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Jurik et al.

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(54) **VERSATILE BEAM AND WASH OPTICAL SYSTEM FOR AN AUTOMATED LUMINAIRE**

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(65) **Prior Publication Data**

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Related U.S. Application Data

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(51) **Int. Cl.**

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F21V 11/18	(2006.01)
F21V 5/04	(2006.01)
F21V 14/06	(2006.01)
F21V 11/14	(2006.01)
F21S 10/00	(2006.01)
F21W 131/406	(2006.01)

(52) **U.S. Cl.**

CPC ***F21V 11/183*** (2013.01); ***F21V 5/045*** (2013.01); ***F21V 11/14*** (2013.01); ***F21V 14/06*** (2013.01); *F21S 10/007* (2013.01); *F21W 2131/406* (2013.01)

(58) **Field of Classification Search**

USPC 362/277

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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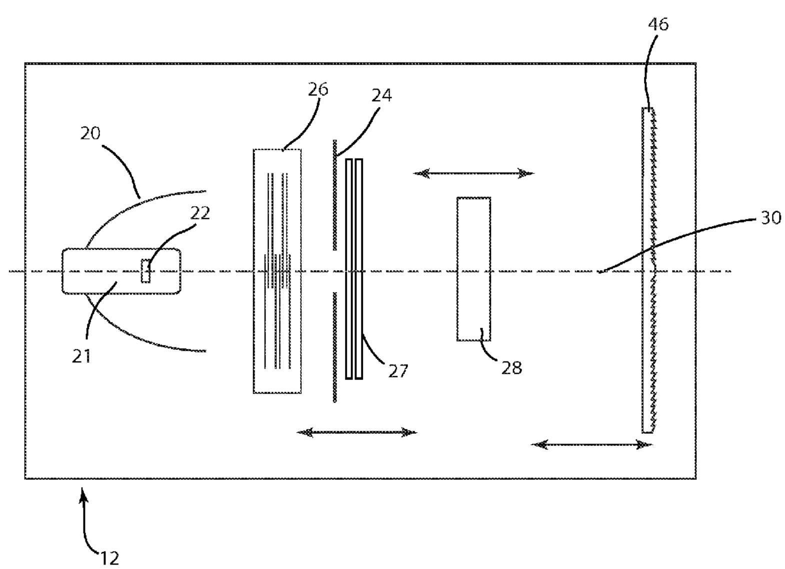
(57) **ABSTRACT**

Described are an improved automated luminaire **12** and luminaire systems **10** employing an improved output Fresnel lens **46** with an optically planar surface **34** combined with an articulable stippling plate **47**. The stippling plate **47** may be inserted and removed immediately behind and adjacent to the planar rear surface of the lens **46** in order to transform the optical system from beam optics to wash optics or immediately adjacent to another articulable lens system **29** directly the light beam toward the previously described Fresnel lens. Further embodiment may include an articulable beam spreader.

7 Claims, 11 Drawing Sheets



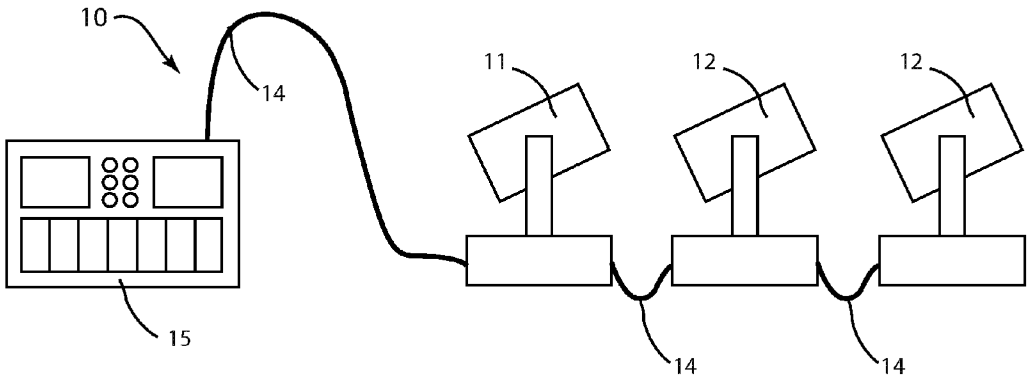


FIG 1

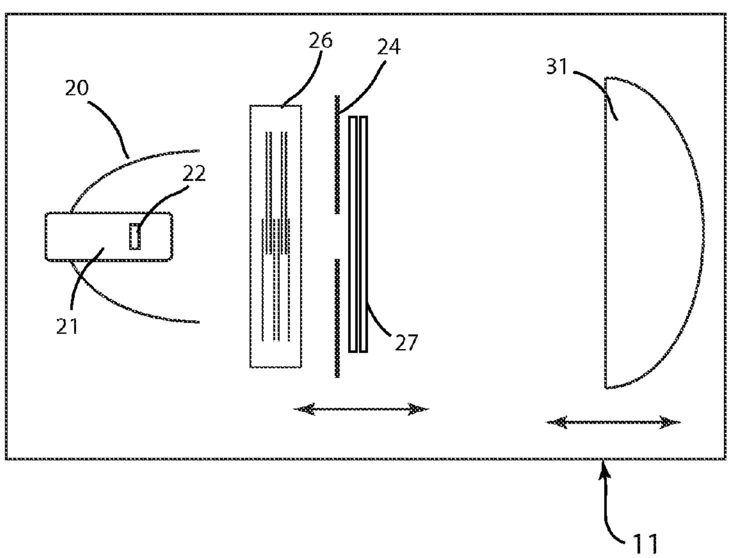
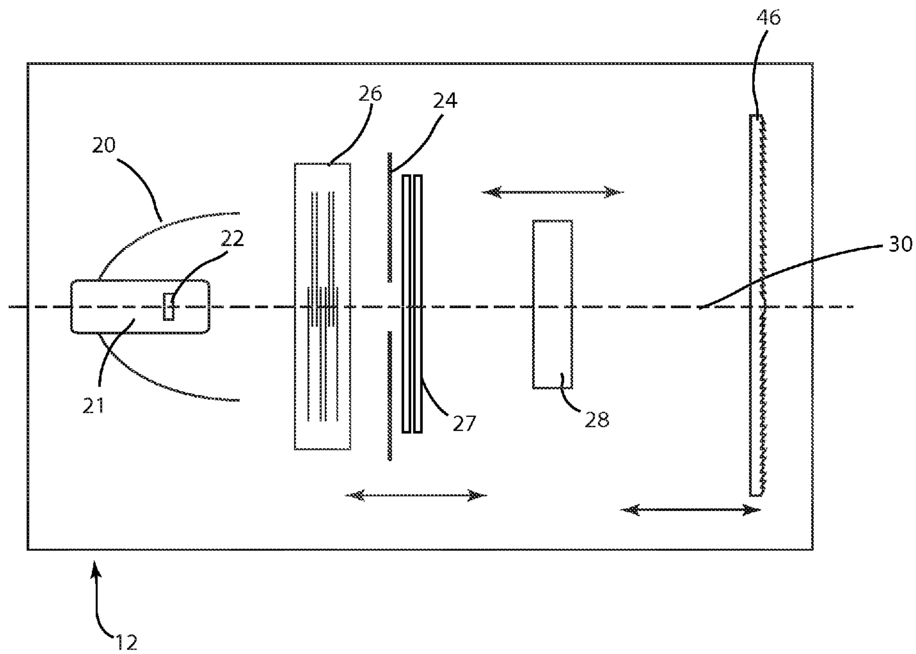


