US008046894B2

(12) **United States Patent**
Williams

(10) **Patent No.: US 8,046,894 B2**
(45) **Date of Patent: Nov. 1, 2011**

(54) **DIORAMA AND METHOD OF MAKING THE SAME**

(75) Inventor: **Anthony D. Williams**, San Carlos, CA (US)

(73) Assignee: **Axial-Digital Corp.**, San Carlos, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 63 days.

(21) Appl. No.: **12/646,597**

(22) Filed: **Dec. 23, 2009**

(65) **Prior Publication Data**

US 2011/0035976 A1 Feb. 17, 2011

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/539,485, filed on Aug. 11, 2009.

(51) **Int. Cl.**
B21D 39/02 (2006.01)
G09F 1/06 (2006.01)

(52) **U.S. Cl.** **29/463**; 40/124.14

(58) **Field of Classification Search** 29/462, 29/428, 463

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,215,962	A		2/1917	Morrison et al.
1,853,615	A		4/1932	Howard
2,059,964	A		11/1936	Hempstone
2,102,553	A		12/1937	Cohen
2,154,087	A	*	4/1939	Fawcett 40/124.09
2,312,644	A		3/1943	Horr
2,314,721	A		3/1943	Lowenstein
2,731,748	A		1/1956	Polay
3,363,360	A		1/1968	Ryan
3,664,049	A		5/1972	Smith
4,146,984	A		4/1979	Lindquist
4,778,392	A		10/1988	Mitchell
5,317,823	A		6/1994	Brunt, II
6,173,515	B1		1/2001	Walsh
6,249,278	B1		6/2001	Segan et al.
6,606,407	B1	*	8/2003	Takahashi et al. 382/164
7,258,592	B2		8/2007	Colak
2002/0110652	A1		8/2002	Conk
2004/0190063	A1	*	9/2004	Brown 358/1.18
2005/0099414	A1	*	5/2005	Kaye et al. 345/419
2006/0046603	A1		3/2006	Colak
2007/0240345	A1	*	10/2007	Davis 40/453
2008/0178501	A1		7/2008	Crowell et al.
2008/0253608	A1		10/2008	Long et al.

* cited by examiner

Primary Examiner — John C Hong
(74) *Attorney, Agent, or Firm* — Edward S. Wright

(57) **ABSTRACT**

Diorama made from a two-dimensional image having a background panel in which a background section of the image appears and a plurality of additional panels on which additional sections of the image appear. The additional panels extend forwardly from the background panel, with edges of adjacent ones of the panels coming together and the image flowing continuously between the panels. The two-dimensional image is transformed into a diorama by constructing a three-dimensional model of the diorama in the form of a plurality of panels on which different areas of the image will appear, converting the three-dimensional model to a two-dimensional layout guide with lines outlining the panels, using the layout guide as a template for adjusting the shape and size of selected areas of the two-dimensional image to match the guide lines on the layout guide, printing the adjusted image, trimming the printed image along facing edges of adjacent ones of the panels, and bringing the trimmed edges together to form a continuous three-dimensional image.

18 Claims, 14 Drawing Sheets

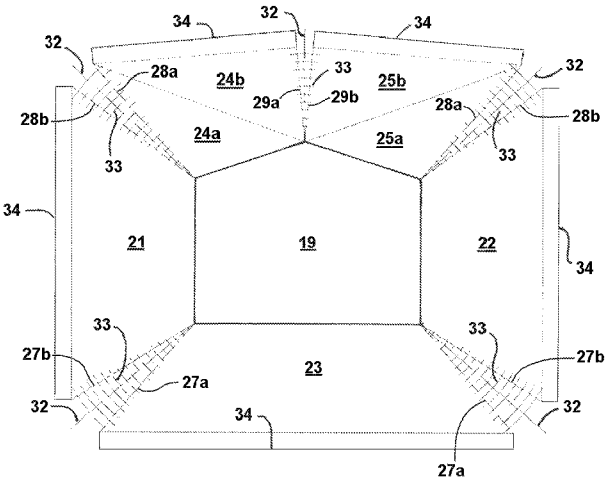


Fig. 1

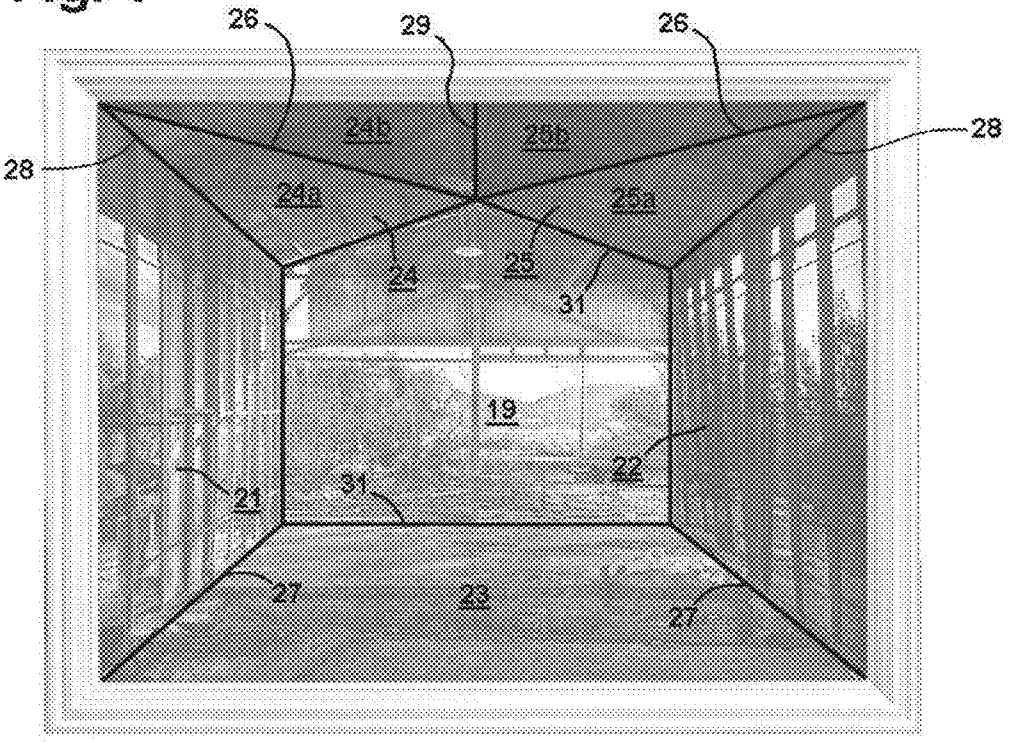


Fig. 2

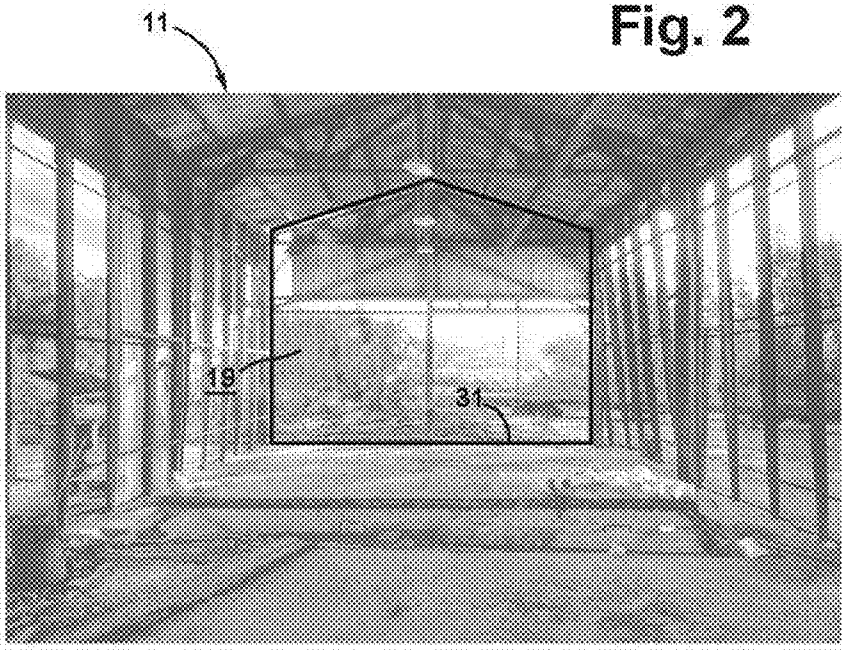
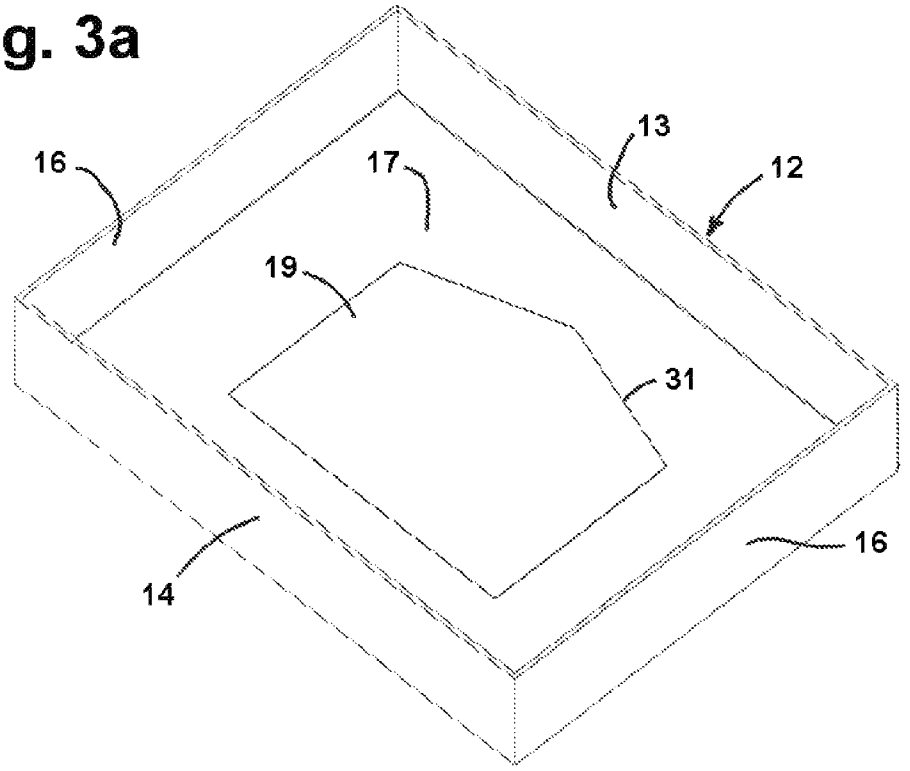


