faltenrohr **103** angebracht, das flexibel ist, um einstellbar zu sein, so dass eine in einer Fassung **204** montierte Lampe **103** den Laptopcomputer mit geeigneter Beleuchtung versehen kann.

[0005] Jedoch wird die herkömmliche Lampeneinrichtung **10** an einem Rand des LCD montiert, und die Lampe **105** bildet nur ein Lichtelement; daher kann die Beleuchtung unzureichend sein.

[0006] Daher existieren hinsichtlich der praktischen Anwendung der obigen herkömmlichen Lampenkonstruktion Nachteile und Mängel. Demgemäß besteht erheblicher Bedarf am Bereitstellen einer verbesserten Lampenkonstruktion, die die obigen Nachteile löst und die zweckdienlicher und praktischer verwendet werden kann.

KURZE ZUSAMMENFASSUNG DER ERFINDUNG

[0007] Durch die Erfindung ist eine Lampenkonstruktion für ein elektrisches Gerät mit einer Anzahl ausgerichteter Beleuchtungselemente geschaffen, um für ausreichende Beleuchtung eines elektrischen Geräts wie eines Laptopcomputers zu sorgen, so dass es für den Benutzer bequem ist, den Laptopcomputer im Dunkeln oder in einer Umgebung mit schlechter Beleuchtung zu bedienen.

[0008] Eine andere Aufgabe der Erfindung ist es, eine Lampeneinrichtung mit verschiedenen vom Benutzer wählbaren Spannungsquellen zu schaffen, um den Gebrauch zu vereinfachen.

[0009] Um die oben genannten Aufgaben zu lösen, verfügt die durch die Erfindung geschaffene Lampenkonstruktion über einen Halteabschnitt und einen Fassungsabschnitt. Der Halteabschnitt verfügt über mindestens ein Klemmelement und ein flexibles Rohr mit einem an dessen oberem Ende angebrachten Adapter. Der Fassungsabschnitt, der an einem Ende des Adapters schwenkbar mit diesem verbunden ist, verfügt über zwei getrennte Leiter mit mehreren daran positionierten Beleuchtungselementen, von denen jedes über zwei Stiftbeine verfügt, die jeweils elektrisch mit den Leitern verbunden sind. Jeder Leiter verfügt über einen geknickten und elastischen Halteteil an einer zugehörigen Seite sowie eine Anzahl von über dem Halteteil ausgebildeten Stecklöchern, so dass zwei Stiftbeine jedes Beleuchtungselements durch die Stecklöcher passen, um jeweils durch die zwei Halteteile gehalten zu werden.

[0010] Ferner verfügt eine durch die Erfindung geschaffene Lampenkonstruktion über zwei mit den jeweiligen Leitern verbundene Drähte, die sich durch das flexible Rohr erstrecken. Der Halteabschnitt verfügt ferner über eine Basis zum Aufnehmen von mit den zwei Drähten verbundenen Batterien zum Liefern von Energie. Außerdem ist an den Enden der Drähte ein Verbinder wie ein USB-Verbinder oder ein Stecker ausgebildet; daher wird die Energie dadurch zugeführt, dass der Verbinder mit dem Laptopcomputer verbunden wird oder er in eine Spannungsbuchse eingesteckt wird.

[0011] Daher werden durch die Erfindung eine Licht emittierende Diode und ein Schalter an einem Griff eines Fahrzeug-Zigarettenanzünders installiert, so dass dann, wenn der Anzünder leitet, der Benutzer oder Fahrer den Leitungszustand leicht durch das durch die Licht emittierende Diode erzeugte Licht erkennen kann.

KURZE BESCHREIBUNG DER ZEICHNUNGEN

[0012] Diese und auch andere Merkmale der Erfindung werden unter Bezugnahme auf die Zeichnungen besser ersichtlich.

[0013] **Fig. 1** zeigt eine perspektivische Ansicht einer herkömmlichen Lampeneinrichtung;

[0014] **Fig. 2** zeigt eine Explosionsansicht einer erfindungsgemäßen Lampenkonstruktion;

[0015] **Fig. 3** zeigt eine Explosionsansicht eines Fassungsabschnitts der Lampenkonstruktion;

[0016] **Fig. 4** zeigt eine vordere Stirnansicht des erfindungsgemäßen Buchsenabschnitts;

[0017] **Fig. 5** zeigt den Zusammenbau des erfindungsgemäßen Buchsenabschnitts;

[0018] **Fig. 6** zeigt den Zusammenbau der Lampenkonstruktion für einen Laptopcomputer;

[0019] **Fig. 7** zeigt eine Anwendung der Lampenkonstruktion für einen Laptopcomputer;

[0020] **Fig. 8** zeigt eine Lampenkonstruktion gemäß einer anderen bevorzugten Ausführungsform der Erfindung; und

[0021] **Fig. 9** zeigt eine Lampenkonstruktion gemäß noch einer anderen bevorzugten Ausführungsform der Erfindung.

DETAILLIERTE BESCHREIBUNG DER ERFINDUNG

[0022] Nun wird detailliert auf die bevorzugten Ausführungsformen der Erfindung Bezug genommen, zu denen Beispiele in den beigefügten Zeichnungen dargestellt sind. Wo immer möglich werden in den Zeichnungen und der Beschreibung dieselben Bezugszahlen dazu verwendet, dieselben oder ähnliche Teile zu kennzeichnen.

[0023] Gemäß der **Fig. 2** verfügt eine Lampenkonstruktion für ein elektrisches Gerät wie einen Laptopcomputer, um gemäß der Erfindung für ausreichende Beleuchtung zu sorgen, über einen Halteabschnitt **20** und einen Buchsenabschnitt **30**.

[0024] Der Halteabschnitt **20** verfügt über eine Basis **21** zum Aufnehmen von Batterien **22**. An einer Seite der Außenfläche der Basis **21** ist mindestens ein Klemmelement **23** ausgebildet. Bei dieser bevorzugten Ausführungsform existieren zwei Klemmelemente **23** zum Festklemmen am LCD des Laptopcomputers.

[0025] Der Halteabschnitt **20** verfügt ferner über ein flexibles Rohr **24** wie ein Faltenrohr, das an einem Ende an der Basis **21** angebracht ist. Am anderen Ende des flexiblen Rohrs **24** ist zum schwenkbaren Anschließen des Buchsenabschnitts ein Adapter **25** angebracht. Daher können sich die Drähte **26** ausgehend vom Buchsenabschnitt **30** so erstrecken, dass sie durch das Innere des flexiblen Rohrs **24** laufen, um mit den Batterien **22** verbunden zu sein.

[0026] Gemäß den **Fig. 3 bis 5** verfügt der Buchsenabschnitt **30** über eine bandförmige Lichtabdeckung **31**, eine Befestigungsplatte **32**, mehrere Beleuchtungselemente **33**, zwei getrennte Leiter **34** und einen halbzylindrischen Sitz **35**.

[0027] Die bandförmige Lichtabdeckung **31** verfügt über eine Grundplatte **31a**, die mit einer bogenförmigen Lichtmaskierung **303** verbunden ist, die über ihr anzubringen ist. Die der Grundplatte **31a** zugewandte Innenseite **302** der Lichtmaskierung **301** ist eine reflektierende Fläche zum Reflektieren des auffallenden Lichts.

[0028] In der Grundplatte **31a** ist eine Anzahl ausgerichteter Löcher **31b** ausgebildet, und an der Unterseite der Bodenplatte **31a** ist eine Anzahl von Schraubzapfen **31c** mit einem Kegelgewinde im Inneren ausgebildet. Jedes an der Befestigungsplatte **32** angebrachte Beleuchtungselement **33** durchdringt ein entsprechendes Loch **31b** der Grundplatte **31a**, um innerhalb der Abdeckung **31** zu liegen. Die Befestigungsplatte **32** besteht aus einem isolierenden Material wie Kunststoff, und sie befindet sich aus Sicherheitsgründen zwischen der Abdeckung **31** und dem Sitz **35**.

[0029] Die Beleuchtungselemente sind helle Licht

emittierende Dioden (LEDs), die gering versorgt werden müssen, um Energie zu sparen. Zwei positive und negative Elektrodenstiftbeine **331** des Beleuchtungselements **33** sind jeweils mit zwei Stecklöchern **341** des Leiters **34** verbunden.

[0030] Ein Ende jedes Leiters **34** ist mit den Drähten **26** verbunden, um die positive oder negative Elektrode zu bilden. An den Leitern **34** sind zwei symmetrisch geknickte und elastische Halteteile **342** ausgebildet. Die mehreren Paare von Stecklöchern **341** sind über den Halteteilen **342** so ausgebildet, dass jedes Paar der Stiftbeine **331** durch das entsprechende Paar von Stecklöchern **341** läuft, um in den Halteteilen gehalten zu werden, wie es in der **Fig. 4** dargestellt ist. Daher stehen die Stiftbeine **331** der Beleuchtungselemente **33** mit den Leitern **34** in stabilem Kontakt, und sie sind fest an den Leitern **34** montiert.

[0031] Der bogenförmige Sitz **35** verfügt über eine Isolierplatte **351** in der Mitte, um die zwei sich im Sitz **35** befindenden Leiter **34** zu trennen, und über zwei Sperrplatten **352**, die an einer jeweiligen Seite der Isolierplatte **351** ausgebildet sind. Jede Halteteil **342** der Leiter **34** ist zwischen der entsprechenden Sperrplatte **352** und der Isolierplatte **351** fixiert.

[0032] Hinsichtlich der am Sitz **35** ausgebildeten Schraubzapfen **31c** existiert eine Anzahl von Schraubblöchern für eine Anzahl von Schrauben, um die bandförmige Lichtabdeckung **31** und den halbzylindrischen Sitz **35** zusammenzusetzen. Ferner wird eine Kappe **36** dazu verwendet, das andere Ende des Buchsenabschnitts **30** abzudecken, wie es in der **Fig. 5** dargestellt ist.

[0033] Es ist auf die **Fig. 6 und 7** Bezug zu nehmen. Die erfindungsgemäße Lampeneinrichtung wird durch die Klemmelemente **23** an einem Rand des LCD **42** eines Laptopcomputers **40** gehalten. Die ausgerichteten Beleuchtungselemente **33** im Buchsenabschnitt **30** sorgen für ausreichende Beleuchtung der Tastatur **31** und des LCD **42**, um die Bedienung des Laptopcomputers **40** durch den Benutzer in einer dunklen oder schlecht beleuchteten Umgebung zu erleichtern.

[0034] Unter Bezugnahme auf die **Fig. 8 und 9** werden andere bevorzugte Ausführungsformen der erfindungsgemäßen Lampenkonstruktion veranschaulicht. Ein Verbinder **50** erstreckt sich weiter von der Basis **21** des Halteabschnitts **20**, um zu einer äußeren Spannungsversorgung zu gelangen. Gemäß der **Fig. 8** ist der Verbinder **50** ein USB-Verbinder für Verbindung mit einem USB-Port des Laptopcomputers. In der **Fig. 9** ist der Verbinder **50** ein Stecker für Verbindung mit einer Spannungsbuchse.

[0035] Die erfindungsgemäße Lampenkonstruktion sorgt zumindest für die folgenden Vorteile:

[0036] 1. Zwei Leiter **34** werden dazu verwendet, vielen Beleuchtungselementen im Buchsenabschnitt **30** zugeordnet zu werden; daher kann eine ausreichend helle Beleuchtung erzielt werden.

[0037] 2. Es ist für verschiedene vom Benutzer auswählbare Spannungsquellen gesorgt, um den Ge-

brauch zu erleichtern, nämlich für die Batterien **22** und den USB- oder den Steckverbinder **50**.

[0038] 3. Das Paar von Stiftbeinen **331** jedes Beleuchtungselements **33** wird durch die Halteteile **342** gehalten; daher ist der Zusammenbau der Beleuchtungselemente **33** und der Leiter einfach und fein, um die Kosten zu senken.

[0039] Der Fachmann erkennt, dass an der Erfindung verschiedenen Modifizierungen und Variationen vorgenommen werden können, ohne vom Grundgedanken oder Schutzzumfang derselben abzuweichen. Angesichts des Vorstehenden sollen durch die Erfindung Modifizierungen und Variationen derselben abgedeckt sei vollständig in den Schutzzumfang der Erfindung und zugehöriger Äquivalente fallen.

Schutzansprüche

1. Lampenkonstruktion für ein elektrisches Gerät, mit:

- einem Halteabschnitt mit mindestens einem Klemmelement und einem flexiblen Rohr mit einem an dessen oberem Ende angebrachten Adapter; und
- einem Buchsenabschnitt, der schwenkbar mit dem Adapter verbunden ist und zwei getrennte Leiter mit einer Anzahl von daran positionierten Beleuchtungselementen aufweist, von denen jedes über zwei Stiftbeine verfügt, die jeweils elektrisch mit den Leitern verbunden sind.

2. Lampenkonstruktion nach Anspruch 1, bei der der Halteabschnitt ferner über eine Basis zum Aufnehmen mindestens einer Batterie sowie zwei zwischen die Leiter und die Batterie geschaltete Drähte verfügt.

3. Lampenkonstruktion nach Anspruch 2, bei der das Klemmelement an einer Seite der Basis angebracht ist.

4. Lampenkonstruktion nach Anspruch 1, bei der das flexible Rohr ein Faltenrohr ist.

5. Lampenkonstruktion nach Anspruch 1, bei der der Buchsenabschnitt über eine bandförmige Lichtabdeckung mit einer Anzahl von an ihrer Unterseite ausgebildeten Schraubzapfen mit Kegelfgewinde im Inneren und einen halbzyklindrischen Sitz mit einer Anzahl von Schraublöchern hinsichtlich der Schraubzapfen verfügt, um die Abdeckung und den Sitz durch eine Anzahl von Schrauben zusammenzusetzen.

6. Lampenkonstruktion nach Anspruch 5, bei der die Abdeckung eine Bodenplatte aufweist, die mit einer darüber anzubringenden bogenförmigen Lichtmaskierung zu verbinden ist, wobei die der Bodenplatte zugewandte Lichtmaskierung eine reflektierende Fläche ist.

7. Lampenkonstruktion nach Anspruch 5, bei der der Buchsenabschnitt ferner über eine zwischen der Abdeckung und dem Sitz angebrachte Isolierplatte mit den Beleuchtungselementen verfügt.

8. Lampenkonstruktion nach Anspruch 5, bei der der Buchsenabschnitt ferner über eine ein Ende desselben abdeckende Kappe verfügt, wobei das andere Ende des Buchsenabschnitts mit dem Adapter verbunden ist.

9. Lampenkonstruktion nach Anspruch 5, bei der der Sitz eine Isolierplatte zum Trennen der zwei Leiter enthält.

10. Lampenkonstruktion nach Anspruch 9, bei der der Sitz ferner zwei an einer jeweiligen Seite der Isolierplatte ausgebildete Sperrplatten enthält, wobei jeder Leiter zwischen einer entsprechenden Sperrplatte und der Isolierplatte fixiert ist.

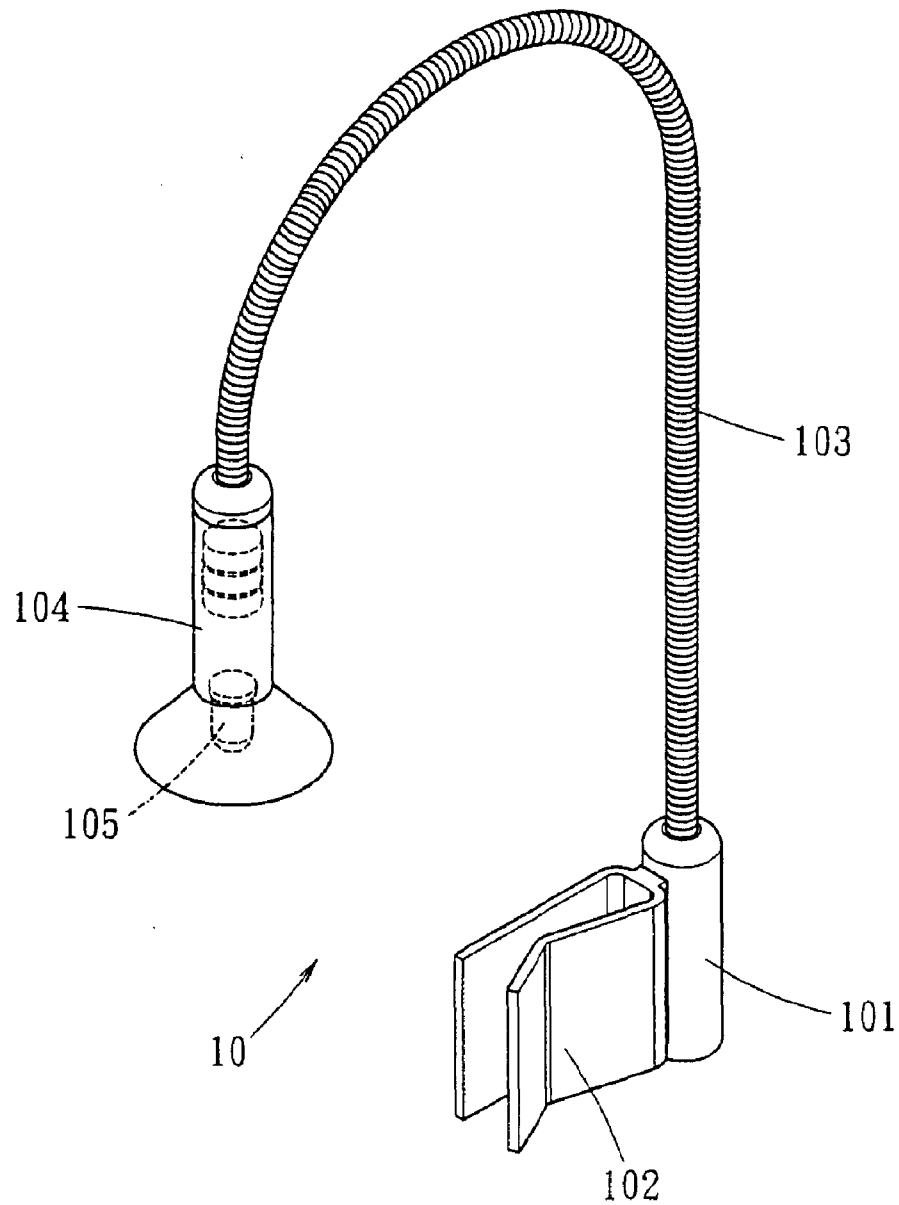
11. Lampenkonstruktion nach Anspruch 1, bei der der Buchsenabschnitt zwei Drähte enthält, die jeweils mit den Leitern verbunden sind und die sich durch das flexible Rohr erstrecken, um an den zugehörigen Enden einen Verbinder zu bilden.

12. Lampenkonstruktion nach Anspruch 11, bei der der Verbinder ein Universal-Serial-Bus(USB)-Verbinder oder ein Stecker ist.

13. Lampenkonstruktion nach Anspruch 1, bei der jeder Leiter einen geknickten und elastischen Halteteil an einer zugehörigen Seite aufweist und eine Anzahl von Stecklöchern über dem Halteteil ausgebildet ist, so dass zwei Stiftbeine jedes Beleuchtungselements durch das Steckloch gesteckt werden, um jeweils durch die zwei Halteteile gehalten zu werden.

14. Lampenkonstruktion nach Anspruch 1, bei der die Beleuchtungselemente Licht emittierende Dioden (LEDs) sind.

Es folgen 9 Blatt Zeichnungen



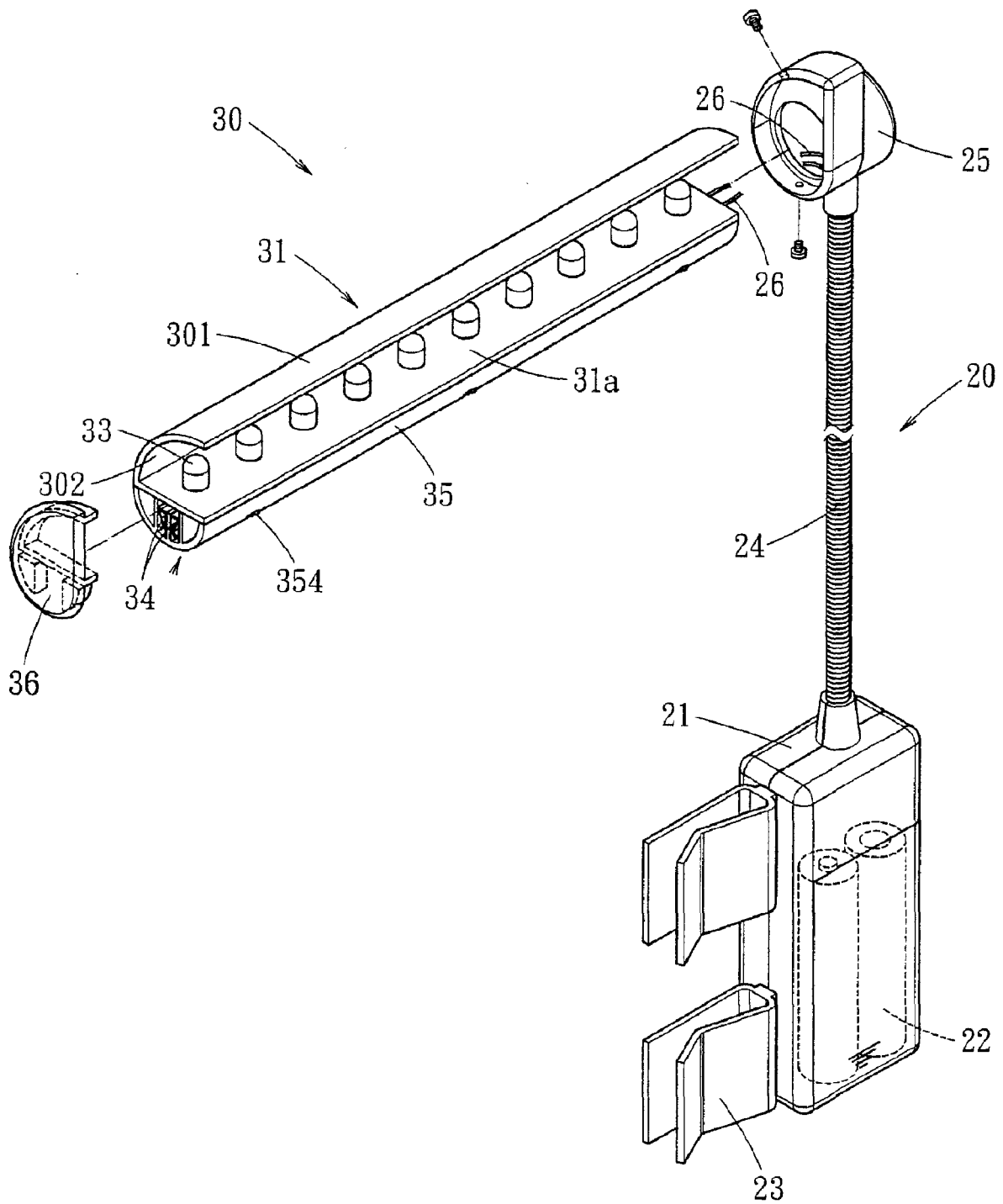


FIG. 2

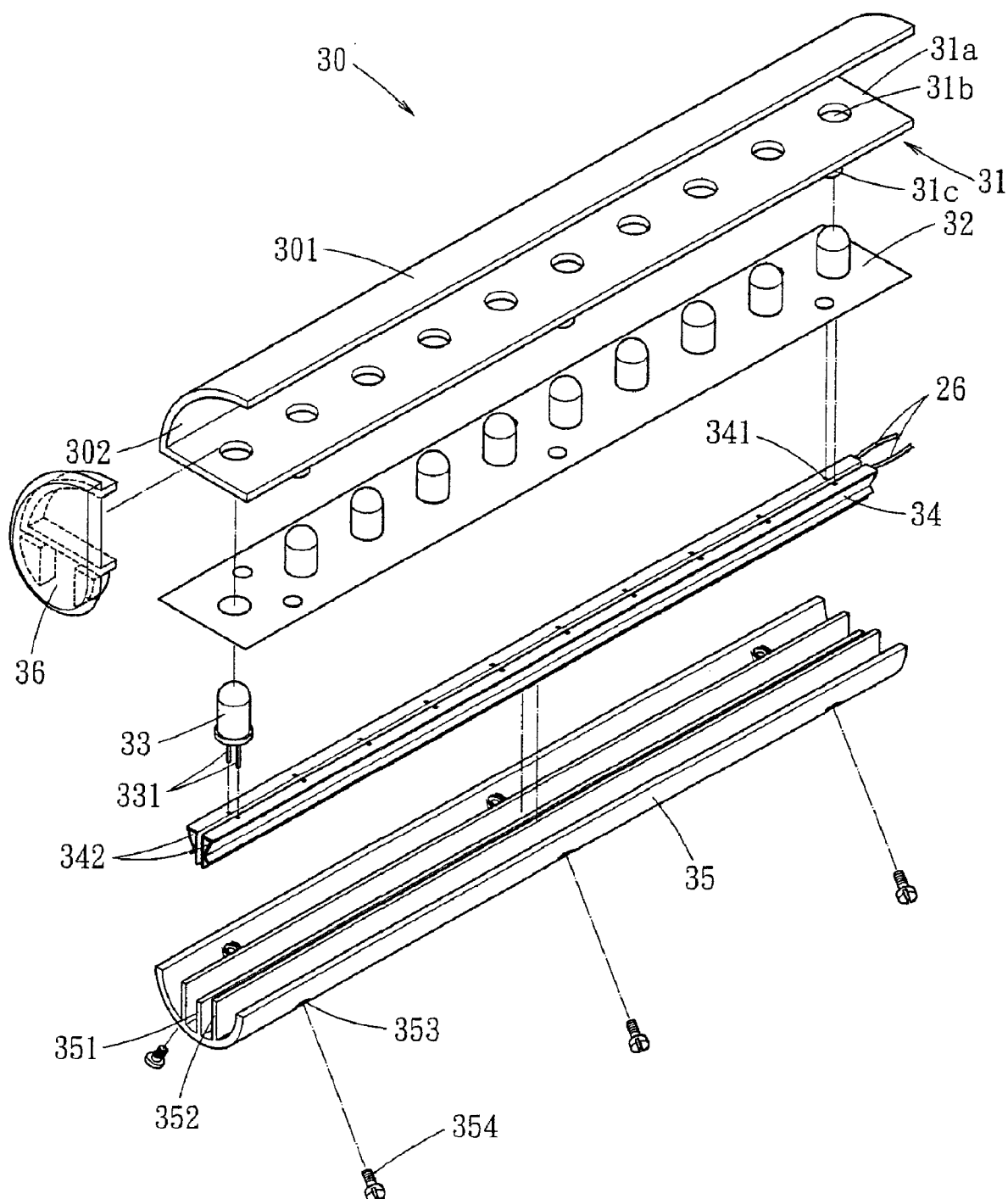


FIG. 3

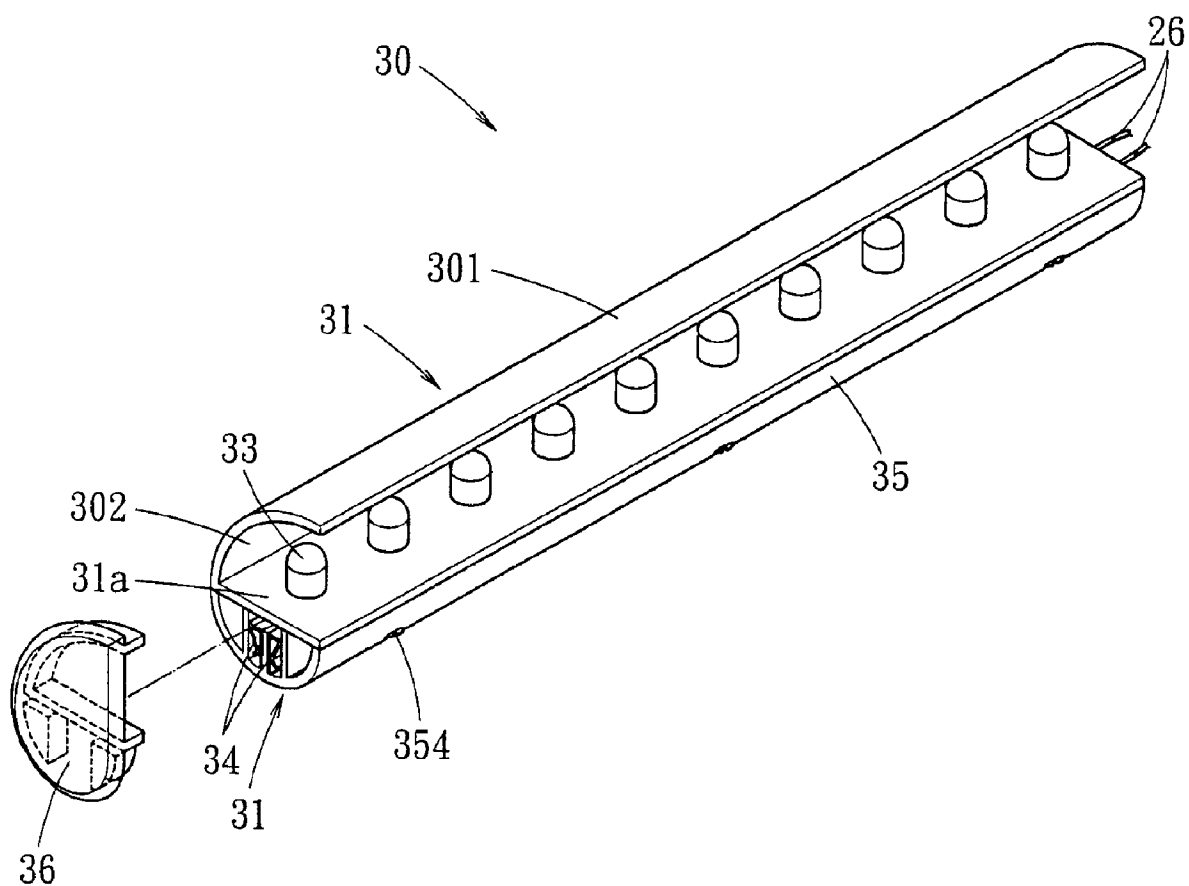


FIG. 5

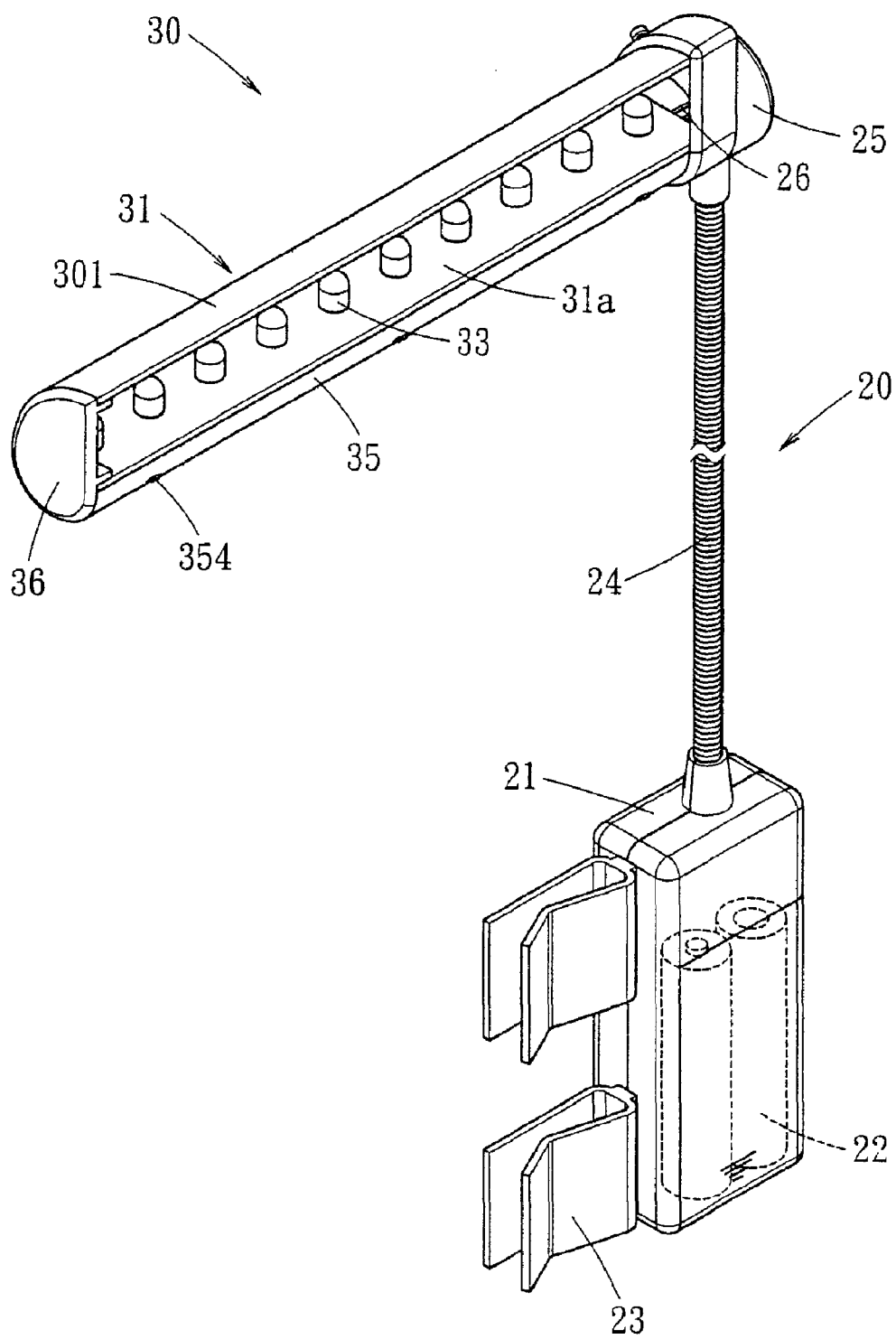


FIG. 6

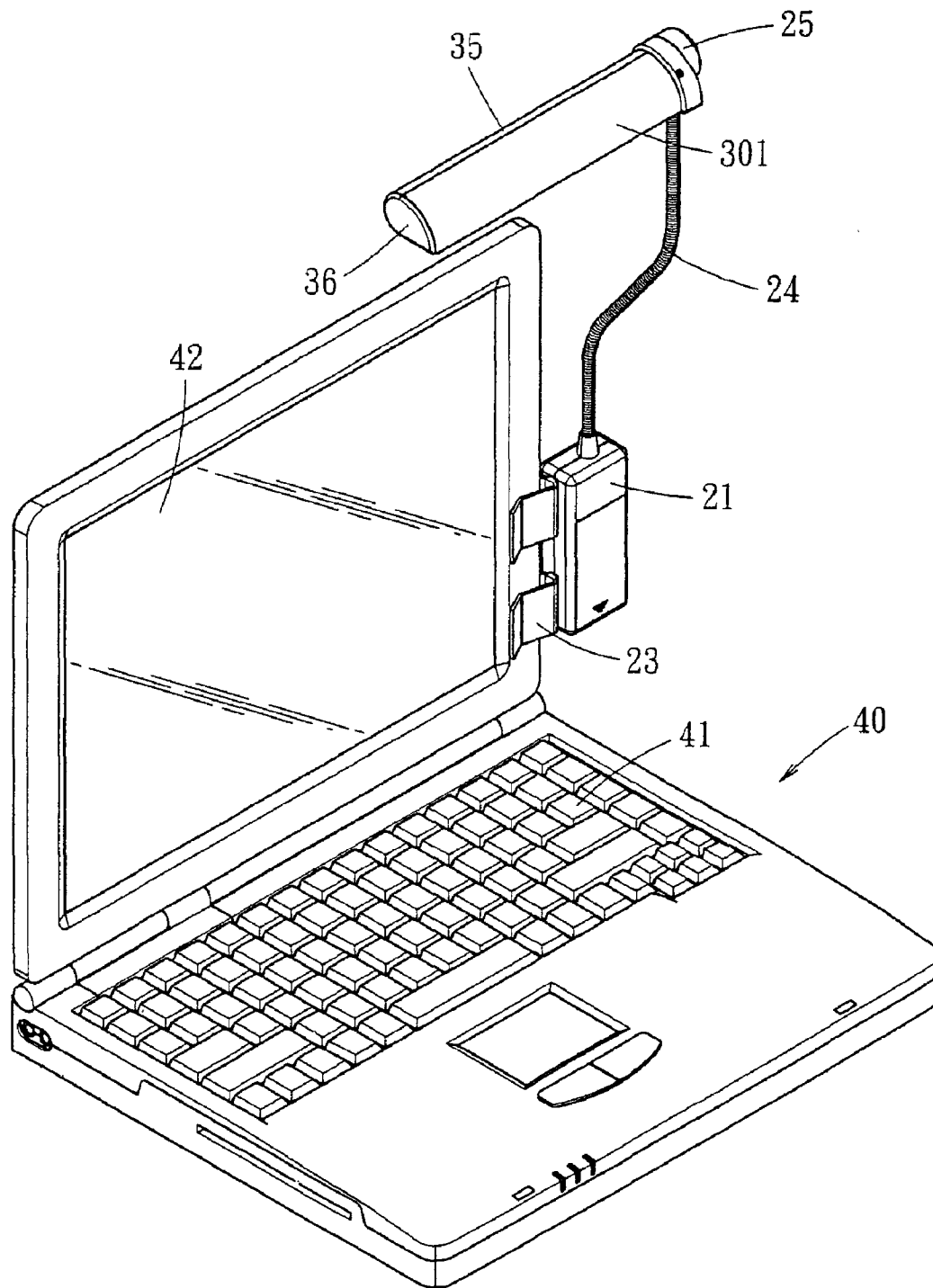


FIG. 7

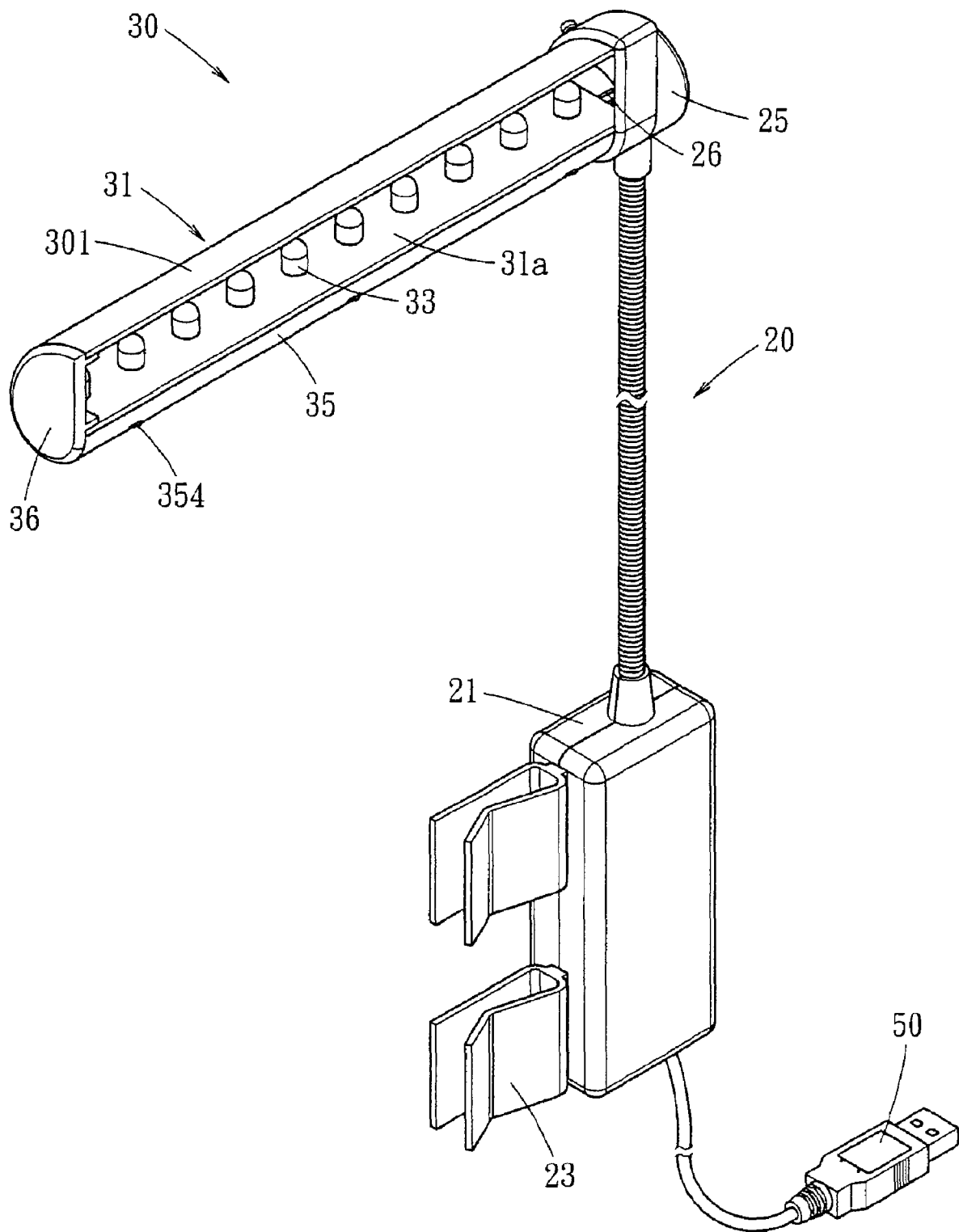


FIG. 8

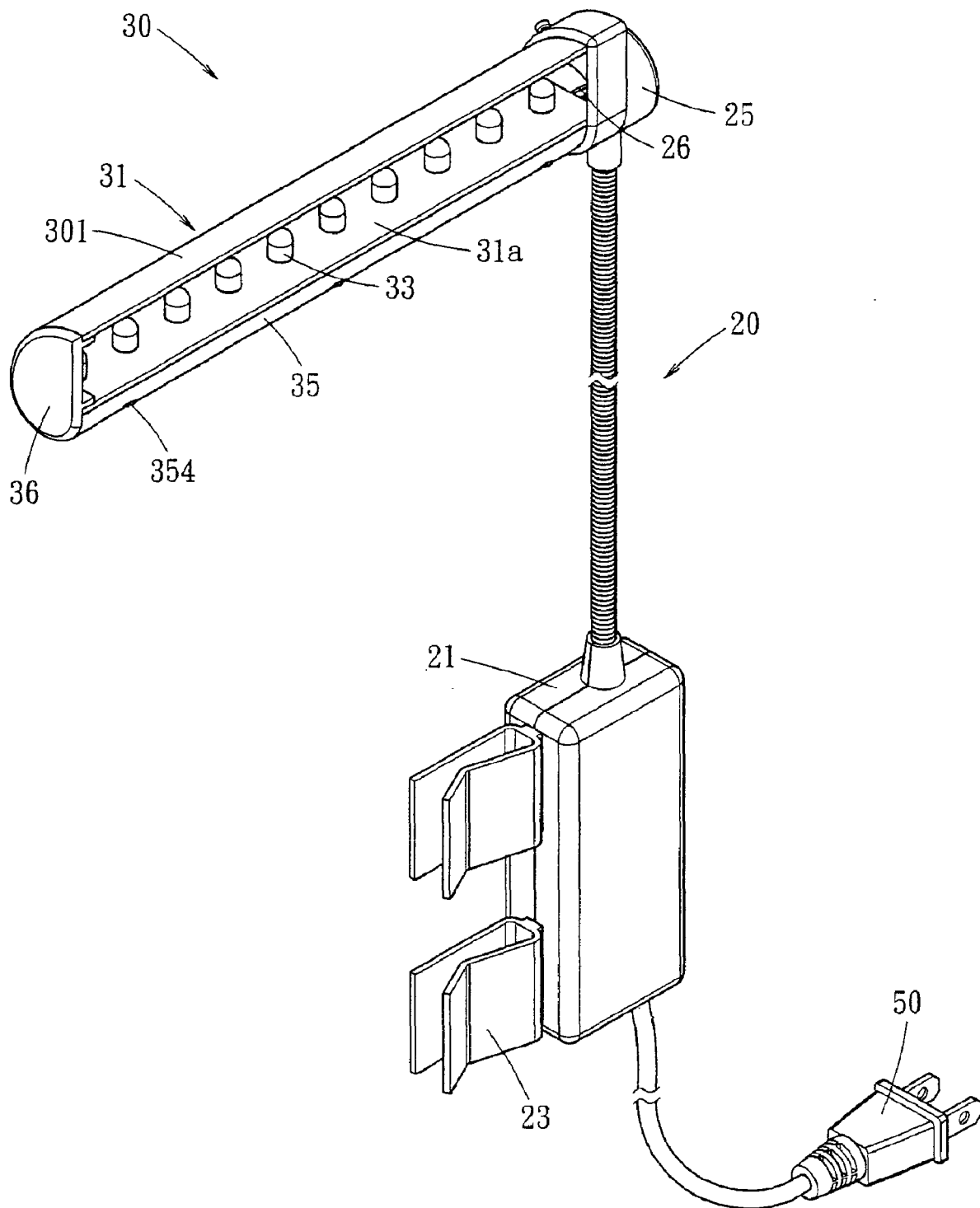


FIG. 9



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/019,924	04/22/2025	7841729

Zhong Law, LLC
51 JFK Parkway
1st Floor West
Short Hills, NEW JERSEY 07078

**CONFIRMATION NO. 7059
REEXAMINATION REQUEST
NOTICE**



OC000000087725064

Date Mailed: 04/24/2025

NOTICE OF STREAMLINED REEXAMINATION REQUEST FILING DATE

(Third Party Requester)

Requester is hereby notified that the filing date of the request for reexamination is 04/22/2025, the date that the filing requirements of 37 CFR § 1.510 were received.

A decision on the request for reexamination will be mailed within three months from the filing date of the request for reexamination. (See 37 CFR 1.515(a)).

A copy of the Notice is being sent to the person identified by the requester as the patent owner. Further patent owner correspondence will be the latest attorney or agent of record in the patent file. (See 37 CFR 1.33). Any paper filed should include a reference to the present request for reexamination (by Reexamination Control Number).

cc: Patent Owner
140225
Finn IP Law, PC
11400 W. Olympic Boulevard, 9th Floor
Los Angeles, CA 90064

/pflewis/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

REEXAM CONTROL NUMBER	FILING OR 371 (c) DATE	PATENT NUMBER
90/019,924	04/22/2025	7841729

140225
Finn IP Law, PC
11400 W. Olympic Boulevard, 9th Floor
Los Angeles, CA 90064

CONFIRMATION NO. 7059
REEXAM ASSIGNMENT NOTICE



OC00000087725065

Date Mailed: 04/24/2025

NOTICE OF ASSIGNMENT OF REEXAMINATION REQUEST

The above-identified request for reexamination has been assigned to Art Unit 3992. All future correspondence to the proceeding should be identified by the control number listed above and directed to the assigned Art Unit.

A copy of this Notice is being sent to the latest attorney or agent of record in the patent file or to all owners of record. (See 37 CFR 1.33(c)). If the addressee is not, or does not represent, the current owner, he or she is required to forward all communications regarding this proceeding to the current owner(s). An attorney or agent receiving this communication who does not represent the current owner(s) may wish to seek to withdraw pursuant to 37 CFR 1.36 in order to avoid receiving future communications. If the address of the current owner(s) is unknown, this communication should be returned within the request to withdraw pursuant to Section 1.36.