FIG 2



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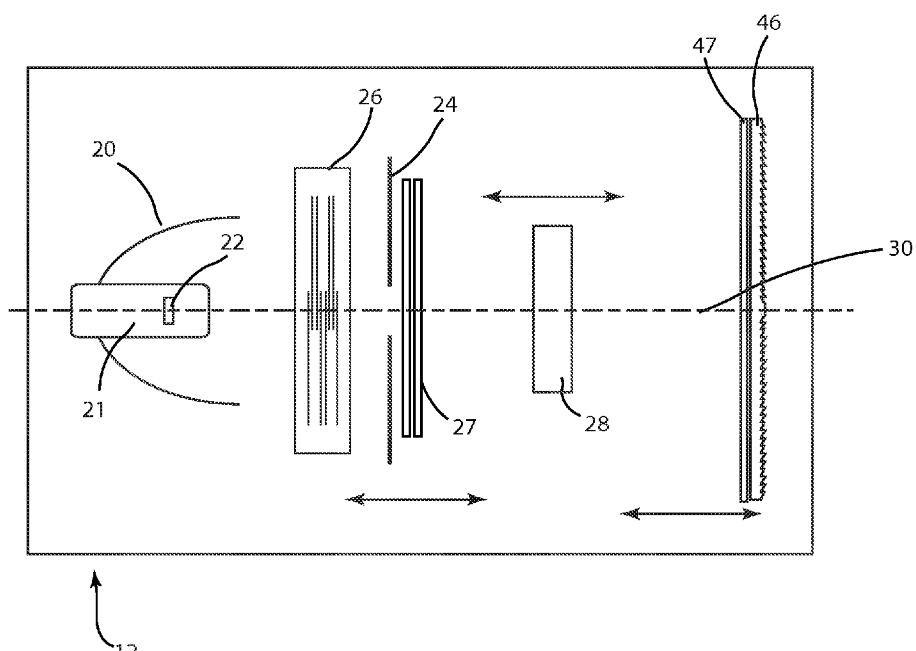

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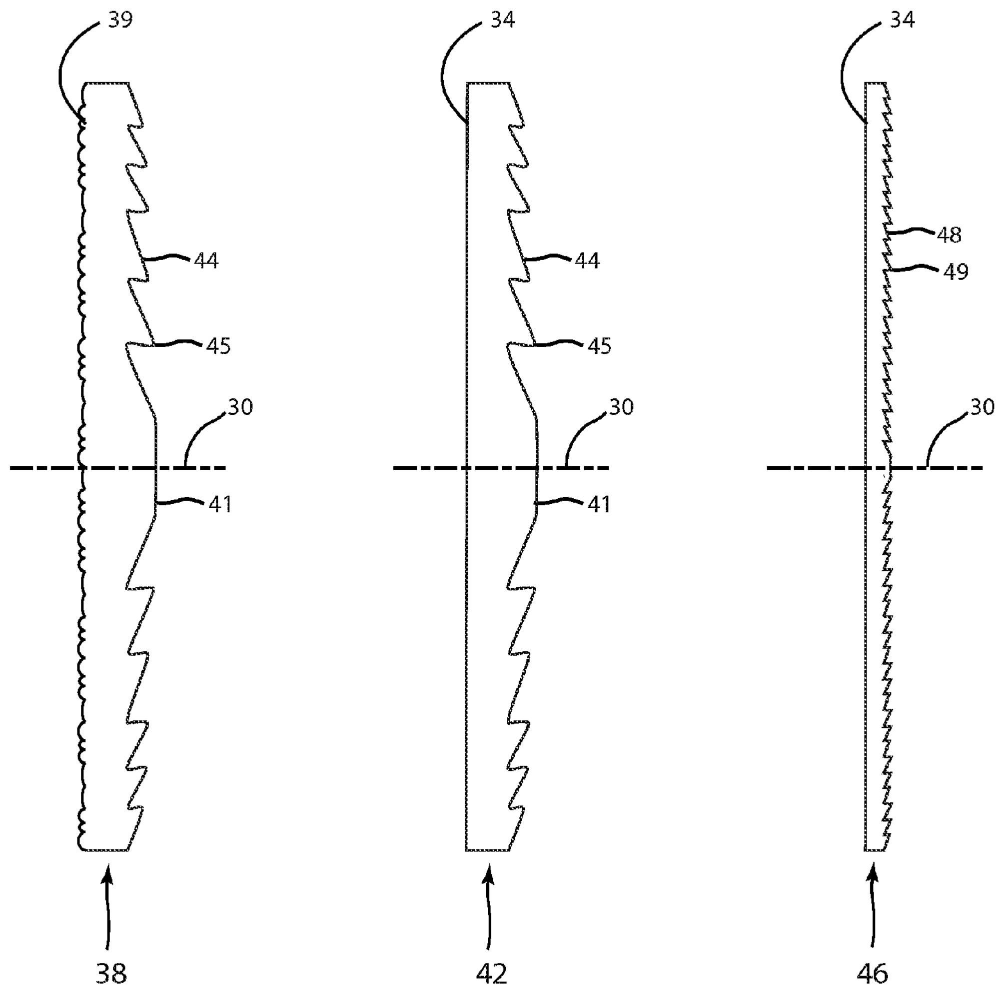