Fig. 3a


16
17
13
12
19
31
14
16

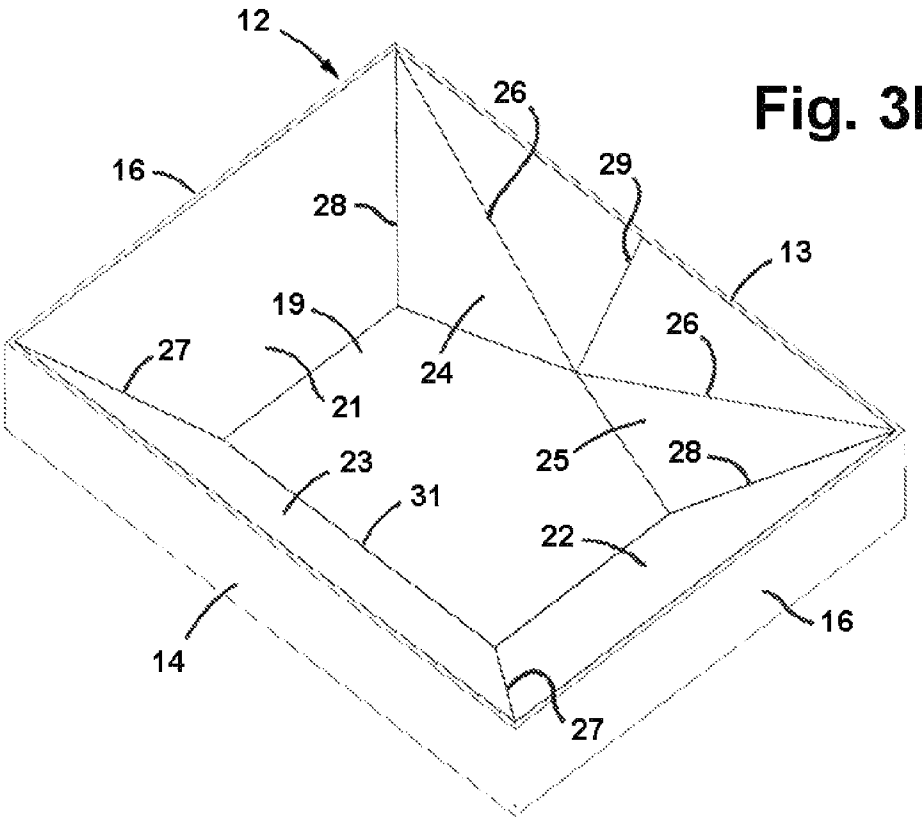

12
26
16
29
28
13
19
26
27
24
21
25
28
23
31
22
14
16
27

Fig. 3b

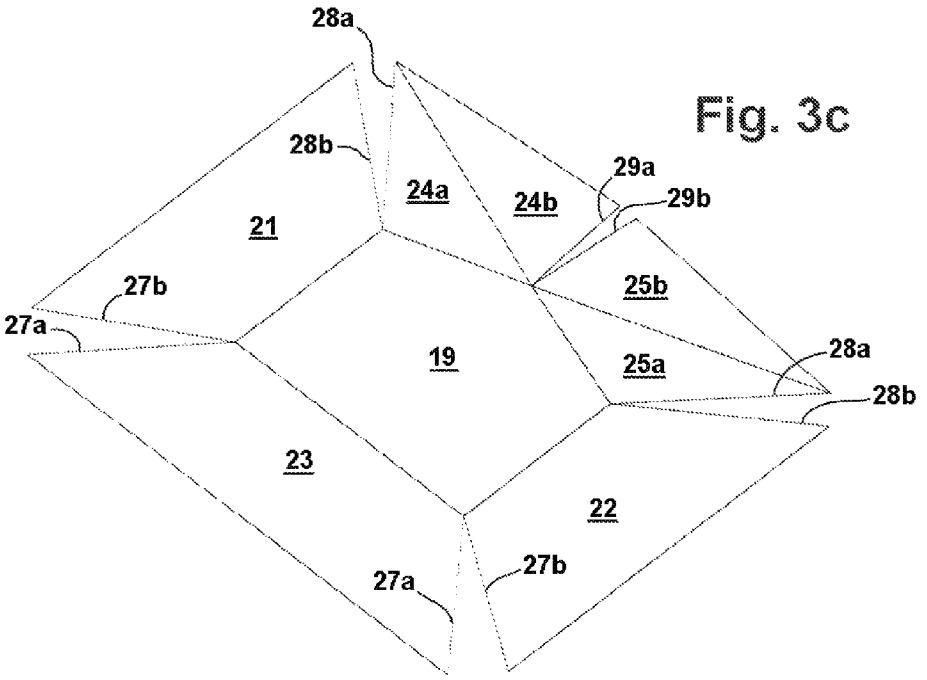

28a
28b
24a
24b
29a
29b
21
25b
27b
27a
19
25a
28a
28b
23
22
27a
27b

Fig. 3c

Fig. 3d

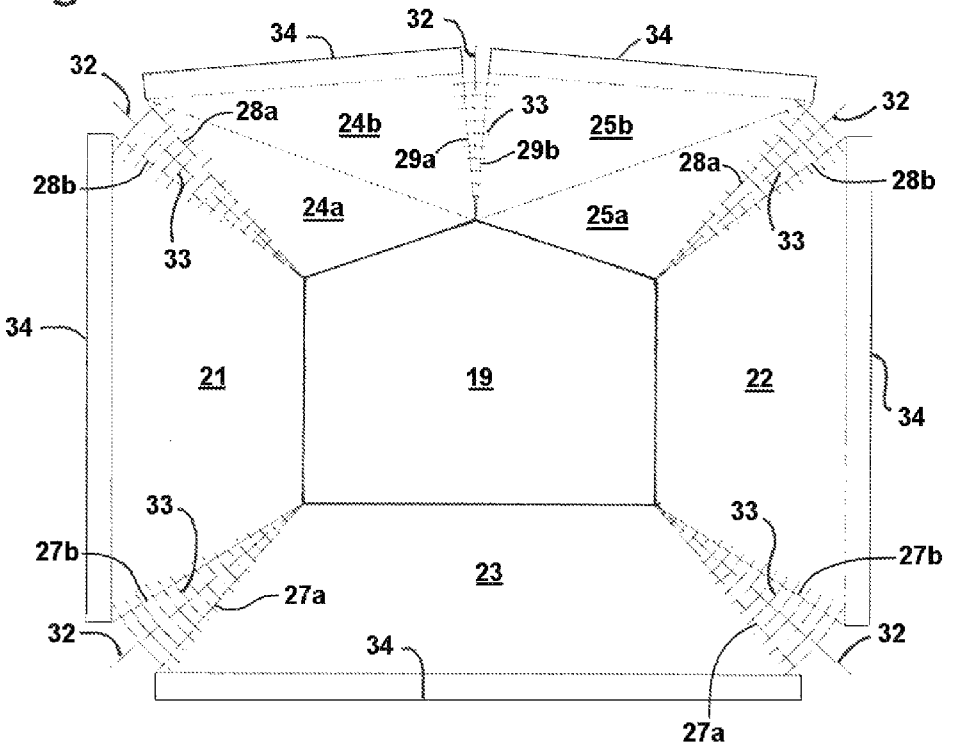

34
32
34
32
28a
24b
33
25b
32
29a
29b
28a
28b
28b
24a
25a
33
33
34
21
19
22
34
33
33
27b
27b
23
27a
32
32
34
27a