NOTICE OF USPTO EX PARTE REEXAMINATION PATENT OWNER STATEMENT WAIVER PROGRAM

The USPTO has implemented a pilot program where, after a reexamination proceeding has been granted a filing date and before the examiner begins his or her review, the patent owner may orally waive the right to file a patent owner's statement. See *"Pilot Program for Waiver of Patent Owner's Statement in Ex Parte Reexamination Proceedings,"* 75 FR 47269 (August 5, 2010). One goal of the pilot program is to reduce the pendency of reexamination proceedings and improve the efficiency of the reexamination process.

Ordinarily when ex parte reexamination is ordered, the USPTO must wait until after the receipt of the patent owner's statement and the third party requester's reply, or after the expiration of the time period for filing the statement and reply (a period that can be as long as 5 to 6 months), before mailing a first determination of patentability. The USPTO's first determination of patentability is usually a first Office action on the merits or a Notice of Intent to Issue Reexamination Certificate (NIRC).

Under the pilot program, the patent owner's oral waiver allows the USPTO to act on the first determination of patentability immediately after determining that reexamination will be ordered, and in a suitable case issue the reexamination order and the first determination of patentability (which could be a NIRC if the claims under reexamination are confirmed) at the same time.

Benefits to the Patent Owner for participating in this pilot program include reduction in pendency.

To participate in this pilot program, Patent Owners may contact the USPTO's Central Reexamination Unit (CRU) at 571-272-7705. The USPTO will make the oral waiver of record in the reexamination file in an interview summary and a copy will be mailed to the patent owner and any third party requester.

cc: Third Party Requester(if any)
Zhong Law, LLC
51 JFK Parkway
1st Floor West
Short Hills, NEW JERSEY 07078

/pflewis/

Legal Instruments Examiner
Central Reexamination Unit 571-272-7705; FAX No. 571-273-9900

Patent Assignment Abstract of Title

Total Assignments: 5

Application #: 12011090

Filing Dt: 01/24/2008

Patent #: 7641729

Issue Dt: 11/30/2010

PCT #: NONE

Intl Reg #:

Publication #: US20080180933

Pub Dt: 07/31/2008

Inventor: Henry Geddes

Title: WEBCAM ILLUMINATOR DEVICE

Assignment: 1

Reel/Frame: 020782 / 0006

Received: 04/09/2008

Recorded: 04/04/2008

Mailed: 04/10/2008

Pages: 3

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignor: GEDDES, HENRY

Exec Dt: 03/04/2008

Assignee: SPLASHLIGHT STUDIOS

555 JEFFERSON AVE.

MIAMI BEACH, FLORIDA 33139

Correspondent: OHLANDT, GREELEY, RUGGIERO & PERLE, LLP

ONE LANDMARK SQUARE, 10TH FLOOR

STAMFORD, CT 06901

Assignment: 2

Reel/Frame: 066633 / 0125

Received: 02/27/2024

Recorded: 02/27/2024

Mailed: 03/21/2024

Pages: 8

Conveyance: CORRECTIVE ASSIGNMENT TO CORRECT THE ASSIGNEE NAME FROM "SPLASHLIGHT STUDIOS" TO "SPLASHLIGHT STUDIOS SOUTH, LLC" AND ASSIGNEE ENTITY TYPE FROM "CORPORATION" TO "LIMITED LIABILITY COMPANY" PREVIOUSLY RECORDED AT REEL: 20782 FRAME: 6. ASSIGNOR(S) HEREBY CONFIRMS THE ASSIGNMENT.

Assignor: GEDDES, HENRY

Exec Dt: 03/04/2008

Assignee: SPLASHLIGHT STUDIOS SOUTH, LLC

555 JEFFERSON AVE.

MIAMI BEACH, FLORIDA 33139

Correspondent: KATHERINE KOENIG

2208 MARINER DR.

FORT LAUDERDALE, FL 33316

Assignment: 3

Reel/Frame: 067525 / 0722

Received: 05/24/2024

Recorded: 03/28/2024

Mailed: 05/28/2024

Pages: 15

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignors: SPLASHLIGHT STUDIOS SOUTH, LLC

Exec Dt: 03/25/2011

GEDDES, HENRY

Exec Dt: 03/25/2011

Assignee: GLOWZI, LLC

622 SE 4TH AVENUE

DELRAY BEACH, FLORIDA 33483

Correspondent: KATHERINE KOENIG

2208 MARINER DR.

FORT LAUDERDALE, FL 33316

Assignment: 4

Reel/Frame: 027504 / 0482

Received: 12/01/2011

Recorded: 12/01/2011

Mailed: 01/11/2012

Pages: 3

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignors: SPLASHLIGHT STUDIOS SOUTH, LLC

Exec Dt: 11/07/2011

GEDDES, HENRY

Exec Dt: 11/07/2011

Assignee: GLOWZI, LLC

622 SE 4TH AVENUE

DELRAY BEACH, FLORIDA 33483

Correspondent: ALLEN F. BENNETT

119 NE 7TH AVENUE SUITE 7

DELRAY BEACH, FL 33483

Assignment: 5

Reel/Frame: 066579 / 0392

Received: 02/27/2024

Recorded: 02/27/2024

Mailed: 02/28/2024

Pages: 2

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignor: GLOWZI, LLC

Exec Dt: 02/21/2024

Assignee: PATHWAY IP, LLC

400 RELLA BLVD., SUITE 156

Shenzhen Ronglida Tech. v. Pathway IP

Shenzhen Ronglida Tech. EX1018

Page 91

MONTEBELLO, NEW YORK 10901

Correspondent: KATHERINE KOENIG

2208 MARINER DR.

FORT LAUDERDALE, FL 33316

Search Results as of: 04/24/2025 07:27 AM

If you have any comments or questions concerning the data displayed, contact PRD / Assignments at 571-272-3350. v 2.6
Web interface last modified: Jun 26, 2017 v 2.6



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 7059

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.			
90/019,924	04/22/2025	362	3992	EXRE_PI_729			
RULE							
APPLICANTS Splashlight Studios (PO), Residence Not Provided; Zhong Law, LLC, Short Hills,, NJ;							
INVENTORS 7841729, Residence Not Provided; Zhong Law, LLC, Residence Not Provided; Henry Geddes, Delray Beach,, FL;							
** CONTINUING DATA ***** This application is a REX of 12/011,090 01/24/2008 PAT 7841729 which claims benefit of 60/897,600 01/26/2007							
** FOREIGN APPLICATIONS *****							
** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **							
Foreign Priority claimed ☐ Yes ☐ No 35 USC 119(a-d) conditions met ☐ Yes ☐ No Verified and Acknowledged <u>Examiner's Signature</u>		☐ Met after Allowance <u>Initials</u>	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS 13	INDEPENDENT CLAIMS 1	
ADDRESS							
Finn IP Law, PC 11400 W. Olympic Boulevard, 9th Floor Los Angeles, CA 90064 UNITED STATES							
TITLE							
WEBCAM ILLUMINATOR DEVICE							
FILING FEE RECEIVED 0.00	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees				
			☐ 1.16 Fees (Filing)				
			☐ 1.17 Fees (Processing Ext. of time)				
			☐ 1.18 Fees (Issue)				
			☐ Other _____				
				☐ Credit			

Litigation Search Report CRU 3999

Reexamination Control No. 90/019,924

To: Examiner	From: B. Harden, Paralegal
Location: OCRU	Location: OCRU
Art Unit: 3993	Phone: 7037561815
Date: <u>23 April 2025</u>	E-mail: bria.harden@uspto.gov

Search Notes

NO LITIGATION WAS FOUND

1. Performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.
2. Performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.
3. Performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.
4. Performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.
5. Performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.

Claims 1-9 of ‘729 patent (earliest priority date: 2007-1-26)	References
1. An illuminator device for illuminating one or more users in front of a web camera and a communication terminal comprising:	Reference 1 - KR200316985Y1 (Kwak Translation) The present utility model relates to <i>a PC webcam stand with a lighting function</i>, including: a fixing component; a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable is extended; a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and <i>a lamp for lighting an object, arranged at a predetermined position of the mounting component to enable the PC webcam positioned on the mounting component to clearly photograph the object.</i> According to the present utility model, <i>the lighting function is provided to light an object, thus enabling the object to be clearly photographed and transmitted regardless of the brightness of the surroundings. Besides, in addition to the lighting function, the lighting angle may be freely adjusted, thus effectively lighting the object.</i> Moreover, the PC webcam may be easily arranged and fixed in a detachable manner by means of a magnetic force, and is very easy to separate, thus providing a very practical effect. See Kwak Translation at abstract (emphasis added). Then, <i>at a position (for example, a display, a computer body, a desk lamp) suitable for photographing the photographed object, the stand 100 is fixed by the fixing component 10</i>, and the flexible pipe 20 is adjusted with reference to the photographed picture, so that the position of the PC webcam 50 is adjusted more finely. See Kwak Translation at page 4, lines 26-29 (emphasis added).

a bulb having a toroidal shape for emitting light;

Reference 1 – Kwas Translation

a fixing component; a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable (C) is extended; a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and *a lamp provided at a predetermined position of the mounting component to light an object so that the object can be clearly photographed by the PC webcam positioned on the mounting component*. See Kwak Translation at page 2, line 39 – page 3, line 4 (emphasis added).

Reference 2 - U.S. Pat. No. 6238060 (Bourn).

In one embodiment, the ring light source includes *a ring-shaped flashtube* located substantially along a circle disposed perpendicular to and centered on the optical axis, and further includes an enclosure having a slit located between the ring-shaped flashtube and the ring reflector, wherein the slit allows light from the flashtube to fall on a reflecting surface of the ring reflector. See Bourn at col. 3, line 50-56. (emphasis added).

The present invention takes advantage of the efficiency of high-brightness red, infra-red, blue, white, or other color LEDs arranged in one or more circular rows, and the properties inherent to a reflective focusing element such as a turned angled reflective ring to produce an illumination source for machine-vision systems. *The illumination source exhibits multi-directional ring-illumination properties which are useful for illumination of small components* (which are being inspected or

	measured) <i>without unwanted shadows</i> . See Bourn at col. 2, line 32-39 (emphasis added).
a reflector having a circular configuration to conform to the toroidal shape of said bulb for projecting the emitted light;	Reference 2 - Bourn In this embodiment, camera 140 is disposed to view object 160 through an opening in <i>ring-reflector illumination source 200</i> which directs light downward and inward. In the exemplary system shown, <i>it is desired to illuminate the top edge, inside walls and inside bottom surface of object 160 for viewing by camera 140 with even, high intensity, short-duration illumination of a fixed intensity</i>. See Bourn at Col. 6, line 34 - 41. FIG. 2B is a cut-away side view of ring-reflector illumination source 200 according to one embodiment of the present invention. In the embodiment shown, <i>ring-reflector illumination source 200 includes bottom enclosure 210, replaceable/changeable ring reflector 220 (designed to fit into a complementary opening 215 in bottom enclosure 210), ring illumination source 230</i> (in this embodiment, this is an LED light source 230 having a single row of LEDs 231 closely spaced in a circle that is centered on optical axis 299 of camera 140, the focal centerlines 298 of each LED directed along a line parallel to optical axis 299), and top cover 240 that is attached to bottom enclosure 210, for example by four screws 242 that pass through spacers 241 used to maintain the desired spacing and placement of the LED light source 230 within ring-reflector illumination source 200. See Bourn at Col. 8, line 7 - 22 (emphasis added). The present invention provides a method and apparatus which provide an illumination source for illuminating an object in a machine-vision system having a machine-vision camera, the camera having an optical axis. One embodiment of the illumination source includes a ring-light source emitting light

	from a plurality of points, the points being along one or more circles, a focusing element, the focusing element including an angled ring reflector to direct rays from the ring light source at an angle generally towards the optical axis. One embodiment provides a replaceable ring reflector for changing the light-source-to-optical-axis and/or changing the spread and/or focus of the light from ring light source. One embodiment provides light from multiple directions in order to reduce shadowing. One embodiment provides light to illuminate the inside of, for example, an aluminum beverage can before it is filled and sealed. See Bourn at Col. 2, line 60 - Col. 3, line 8.
and an arm disposed between said bulb and the terminal for connection to the terminal,	Reference 1 – Kwak Translation The PC webcam stand 100, as shown in FIG. 2 and FIG. 3, includes a fixing component 10, attached to a display 1; a connecting pipe 20, one side end of which is coupled to the fixing component 10 and through an inside of which a USB cable (C) is extended; <i>a mounting component 30, to a bottom surface of which the other side end of the connecting pipe 20 is coupled</i>, on an upper surface of which a PC webcam 50 is positioned, and on a rear surface of which a USB port 31 electrically connected to the PC webcam 50 is arranged; and <i>a lighting device 40 provided at a predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30</i>. See Kwak Translation at page 3, lines 22-29 (emphasis added) and Figures 2-3. Then, <i>at a position (for example, a display, a computer body, a desk lamp) suitable for photographing the photographed object, the stand 100 is fixed by the fixing component 10</i>, and the flexible pipe 20 is adjusted with reference to the photographed

	picture, so that the position of the PC webcam 50 is adjusted more finely. See Kwak Translation at page 4, lines 26-29 and Figure 1 (emphasis added).
wherein said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera.	Reference 1 – Kwak Translation One side of the connecting pipe 20 is coupled to the fixing component 10, a USB cable extends through the inner side thereof, and the USB cable is electrically connected to the USB port (not shown) of the computer body. In addition, <i>the connecting pipe 20 is preferably formed by a flexible pipe, so that the lighting angle of the lamp 41 can be easily adjusted.</i> See Kwak Translation at page 3, lines 37-40. First, the USB cable C of the PC webcam stand 100 is inserted into the USB port (not shown) of the computer body, and the USB cable C' of the PC webcam 50 is inserted into the USB port 31 in the rear surface of the mounting component 30 of the stand 100. At this time, the PC webcam 50 and the computer body will be electrically connected according to the USB cables C-C'. At this time, <i>the PC webcam 50 is mounted on the upper surface of the mounting component 30 of the stand 100. As described above, the position the of PC webcam is determined according to the reference wall 33. Since the assembling and disassembling can be achieved by magnetism, the PC webcam can be easily relocated.</i> See Kwak Translation at page 4 at lines 18-25 (the position of the PC video camera is determined by its position on the reference wall (33) or depending on where it is installed on the reference wall, the PC video camera position may change easily) See Kwas Translation at page 4, lines 18-25 (emphasis added). Reference 3 - U.S. Pat. Pub. 2005/0151042 (Watson)

	A camera mount supports a web camera thereon. The mount includes a bracket for supporting a light source thereon and a platform supported on the bracket for receiving the base of the web camera thereon. The light source may be operable in either flash or steady-on modes to provide optimum lighting for the web camera. The platform ensures various designs of web cameras and web camera bases can be accommodated and supported thereon. The bracket also readily permits the camera mount to be supported on an upright supporting surface to remove the clutter of cords from the workspace on a desk supporting a computer thereon. See Watson at abstract. The camera is preferably adjustable in position relative to the bracket, so as to be pivotal about two axes, oriented transversely to one another, relative to the bracket. Additional, <i>there may be provided a telescoping arm supporting the platform on the bracket for</i> adjusting a relative spacing therebetween. See Watson at 0017 (emphasis added). <i>the light source is adjustable in position relative to the camera.</i> See Watson claim 12. In some embodiments the platform 14 may be provided by itself with the support bracket simply for supporting the camera thereon out of the way of the user. It is desirable however to provide a combination of a support for lights and for a web camera to ensure adequate lighting when using the video mode of the web camera. See Watson at paragraph 0044.
2. The illuminator device of claim 1, wherein said reflector is positioned proximate said bulb to	Reference 1 – Kwak Translation The bottom surface of the mounting component 30 is coupled to the other side end of the connecting pipe 20. Therefore, a fastening pipe 32 is provided on the bottom surface of the

project light towards a face of said user or said users.

mounting component 30, so that the other side end of the connecting pipe 20 can be inserted. The connecting pipe 20 is fixed by a usual fastening device or adhesive material in a state of being inserted into the fastening pipe 32. In addition, a specified space portion is formed on the front inner side of the mounting component 30, *so that the lamp 41 can be easily arranged, and moreover, a reflecting cover 42 is arranged behind the lamp 41, and a convex lens 43 is provided in front of the lamp 41.* In addition, a reference wall 33 is formed in a protruding manner on one side of an upper surface of the mounting component 30 for positioning the PC webcam 50, and a magnet or a metal plate 34 is provided on the upper surface thereof to easily fix the PC webcam 50 according to a magnetic force. That is, when the magnet is attached to the bottom surface of the camera 50, the metal plate is provided on the upper surface of the mounting component 30, and when a shell of the camera 50 is of a metal material or is attached to the metal plate, the magnet is attached to the upper surface of the mounting component 30. In addition, a USB port 31 is provided on a rear surface of the mounting component 30, so that the USB cable C extending through the connecting pipe 20 is easily connected to the PC webcam 50.

The lamp 41 is configured to light the photographed object photographed by the PC webcam 50 and receives a power supply through an electric wire of the USB cable C. Namely, an electric wire of about 5V of the USB cable C is electrically connected in a state that the electric wire is branched to the sides of the lamp 41 and the PC webcam 50. In addition, the lamp 41 is connected to a dimmer 44 between the lamp 41 and the electric wire of the USB cable C, so that the brightness thereof may be adjustable. To facilitate operation, a handle portion of the

	dimmer 44 protrudes from the bottom portion of the mounting component 30. See Kwak Translation at page 3, line 41 – page 4, line 15 (emphasis added) Reference 2 - Bourn The present invention provides a method and apparatus which provide an illumination source for illuminating an object in a machine-vision system having a machine-vision camera, the camera having an optical axis. One embodiment of the illumination source includes a ring-light source emitting light from a plurality of points, the points being along one or more circles, a focusing element, <i>the focusing element including an angled ring reflector to direct rays from the ring light source at an angle generally towards the optical axis</i>. One embodiment provides a replaceable ring reflector for changing the light-source-to-optical-axis and/or changing the spread and/or focus of the light from ring light source. One embodiment provides light from multiple directions in order to reduce shadowing. One embodiment provides light to illuminate the inside. See Bourn at Col. 2, line 60 - Col. 3, line 8 (emphasis added).
3. The illuminator device of claim 1, wherein said reflector is lined with a reflective material or film.	Reference 2 - Bourn The present invention provides a method and apparatus which provide an illumination source for illuminating an object in a machine-vision system having a machine-vision camera, the camera having an optical axis. One embodiment of the illumination source includes a ring-light source emitting light from a plurality of points, the points being along one or more circles, a focusing element, <i>the focusing element including an angled ring reflector to direct rays from the ring light source at an angle generally towards the optical axis</i>. One embodiment provides a replaceable ring reflector for changing the light-

	source-to-optical-axis and/or changing the spread and/or focus of the light from ring light source. One embodiment provides light from multiple directions in order to reduce shadowing. One embodiment provides light to illuminate the inside of, for example, an aluminum beverage can before it is filled and sealed. See Bourn at Col. 2, line 60 - Col. 3, line 8 (emphasis added).
4. The illuminator device of claim 1, wherein said arm is a flexible arm that permits said bulb to be positioned relative to the web camera.	Reference 1 – Kwak Translation One side of the connecting pipe 20 is coupled to the fixing component 10, a USB cable extends through the inner side thereof, and the USB cable is electrically connected to the USB port (not shown) of the computer body. In addition, <i>the connecting pipe 20 is preferably formed by a flexible pipe, so that the lighting angle of the lamp 41 can be easily adjusted.</i> See Kwak Translation at page 3, lines 37-40. (emphasis added)
5. The illuminator device of claim 1, wherein said arm is connected to the terminal by a clamp.	Reference 3 - Watson While various embodiments of the camera are illustrated in the accompanying figures, the common elements will first be described herein. The camera mount 10 includes a platform 14 for supporting the camera thereon. The camera includes a broad flat supporting surface which readily accepts the base of various types of commercially available web cameras 12 to be supported thereon. <i>A support bracket 16 is provided which can be mounted on a suitable supporting surface such as a wall and the like or may be adapted for attachment to a laptop screen in some embodiments.</i> A support arm 18 couples the platform to the support bracket for supporting the camera 12 on the supporting surface to which the bracket is attached. A light mount 20 is provided on the bracket 16 for supporting a light source 22 thereon. See Watson at paragraph 0029.

	Turning now to the embodiment of FIG. 3, the bracket 16 is adapted to include inverted <i>U-shaped clips 60 which can be secured overtop of the top edge of a lap top display</i> monitor 62 in a snap fit engagement therewith. The remaining features of the bracket including the adjustable support arm 18 and light sources 22 remain identical to the previous embodiment. See Watson at paragraph 0035 (emphasis added)
6. The illuminator device of claim 5, wherein the clamp is movable along an edge of the terminal to adjust the location of said bulb.	Reference 1 – Kwak Translation In the above technical structure, although the fixing component 10 is shown attached to the display 1, the fixing component can be attached to any position where the photographed object can be photographed during the video chat. Therefore, an adhesive surface (for example, a double adhesive tape: 11) is arranged on the bottom surface of the fixing component 10. See Kwak Translation at page 3, lines 30-33.
7. The illuminator device of claim 1, wherein the arm has a base that supports the illuminator device on a flat surface adjacent to the terminal.	Reference 1 – Kwak Translation In the above technical structure, although the fixing component 10 is shown attached to the display 1, the fixing component can be attached to any position where the photographed object can be photographed during the video chat. Therefore, an adhesive surface (for example, a double adhesive tape: 11) is arranged on the bottom surface of the fixing component 10. See Kwak Translation at page 3, lines 30-33.
8. The illuminator device of claim 1, wherein said reflector has a piece of fabric thereon disposed between said bulb and a user's face for diffusing the light emitted from said bulb.	Reference 2 - Bourn In one embodiment, <i>ring reflector 220 is fabricated by turning on a lathe a blank of aluminum, stainless steel, plastic, glass or other suitable material to generate a circularly symmetric reflective face</i> (e.g., conical-section face 2211) (i.e., the surface of the cross section shown is a straight line at an angle of 52 degrees from the plane of exit opening, i.e., 38 degrees from the optical axis 299), which is then polished and/or chrome plated to

enhance its reflectivity at a wavelength of ring-light source 230. In another embodiment, ring reflector 221 is cast, e.g., by injection molding, from a suitable plastic, and then coated by well known methods with a reflective coating of chrome, gold or other metal, alloy, or multiple optical coating layers to enhance its reflectivity at one or more selected wavelengths of ring-light source 230. (These manufacturing methods can apply to any of the ring reflectors described below.) See Bourn at Col. 11, line 16-31 (emphasis added).

The present invention provides a method and system for generating rays of light with suitable brightness and evenness from a source surrounding, for example, the lens of a machine-vision camera. The rays are directed generally towards the optical axis of the camera. One embodiment provides *a diffuse source circumferentially* such that even extremely small objects can be adequately inspected and accurately measured by a machine-vision system 100. See Bourn at Col. 5, line 64 – col. 6, line 4 (emphasis added).

Reference 4 - U.S. Pub. No. 2006/0007666 (“Cook”)

The light modifier 10 has a collapsible housing 13 that defines a sidewall 17. The sidewall 17 is usually formed of a four separate panels 19, 21, 23 and 25 respectively that are joined together to form the sidewall 17 of the collapsible housing 13. The panels of the sidewall 17 are generally trapezoidal in shape and are made of a fabric material. The fabric panels 19, 21, 23, and 25 are assembled to form the sidewall 17 of the housing so that the housing 13 defines a first end 29 and a second end 31.

The panels 19, 21, 23 and 25 are usually formed of a fabric

	material having an outer layer 37 and an inner layer 41. The outer layer 37 of fabric is typically black and is opaque to light that is contained within the housing 13. The inner layer of fabric is typically reflective in nature and the inner layer 41 of fabric forms the interior of the collapsible housing 13. A loop or passageway 45 is formed in the inner layer 41 of fabric along at least a portion of the edges where the panels 19, 21, 23 and 25 are joined together to form the sidewall 17. Normally the passageways 45 are created by sewing in an additional layer of fabric that forms the inner layer 41 to create the passageway. However, other methods can be utilized to form the passageways in the interior of the collapsible housing 13. See Cook at paragraph 0013.
9. The illuminator device of claim 8, wherein said fabric is silk or muslin.	Reference 4 – Cook the baffle is white nylon fabric that diffuses the light from a light source. See Cook Claim 7. at least one layer of netting is made of a fabric selected from the group of nylon, polyester or cotton. See Cook Claim 11.



US006238060B1

(12) **United States Patent**
Bourn et al.

(10) **Patent No.:** **US 6,238,060 B1**
(45) **Date of Patent:** **May 29, 2001**

(54) **MACHINE-VISION RING-REFLECTOR
ILLUMINATION SYSTEM AND METHOD**

(75) Inventors: **Charles T. Bourn**, Minnetonka; **Gary A. Lebens**, Chaska, both of MN (US)

(73) Assignee: **PPT Vision, Inc.**, Eden Prairie, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/499,250**

(22) Filed: **Feb. 7, 2000**

Related U.S. Application Data

(62) Division of application No. 08/914,441, filed on Aug. 19, 1997, now Pat. No. 6,022,124.

(51) Int. Cl.⁷ **F21Y 103/02**; G03B 15/03

(52) U.S. Cl. **362/216**; 362/3; 362/33

(58) Field of Search 348/131, 132,
348/370, 371; 356/237; 359/387; 362/3,
11, 33, 216, 297, 346

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,974,138	*	11/1990	Negishi	362/297
5,179,474	*	1/1993	Bailey et al.	359/387
5,457,492		10/1995	Sasaki et al.	348/126
5,745,176		4/1998	Lebens	348/370
5,825,495	*	10/1998	Huber	356/237
5,828,449		10/1998	King et al.	356/237
6,084,631		7/2000	Tonkin et al.	348/212

OTHER PUBLICATIONS

"Communication from Client", *Vision Light Tech. BV*, 3 pages, (Apr. 4, 1997).

"Communication from Client", *Vision Light Tech. BV*, 1 page, (May 5, 1997).

"Copy of U.S. application Ser. No. 08/532,213, now issued U.S. Pat. No. 5,745,176, entitled "Machine-Vision Illumination System & Method", 27 pgs (Oct. 12, 1995).

"Copy of U.S. application Ser. No. 08/825,774 entitled "High Speed Digital Video Serial Link", 33 pgs., (Apr. 2, 1997), now U.S. Pat. No. 6,084,631.

* cited by examiner

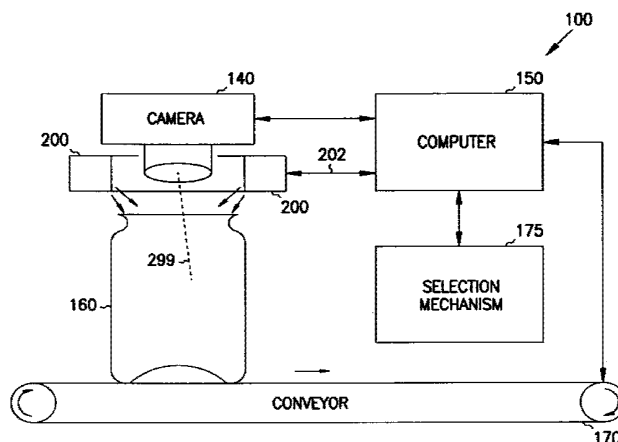
Primary Examiner—Alan Cariaso

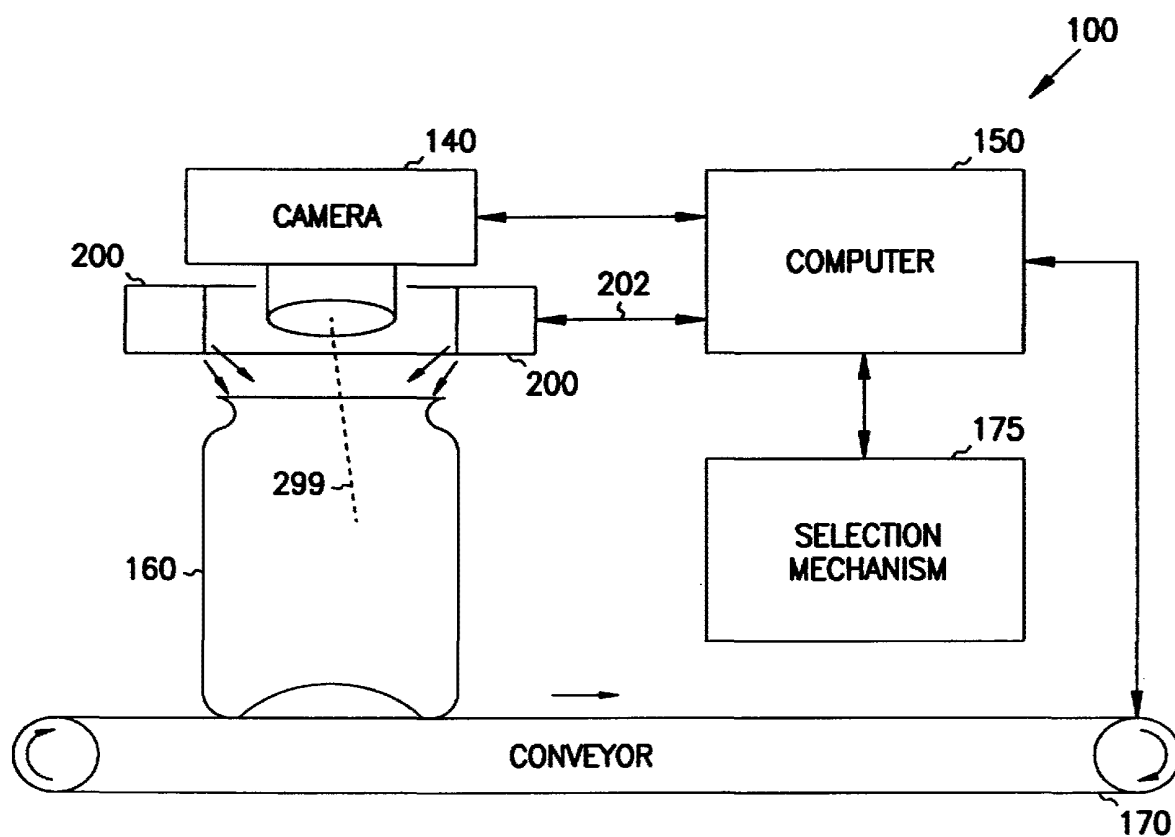
(74) *Attorney, Agent, or Firm*—Schwegman, Lundberg, Woessner & Kluth, P.A.

(57) **ABSTRACT**

An illumination method and apparatus for machine-vision systems, including a ring-light source (e.g., LEDs arranged in one or more circular rows), and a reflective-ring focusing element. The illumination source exhibits multidirectional ring-illumination properties which are useful for illumination of small components (which are being inspected or measured) without unwanted shadows. One embodiment provides a dark field illumination system. One embodiment of the present invention uses a strobed (or pulsed) power supply to drive the LEDs. Yet another embodiment of the present invention uses a xenon strobe ring-light source and a backplane slit in place of the row of LEDs. In one such xenon strobe embodiment, a color filter is also placed in series with the light path in order to obtain a monochromatic light. While xenon flashtube light sources tend to exhibit a five per cent (5%) flash-to-flash variation in intensity which makes accurate measurements of certain characteristics difficult, they are useful in certain cases where intense white, or especially ultraviolet, light is desired. Strobed LEDs provide very little flash-to-flash variation in intensity. The compact ring-light generator has little, if any, shadowing. The present invention also provides an inexpensive apparatus and method for changing the light-source-to-optical-axis angle.