FIG 5

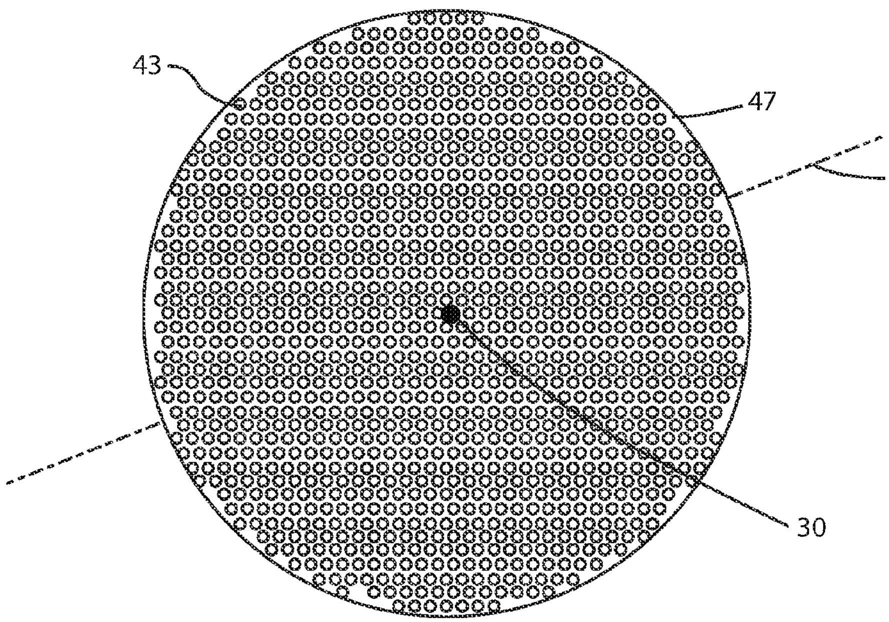

FIG 6

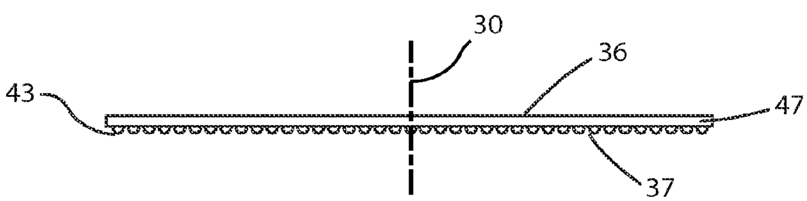

FIG 7

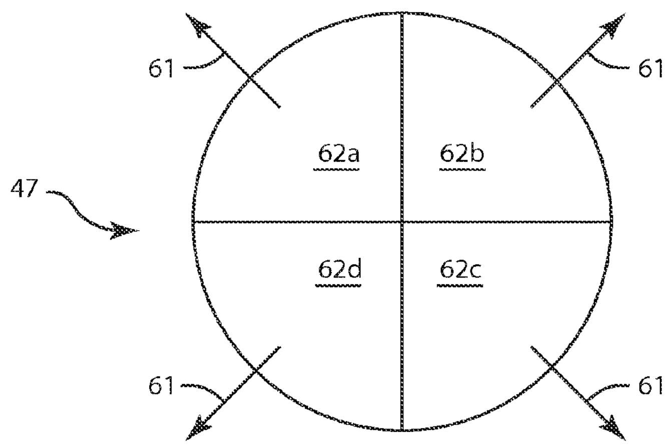

FIG 8

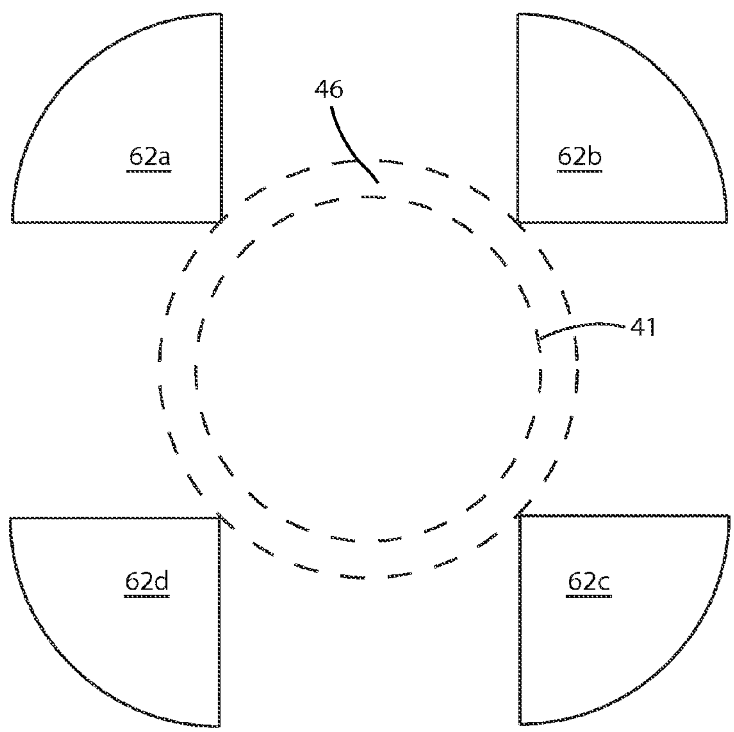

FIG 9

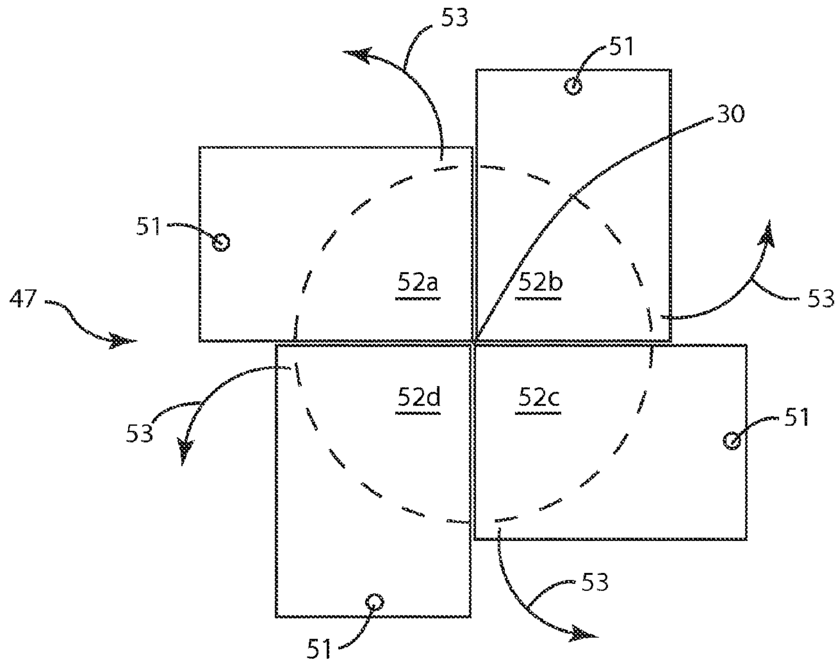
53
51
30
51
52a
52b
53
47
52d
52c
53
51
53
51

FIG 10

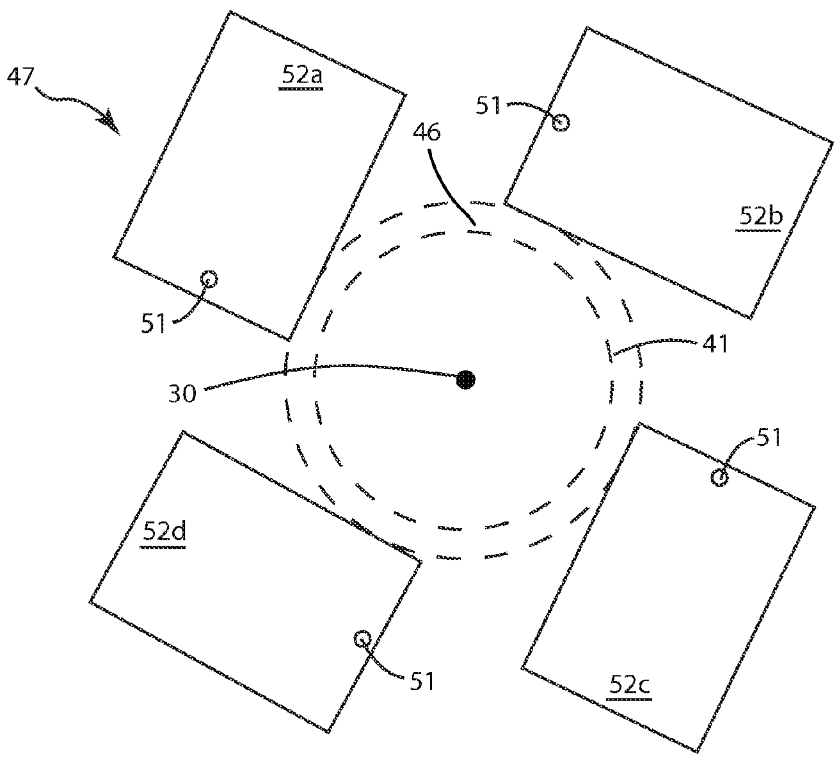
47
52a
51
46
52b
51
41
30
51
52d
51
52c

FIG 11

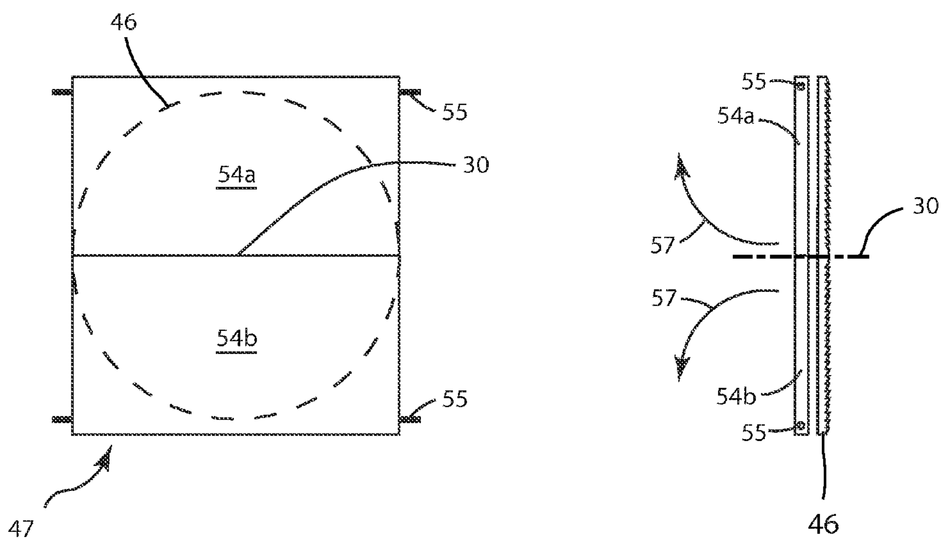
46
55
54a
30
54b
55
47
55
54a
57
30
57
54b
55
46

FIG 12

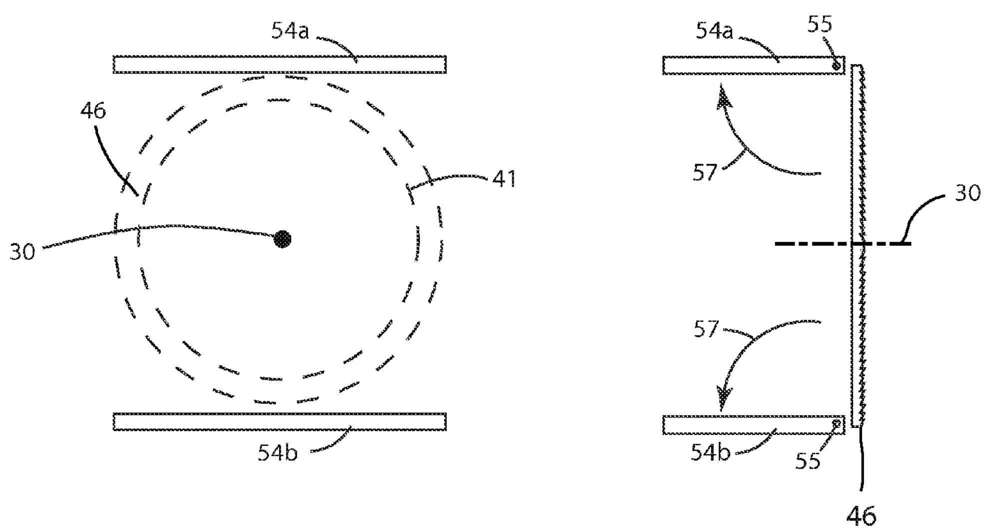
54a
46
41
30
54b
54a
55
57
30
57
54b
55
46