Fig. 4a

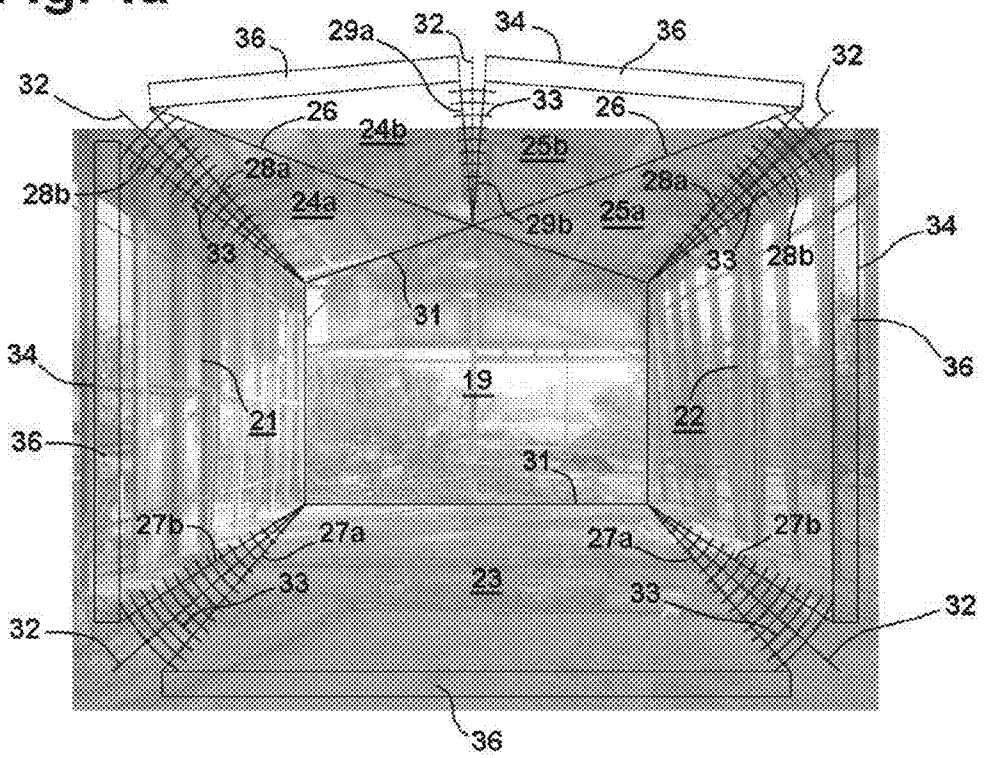

36
29a
32
34
36
32
32
26
33
26
24b
25b
28a
28a
28b
24a
29b
25a
34
33
33
28b
31
36
34
19
21
22
36
31
27b
27a
27a
27b
33
23
33
32
32
36

Fig. 4b

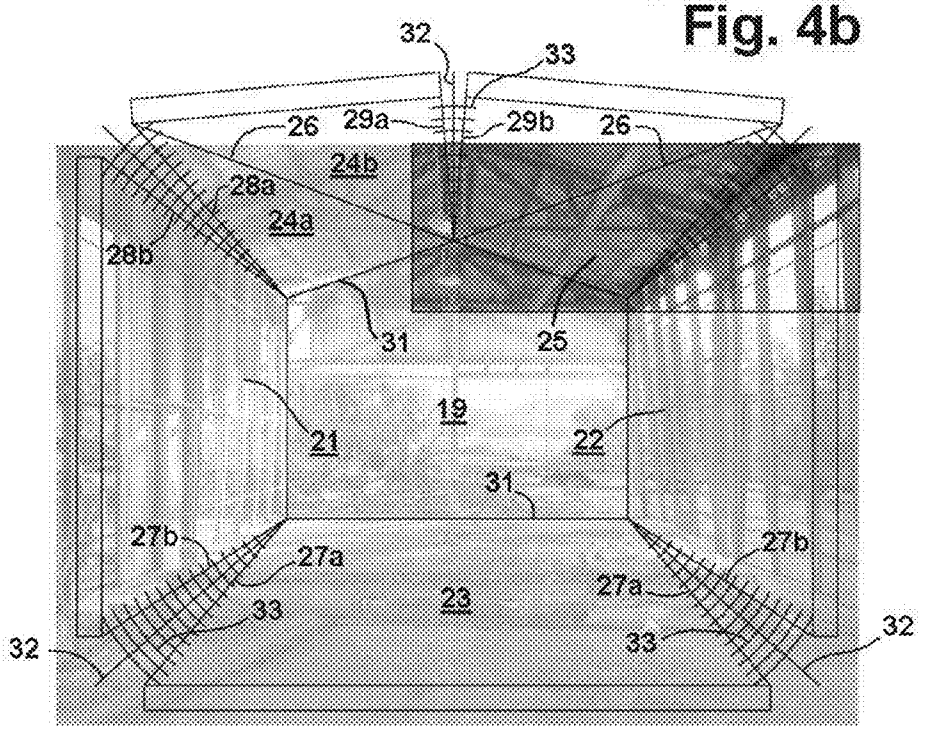

32
33
26
29a
29b
26
24b
28a
24a
28b
31
25
19
21
22
31
27b
27a
27b
27a
23
33
33
32
32