22 Claims, 22 Drawing Sheets



**FIG. 1A**

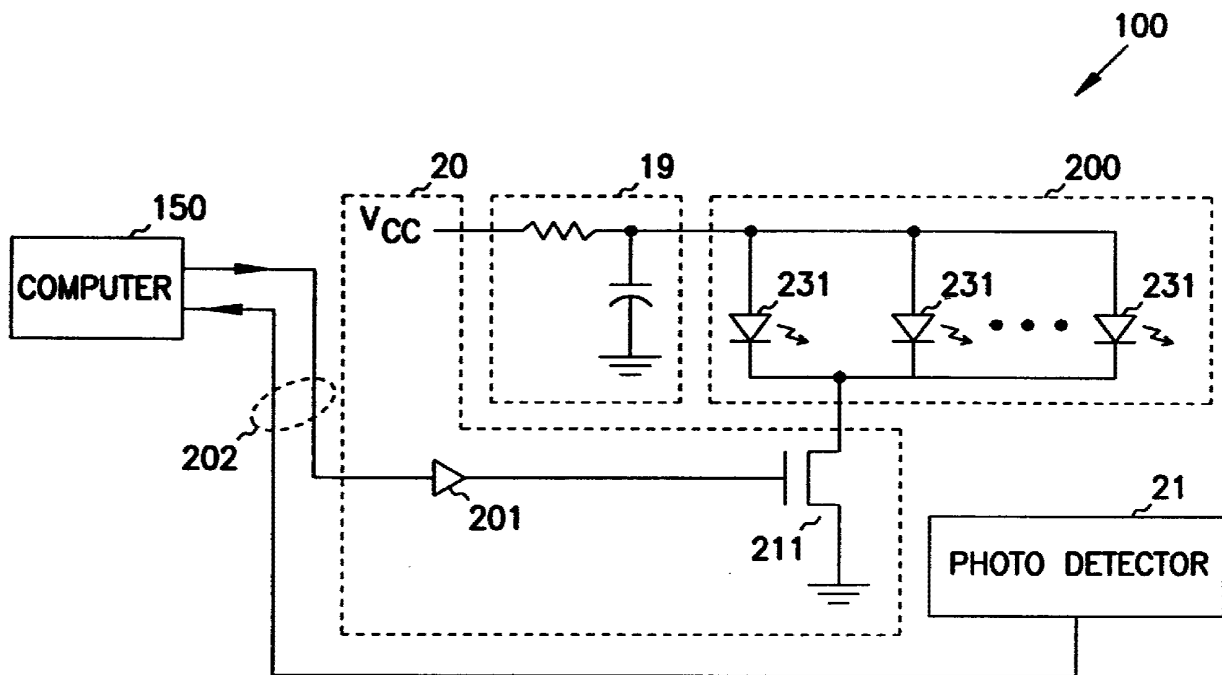


FIG. 1B

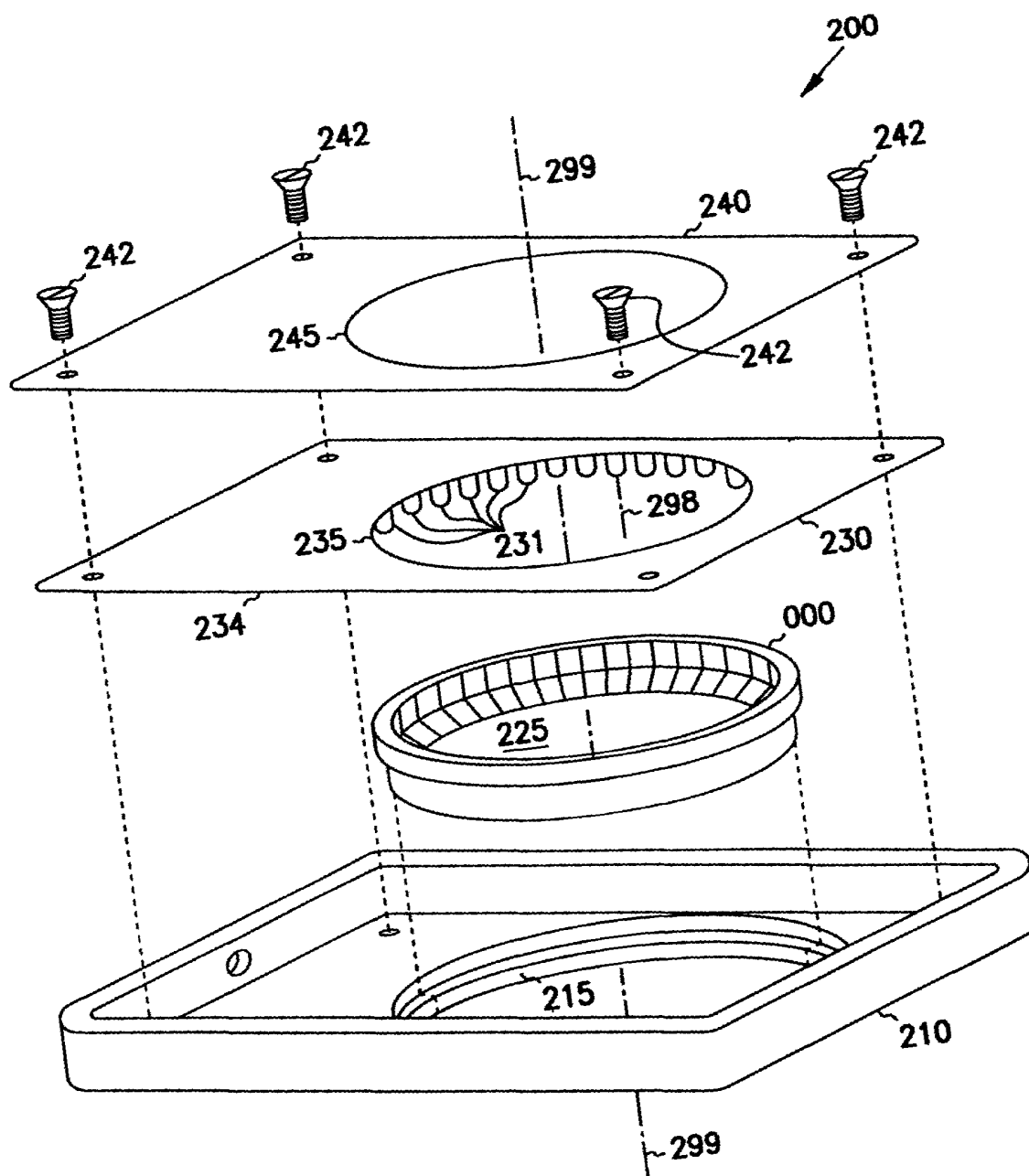


FIG. 2A

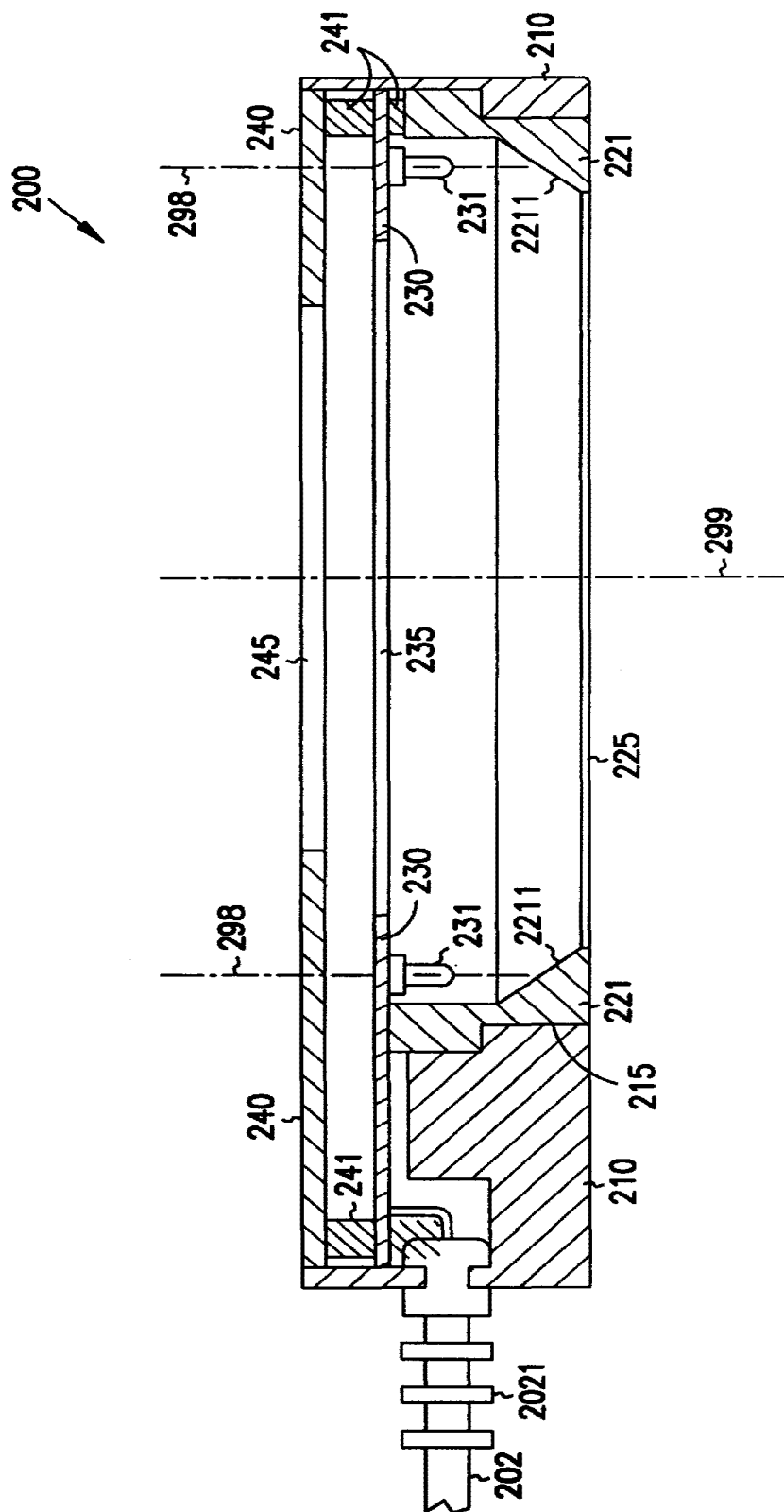


FIG. 2B

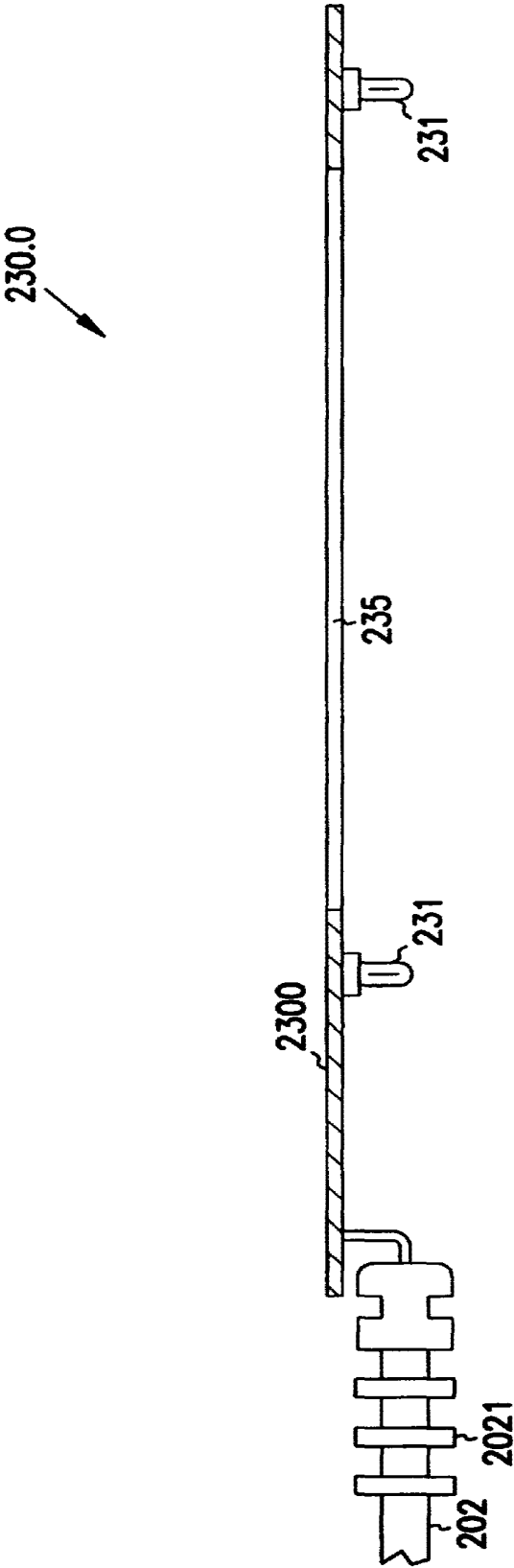


FIG. 2C

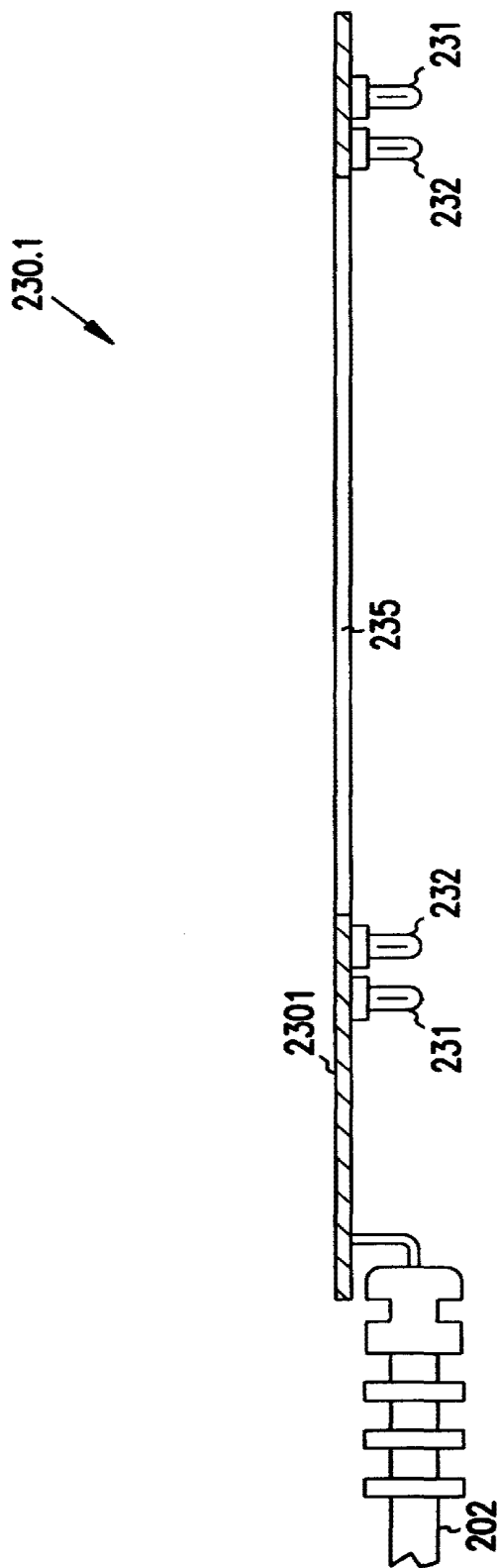


FIG. 2D

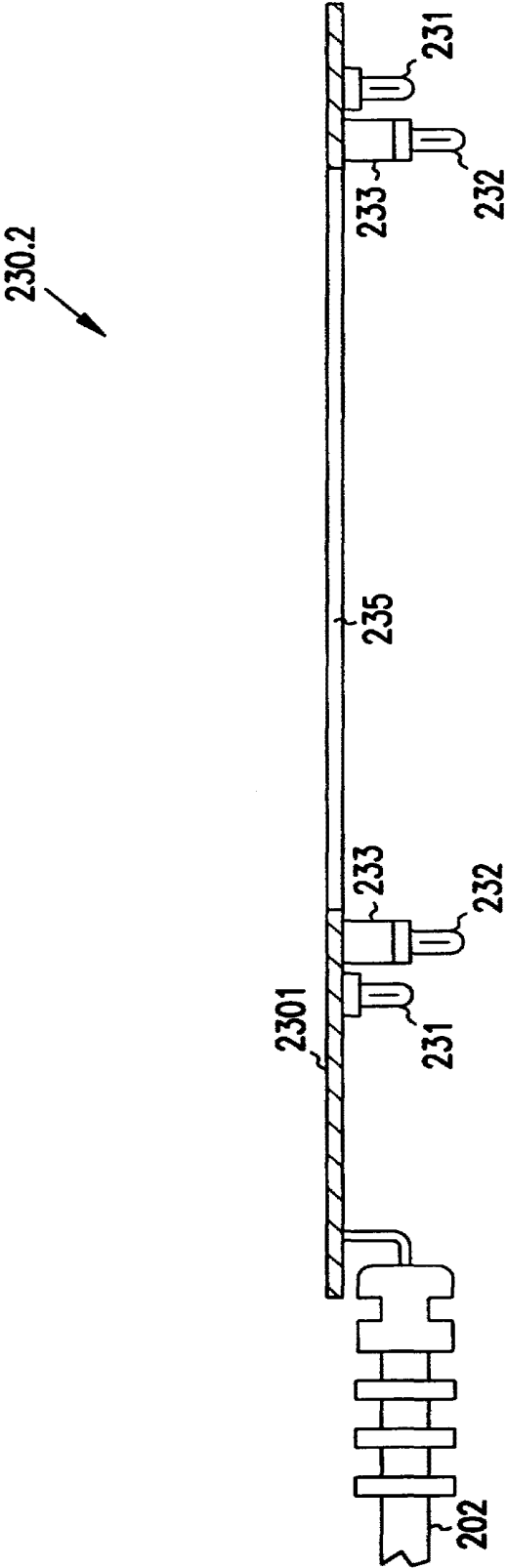


FIG. 2E

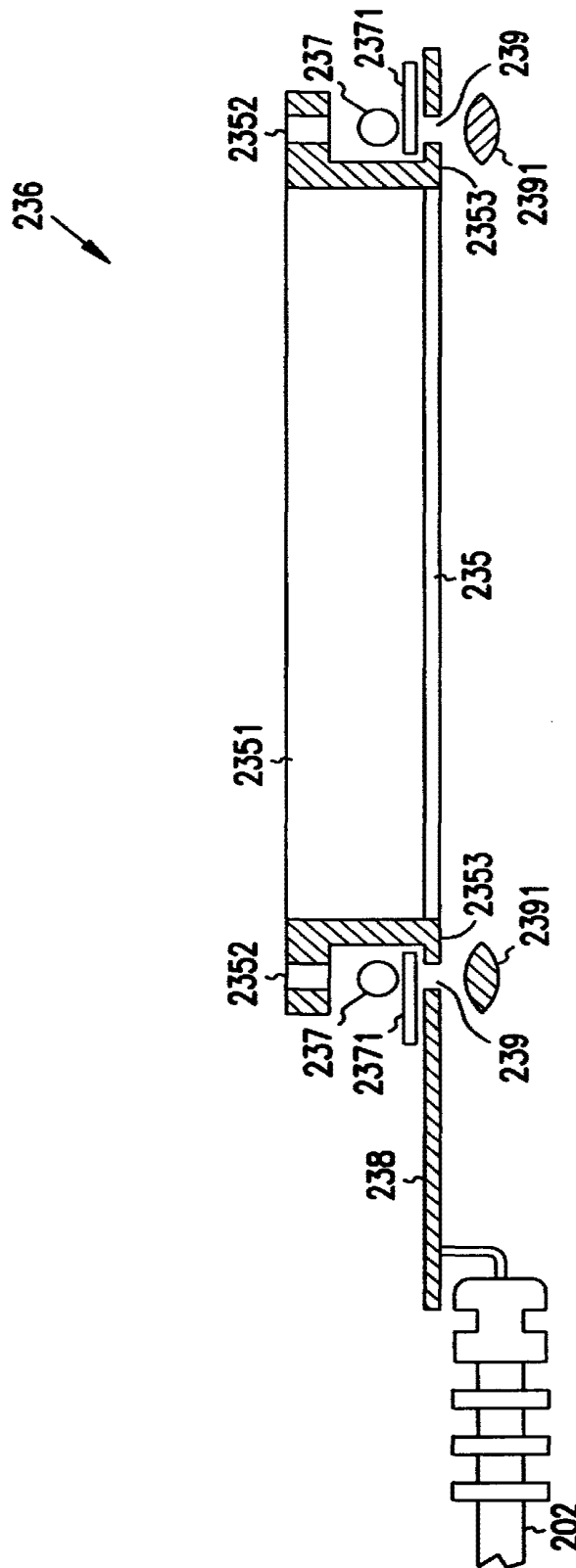


FIG. 2F

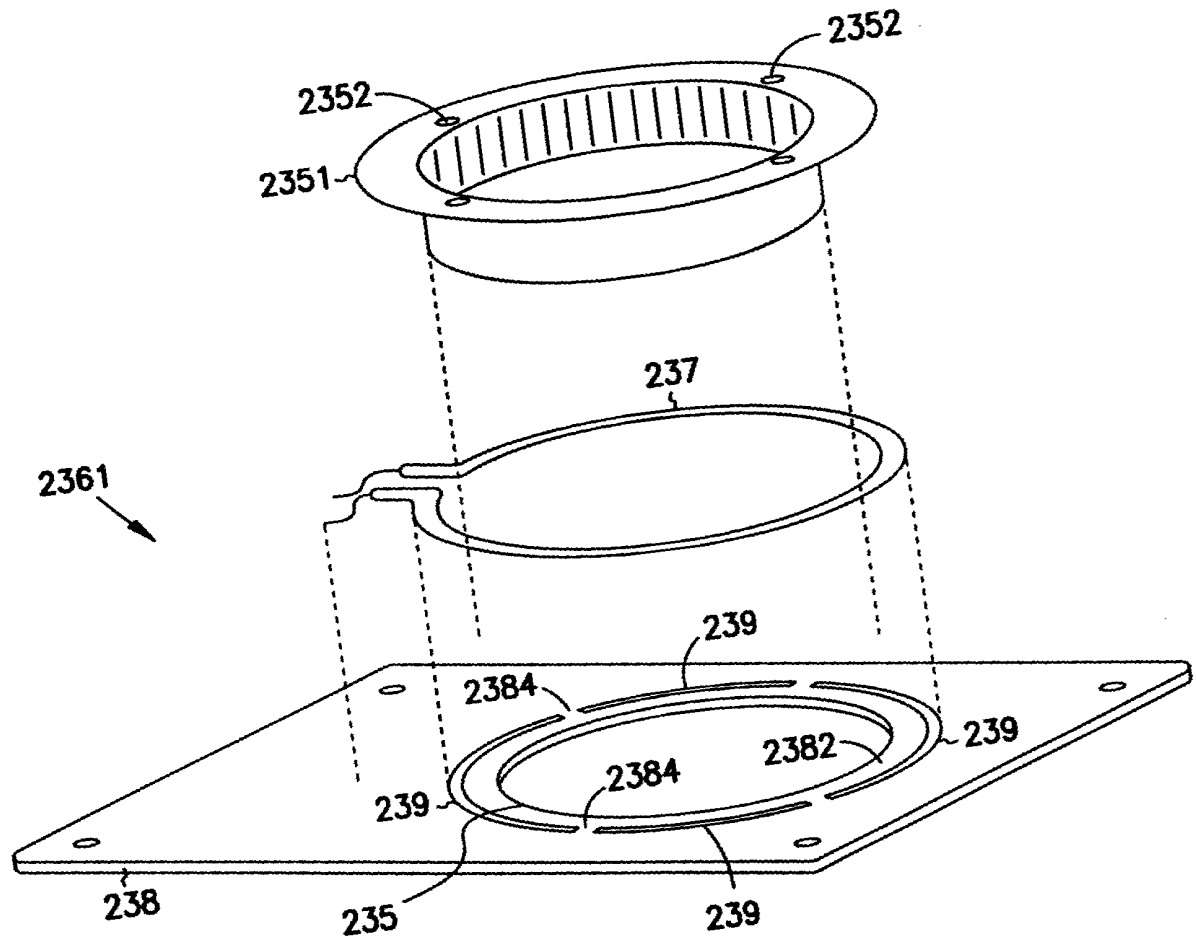


FIG. 2G

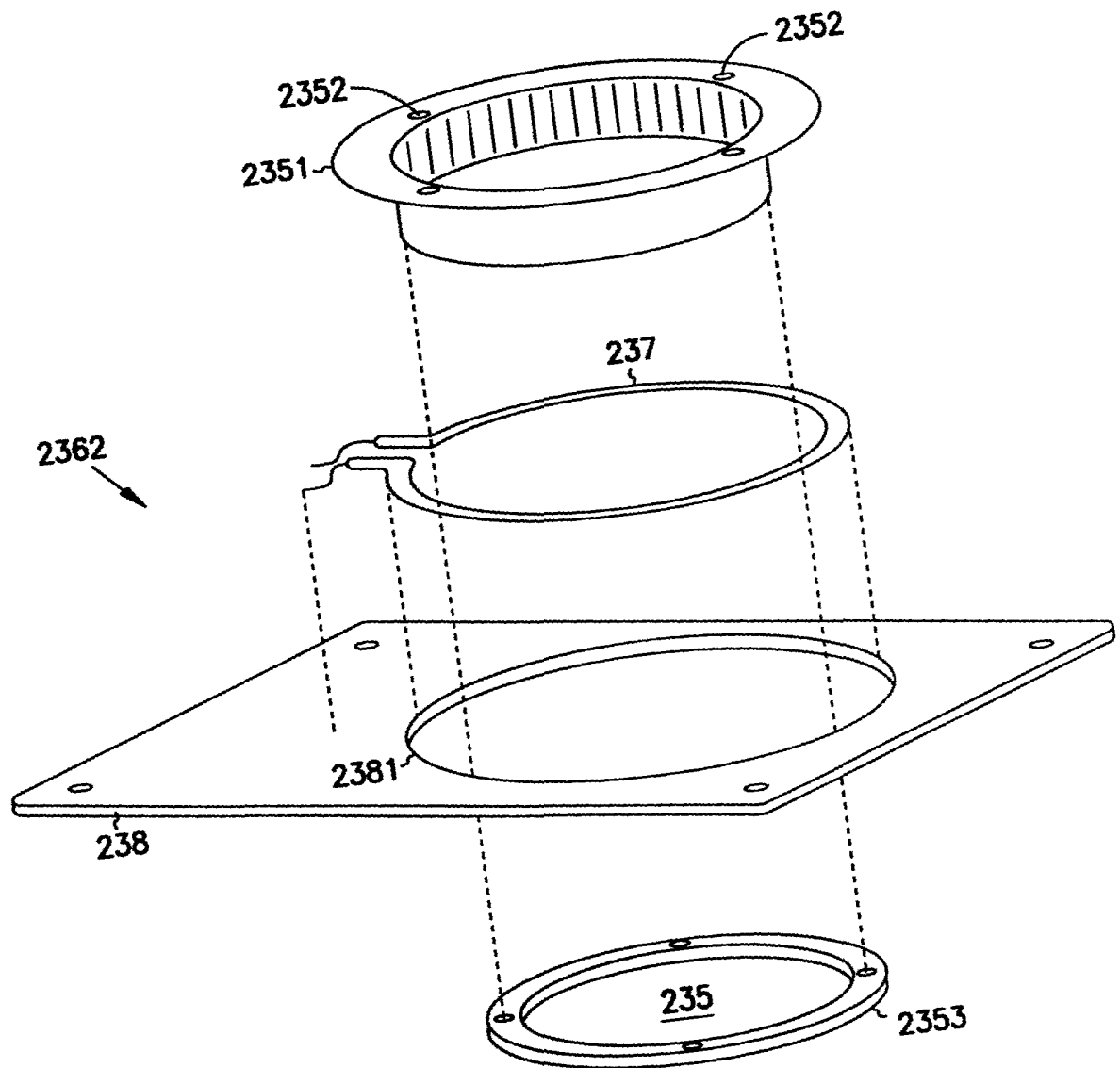


FIG. 2H

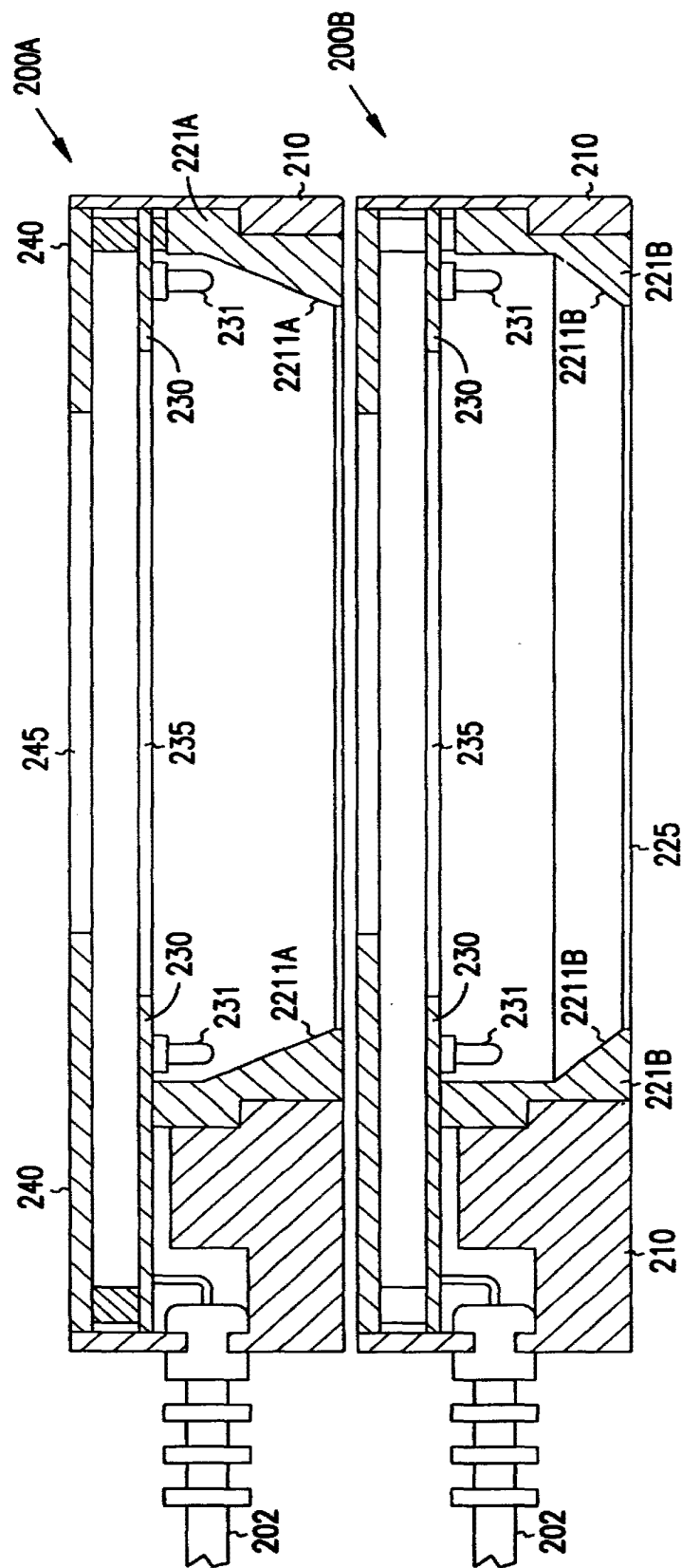


FIG. 2I

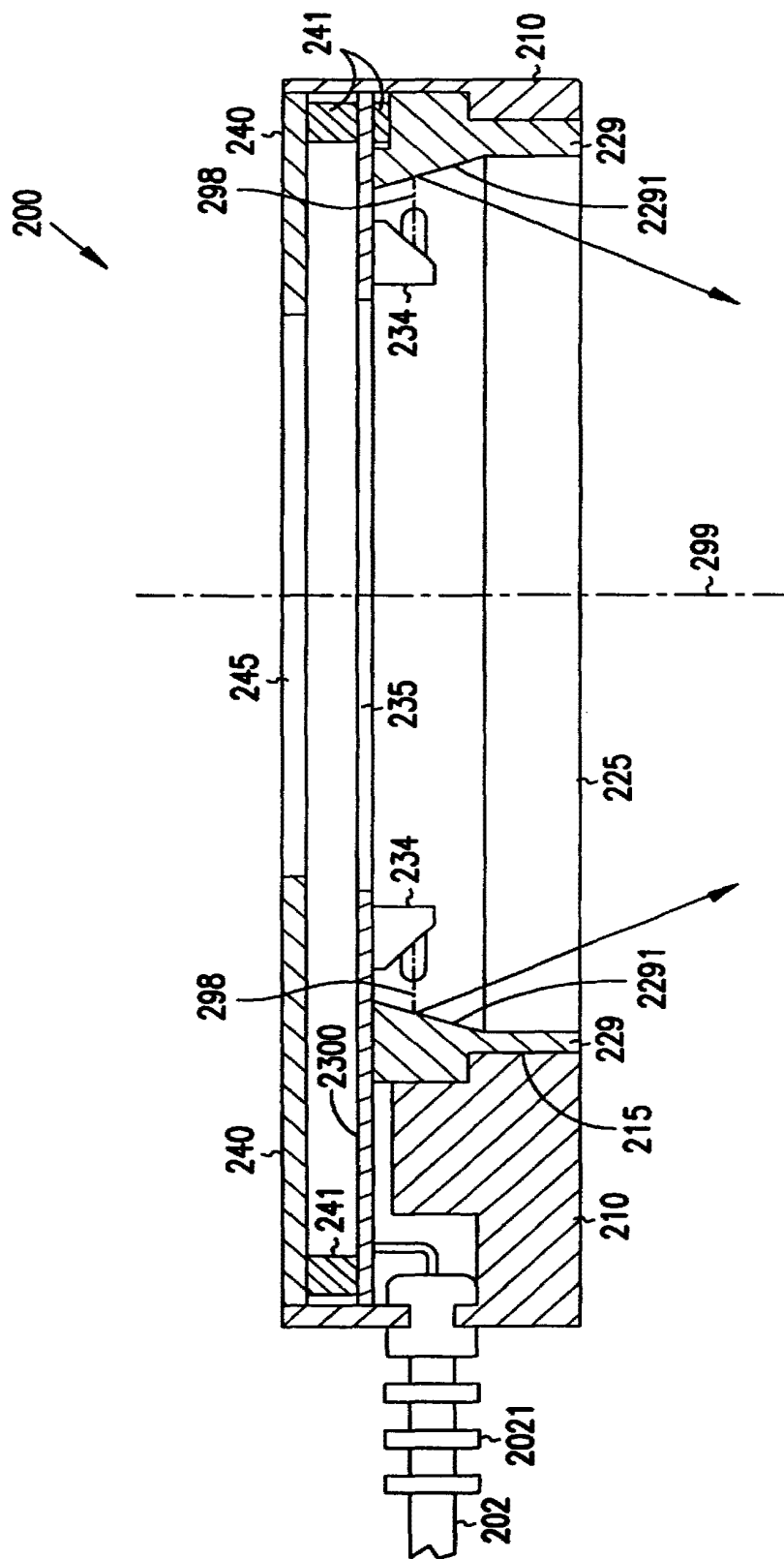


FIG. 2J

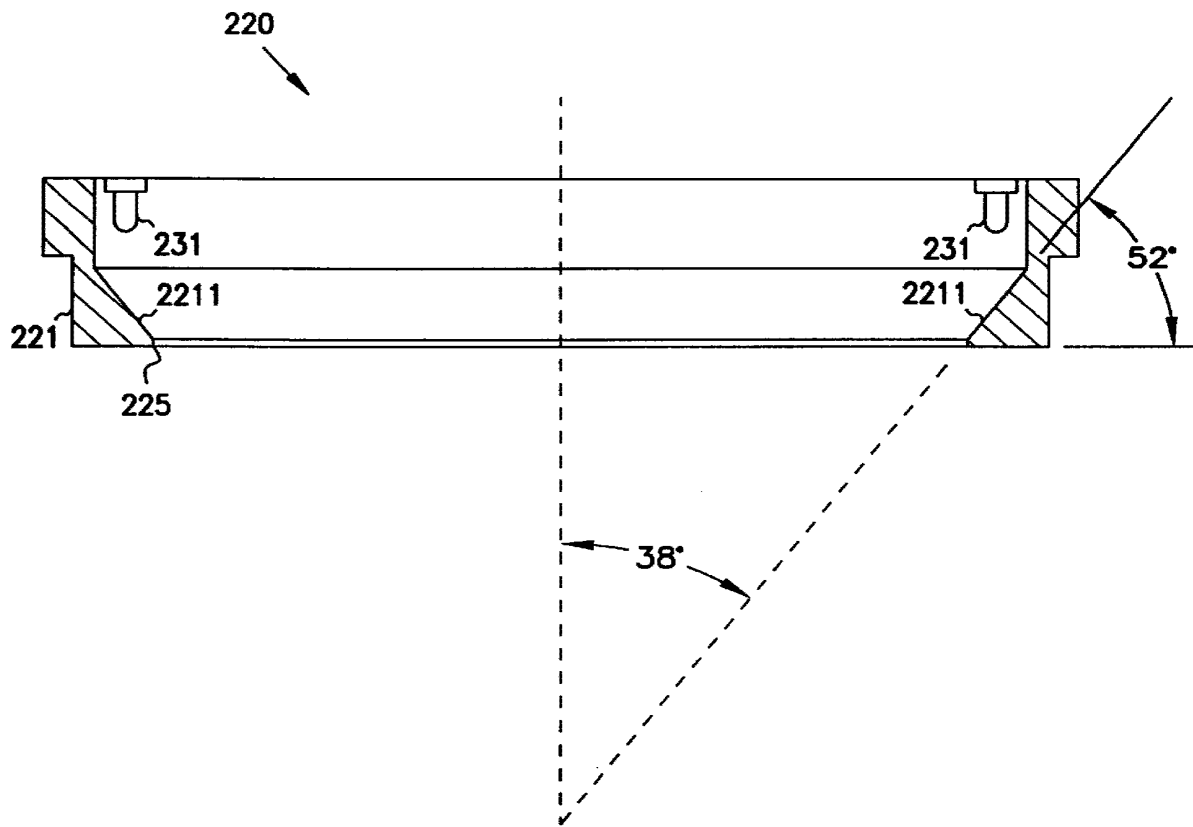


FIG. 3A

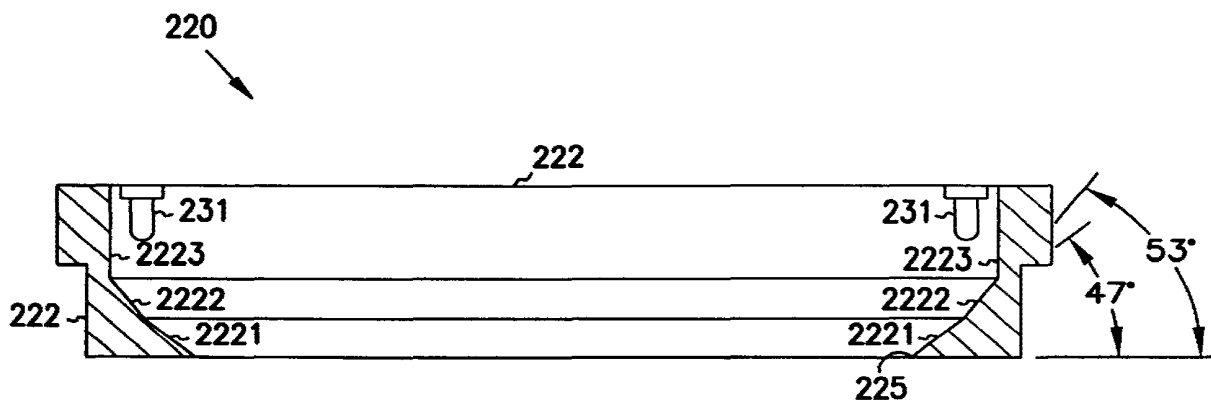


FIG. 3B

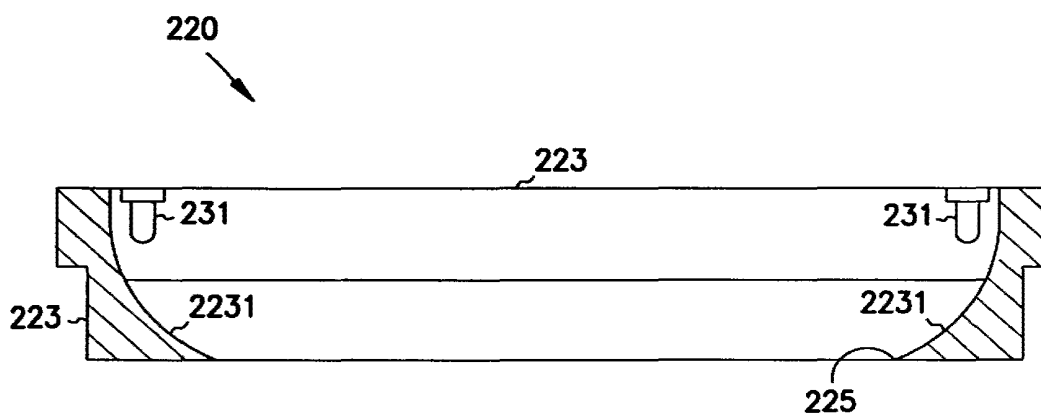


FIG. 3C

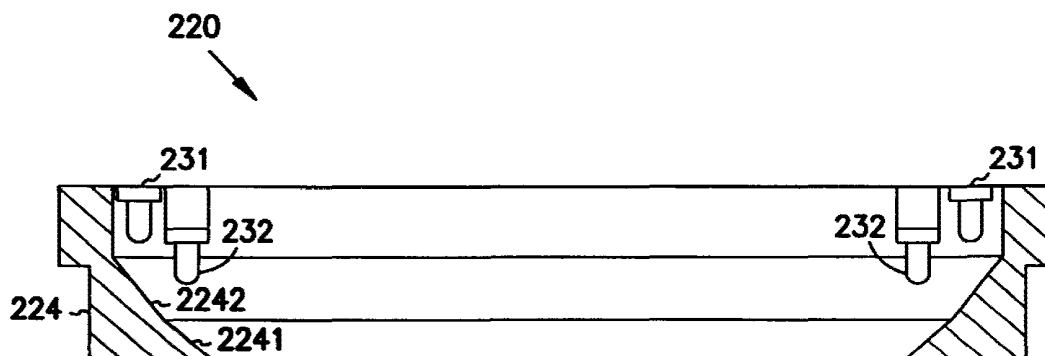


FIG. 3D

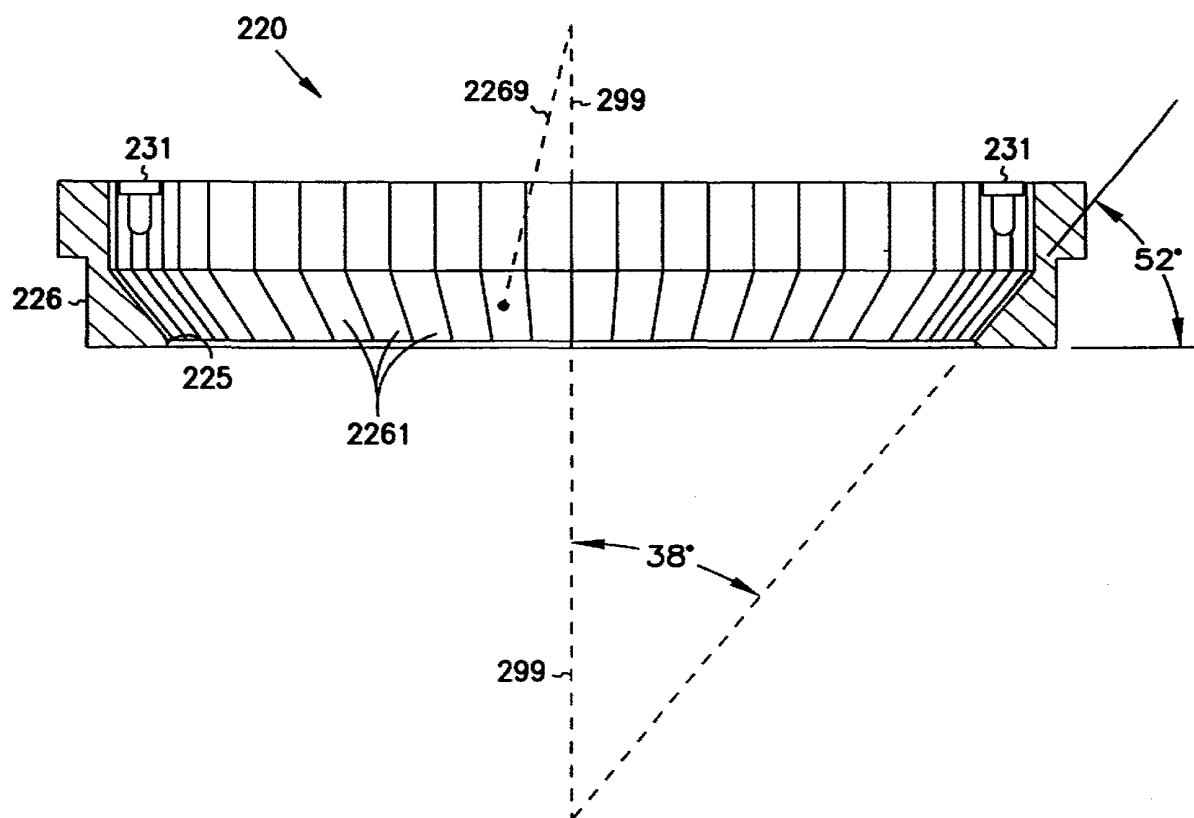


FIG. 3E

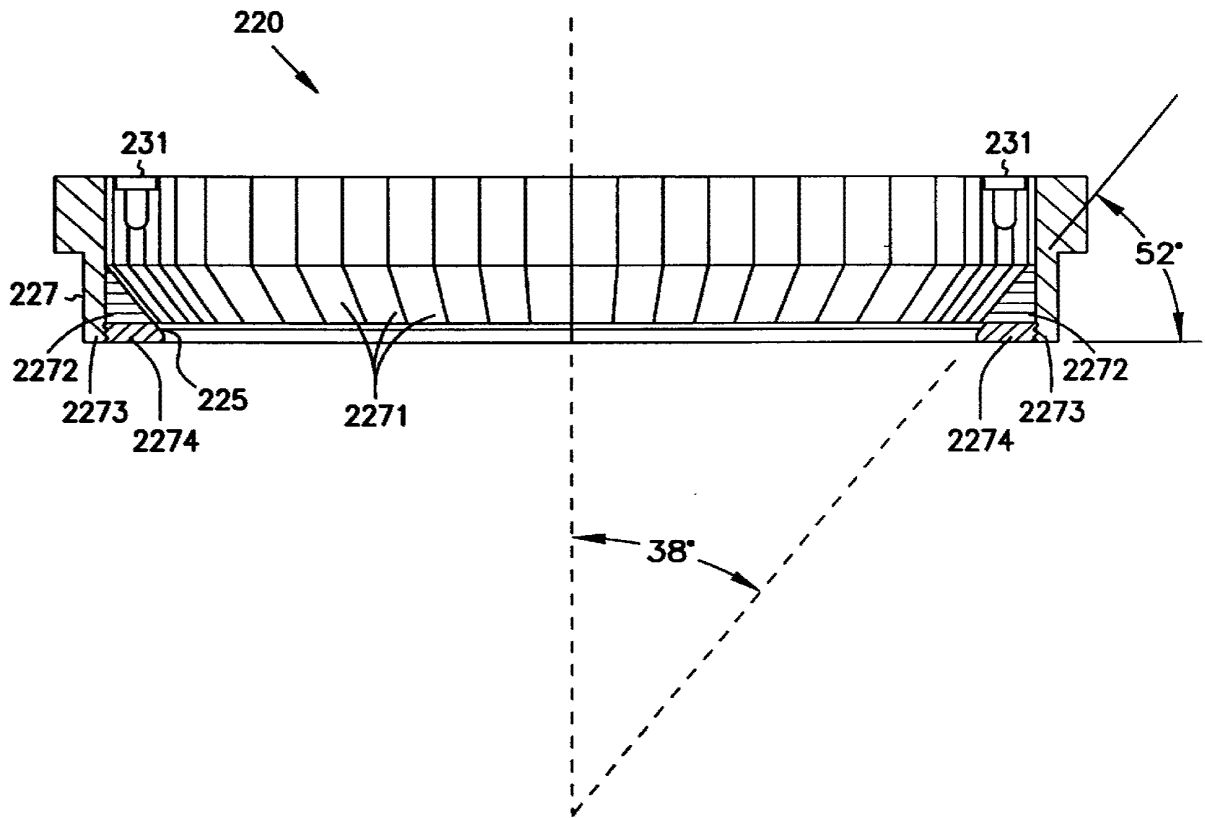


FIG. 3F

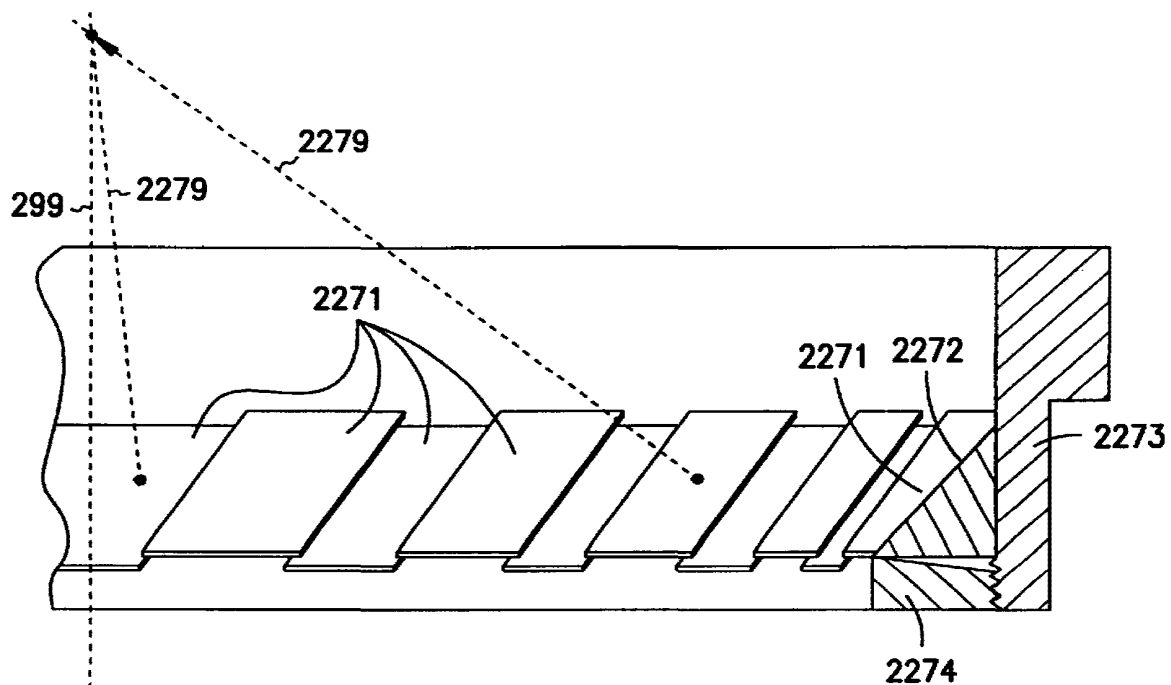


FIG. 3G

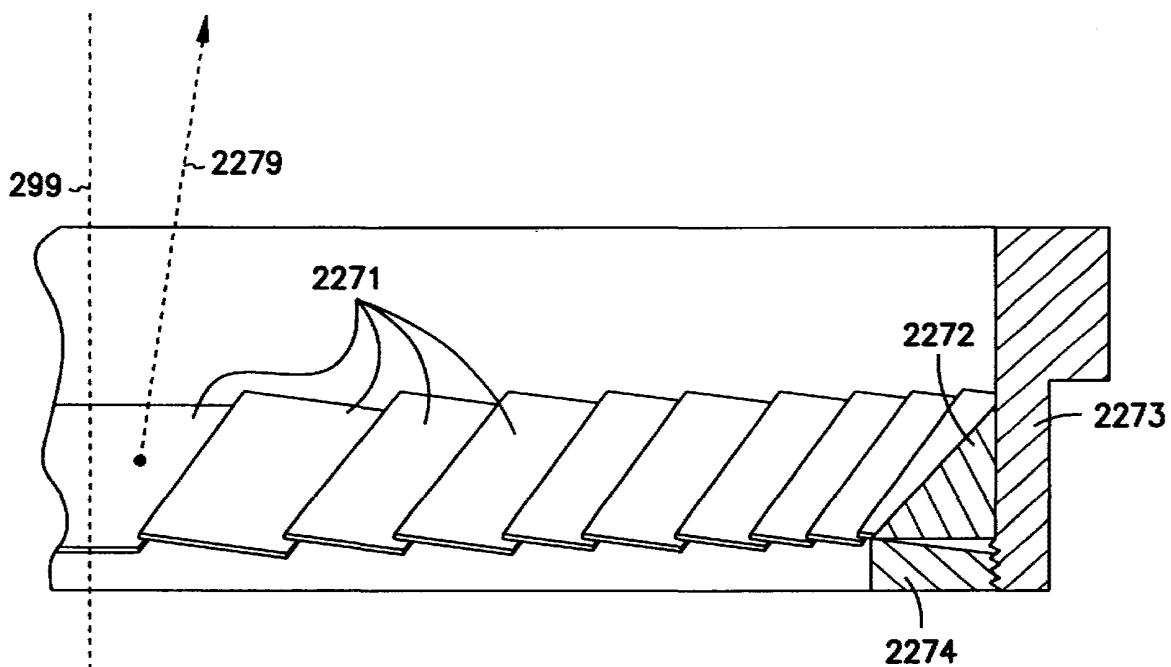


FIG. 3H

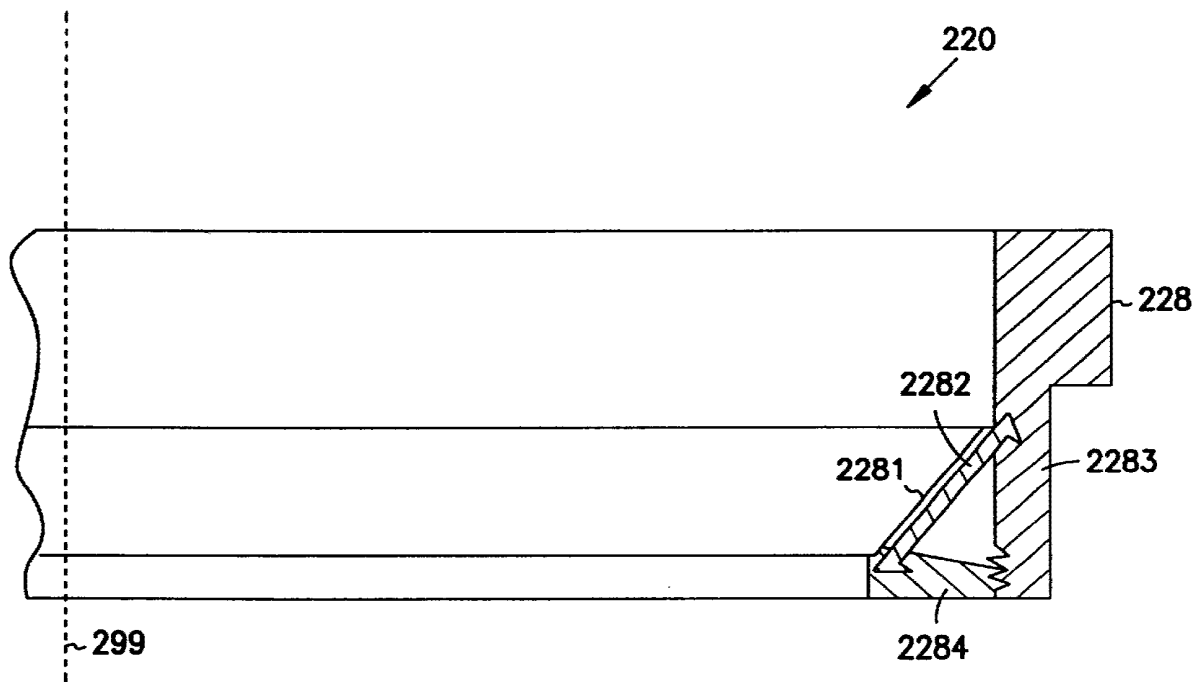
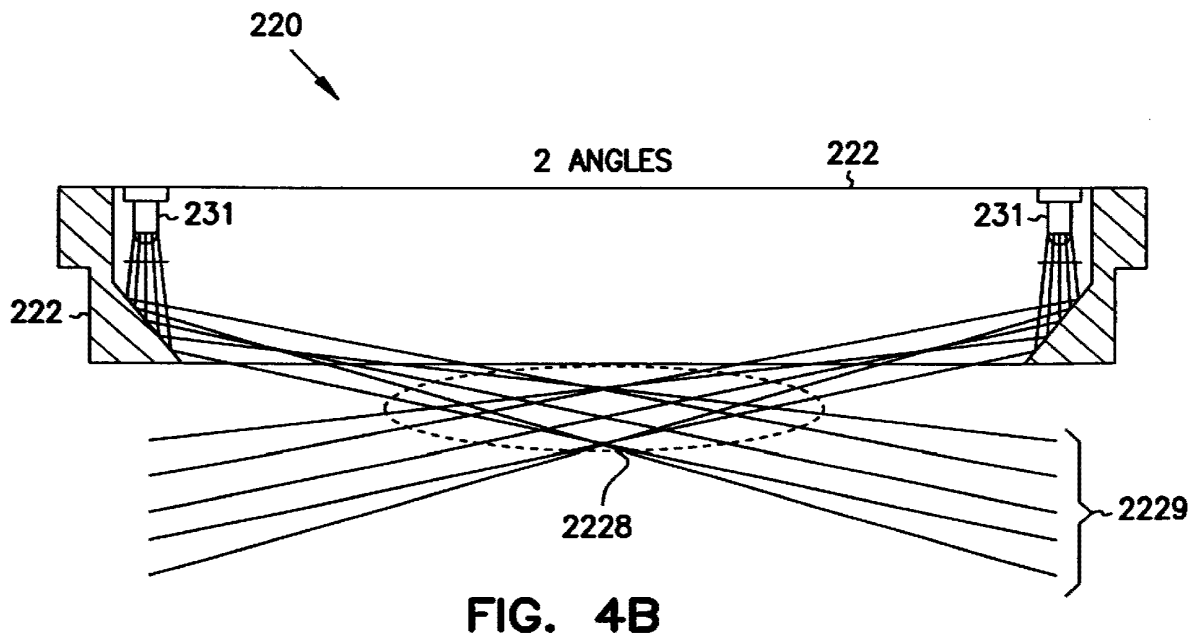
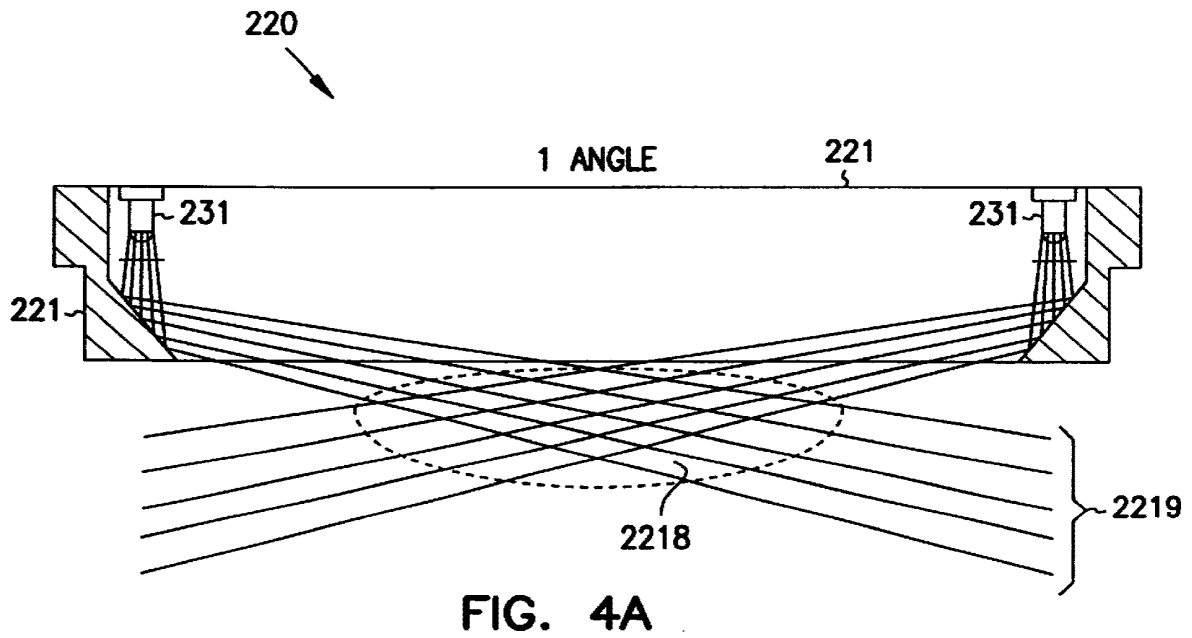


FIG. 3I



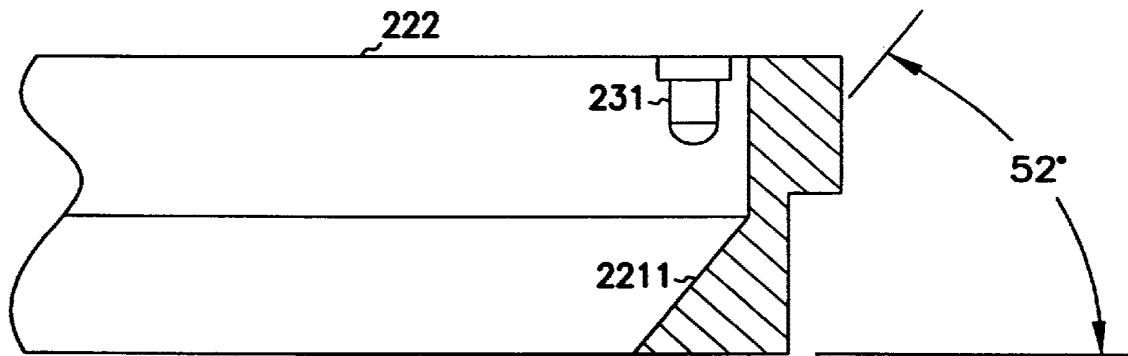


FIG. 5A

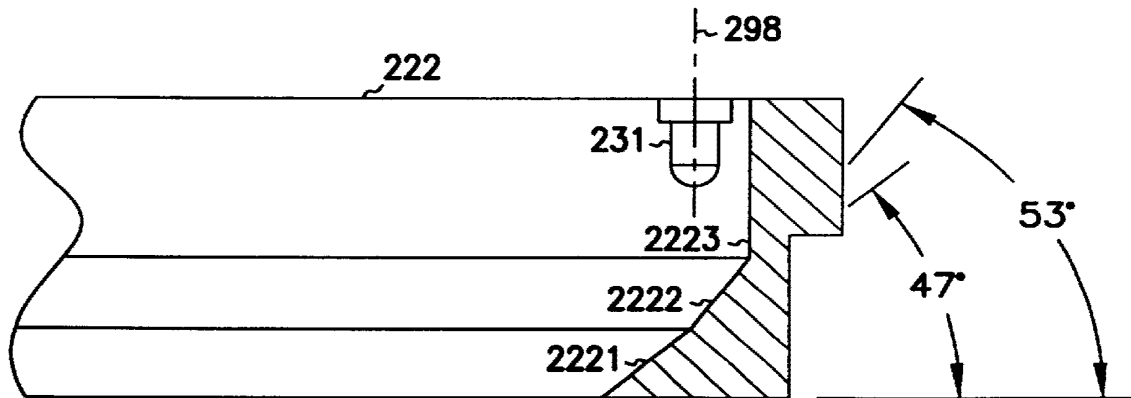


FIG. 5B

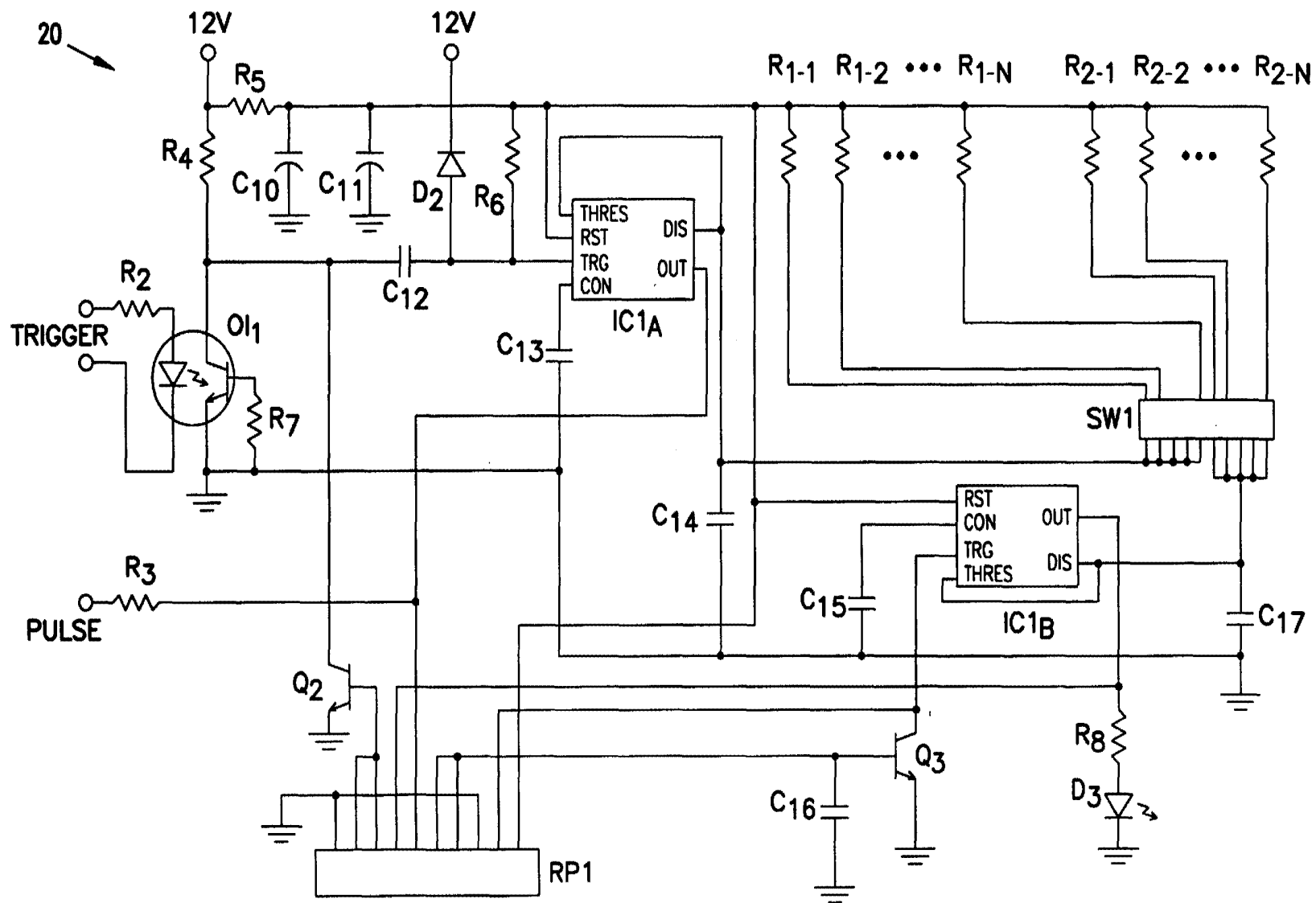


FIG. 7

MACHINE-VISION RING-REFLECTOR ILLUMINATION SYSTEM AND METHOD

This application is a divisional of U.S. patent application Ser. No. 08/914,441, filed Aug. 19, 1997, now U.S. Pat. No. 6,022,124 which application is incorporated by reference.