FIG 13

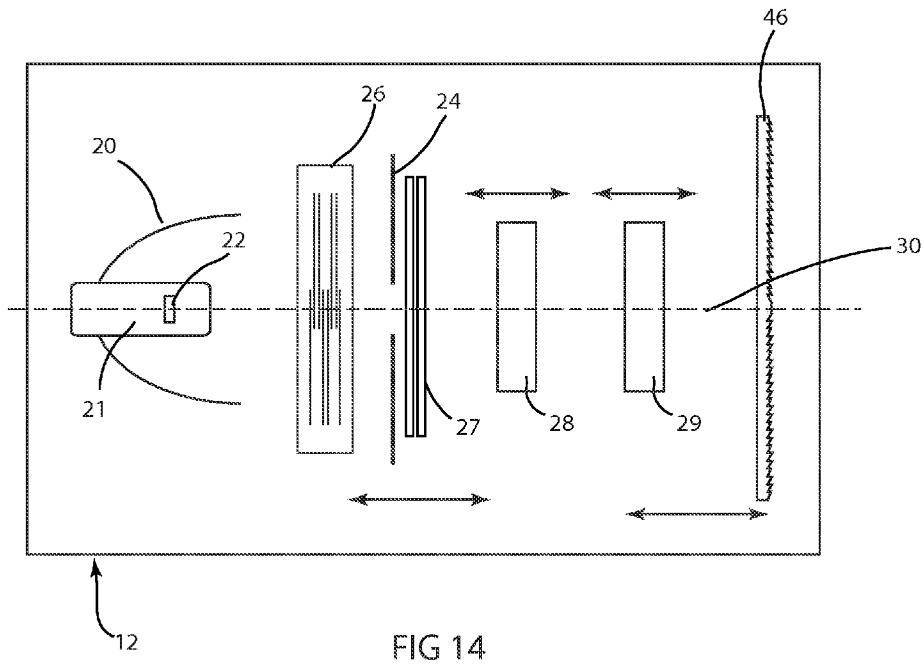

FIG 14

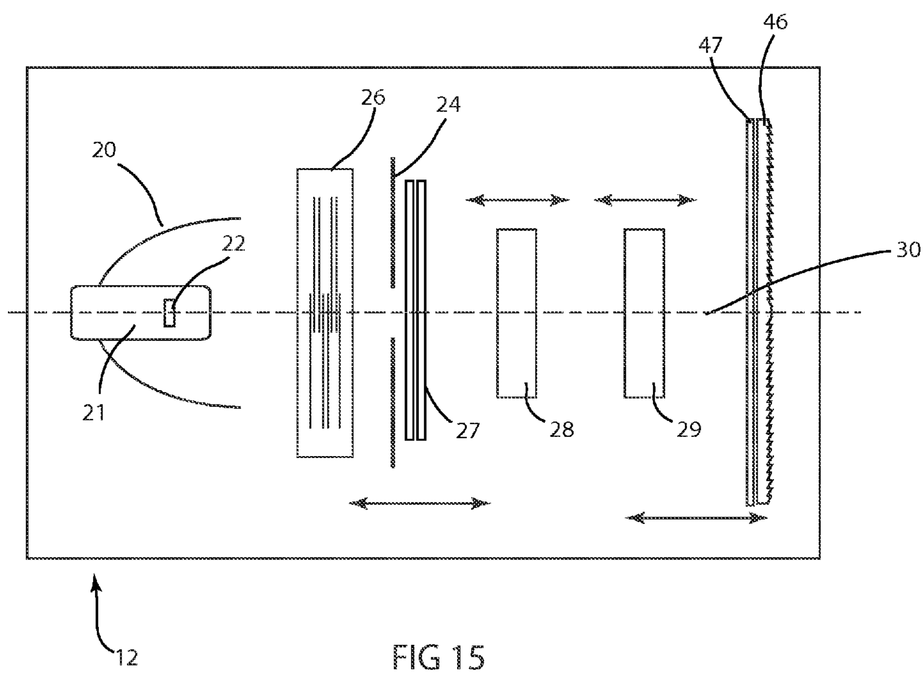

FIG 15

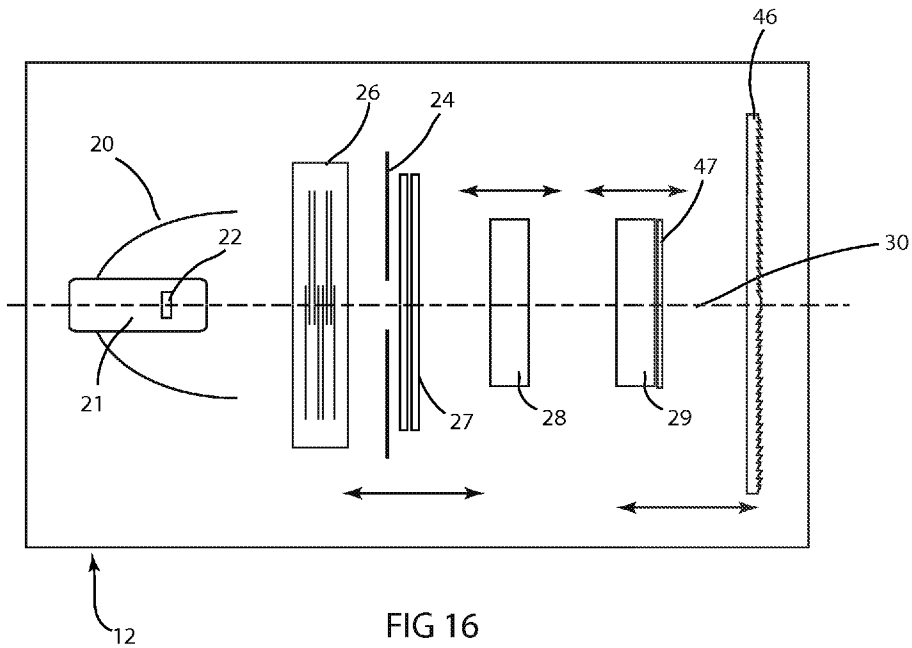
46
26
24
20
47
22
30
21
27
28
29
12

FIG 16

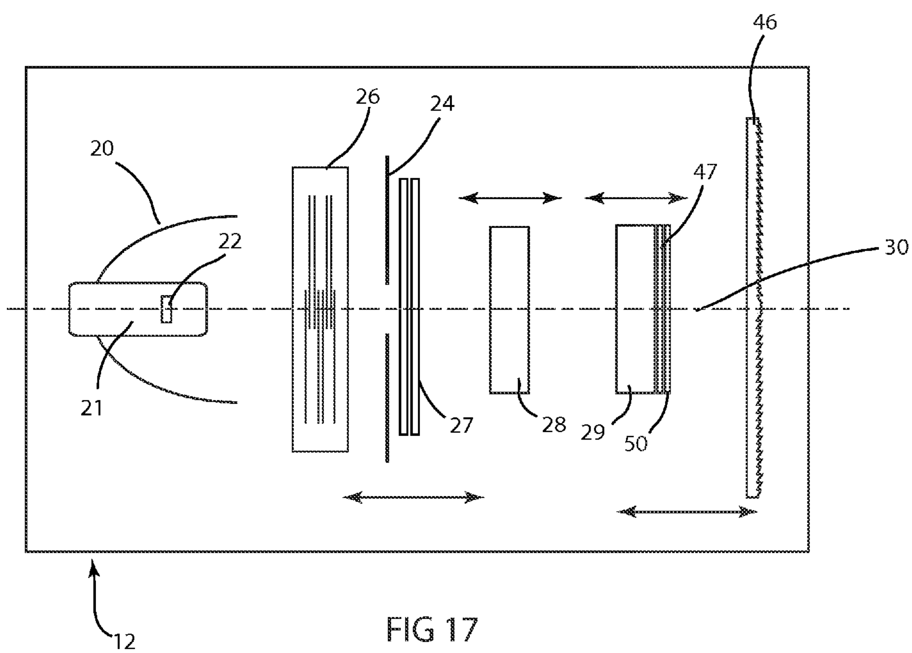
46
26
24
20
47
22
30
21
27
28
29
50
12

FIG 17

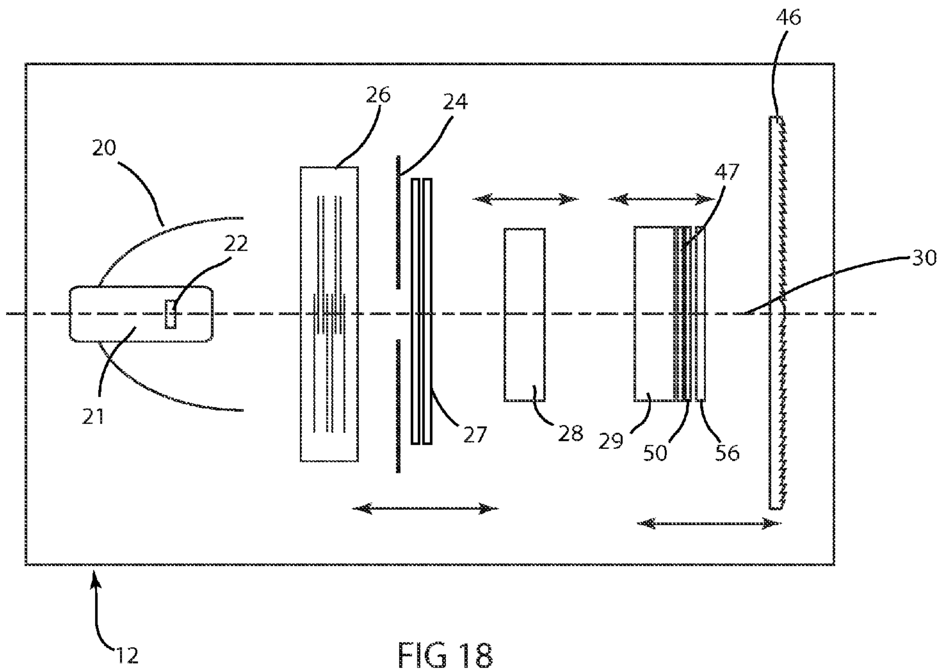

FIG 18

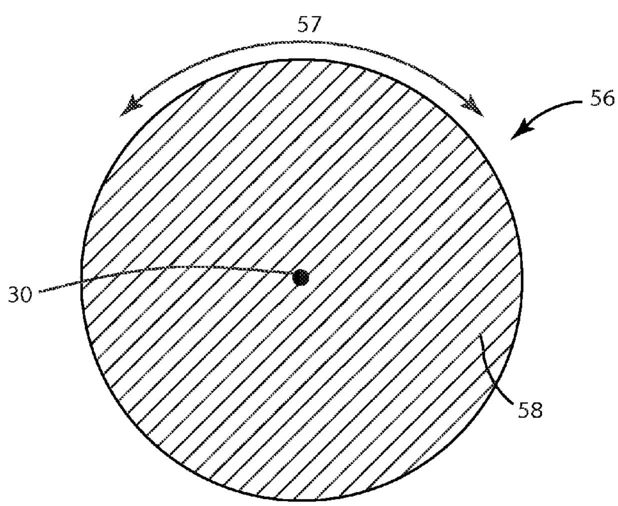

FIG 19

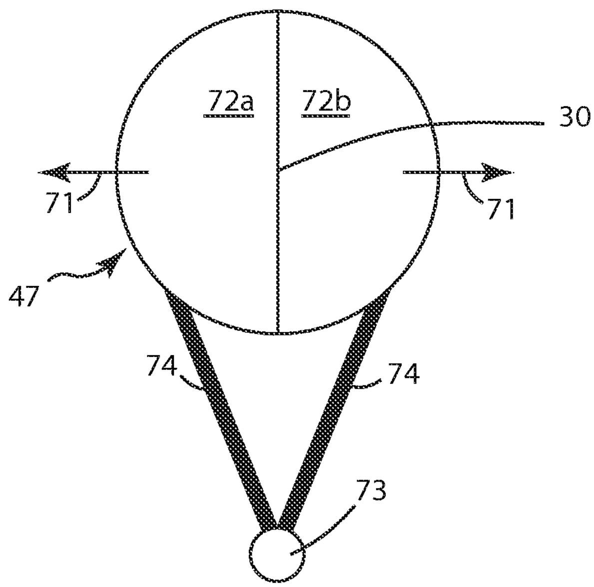

FIG 20

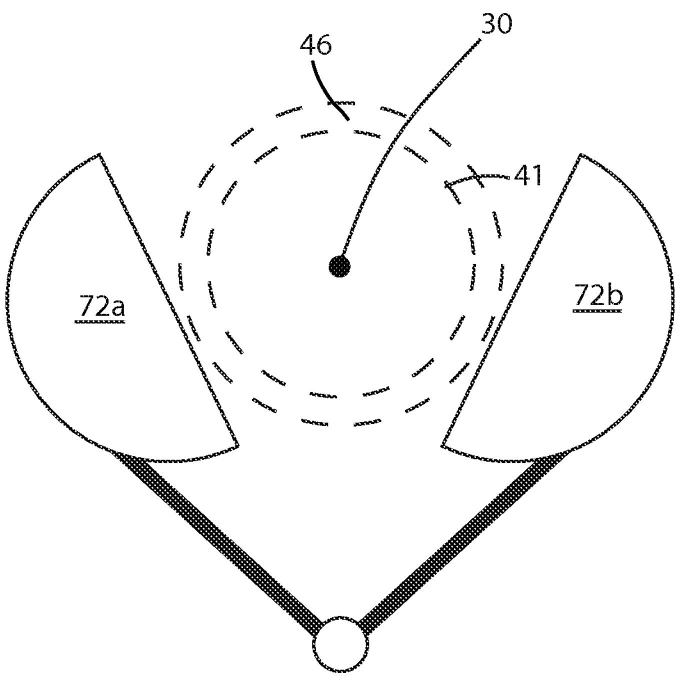

FIG 21

VERSATILE BEAM AND WASH OPTICAL SYSTEM FOR AN AUTOMATED LUMINAIRE

RELATED APPLICATIONS

This application is a full utility patent application claiming priority of provisional patent application(s) 61/531,062 filed 5 Sep. 2011 and 61/599,420 filed 15 Feb. 2012.

TECHNICAL FIELD OF THE INVENTION

The present invention generally relates to automated luminaires, specifically to optical systems for use within automated luminaires.

BACKGROUND OF THE INVENTION

Luminaires with automated and remotely controllable functionality are well known in the entertainment and architectural lighting markets. Such products are commonly used in theatres, television studios, concerts, theme parks, night clubs and other venues. A typical product will commonly provide control over the pan and tilt functions of the luminaire allowing the operator to control the direction the luminaire is pointing and thus the position of the light beam on the stage or in the studio. Typically this position control is done via control of the luminaire's position in two orthogonal rotational axes usually referred to as pan and tilt. Many products provide control over other parameters such as the intensity, color, focus, beam size, beam shape and beam pattern. The beam pattern is often provided by a stencil or slide called a gobo which may be a steel, aluminum or etched glass pattern. The products manufactured by Robe Show Lighting such as the ColorSpot 700E are typical of the art.