Fig. 4c

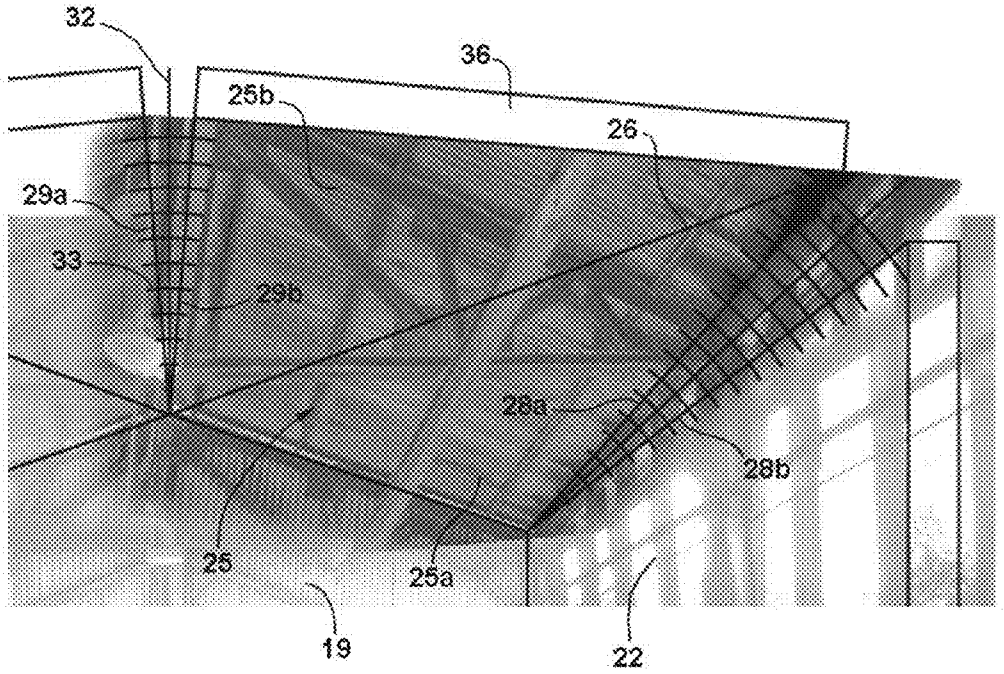

32
36
25b
26
29a
33
29b
28a
28b
25
25a
19
22

Fig. 4d

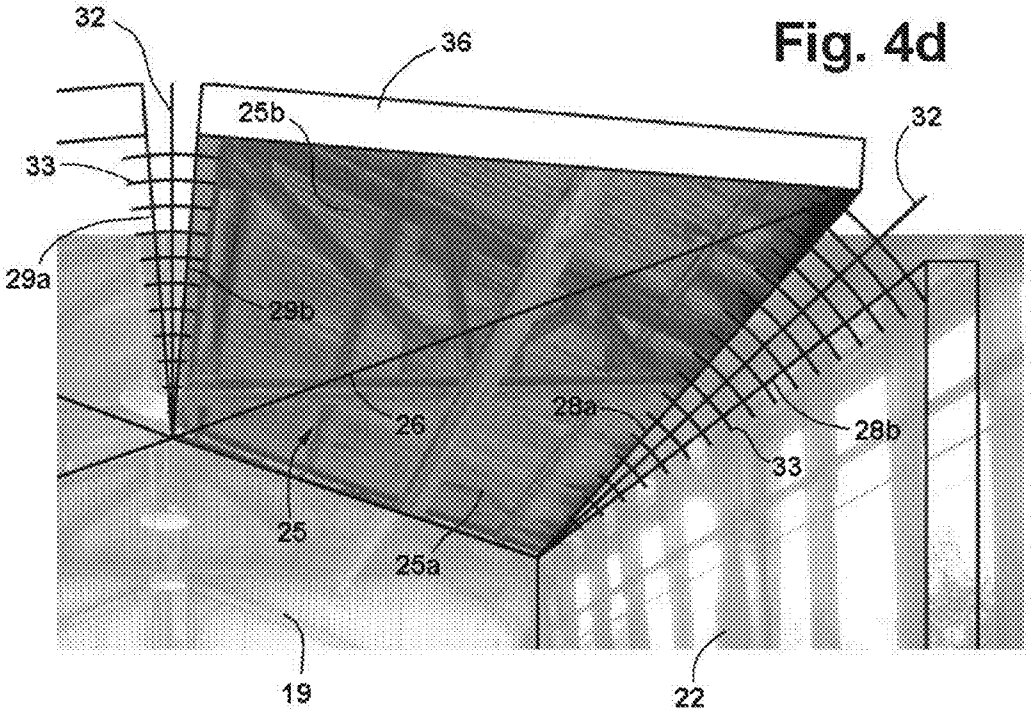

32
36
25b
32
33
29a
29b
26
28a
28b
33
25
25a
19
22

Fig. 5

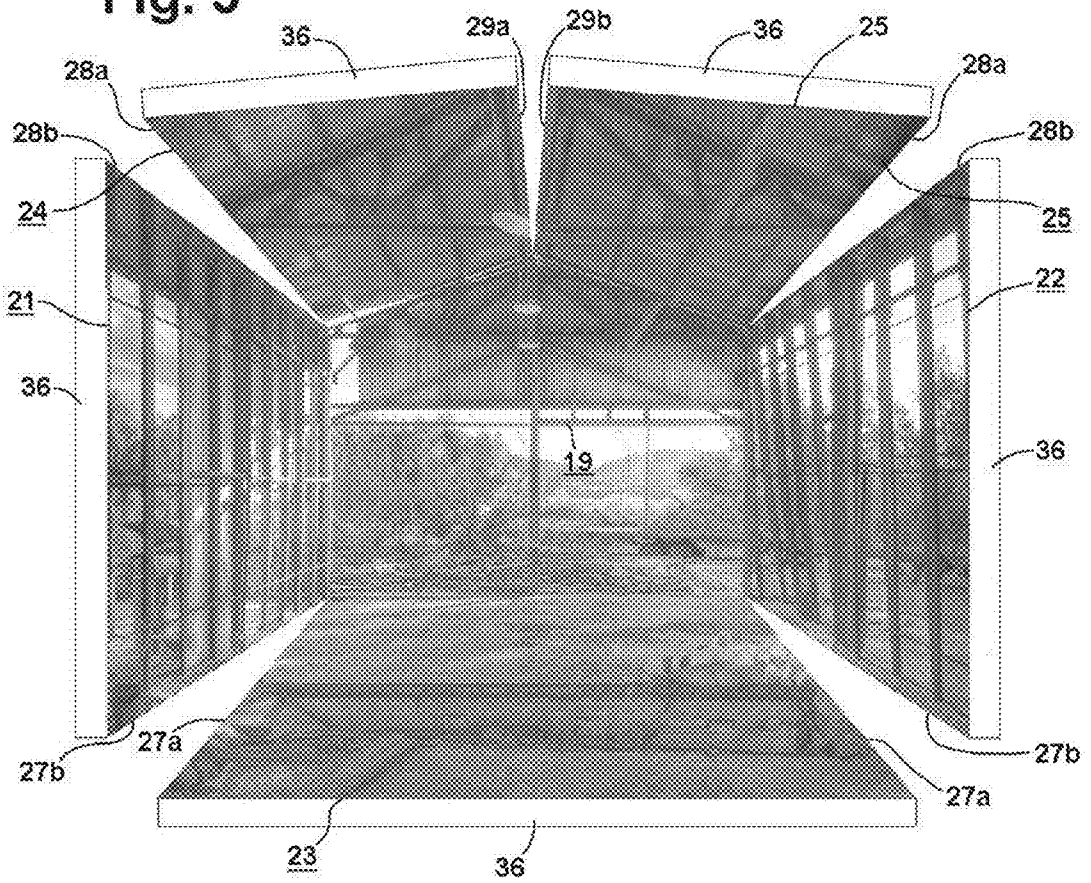
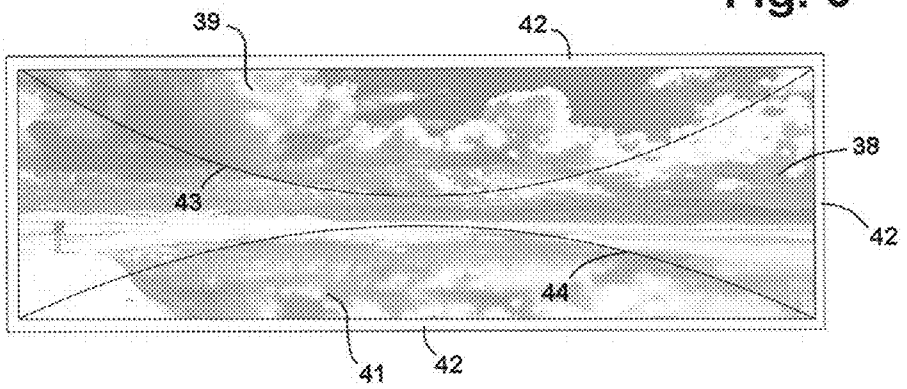

36
29a
29b
36
25
28a
28a
28b
28b
24
25
21
22
36
19
36
27a
27b
27b
27a
23
36

Fig. 6



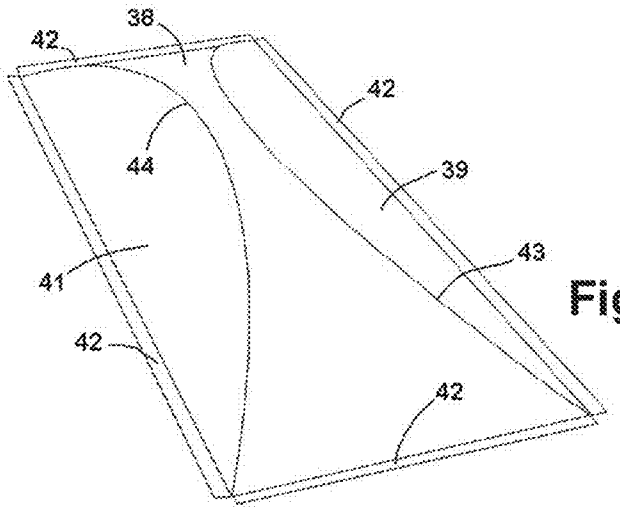


Fig. 7

Fig. 8

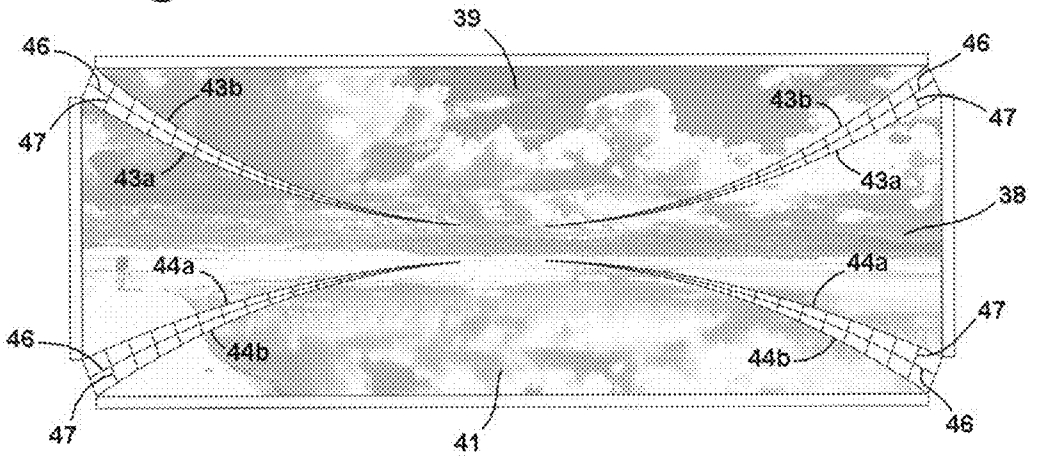
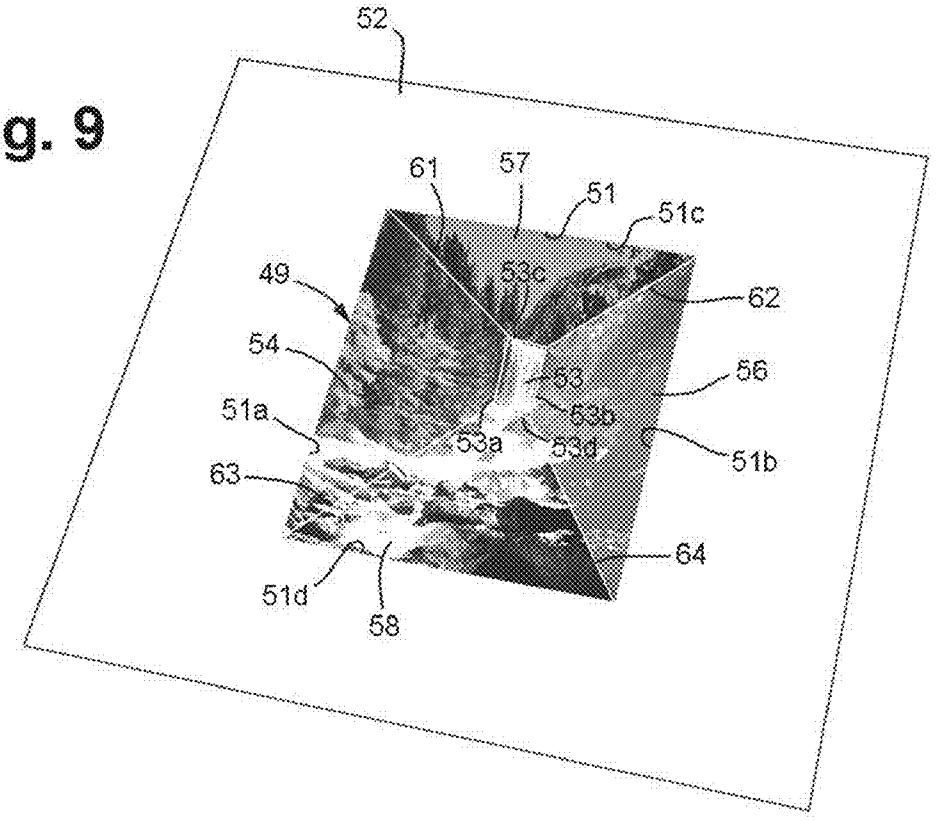