TECHNICAL FIELD OF THE INVENTION

The present invention pertains generally to illumination optics, and more particularly systems and methods for illumination of objects in machine-vision systems.

BACKGROUND OF THE INVENTION

During the manufacture of certain products, such as electrical components, it is necessary to be able to provide high-intensity illumination so that components can be thoroughly inspected with a machine-vision system. Often, the light source needed includes one or more light sources, for example a ring-shaped flashtube or a number of light-emitting diodes arranged along a circle or a remote light source that drives light into a number of optical fibers arranged along a circle, surrounding the lens of a video camera such that the object being imaged by the video camera is illuminated with light angled in towards the optical axis of the camera from the light source surrounding the lens. It is desirable that the light source or sources are arranged such that no light shines directly from the light sources into the lens.

Typically, a xenon flashtube or laser-based single-point source or other high-intensity light source is used for providing light into fiber-optic-based ring source. Such systems, however, are costly, very large and bulky, and can interfere with the placement of other components in the machine-vision system. This is particularly troublesome when the components being measured or inspected are extremely small. Xenon flashtube light sources also tend to exhibit up to about a five per cent (5%) flash-to-flash variation in intensity which makes accurate measurements of certain characteristics difficult. Single-point source systems are also generally limited to emitting light radially from only one single point, which is of limited value when shadows are problematic, such as, when inspecting a grid of electrical connectors. Specifically, light from only one or just a few point sources only illuminates the first over-sized or over-height electrical connector and, due to shadows from the first object encountered, does not provide proper illumination which would determine if other objects behind this particular first object are missing, of the incorrect size or height, or perhaps in the wrong position.

Conventional illumination systems produce a light which can be too bright in certain areas and too dim in other areas. Often, the end-result is "bloom", especially when viewing white, lightly colored, or very reflective objects which are near other objects which need to be viewed by a machine-vision camera. In order to get enough light on the other objects which need to be viewed, the aperture on the camera cannot be "stopped down" in order to prevent overexposure of the bright objects. Specifically, the area is illuminated to such an extent that the entire image appears to be the same bright saturated white color (or, if a monochromatic light source is used, saturated at whatever color is used) as viewed by the machine-vision camera and system. Such extreme brightness also poses a danger of blinding, at least temporarily, human workers nearby.

Quite often, illumination sources either leave certain portions of the scene in shadows, or provide too much light

in certain areas, while leaving other areas with too little light. In other cases, the illumination source is too bulky and gets in the way of other components of the machine-vision system, associated robots, manipulators, and/or human workers.

The optimal light-source-to-optical-axis angle can vary depending on the object being inspected. One shortcoming of conventional ring light sources is the cost and difficulty in changing the angle between the light sources relative to the optical axis, and in changing the spread and/or focus of the light from ring-light source.

Thus, what is needed is an ring-light illumination system and method which is compact, provides control over both the angle between the light source and the optical axis of the camera, as well as the spread and/or focus of the light from ring light source, so that even extremely small parts can be quickly and adequately inspected and accurately viewed or measured with a machine-vision system. Another need is to provide a compact illumination source, preferably monochromatic, which can be focused to provide uniform multi-directional light onto objects from all sides while avoiding light going directly from the light sources to the lens of the camera. Another need is to provide a compact monochromatic LED (light-emitting diode) illumination source, which can be changeably focused to provide uniform multi-directional light onto objects. Another need is to have such an LED illumination source be pulsed with a relatively high-power, low duty-cycle power source.

SUMMARY OF THE INVENTION

The present invention takes advantage of the efficiency of high-brightness red, infra-red, blue, white, or other color LEDs arranged in one or more circular rows, and the properties inherent to a reflective focusing element such as a turned angled reflective ring to produce an illumination source for machine-vision systems. The illumination source exhibits multi-directional ring-illumination properties which are useful for illumination of small components (which are being inspected or measured) without unwanted shadows. One embodiment provides a darkfield illumination system. One embodiment of the present invention uses a strobed (or pulsed) power supply to drive the LEDs. Yet another embodiment of the present invention uses a xenon strobe ring-light source and a backplane slit in place of the row of LEDs. In one such xenon strobe embodiment, a color filter is also placed in series with the light path in order to obtain a monochromatic light. While xenon flashtube light sources tend to exhibit a five per cent (5%) flash-to-flash variation in intensity which makes accurate measurements of certain characteristics difficult, they are useful in certain cases where intense white, or especially ultraviolet, light is desired.

The present invention provides a compact ring-light generator which has little, if any, shadowing. The present invention also provides an inexpensive method for changing the light-source-to-optical-axis angle. The present invention also provides an inexpensive method for changing the spread and/or focus of the light from ring light source.

The present invention provides a method and apparatus which provide an illumination source for illuminating an object in a machine-vision system having a machine-vision camera, the camera having an optical axis. One embodiment of the illumination source includes a ring-light source emitting light from a plurality of points, the points being along one or more circles, a focusing element, the focusing element including an angled ring reflector to direct rays from

3

the ring light source at an angle generally towards the optical axis. One embodiment provides a replaceable ring reflector for changing the light-source-to-optical-axis and/or changing the spread and/or focus of the light from ring light source. One embodiment provides light from multiple directions in order to reduce shadowing. One embodiment provides light to illuminate the inside of, for example, an aluminum beverage can before it is filled and sealed.

One embodiment uses a ring-reflector focusing element which includes a first conical section reflective surface at a first conical angle to the optical axis. Another embodiment further includes a second conical section reflective surface at a second conical angle to the optical axis.

One embodiment includes an illumination source for illuminating an object in a machine-vision system, the system having an optical axis. The illumination source includes a ring light source and a ring reflector. The ring light source emits light from a plurality of points or from a line, the points or line being substantially in a plane that intersects the optical axis, each of the points or the line disposed at least a first distance from the optical axis and less than a second distance from the optical axis. The ring reflector has an exit opening through which the optical axis passes, the emitted light from the ring light source being generally directed centered on lines that intersect a reflecting surface of the ring reflector, the ring reflector reflecting the emitted light from the light source through the exit opening inwards and generally towards the optical axis or an area around the optical axis.

In one such embodiment, the ring light source includes a plurality of light-emitting diodes (LEDs) arranged substantially along a circle disposed perpendicular to and centered on the optical axis. In another such embodiment, each LED has an focal centerline emission axis along which emission is centered, and each LED's emission axis is parallel to the optical axis. In yet another such embodiment, each LED has an focal centerline emission axis along which emission is centered, and each LED's emission axis is perpendicular to the optical axis.

In one embodiment, the light emitted from the LEDs is two or more selected from the following: infra-red, red, amber, yellow, green, blue, violet, ultraviolet, or white in color. In another such embodiment, the light emitted from the LEDs is primarily within an angle of about 5° from a focal centerline of each individual LED.

One embodiment further includes a focusing element that includes a cylindrical ring lens having at least one convex face.

In one embodiment, the ring light source includes a ring-shaped flashtube located substantially along a circle disposed perpendicular to and centered on the optical axis, and further includes an enclosure having a slit located between the ring-shaped flashtube and the ring reflector, wherein the slit allows light from the flashtube to fall on a reflecting surface of the ring reflector.

In one embodiment, the ring reflector has a surface that enhances its reflectivity at one or more selected wavelengths of the ring light source.

In one embodiment, the ring reflector and ring light source are configured to produce a darkfield illumination.

Another aspect of the present invention is a method for illuminating an object located along an optical axis. The method includes the steps of (a) emitting light from a plurality of points or from a line, the points or line being substantially in a plane that intersects the optical axis, each of the points or the line disposed at least a first distance from

4

the optical axis and less than a second distance from the optical axis; and (b) reflecting the emitted light from the light source inwards and generally towards the object at the optical axis or in an area around the optical axis.

In one such embodiment, the object is an electrical connector, and the method further includes the step of acquiring a machine-vision image of the electrical connector. One application for such a method is inspecting ball-grid arrays.

Another aspect of the present invention provides a machine-vision illumination system. The system includes an imaging device, an image processor coupled to the imaging device, and an illumination source coupled to the image processor. The illumination source includes a ring light source and a ring reflector. Other aspects of such a system are described above.

Another aspect of the present invention provides a ring reflector for use in reflecting light from a ring light source. The ring reflector includes a substantially circular exit opening through which the optical axis passes and a reflective surface surrounding the exit opening. The reflective surface extends from approximately a first circle having a first radius, to approximately a second circle and having a second radius, the second radius being larger than the first radius, the first radius being larger than the difference between the second radius and the first radius.

In one such embodiment, the reflective surface includes a conical section. In another such embodiment, the reflective surface includes a plurality of adjoining conical sections. In yet another such embodiment, the reflective surface includes a circularly-rotated parabolic section. In still another such embodiment, the reflective surface includes a plurality of reflective facets. In one such embodiment, for a plurality of the facets, a line normal to the facet surface passes through the optical axis. Another aspect of the present invention provides a reflective surface that is configurable to change the angle at which it reflects light.

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a side-view schematic diagram of one embodiment of machine-vision illumination system **100**.

FIG. 1B is a circuit schematic diagram of a portion of one embodiment of machine-vision illumination system **100**.

FIG. 2A is an exploded isometric view of ring-reflector illumination source **200** according to one embodiment of the present invention.

FIG. 2B is a cut-away side view of ring-reflector illumination source **200** according to one embodiment of the present invention.

FIG. 2C is a cut-away side view of one ring-light source **230** using LEDs according to one embodiment of the present invention.

FIG. 2D is a cut-away side view of another ring-light source **230** using LEDs according to one embodiment of the present invention.

FIG. 2E is a cut-away side view of yet another ring-light source **230** using LEDs according to one embodiment of the present invention.

FIG. 2F is a cut-away side view of ring-light source **236** using a xenon flashtube according to one embodiment of the present invention.

5

FIG. 2G is an exploded isometric view of a flash-tube light source **2361** according to one embodiment of the present invention.

FIG. 2H is an exploded isometric view of a flash-tube light source **2362** according to one embodiment of the present invention.

FIG. 2I is a cut-away side view of two stacked ring-reflector illumination sources **200A** and **200B** according to one embodiment of the present invention.

FIG. 2J is a cut-away side view of an alternative ring-reflector illumination source **200** according to one embodiment of the present invention.

FIG. 3A is a cut-away side view of one ring reflector **220** according to one embodiment of the present invention.

FIG. 3B is a cut-away side view of another ring reflector **220** according to one embodiment of the present invention.

FIG. 3C is a cut-away side view of yet another ring reflector **220** according to one embodiment of the present invention.

FIG. 3D is a cut-away side view of still another ring reflector **220** according to one embodiment of the present invention.

FIG. 3E is a cut-away side view of a faceted ring reflector **226** according to one embodiment of the present invention.

FIG. 3F is a cut-away side view of a configurable ring reflector **227** according to one embodiment of the present invention.

FIG. 3G is an enlarged cut-away side view of a configurable ring reflector **2273** having overlapped facets **2271** each pointing towards the optical axis **299**.

FIG. 3H is an enlarged cut-away side view of a configurable ring reflector **2283** having overlapped facets **2281** each pointing off to the side of the optical axis **299**.

FIG. 3I is an enlarged cut-away side view of a configurable ring reflector **2283** having a stretchable reflective membrane **2281**.

FIG. 4A is a cut-away side schematic of the ring reflector **220** of FIG. 3A showing the light pattern generated.

FIG. 4B is a cut-away-side schematic of the ring reflector **220** of FIG. 3B showing the light pattern generated.

FIG. 5A is an enlarged cut-away side schematic of the ring reflector **220** of FIG. 3A.

FIG. 5B is an enlarged cut-away side schematic of the ring reflector **220** of FIG. 3B.

FIG. 6 is a schematic diagram of the LED drive electronics for one exemplary system **100**.

FIG. 7 is a schematic diagram of one exemplary power supply **20**.

DETAILED DESCRIPTION OF THE INVENTION

In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings which form a part hereof, and in which are shown, by way of illustration, specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

The present invention provides a method and system for generating rays of light with suitable brightness and evenness from a source surrounding, for example, the lens of a machine-vision camera. The rays are directed generally

6

towards the optical axis of the camera. One embodiment provides a diffuse source circumferentially such that even extremely small objects can be adequately inspected and accurately measured by a machine-vision system **100**.

The unique ability of the method and apparatus of the LED illumination system of the present invention to provide an inexpensive and changeable light source within these constraints distinguishes this system from other illumination systems purporting to provide suitable high-intensity illumination for machine-vision inspecting or measuring purposes.

An illumination system is described in MACHINE-VISION ILLUMINATION SYSTEM AND METHOD, U.S. patent application Ser. No. 08/532,213, filed Oct. 12, 1995, by Gary A. Lebens and assigned to PPT Vision, Inc., the assignee of the present invention, and which is hereby incorporated by reference.

A serial machine-vision interconnection system is described in HIGH-SPEED DIGITAL VIDEO SERIAL LINK, U.S. patent application Ser. No. 08/825,774, filed Apr. 2, 1997, which is a file-wrapper continuation of Ser. No. 08/410,119, filed Mar. 24, 1995 by Joseph C. Christianson and Larry G. Paulson and assigned to PPT Vision, Inc., the assignee of the present invention, and which is hereby incorporated by reference.

FIG. 1A is a side-view schematic diagram of an embodiment of machine-vision illumination system **100** according to the present invention. In FIG. 1, an object **160** (for example, a beverage can or other food or drink container, or an electronics assembly or other manufactured item) is illuminated for inspection by a machine-vision camera (or other imaging device) **140** which is coupled to computer/image processor **150**. In this embodiment, camera **140** is disposed to view object **160** through an opening in ring-reflector illumination source **200** which directs light downward and inward. In the exemplary system shown, it is desired to illuminate the top edge, inside walls and inside bottom surface of object **160** for viewing by camera **140** with even, high intensity, short-duration illumination of a fixed intensity. In one embodiment camera **140** is a video camera, such as a Panasonic model GPMF702, having a telecentric lens, such as an Invaritar-brand lens made by Melles-Griot. In one such embodiment, the telecentric lens, which has uniform magnification across the field of view, of camera **140** is made larger in diameter than the diameter of object **160** being viewed (e.g., one embodiment uses a 6-inch diameter lens for 3-inch diameter objects) in order to reduce lens distortion, such as pin-cushioning and barrel distortion. Camera **140** is coupled to image processor **150** with suitable cables, for example, a digital-serial link such as described in patent application Ser. No. 08/825,774 cited above, or other suitable electrical or fiber-optical signal cables. In one embodiment, camera **140** is positioned above and facing objects **160** moving by action of conveyor mechanism **170** across the camera field of view, so that camera **140** can obtain and send a captured image of object **160** to image-processing computer **150**. In one embodiment, computer **150** analyzes the captured image and activates selection mechanism **175** to accept or reject each successive object (e.g., diverting rejected items into a reject bin) based on predetermined criteria, all using methods and apparatus well known to those skilled in the art of machine vision.

Camera **140** is implemented as any one of a number of device technologies including vidicon, CCD (charge-coupled device) line- or array-imaging devices, metal-oxide semiconductor (MOS) video cameras, and so forth. In one

embodiment, camera **140** is a solid-state MOS camera having a peak wavelength sensitivity of about 550 nanometers (nm), and range of approximately 500 to 600 nm at about 97% of peak. In one embodiment, the aperture on the lens of camera **140** is suitably small in order that a relatively large depth-of-field is obtained. The type and size of lens is chosen to match the field-of-view to the size/depth of object **160**.

In one embodiment, shown in FIG. 1B (FIG. 1B is a circuit schematic diagram of a portion of one embodiment of machine-vision illumination system **100**), each ring-reflector illumination source **200** is connected to a capacitor box **19**, which is connected to a power supply **20**, which is connected to image processor **150**. The charge on capacitor box **19** is discharged through LEDs **231** in ring-reflector illumination source **200** when computer **150** drives a pulse on signal cable **202** to amplifier **201** which in turn drives power MOSFET (metal-oxide-semiconductor field-effect transistor) **211** to substantially short to ground. In one embodiment, a short-duration pulse (approximately 10 microseconds to 100 microseconds long) to provide a short, intense pulse of light. Further details of power supply **20** and capacitor box **19** are found on Ser. No. 08/532,213 cited above. In one such embodiment, a photodetector **21** is used to detect the light output and provides feedback to computer **150** which is used to control the duration or frequency of the light pulses.

In the embodiment shown in FIG. 1, ring-reflector illumination source **200** is enclosed to light except for the lens opening **245** through back plate **240** and opening **225** in ring reflector **220**.

FIG. 2A is an exploded isometric view of ring-reflector illumination source **200** according to one embodiment of the present invention. Ring-reflector illumination source **200** includes bottom enclosure **210**, replaceable/changeable ring reflector **220**, ring illumination source **230** (in this embodiment, this is an LED light source **230** having a single row of LEDs arranged in a circle that is centered on optical axis **299** of camera **140**, the focal centerlines **298** of each LED is directed along a line parallel to optical axis **299**), and top cover **240** that is attached to bottom enclosure **210**, for example by four screws **242**. In the embodiment shown, bottom enclosure **210** has an opening **215** having a lip or collar into which reflector ring **220** fits.

It is contemplated that a user will have more than one reflector ring **220**, each having a different reflective angle or reflective configuration/focus, so that the ring reflector **220** in ring reflector illumination source **200** may be changed according to the needs of the object being inspected, the particular camera or lens being used, etc., without replacing other parts in ring-reflector illumination source **200**. Alternatively, a configurable ring reflector **2205** can be used in place of multiple replaceable/changeable ring reflectors **220**, thus allowing the user to change the reflective angle or reflective configuration/focus by changing the configuration of reflector **2205** (explained further below). It is further contemplated that a user may have more than one ring-light source **230**, each having a different configuration of LEDs, dispersion angle, color or wavelength configuration, intensity or pulse response, so that the ring-light source **230** in ring-reflector illumination source **200** may be changed according to the needs of the object being inspected, the camera being used, etc., without replacing other parts in ring-reflector illumination source **200**. FIG. 2A shows one configuration that makes possible the exchange of ring reflector **220** and/or ring-light source **230**, however other configurations are contemplated that make changing of the

ring reflector **220** and/or ring-light source **230** easier and faster, such as by threading with matching complementary threads the outer circumference of ring-light source **230** and the inner circumference of opening **215**, such that ring reflector **220** can be exchanged without otherwise disassembling ring-reflector illumination source **200**.

FIG. 2B is a cut-away side view of ring-reflector illumination source **200** according to one embodiment of the present invention. In the embodiment shown, ring-reflector illumination source **200** includes bottom enclosure **210**, replaceable/changeable ring reflector **220** (designed to fit into a complementary opening **215** in bottom enclosure **210**), ring illumination source **230** (in this embodiment, this is an LED light source **230** having a single row of LEDs **231** closely spaced in a circle that is centered on optical axis **299** of camera **140**, the focal centerlines **298** of each LED directed along a line parallel to optical axis **299**), and top cover **240** that is attached to bottom enclosure **210**, for example by four screws **242** that pass through spacers **241** used to maintain the desired spacing and placement of the LED light source **230** within ring-reflector illumination source **200**. In one embodiment (see FIG. 2C), LED light source **230** includes a printed circuit board **2300** onto which are soldered (or otherwise mechanically and electrically connected) a plurality of individual LEDs **231** (e.g., in one embodiment, high-brightness red LEDs 1200 millicandies (mcd) at a peak wavelength of approximately 621 nm., for example, HLMA-KH00-type T1-sized lights having a half-angle of approximately 22.5° available from Hewlett-Packard; In another embodiment, a Toshiba part number TLRH160 emitting red light (644 nm at 1800 typical mcd) with a 5-degree half angle is used), spaced as closely as possible in a single row, the row centered on a circle that is perpendicular to and has a center on the optical axis **299**. (In other embodiments, other LEDs having different colors/wavelengths, half-angles, intensity, or power capabilities are used. In one such embodiment, LED light source **230** is configured to be replaced/changed in order to let the user choose a suitable combination of colors/wavelengths, half-angles, intensity, or power capabilities for a particular application.)

In the following discussion, ring reflector **220** refers generally to any ring reflector (e.g., ring reflector **221** of FIG. 3A, ring reflector **222** of FIG. 3B, ring reflector **223** of FIG. 3C, or ring reflector **224** of FIG. 3D, or other similar ring reflector). Similarly, ring light source **230** refers generally to any ring light source (e.g., ring light source **230.0** of FIG. 2C, ring light source **230.1** of FIG. 2D, ring light source **230.2** of FIG. 2E, ring light source **236** of FIG. 2F, or other similar ring light source).

In the embodiments shown in FIGS. 2A–2F, printed circuit board (PCB) **2300** has a circular opening **235** also having a center on the optical axis **299**. Signal wire **202** passes through insulating strain relief **2021** which is mounted to bottom enclosure **210**. Signal wire **202** is soldered to PCB **2300**, which then distributes the electrical power from signal wire **202** to each of the LEDs **231**.

FIG. 2C is a cut-away side view of one ring-light source **230** using a single circular row of LEDs **231** according to one embodiment of the present invention. In one embodiment, all LEDs **231** are of the same color and type. In another such embodiment, a mix of LED colors are used in order to get a polychromatic light. In yet another such embodiment, white phosphor/LED devices, such as a blue LED having a broad-spectrum phosphor that absorbs the blue light and re-emits a broad-spectrum centered at yellow to achieve a compact, very-long-life, efficient white light

source (e.g., white LEDs such as manufactured by Nichia Chemical Industries, Ltd. of Japan; for example Part No. NLPB 510; see internet address <http://www1a.meshnet.or.jp/nichia/wled-e.htm>) are used in order to get a polychromatic, white-appearing light. In one embodiment, a pulsed electrical drive current is used (described in further detail below) in order to increase light efficiency (particularly during the time that the camera 140 is and/or to strobe the light pulse thereby reducing any blurring due to motion of the object being observed. In another embodiment, a direct-current (DC) electrical drive is used.

In the embodiments shown in FIGS. 2C–2E, each individual LED 231 and 232 has a built in focussing arrangement, typically including a cone-shaped reflector holding an LED chip, and a convex plastic lens package, that together direct and “focus” the light emitted from the LED chip in a direction centered about a focal centerlines 298 along an axis of the package. Such LED packages can be purchased at a number of dispersion angles (generally specified as the “half-angle” for the LED package), and at a variety of intensity capabilities (generally specified as millicandels (mcd) or milliwatts (mw) of light output). Conventionally, this arrangement has required that the axis of each LED package be pointed in the direction that light is wanted, i.e., at one or another angle pointed obliquely towards the optical axis of camera 140. It has been expensive to fabricate such a ring of LEDs, each pointed obliquely towards the optical axis of camera 140. Further, it is cumbersome and expensive to change the angle at which the LEDs point towards the optical axis (i.e., to move the angle of all of the LEDs, or to replace the ring with another having the desired angle.

The present invention provides an inexpensive and elegant solution to these problems. By providing an LED ring-light source having all the LEDs with the axes of their packages (i.e., the LED’s individual focal centerlines 298) aligned parallel to the optical axis 299 (i.e., perpendicular to PCB 238), the cost of manufacture is minimized. In order to direct the light obliquely towards the optical axis 299, one or more inexpensive and easily changeable reflective rings 220 are provided. In order to change the intensity of light provided, a variable pulse-width and/or variable pulse-frequency LED power supply is provided.

FIG. 2D is a cut-away side view of another ring-light source 230 using a circular double row of LEDs 231 and 232 according to another embodiment of the present invention. In this embodiment, PCB 2301 is configured to mechanically and electrically connect to two rows of LEDs (outer circular row 231 and inner circular row 232). In one such embodiment, a two-angle reflector (e.g., 222 or 224 of FIG. 3B or FIG. 3D) is used, and the outer row 231 of LEDs is reflected at a shallow angle (e.g., by a face 2222 that is at an angle of approximately 53 degrees from the plane of exit opening 225) in order to achieve a deep area of illumination (i.e., further from exit opening 225), and the inner row 232 of LEDs is reflected at a less-shallow angle (e.g., by a face 2221 that is at an angle of approximately 47 degrees from the plane of exit opening 225) in order to achieve a shallower area of illumination (i.e., closer to exit opening 225). In one embodiment, both rows of LEDs (231 and 232) are simultaneously illuminated, in order to simultaneously get both deep and shallow illumination. In another embodiment, each row is flashed at different times, in order to get either deep or shallow illumination.

FIG. 2E is a cut-away side view of yet another ring-light source 230 using a circular double row of LEDs 231 and

232, wherein row of LEDs 232 is mounted at a small distance from PCB 2301, for example, by inserting spacers 233 between each LED and the PCB 2301, according to another embodiment of the present invention. In this embodiment, PCB 2301 is configured the same as for FIG. 2D, however, spacers 233 or other means, are used to drop the position of LEDs 232 relative to the PCB 2301, thus moving the plane of the circle for those LEDs closer to ring reflector 220 (e.g., ring reflector 222, 223 or 224).

FIG. 2F is a cut-away side view of ring-light source 236 using a xenon flashtube according to one embodiment of the present invention. In one embodiment, a xenon strobe light source 237, e.g., any suitable circular short-arc flashlamp bulb, and a diaphragm 238 having backplane slit 239, are used in place of the row of LEDs. In one such embodiment, raised collar 2351 is fabricated to be bolted to top cover 240 through screw holes 2352, then inner slit ring 2353 (having opening 235) is fastened to the lower edge of collar 2351, in order that only light passing through slit 239 is used (i.e., reflected and directed by ring reflector 220). The gap between the outer circumference of slit ring 2353 and the inner edge of the hole 2381 in diaphragm 238 defines a continuous (e.g., circular) slit 239 having no breaks. In another embodiment (see FIG. 2G which shows four struts holding the inner ring to the diaphragm 238), such breaks are due to, for example, support struts that are needed to hold inner slit ring 2382 to diaphragm 238. In one such xenon strobe embodiment, an optional color filter 2371 is also placed in series with the light path in order to obtain a monochromatic light, which can be more sharply focused by the lens of camera 140 than white light.

In one such xenon strobe embodiment, an optional circular cylindrical ring lens 2391 (i.e., equivalent or similar to the cross-section of a convex-convex cylindrical lens as shown, that is rotated in a circle centered on optical axis 299; another embodiment uses a plano-convex) is also placed in series with the light path in order to focus light from the circular xenon source (i.e., focusing the emitted light to a circular line). In another embodiment, such a cylindrical ring lens 2391 is placed in series with light emitted from a ring-LED source such as ring light source 230.0 of FIG. 2C.

Ring-light source 236 refers generally to a flashtube-slit assembly such as flash-tube light source 2361 of FIG. 2G or flash-tube light source 2362 of FIG. 2H. In some embodiments, flashtube 237 is replaced by a similarly shaped enclosed incandescent filament circular tube, or a fluorescent circular tube, or linear LED chips arranged in a polyhedron, or other continuous circular light source.

FIG. 2G is an exploded isometric view of a flash-tube light source 2361 according to one embodiment of the present invention. Struts 2384 hold inner slit ring 2382 to diaphragm 238. Raised collar 2351 is fabricated to be bolted to top cover 240 through screw holes 2352, and for its lower edge to be light-tight against inner slit ring 2382 when assembled in ring-reflector illumination source 200.

FIG. 2H is an exploded isometric view of a flash-tube light source 2362 according to another embodiment of the present invention. In this embodiment, as described above, raised collar 2351 is fabricated to be bolted to top cover 240 through screw holes 2352, then inner slit ring 2353 (having opening 235) is fastened to the lower edge of collar 2351, in order that only light passing through slit 239 is used (i.e., reflected and directed by ring reflector 220). The gap between the outer circumference of slit ring 2353 and the inner edge of the hole 2381 in diaphragm 238 defines a continuous (e.g., circular) slit 239 having no breaks.

FIG. 2I is a cut-away side view of two stacked ring-reflector illumination sources **200A** and **200B** according to one embodiment of the present invention. In this embodiment, ring-reflector illumination source **200A** is configured to have the light from its LEDs **231** reflected at a shallow angle (e.g., by a face **2211A** that is at an angle of approximately 53 degrees from the plane of exit opening **225**) in order to achieve a deep area of illumination (i.e., further from its exit opening **225**). Ring-reflector illumination source **200A** is configured to have the light from its LEDs **231** reflected at a less-shallow angle (e.g., by a face **2211B** that is at an angle of approximately 47 degrees from the plane of its exit opening **225**) in order to achieve a shallower area of illumination (i.e., closer to exit opening **225**).

In one embodiment, ring reflector **220** is fabricated by turning on a lathe a blank of aluminum, stainless steel, plastic, glass or other suitable material to generate a circularly symmetric reflective face (e.g., conical-section face **2211**) (i.e., the surface of the cross section shown is a straight line at an angle of 52 degrees from the plane of exit opening, i.e., 38 degrees from the optical axis **299**), which is then polished and/or chrome plated to enhance its reflectivity at a wavelength of ring-light source **230**. In another embodiment, ring reflector **221** is cast, e.g., by injection molding, from a suitable plastic, and then coated by well known methods with a reflective coating of chrome, gold or other metal, alloy, or multiple optical coating layers to enhance its reflectivity at one or more selected wavelengths of ring-light source **230**. (These manufacturing methods can apply to any of the ring reflectors described below.)

FIG. 2J is a cut-away side view of an alternative ring-reflector illumination source **200** according to one embodiment of the present invention. In this embodiment, each LED **234** is mounted on PCB **2300** in a circle around PCB opening **235** such that its light-emission focal centerline **298** is directed along a line radially perpendicular to optical axis **299** (i.e., the light is directed radially outward, centered on an emission plane that is perpendicular to optical axis **299**). Ring reflector **229** is configured so that the emission plane intersects its operative reflective surface **2291**, which redirects the light to a darkfield pattern (such as pattern **2218** as shown in FIG. 4A).

Darkfield illumination patterns, often used in microscopy applications, involve illumination in which light approaches the object (i.e., object **160**) at an angle oblique or perpendicular to the optical axis, in order to minimize or eliminate light from the illumination source entering the camera (or microscope) lens either directly, or by reflection off some background object behind the object of interest. Thus, one application of the present invention is to provide darkfield illumination within, for example, a food container or beverage can **160**, without illuminating the bottom of the can, e.g., in order to check for foreign objects within a clear beverage. One embodiment of darkfield illumination of the present invention is thus particularly useful for spotting foreign objects within open opaque aluminum cans, while minimizing light reflecting off the bottom of the can towards the camera. In one such embodiment, a pattern **2218** is designed so as to illuminate as deep as possible within a can **160** while minimizing illumination of the bottom of the can **160**. The embodiments **221**, **222**, **223** of ring reflector **220** are particularly useful for generating such darkfield illumination patterns, since these ring reflectors **220** block the light from LEDs **231** that travels generally in the direction of the optical axis and that otherwise could illuminate background below the object of interest.

In contrast, other applications benefit from a deep illumination pattern which also illuminates the bottom of the can or food container. In one such embodiment, a pattern **2218** is designed so as to illuminate as deep as possible within a can **160** including illumination of the bottom of the can **160**. The embodiments **229** (FIG. 2J) of ring reflector **220** is particularly useful for generating such darkfield illumination patterns, since these ring reflectors **220** block the light from LEDs **231** that otherwise could illuminate below the object of interest.

All of the embodiments shown are useful for inspecting electrical components, and in particular, components or substrates having ball-grid arrays of connector pads. Ball-grid arrays, such as IBM Corporation's C4 controlled-collapse connectors, generally include rectangular grids of spherical connector balls (i.e., tiny solder balls), that are used to simultaneously connect multiple signals from chips to modules, or modules to boards.

In the embodiment shown in FIG. 2J, the reflective surface **2291** is a single conical section; in other embodiments, this reflective surface is replaced by two conical sections (in a manner similar to that shown in FIG. 3B below); a circularly symmetric parabolic or other curved section (in a manner similar to that shown in FIG. 3C below); a series of facets (in a manner similar to that shown in FIG. 3E below), or a configurable reflective surface (in a manner similar to that shown in FIGS. 3F, 3G, or 3H below).

FIG. 3A is a cut-away side view of one ring reflector **220** according to one embodiment of the present invention. In this embodiment, ring reflector **221** is a circularly symmetric conical-section reflective face **2211** (i.e., the surface of the cross section shown is a single straight line at an angle of approximately 52 degrees from the plane of exit opening, i.e., approximately 38 degrees from the optical axis **299**). In this embodiment, the spread half-angle of light emission from the LEDs **231** is not significantly changed by reflecting off of surface **2211**, and continues to diverge at approximately the same half-angle as before reflection (although now directed along a cone converging towards optical axis **299**) thus providing a relatively broad spread of light below exit opening **225**, as shown in FIG. 5A. Since the angle of incidence (approximately 38 degrees) is equal to the angle of reflection (also approximately 38 degrees), the cone of the centerlines of the LEDs approached the optical axis **299** at an angle of approximately 76 degrees. In other embodiments, the angle of face **2211** is set to other values to achieve the lighting pattern desired. In one embodiment, the lower edge of face **2211** is given a small chamfer (e.g., 0.02 inches) to reduced the danger to a user of otherwise sharp edges. In one embodiment, the length of face **2211**, the distance from face **2211** to LEDs **231** (e.g., in one embodiment, this is made as close as possible), and the half-angle of light emission of the LEDs **231** (e.g., in one embodiment, LEDs are specified to have a small half-angle), are together configured such that most or all of the light emitted from LEDs **231** is reflected by face **2211** (rather than passing directly through exit opening **225**). FIG. 5A is an enlarged cut-away side schematic of the ring reflector **220** of FIG. 3A.

In one such embodiment, particularly useful for darkfield microscopy, ring reflector **221** is a circularly symmetric conical-section reflective face **2211** having an angle of approximately 45 degrees from the plane of exit opening, i.e., approximately 45 degrees from the optical axis **299**. In this embodiment, the spread half-angle of light emission from the LEDs **231** is not significantly changed by reflecting off of surface **2211**, and continues to diverge at approxi-

mately the same half-angle as before reflection (although now directed along a cone diverging towards optical axis **299**) thus providing a relatively broad spread of light within ring reflector **221** within exit opening **225**. Since the angle of incidence (approximately 45 degrees) is equal to the angle of reflection (also approximately 45 degrees), the cone of the centerlines of the LEDs approached the optical axis **299** at an angle of approximately 90 degrees (perpendicular). For example, a glass slide could be placed flush against exit opening **225**, with the specimen suspended in water above the slide and within such a ring reflector **221**, whereby only light impinging on the specimen is visible through the lens of the camera or microscope.

In another such embodiment, the arrangement of FIG. 2B is inverted (i.e., with cover **240** further from the lens of camera **140** (or the microscope) and exit opening **225** closer to camera **140** (or the microscope)), such that the lens of the camera **140** (or microscope) is above, and on the same side of ring-reflector illumination source **200** as, exit opening **225**. In this case, the glass slide is placed on top of exit opening **225** (towards the lens) with the specimen in a liquid above the slide, an opening **245** (now at the bottom) is covered with a non-reflective black surface such as black felt. In this way, the specimen is illuminated at oblique angles from below, with a darkfield illumination.

FIG. 3B is a cut-away side view of another ring reflector **220** according to one embodiment of the present invention. In this embodiment, ring reflector **222** is a circularly symmetric reflective face having two adjacent conical-sections **2221** and **2222** (i.e., the surface of the cross section shown is two straight-line chords at angles of approximately 47 and 53 degrees respectively from the plane of exit opening, i.e., approximately 37 and 43 degrees from the optical axis **299**, the chords meeting at a concave intersection). In this embodiment, the spread half-angle of light emission from the LEDs **231** is narrowed by reflecting off of surfaces **2221** and **2222**, and continues to diverge at a smaller half-angle than before reflection (although now redirected along a cone converging towards optical axis **299**) thus providing a relatively smaller spread of light below exit opening **225**, as shown in FIG. 5B. Since the two conical-section surfaces **2221** and **2222** form a somewhat concave surface having an average angle of incidence and reflection of 40 degrees, the cone of the centerlines of the LEDs approached the optical axis **299** at an angle of approximately 80 degrees. In other embodiments, the angles of faces **2221** and **2222** are set to other values to achieve the lighting pattern desired. In one embodiment, the angles of faces **2221** and **2222** are approximately 53 and 47 degrees respectively from the plane of exit opening (i.e., the reverse of the above case), thus forming a convex reflecting cross-section, and thus increasing the half-angle of dispersion of the emitted light.

FIG. 5B is an enlarged cut-away side schematic of the ring reflector **220** of FIG. 3B.

FIG. 3C is a cut-away side view of yet another ring reflector **220** according to one embodiment of the present invention. In this embodiment, ring reflector **223** is a circularly symmetric reflective face having a cross section that is concave circular or concave parabolic **2231** (i.e., the surface of the cross section shown is a curved concave section of a circle or parabola at continuously varying angles from the plane of exit opening). In this embodiment, the spread half-angle of light emission from the LEDs **231** is narrowed by reflecting off of surface **2231**, and continues to converge at a smaller half-angle than before reflection (although now redirected along a cone converging towards optical axis **299**) thus providing a relatively smaller spread of light below exit

opening **225**, similar to as shown in Figure 5B. By choosing an appropriate curved concave section, the focus provided by reflector ring **223** can be determined to the degree desired. By extension, by choosing an appropriate curved convex section, the additional divergence provided by reflector ring **223** can alternatively be determined to the degree desired.

FIG. 3D is a cut-away side view of still another ring reflector **220** according to one embodiment of the present invention. In this embodiment, ring reflector **224** is a circularly symmetric reflective face having two adjacent conical-sections **2241** and **2242**, and is otherwise identical to ring reflector **222** of FIG. 3B. Ring reflector **224** is configured to have the light from an outer row of LEDs **231** reflected by surface **2242**, and to have the light from an inner row of LEDs **232** reflected by surface **2241**. In one such embodiment, outer row of LEDs **231** emits light of a first color, and inner row of LEDs **232** of a second color, and are lit alternatively or simultaneously to achieve lighting effects as desired. In another such embodiment, outer row of LEDs **231** and inner row of LEDs **232** both emit light of the same color, and are lit alternatively or simultaneously to achieve lighting effects as desired (i.e., shallow lighting, deep lighting, or both).

FIG. 3E is a cut-away side view of a faceted ring reflector **226** according to one embodiment of the present invention. In one such embodiment, for every facet **2261**, a line **2269** drawn from the center of the facet perpendicular to the plane of the facet will intersect the optical axis **299** on order that the most amount of light will be centered on the optical axis. In another such embodiment, for every facet **2261**, a line **2269** drawn from the center of the facet perpendicular to the plane of the facet will pass to the side of the optical axis **299** (e.g., approximately 1 or 2 centimeters (cm) to the side) in order that the light is spread onto a wider volume (still centered around the optical axis) than in the just-before described example. In a third such embodiment, for every facet **2261**, a line **2269** drawn from the center of the facet perpendicular to the plane of the facet will pass through or pass to the side of the optical axis **299** by successively different amounts (e.g., a first facet perpendicular passes through the optical axis **299**, the next adjacent facet perpendicular passes approximately 1 cm to the clockwise side, the next adjacent facet perpendicular passes approximately 2 cm to the clockwise side, and then the pattern repeats for each successive three facets) in order that the light is spread onto a wide volume, but now slightly more centered around the optical axis, than in the just-before described example.

FIG. 3F is a cut-away side view of a configurable ring reflector **227** according to one embodiment of the present invention. In this embodiment, each facet **2271** is made of a thin reflective material such as a small trapezoid of aluminum, aluminized silicon, aluminized mylar, or other reflective chip, and is fastened to pliable focusing gasket **2272** preferably made of rubber or pliable plastic. Outside ring **2273**, preferably made of metal such as aluminum, is permanently attached to pliable focusing gasket **2272** at their junction (e.g., by adhesive), and is threaded at the bottom of its inside circumference to accept threaded, tapered compression ring **2274**. As compression ring **2274** is rotated into the threads of the inner bottom of outside ring **2272**, it first contacts the inner diameter edge of pliable focusing gasket **2272**, thus deflecting each facet **2271** upward at their bottom edges, while the top edges of each facet **2271** remains at the junction of pliable focusing gasket **2272** and outside ring **2273**. This changes the angle of each facet **2271** (e.g., from a nominal undeflected angle of approximately 38 degrees to

15

a larger angle). In one such embodiment, for every facet 2271, a line 2269 drawn from the center of the facet perpendicular to the plane of the facet will intersect the optical axis 299 on order that the most amount of light will be centered on the optical axis. In one such embodiment, every other facet has edges that overlay above the edges of each of its closest neighbors, as shown in FIG. 3G. In another such embodiment, every facet 2271 has its, e.g., left edge overlaying above the right edge of each of its closest left-hand neighbor, as shown in FIG. 3H, in order that, for every facet 2271, a line 2279 drawn from the center of the facet perpendicular to the plane of the facet will pass to the side of the optical axis 299 (e.g., approximately 1 or 2 centimeters (cm) to the right side in the example FIG. 3H) in order that the light is spread onto a wider volume (still centered around the optical axis) than in the just-before described example.

FIG. 3I is a cut-away side view of a configurable ring reflector 228 according to one embodiment of the present invention. In this embodiment, thin reflective surface 2281 is fastened to (or deposited on the surface of) stretchable focusing membrane 2282 preferably made of rubber or pliable plastic. Outside ring 2283, preferably made of metal such as aluminum, is permanently attached to stretchable focusing membrane 2282 at their junction (e.g., by adhesive or a dovetail joint), and is threaded at the bottom of its inside circumference to accept threaded, tapered stretching ring 2284. As stretching ring 2284 is rotated into the threads of the inner bottom of outside ring 2282, it releases some of the stretch of stretchable focusing membrane 2282, thus deflecting reflective surface 2281 upward at its bottom edge, while the top edge of reflective surface 2281 remains at the junction of stretchable focusing membrane 2282 and outside ring 2283. This changes the angle of reflective surface 2281 (e.g., from a nominal undeflected angle of approximately 38 degrees to a larger angle).

FIG. 4A is a cut-away side schematic of the single-conical-section ring reflector 221 of FIG. 3A showing the light pattern generated (having highest intensity within the dotted line volume 2218), which is sometimes called a darkfield-illumination pattern. In such a darkfield-illumination pattern, an object 160 located within A deeper pattern is generated by a shallower angle in reflector 221, and/or a wider half-angle of LEDs 231.

FIG. 4B is a cut-away side schematic of the concave dual-conical-section ring reflector 222 of FIG. 3B showing the light pattern generated (having highest intensity within the dotted line volume 2228). A deeper pattern is generated by a shallower angles in reflector 222, and/or a wider half-angle of LEDs 231.

FIG. 5A is an enlarged cut-away side schematic of the ring reflector 220 of FIG. 3A.

FIG. 5B is an enlarged cut-away side schematic of the ring reflector 220 of FIG. 3B.

FIG. 6 is a block diagram of the electrical connections for one embodiment of machine-vision illumination system 100. Image processor 150 sends a reset signal to camera 140, then shortly thereafter (or simultaneously) sends a trigger signal to power supply 20. Within power supply 20, the trigger signal activates pulse generator 20.1 to generate a control pulse of a predetermined length. The control pulse is used to turn on transistor Q1 to generate a flash on LEDs 231, which is current-limited (if desired) by resistor R30. The control pulse also activates the maximum-rate-limit circuit 20.2, which inhibits any further control pulses from pulse generator 20.1 for a predetermined amount of time.