The optical systems of such automated luminaires may be designed such that a very narrow output beam is produced so that the units may be used with long throws or for almost parallel light laser like effects. These optics are often called 'Beam' optics. To form this narrow beam the output lens either needs to be very large with a large separation between the lens and the gobos or of a short focal length and much closer to the gobos. It is problematic to use a large separation with a large lens as such an arrangement makes the luminaire large and unwieldy and makes automation of the pan and tilt movement difficult. Thus the normal solution is a closer and smaller lens with a short focal length. A short focal length lens if constructed as a conventional glass plano-convex lens needs to be very thick and heavy which may also cause problems with the center of gravity of the luminaire, especially if the lens is moved along the optical axis by motors to provide an automated focus function. As the heavy lens moves the center of gravity of the luminaire is constantly changing and causes problems for the automated pan and tilt systems which are optimized for a balanced mechanical load. Prior art manufacturers may attempt to remedy this problem in one of two ways. Firstly they may maintain the heavy front lens static and instead move the gobo, iris and shutter assemblies backwards and forwards instead. Although these assemblies are also heavy they are closer to the center of gravity of the luminaire so that moving them has less affect on the overall balance. Alternatively the thick heavy plano-convex front lens may be replaced with a Fresnel lens where the same focal length is achieved with a much lighter molded glass lens using multiple circumferential facets. Fresnel lenses are well known in the art and can provide a good match to the focal length of an equivalent plano-convex lens, however the image projected by such a lens is typically soft edged and fuzzy and not a sharp image as may be desired. This softness may be caused by the facets on the molded glass Fresnel lens; there are relatively few facets and each one has an edge which, instead of being sharp, is constrained by the molding process and the surface tension of the molten glass during molding to instead have a large radius of curvature. This radius on the tip of each circumferential facet tends to diffuse the light beam and produce a softened image.