Fig. 9


52
61
57
51
51c
49
53c
62
54
53
56
53b
51a
53a
53d
51b
63
64
51d
58

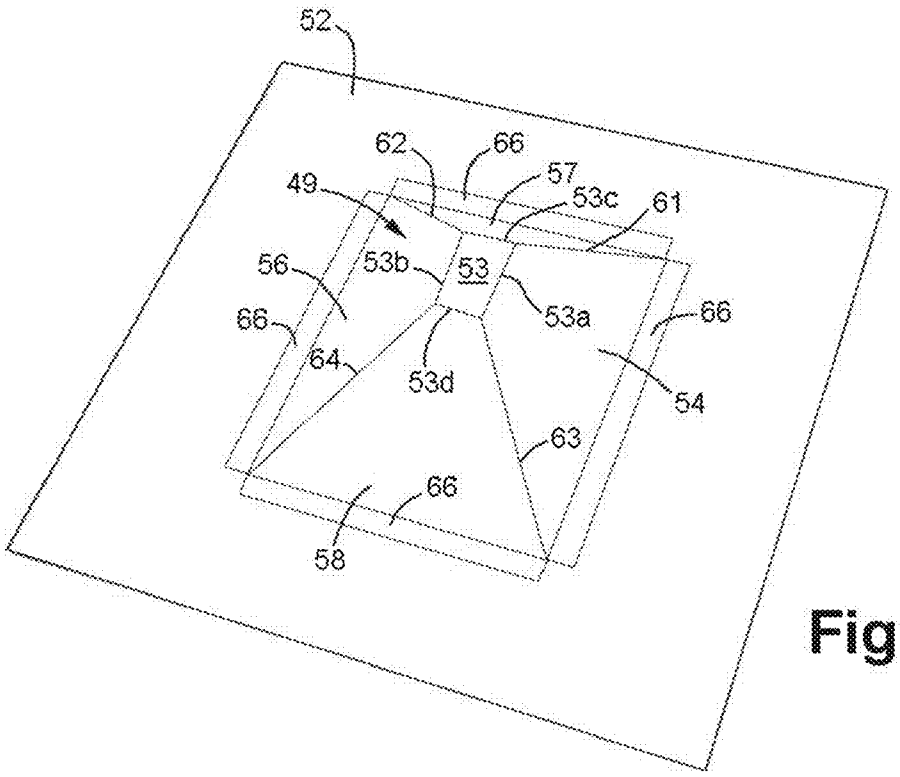

52
62
66
57
49
53c
61
56
53b
53
53a
66
66
64
53d
54
63
66
58

Fig. 10

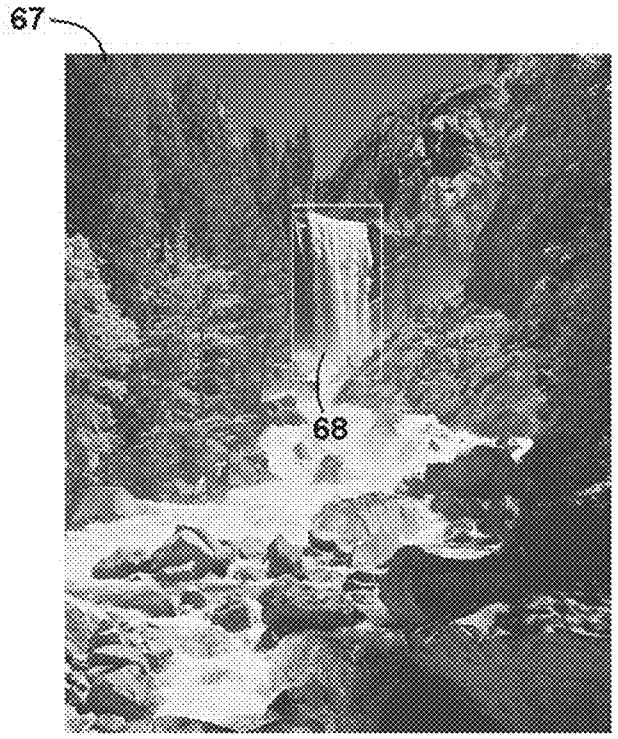


Fig. 11

Fig. 12

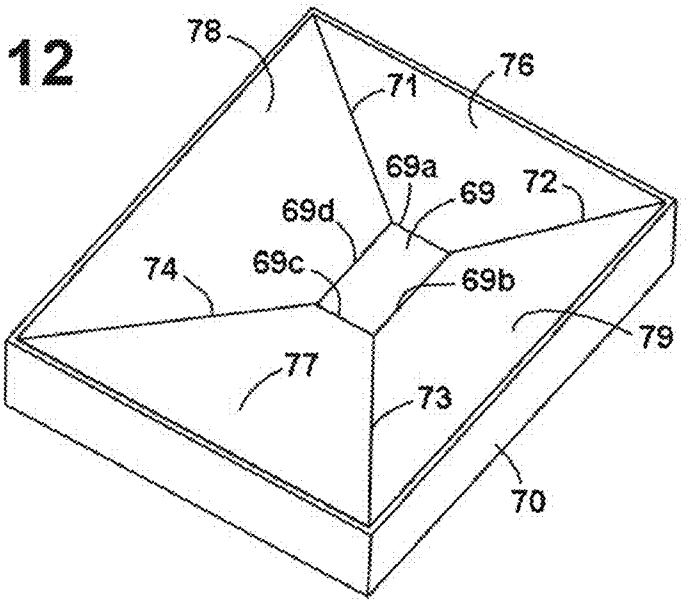


Fig. 13

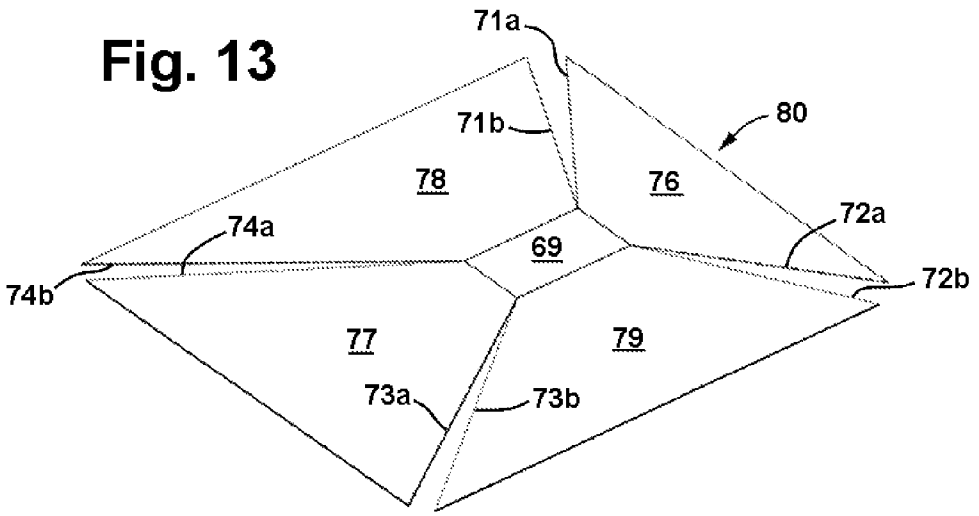
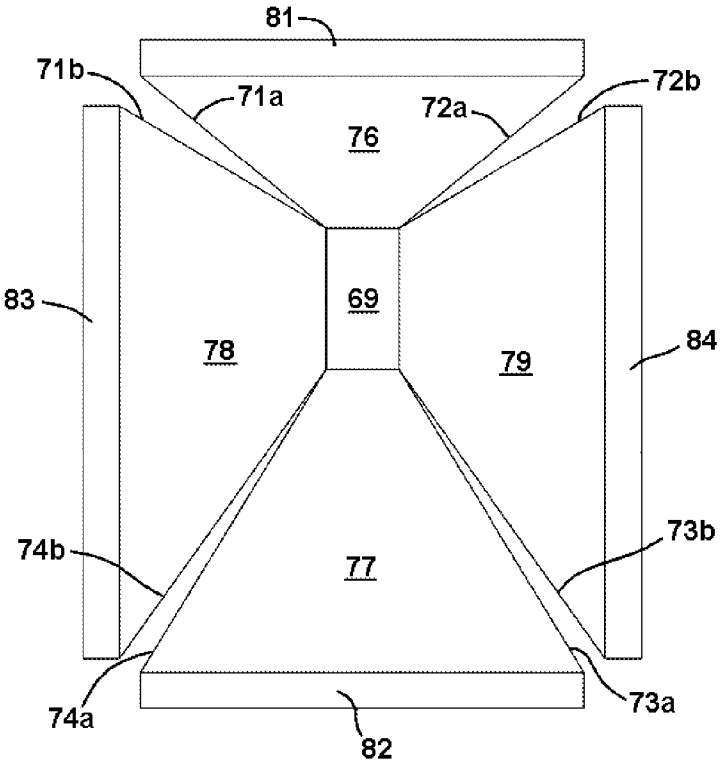