16

The 12-volt signal from power supply 20 is filtered by the low-pass filter comprising C1, L1, D1, and R10, and charges capacitors C2 through C_N (in one embodiment, N is 12). In one such embodiment, C1 through C12 are each 2200 μ F, L1 is 40 μ H iron-core, D1 as a 1N4001 diode, and R10 is a 0 ohm conductor (i.e., a short). C2 through C_N are discharged through, e.g., fifteen LEDs 231 as shown in the circuit diagram, which in this embodiment are wired in a parallel-series manner as shown, (in another embodiment, sixty LEDs arranged in a single row are used; in another embodiment, 150 LEDs are used, each in a similar serial-parallel-wired connection circuit), and R30 and Q1, as activated by the above-described control pulse. In one such embodiment, R30 is replaced by a zero-ohm conductor, and the voltage drop across the LEDs 231 and Q1 is used to self-limit the current through the LEDs 231. The control pulse is fed across resistor R20, which in one embodiment is 100K Ω , to develop the necessary voltage for driving transistor Q1, which in this embodiment is a MTP75N05HD MOSFET.

FIG. 7 is a more-detailed schematic diagram of power supply 20. The input trigger is fed through resistor R21 to drive the input of opto-isolator OI1. The output of opto-isolator OI1 is coupled through capacitor C12 (and the associated circuit R4, R6 and D2) to the TRG input of timer circuit 1C1A. (IN one embodiment, timers 1C1A and 1C1B are each $\frac{1}{2}$ of a 556-type dual timer.) The timing constant of timer 1C1A is set by C14 and R1-x, (where x is selected from 1 through N), and determines the pulse width of the control pulse driving Q1, and thus the LEDs 231. In one embodiment, five selectable pulse widths are predetermined and selected by SW1, which is a five-way exclusive dual-pole-single-throw switch, wherein one resistor of the set R1-1 through R1-N is selected for connection to the DIS input pin of 1C1A, and a corresponding one resistor of the set R2-1 through R2-N is selected for connection to the DIS input pin of 1C1B. The timing constant of timer 1C1B is set by C17 and R2-x, (where x is selected from 1 through N), and determines the minimum time between control pulses driving Q1, and thus the LEDs 231. In one embodiment, the five selectable predetermined pulse widths are 25 microseconds (μ s), 50 μ s, 100 μ s, 200 μ s and 500 μ s; the corresponding maximum pulse rates controlled by maximum rate limit circuit 20.2 are 200 Hz, 120 Hz, 60 Hz, 30 Hz, and 10 Hz, respectively, and are predetermined and selected by SW1. Thus, in the embodiment which uses a 60 Hz camera image rate, 100 μ s-long control pulses are used to activate LEDs 231. In one embodiment, it is desired to have an average LED illumination intensity of at least ten times the ambient light; thus, when camera 140 is taking one frame every 16.7 milliseconds, a 100 microsecond pulse should be at least 1670 times as intense as the ambient light. In one such an embodiment, a shroud is used to reduce the ambient light, and a red filter (substantially transparent to the peak wavelength of ring-reflector illumination source 200) is placed over the lens of camera 140 in order to reduce ambient light and pass the light of ring-reflector illumination source 200. The control pulse output signal is driven through resistor R31.

In one embodiment, opto-isolator OI1 is a 4N37-type part, resistor R2 is 100 Ω , resistor R3 is 1000 Ω , resistor R7 is 1 M Ω , resistor R8 is 1K Ω and visible-color LED D3 indicates when the circuit is active, resistor R4 is 4700 Ω , resistor R5 is 10 Ω , resistor R6 is 10K Ω , diode D2 is a 1N914, resistor R1-1 is 2.26K Ω , resistor R1-2 is 4.53K Ω , resistor R1-3 is 9.0K Ω , resistor R1-4 is 18.2K Ω , resistor R1-5 is 45.3K Ω , resistor R2-1 is 37.4K Ω , resistor R2-2 is 75K Ω , resistor

17

R2-3 is 150K Ω , resistor R2-4 is 301K Ω , resistor R2-5 is 909K Ω , C14 is 0.01 μ F, C17 is 0.1 μ F, C12 is 0.001 μ F, C10 is 100 μ F, C11 is 0.1 μ F, C13, C15, and C16 are each 0.01 μ F, Q2 and Q3 are each 2N3904 NPN transistors, and RP1 is a 10K Ω resistor pack.

“Chromatic aberration” is where a lens focuses different wavelengths of light at different focal points. “Spherical aberration” occurs when light from the edges of a circularly-curved lens are focused at different distances that light through the center of the lens. Circularly curved lenses are used since they are cheaper to produce a lens with a spherical curved surface than one in which the curvature changes. The problem, however, is that spherical aberration can occur, where the edges of the lens focus the light waves at a different point from the center of the lens, causing lack of sharpness. Regarding the oblique rays passing through the lens, these fall on different parts of the “image plane,” in a blur rather than being superimposed. This slightly different aspect of spherical aberration is called coma. To overcome this can be costly, but mirror-type ring-reflector focusing elements 220 do not suffer from these aberrations.

The process of the present invention is unlike conventional illumination sources since it is compact, generates a light source from more than one point source with suitable brightness in order to reduce shadows, focuses the light source into a broad, deep, multidirectional source illuminating a volume with light rays that approach generally the optical axis of the machine-vision system at oblique angles from a ring that surrounds the optical axis, so that even extremely small parts can be adequately inspected and accurately viewed or measured with machine-vision system 100. Another aspect of the present invention is to provide a compact illumination source, preferably monochromatic, which can be focused to provide uniform multi-directional light onto all surfaces that are viewable by the machine vision camera. Yet another aspect of the present invention is to have such an LED illumination source be pulsed with a relatively high-power, low duty-cycle power source.

In one embodiment, most or all interior surfaces of ring-reflector illumination source 200 except the operative reflecting surface (e.g., surfaces 2211, 2221, 2222, or 2231) have an anti-reflective (e.g., flat black) surface to prevent stray reflections. In one embodiment, the flat black surface is obtained by applying flat black paint. In another embodiment, the flat black surface is obtained through use of a standard black anodization process.

It is to be understood that the above description is intended to be illustrative, and not restrictive. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

What is claimed is:

1. An illumination system for illuminating an object for machine-vision, the system having an optical axis, comprising:

a ring light source that comprises:

a substantially ring-shaped flashtube emitting light from a light-emitting region disposed substantially in a plane that intersects the optical-axis, the light-emitting region disposed at least a first distance from the optical axis and less than a second distance from the optical axis; and

a first ring reflector, the ring reflector having an exit opening through which the optical axis passes, the

18

emitted light from the ring light source being generally directed centered on lines that intersect a reflecting surface of the ring reflector, the ring reflector reflecting the emitted light from the light source through the exit opening inwards and generally towards the optical axis; and

an enclosure generally surrounding the flashtube but having a elongated aperture disposed between the ring-shaped flashtube and the ring reflector, wherein the elongated aperture allows light from the flashtube to fall on a reflecting surface of the ring reflector.

2. The illumination system as recited in claim 1, further comprising a focusing element, disposed in a path of the emitted light from the ring light source, and that includes a cylindrical ring lens having at least one convex face.

3. The illumination system as recited in claim 1, wherein the ring reflector has a surface that enhances its reflectivity at one or more selected wavelengths of the ring light source.

4. The illumination system as recited in claim 3, wherein the first ring reflector and ring light source are configured to produce a darkfield illumination.

5. The illumination system as recited in claim 1, wherein the first ring reflector includes a reflective surface that comprises a first conical section.

6. The illumination system as recited in claim 5, wherein the first conical section includes a reflective surface at a first conical angle to the optical axis.

7. The illumination system as recited in claim 1, wherein the first ring reflector includes a reflective surface that comprises a plurality of adjoining conical sections.

8. The illumination system as recited in claim 7, wherein the plurality of adjoining conical sections includes a first conical section having a reflective surface at a first conical angle to the optical axis, and a second conical section having reflective surface at a second conical angle to the optical axis, the second conical angle being different than the first conical angle.

9. The illumination system as recited in claim 1, wherein the first ring reflector includes a reflective surface that comprises a circularly-rotated parabolic section.

10. The illumination system as recited in claim 1, wherein the first ring reflector includes a reflective surface that is configurable to change at least one angle at which the reflective surface reflects light.

11. The illumination system as recited in claim 1, wherein the first ring reflector includes a reflective surface that comprises a plurality of reflective facets.

12. The illumination system as recited in claim 11, wherein, for a plurality of the facets, a line normal to a facet surface passes through the optical axis.

13. A method for illuminating an object located along an optical axis, comprising the steps

(a) emitting light from a light source that includes a ring-shaped flashtube disposed substantially along a circle disposed perpendicular to and centered on the optical axis, the light-emitting portion of the flashtube disposed at least a first distance from the optical axis and less than a second distance from the optical axis; and

(b) reflecting the emitted light from the light source inwards and generally towards the object at the optical axis or in an area around the optical axis, wherein the object is an electrical connector, and further comprising the step of acquiring a machine-vision image of the electrical connector.

14. A method for illuminating an object located along an optical axis, comprising the steps

19

- (a) emitting light from a light source that includes a ring-shaped flashtube disposed substantially along a circle disposed perpendicular to and centered on the optical axis, the light-emitting portion of the flashtube disposed at least a first distance from the optical axis and less than a second distance from the optical axis; and
- (b) reflecting the emitted light from the light source inwards and generally towards the object at the optical axis or in an area around the optical axis,
- further comprising the step of focusing the emitted light to a circular line.
- 15.** A method for illuminating an object located along an optical axis, comprising the steps of:
- (a) emitting light from a light source that includes a ring-shaped flashtube disposed substantially along a circle disposed perpendicular to and centered on the optical axis, the light-emitting portion of the flashtube disposed at least a first distance from the optical axis and less than a second distance from the optical axis;
- (b) focussing the emitted light through a circular cylindrical ring lens; and
- (c) reflecting the emitted light from the light source inwards and generally towards the object at the optical axis or in an area around the optical axis.
- 16.** A machine-vision illumination system, comprising:
- an imaging device disposed along an optical axis to receive an image of an object;
- an image processor coupled to the imaging device that processes the image and produces machine-vision information; and
- a ring-light source to illuminate the object, wherein the ring light source comprises:
- a ring-shaped flashtube disposed substantially along a circle disposed perpendicular to and centered on the optical axis;
- a ring reflector configured to reflect light along at least one conical angle; and

20

an enclosure having a slit disposed between the ring-shaped flashtube and the ring reflector, wherein the slit allows light from the flashtube to fall on a reflecting surface of the ring reflector.

17. The illumination system as recited in claim **16**, further comprising a focusing element that includes a cylindrical ring lens having at least one convex face.

18. The machine-vision illumination system as recited in claim **16**, wherein the ring reflector has a surface that enhances its reflectivity at one or more selected wavelengths of the ring light source.

19. The machine-vision illumination system as recited in claim **16**, wherein the ring reflector and ring light source are configured to produce a darkfield illumination.

20. A method for illuminating an object located along an optical axis, comprising the steps

- (a) emitting light from a light source that includes a ring-shaped flashtube disposed substantially along a circle disposed perpendicular to and centered on the optical axis, the light-emitting portion of the flashtube disposed at least a first distance from the optical axis and less than a second distance from the optical axis; and

- (b) reflecting the emitted light from the light source inwards and generally towards the object at the optical axis or in an area around the optical axis,

wherein the step of emitting light further comprises passing the emitted light through a circular slit.

21. The method for illuminating an object as recited in claim **15**, wherein the step of reflecting light further comprises reflecting light at a plurality of discrete conical angles each defined by a conical section reflecting surface having a straight line cross section.

22. The method for illuminating an object as recited in claim **21**, wherein the plurality of conical angles include a first conical angle to the optical axis, and a second conical angle to the optical axis, the second conical angle being different than the first conical angle.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,238,060 B1
DATED : May 29, 2001
INVENTOR(S) : Bourn et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 5,

Line 7, delete "FIG. 21" and insert -- FIG. 2I --, therefor.

Column 18, claim 13,

Line 52, delete "steps" and insert -- steps of: --, therefor.

Column 18, claim 14,

Line 67, delete "steps" and insert -- steps of: --, therefor.

Column 20, claim 20,

Line 16, delete "steps" and insert -- steps of: --, therefor.

Signed and Sealed this

Eleventh Day of December, 2001

Attest:

Nicholas P. Godici

Attesting Officer

NICHOLAS P. GODICI
Acting Director of the United States Patent and Trademark Office

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

(Also referred to as FORM PTO-1465)

REQUEST FOR *EX PARTE* REEXAMINATION TRANSMITTAL FORM

Address to:
Mail Stop *Ex Parte* Reexam
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attorney Docket No.: EXRE_PI_729

Date: April 22, 2025

1. ☒ This is a request for *ex parte* reexamination pursuant to 37 CFR 1.510 of patent number 7,841,729
issued _____. The request is made by:
☐ patent owner. ☒ third party requester.
2. ☒ The name and address of the person requesting reexamination is:
Jialin Zhong
Zhong Law, LLC
51 JFK Parkway, First Floor West, Short Hills, New Jersey 07078
3. Requester ☐ asserts small entity status (37 CFR 1.27) or ☐ certifies micro entity status (37 CFR 1.29). Only a patent owner requester can certify micro entity status. Form PTO/SB/15A or B must be attached to certify micro entity status.
4. This request is accompanied by payment of the reexamination fee as set forth in:
☐ 37 CFR 1.20(c)(2); **or**
☒ 37 CFR 1.20(c)(1). **In checking this box for payment of the fee set forth in 37 CFR 1.20(c)(1), requester asserts that this request has forty (40) or fewer pages and complies with all other requirements of 37 CFR 1.20(c)(1).**
Payment of the reexamination fee is made by the method set forth below.
 - a. ☐ A check in the amount of \$ _____ is enclosed to cover the reexamination fee;
 - b. ☐ The Director is hereby authorized to charge the reexamination fee
to Deposit Account No. _____;
 - c. ☐ Payment by credit card. Form PTO-2038 is attached; **or**
 - d. ☒ Payment made via USPTO patent electronic filing system.☒ In addition, the Director is hereby authorized to charge any fee deficiencies to
Deposit Account No. 60-2313.
5. ☒ Any refund should be made by ☐ check or ☒ credit to Deposit Account No. 60-2313
37 CFR 1.26(c). If payment is made by credit card, refund must be to credit card account.
6. ☒ A copy of the patent to be reexamined having a double column format on one side of a separate paper is enclosed. 37 CFR 1.510(b)(4).
7. ☐ CD-ROM or CD-R in duplicate, Computer Program (Appendix) or large table
☐ Landscape Table on CD

[Page 1 of 3]

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0064. Public burden for this form is estimated to average 55 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

8. ☐ Nucleotide and/or Amino Acid Sequence Submission
If applicable, items a. – c. are required.
- a. ☐ Computer Readable Form (CRF)
- b. Specification Sequence Listing on:
- i. ☐ CD-ROM (2 copies) or CD-R (2 copies) **or**
- ii. ☐ paper
- c. ☐ Statements verifying identity of above copies.
9. ☐ A copy of any disclaimer, certificate of correction or reexamination certificate issued in the patent is included.
10. ☒ Reexamination of claim(s) 1-9 is requested.
11. ☒ A copy of every patent or printed publication relied upon is submitted herewith including a listing thereof on Form PTO/SB/08, PTO-1449, or equivalent.
12. ☐ An English language translation of all necessary and pertinent non-English language patents and/or printed publications is attached.
13. ☒ The attached detailed request includes at least the following items:
- a. A statement identifying each substantial new question of patentability based on prior patents and printed publications. 37 CFR 1.510(b)(1).
- b. An identification of every claim for which reexamination is requested, and a detailed explanation of the pertinency and manner of applying the cited art to every claim for which reexamination is requested. 37 CFR 1.510(b)(2).
14. ☐ A proposed amendment is included (only where the patent owner is the requester). 37 CFR 1.510(e).
15. ☒ It is certified that the statutory estoppel provisions of 35 U.S.C. 315(e)(1) or 35 U.S.C. 325(e)(1) do not prohibit requester from filing this *ex parte* reexamination request. 37 CFR 1.510(b)(6).
16. Service
- a. ☒ It is certified that a copy of this request (if filed by other than the patent owner) has been served in its entirety on the patent owner as provided in 37 CFR 1.33(c).
- The name and address of the party served are:
- Finn IP Law, PC, 11400 W. Olympic Blvd, 9th FL, Los Angeles, CA 90064
- and
- Pathway IP LLC, 400 Rella Blvd, STE 156, Montebello, NY 10901
- Date of Service: April 22, 2025
- OR**
- b. ☐ A duplicate copy is enclosed since service on patent owner was not possible. An explanation of the efforts made to serve patent owner **is attached**. See MPEP 2220.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

17. Correspondence Address: Direct all communication about the reexamination to:



The address associated with Customer Number:

155075

OR



Firm or Individual Name _____
(at the address identified below)

Address

City

State

Zip

Country

Telephone

Email

18. ☐ The patent is currently the subject of the following concurrent proceeding(s):

- a. ☐ Copending reissue Application No. _____
- b. ☐ Copending reexamination Control No. _____
- c. ☐ Copending Interference No. _____
- d. ☐ Copending litigation styled: _____

WARNING : Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

/Jialin Zhong/

Authorized Signature

April 22, 2025

Date

Jialin Zhong

Typed/Printed Name

62,937

Registration No.



For Patent Owner Requester



For Third Party Requester

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013), <https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>.

Routine uses of the information in this record may include disclosure to: 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law; 2) a federal, state, local, or international agency, in response to its request; 3) a contractor of the USPTO having need for the information in order to perform a contract; 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record; 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record; 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations; 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals; 8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)); 9) the Office of Personnel Management (OPM) for personnel research purposes; and 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.



US007841729B2

(12) **United States Patent**
Geddes

(10) **Patent No.:** **US 7,841,729 B2**
(45) **Date of Patent:** **Nov. 30, 2010**

(54) **WEBCAM ILLUMINATOR DEVICE**

(75) Inventor: **Henry Geddes**, Delray Beach, FL (US)

(73) Assignee: **Splashlight Studios**, Miami Beach, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 234 days.

(21) Appl. No.: **12/011,090**

(22) Filed: **Jan. 24, 2008**

(65) **Prior Publication Data**

US 2008/0180933 A1 Jul. 31, 2008

Related U.S. Application Data

(60) Provisional application No. 60/897,600, filed on Jan. 26, 2007.

(51) **Int. Cl.**
G03B 15/02 (2006.01)

(52) **U.S. Cl.** **362/16**

(58) **Field of Classification Search** 362/3,
362/8, 16, 11

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,604,913 A * 9/1971 Crete 362/8

2006/0007666 A1 * 1/2006 Cook 362/16

2007/0121343 A1 5/2007 Brown 362/612

2007/0139515 A1 * 6/2007 Du Breuil 348/14.01

* cited by examiner

Primary Examiner—Stephen F Husar

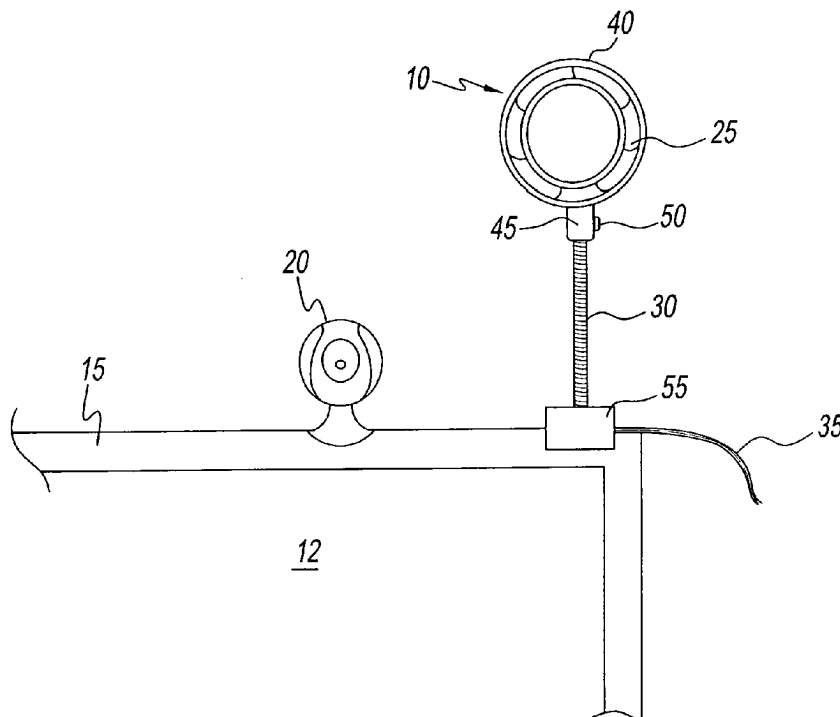
Assistant Examiner—James W Cranson

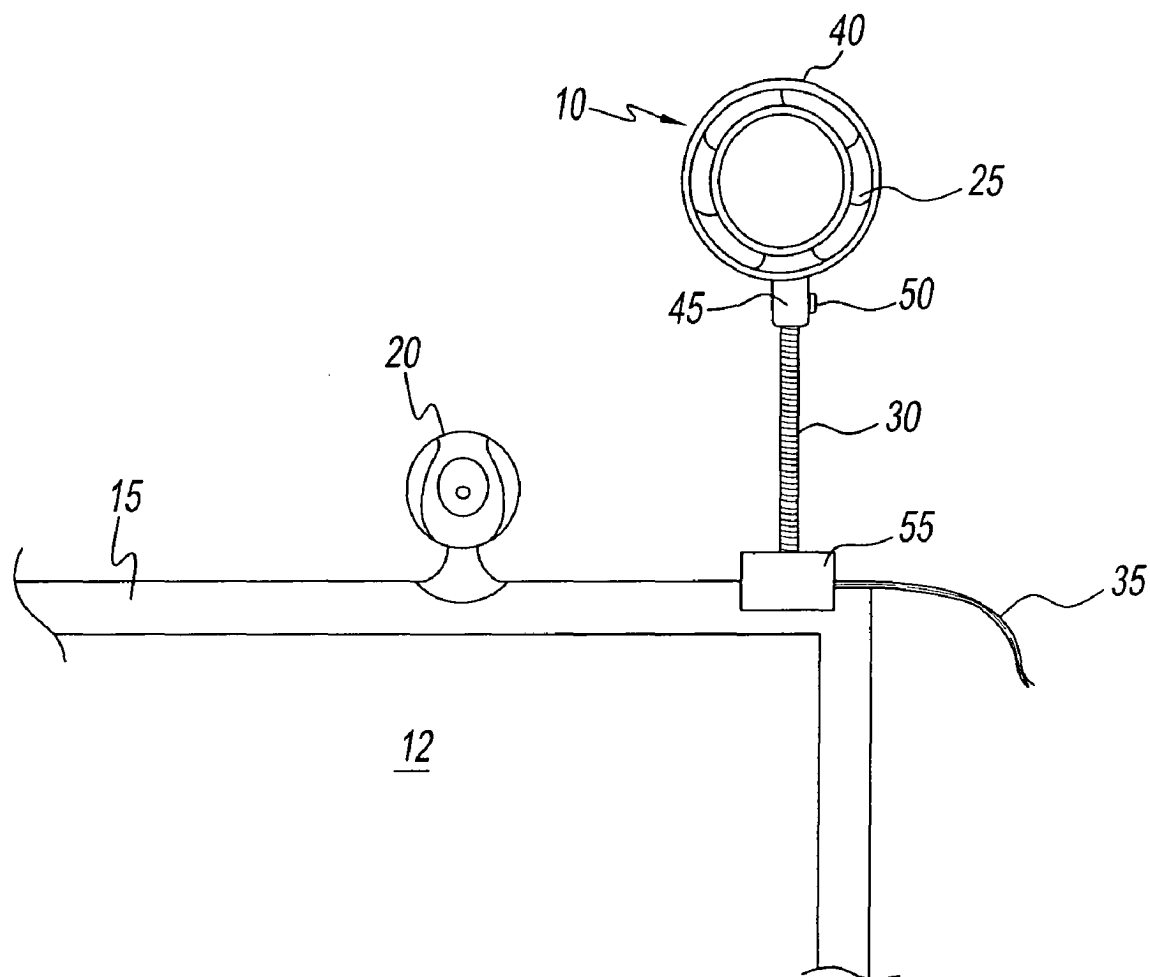
(74) *Attorney, Agent, or Firm*—Ohlandt, Greekley, Ruggiero & Perle, L.L.P.

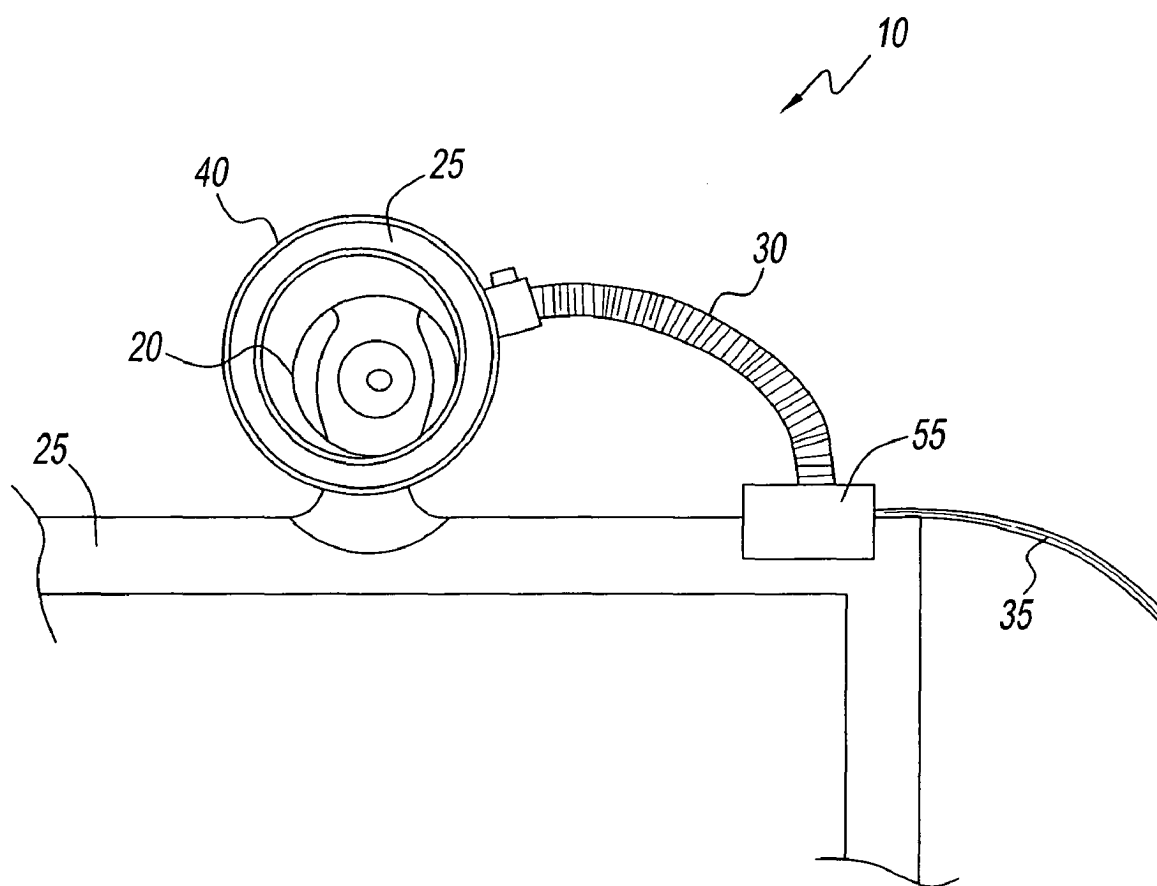
(57) **ABSTRACT**

An illuminator device for illuminating one or more users in front web camera and a communication terminal having a bulb for emitting light; a reflector operatively associated with the bulb for projecting the emitted light; and an arm disposed between the bulb and the terminal for connection to the terminal are provided. The bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera. An illuminator device for illuminating one or more users in front of a webcam and a communications terminal having a frame and a screen having a plurality of bulbs, wherein the plurality of bulbs are disposed in the frame of the terminal to provide illumination to the face or faces of the users.

13 Claims, 6 Drawing Sheets



*Fig. 1*

*Fig. 2*

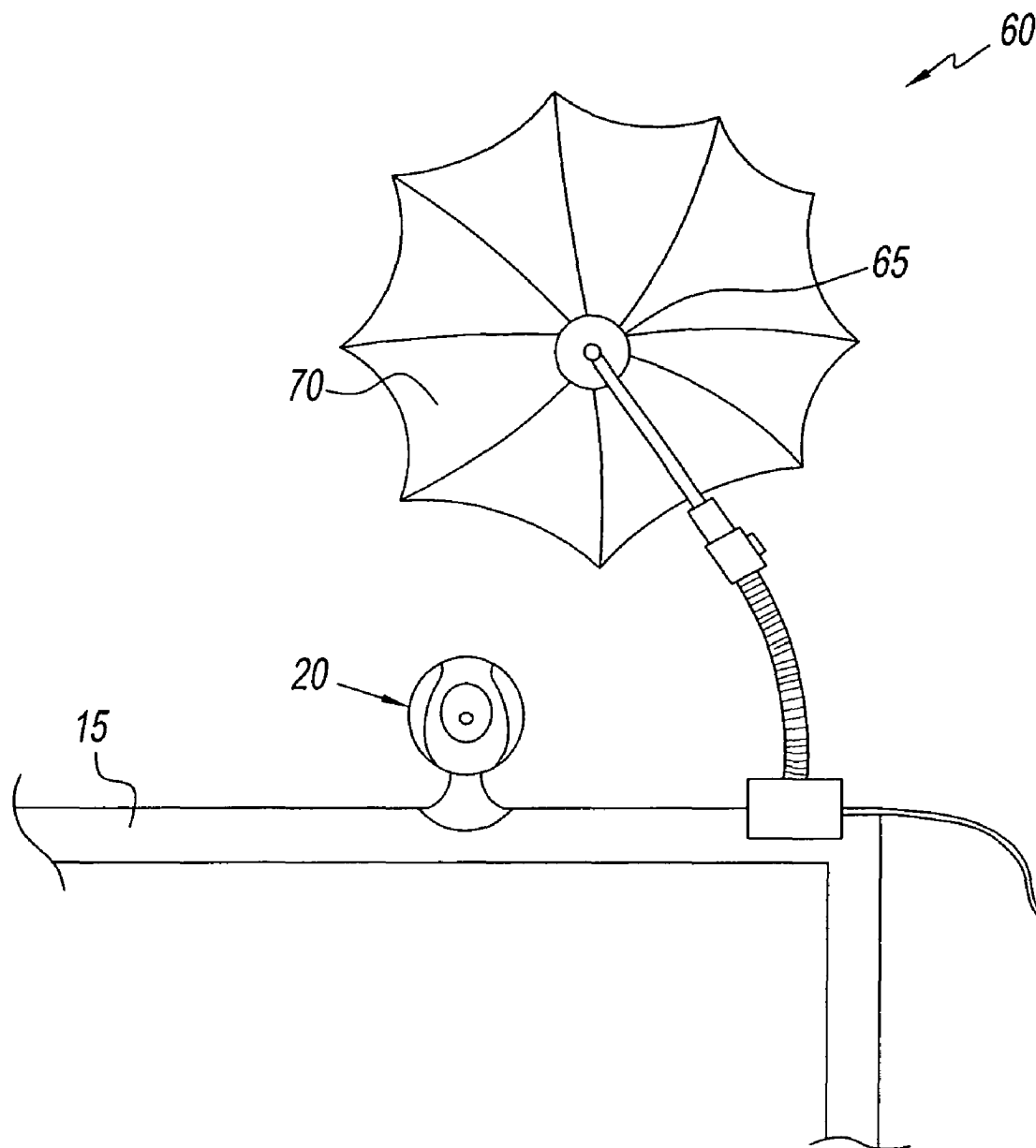


Fig. 3

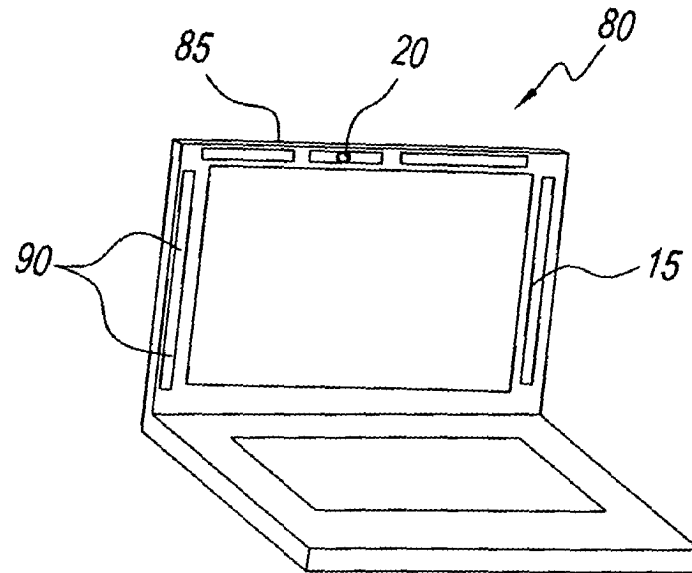


Fig. 4

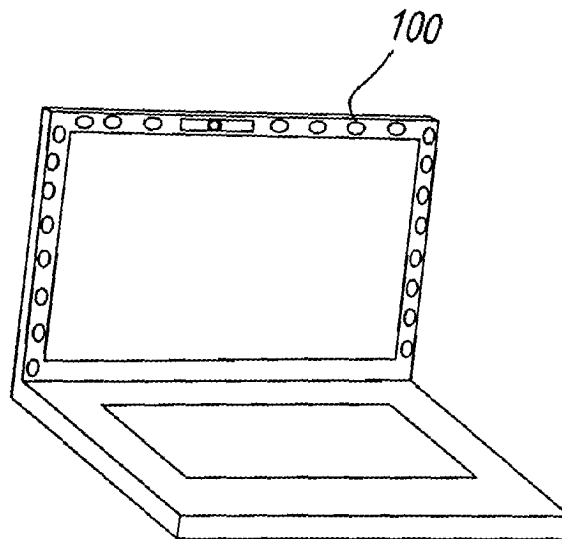


Fig. 5

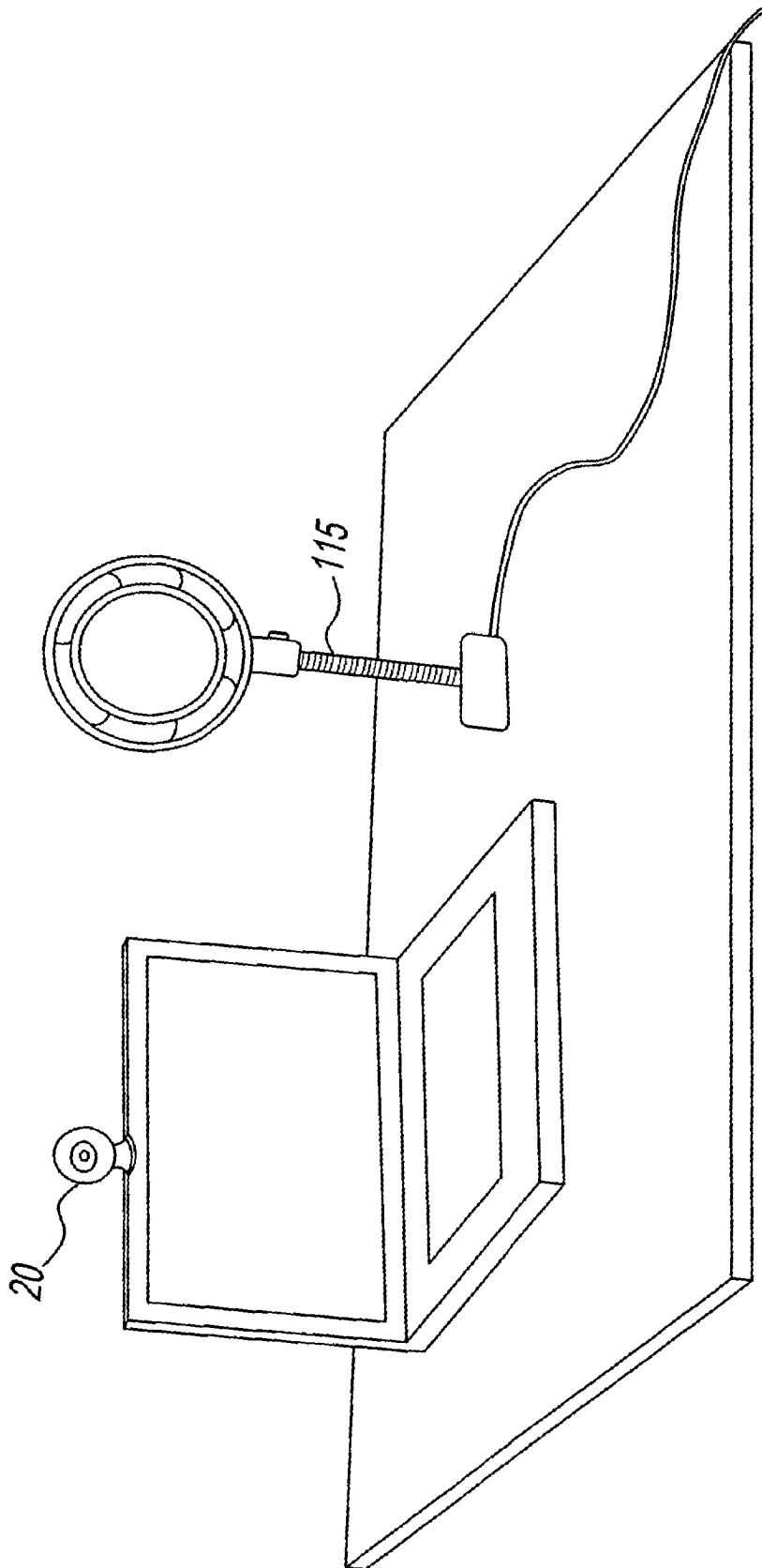


Fig. 6

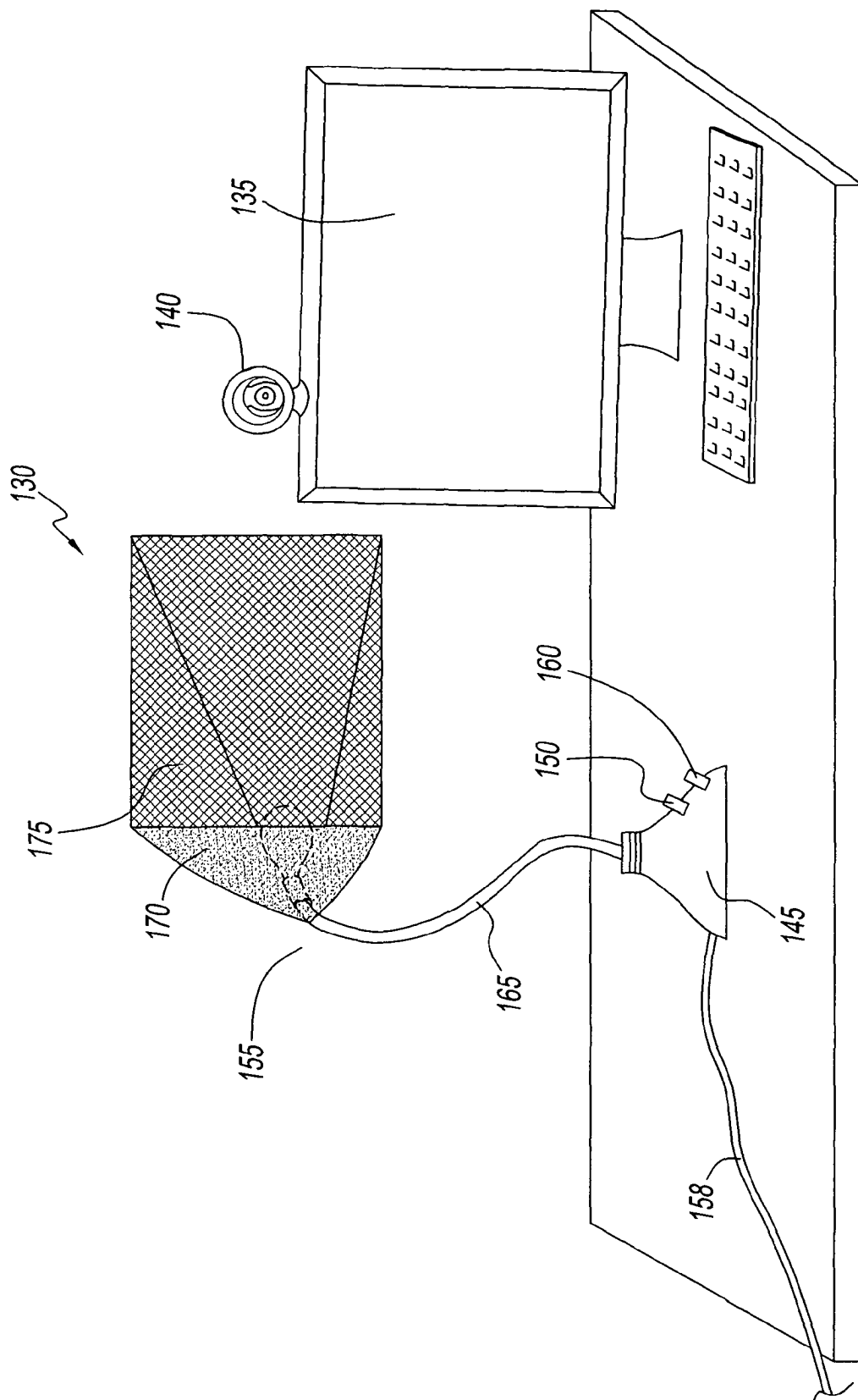


Fig. 7

1

WEBCAM ILLUMINATOR DEVICE

This application claims the benefit to U.S. Provisional Application Ser. No. 60/897,600 filed on Jan. 26, 2007, the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

This invention relates to an illuminator device. More particularly, this invention relates to an illuminator device for a web camera (hereinafter "webcam") that illuminates the face of the person who is viewed using a webcam.

2. Description of Related Art

Video conference calls are a common method for people to communicate when the parties are remote and wish to be simultaneously viewed. Generally, during video conferencing, the parties are not concerned about the appearance of the individuals, because the purpose of the call is of greater importance than the individuals' appearance.

However, as online viewing using the Internet has become more popular, users are now able to have their image files uploaded to a website for online viewing. While these uploaded images can be for business purposes, they are increasingly used for social purposes. For example, in online chatting or dating sites, a user desires to appear as attractive as possible during communications using personal computers equipped with a webcam.

Poor lighting is one of the primary reasons for the poor appearance of facial images that are viewed online from webcams. The individual does not appear as attractive as they otherwise would in person. The proper lighting ensures an aesthetically pleasing appearance of an individual's face.

Accordingly, there is a need to provide proper lighting for users that are viewed through a webcam to ensure that they appear aesthetically pleasing.

SUMMARY OF THE INVENTION

The present disclosure provides for an illuminator device for the face of the user viewed through a webcam, wherein the illuminator provides diffuse illumination to the face of the user.

The present disclosure also provides for an illuminator device for the face of the user viewed through a webcam, in which the illuminator device has a bulb that is shaped as one of a toroid, a sphere and a semi-sphere.

The present disclosure further provides for an illuminator device for the face of the user viewed through a webcam in which the illuminator device is embedded in the periphery of a screen of a monitor to provide illumination to the face of a user.

The present disclosure yet further provides for an illuminator device for the face of the user viewed through a webcam, in which the illuminator device has a bulb that is surrounded by a reflector to reflect the light of the bulb towards the face of the user.

The present disclosure yet still further provides for an illuminator device for the face of the user viewed through a webcam, in which the illuminator is movable on a surface relative to the user and the webcam for optimal adjustability.

The present disclosure still yet further provides for an illuminator device that is covered by a diffusion cover to provide diffuse light to the face of the user when the face is viewed through a webcam.

An illuminator device for illuminating one or more users in front web camera and a communication terminal having a

2

bulb for emitting light; a reflector operatively associated with the bulb for projecting the emitted light; and an arm disposed between the bulb and the terminal for connection to the terminal are provided. The bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera.

An illuminator device for illuminating one or more users in front of a webcam and a communications terminal having a frame and a screen having a plurality of bulbs, wherein the plurality of bulbs are disposed in the frame of the terminal to provide illumination to the face or faces of the users.

BRIEF DESCRIPTION OF THE DRAWINGS

Other and further benefits, advantages and features of the present invention will be understood by reference to the following specification in conjunction with the accompanying drawings, in which like reference characters denote like elements of structure and:

FIG. 1 illustrates a front view of the first embodiment of the webcam illuminator of the present invention;

FIG. 2 illustrates a front view of the webcam illuminator of FIG. 1 of the present invention proximate the webcam;

FIG. 3 illustrates a front view of the webcam illuminator according to a second embodiment of the present invention;

FIGS. 4 and 5 illustrate a perspective view of a third embodiment of the present invention in which the illuminator is integrated into the frame of the screen and surrounds the webcam;

FIG. 6 illustrates a perspective view of a fourth embodiment of the present invention; and

FIG. 7 illustrates a perspective view of a fifth embodiment of the present invention in which the illuminator has a diffusion fabric.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a webcam illuminator of the present invention is shown and is generally represented by reference numeral 10. Illuminator 10 of the present invention is a connected frame 15 of screen 12 of a computer proximate a webcam 20. A webcam 20 is a video camera that is used to send periodic images or continuous frames to a Web site for display. Webcam software typically captures the images as JPEG or MPEG files and uploads them to the Web server. Illuminator 10 has a bulb 25 for illumination of the user, and particularly of the face of the user of the webcam 20. Illuminator 10 preferably has a flexible arm 30 and a clamp 55 that permit adjustment of the location of bulb 25 relative to webcam 20. While illuminator 10 is shown as having an alternating current power cord 35, illuminator 10 could also be battery powered to enable portable use of webcam 20 and illuminator 10.

Illuminator 10 further has a reflector 40 that surrounds or encases bulb 25. Bulb 25 has a toroidal or ring configuration that is capable of diffusing and shaping light through its surface. Such a configuration permits light illuminating the face of the user to be as diffuse as possible. Further, reflector 40 reflects the light of bulb 25 back onto the face of the user. Illuminator 10 has a base 45 that is capable of receiving different sized or shaped bulbs and reflectors. Illuminator 10 has a switch 50 for easy activation of the bulb during use.

Referring to FIG. 2, the illuminator 10 is shown in use in a position surrounding and in front of webcam 20. By surrounding webcam 20, the direct light from bulb 25 and the reflected light from bulb 25 illuminate the face with diffuse

3

light. The diffuse light is the most flattering light to view a person's face because it prevents any shadows from being cast on a user's face. Diffuse light also prevents any facial imperfections from being highlighted on the face of the user. Illuminator **10** can be affixed to screen **15** of computer at any point along the edge to maximize direct and diffuse light from bulb **25**. Because illuminator **10** is movable along the length of screen **15**, a recipient of the image over the internet may request that the user adjust the location of the illuminator **10** for enhanced viewing of the user. The ability to move the device allows for the user to adjust how they want to be seen, as well. The different positions that the device can be positioned will create different looks and effects allowing for more choice and control.