Prior art beam optical systems may also be unforgiving when it is desired to soften the image and produce a light output capable of being blended between units to provide seamless coverage. This mode of operation is often called a "wash light" as it washes the stage with light. Prior art systems will commonly insert a further optical element(s) such as a frost glass or secondary lens(es) before the final output lens in order to provide this wash distribution. However, such systems often do not provide the ideal light distribution, as a frosted out image is different from the light pattern from a "true" wash light. Further, using a frost or diffusing filter reduces the light output of the luminaire considerably. Additionally a problem with using a secondary lens is that the output lens may not then be filled completely and all the light will appear to be emitted from a portion at the centre of the output lens a "hot spot". This reduces the performance of the luminaire as a wash light as it is an important feature of wash luminaires that the effective light source be as large as possible in order to soften and reduce shadowing.

FIG. **1** illustrates a multiparameter automated luminaire system **10**. These systems commonly include a plurality of multiparameter automated luminaires **12** which typically each contain on-board a light source, light modulation devices, electric motors coupled to mechanical drives systems and control electronics (not shown). In addition to being connected to mains power either directly or through a power distribution system (not shown), each luminaire is connected is series or in parallel to data link **14** to one or more control desks **15**. The luminaire system **10** is typically controlled by an operator through the control desk **15**.

FIG. **2** illustrates a prior art automated luminaire **11** designed as a beamlight in contrast to a wash light. A lamp **21** contains a light source **22** which emits light. The light is reflected and controlled by reflector **20** through optical devices **26** which may include dichroic color filters, effects glass and other optical devices well known in the art and then through an aperture or imaging gate **24**. Optical components **27** are the imaging components and may include gobos, rotating gobos, iris and framing shutters. The final output beam may be transmitted through output lens **31**. Lens **31** may be a short focal length glass lens or equivalent Fresnel lens as described herein. Either optical components **27** or lens **31** may be moved backwards and forwards along the optical axis to provide focus adjustment for the imaging components. A frost or diffusing filter may optionally be included as one of the optical components **26** or **27** such that the output of the beam is diffused to emulate a wash light.

There is a need for an improved output lens system for an automated luminaire which provides the user selectable option of either a narrow beam output with sharply focused images or a wash light distribution with a large effective source and true blending output distribution.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings in which like reference numerals indicate like features and wherein:

FIG. **1** illustrates a typical automated lighting system;

FIG. **2** illustrates a prior art automated luminaire;

FIG. **3** illustrates an embodiment of an improved Fresnel output lens luminaire in beamlight mode;

FIG. **4** illustrates an embodiment of an improved Fresnel output lens luminaire in wash light mode;

FIG. **5** illustrates an embodiment of a Fresnel lens for an improved luminaire;

FIG. **6** illustrates a front view of an embodiment of the stippling lens plate from FIG. **5**;

FIG. **7** illustrates a cross-sectional view stippling lens plate illustrated in FIG. **6**;

FIGS. **8** & **9** illustrate the movement of an embodiment of a partitioned stippling lens plate;

FIGS. **10** & **11** illustrate the movement of an alternative embodiment of a partitioned stippling plate lens in an embodiment of the invention;

FIGS. **12** &**13** illustrate the movement of another alternative embodiment of a partitioned stippling lens plate;

FIG. **14** illustrates an alternative embodiment of an improved Fresnel output lens luminaire in beamlight mode;

FIG. **15** illustrates an embodiment of an improved Fresnel output lens luminaire in wash light mode;

FIG. **16** illustrates an embodiment of an improved Fresnel output lens luminaire in wash light mode;

FIG. **17** illustrates an embodiment of an improved Fresnel output lens luminaire in wash light mode;

FIG. **18** illustrates an embodiment of an improved Fresnel output lens luminaire in wash light mode;

FIG. **19** illustrates in greater detail an embodiment of the beam shaper plate from FIG. **18**, and,

FIGS. **20** & **21** illustrate the movement of an alternative embodiment of a partitioned stippling lens plate in an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Preferred embodiments of the present invention are illustrated in the FIGUREs, like numerals being used to refer to like and corresponding parts of the various drawings.

The present invention generally relates to an automated luminaire, specifically to the configuration of the optical systems within such a luminaire to provide the user selectable option of either a narrow beam output with sharply focused images or a wash light distribution with a large effective source and true blending output distribution.

FIG. **3** illustrates an embodiment of an improved Fresnel output lens luminaire when in beam light mode. Automated luminaire **12** may contain a lamp **21** and reflector **20** where the lamp and reflector may be moved relative to each other for beam hot-spot control, color control components **26** which may include, but are not limited to, color mixing flags or wheels, color wheels and other dichroic color control components, an aperture **24**, imaging optical components **27** which may include but are not limited to gobos, rotating gobos, shutters, beam shapers, variable frost filters, prisms and iris. The light beam from these images is focused by optical assembly **28** and Fresnel output lens **46**. Optical assembly **28** may comprise one or more optical elements all or some of which may be moved backwards and forwards along the optical axis **30** of the luminaire **12** so as to direct light towards output lens **46**. Optical assembly **28** may further homogenize and constrain the light beam and ensure that the light beam entirely fills output lens **46**. Output lens **46** may be the improved Fresnel lens **46** illustrated in FIG. **5**. Lens **46** may be moved backwards and forwards along the optical axis **30** of the luminaire **12** so as to provide focus adjustment of the projected images of optical elements **27**. The combination of optical assembly **28** and output lens **46** provides an output beam which is emitted from the entire surface of output lens **46**, is capable of very narrow angle, almost parallel, output, and avoids an external secondary focus point in the beam.

FIG. **5** illustrates Fresnel lens **38** used in the prior art and embodiments of improved Fresnel lens used in the embodiments of the described improved luminaire. Output lens may be a conventional Fresnel lens **42** or may be a Fresnel lens **46** with a greatly increased number of circumferential facets **48** compared to the faceted surface **41** of the Fresnel lens **38** illustrated in FIG. **5**. The front surface **41** of the lenses **38** and **42** is typical of a prior art Fresnel lens for a luminaire application and may typically comprise 10-15 circumferential facets **44** in a 150 mm diameter lens whereas in an embodiment of the invention the improved Fresnel lens **46** may comprise twice or more the number of circumferential facets **48**. In one embodiment the Fresnel lens comprises approximately 100 circumferential facets **48**. This substantial increase in the number of circumferential facets serves to significantly improve the optical resolution of the lens and thus provide a sharper output image. Although not required by the invention, further improvement may be provided by the lens material and manufacture. A typical prior art Fresnel lens is manufactured of glass and suffers from surface tension effects during molding such that the tips of each facet, which should be sharply pointed, are rounded to a large radius **45**. This radius causes unwanted scattering of the transmitted light and thus softens the projected image. An improved lens of the invention may be manufactured of a plastic or polymer through a molding process that provides significantly reduced radius of curvature on the pointed tips of the facets **49**. This smaller radius of curvature significantly reduces light scattering from these tips and thus provides enhanced sharpness in the projected image. The choice of material as a polymer or plastic further serves to reduce the weight of lens **46**.

A further improvement may be provided by altering the rear surface of the Fresnel lens. Prior art Fresnel lenses **38** also commonly have a break-up or stippling pattern **39** molded into the rear surface. This stippling serves to diffuse the image and thereby disguise defects of the lens—in particular the distortion effects caused by the facet tips **45**. The stippling further softens the image and gives it a wash light like output with diffused shadows and soft images—in contrast to a beam light with more defined images. As further described below, the Fresnel lens in the improved luminaire does not include such stippling or break-up pattern(s)—the rear surface **34** of Fresnel lens **42** and Fresnel lens **46** are optically planar. This planar rear surface allows the luminaire to provide sharply focused output images and tight, narrow beams when desired. It is possible in further embodiments of the invention with less stringent requirements for image quality to use a more conventional glass Fresnel lens **42** with a smaller number of circumferential facets; however the rear surface **34** of such a Fresnel lens must be optically planar, such that it does not include stippling or break-up pattern(s).