71a
71b
80
78
76
72a
74a
69
74b
72b
77
79
73a
73b

Fig. 14


81
71b
71a
72a
72b
76
83
69
78
79
84
74b
73b
77
74a
73a
82

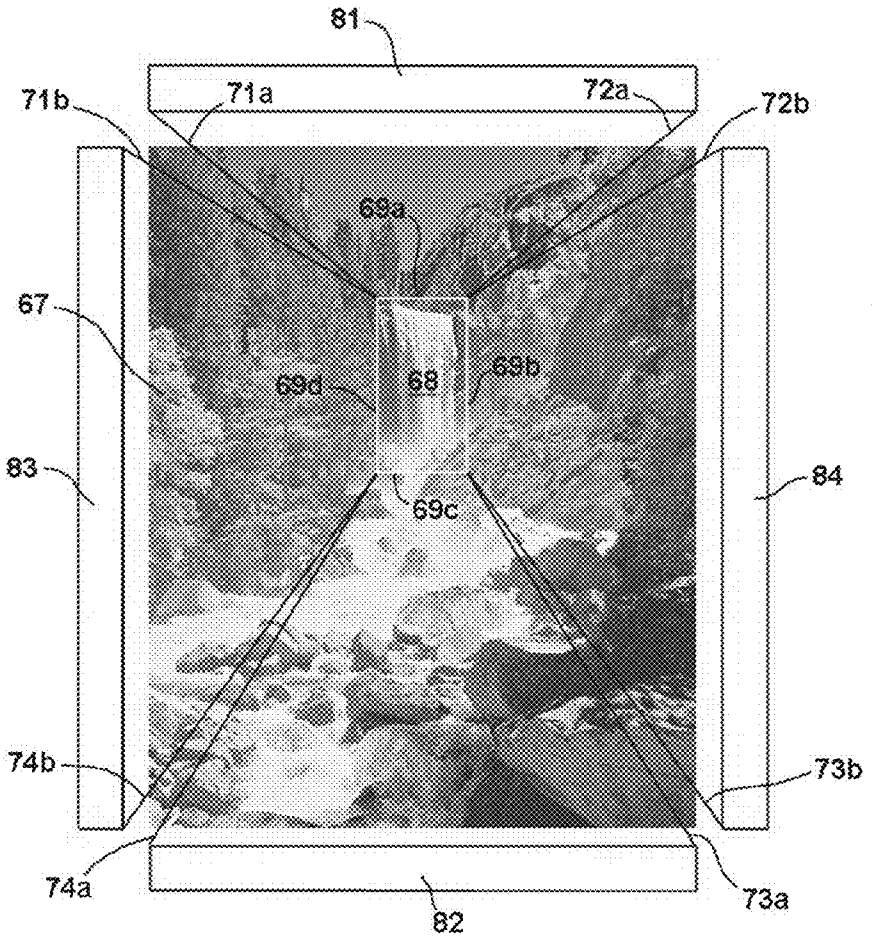

81
71a
72a
71b
72b
69a
67
69d
68
69b
83
84
69c
74b
73b
74a
73a
82

Fig. 15

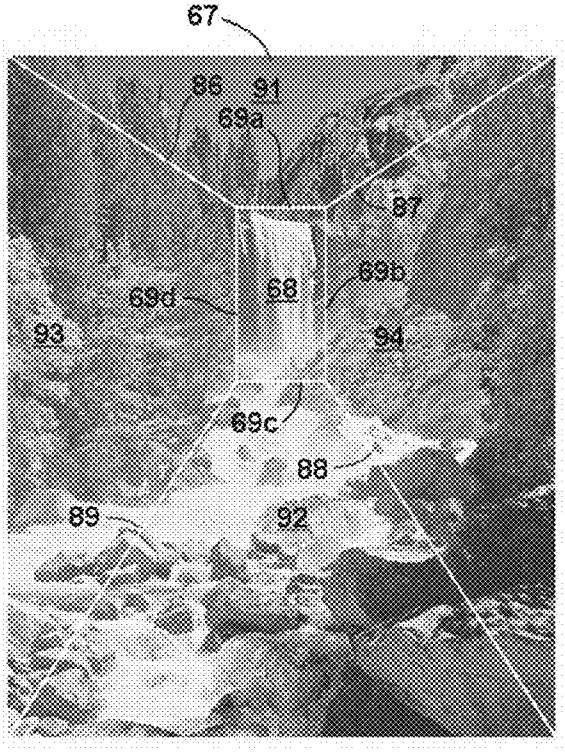

67
86
91
69a
87
69b
69d
68
93
94
69c
88
89
92

Fig. 16

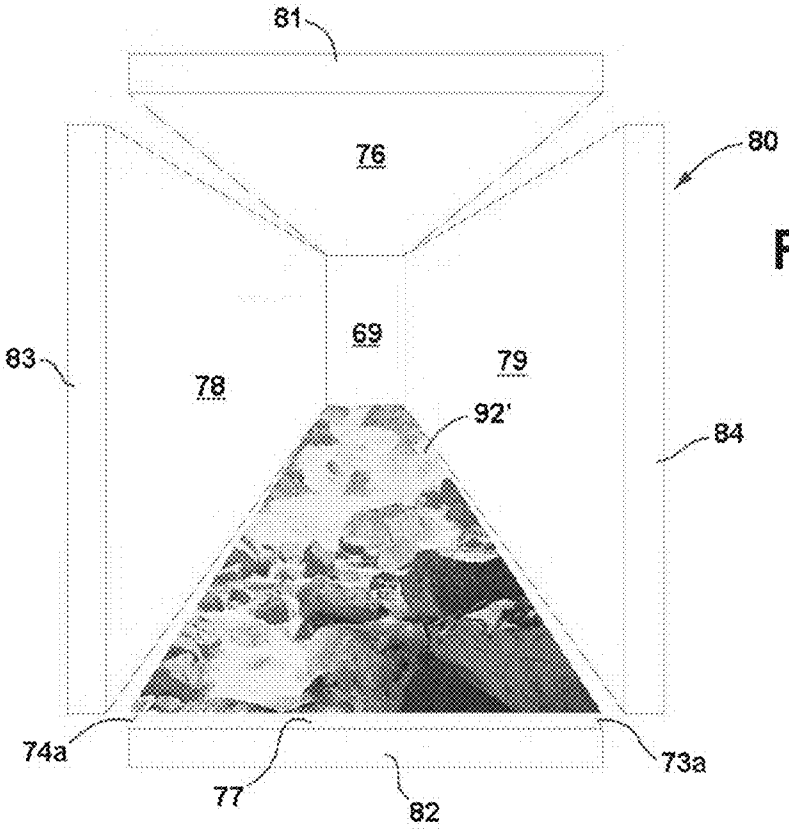

81
76
80
69
79
83
78
92'
84
74a
73a
77
82

Fig. 17

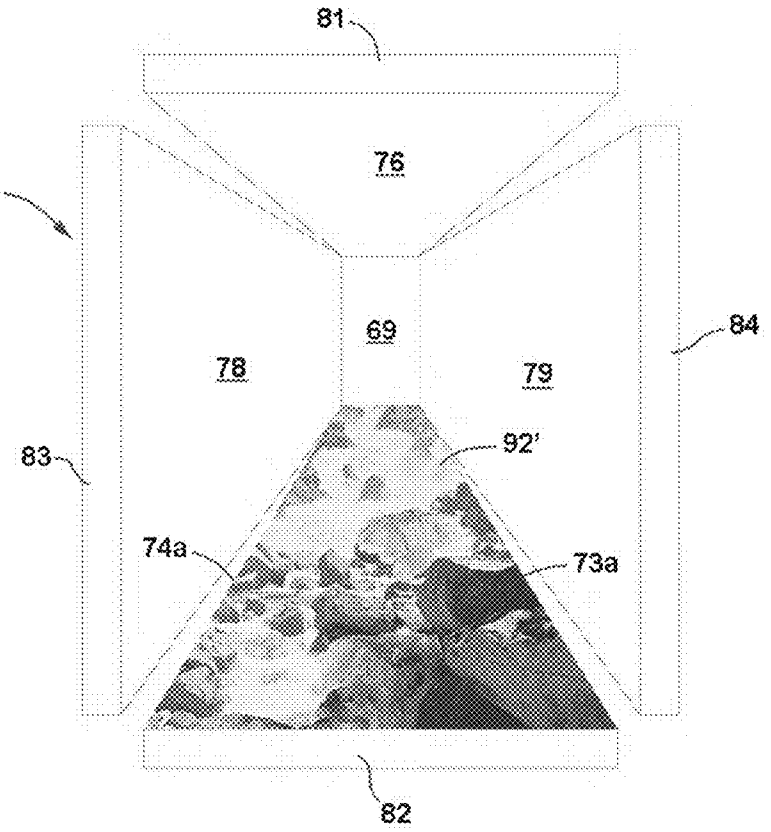

81
76
80
69
84
78
79
83
92'
74a
73a
82

Fig. 18

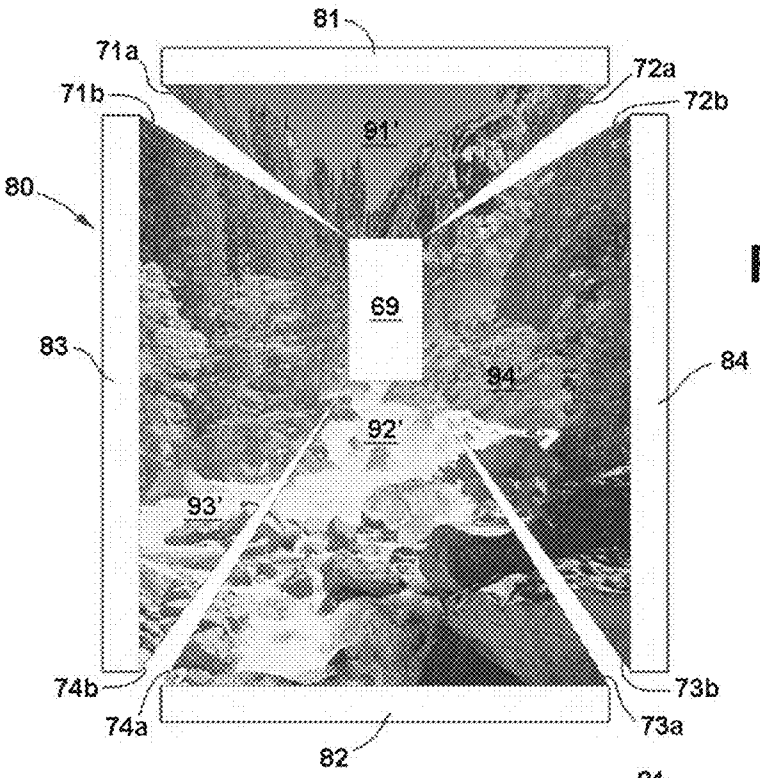