Referring to FIG. 3, second embodiment of the illuminator present invention is shown and generally reference with reference numeral **60**. Similar features of the first embodiment will be referred to using the same reference numerals in the second embodiment. In FIG. 3, illuminator **60** has similar elements as the first embodiment except that bulb **65** has a semi-spherical or spherical shape. The reflector **70** of this embodiment has an umbrella shape that is capable of reflecting light onto the users face from bulb **65**. Bulb **65** is substantially a point source and its light is reflected by the relatively large umbrella reflector. Similar to the first embodiment, the purpose of the second embodiment is to move light forward onto the user's face and to create as much diffuse light as possible so that the user's face will be illuminated in the most flattering manner during webcam use. In the absence of a mechanism to diffuse light, the user's face would appear harsh with many shadows. In the absence of diffuse light, wrinkles or crevices would be deepened and highlighted on the surface of the skin making the user appear not as attractive when viewed by a recipient via webcam **20**. Further the diffuse light makes the whites and the color of the eyes appear clearer. By casting the light on to the user's face the overall illumination of the face is achieved.

Reflectors **40** and **70** of the first and second embodiment, respectively, have an inside surface that is preferably coated with a thin film of silver or a white film to maximize reflective capability. Additionally, reflectors **40** and **70** are able to direct the light to the user's face and away from screen **15**. By highlighting the user's face and projecting the maximum amount of light on to the user's face, the resolution of webcam **20** is optimized. A brighter subject enhances the resolution of webcams **10** and **60**. Further, the readability of screen **15** is increased because the light that would otherwise be directed toward the screen is minimized and redirected to the face to enhance the contrast of colors on the screen. Illuminators **10** and **60** simulate the lights are used in photographic studios that use professional lighting to enhance a user's appearance.

A further benefit of the webcam illuminator **10**, **60** and reflectors **40** and **70**, respectively, is that they together simulate natural light. Natural light or average noon daylight has a temperature of 5500 degrees Kelvin. Light at 5500 degrees Kelvin is has the quality of white light that is identical to the color of the sun at midday. The temperature that reflectors **40**, **70** of the present invention reflect on the face of the user is approximately 5500 Kelvin, a value that is neither too hot like blue light or too cold like orange light. A user seen using the webcam will have a flattering appearance.

In the third embodiment shown in FIGS. 4 and 5, illuminator **80** is built into a frame **85** of screen **15** of computer. Illuminator **80** is in the form of a plurality of lights **90** configured to achieve a similar effect to the bulbs of earlier embodiments. Plurality of lights **90** surround the webcam **20** and cast diffuse light on the face of the user to minimize any

4

shadows that would not be as flattering to the user. Lights **90** are set back from the screen **15** of computer to enhance the contrast of the screen with the background for easier viewing by the user. By highlighting the face of the user, the function of the webcam **20** is maximized. By providing a greater degree of light to the user's face, the resolution of the webcam is increased.

FIG. 5 shows a more decorative arrangement of lights or electrodes **100** much like a make-up mirror. The illuminators shown in FIGS. 4 and 5 can be automatically activated when webcam is brought into service. Lights **90** are mounted in the frame are compact and thus very convenient. Lights **90** occupy less space and are more discreet, than a frame mounted illuminator of embodiment one or two. Furthermore, the third embodiment is useful for people who travel and work exclusively with laptops, thus eliminating the need of carrying around an additional device.

A benefit of the illuminator of the present invention is to provide the most flattering lighting and viewing of a user of a webcam during conference calls or any on-line scenario using a webcam such as an on-line dating scenario.

In the embodiments described above, the illuminator is shown as being connected to or integral with the computer screen. Referring to FIG. 6, it is also within the scope of the instant invention to have a fourth embodiment in which an illuminator **115** is placed on a table surface proximate user and webcam **20** to illuminate the face of user. In this embodiment, a user is able to position illuminator as desired on a flat surface flat surface relative to webcam **20**.

Referring to FIG. 7, a fifth embodiment of the present invention is shown, and generally referenced using reference numeral **130**. The fifth embodiment shows illuminator **130** on a surface adjacent to computer screen **135** with web camera **140**. Illuminator **130** has a base **145** having a dimmer switch **150** to adjust the brightness of bulb **155**. Base **145** has a power cord **158** and a switch **160** to enable operation. Bulb **155** is connected to base by an adjustable arm **165** to adjust the position of bulb **155** relative to user and webcamera. In this embodiment, bulb **155** is surrounded by and attachable box **170** that is covered with a diffusion fabric **175**. Inside surface of attachable box **170** is lined with a white reflective film to reflect light from bulb **155**. The shape of box **170** ensures that light from bulb **155** will project forward from bulb **155** towards diffusion fabric **175**. Diffusion fabric **175** provides a diffuse light to the face of the viewer positioned proximate webcamera and computer screen. The diffusion fabric minimizes the harshness that direct light being projected from box **170** would cast on the face of the user. Diffusion fabric **175** is able to scatter directional light rays that pass therethrough to enable scattering. The resulting light on the user's face appears softer and more general, to minimize or even eliminate shadows. The resultant softer light that is achieved by passing through diffusion fabric **175** has several advantages. The resultant light is natural and more like daylight or uniform overhead office lighting. This light flatters subjects by diplomatically suppressing wrinkles and other facial blemishes. Further, the light that passes through diffusion fabric **175** reduces uncomfortable glare in a subject's eyes. The diffusion fabric is preferably made from a material such as silk or white muslin.

While the instant disclosure has been described with reference to one or more exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope thereof. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the disclosure without

5

departing from the scope thereof. Therefore, it is intended that the disclosure not be limited to the particular embodiment(s) disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

I claim:

1. An illuminator device for illuminating one or more users in front of a web camera and a communication terminal comprising: a bulb having a toroidal shape for emitting light; a reflector having a circular configuration to conform to the toroidal shape of said bulb for projecting the emitted light; and an arm disposed between said bulb and the terminal for connection to the terminal, wherein said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera.

2. The illuminator device of claim 1, wherein said reflector is positioned proximate said bulb to project light towards a face of said user or said users.

3. The illuminator device of claim 1, wherein said reflector is lined with a reflective material or film.

4. The illuminator device of claim 1, wherein said arm is a flexible arm that permits said bulb to be positioned relative to the web camera.

5. The illuminator device of claim 1, wherein said arm is connected to the terminal by a clamp.

6

6. The illuminator device of claim 5, wherein the clamp is movable along an edge of the terminal to adjust the location of said bulb.

7. The illuminator device of claim 1, wherein the arm has a base that supports the illuminator device on a flat surface adjacent to the terminal.

8. The illuminator device of claim 1, wherein said reflector has a piece of fabric thereon disposed between said bulb and a user's face for diffusing the light emitted from said bulb.

9. The illuminator device of claim 8, wherein said fabric is silk or muslin.

10. An illuminator device for illuminating one or more users in front of a web camera and a communications terminal having a frame and a screen comprising: a plurality of bulbs, wherein said plurality of bulbs are disposed in the frame of the terminal and one of said plurality of bulbs surrounds the web camera.

11. The illuminator device of claim 10, wherein one of said plurality of bulbs is on one side of the web camera and another of said plurality of bulbs is on the other side of the web camera.

12. The illuminator device of claim 10, wherein in each of said plurality of bulbs are rectangularly shaped.

13. The illuminator device of claim 10, wherein said plurality of bulbs are a plurality of electrodes spaced in the frame of the screen.

* * * * *



US 20060007666A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0007666 A1****Cook**(43) **Pub. Date:****Jan. 12, 2006**(54) **LIGHT MODIFIER**(52) **U.S. Cl. 362/16; 362/351; 362/355**(76) **Inventor: Kenneth O. Cook, Salinas, CA (US)**

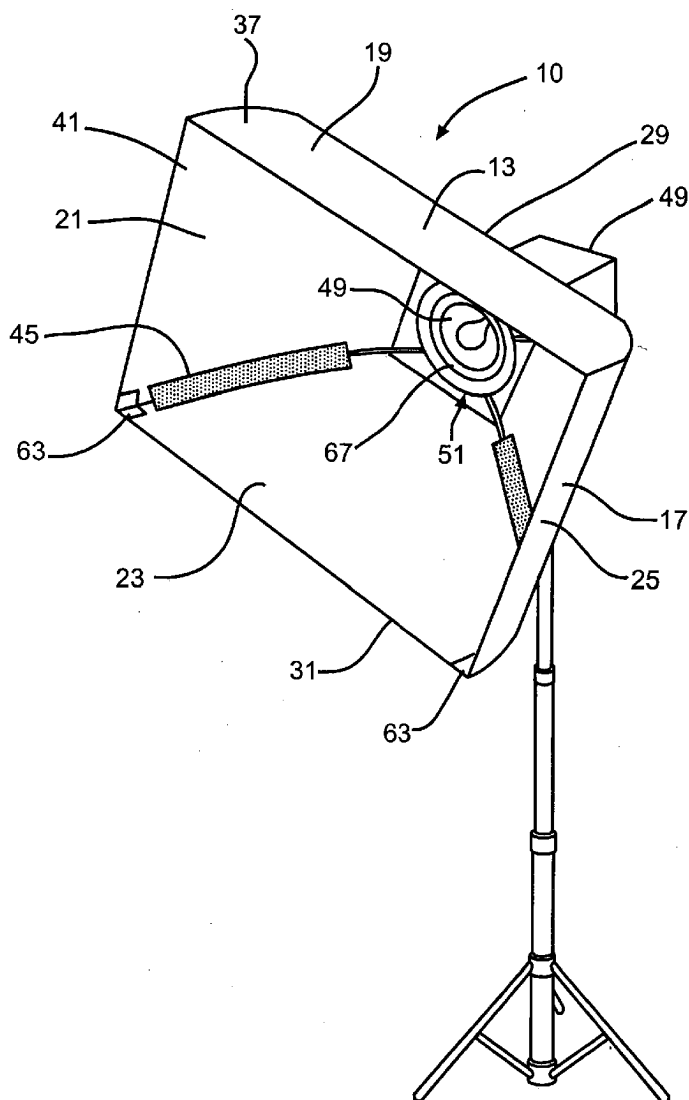
Correspondence Address:

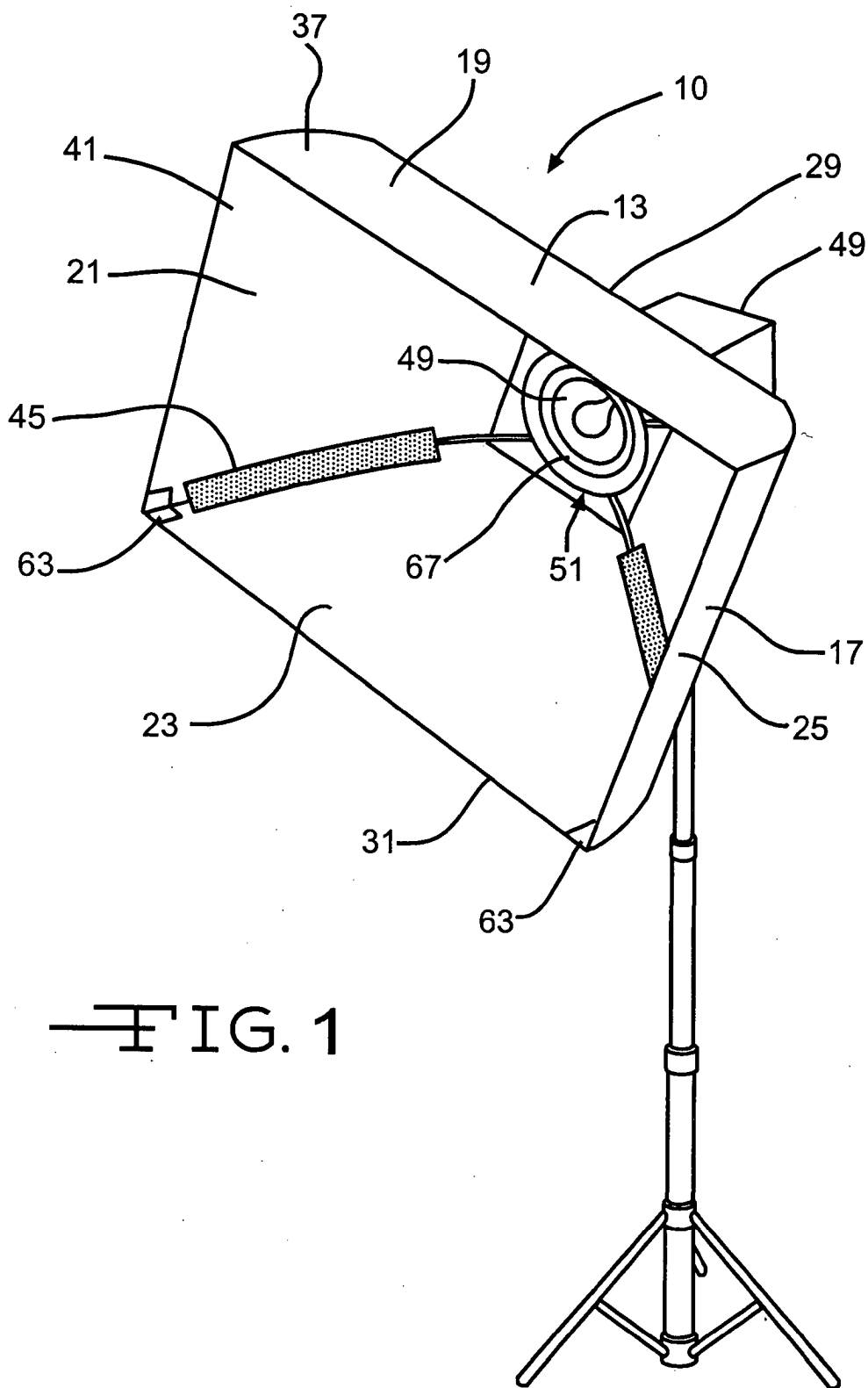
**EMCH, SCHAFFER, SCHAUB & PORCELLO
CO****P O BOX 916****ONE SEAGATE SUITE 1980****TOLEDO, OH 43697**(21) **Appl. No.: 10/887,463**(22) **Filed: Jul. 8, 2004****Publication Classification**(51) **Int. Cl.**
G03B 15/02 (2006.01)

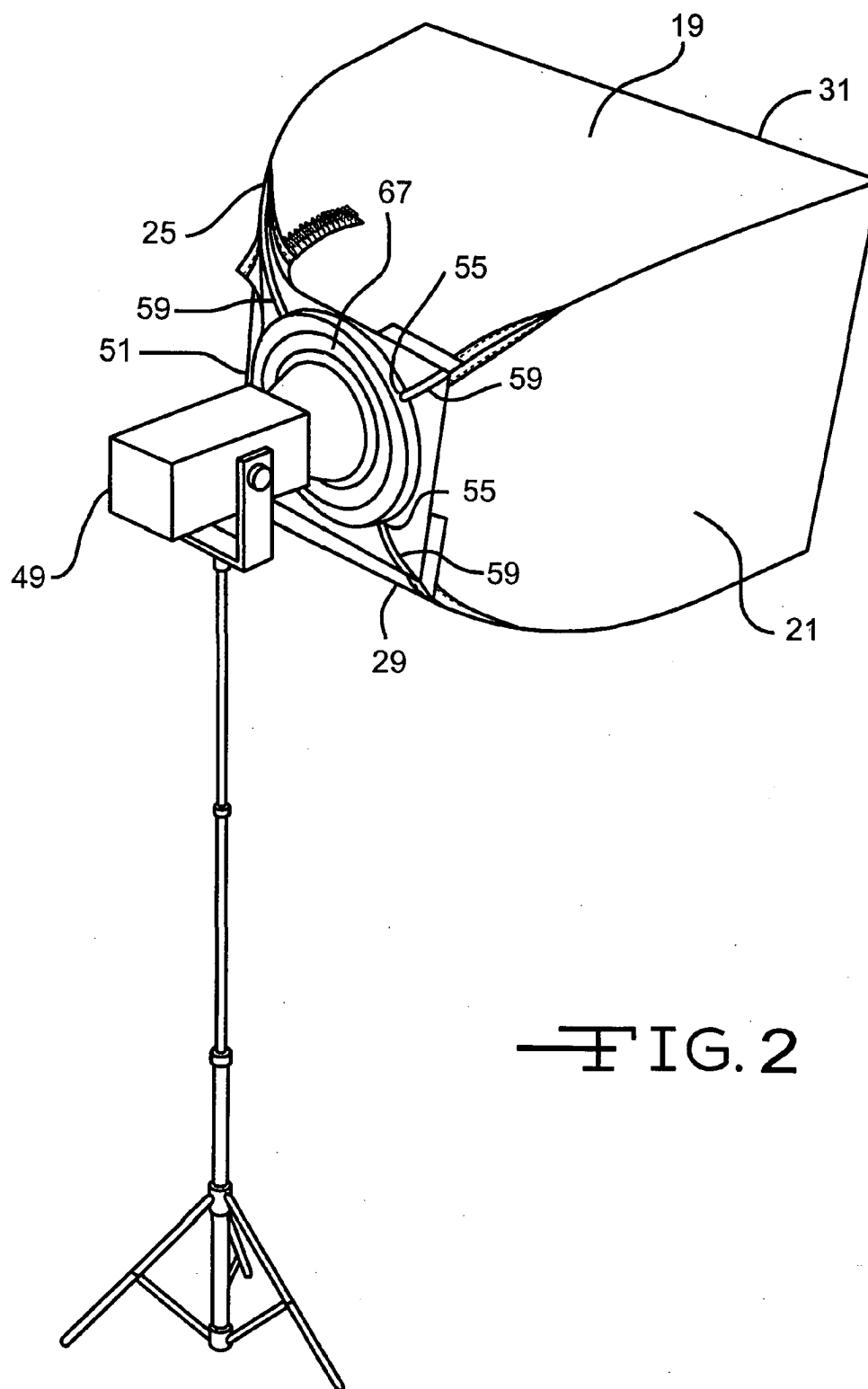
(57)

ABSTRACT

A light modifier for creating an enhanced depth of lighting on a subject. The light modifier has a housing with a sidewall that defines a first and second end. The first and second ends are in opposed relationship. The first end is adapted to mount a light source in the housing. A panel is positioned on the second end of the housing. The panel has at least one layer of netting having an aperture. Light that passes through the netting has different characteristics than the light passing through the aperture whereby the light modifier creates enhanced depth of lighting on a subject.







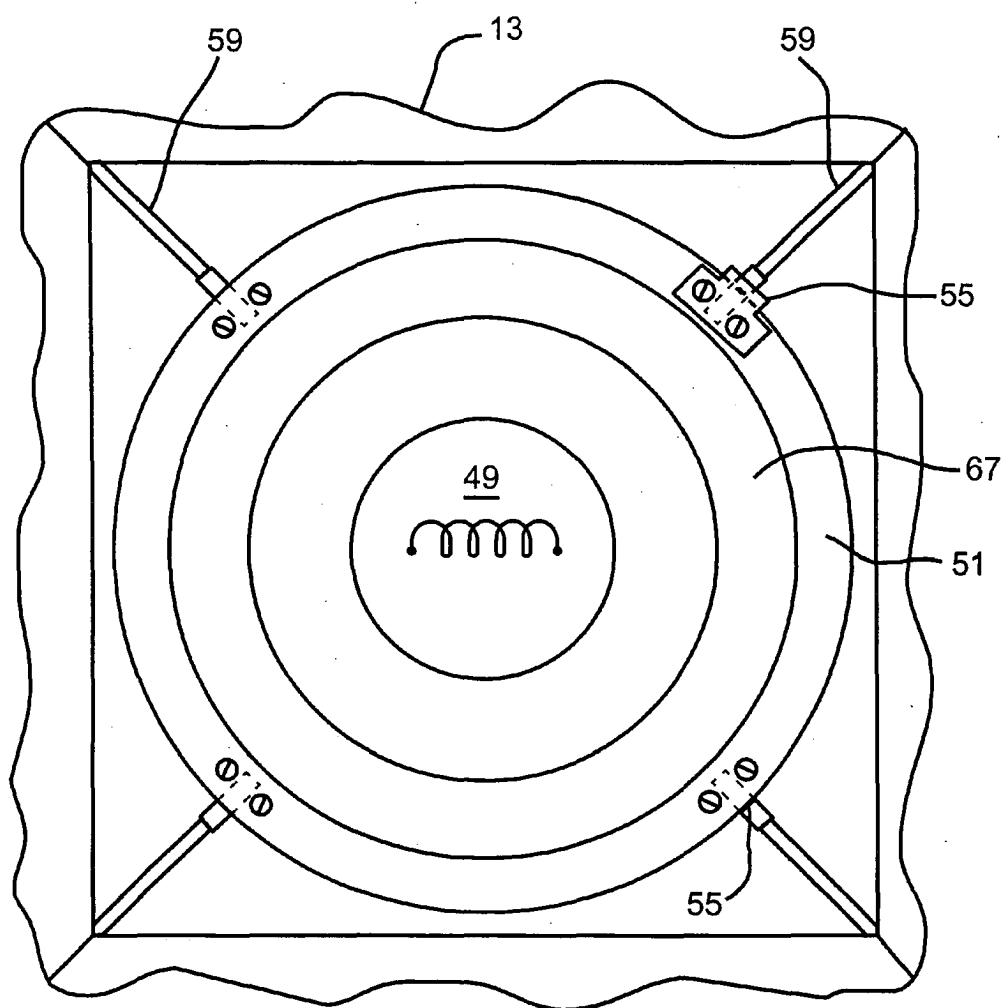


FIG. 3

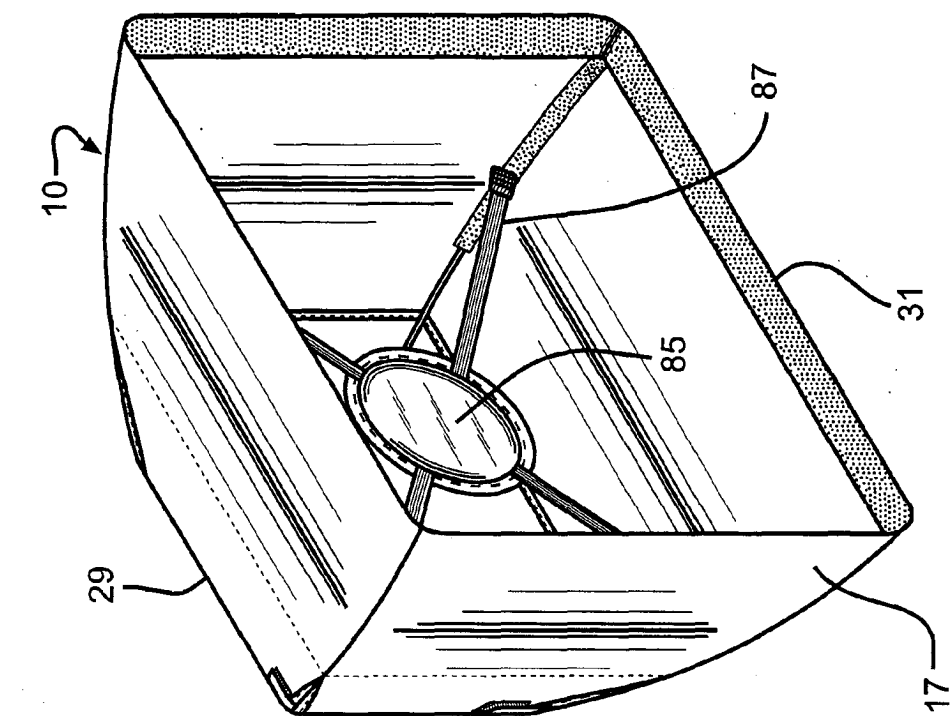


FIG. 4

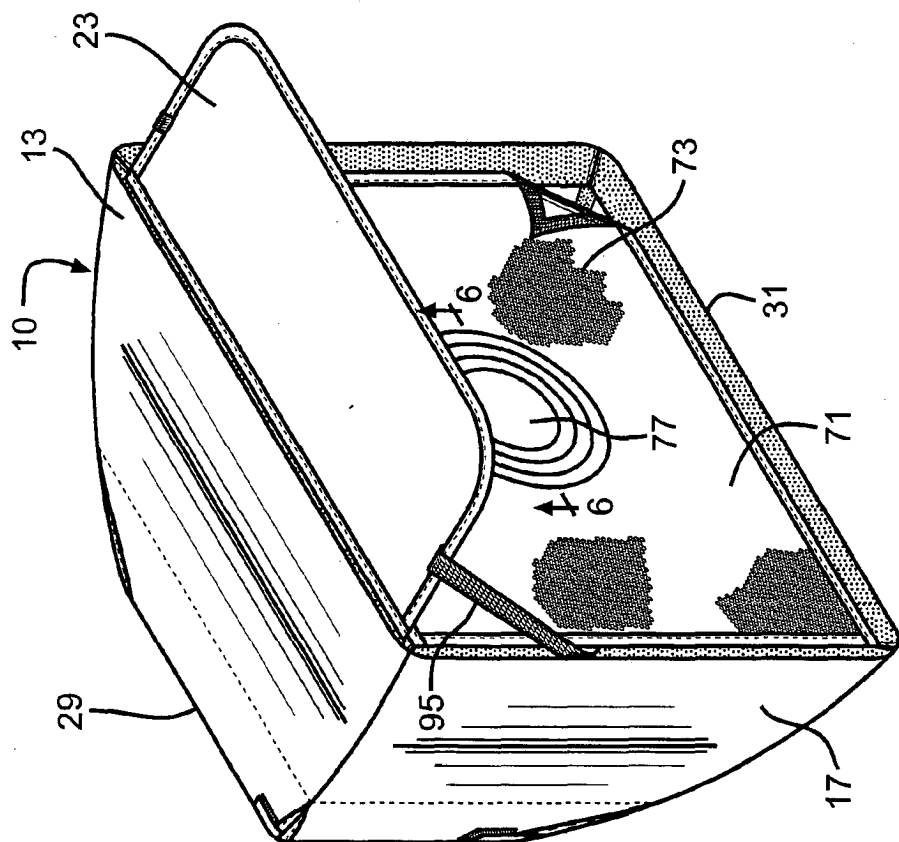


FIG. 5

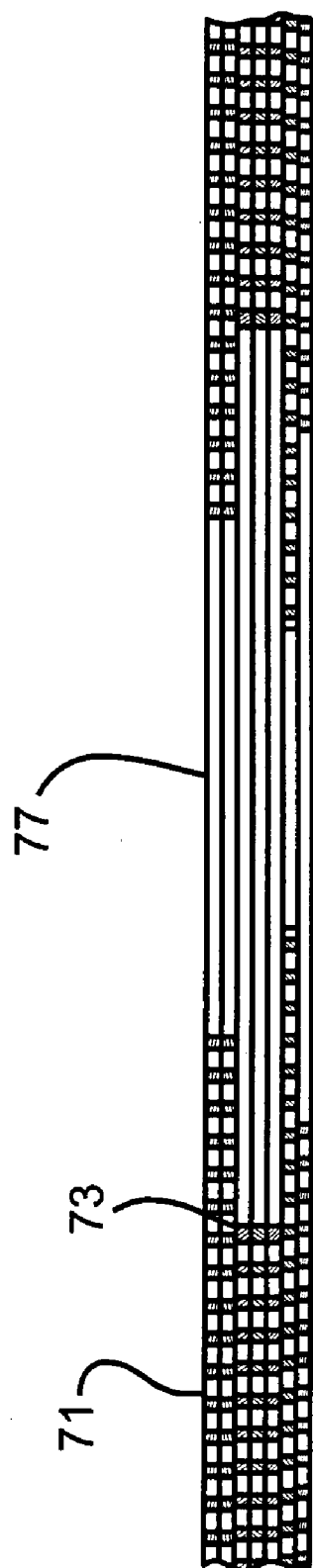


FIG. 6

LIGHT MODIFIER

[0001] This invention relates to improvements to a light modifier that is used to modify light from a light source. The light modifier is used by photographers and image makers to modify the light that is presented to a subject or an image to create the desired depth of field and shadowing.

BACKGROUND OF THE INVENTION

[0002] Light modifiers have been used in the photography industry for quite some time. A well-known example is light diffusion boxes, which have been used by photographers and others to defuse or soften the lighting on a subject. These diffusion boxes have an outer housing with a light source at one end and a diffusion panel at the other end through which the light from the light source must pass before striking the subject. This type of light modifier has been focused on obtaining a uniform quality to the light that is presented on the subject that is to be photographed. These light boxes can be collapsible in nature or have a fixed outer structure. However, all of these prior light boxes are trying to achieve a uniform distribution of light on the subject that is to be photographed or otherwise captured.

SUMMARY OF THE INVENTION

[0003] The present invention is directed to a light modifier having a collapsible outer housing with a light source mounted on one end with a panel positioned on the other end of the outer housing in an opposed relationship to the light source. However, the light modifier of the present invention is not directed to achieving a uniform quality for the light produced from the light source. The panel that is placed across the end of the outer housing has a hole or aperture in the center that allows at least some of the light from the light source to pass through the panel without being modified or diffused by the panel. The panel can have several layers and the aperture or hole in the center of the layers can vary in size whereby the light from the light source is modified or diffused at different levels across the face of the panel. It is the intent of the present invention to produce a lighting and shadowing effect on the subject that is similar to the lighting patterns utilized by the old masters in their oil paintings. The lighting patterns that make these paintings unique and desirable vary across the subject that is being painted and produce dramatic characteristics for these paintings.

[0004] It is an object of the present light modifier to replicate the lighting patterns and characteristics utilized by the old masters in their master piece oil paintings.

[0005] These and other objects and advantages of the invention will be more fully understood by reference to the following written description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a perspective view of the light modifier of the present invention;

[0007] FIG. 2 is a perspective view of the light modifier;

[0008] FIG. 3 is a front elevation view of the housing of the light modifier;

[0009] FIG. 4 is a perspective view of the housing of the light modifier;

[0010] FIG. 5 is a perspective view of a portion of the housing; and

[0011] FIG. 6 is a cross sectional view taken along line 6-6 in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] The invention is directed to a light modifier that is used to provide lighting for a subject. More particularly, the light modifier modifies the characteristics of light from a light source to create enhanced depth of lighting on a subject or image that is being photographed, video taped or captured on film. The features of the invention will be more readily understood by referring to the attached drawings in combination with the following description.

[0013] The light modifier 10 has a collapsible housing 13 that defines a sidewall 17. The sidewall 17 is usually formed of a four separate panels 19, 21, 23 and 25 respectively that are joined together to form the sidewall 17 of the collapsible housing 13. The panels of the sidewall 17 are generally trapezoidal in shape and are made of a fabric material. The fabric panels 19, 21, 23, and 25 are assembled to form the sidewall 17 of the housing so that the housing 13 defines a first end 29 and a second end 31. The panels 19, 21, 23 and 25 are usually formed of a fabric material having an outer layer 37 and an inner layer 41. The outer layer 37 of fabric is typically black and is opaque to light that is contained within the housing 13. The inner layer of fabric is typically reflective in nature and the inner layer 41 of fabric forms the interior of the collapsible housing 13. A loop or passageway 45 is formed in the inner layer 41 of fabric along at least a portion of the edges where the panels 19, 21, 23 and 25 are joined together to form the sidewall 17. Normally the passageways 45 are created by sewing in an additional layer of fabric that forms the inner layer 41 to create the passageway. However, other methods can be utilized to form the passageways in the interior of the collapsible housing 13.

[0014] The first end 29 of the housing 13 is adapted to receive a light source 49 and a cylindrical fixture 51 is positioned in the first end 29 for removably receiving the light source 49. The cylindrical fixture 51 has 4 holes 55 positioned in the outer perimeter of the cylindrical fixture. The holes 55 are spaced equidistantly from each other around the outer periphery of the cylindrical fixture 51 so that the holes 55 are in alignment with the four seams where the panels 19, 21, 23 and 25 are joined together to form the collapsible housing 13. A flexible rod 59 can be positioned in each of the holes 55 so that the rods extend from the cylindrical fixture 51. The flexible rod 59 can be positioned in the passageways 45 formed in the sidewall 17 of the housing 13. The flexible rods 59 provide a support structure that is suitable to support the panels 19, 21, 23 and 25 in a manner to form the collapsible housing 13 of the light modifier 10. In some applications, it is desirable to have a pocket 63 formed in the panels 19, 21, 23 and 25 to receive the ends of the flexible rods 59. The pocket 63 can be formed as part of the passageways 45 or they can be formed as a separate element. The pocket 63 are normally positioned adjacent the second end 31 of the housing 13. Suitable adaptors 67 can be utilized with the cylindrical fixture 51 to secure a light source 49 to the light modifier 10. The adaptor 67 allow the light source to be mounted so that the light

source is positioned in the interior of the collapsible housing 13 or at least directs the light produced by the light source into the interior of the collapsible housing 13.

[0015] A panel 71 is removably secured to the second end 31 of the collapsible housing 13. The panel 71 can be held in place by hook and loop type fasteners or other suitable securing means. The panel 71 is formed of at least one layer of netting 73 having an aperture 77 located essentially in the center of the panel 71. The layer of netting 73 acts to diffuse or modify the light that it receives from the light source 49 and the aperture 77 does not modify or diffuse the light that it receives from the light source 49. Accordingly, the light modifier 10 can create an enhanced depth of field for the lighting that is used to illuminate a subject. The panel 71 can have several layers of netting 73 to create a larger variation between the light passing through the netting and the light passing through the apertures 77 in the center of the layers of netting. In practice it has been found that between 1 and 20 layers of netting can be used to form the panel 71. Examples of netting that are particularly useful are cotton, nylon, polyester or similar fabric netting having the ability to withstand high heat applications. In particular, a cotton bobbin net with round holes has been found to work effectively as the netting 73 that forms the panel 71. Netting is used to form the panel 71 as the netting has a plurality of openings that alter the density of the light from the light source 49 but does not change the quality of the light from the light source. The quality of the light refers to the specular nature of the light and is directly related to the clarity or sharpness of the light. Woven or knit textile diffusion type of fabrics are not preferable for the panel 71 as such fabrics change the quality of the light in addition to altering the density of the light. The netting is also usually black in color as the black fabric portion of the netting absorbs or blocks a portion of the light from the light source 49 and reduces the density of the light from the light source. Other colors can be used for the netting but other colors are not as effective as black in reducing the density of the light from the light source 49. As more layers of netting are used to form the panel 71, there will be a layer reduction in the density of the light from the light source that passes through the panel 71, as there will be more fabric present to absorb the light. The aperture 77 formed in the layers of netting 73 can have the same diameter and location in the layers of netting or the diameters of the apertures can vary between the individual layers of netting 78 to form the panel 71. However, it is usually desirable to have the apertures 77 have a common center point and be concentrically positioned in the panel 71. Although the apertures 77 have been shown as being circular in shape it should be understood that other geometric shapes could be used to form the apertures and as such other geometric would change the pattern of the lighting that is presented to the subject. It is also possible to utilize apertures in the panel 77 that have different geometric shapes in some or all of the layers of netting that form the panel.

[0016] In applications where multiple layers of netting 73 are used to form the panel 71 it is possible to create different levels of diffusion or modification for the light by increasing the size of the apertures 77 in the various layers of netting. If different sized aperture 77 are utilized the light from the light source will pass through more layers of netting as the light moves away from the center of the panel 71 to the outer periphery of the panel 71. The light closer to the center of the panel 71 will pass through fewer layers of netting and

therefore receive less diffusion or modification than the light around the outer periphery of the panel 71. The light passing through the open aperture 77 formed in the center of the panel 71 will not be diffused or modified by the panel and will have a different impact on the subject. The number of layers of netting 73 and the size and shape of the aperture 77 can be selected to produce the desired lighting effect on the subject. In FIG. 6 the aperture 77 in the layers of netting 73 are shown as being randomly spaced. However, in practice it has been found to be desirable to have the layers of netting 73 that form the panel 71 be positioned so that the aperture 77 are progressively larger or smaller as light from the light source 49 moves through the panel 71.

[0017] To further modify the light from the light source 49 it is possible to position a removable baffle 85 in the interior of the collapsible housing 13. The removable baffle 85 is positioned in the interior of the housing so that the light from the light source 49 must pass through the baffle before engaging the panel 71 on the second end 31 of the housing 13. As shown in the drawings the removable baffle is a circular piece of fabric that is connected to the sidewall 17 of the housing 13 by resilient straps 87. The resilient straps can be removably secured to the sidewall 17 by loop and hook type fastening means or other suitable releasable securing means. The fabric for the removable baffle can be white nylon or other suitable fabric that can be used to diffuse the light from the light source 49. Although the removable baffle 85 has been shown as being circular in shape it should be appreciated that other geometric shapes can be used for the baffle. The baffle can also be positioned at different locations within the housing 13 with respect to the light source 49 to alter the diffusion that is created by the baffle 85. In most applications, the baffle 85 is configured and positioned to diffuse the light that passes through the aperture 77 in the panel 71. However, if different light patterns are desired the baffle 85 can be of a shape or size to impact or diffuse more or less than the light that passes through the aperture 77.

[0018] Spill light panels 93 can be removably secured to the second end 31 of the housing 13. The spill light panels are formed of a fabric material that is usually similar to the fabric utilized for the outer layer 37 of the panels 19, 21, 23 and 25 that form the sidewall 17 of the housing 13. The spill light panels 93 can be positioned at the end of each panel 19, 21, 23 and 25 that form the second end 31 of the housing 13. Alternatively, the spill light panels can only be secured to a portion of the panels that form the sidewall 17. The spill light panels are movably positioned on the housing 13 so that the spill light panels can be moved to cover a portion of the panel 71 located on the second end 31 of the housing 13. The spill light panels 93 cover the portion of the panel 71 that forms the outer periphery of the light modifier 10. The spill light panels 93 are held in the desired position with respect to the panel 71 by straps 95 that secure to the panels 19, 21, 23 and 25. The straps 95 can be secured to the panels by hook and loop type fasteners or other suitable fastening means.

I claim:

1. A light modifier for lighting a subject comprising:

a housing having a sidewall; the housing having a first end and a second end, the first and second ends being in opposed relationship, the first end adapted to mount a

light source in the housing, a panel positioned on the second end of the housing, the panel having at least one layer of netting having an aperture whereas light from the light source passing through at least one layer of netting has different characteristics than the light passing through the aperture whereas the light modifier creates enhanced depth of lighting on a subject.

2. The light modifier of claim 1 wherein the panel has a plurality of layers of netting.

3. The light modifier of claim 2 wherein the aperture is in the center of each of the panels.

4. The light modifier of claim 3 wherein the layers of netting have different size apertures whereby there are more layers of netting that impact the light generated by the light source at the perimeter of the panel than in the center of the panel.

5. The light modifier of claim 4 wherein the layers of netting increase in a uniform manner from the center aperture to the perimeter of the panel.

6. The light modifier of claim 1 wherein an interior baffle is positioned between the first and second ends of the housing, the baffle acting to diffuse light from a light source before the light reaches the second end of the housing.

7. The light modifier of claim 6 wherein the baffle is white nylon fabric that diffuses the light from a light source.

8. The light modifier of claim 7 wherein the baffle is removable positioned in the housing.

9. The light modifier of claim 7 wherein the baffle is circular in shape and is sized to diffuse all of the light projected from a light source that passes through the aperture in the panel.

10. The light modifier of claim 5 wherein the apertures in the layers of netting are positioned concentrically in the layers of netting.

11. The light modifier of claim 1 wherein at least one layer of netting is made of a fabric selected from the group of nylon, polyester or cotton.

12. The light modifier of claim 1 wherein the at least one layer of netting is a cotton bobbin net material having the characteristics that allow the material to be used in high heat applications.

13. The light modifier of claim 12 wherein the cotton bobbin net material has round holes.

14. The light modifier of claim 1 wherein at least one spill light panel is moveably positioned on the second end of the housing and can be positioned to cover a portion of the panel to create different light patterns.

15. The light modifier of claim 14 wherein the spill light panel is made of a dark fabric.

16. The light modifier of claim 1 wherein the at least one layer of netting is made from a black fabric.

* * * * *



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
90/019,924

RECEIPT DATE / TIME
04/22/2025 02:10:37 PM Z ET

ATTORNEY DOCKET #
EXRE_PI_729

Title of Invention

WEBCAM ILLUMINATOR DEVICE

Application Information

APPLICATION TYPE Utility / ex parte reexam

PATENT # 7841729

CONFIRMATION # 7059

FILED BY Jialin Zhong

PATENT CENTER # 70108270

FILING DATE -

CUSTOMER # 140225

FIRST NAMED INVENTOR Henry Geddes

CORRESPONDENCE ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 8

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
EXRE_PI_729_EX PARTE REEXAMINATION TRANSMITTAL.pdf	4	Transmittal Letter	602 KB
Streamlined Request for Ex Parte Reexamination USP 7841729.pdf	26	Receipt Original Ex Parte Reexamination by 3rd party fewer then 40 Pages Rule 1.20(C)(1)	420 KB
EXH1 US7841729.pdf	10	Copy of patent for which reexamination is requested	568 KB
EXH2 KR200316985Y1 and Translation.pdf	15	Other reference-Patent/Application/Search Documents	851 KB
EXH3 US6238060.pdf	34	Other reference-Patent/Application/Search	2092 KB

Documents

EXH4 US20060007666A1.pdf	9	Other reference- Patent/Application/Search Documents	546 KB
EXH5 US20050151042A1.pdf	8	Other reference- Patent/Application/Search Documents	691 KB
EXH6 claim chart.pdf	12	Receipt Original Ex Parte Reexamination by 3rd party fewer then 40 Pages Rule 1.20(C)(1)	148 KB

Digest**DOCUMENT****MESSAGE DIGEST(SHA-512)**

EXRE_PI_729_EX PARTE REEXAMINATION TRANSMITTAL.pdf	A6A57C5C8D858CBF4CE0008AA999AA9B677D04A400A8AB0C 317D4DBD9AFF8A76729F59791EB981E4171E10DF62C2754B3 D176704B202024B1B491662297293A6
Streamlined Request for Ex Parte Reexamination USP 7841729.pdf	6762EE4F808B70837F2B67A3AAA7D9450C5D75DB51D05F40C B9EEEE62EABDDA04D1E47AFE708C4422B58236CB834F9FC CE1D8DDB632B0AE19A3A2ABF67220C4E
EXH1 US7841729.pdf	9C4F3296A8A595FF956B5B8F0877CB992E7C567881BD7267D DED86568D1FA83741F4404907C9BB3F05E0A00EB375332992 64828D21EBC94B9A5B8215D30FED21
EXH2 KR200316985Y1 and Translation.pdf	2E3CCEE576EA9E4C5C67D49B37E7CF19691682170B66639D D09D69B564D5A95D6FA9D8E45062A619247E3D237EB1F86C8 F4BB8EA1E2CA0DC6986FC17999ADBAE
EXH3 US6238060.pdf	C11F256C2028AC2918BF921FABC3AD911717FE4BAA25CAEC 72904257910E22972E80E7A06629DDBE17684945A6ADD3F6C 76601734D6FFF77E862129443EDBD48
EXH4 US20060007666A1.pdf	9BD53BA41E5A45E6146305C2666C05ABFFD56CAD9B8603232 9622BED6D4C4A71F450101F09923ACDDA69FDF0A5C43B048 55CF5C77063E7D9260294F43BEB2B31
EXH5 US20050151042A1.pdf	7B2DFCE46357C80DEFB36F3C58B0ADAAD472BF0EF756BF09 2E1B92770E16D50B9F1FADC92FEF7D9CE3F58277DB07E6C9 1D2438FC43E54550B4B9AEEF53C67554
EXH6 claim chart.pdf	80CA810EC712B1F7CD018D67CCF60F4DDEE65590E910B1F6 583F25758A802BFD1166EF77AB50D0447D7CE991456D056560 BF96FC1F0B2DA66DCA350C97E98E32

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #
90/019,924

RECEIPT DATE / TIME
04/22/2025 02:10:37 PM Z ET

ATTORNEY DOCKET #
EXRE_PI_729

Title of Invention

WEBCAM ILLUMINATOR DEVICE

Application Information

APPLICATION TYPE Utility / ex parte reexam

PATENT # 7841729

CONFIRMATION # 7059

FILED BY Jialin Zhong

PATENT CENTER # 70108270

AUTHORIZED BY -

CUSTOMER # 140225

FILING DATE -

CORRESPONDENCE ADDRESS -

FIRST NAMED INVENTOR Henry Geddes

Payment Information

PAYMENT METHOD
CARD / 9633

PAYMENT TRANSACTION ID
E20254LE11009818

PAYMENT AUTHORIZED BY
Jialin Zhong

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1831	EX PARTE REEXAMINATION (1.510(A)) STREAMLINED	6775.00	1	6775.00
TOTAL AMOUNT:				\$6,775.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Reexamination of:	) Examiner: Unassigned
	)
Henry Geddes	) Art Unit: Unassigned
	)
U.S. Patent No. 7,841,729	) Confirmation No.:
Filed: January 24, 2008	)
Issued: November 30, 2010	) CERTIFICATE OF ELECTRONIC
	) FILING
	) I hereby certify that this correspondence is being
For: WEBCAM ILLUMINATOR DEVICE	) submitted electronically via EFS Web on the date
	) shown below.
	)
	) <u>/Jialin Zhong /</u>
	) Date: April 22, 2025

**STREAMLINED REQUEST FOR EX PARTE REEXAMINATION OF
U.S. PATENT NO. 7,841,729 PURSUANT TO 37 C.F.R. §1.510**

E-Filed via EFS-Web
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir/Madam:

This is a request for *ex parte* reexamination pursuant to 37 C.F.R. §1.510 *et seq.* of claims 1-9 of U.S. Patent 7,841,729 (hereinafter “the ‘729 patent”), with a title of “Webcam Illuminator Device,” which issued November 30, 2010 from U.S. App. No. 12/011,090 filed January 24, 2008 (the ‘090 application). The ‘090 application on its face claims benefit from U.S. Provisional App. No. 60/897,600 filed January 26, 2007.

The *ex parte* reexamination fee of \$6,775.00 for a streamlined request is paid herein by credit card. The Commissioner is hereby authorized to charge any shortage to the Deposit Account No. 60-2313.

I. List of Exhibits	4
II. Identification of Claims for Which Reexamination is Requested	5
III. Summary of Substantial New Questions of Patentability and Proposed Rejections	6
A. Table I – Summary of Substantial New Questions of Patentability	6
B. Table II – Summary of References that Raise Substantial New Questions of Patentability	6
IV. Table III – Summary of Proposed Rejections.....	7
V. Summary of the Prosecution History of the ‘729 patent	8
VI. Detailed Explanation of Substantial New Questions of Patentability	9
A. (SNQ1) Claims 1-9 of the ‘729 patent are obvious under pre-AIA 35 U.S.C. §103(a) over Kwak, Bourn, and Watson	10
Independent claim 1	11
Dependent claim 2	18
Dependent claim 3	19
Dependent claim 4	19
Dependent claim 5	20
Dependent claim 6	21
Dependent claim 7	21
Dependent claim 8	22
Dependent claim 9	23
VII. Proposed Rejections.....	24

A. Proposed Rejection 1. Claims 1-9 should be rejected under pre-AIA 35 U.S.C. §103(a) as unpatentable over Kwak, Bourn, Watson, and Cook.....	24
VIII. Conclusion	25

I. List of Exhibits

<u>Exhibit No.</u>	<u>Description</u>
Exhibit 1	U.S. Patent 7,841,729 (patent to be reexamined)
Exhibit 2	KR 200316985 (“Kwak”) and its translation (“Kwak Translation”)
Exhibit 3	U.S. Patent 6,238,060 (“Bourn”)
Exhibit 4	U.S. Pub. No. 2005/0151042 (“Watson”)
Exhibit 5	U.S. Pub. No. 2006/0007666 (“Cook”)
Exhibit 6	Claim chart of claims 1-9 compared to disclosures of Kwak, Bourn, Watson, and Cook

II. Identification of Claims for Which Reexamination is Requested

Ex parte reexamination of claims 1-9 of U.S. Patent 7,841,729 is requested pursuant to 37 CFR 1.510.