FIG. **4** illustrates an embodiment of the improved luminaire **12** in wash light mode. In this mode a stippling lens plate(s) **47** has been added (moved into position) immediately behind and adjacent to the Fresnel lens **46**.

An embodiment of a stippling lens plate **47** is further illustrated in greater detail in FIG. **6** and FIG. **7**. In the embodiment shown the stippling lens is a flat, thin optical plate constructed either of glass, or suitable transparent polymer such as acrylic or polycarbonate. FIG. **6** illustrates a front view of the stippling lens plate down the optical axis **30** of the luminaire. FIG. **7** is a cross-sectional view of stippling lens plate **47** along section **147** indicated in FIG. **6**. In the embodiment shown, The stippling lens plate **47** has one planar surface **36** and one stippled or break-up surface **37** containing a pattern of lenslets **43** or other break-up pattern as well known in the art. The lenslets **43** are illustrated here as circular but the invention is not so limited and lenslets **43** may be any shape or configuration so as to break-up or stipple the image. In operation the stippling lens plate **47** is placed adjacent to the planar surface **34** of Fresnel lens **46**. In this configuration, with the stippling lens plate **47** and Fresnel lens **46** close to each other, the combination behaves substantially as if it were a single optical element. The combination optical element Fresnel lens **46** and stippling lens **47** will produce a soft-edged beam with the true blending light distribution required by a wash light.

The combination has the further advantage over prior art systems that the combination is optically efficient—the two elements **46** and **47** are very close to each other so the majority of the light that is distributed by the stippling lens plate **47** enters the Fresnel lens **46** and there is very little light loss.

A yet further advantage is that the stippling system provides identical results at all beam angles and the system will continue to work as the optical system is zoomed by moving the combination of lens **46** and stippling lens plate **47** backwards and forwards along the optical axis **30**. As in the spot configuration optical assembly **28** may comprise one or more optical elements some of which may be moved backwards and forwards along the optical axis **30** of the luminaire **12** so as to direct light towards output lens **46**. The combination of optical assembly **28** and output lens **46** provides an output beam which is emitted from the entire surface of output lens **46**, is capable of very narrow angle, almost parallel, output, and avoids an external secondary focus point in the beam.

In some embodiments the optically planar surface **36** of the stippling lens plate(s) **37** face the optically planar surface **34** of the Fresnel lens **46**. In other embodiment the stippled lenslets **43** surface of the stippling lens plate **37** faces the optically planar surface **34** of the Fresnel lens **46**.

Various means for inserting and removing the stippling lens plate **37** behind and adjacent to the Fresnel lens are illustrated in various embodiments in FIGS. **8&9**, **10&11**, **12&13**, and/or **20&21**. The invention is not limited to these means and any means of inserting and removing the stippling lens plate as well known in the art should be considered. The stippling lens plate may be inserted and removed in a single piece or may be divided into multiple pieces without affecting its optical properties to aid its insertion and removal, and to minimize the space taken up by the stippling lens plate when it is removed from the beam.

FIGS. **8** and **9** illustrate the movement of the stippling lens plate **47** in an embodiment of the invention. In FIG. **8** the stippling lens plate **47** has been divided into four quarters, **62***a*, **62***b*, **62***c* and **62***d*. Each of these four quarters may be moved radially out of the light path **41** and away from behind Fresnel lens **46** in the directions shown by the arrows **61**.

FIG. **9** shows the four quarters, **62***a*, **62***b*, **62***c* and **62***d*, of the stippling lens plate **47** after they have been moved out of the light path **41**, fully exposing the rear of Fresnel lens **46**. The movement of the stippling lens plate quarters **62***a*, **62***b*, **62***c* and **62***d* may be through mechanical linkages (not shown) driven by stepper motors (not shown) or other means as well known in the art.

FIGS. **10** and **11** illustrate a further example of the movement of the stippling lens plate **47** in an embodiment of the improved luminaire. In FIG. **10** the stippling lens plate **47** has been divided into four flags, **52***a*, **52***b*, **52***c* and **52***d*. Each of these four flags **52***a*, **52***b*, **52***c* and **52***d* may be rotated about four rotating axes **51** (one for each flag **52***a*, **52***b*, **52***c* and **52***d*) out of the light path **41** and away from behind Fresnel lens **46** in the directions shown by the arrows **53**.

FIG. **11** shows the four flags, **52***a*, **52***b*, **52***c* and **52***d*, of the stippling lens plate **47** after they have been rotated out of the light path **41**, fully exposing the rear of Fresnel lens **46**. The movement of the stippling lens plate flags may be through mechanical linkages (not shown) driven by stepper motors (not shown) or other means as well known in the art.

FIGS. **12** and **13** illustrate both plan (front) and elevation (side) views of a further example of the movement of the stippling lens plate in an embodiment of the invention. In FIG. **12** the stippling lens plate **47** has been divided into two halves, **54***a*, and **54***b*. Each of these two halves may be rotated about pivots **55** out of the plane of the light path **41** and away from behind Fresnel lens **46** in the direction shown by the arrows **57**. This movement is like lifting and opening the pages of a book. FIG. **12** shows the two halves, **54***a*, and **54***b*, of the stippling lens plate **47** after they have been lifted and rotated out of the light path, fully exposing the rear of Fresnel lens **46**. The movement of the stippling lens plate halves may be through mechanical linkages driven by stepper motors or other means as well known in the art.

FIGS. **20** and **21** illustrate a further alternative embodiment of the movement of the stippling lens plate(s) **47** in an embodiment of the invention. In FIG. **20** the stippling lens plate **47** has been divided into two halves, **72***a* and **72***b*. Each of these two halves may be swung out of the light path **41** and away from behind Fresnel lens **46** in the directions shown by the arrows **71** through the contra rotation of shafts **73** and connecting arms **74**. Shafts **73** may be driven by a stepper motor (not shown). Such mechanisms are well known in the art.

FIG. **14** illustrates a further embodiment of the invention when in beam light mode. Automated luminaire **12** may contain a lamp **21** and reflector **20** where the lamp and reflector may be moved relative to each other for beam hot-spot control, color control components **26** which may include but are not limited to color mixing flags or wheels, color wheels and other dichroic color control components, an aperture **24**, imaging optical components **27** which may include but are not limited to gobos, rotating gobos, shutters, beam shapers, variable frost filters, prisms and iris. The light beam from these images is focused by first optical assembly **28**, second optical assembly **29**, and output lens **46**. First optical assembly **28** and second optical assembly **29** may each comprise one or more optical elements and some of which may be moved backwards and forwards along the optical axis **30** of the luminaire **12** so as to direct light towards output lens **46**. First optical assembly **28** and second optical assembly **29** may further homogenize and constrain the light beam and ensure that the light beam substantially fills output lens **46**. Output lens **46** may be the improved Fresnel lens **46** illustrated in FIG. **5**. First optical assembly **28**, second optical assembly **29** and lens **46** may be moved backwards and forwards along the optical axis **30** of the luminaire **12** so as to provide focus and beam angle adjustment of the projected images of optical elements **27**. The combination of first optical assembly **28**, second optical assembly **29**, and output lens **46** provides an output beam which is emitted from substantially the entire surface of output lens **46**, is capable of very narrow angle, almost parallel, output, and avoids an external secondary focus point in the beam.

FIG. **15** illustrates the further embodiment of the improved luminaire **12** in wash light mode. In this mode a stippling lens plate **47** has been added (moved into position) immediately behind and adjacent to the Fresnel lens **46**. The combination optical element Fresnel lens **46** and stippling lens **47** will produce a soft-edged beam with the true blending light distribution required by a wash light. As in the spot configuration illustrated in FIG. **14** (stippling lens not in the beam path) first optical assembly **28** and second optical assembly **29** may each comprise one or more optical elements some of which may be moved backwards and forwards along the optical axis **30** of the luminaire **12** so as to direct light towards output lens **46**. The combination of first optical assembly **28**, second optical assembly **29**, and output lens **46** provides an output beam which is emitted from the entire surface of output lens **46**, is capable of very narrow angle, almost parallel, output, and avoids an external secondary focus point in the beam.

In some embodiments the optically planar surface **36** of the stippling lens plate(s) **37** face the optically planar surface **34** of the Fresnel lens **46**. In other embodiment the stippled lenslet **43** surface of the stippling lens plate **37** faces the optically planar surface **34** of the Fresnel lens **46**.