81
71a
72a
71b
72b
91'
80
69
83
84
94
92'
93'
74b
73b
74a
73a
82

Fig. 19

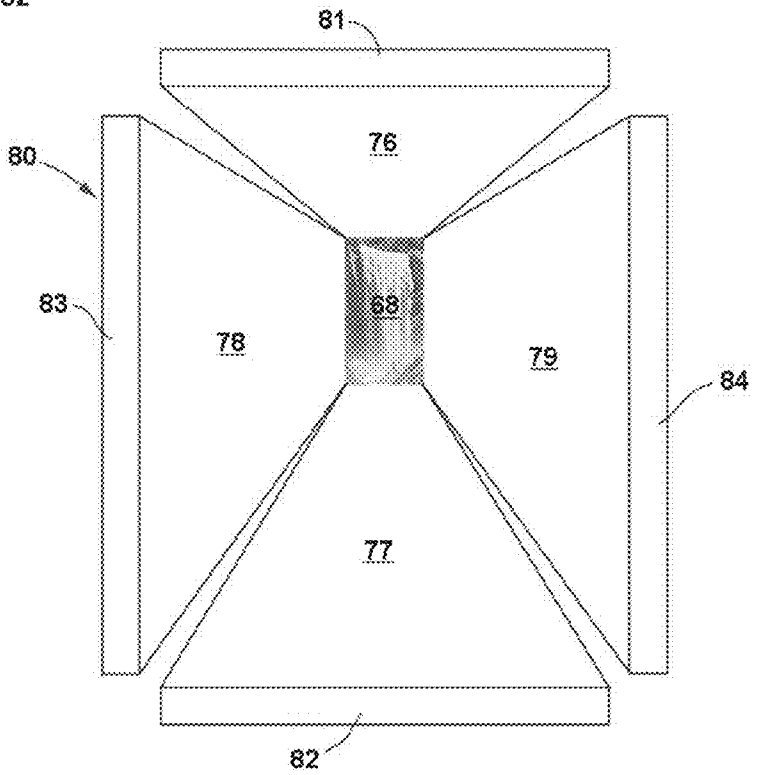

81
76
80
68
83
78
79
84
77
82

Fig. 20

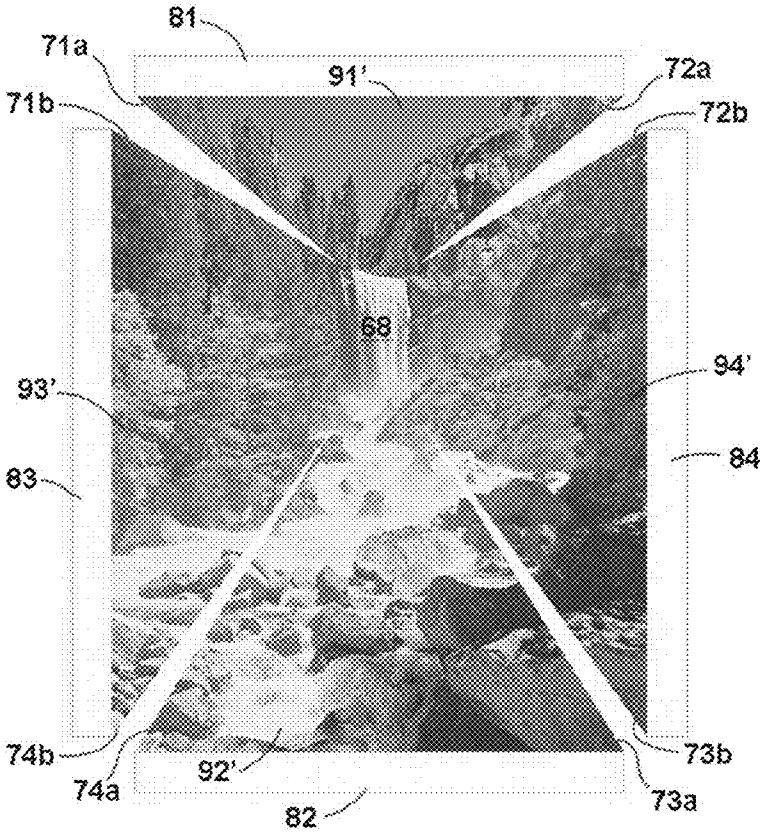

81
71a
91'
72a
71b
72b
68
94'
93'
84
83
74b
92'
73b
74a
73a
82

Fig. 21

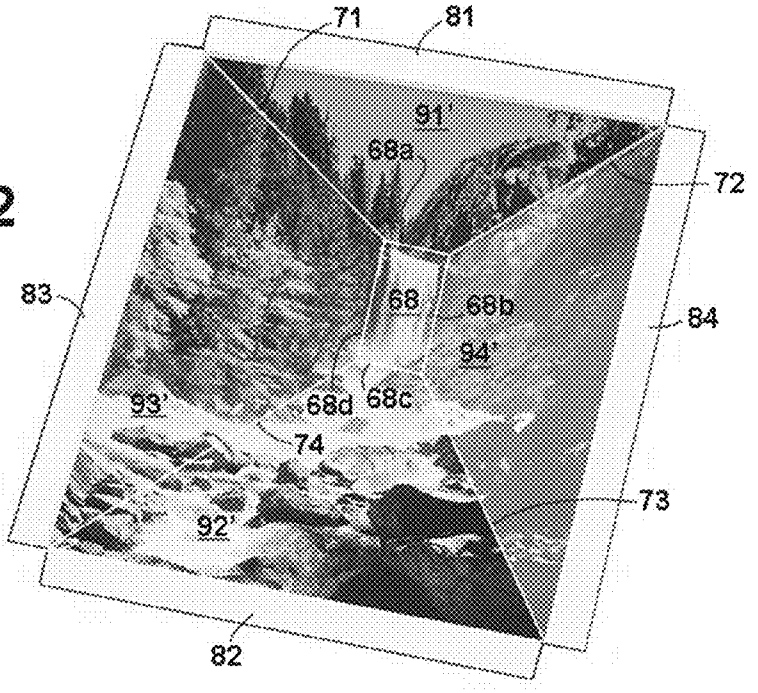

71
81
91'
68a
72
83
68
68b
84
94'
93'
68d
68c
74
73
92'
82

Fig. 22

DIORAMA AND METHOD OF MAKING THE SAME

RELATED APPLICATIONS

This is a continuation-in-part of Ser. No. 12/539,485, filed Aug. 11, 2009, the priority of which is claimed.