III. Summary of Substantial New Questions of Patentability and Proposed Rejections

In this request, a substantial new question of patentability is set forth, as summarized below in Table I. The substantial new questions of patentability listed in Table I are based on the references cited herein. The proposed rejections for each substantial new question of patentability are summarized in Table III below.

A. Table I – Summary of Substantial New Questions of Patentability

Substantial New Question (SNQ) of Patentability	Page Number
SNQ1. Claims 1-9 of the '729 patent are unpatentable under pre-AIA 35 U.S.C. §103 or obvious under pre-AIA 35 U.S.C. §103 over Kwak, Bourn, Watson, and Cook	9

B. Table II – Summary of References that Raise Substantial New Questions of Patentability

Reference	Short Name	Previously Discussed in Office Actions?	Previously Considered On The Record?
KR 200316985	Kwak	No	No
U.S. Pat. No. 6,238,060	Bourn	No	No
U.S. Pat. Pub. 2005/0151042	Watson	No	No
U.S. Pat. Pub. 2006/0007666	Cook	Yes	Yes

IV. Table III – Summary of Proposed Rejections

Proposed Rejection	Detailed Discussion Page
Claims 1-9 of the '729 patent are obvious under pre-AIA 35 U.S.C. §103 or are obvious under pre-AIA 35 U.S.C. §103 over Kwak, Bourn, Watson, and Cook	23

V. Summary of the Prosecution History of the ‘729 patent

The ‘729 patent was issued November 30, 2010 from U.S. App. No. 12/011,090, filed January 24, 2008 (the ‘090 application). The ‘090 application on its face claims benefit from U.S. Provisional App. No. 60/897,600 filed January 26, 2007. Thus, the earliest possible priority date of the ‘729 patent is January 26, 2007.

At the time of filing, the ‘090 application included 16 claims including independent claims 1 and 13.

The Examiner issued the first Office Action dated November 27, 2009 in which claims 1-10 were rejected as being anticipated by U.S. Pat. 3,604,913 (“Crete”); claims 11 and 12 were rejected as unpatentable over Crete in view of U.S. Pat. Pub. 2006/0007666 (“Cook”); claims 13-16 were rejected as being anticipated by U.S. Pat. Pub. 2007/0139515 (“Du Breuil”).

Applicant of the ‘090 application submitted a response dated March 1, 2010 to the first Office Action. The response canceled claims 3 and 5 and amended claims 1, 4, and 13.

The Office issued a Notice of Allowance May 12, 2010.

Applicant of the ‘090 application subsequently R312 amendment including cancellation of claim 2 and amendments to claims 7 and 10-13. The R312 amendment was entered August 23, 2010.

The applicant submitted the Issue Fee August 12, 2010. The ‘729 patent was issued February 17, 2023.

VI. Detailed Explanation of Substantial New Questions of Patentability

Kwak, Bourn, and Watson were not considered or listed as considered by the Examiner during the prosecution of the '729 patent. As explained herein below, various combinations of the cited references raise substantial new questions (SNQ) of patentability with respect to claims 1-9 of the '729 patent.

As a preliminary matter, the filing date of the '729 patent (or the '090 application) as listed on its face was January 24, 2008 which was prior to the adaptation of the America Invents Act (AIA). Therefore, the reexamination of claims 1-9 of the '729 patent is governed by the pre-AIA 35 U.S.C. The '729 patent claims benefit to U.S. Provisional App. 60/897,600 filed January 26, 2007. Thus, the earliest possible priority date of the '729 patent was January 26, 2007.

Kwak was filed as a Korean utility model patent application April 3, 2003 and was granted and published June 19, 2003 which was more than one year earlier than the January 26, 2007 effective filing date of the '729 patent. Therefore, Kwak is a pre-AIA 35 U.S.C. 102(b) prior reference to the '729 patent. A certified translation of Kwak (Kwak Translation) is provided as Exhibit 2.

Bourn is a U.S. patent granted May 29, 2001 which was more than one year earlier than the January 26, 2007 effective filing date of the '729 patent. Therefore, Bourn is a pre-AIA 35 U.S.C. 102(b) prior reference to the '729 patent. Bourn is provided as Exhibit 3.

Watson is a U.S. patent publication published July 14, 2005 which was more than one year earlier than the January 26, 2007 effective filing date of the '729 patent. Therefore, Watson is a pre-AIA 35 U.S.C. 102(b) prior reference to the '729 patent.

Cook is a U.S. patent publication published January 12, 2006 which was more than one year earlier than the January 26, 2007 effective filing date of the '729 patent. Therefore, Cook is a pre-AIA 35 U.S.C. 102(b) prior reference to the '729 patent. Cook was considered in the Office action dated November 27, 2009 against dependent claims 11 and 12 (which corresponds to dependent claims 8 and 9 of the '729 patent).

A. (SNO1) Claims 1-9 of the ‘729 patent are obvious under pre-AIA 35 U.S.C. §103(a) over Kwak, Bourn, Watson, and Cook

The combination of Kwak, Bourn, Watson, and Cook raises a substantial new question of patentability with respect to claims 1-9 of the ‘729 patent because the combination, while pertaining to the same technical field, discloses or teaches all of the elements of each of claims 1-9.

Kwak is concerned with “a PC webcam stand with a lighting function.” See Kwak Translation at abstract. The applicant of Kwak recognizes that “in most PC cafes, the PC webcam is arranged on a display, so that a video chat with an opposite side can be performed” and the associated issue that “because most users in the PC cafes use computers, the overall lighting is darker. Therefore, the image photographed by the camera is not clear during video chats, limiting the enjoyment of the video chats.” The invention of Kwak was made “to provide a PC webcam stand with a lighting function, thereby *enabling a photographed object to be lighted during a video chat.*” See Kwak Translation at page 2, lines 14-30 (emphasis added).

In the same and related field of illumination technology, Bourn is concerned with an “illumination method and apparatus for machine-vision systems, including a ring-light source (e.g., LEDs arranged in one or more circular rows), and a reflective-ring focusing element.” See Bourn at abstract. Therefore, Bourn is in the same and related technical field of illumination technology as Kwak.

In the same and related field of webcam and lighting, Watson is concerned with a camera mount that “supports a web camera thereon. The mount includes a bracket for supporting a light source thereon and a platform supported on the bracket for receiving the base of the web camera thereon. The light source may be operable in either flash or steady-on modes to provide optimum lighting for the web camera.” See Watson at abstract.

In the same and related field of lighting, Cook is concerned with a light modifier for creating an enhance depth of lighting on a subject. See Cook at abstract.

Therefore, it is obvious for a person of ordinary skill in the art, if needed, to combine Kwak, Bourn, Watson, and Cook because the combination is a “predictable variation” or a “combination of familiar elements according to known methods [that] does no more than yield predictable results,” within the same technical field and such combination is obvious under *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 415-16, 82.

Claim charts mapping the teachings of the applied references to the elements of claims 1-9 are attached hereto as Exhibit 6 and incorporated herein by reference.

Independent claim 1

- **An illuminator device for illuminating one or more users in front of a web camera and a communication terminal comprising:**

With respect to the substantial new question of patentability of the ‘729 patent, Kwak discloses:

The present utility model relates to *a PC webcam stand with a lighting function*, including: a fixing component; a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable is extended; a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and a lamp for lighting an object, arranged at a predetermined position of the mounting component to *enable the PC webcam positioned on the mounting component to clearly photograph the object*.

According to the present utility model, *the lighting function is provided to light an object, thus enabling the object to be clearly photographed and transmitted regardless of the brightness of the surroundings. Besides, in addition to the lighting function, the lighting angle may be freely adjusted, thus effectively lighting the object*. Moreover, the PC webcam may be easily arranged and fixed in a detachable manner by means of a magnetic force, and is very easy to separate, thus providing a very practical effect. See Kwak Translation at abstract (emphasis added).

Kwas further recognizes that “in most PC cafes, the PC webcam is arranged on a display, so that a video chat with an opposite side can be performed.” and the associated issue that “because most users in the PC cafes use computers, the overall lighting is darker. Therefore, the image photographed by the camera is not clear during video chats, limiting the enjoyment of the

video chats.” The invention of Kwak was made “[t]o solve the above technical problem, the objective of the present utility model is *to provide a PC webcam stand with a lighting function, thereby enabling a photographed object to be lighted during a video chat.*” See Kwak Translation at page 2, lines 14-30 (emphasis added). Therefore, Kwak is concerned with the same technology field and solves the same challenges as those of the ‘729 patent.

Therefore, Kwak discloses and teaches “[a]n illuminator device for illuminating one or more users in front of a web camera and a communication terminal” recited in claim 1.

- **a bulb having a toroidal shape for emitting light;**

Kwak discloses:

a fixing component; a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable (C) is extended; a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and *a lamp provided at a predetermined position of the mounting component to light an object so that the object can be clearly photographed by the PC webcam positioned on the mounting component.* See Kwak Translation at page 2, line 39 – page 3, line 4 (emphasis added).

The PC webcam stand 100, as shown in FIG. 2 and FIG. 3, includes a fixing component 10, attached to a display 1; a connecting pipe 20, one side end of which is coupled to the fixing component 10 and through an inside of which a USB cable (C) is extended; a mounting component 30, to a bottom surface of which the other side end of the connecting pipe 20 is coupled, on an upper surface of which a PC webcam 50 is positioned, and on a rear surface of which a USB port 31 electrically connected to the PC webcam 50 is arranged; and *a lighting device 40 provided at a predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30.* See Kwak Translation at page 3, lines 22-29 (emphasis added).

The bottom surface of the mounting component 30 is coupled to the other side end of the connecting pipe 20. Therefore, a fastening pipe 32 is provided on the bottom

surface of the mounting component 30, so that the other side end of the connecting pipe 20 can be inserted. The connecting pipe 20 is fixed by a usual fastening device or adhesive material in a state of being inserted into the fastening pipe 32. In addition, a specified space portion is formed on the front inner side of the mounting component 30, *so that the lamp 41 can be easily arranged, and moreover, a reflecting cover 42 is arranged behind the lamp 41, and a convex lens 43 is provided in front of the lamp 41.* In addition, a reference wall 33 is formed in a protruding manner on one side of an upper surface of the mounting component 30 for positioning the PC webcam 50, and a magnet or a metal plate 34 is provided on the upper surface thereof to easily fix the PC webcam 50 according to a magnetic force. That is, when the magnet is attached to the bottom surface of the camera 50, the metal plate is provided on the upper surface of the mounting component 30, and when a shell of the camera 50 is of a metal material or is attached to the metal plate, the magnet is attached to the upper surface of the mounting component 30. In addition, a USB port 31 is provided on a rear surface of the mounting component 30, so that the USB cable C extending through the connecting pipe 20 is easily connected to the PC webcam 50.

The lamp 41 is configured to light the photographed object photographed by the PC webcam 50 and receives a power supply through an electric wire of the USB cable C. Namely, an electric wire of about 5V of the USB cable C is electrically connected in a state that the electric wire is branched to the sides of the lamp 41 and the PC webcam 50. In addition, the lamp 41 is connected to a dimmer 44 between the lamp 41 and the electric wire of the USB cable C, so that the brightness thereof may be adjustable. To facilitate operation, a handle portion of the dimmer 44 protrudes from the bottom portion of the mounting component 30. Kwak Translation at page 3, line 41 – page 4, line 15 (emphasis added)

Therefore, Kwak discloses and teaches *a bulb . . . for emitting light* recited in claim 1. Although Kwak discloses a lamp 41 without a limitation on the shape of the lamp, Kwak is silent as to the shape of lamp 41. In the same and related technical field of illumination systems, Bourn discloses and teaches:

In one embodiment, the ring light source includes *a ring-shaped flashtube* located substantially along a circle disposed perpendicular to and centered on the optical axis, and further includes an enclosure having a slit located between the ring-shaped flashtube and the ring reflector, wherein the slit allows light from the flashtube to fall on a reflecting surface of the ring reflector. See Bourn at col. 3, line 50-56 (emphasis added).

The present invention takes advantage of the efficiency of high-brightness red, infra-red, blue, white, or other color LEDs arranged in one or more circular rows, and the properties inherent to a reflective focusing element such as a turned angled reflective ring to produce an illumination source for machine-vision systems. The illumination source exhibits multi-directional ring-illumination properties which are useful for illumination of small components (which are being inspected or measured) without unwanted shadows. See Bourn at col. 2, line 32-39 (emphasis added).

A person of ordinary skill in the art (POSITA) would be motivated to substitute the lamp 41 of Kwak with the ring-shaped light because the ring-shaped light “exhibits multidirectional ring-illumination properties which are useful for illumination” without unwanted shadows. See Bourn at abstract and col. 2, line 32-39 for the motivation. Therefore, Kwak in view of Bourn teaches *a bulb having a toroidal shape for emitting light*.

- **a reflector having a circular configuration to conform to the toroidal shape of said bulb for projecting the emitted light;**

Kwak discloses and teaches that *a reflector 42 is provided behind the lamp 41*. Further, Bourn discloses and teaches:

The present invention provides a method and apparatus which provide an illumination source for illuminating an object in a machine-vision system having a machine-vision camera, the camera having an optical axis. One embodiment of the illumination source includes a ring-light source emitting light from a plurality of points, the points being along one or more circles, a focusing element, *the focusing element including an angled ring reflector to direct rays from the ring light source at an angle generally towards the optical axis*. One embodiment provides a replaceable ring reflector for changing the light-source-to-optical-axis and/or changing the spread and/or

focus of the light from ring light source. One embodiment provides light from multiple directions in order to reduce shadowing. One embodiment provides light to illuminate the inside of, for example, an aluminum beverage can before it is filled and sealed. See Bourn at Col. 2, line 60 - Col. 3, line 8 (emphasis added).

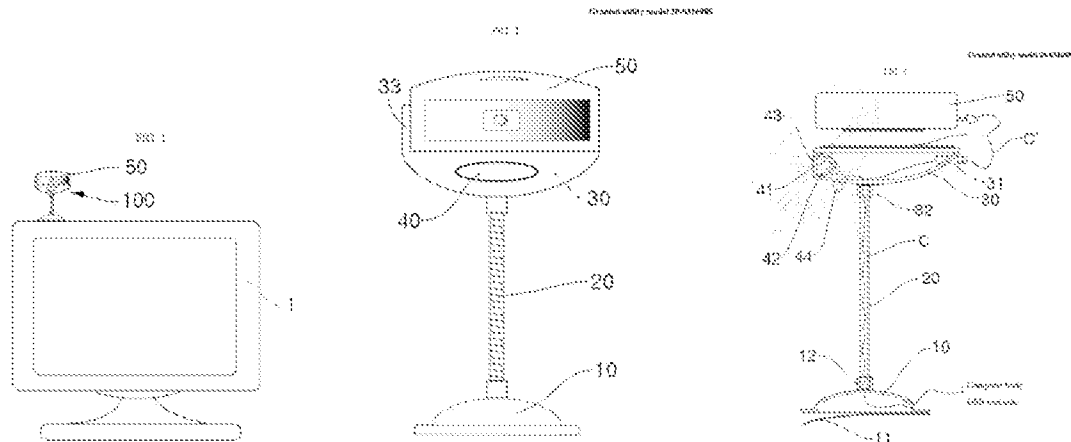
Therefore, Kwak in view of Bourn teaches *a reflector having a circular configuration to conform to the toroidal shape of said bulb for projecting the emitted light* recited in claim 1.

- **and an arm disposed between said bulb and the terminal for connection to the terminal;**

Kwak discloses:

The PC webcam stand 100, as shown in FIG. 2 and FIG. 3, includes a fixing component 10, attached to a display 1; a connecting pipe 20, one side end of which is coupled to the fixing component 10 and through an inside of which a USB cable (C) is extended; *a mounting component 30, to a bottom surface of which the other side end of the connecting pipe 20 is coupled, on an upper surface of which a PC webcam 50 is positioned*, and on a rear surface of which a USB port 31 electrically connected to the PC webcam 50 is arranged; and a lighting device 40 provided at a predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30. See Kwak Translation at page 3, lines 22-29

Then, at a position (for example, a display, a computer body, a desk lamp) suitable for photographing the photographed object, the stand 100 is fixed by the fixing component 10, and *the flexible pipe 20* is adjusted with reference to the photographed picture, so that the position of the PC webcam 50 is adjusted more finely. See Kwak Translation at page 4, lines 26-29 (emphasis added).



See also Figures 1-3 of Kwak (showing connecting pipe 20 disposed between light device 40 (including lamp 41) and the computer.

Therefore, Kwak discloses and teaches *an arm disposed between said bulb and the terminal for connection to the terminal* recited in claim 1.

- **wherein said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera.**

The description of the '729 patent does not provide a definition for the meaning for the term "positionable." Further, the English dictionary does not have an entry for this term. See Merriam-Webster's Collegiate Dictionary, Eleventh Edition. Claim 1 of the '729 patent only requires that "bulb is positionable relative to the web camera" without limiting how the bulb is positionable relative to the web camera. Claim 4 which depends from claim 1 recites that "said arm is a flexible arm that *permits said bulb to be positioned relative to the web camera,*" (emphasis added), which provides one way to position the bulb with respect to the web camera. Therefore, that "bulb is positionable" can be achieved by bending the flexible arm. Kwak in various portions discloses that the position of its lamp 41 can be changes or positionable. See, e.g., Kwak at page 3, lines 37-40 ("the connecting pipe 20 is preferably formed by a flexible pipe, so that the lighting angle of the lamp 41 can be easily adjusted"). Therefore, Kwak discloses or teaches "said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera."

Kwak further discloses that "[a]nother objective of the present utility model is to *provide a PC webcam stand that allows the lighting angle to be freely adjusted.*" See Kwak Translation at page 2 at lines 31-32. Kwak further discloses "*a lighting device 40 provided at a*

predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30.” See Kwak Translation at page 3 at lines 27-29. Kwak further states:

First, the USB cable C of the PC webcam stand 100 is inserted into the USB port (not shown) of the computer body, and the USB cable C' of the PC webcam 50 is inserted into the USB port 31 in the rear surface of the mounting component 30 of the stand 100. At this time, the PC webcam 50 and the computer body will be electrically connected according to the USB cables C-C'. At this time, *the PC webcam 50 is mounted on the upper surface of the mounting component 30 of the stand 100. As described above, the position the of PC webcam is determined according to the reference wall 33. Since the assembling and disassembling can be achieved by magnetism, the PC webcam can be easily relocated.* See Kwak Translation at page 4 at lines 18-25 (the position of the PC video camera is determined by its position on the reference wall (33) or depending on where it is installed on the reference wall, the PC video camera position may change easily) See Kwas Translation at page 4, lines 18-25 (emphasis added).

Kwak discloses that the position of the PC video camera can be mounted at different positions easily by magnetic force on the reference wall and also discloses “a lighting device 40 provided at a predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30.” Therefore, Kwak discloses and teaches that *said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera* because by adjusting the position of the PC video camera on mounting component 30 -- thereby adjusting the relative position between the PC video camera 30 and lamp 41, Kwak achieves a clear capture of the subject or achieving optimal view of the user through the PC video camera.

Further, Watson in the related and same technical field discloses a camera mount for supporting a web camera on a supporting surface and more particularly relates to a camera mount for supporting a light source in combination with a web camera. See Watson abstract. Figs. 1-3 of Watson shows a web camera 12 and a light bulb 44, where the camera is preferably adjustable in position relative to the bracket. See Watson at paragraph 0017. Watson also explicitly states that the light source is adjustable in position relative to the camera. See Watson

claim 12. Therefore, Watson discloses and teaches *said bulb is positionable relative to the web camera*.

Watson discloses that “the light source is adjustable in position relative to the camera.” See Watson claim 12.

Watson discloses that “In some embodiments the platform 14 may be provided by itself with the support bracket simply for supporting the camera thereon out of the way of the user. *It is desirable however to provide a combination of a support for lights and for a web camera to ensure adequate lighting when using the video mode of the web camera*. See Watson at paragraph 0044.

Watson is in the same technical field of a camera mount support and illumination technology as Kwak. A POSITA would be motivated to combine Watson with Kwak because the POSITA would have known that adjusting the position of the light source relative to the camera can help achieve optimum imaging. Therefore, Kwak in view of Watson discloses and teaches that *said bulb is positionable relative to the web camera to provide optimal viewing of the user through the web camera* recited in claim 1.

For at least the above-discussed reasons, Kwak in view of Bourn further in view of Watson teaches all features recited in claim 1 of the ‘729 patent. Therefore, claim 1 is unpatentable under pre-AIA 35 U.S.C. 103(a) over Kwak in view of Bourn further in view of Watson.

Dependent claim 2

- **wherein said reflector is positioned proximate said bulb to project light towards a face of said user or said users.**

Claim 2 depends from claim 1. As explained herein above, Kwak teaches *a lighting device 40 provided at a predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30 and a reflector 42 is provided behind the lamp 41*. Therefore, Kwak discloses and teaches the reflector is positioned proximate said bulb to project light towards a face of said user or said users. Bourn teaches a focusing element, *the focusing element including an angled ring reflector to direct rays from the ring light source at an angle generally towards the optical axis*. See Bourn at Col. 2, line 60 - Col. 3, line 8.

Therefore, Kwak in view of Bourn teaches that said reflector is positioned proximate said bulb to project light towards a face of said user or said users recited in claim 1.

Dependent claim 3

- **wherein said reflector is lined with a reflective material or film.**

Claim 3 depends from claim 1. It is well known that a reflector is commonly lined with reflective materials. Further, Bourn discloses:

In one embodiment, *ring reflector 220 is fabricated by turning on a lathe a blank of aluminum, stainless steel, plastic, glass or other suitable material to generate a circularly symmetric reflective face* (e.g., conical-section face 2211) (i.e., the surface of the cross section shown is a straight line at an angle of 52 degrees from the plane of exit opening, i.e., 38 degrees from the optical axis 299), which is then polished and/or chrome plated to enhance its reflectivity at a wavelength of ring-light source 230. In another embodiment, ring reflector 221 is cast, e.g., by injection molding, from a suitable plastic, and *then coated by well known methods with a reflective coating of chrome, gold or other metal, alloy, or multiple optical coating layers to enhance its reflectivity at one or more selected wavelengths of ring-light source 230*. (These manufacturing methods can apply to any of the ring reflectors described below.) See Bourn at Col. 11, line 16-31 (emphasis added).

Therefore, Kwak in view of Bourn teaches that “said reflector is lined with a reflective material or film” recited in claim 3.

Dependent claim 4

- **wherein said arm is a flexible arm that permits said bulb to be positioned relative to the web camera.**

Claim 4 depends from claim 1. Kwak discloses:

One side of the connecting pipe 20 is coupled to the fixing component 10, a USB cable extends through the inner side thereof, and the USB cable is electrically connected to the USB port (not shown) of the computer body. In addition, *the*

connecting pipe 20 is preferably formed by a flexible pipe, so that the lighting angle of the lamp 41 can be easily adjusted. See Kwak Translation at page 3, lines 37-40.

(emphasis added)

Therefore, Kwak discloses *a flexible arm* that permits said bulb to be positioned relative to the web camera. Further, Watson discloses an elongate flexible rod 42 connecting to a light bulb 44, where the flexible rod 42 can be manually adjusted such that the light bulb is positioned relative to web camera 12. See Watson at Figures 1 and 2; and at paragraph 0033 (“The lights 22 each include an elongate flexible rod 42 which carries wiring therethrough from a base end received in the receptacles 38 to a free end supporting a light bulb 44 thereon. The rods 42 are flexible and are sufficiently stiff to remain in a selected orientation once manually adjusted.”)

Therefore, Kwak in view Watson teaches that *said arm is a flexible arm that permits said bulb to be positioned relative to the web camera* recited in claim 4.

Dependent claim 5

- **wherein said arm is connected to the terminal by a clamp.**

Claim 5 depends from claim 1. Kwak discloses a fixing component 10 attached to display 1. See Kwak Translation at Fig. 2. Further, Watson discloses:

While various embodiments of the camera are illustrated in the accompanying figures, the common elements will first be described herein. The camera mount 10 includes a platform 14 for supporting the camera thereon. The camera includes a broad flat supporting surface which readily accepts the base of various types of commercially available web cameras 12 to be supported thereon. *A support bracket 16 is provided which can be mounted on a suitable supporting surface such as a wall and the like or may be adapted for attachment to a laptop screen in some embodiments.* A support arm 18 couples the platform to the support bracket for supporting the camera 12 on the supporting surface to which the bracket is attached. A light mount 20 is provided on the bracket 16 for supporting a light source 22 thereon. See Watson at paragraph 0029.

Turning now to the embodiment of FIG. 3, the bracket 16 is adapted to include inverted *U-shaped clips 60 which can be secured overtop of the top edge of a lap top display monitor 62 in a snap fit engagement therewith.* The remaining features of the

bracket including the adjustable support arm 18 and light sources 22 remain identical to the previous embodiment. See Watson at paragraph 0035 (emphasis added).

Therefore, Kwak in view of Watson teaches that said arm is connected to the terminal by a clamp recited in claim 5. Further, it is well known in the art that a clamp is designed for and can be used for connecting a lamp to a support.

Dependent claim 6

- **wherein the clamp is movable along an edge of the terminal to adjust the location of said bulb.**

Claim 6 depends from claim 5. Kwak discloses “In the above technical structure, although the fixing component 10 is shown attached to the display 1, the fixing component can be attached to any position where the photographed object can be photographed during the video chat. Therefore, an adhesive surface (for example, a double adhesive tape: 11) is arranged on the bottom surface of the fixing component 10.” See Kwak Translation at page 3, lines 30-33. Thus, Kwak teaches the fixing component 10 can be attached to any position on display 1. Further, Watson discloses that “the bracket **16** is adapted to include inverted U-shaped clips **60** which can be secured overtop of the top edge of a lap top display monitor **62** in a snap fit engagement therewith.” See Watson at paragraph 0018 and Fig. 3 (U-shape clip 60 that is movable along the edge of monitor 62).

Therefore, Kwak in view of Watson teaches that *the clamp is movable along an edge of the terminal to adjust the location of said bulb* recited in claim 6.

Dependent claim 7

- **wherein the arm has a base that supports the illuminator device on a flat surface adjacent to the terminal.**

Claim 7 depends from claim 1. Kwak discloses a fixing component 10 that corresponds to a base that supports lamp 41 on a flat surface adjacent to display 1. See Kwak at Figures. 1 and 2 (fixing component 10 is on a flat surface adjacent to display 1).

Therefore, Kwak discloses that the arm has a base that supports the illuminator device on a flat surface adjacent to the terminal recited in claim 7.

Dependent claim 8

- **wherein said reflector has a piece of fabric thereon disposed between said bulb and a user's face for diffusing the light emitted from said bulb.**

Claim 8 depends from claim 1. It is well known at the effective filing date of the '729 patent that a piece of fabric can be disposed between a light bulb and the subject for diffusing the light emitted from the light bulb. Further, Bourn discloses:

In one embodiment, *ring reflector 220 is fabricated by turning on a lathe a blank of aluminum, stainless steel, plastic, glass or other suitable material to generate a circularly symmetric reflective face* (e.g., conical-section face 2211) (i.e., the surface of the cross section shown is a straight line at an angle of 52 degrees from the plane of exit opening, i.e., 38 degrees from the optical axis 299), which is then polished and/or chrome plated to enhance its reflectivity at a wavelength of ring-light source 230. In another embodiment, ring reflector 221 is cast, e.g., by injection molding, from a suitable plastic, and then coated by well known methods with a reflective coating of chrome, gold or other metal, alloy, or multiple optical coating layers to enhance its reflectivity at one or more selected wavelengths of ring-light source 230. (These manufacturing methods can apply to any of the ring reflectors described below.) Bourn at Col. 11, line 16-31 (emphasis added).

The present invention provides a method and system for generating rays of light with suitable brightness and evenness from a source surrounding, for example, the lens of a machine-vision camera. The rays are directed generally towards the optical axis of the camera. *One embodiment provides a diffuse source circumferentially* such that even extremely small objects can be adequately inspected and accurately measured by a machine-vision system 100. Bourn at Col. 5, line 64 – col. 6, line 4 (emphasis added).

Therefore, Bourn teaches providing *a diffuse source circumferentially*. Although Kwak in view Bourn further in view of Watson does not specifically teach the use of a piece of material of fabric as a diffuser. Cook in a light modifier teaches the use of a piece of material of fabric in a

light box as a diffuser. See Cook at paragraph 0013. It would be obvious to a person of ordinary skill in the art at the time of the invention to incorporate the teaching of Cook and provide a piece of fabric material as a diffuser. The reason, as stated by Cook, is to create an enhanced depth of lighting.

Therefore, Kwak in view of Bourn further in view of Cook teaches “said reflector has a piece of fabric thereon disposed between said bulb and a user's face for diffusing the light emitted from said bulb” recited in claim 8.

Dependent claim 9

- **wherein said fabric is silk or muslin.**

Claim 9 depends from claim 8. Cook discloses that various materials may be diffuse light. It is well known that silk or muslin is a type of fabric that can be used as a diffuse material. See Cook claims 7 and 11. Therefore, Kwak in view of Bourn further in view of Cook teaches “said fabric is silk or muslin” recited in claim 9.

VII. Proposed Rejections

A. Proposed Rejection 1. Claims 1-9 should be rejected under pre-AIA 35 U.S.C. §103(a) as unpatentable over Kwak, Bourn, Watson, and Cook

Claims 1-9 should be rejected under pre-AIA 35 U.S.C. §103(a) as unpatentable over Kwak, Bourn, Watson, and Cook.

The combination of Kwak, Bourn, Watson, and Cook raises a substantial new question of patentability with respect to claims 1-9 as discussed above.

Elements of the above-referenced claims are item-mapped to the teachings of Kwak, Bourn, Watson, and Cook in the claim chart attached as Exhibit 6, which is incorporated herein by reference.

VIII. Conclusion

For the foregoing reasons, Requester respectfully submits that reexamination should be ordered, and claims 1-9 of the '729 patent should be rejected.

Please charge any shortage to our Deposit Account No. 60-2313.

Respectfully submitted,

ZHONG LAW, LLC

Date: April 22, 2025

/Jialin Zhong/

Jialin Zhong

Reg. No.: 62,937

51 JFK Parkway, First Floor West

Short Hills, New Jersey 07078

CERTIFICATE OF SERVICE

The undersigned hereby certifies that this *ex parte* reexamination request with all appendices and certificates was served on the patent owner by placing a copy in first class mail with sufficient postage addressed to counsel of record for U.S. Pat. No. 7,841,729:

Finn IP Law, PC
11400 W. Olympic Blvd, 9th FL
Los Angeles, CA 90064
United States

And

Pathway IP LLC
400 Rella Blvd, STE 156
Montebello, NY 10901
United States

Date: April 22, 2025

/Jialin Zhong/

Jialin Zhong

(19)대한민국특허청(KR)
(12) 등록실용신안공보(Y1)

(51) Int. Cl.⁷
H04N 5/225

(45) 공고일자 2003년06월19일
(11) 등록번호 20-0316985
(24) 등록일자 2003년06월05일

(21) 출원번호 20-2003-0010158
(22) 출원일자 2003년04월03일

(73) 실용신안권자 박철호
광주광역시 북구 중흥2동 모타타운 107동 502호

(72) 고안자 박철호
광주광역시 북구 중흥2동 모타타운 107동 502호

(74) 대리인 이현재

기술적요건 심사관 : 장현근

기술평가청구 : 없음

(54)피씨용 화상 카메라 거치대

요약

본 고안은 조명기능이 부가된 피씨(PC)용 화상 카메라 거치대에 관한 것으로, 고정부재와, 고정부재에 그 일측단이 체결되고 그 내측을 통하여 USB케이블이 연장형성된 연결관과, 연결관의 타측단이 그 저면에 체결되고 그 상면에 피씨용 화상 카메라가 위치되며 그 후면에 피씨용 화상 카메라가 전기적으로 접속되는 USB포트가 마련된 장착부재와, 장착부재에 위치된 피씨용 화상 카메라를 통하여 피사체를 선명하게 촬영할 수 있도록 장착부재의 소정위치에 피사체를 조명하기 위한 램프가 구비된 것을 특징으로 한다.

본 고안에 따르면, 피사체를 조명할 수 있도록 조명기능이 구비됨으로써 주변의 밝기에 관계없이 피사체를 선명하게 촬영하여 전송할 수 있다. 또한, 조명기능과 함께 조명 각도를 자유롭게 조절할 수 있어, 피사체를 보다 효과적으로 조명할 수 있다. 그리고 자력(磁力)에 의한 착탈 방식으로, 피씨용 화상 카메라를 손쉽게 설치 · 고정시킬 수 있고, 분리 또한 매우 간편하다는 매우 실용적인 효과가 있다.

대표도

도 2

색인어

화상 카메라, USB케이블, 가요관, 조명, 램프

명세서

고안의 구성 및 작용

본 고안의 또 다른 목적은 피씨용 화상 카메라를 용이하게 작동시킬 수 있도록 한 피씨용 화상 카메라 장치대를 제공하는데 있다.

본 고안의 다른 목적은 조명 각도(角度)를 자유롭게 조절할 수 있도록 한 피씨용 화상 카메라 장치대를 제공하는데 있다.

본 고안은 전술한 문제점을 해결하기 위하여 안출된 것으로, 그 목적은 화상채팅 시 피사체를 조명할 수 있도록 조명이 구비된 피씨용 화상 카메라 장치대를 제공하는데 있다.

고안이 이루고자 하는 기술적 과제

즉, PC방은 다수의 이용자들이 컴퓨터를 사용하므로 전체적인 조명이 어둡다. 그에 따라, 화상 채팅시 카메라로 찍힌 영상이 선명하지 못해 화상 채팅의 묘미를 즐기는 데 한계가 있었다.

그러나 PC방에서의 화상 채팅 시 다음과 같은 문제점이 있었다.

이에 따라, 대부분의 PC방에는 상대방의 얼굴을 보며 채팅할 수 있도록 모니터 상에 피씨용 화상 카메라가 설치되어 이와 같은 피씨용 화상 카메라는 카메라에 찍힌 영상을 리얼 타임으로 보여 준다는데 점에서 큰 인기를 끌고 있다.

일반적으로 컴퓨터를 통한 화상회의나 화상 채팅 등에 주로 사용되는 작은 카메라를 피씨용 화상 카메라라 일컫는다.

본 고안은 피씨용 화상 카메라 장치대에 관한 것으로, 더욱 상세하게는 조명기능이 부가된 피씨(PC)용 화상 카메라 장치대에 관한 것이다.

고안이 속하는 기술 및 그 분야의 종래기술

고안의 목적

고안의 상세한 설명

50: 피씨용 화상 카메라

30: 장착부재 40: 조명수단

10: 고정부재 20: 연결부재

1: 모니터 100:거치대

도면의 주요부분에 대한 부호의 설명

도 3은 본 고안에 따른 피씨용 화상 카메라 장치대의 단면도이다.

도 2는 본 고안에 따른 피씨용 화상 카메라 장치대의 정면도이다.

도 1은 본 고안에 따른 피씨용 화상 카메라 장치대의 사용 예시도이다.

고안의 간단한 설명

본 고안은 상기의 기술적 과제를 달성할 수 있도록 고정부재와, 고정부재에 그 일측단이 체결되고 그 내측을 통하여 USB케이블이 연장형성된 연결관과, 연결관의 타측단이 그 저면에 체결되고 그 상면에 피씨용 화상 카메라가 위치되며 그 후면에 피씨용 화상 카메라가 전기적으로 접속되는 USB포트가 마련된 장착부재와, 장착부재에 위치된 피씨용 화상 카메라를 통하여 피사체를 선명하게 촬영할 수 있도록 장착부재의 소정위치에 피사체를 조명하기 위한 램프가 구비된 것을 특징으로 한다.

또, 장착부재는 그 상면 일측에 피씨용 카메라를 정위치 시키기 위한 기준벽이 돌출 형성되고, 그 상면에 피씨용 카메라를 자력(磁力)에 의해 용이하게 고정시킬 수 있도록 자석 또는 금속판이 구비된 것을 특징으로 한다.

또한, 연결관은 램프의 조명 각(角)을 용이하게 조절할 수 있도록 가요관으로 형성된 것을 특징으로 한다.

또, 램프는 상기 USB케이블을 통하여 전원을 공급받되 상기 램프의 밝기를 조절할 수 있도록 램프와 USB케이블의 사이에 조광기가 더 구비된 것을 특징으로 한다.

이하, 첨부도면을 참조하여 본 고안에 따른 피씨(PC)용 화상 카메라 거치대의 바람직한 실시예를 상세히 설명한다.

도 1은 본 고안에 따른 피씨용 화상 카메라 거치대의 사용 예시도이다.

도 2는 본 고안에 따른 피씨용 화상 카메라 거치대의 정면도이다.

도 3은 본 고안에 따른 피씨용 화상 카메라 거치대의 단면도이다.

일반적으로 피씨용 화상 카메라(50)는 별도의 거치대에 설치되고, 보다 바람직하게는 도 1에 도시한 바와 같이 모니터(1) 상에 부착된 거치대(50)에 설치된다.

이와 같이 설치된 피씨용 화상 카메라(50)는 컴퓨터 본체의 USB(Universal Serial Bus, 범용 직렬 버스)포트(미도시)에 전기적으로 접속되고, 그에 따라 촬영된 영상은 컴퓨터 상의 소정의 프로그램과 규약된 전송방식에 의해 외부로 전송되게된다.

상기의 피씨용 화상 카메라의 거치대(100)는 도 2 및 도3에 도시한 바와 같이, 모니터(1) 상에 부착되는 고정부재(10)와, 고정부재(10)에 그 일측단이 체결되고 그 내측을 통하여 USB케이블(C)이 연장형성된 연결관(20)과, 연결관(20)의 타측단이 그 저면에 체결되고 그 상면에 피씨용 화상 카메라(50)가 위치되며 그 후면에 피씨용 화상 카메라(50)가 전기적으로 접속되는 USB포트(31)가 마련된 장착부재(30)와, 장착부재(30)에 위치된 피씨용 화상 카메라(50)를 통하여 피사체를 선명하게 촬영할 수 있도록 장착부재(30)의 소정위치에 피사체를 조명하기 위한 조명수단(40)이 구비된다.

전술한 기술적 구성에서 고정부재(10)는 모니터(1) 상에 부착되는 것으로 예시하였으나, 화상 채팅시 피사체를 촬영할 수 있는 위치면 어디든 가능하고, 이를 위하여 고정부재(10)의 바닥면에는 집착면(일례로 양면테이프;11)이 마련된다. 또한 고정부재(10)의 상면에는 연결관(20)을 끼움 결속시킬 수 있도록 체결관(12)이 구비되며, 연결관(20)은 체결관(12)에 끼워진 상태에서 통상의 체결수단 또는 집착재에 의해 고정된다.

연결관(20)은 일측단이 고정부재(10)에 결속되고, 그 내측에 컴퓨터 본체의 USB포트(미도시)와 전기적으로 접속된 USB케이블(C)이 연장형성된다. 또한, 연결관(20)은 램프(41)의 조명 각(角)을 용이하게 조절할 수 있도록 보다 바람직하게 가요관으로 형성된다.

장착부재(30)는 그 저면이 연결관(20)의 타측단에 결속되고, 이를 위하여 장착부재(30)의 저면에는 연결관(20)의 타측단을 끼움 결속시킬 수 있도록 체결관(32)이 구비되며, 연결관(20)은 체결관(32)에 끼워진 상태에서 통상의 체결수단 또는 집착재에 의해 고정된다. 또, 장착부재(30)는 그 전방 내측에 램프(41)를 용이하게 설치할 수 있도록 소정의 공간부가 형성되고, 램프(41) 후방에 반사갓(42)이, 그리고 램프(41) 전면에 볼록렌즈(43)가 구비된다. 또한, 장착부재(30)는 그 상면 일측에 피씨용 카메라(50)를 정위치 시키기 위한 기준벽(33)이 돌출 형성되고, 그 상면에 피씨용 카메라(50)를 자력(磁力)에 의해 용이하게 고정시킬 수 있도록 자석 또는 금속판(34)이 구비된다. 즉, 카메라(50) 저면에 자석이 부착된 경우 장착부재(30) 상면에 금속판을 구비시키고, 카메라(50) 케이스가 금속제이거나 금속판이 부착된 경우 장착부재(30) 상면에 자석을 부착시키면된다. 또, 장착부재(30)는 그 후면에 연결관(20)을 통하여 연장형성된 USB케이블(C)을 피씨용 화상 카메라(50)와 용이하게 접속시킬 수 있도록 USB포트(31)가 구비된다.

램프(41)는 피씨용 화상 카메라(50)에 찍히는 피사체를 조명하기 위한 것으로, USB케이블(C)의 전력선을 통하여 전원을 공급받는다. 즉, USB케이블(C)의 대략 5볼트(V)의 전력선은 램프(41)와 피씨용 화상 카메라(50) 측으로 분기된 채 전기적으로 접속된다. 또한, 램프(41)는 그 밝기를 조절할 수 있도록 램프(41)와 USB케이블(C)의 전력선 사이에

조광기(44)가 연결되며, 조광기(44)는 그 조작이 용이하도록 손잡이부가 장착부재(30)의 저면부에 돌출형성된다.

다음은 전술한 기술적 구성 및 첨부도면을 참조하여 본 고안에 따른 피씨용 화상 카메라 거치대의 작동과정을 설명한다.

먼저, 피씨용 화상 카메라 거치대(100)의 USB케이블(C)을 컴퓨터 본체의 USB포트(미도시)에 삽입하고, 피씨용 화상 카메라(50)의 USB케이블(C')을 거치대(100)의 장착부재(30)의 후면에 형성된 USB포트(31)에 삽입한다. 그 결과, 피씨용 화상 카메라(50)와 컴퓨터 본체는 USB케이블(C-C')에 의해 전기적으로 접속되게된다. 이때, 피씨용 화상 카메라(50)는 거치대(100)의 장착부재(30) 상면에 장착되는데, 이는 전술한 바와 같이 기준벽(33)에 의해 그 위치가 정해지며 자력에 의한 착탈식이라 용이하게 설치가능하게된다.

이후, 피사체를 촬영하기에 적당한 위치(일례로 모니터, 컴퓨터 본체, 책상 위 등)에 고정부재(10)를 이용하여 거치대(100)를 고정시키고, 촬영된 화면을 참조하여 가오관(20)을 조절함으로써 보다 세밀하게 피씨용 화상 카메라(50)의 위치를 조정한다.

이때, 촬영된 피사체가 어둡게 나타난 경우 장착부재(30)에 구비된 램프(41)를 점등시켜 조명하고, 촬영된 화면을 참조하여 조광기(44)를 조절함으로써 피사체를 보다 선명하게 촬영할 수 있도록 램프(41)의 밝기를 조절한다.

그 결과, 주변의 밝기에 상관없이 피사체를 선명하게 촬영하여 전송할 수 있게된다.

고안의 효과

이상에서 상세히 설명한 바와 같이, 본 고안에 따르면 피사체를 조명할 수 있도록 조명기능이 구비됨으로써 주변의 밝기에 관계없이 피사체를 선명하게 촬영하여 전송할 수 있게된다. 그 결과, 화상 채팅시 상대방의 얼굴을 보며 채팅하는 화상 채팅의 묘미를 효과적으로 즐길 수 있다.

또한, 본 고안에 따르면 조명기능과 함께 조명 각도를 자유롭게 조절할 수 있어, 피사체를 보다 효과적으로 조명할 수 있게된다.

그리고 본 고안에 따르면 자력(磁力)에 의한 착탈 방식으로, 피씨용 화상 카메라를 손쉽게 설치 · 고정시킬 수 있고, 분리 또한 매우 간단하여 사용상 매우 편리하다는 효과가 있다.

(57) 청구의 범위

청구항 1.

피씨용 화상 카메라 거치대에 있어서,

고정부재와,

상기 고정부재에 그 일측단이 체결되고 그 내측을 통하여 USB케이블이 연장형성된 연결판과,

상기 연결판의 타측단이 그 저면에 체결되고 그 상면에 상기 피씨용 화상 카메라가 위치되며 그 후면에 상기 피씨용 화상 카메라가 전기적으로 접속되는 USB포트가 마련된 장착부재와,

상기 장착부재에 위치된 상기 피씨용 화상 카메라를 통하여 피사체를 선명하게 촬영할 수 있도록 상기 장착부재의 소정위치에 상기 피사체를 조명하기 위한 램프가 구비된 것을 특징으로 하는 피씨용 화상 카메라 거치대.

청구항 2.

제 1항에 있어서,

상기 장착부재는 그 상면 일측에 상기 피씨용 카메라를 정위치 시키기 위한 기준벽이 돌출 형성되고, 그 상면에 상기 피씨용 카메라를 자력(磁力)에 의해 용이하게 고정시킬 수 있도록 자석 또는 금속판이 구비된 것을 특징으로 하는 피씨용 화상 카메라 거치대.

청구항 3.

제 1항에 있어서,

상기 연결관은 상기 램프의 조명 각(角)을 용이하게 조절할 수 있도록 가요관으로 형성된 것을 특징으로 하는 피씨용 화상 카메라 거치대.

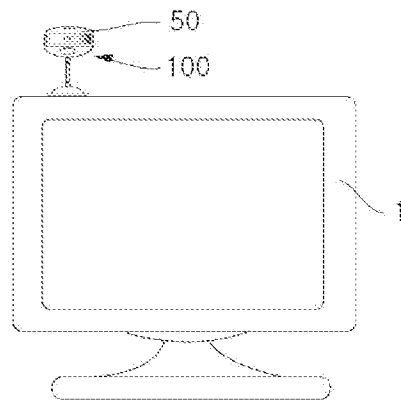
청구항 4.

제 1항에 있어서,

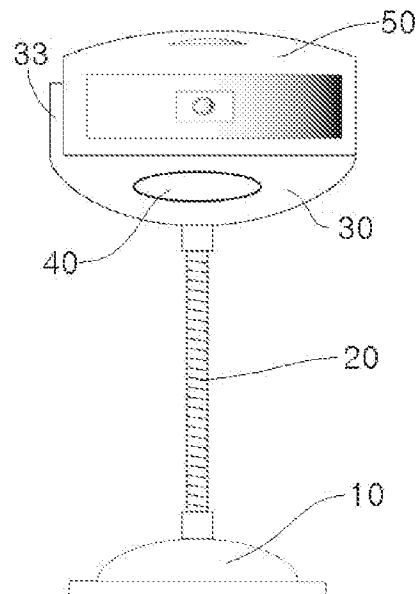
상기 램프는 상기 USB케이블을 통하여 전원을 공급받되 상기 램프의 밝기를 조절할 수 있도록 상기 램프와 상기 USB케이블의 사이에 조광기가 더 구비된 것을 특징으로 하는 피씨용 화상 카메라 거치대.