FIG. **16** illustrates an alternative embodiment of the improved luminaire **12** shown in FIG. **15** in wash light mode. In this embodiment the removable stippling lens plate(s) **47** has been added after second optical assembly **29**, between that assembly and Fresnel lens **46**. This configuration offers the same advantages as those discussed for FIG. **15** with the further advantage that stippling lens plate lens **47** may be smaller than Fresnel lens **46**, a diameter closer to the size of the second optical assembly **29**. Stippling lens plate **47** may be part of the same mechanical assembly as second optical assembly **29** and may move with it backwards and forwards along the optical axis **30** of the luminaire **12** as the focus and beam angle of the luminaire are adjusted. Various means for inserting and removing the stippling lens plate after second optical assembly **29** are similar to those illustrated in various embodiments in FIGS. **8&9**, **10&11**, **12&13**, and/or **20&21**. The invention is not limited to these means and any means of inserting and removing the stippling lens plate as well known in the art should be considered. The stippling lens plate may be inserted and removed as a single piece or may be divided into multiple pieces without affecting its optical properties to aid its insertion and removal, and to minimize the space taken up by the stippling lens plate when it is removed from the beam.

In some embodiments the optically planar surface **36** of the stippling lens plate(s) **37** face lens set **29**. In other embodiment the stippled lenslet **43** surface of the stippling lens plate **37** away from lens set **29**.

FIG. **17** illustrates an alternative embodiment of the improved luminaire **12** shown in FIG. **15** in wash light mode. In this embodiment a further removable diffusing plate **50** has been added after second optical assembly **29**, between that assembly and Fresnel lens **46**. Diffusing plate **50** may have a micro lens structure or be manufactured of a frosted or diffusing material, either glass or a polymer. Diffusing plate **50** may spread light through a greater angle than stippling lens plate **47** and may allow the luminaire to produce a wider output angle. Diffusing plate **50** may be added to the optical assembly instead of stippling lens plate **47** or in addition to stippling lens plate **47** to provide further combinational options on beam angle. Diffusing plate **50** may be part of the same mechanical assembly as second optical assembly **29** and may move with it backwards and forwards along the optical axis **30** of the luminaire **12** as the focus and beam angle of the luminaire are adjusted. Various means for inserting and removing the diffusing plate **50** after second optical assembly **29** are similar to those illustrated in various embodiments in FIGS. **8&9**, **10&11**, **12&13**, and/or **20&21**. The invention is not limited to these means and any means of inserting and removing the diffusing plate as well known in the art should be considered. The diffusing plate may be inserted and removed as a single piece or may be divided into multiple pieces without affecting its optical properties to aid its insertion and removal, and to minimize the space taken up by the diffusing plate when it is removed from the beam.

In some embodiments the optically planar surface **36** of the stippling lens plate(s) **37** face lens set **29**. In other embodiment the stippled lenslet **43** surface of the stippling lens plate **47** away from lens set **29**. In further embodiments rather than the stippling lens plate **47** being between the second lens set **29** and the diffusing plate **50**, the diffusing plate **50** can be between the second lens set **29** and the stippling lens plate **47**. In preferred embodiments these components, lens set **29**, stippling lens plate **47** and diffusion plate **50** are tightly configured.

FIG. **18** illustrates an alternative embodiment of the improved luminaire **12** shown in FIG. **15** in wash light mode. In this embodiment a further removable beam spreader plate **56** has been added after second optical assembly **29**, between that assembly and Fresnel lens **46**. Beam spreader plate **56** may have an asymmetrical optical structure such that it spreads light in one axis more than in another. This may impart an oval shape to the resultant light beam with the asymmetry of the beam spreader plate affecting the eccentricity of the ellipse. Beam spreader plate **56** may have a lenticular or micro lens structure or be manufactured of a rippled, frosted or diffusing material, either glass or a polymer. Beam spreader plate **56** may be added to the optical assembly instead of stippling lens plate **47** and diffusing plate **50** or may be used in any combination with stippling lens plate **47** and diffusing plate **50** to provide further combinational options on beam angle and beam shape. Beam spreader plate **56** may be part of the same mechanical assembly as second optical assembly **29** and may move with it backwards and forwards along the optical axis **30** of the luminaire **12** as the focus and beam angle of the luminaire are adjusted. Various means for inserting and removing the beam spreader plate **56** after second optical assembly **29** are similar to those illustrated in various embodiments in FIGS. **8 & 9**, **10 & 11**, **12 & 13**, and/or **20 & 21**. The invention is not limited to these means and any means of inserting and removing the beam spreader plate as well known in the art should be considered. The beam spreader plate may be inserted and removed as a single piece or may be divided into multiple pieces without affecting its optical properties to aid its insertion and removal, and to minimize the space taken up by the beam spreader plate when it is removed from the beam. Beam spreader plate **56** may also be configures such that it may be rotated around the optical axis **30** of the luminaire **12**. This rotation allows the resultant oval beam to be rotated as the user desires.

In some embodiments the optically planar surface **36** of the stippling lens plate(s) **37** face lens set **29**. In other embodiment the stippled lenslet **43** surface of the stippling lens plate **47** away from lens set **29**. In further embodiments the stippling lens plate **47**, diffusion plate **50** and beam spreader **56** can appear in different order(s) after a lens set **29**. In preferred embodiments these components, lens set **29**, stippling lens plate **47**, diffusion plate **50** and beam spreader **56** are tightly configured.

FIG. **19** illustrates in greater detail an embodiment of a beam shaper plate **56** from FIG. **18**. Beam shaper plate **57** may comprise a plurality of lenticular lens elements **58**. Each lenticular lens element **58** will spread the light passing through the plate by a greater angle in a first direction, perpendicular to the lenticular axis, than in a second direction, parallel to the lenticular axis. This imparts an elliptical or oval shape to the resultant beam. Beam shaper plate **56** may be rotated **57** around the optical axis **30** so as to rotate this ellipse or oval as desired. As first optical element **28**, second optical element **29**, coupled beam shaping plate **56** and Fresnel lens **46** are moved backwards and forwards along optical axis **30**, the elliptical or oval shaped beam may be reduced or increased in size. Means for actuating the movement of the beam shaper plate **56** are known in the art.

While the disclosure has been described with respect to a limited number of embodiments, those skilled in the art, having benefit of this disclosure, will appreciate that other embodiments may be devised which do not depart from the scope of the disclosure as disclosed herein. The disclosure has been described in detail, it should be understood that various changes, substitutions and alterations can be made hereto without departing from the spirit and scope of the disclosure.

The invention claimed is:

1. An automated luminaire generating a modulated light beam along a light beam axis comprising: a Fresnel lens with a planar rear surface a stipple plate with a planar front surface and a stippled rear surface mounted adjacent to the Fresnel lens so that the planar surface of the Fresnel lens is adjacent to the planar surface of the stippled plate; the stipple plate is articulated to be selectively removed from the light beam and inserted in the light beam adjacent to the Fresnel lens; the stipple lens is partitioned into a plurality of separate sections and the stipple lens partitions articulations incorporate a pivot about which the partitions are rotated from out of the light beam to a position in the light beam immediately adjacent to the Fresnel lens.

2. The automated luminaire of claim **1** wherein the Fresnel lens and stipple plate are selectively articulated to variable positions along a range along the light beam axis.

3. The automated luminaire of claim **1** wherein the pivots are positioned so that the potion rotational plane of the stipple lens partitions is in a plane perpendicular to the light beam axis.

4. An automated luminaire generating a modulated light beam along a light beam axis comprising: a Fresnel lens with a planar surface; a stipple plate with a planar surface facing the planar surface of the Fresnel lens and a stippled surface opposite the planar surface of the stippled plate; the planar surface of the Fresnel lens faces the light beam; wherein the Fresnel lens and stipple plate are selectively articulated to variable positions along a range along the light beam axis and the stipple lens partitions articulations incorporate a pivot about which the partitions are rotated from out of the light beam to a position in the light beam immediately adjacent to the Fresnel lens.

5. The automated luminaire of claim **1** where the stipple plate is articulated to be selectively removed from the light beam and inserted in the light beam adjacent to the Fresnel lens.

6. The automated luminaire of claim **1** wherein the stipple lens is partitioned into a plurality of separate sections.

7. The automated luminaire of claim **6** wherein the pivots are positioned so that the potion rotational plane of the stipple lens partitions is in a plane perpendicular to the light beam axis.

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