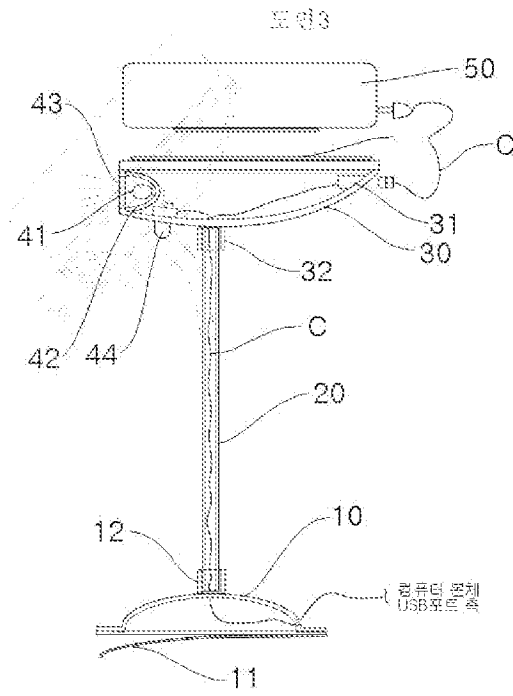
도면

도면1



도면2





(19) Korean Intellectual Property Office (KR)
 (12) Official Gazette for Granted Utility Model
 (Y1)

(51) . Int. Cl.⁷
 H04N 5/225

(45) Announcement Date June 19, 2003
 (11) Utility Model Patent Number 20-0316985
 (24) Grant Date June 5, 2003

(21) Application Number 20-2003-0010158
 (22) Application Date April 3, 2003

(73) Utility Model Patentee KWAK, Cheol-ho
 502, 107, Mota Town, Jungheung 2-dong, Buk-gu, Gwangju, Republic of Korea

(72) Inventor KWAK, Cheol-ho
 502, 107, Mota Town, Jungheung 2-dong, Buk-gu, Gwangju, Republic of Korea

(74) Agent LEE, Hyun-jae

Basic Requirement Examiner JANG, Hyun-kwon

Request Technical Evaluation: None

(54) PC webcam stand

ABSTRACT

The present utility model relates to a PC webcam stand with a lighting function, including: a fixing component; a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable is extended; a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and a lamp for lighting an object, arranged at a predetermined position of the mounting component to enable the PC webcam positioned on the mounting component to clearly photograph the object.

According to the present utility model, the lighting function is provided to light an object, thus enabling the object to be clearly photographed and transmitted regardless of the brightness of the surroundings. Besides, in addition to the lighting function, the lighting angle may be freely adjusted, thus effectively lighting the object. Moreover, the PC webcam may be easily arranged and fixed in a detachable manner by means of a magnetic force, and is very easy to separate, thus providing a very practical effect.

DRAWING OF ABSTRACT

FIG. 2

Index terms

Webcam, USB cable, flexible tube, lighting, lamp

SPECIFICATION

Description of drawings

FIG.1 is a diagram of a usage example of a PC webcam stand according to the present utility model.

FIG.2 is a main view of a PC webcam stand according to the present utility model.

FIG.3 is a sectional view of a PC webcam stand according to the present utility model.

5 Descriptions of numerals of main portions in the drawings

1: display; 100: stand

10: fixing component; 20: connecting component

30: mounting component; 40: lighting device

50: PC webcam

10

Detailed description of the present utility model

Objective of the present utility model

Technical field and background

15 The present utility model relates to a PC (personal computer) webcam stand, and more specifically to a PC webcam stand with an integrated lighting function.

Small cameras mainly used for video conferences or video chats through computers are usually referred to as PC webcams.

Such PC webcam represents an image photographed by the camera in real time, and thus, it is widely accepted.

20 Therefore, in most PC cafes, the PC webcam is arranged on a display, so that a video chat with an opposite side can be performed.

However, there are the following problems when video chats are performed in the PC cafes:

25 Namely, because most users in the PC cafes use computers, the overall lighting is darker. Therefore, the image photographed by the camera is not clear during video chats, limiting the enjoyment of the video chats.

Technical problem to be solved by the present utility model

30 To solve the above technical problem, the objective of the present utility model is to provide a PC webcam stand with a lighting function, thereby enabling a photographed object to be lighted during a video chat.

Another objective of the present utility model is to provide a PC webcam stand that allows the lighting angle to be freely adjusted.

Yet another objective of the present utility model is to provide a PC webcam stand that the PC webcam is easily disassembled.

35

Structure and effects of the present utility model

To achieve the aforementioned technical objectives, the present utility model provides a PC webcam stand, including:

40 a fixing component; a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable (C) is extended; a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC

webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and a lamp provided at a predetermined position of the mounting component to light an object so that the object can be clearly photographed by the PC webcam positioned on the mounting component.

- 5 In addition, a reference wall is protruded on one side of an upper surface of the mounting component to position the PC webcam, and a magnet or a metal plate is provided on the upper surface thereof to easily fix the PC webcam according to a magnetic force.

In addition, the connecting pipe is formed by a flexible pipe, so that the lighting angle of the lamp is easily adjustable.

- 10 In addition, the lamp receives a power supply through the USB cable, and a dimmer is further provided between the lamp and the USB cable to adjust the brightness of the lamp.

Preferred embodiments of the PC webcam stand according to the present utility model are described in detail below with reference to drawings.

FIG. 1 is a diagram of a usage example of a PC webcam stand according to the present utility model.

- 15 FIG.2 is a main view of a PC webcam stand according to the present utility model.

FIG. 3 is a sectional view of a PC webcam stand according to the present utility model.

Usually, a PC webcam 50 is provided on an independent stand. Preferably, as shown in FIG. 1, it is arranged on a stand 50 attached to a display 1.

- 20 Such PC webcam 50 is electrically connected to a universal serial bus (USB) port (not shown) of a computer body. Therefore, a photographed image is transmitted to the outside through an established procedure and an established transmitting mode on a computer.

- 25 The PC webcam stand 100, as shown in FIG. 2 and FIG. 3, includes a fixing component 10, attached to a display 1; a connecting pipe 20, one side end of which is coupled to the fixing component 10 and through an inside of which a USB cable (C) is extended; a mounting component 30, to a bottom surface of which the other side end of the connecting pipe 20 is coupled, on an upper surface of which a PC webcam 50 is positioned, and on a rear surface of which a USB port 31 electrically connected to the PC webcam 50 is arranged; and a lighting device 40 provided at a predetermined position on the mounting component 30 to light an object so that the object can be clearly photographed by the PC webcam 50 positioned on the mounting component 30.

- 30 In the above technical structure, although the fixing component 10 is shown attached to the display 1, the fixing component can be attached to any position where the photographed object can be photographed during the video chat. Therefore, an adhesive surface (for example, a double adhesive tape: 11) is arranged on the bottom surface of the fixing component 10. In addition, a fastening pipe 12 is provided on the upper surface of the fixing component 10, so that the connecting pipe 20 can be inserted. The connecting pipe 20 is fixed by a usual fastening device or adhesive material in a state of being inserted into the fastening pipe 12.

- 40 One side of the connecting pipe 20 is coupled to the fixing component 10, a USB cable extends through the inner side thereof, and the USB cable is electrically connected to the USB port (not shown) of the computer body. In addition, the connecting pipe 20 is preferably formed by a flexible pipe, so that the lighting angle of the lamp 41 can be easily adjusted.

- 45 The bottom surface of the mounting component 30 is coupled to the other side end of the connecting pipe 20. Therefore, a fastening pipe 32 is provided on the bottom surface of the mounting component 30, so that the other side end of the connecting pipe 20 can be inserted. The connecting pipe 20 is fixed by a usual fastening device or adhesive material in a state of being inserted into the fastening pipe 32. In addition, a specified space portion is formed on the front inner side of the mounting component 30, so that the lamp 41 can be easily arranged, and moreover, a reflecting cover 42 is arranged behind the lamp 41, and a convex lens 43 is provided in front of the lamp 41. In addition, a

reference wall 33 is formed in a protruding manner on one side of an upper surface of the mounting component 30 for positioning the PC webcam 50, and a magnet or a metal plate 34 is provided on the upper surface thereof to easily fix the PC webcam 50 according to a magnetic force. That is, when the magnet is attached to the bottom surface of the camera 50, the metal plate is provided on the upper surface of the mounting component 30, and when a shell of the camera 50 is of a metal material or is attached to the metal plate, the magnet is attached to the upper surface of the mounting component 30. In addition, a USB port 31 is provided on a rear surface of the mounting component 30, so that the USB cable C extending through the connecting pipe 20 is easily connected to the PC webcam 50.

The lamp 41 is configured to light the photographed object photographed by the PC webcam 50 and receives a power supply through an electric wire of the USB cable C. Namely, an electric wire of about 5V of the USB cable C is electrically connected in a state that the electric wire is branched to the sides of the lamp 41 and the PC webcam 50. In addition, the lamp 41 is connected to a dimmer 44 between the lamp 41 and the electric wire of the USB cable C, so that the brightness thereof may be adjustable. To facilitate operation, a handle portion of the dimmer 44 protrudes from the bottom portion of the mounting component 30.

Next, a working process of the PC webcam stand according to the present utility model is described with reference to the above technical structure and drawings.

First, the USB cable C of the PC webcam stand 100 is inserted into the USB port (not shown) of the computer body, and the USB cable C' of the PC webcam 50 is inserted into the USB port 31 in the rear surface of the mounting component 30 of the stand 100. At this time, the PC webcam 50 and the computer body will be electrically connected according to the USB cables C-C'. At this time, the PC webcam 50 is mounted on the upper surface of the mounting component 30 of the stand 100. As described above, the position of the PC webcam is determined according to the reference wall 33. Since the assembling and disassembling can be achieved by magnetism, the PC webcam can be easily relocated.

Then, at a position (for example, a display, a computer body, a desk lamp) suitable for photographing the photographed object, the stand 100 is fixed by the fixing component 10, and the flexible pipe 20 is adjusted with reference to the photographed picture, so that the position of the PC webcam 50 is adjusted more finely.

In this case, when the photographed object is darker, the lamp 41 provided on the mounting component 30 is turned on for lighting, and the dimmer 44 is adjusted with reference to the photographed picture, so that the brightness of the lamp 41 is adjusted, and the photographed object can be photographed more clearly.

As a result, it enables the object to be clearly photographed and transmitted regardless of the brightness of the surroundings.

Effects of the present utility model

As described above in detail, according to the present utility model, in order to light the photographed object, the PC webcam stand has the lighting function, thus enabling the object to be clearly photographed and transmitted regardless of the brightness of the surroundings. Therefore, a user can enjoy the interestingness of performing the video chat while watching the face of the opposite side during the video chat.

Besides, according to the present utility model, in addition to the lighting function, the lighting angle may be freely adjusted, thus effectively lighting the object.

Moreover, the PC webcam may be easily arranged and fixed in a detachable manner by means of a magnetic force, and is very easy to separate, thus providing a very practical effect in terms of use.

(57) CLAIMS

Claim 1

A PC (personal computer) webcam stand, comprising:

a fixing component;

5 a connecting pipe, one side end of which is coupled to the fixing component and through an inside of which a USB cable is extended;

a mounting component, to a bottom surface of which the other side end of the connecting pipe is coupled, on an upper surface of which a PC webcam is positioned, and on a rear surface of which a USB port electrically connected to the PC webcam is arranged; and

10 a lamp for lighting an object, arranged at a predetermined position of the mounting component to enable the PC webcam positioned on the mounting component to clearly photograph the object.

Claim 2

The PC webcam stand according to claim 1, wherein

15 a reference wall is formed in a protruding manner on one side of an upper surface of the mounting component to position the PC webcam stand, and a magnet or a metal plate is provided on the upper surface thereof to easily fix the PC webcam according to a magnetic force.

Claim 3

The PC webcam stand according to claim 1, wherein

the connecting pipe is formed by a flexible pipe, so that a lighting angle of the lamp is easily adjustable.

20 Claim 4

The PC webcam stand according to claim 1, wherein

the lamp receives a power supply through the USB cable, and a dimmer is further provided between the lamp and the USB cable to adjust the brightness of the lamp.

25

DRAWINGS

FIG. 1

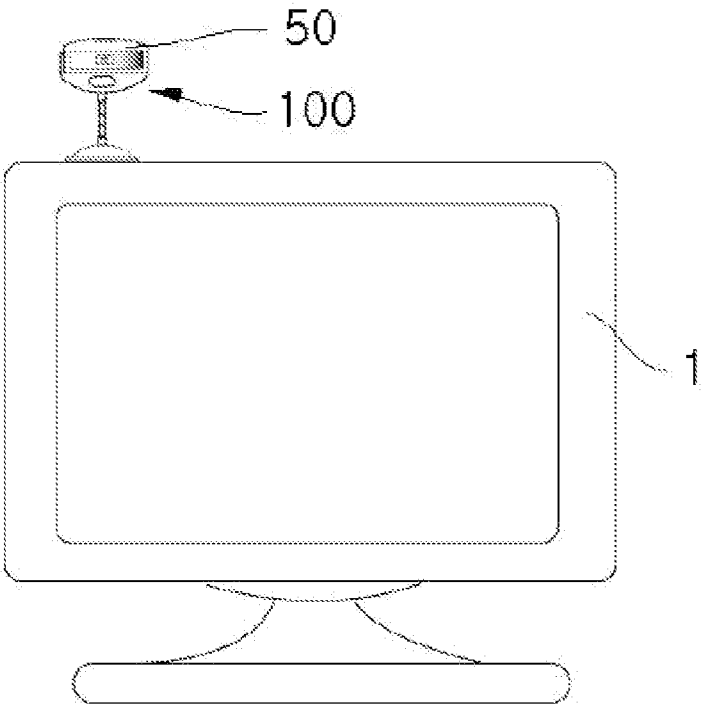


FIG. 2

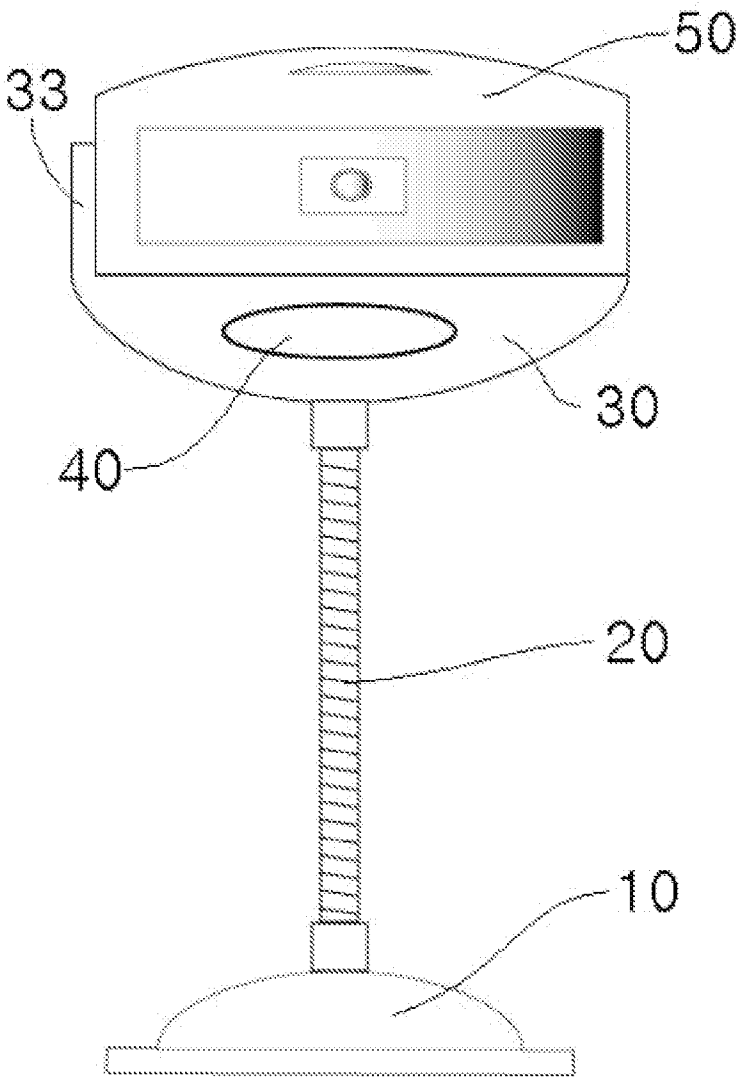
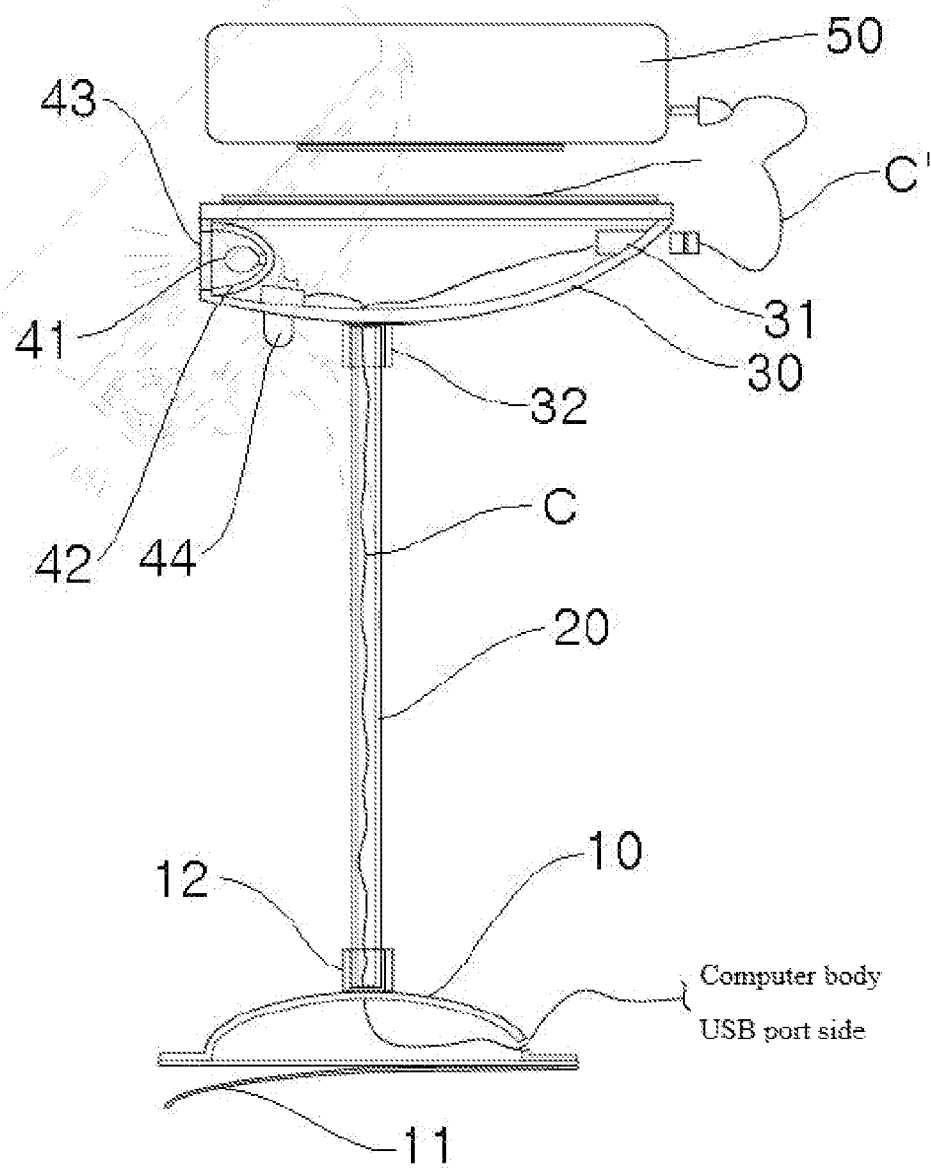


FIG. 3



VERIFICATION OF TRANSLATION

I, BeomJin Kim

of Room 1005A, Global New Times Plaza, 1666 Sichuan RD. (NORTH), Hongkou District, Shanghai China,

do hereby declare that I am well acquainted with the **Korean and English** languages, and that the attached is to the best of my knowledge and belief a true and accurate translation into the **English** language of the text of KR200316985Y1.

Signature: BEOMJIN KIM

Date: March 14, 2025



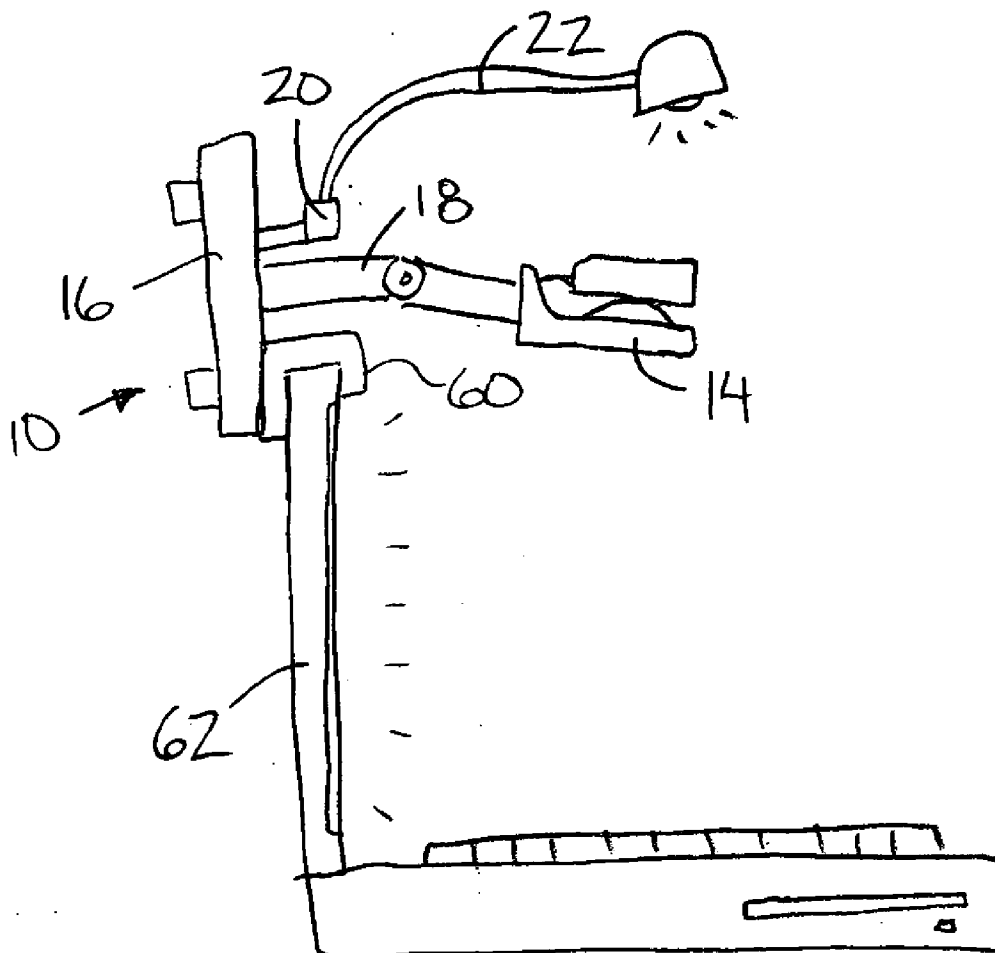
US 20050151042A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0151042 A1****Watson**(43) **Pub. Date: Jul. 14, 2005**(54) **CAMERA MOUNT**(52) **U.S. Cl. 248/226.11**(76) **Inventor: Robert Watson, Beausejour (CA)**(57) **ABSTRACT**

Correspondence Address:

ADE & COMPANY**1700-360 MAIN STREET****WINNIPEG, MB R3C3Z3 (CA)**(21) **Appl. No.: 10/752,553**(22) **Filed: Jan. 8, 2004****Publication Classification**(51) **Int. Cl.⁷ A47K 1/00**

A camera mount supports a web camera thereon. The mount includes a bracket for supporting a light source thereon and a platform supported on the bracket for receiving the base of the web camera thereon. The light source may be operable in either flash or steady-on modes to provide optimum lighting for the web camera. The platform ensures various designs of web cameras and web camera bases can be accommodated and supported thereon. The bracket also readily permits the camera mount to be supported on an upright supporting surface to remove the clutter of cords from the workspace on a desk supporting a computer thereon.



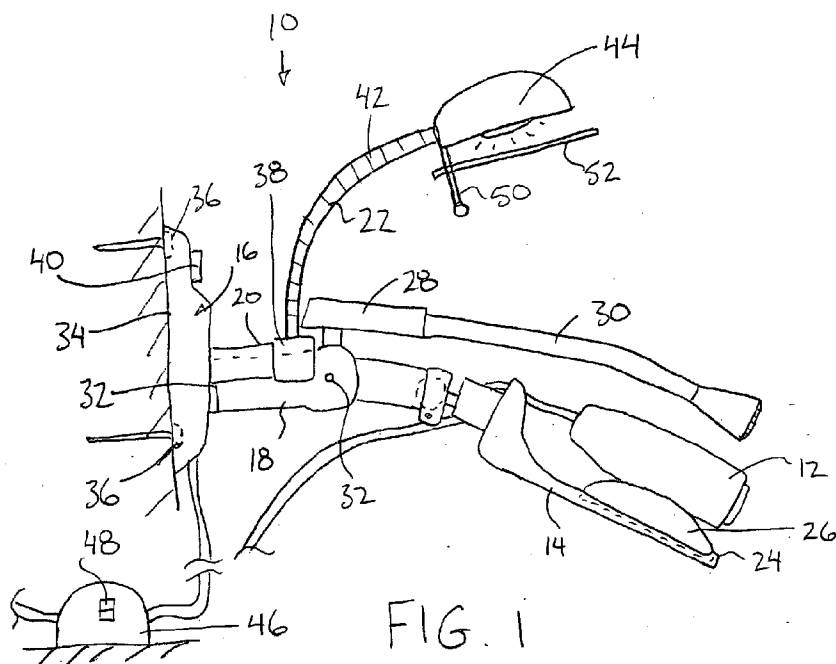


FIG. 1

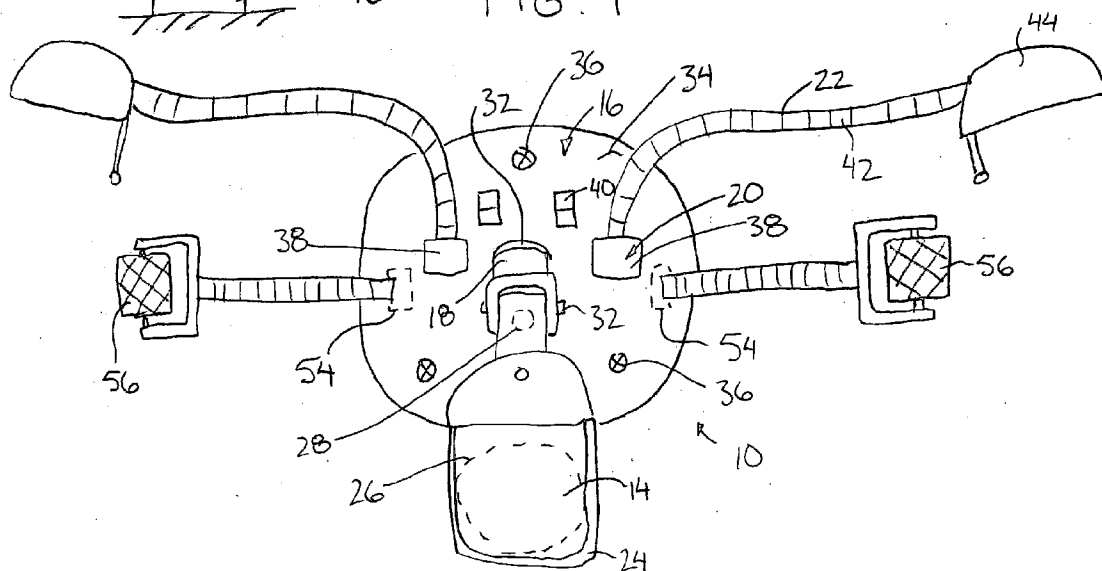


FIG. 2

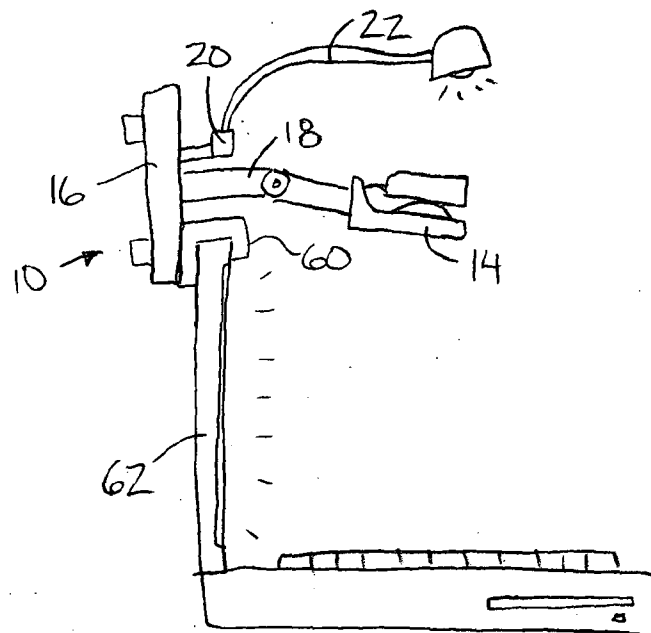


FIG. 3

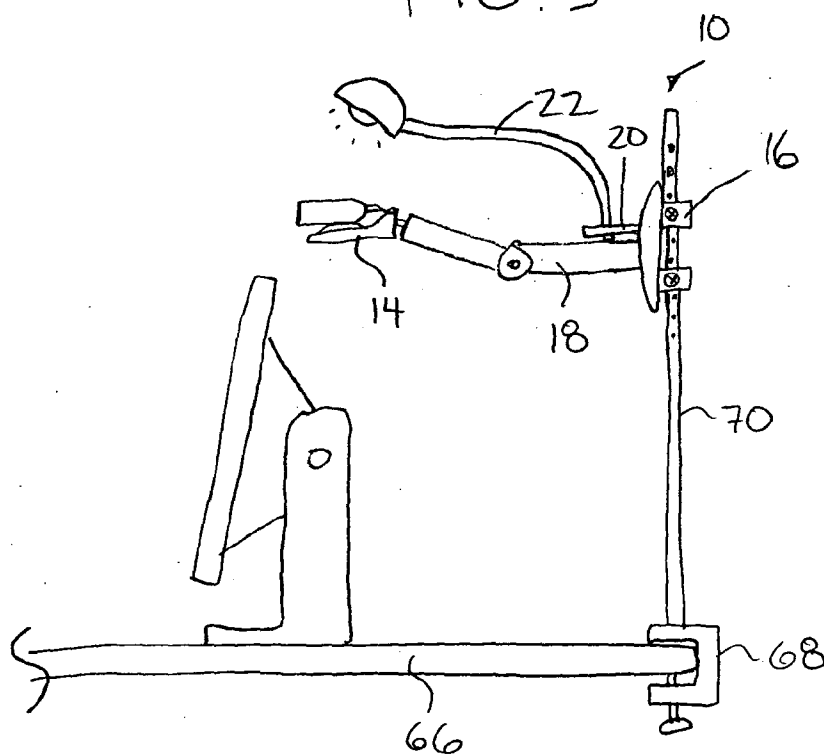


FIG. 4

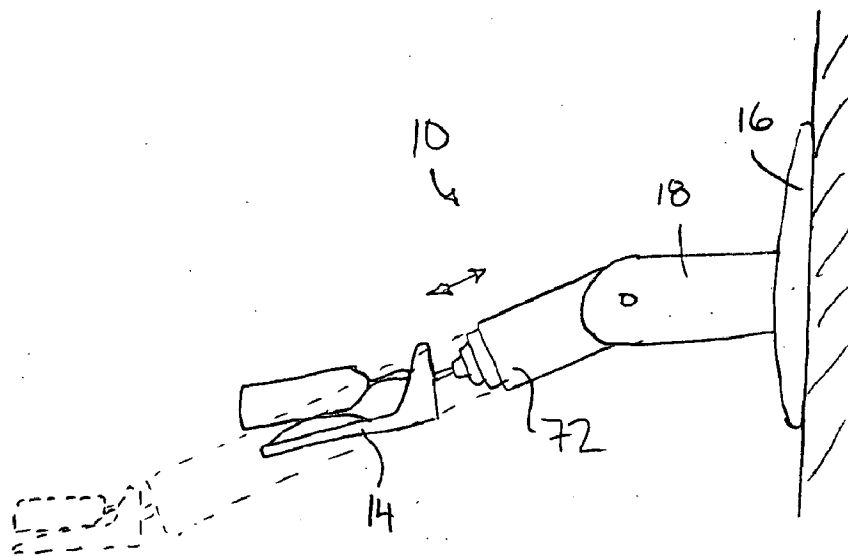


FIG. 5

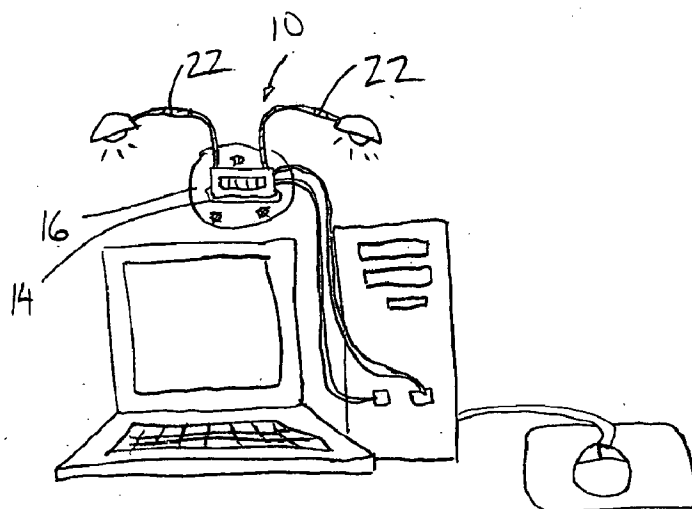


FIG. 6

CAMERA MOUNT

FIELD OF THE INVENTION

[0001] The present invention relates to a camera mount for supporting a web camera on a supporting surface and more particularly relates to a camera mount for supporting a light source in combination with a web camera.

BACKGROUND

[0002] The use of a web camera with a computer is well known. Typically the web camera has a housing supporting a lens therein for capturing a digital image to be recorded on the computer and a base for supporting the housing of the lens thereon. The web camera is typically connected to the computer through a USB port of the computer by an elongate cord. Various other multimedia related accessories for the computer including microphones and speakers and the like, also include elongate cords which can be messy and occupy considerable desk space surrounding a computer. Other problems typically associated with web cameras is poor performance as a result of insufficient lighting.

[0003] Typically, web cameras are supported on an upper, generally horizontal surface of the computer's monitor with tape and the like. Many current computers make use of flat screens however which are difficult to accommodate conventional web camera designs.

[0004] US patents U.S. Pat. No. 4,398,815 to Barzee et al and U.S. Pat. No. 5,921,523 to South et al each disclose camera mounts for supporting a camera thereon, however neither is suitably arranged to support a conventional web camera thereon. Neither camera mount would permit a web camera to be supported on an upright supporting surface. Furthermore, the prior art relating to camera mounts propose no means for supporting a light source suitable for increasing performance of a web camera.

SUMMARY

[0005] According to one aspect of the present invention there is provided a camera mount for supporting a web camera having a lens for capturing a digital image to be recorded on a computer and a base for supporting the lens thereon, the camera mount comprising:

[0006] a bracket for supporting a light source thereon; and

[0007] a platform supported on the bracket for receiving the base of the web camera thereon.

[0008] The use of a bracket for supporting a light source operable in either flash or steady-on modes and a web camera ensures sufficient lighting for optimum performance of the web camera. The use of a platform ensures various designs of web cameras and web camera bases can be accommodated and supported thereon. The bracket also readily permits the camera mount to be supported on an upright supporting surface to remove the clutter of cords from the workspace on a desk supporting a computer thereon.

[0009] The camera mount may be provided in combination with the light source, wherein the light source is supported rearward of the platform when the camera is supported on the platform to face forwardly.

[0010] Preferably the light source and the camera are independently adjustable relative to the bracket.

[0011] There may be provided switch means for operating the light source on the bracket and/or when the light source includes a remotely positioned power source connected to the light source by an electrical cord, switch means may be provided at the power source.

[0012] The light source and the camera mount are preferably connectable to a computer through USB ports. Preferably software is provided in this instance for controlling operation of the light source and the camera independently of one another. The software may permit operation of the light source in various modes, for example a flash camera mode or a strobe mode.

[0013] There may be provided a clamp member for clamping to an edge of a horizontal supporting surface and an upright support slidably supporting the bracket thereon for height adjustment relative horizontal supporting surface.

[0014] According to a second aspect of the present invention there is provided a camera mount for supporting a web camera having a lens for capturing a digital image to be recorded on a computer and a base for supporting the lens thereon, the camera mount comprising:

[0015] a bracket for attachment to an upright supporting surface;

[0016] a platform supported on the bracket for receiving the base of the web camera thereon.

[0017] The camera is preferably adjustable in position relative to the bracket, so as to be pivotal about two axes, oriented transversely to one another, relative to the bracket. Additional, there may be provided a telescoping arm supporting the platform on the bracket for adjusting a relative spacing therebetween.

[0018] There may be provided a pair of inverted U-shaped clips on the bracket for securement to a laptop monitor.

[0019] The bracket may also include a microphone mount, a pair of speakers, or various light sources supported thereon.

[0020] The platform may include a peripheral lip for supporting the base of the camera snugly within a perimeter of the peripheral lip in a snap-fit configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] In the accompanying drawings, which illustrate exemplary embodiments of the present invention:

[0022] FIG. 1 is a side elevational view of a first embodiment of the camera mount.

[0023] FIG. 2 is a front elevational view of the camera mount according to FIG. 1.

[0024] FIG. 3 is a side elevational view of a further embodiment of the camera mount for support on a laptop monitor.

[0025] FIG. 4 is a side elevational view of a further embodiment of the camera mount for support above a horizontal supporting surface.

[0026] FIG. 5 is a side elevational view of a telescoping embodiment of the camera mount.

[0027] FIG. 6 is a schematic view of the camera mount in combination with a desktop computer.

DETAILED DESCRIPTION

[0028] Referring to the accompanying drawings, there is illustrated a camera mount generally indicated by reference numeral 10. The camera mount is suitable for supporting a web camera 12 of the type typically connected to a computer by suitable cable for recording either video or still images to the computer in a digital format.

[0029] While various embodiments of the camera are illustrated in the accompanying figures, the common elements will first be described herein. The camera mount 10 includes a platform 14 for supporting the camera thereon. The camera includes a broad flat supporting surface which readily accepts the base of various types of commercially available web cameras 12 to be supported thereon. A support bracket 16 is provided which can be mounted on a suitable supporting surface such as a wall and the like or may be adapted for attachment to a laptop screen in some embodiments. A support arm 18 couples the platform to the support bracket for supporting the camera 12 on the supporting surface to which the bracket is attached. A light mount 20 is provided on the bracket 16 for supporting a light source 22 thereon.

[0030] Turning now to the embodiment of FIGS. 1 and 2 the platform 14 includes a raised peripheral lip which snugly receives a base 26 of the camera 12 snugly within the perimeter of the lip 24 such that the web camera can be securely snap-fit onto the platform. A microphone mount 28 is positioned on the bracket for supporting a microphone 30 thereon.

[0031] The support arm 18 is formed with two pivot joints 32 therein which pivot about respective axis oriented perpendicularly to one another. Also, the platform connects to the free end of the support arm 18 with a ball and socket joint so that the platform 14 can be freely positioned in various orientations relative to the support bracket 16. The joints are all friction joints permitting the joints to remain in a set position once manually adjusted while additionally supporting the weight of the camera 12 and microphone 30 in the selected orientation of the support arm 18.

[0032] The bracket 16 generally comprises a mounting plate 34 having fastener apertures 36 formed therein to permit the use of fasteners for attachment of the mounting plate to a wall or other suitable supporting surface. Receptacles 38 are supported on the mounting plate 34 for selectively supporting lights 22 thereon. A pair of the receptacles 38 are provided at spaced positions on opposing sides of the support arm 18 mounted to the bracket. The mounting plate 34 also supports a pair of switches 40 thereon which can be wired in series with the lights 22 respectively.

[0033] The lights 22 each include an elongate flexible rod 42 which carries wiring therethrough from a base end received in the receptacles 38 to a free end supporting a light bulb 44 thereon. The rods 42 are flexible and are sufficiently stiff to remain in a selected orientation once manually adjusted. Wiring delivering power to the bulbs 44 is connected through the switches 40 to respective power convert-

ers 46 formed in desk top units locating additional switches 48 therein. The elongate cords connecting the power converters 46 to the bracket 16 permits the switches 48 to be positioned remotely from the light sources 22. Adjacent the bulb 44 of each light, a rod 50 is provided which acts as a handle for readily positioning the bulb. A series of lenses 52 are provided which include a snap fit socket which can be secured to the rod 50 to position the lenses to span an opening of the housing locating each bulb 44 therein.

[0034] The bracket 16 also includes two speaker receptacles 54 formed on the mounting plate which selectively receive respective speaker mounts. The receptacles 54 are located on opposing sides respectively of the arm 18 mounting the camera thereon to permit speakers 56 to be mounted on opposing sides of the camera and light source. Each speaker mount generally comprises an elongate flexible support arm with a bracket at a free end thereof for supporting a respective one of the speakers 56 thereon to permit speaker position to be manually adjusted as desired.

[0035] Turning now to the embodiment of FIG. 3, the bracket 16 is adapted to include inverted U-shaped clips 60 which can be secured overtop of the top edge of a lap top display monitor 62 in a snap fit engagement therewith. The remaining features of the bracket including the adjustable support arm 18 and light sources 22 remain identical to the previous embodiment.

[0036] Turning now to FIG. 4 a further embodiment of the bracket 16 is illustrated for support on a horizontal desk top surface 66 and the like. A clamp 68 adjustably clamps over an edge at a periphery of the desk surface 66. A pair of mounting rods 70 extend vertically upward therefrom for slidably supporting the support bracket 16 thereon. The support bracket 16 in this instance includes mounting apertures slidably receiving the rod therethrough. The rod in this instance is notched at spaced positions for cooperation with a spring loaded bearing located in the apertures of the support bracket which receive the rods therethrough. The bearings cooperate with the notches and the rods 70 for selectively supporting the bracket 16 at any one of the spaced notches along the rod similar to many conventional click-stop mounting configurations.

[0037] As illustrated in FIG. 5, in a further embodiment of the support arm 18, the arm may be provided with telescopic sections 72 to permit the platform 14 to be extended away from the bracket as desired. Preferably the telescopic sections 72 are located between the pivot joints 32 of the arm and the platform to permit telescopic extension in any desired direction as set by the joints 32.

[0038] As illustrated in FIG. 6 both the camera and the lights supported on the bracket 16 may be coupled to the USB ports of a computer including suitable software thereon for controlling activation of the camera and lights independently of one another by selecting options displayed on the monitor using a mouse. The software control permits the light source to be activated as a camera flash when taking still pictures with the camera, or may cause the lights to remain in a steady on position when using the camera for video. Independently of camera use, the lights can also be controlled for strobe operation or for dimming and the like. In combination with the various lenses that can be snap-fit onto the rod of the light sources 22, various lighting configurations are possible.

[0039] In the various embodiments described herein, the support arm may be extendable and provided with various joints including knuckle joints or knee joints to permit the camera or a mic to be readily positioned in relation to the mounting bracket supporting the camera thereon. Various platform designs are possible to accommodate different styles of cameras. In some embodiments the support arm 18 may be controlled by actuators to adjust the position thereof remotely or manually as desired. Variation of the platform may also be accomplished to support various designs of mics thereon.

[0040] The incorporation of speakers are also possible as described above by either providing mounting locations on the support bracket 16 or on the platform 14 in which case the position of the speakers are adjustable with the camera.

[0041] When using software control, an icon may be provided of the task bar of the computer desktop to permit control of the lights including dimming functions and the like.

[0042] Installation of a chip would permit the lights to work as a flash for still pictures powered by a computer via USB ports and the like. The platform itself can be designed to form various shapes representative of any desired object of which the appearance is desirable.

[0043] By providing a camera mount according to the present invention, much of the clutter and mess from cables and the like are removed from the desk surface supporting the computer thereon. Furthermore no sticky tape or other mounting configurations including screw holes and the like are required to be attached to the monitor. The wires operating the camera and light sources can instead run along the wall behind a desk or other supporting surface of the computer. The camera mount also permits a web camera to be supported in instances where flat screens previously did not permit support of the camera at all. The lighting is operable independently of the camera to permit lighting of a workspace surrounding the computer as desired. The light sources preferably operate from twelve volt transformers which consume minimal power while permitting operation through the computer control as desired.

[0044] In some embodiments the platform 14 may be provided by itself with the support bracket simply for supporting the camera thereon out of the way of the user. It is desirable however to provide a combination of a support for lights and for a web camera to ensure adequate lighting when using the video mode of the web camera. The lights in this instance are supported rearwardly of the camera to eliminate glare on the camera lens. In some embodiments the bracket may be adapted to support a combination of a camera, a microphone, light sources and speakers to permit all wiring of accessories relating to multimedia computer tools to be held out of the way rearwardly of the computer.

[0045] While various embodiments of the present invention have been described in the foregoing, it is to be understood that other embodiments are possible within the scope of the invention. The invention is to be considered limited solely by the scope of the appended Claims.

1. A camera mount for supporting a web camera having a lens for capturing a digital image to be recorded on a computer and a base for supporting the lens thereon, the camera mount comprising:

a bracket for attachment to an upright supporting surface;

a platform supported on the bracket for receiving the base of the web camera thereon.

2. The camera mount according to claim 1 wherein the camera is adjustable in position relative to the bracket.

3. The camera mount according to claim 1 wherein the camera is pivotal about two axes, oriented transversely to one another, relative to the bracket.

4. The camera mount according to claim 1 wherein there is provided a pair of inverted U-shaped clips on the bracket for securement to a laptop monitor.

5. The camera mount according to claim 1 wherein there is provided a microphone mount on the bracket.

6. The camera mount according to claim 1 wherein the platform includes a peripheral lip for supporting the base of the camera snugly within a perimeter of the peripheral lip.

7. The camera mount according to claim 1 wherein there is provided a telescoping arm supporting the platform on the bracket.

8. The camera mount according to claim 1 wherein there is provided a pair of speakers supported on the bracket.

9. The camera mount according to claim 1 wherein there is provided a pair of lights supported on the bracket.

10. A camera mount for supporting a web camera having a lens for capturing a digital image to be recorded on a computer and a base for supporting the lens thereon, the camera mount comprising:

a bracket for supporting a light source thereon; and

a platform supported on the bracket for receiving the base of the web camera thereon.

11. The camera mount according to claim 10 in combination with the light source, wherein the light source is supported rearward of the platform when the camera is supported on the platform to face forwardly.

12. The camera mount according to claim 11 wherein the light source is adjustable in position relative to the camera.

13. The camera mount according to claim 10 wherein the light source and the camera are independently adjustable relative to the bracket.

14. The camera mount according to claim 10 wherein the bracket is suitably arranged for being supported on an upright supporting surface.

15. The camera mount according to claim 10 in combination with the light source, wherein there is provided switch means for operating the light source on the bracket.

16. The camera mount according to claim 10 in combination with the light source, wherein the light source includes a remotely positioned power source connected to the light source by an electrical cord and switch means at the power source.

17. The camera mount according to claim 10 in combination with the light source, wherein the light source and the

camera mount are connectable to a computer and wherein there is provided software for controlling operation of the light source.

18. The camera mount according to claim 17 wherein the software permits operation of the light source in a flash camera mode.

19. The camera mount according to claim 17 wherein the camera and the light source are independently controlled by the light source.

20. The camera mount according to claim 10 wherein there is provided a clamp member for clamping to an edge of a horizontal supporting surface and an upright support slidably supporting the bracket thereon for height adjustment relative horizontal supporting surface.

* * * * *