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention pertains generally to three-dimensional images and, more particularly, to a diorama and method of making the same.

2. Related Art

The earliest dioramas were in the form of large images used in theaters. They were printed and/or painted on thin gauze curtains that allowed the theater operators to change the light intensity in front of or behind the gauze curtains, thus changing the mood of the display.

Modern dioramas are typically in the form of three dimensional models, both full and scaled sizes, utilizing three dimensional models of persons and other objects positioned, sometimes on scaled terrain, in front a background image to produce a three-dimensional effect. Such dioramas are sometimes placed in shadow boxes, but fail to provide a true perspective effect.

OBJECTS AND SUMMARY OF THE INVENTION

It is, in general, an object of the invention to provide a new and improved diorama and method of making the same.

Another object of the invention is to provide a diorama and method of the above character in which a realistic perspective effect is created.

These and other objects are achieved in accordance with the invention by providing diorama made from a two-dimensional image having a background panel in which a background section of the image appears and a plurality of additional panels on which additional sections of the image appear. The additional panels extend forwardly from the background panel, with edges of adjacent ones of the panels coming together and the image flowing continuously between the panels.

The two-dimensional image is transformed into a diorama by constructing a three-dimensional model of the diorama in the form of a plurality of panels on which different areas of the image will appear, converting the three-dimensional model to a two-dimensional layout guide with lines outlining the panels, using the layout guide as a template for adjusting the shape and size of selected areas of the two-dimensional image to match the guide lines on the layout guide, printing the adjusted image, trimming the printed image along facing edges of adjacent ones of the panels, and bringing the trimmed edges together to form a continuous three-dimensional image.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of one embodiment of a diorama according to the invention.

FIG. **2** a plan view of the original photograph in the embodiment of FIG. **1**.

FIGS. **3***a*-**3***c* are isometric views illustrating some of the steps in one embodiment of a preferred method of constructing a layout guide for use in making the diorama of FIG. **1**.

FIG. **3***d* is a plan view illustrating the remainder of the steps in constructing the layout guide.

FIGS. **4***a*-**4***d* are plan views illustrating the use of the layout guide in making the diorama of FIG. **1**.

FIG. **5** is a plan view of the diorama in the embodiment of FIG. **1** in a flattened state prior to being formed into the three-dimensional configuration illustrated in FIG. **1**.

FIG. **6** is a front elevational view of another embodiment of a diorama according to the invention.

FIG. **7** is a rear perspective view of the embodiment of FIG. **6**.

FIG. **8** is a plan view of a two-dimensional layout of the embodiment of FIG. **6**.

FIG. **9** is a front perspective view of another embodiment of a diorama according to the invention.

FIG. **10** is a rear perspective view of the embodiment of FIG. **9**.

FIGS. **11-22** illustrate steps in another embodiment of a method of making a diorama in accordance with the invention.

DETAILED DESCRIPTION

The diorama consists of a two-dimensional image **11** which has been adjusted and configured for three-dimensional display in a frame or container **12**. The image can be of any desired subject, and typically is a photographic image, although it can also be a drawing, painting, or other form of image, if desired. In the embodiment illustrated in FIGS. **1-5**, the frame or container is illustrated as being a five-sided, rectangular shadow box having an upper wall **13**, a lower wall **14**, side walls **16**, **16**, a rear wall **17**, and an open front.

As shown in FIGS. **1** and **2**, one section or panel of the image is selected as a background section or panel **19** which is positioned in a central location toward the rear of the box, as seen in FIG. **3***a*. This panel is of lesser width and height than the rear wall of the box, and additional sections or panels of the image extend between the edges of the central panel and the corresponding edges at the front of the box. In the embodiment illustrated, the primary subject is a partially completed garage, and the back wall of the garage has been selected as the background section which appears on the central panel **19** of the diorama. The side walls of the garage are depicted on panels **21**, **22** which extend between the side edges of the central panel and the front edges of the sides of the box, and the floor of the garage is depicted on a panel **23** which extends between the lower edge of the central panel and the front edge of the lower wall of the box, with panels **21-23** being generally trapezoidal in shape.

In this particular example, the garage has a gable roof, and the back wall has two upper edges which extend between tops of the side walls and the ridge of the roof. The roof structure is depicted on panels **24**, **25** which extend between the upper edges of the central panel and the front edge of the upper wall of the box. Since the top edges of the central panel are not parallel to the front edges of the box, the roof panels are folded along lines **26**, **26** which extend between the peak of the central panel and the upper front corners of the box, to make the outer edges of the roof panels parallel to the edge of the box.

Panels **21-25** extend from the central, or back, panel at angles on the order of 30-45 degrees relative to the rear wall of the box, with adjacent edges of the panels coming together along lines which extend between the corners of the back panel and the front corners or edges of the box. Thus, the side panels and floor panel come together along lines **27**, **27** which extend between lower corners of the back panel and the lower

front corners of the box, and side panels and roof panels come together along lines **28**, **28** which extend between upper corners at the sides of the back panel and the upper front corners of the box. The two roof panels come together along a line **29** which extends between the ridge or peak of the central panel and the midpoint of the front edge of the upper wall of the box. This three-dimensional configuration of the image provides a unique perspective effect that gives the diorama a very realistic appearance, particularly when the image is adjusted in the manner described below to align objects which appear in adjoining panels so that there will not be any discontinuities between the panels.

The first step in making the diorama is selecting the image and converting it to digital form if it is not already in digital form. Then, using a photo manipulation program, features such as colors, contrast, and sharpness are adjusted as desired or required. The area to be the background or central section of the diorama is selected and adjusted for squareness and/or parallelism with the photo manipulation program. The background section, indicated by outline **31** in FIG. **2**, is then measured, the dimensions are recorded, and the adjusted image is stored as a discrete file.

The frame or container **12** is selected or constructed as desired. In the embodiment illustrated, it is in the form of a five-sided box having an open front and a rear wall of greater width and height than the background section of the photograph. In this particular embodiment, the background section has a width of 6.930 inches and a height of 4.469 inches on the sides, and the interior of the box is 12.75 inches wide, 9.75 inches high, and 2.44 inches deep. These dimensions are also recorded.

Next, a guide for the flat layout of the diorama is constructed. This can be done either with a three-dimensional CAD (computer-aided design) program or by hand using orthographic projection techniques. First, a three-dimensional drawing of the shadow box or frame is prepared, as illustrated in FIG. **3***a*, following which the outline **31** of background section of the diorama is drawn in the desired position on the rear wall of the box.

A three-dimensional model of the upper, lower, and side panels of the diorama is then constructed by drawing lines between the edges and corners of the background section and corresponding edges and corners of the frame or container. Thus, as illustrated in FIG. **3***b*, lines **27**, **27** are drawn between lower corners of the back panel and the lower front corners of the box, lines **28**, **28** are drawn between the upper corners at the sides of the back panel and the upper front corners of the box, a line **29** is drawn between the peak of the back panel and the midpoint of the front edge of the upper wall of the box, and fold lines **26**, **26** are drawn between the peak of the back panel and the upper front corners of the box.

A flat, two-dimensional layout guide is then developed from the three-dimensional model of FIG. **3***b*. Initially, as illustrated in FIG. **3***c*, a two-dimensional projection of the model is drawn either manually or with software such as that utilized in the layout of sheet metal. In the two-dimensional representation, the edges of the panels which come together along lines **27-29** in the three-dimensional configuration are separated, as indicated by lines **27***a*, **27***b*; **28***a*, **28***b*; and **29***a*, **29***b*. These lines diverge outwardly from the corners of the back panel at angles corresponding to the angles of panels **21-25** in the finished diorama.

The two-dimensional projection of FIG. **3***c* is converted to an orthographic, or plan, view, as shown in FIG. **3***d*, with corner dividing lines **32** and concentric alignment arcs **33** being added to aid in the alignment of objects which appear in adjoining panels so that there will be no discontinuities in them when the panels of the image are folded up and brought together at their edges to form the diorama. The corner dividing lines emanate from the five corners of background panel **19** and are positioned midway between the lines defining the edges of panels **21-25**. The concentric arcs are centered at the corners of the background panel and are spaced uniformly along the dividing lines, crossing the lines defining the edges of the panels. Guide lines **34** are added to the outer edges of the panels for use in constructing mounting tabs **36** which extend along the outer edges of panels **21-25** and are attached to the frame or box to hold the diorama in place.

The two-dimensional layout guide of FIG. **3***d* is then imported into the photo manipulation program. If the layout guide was generated with a CAD program, it is simply saved as a standard digital image file. If, however, the layout guide was drafted by hand, it is scanned electronically and then stored as a digital image file. In either case, the image of the layout guide is saved as a discrete file.

Using the layout guide as a template or guide, the two-dimensional photograph is converted into a three-dimensional diorama. For that purpose, the photograph and the image of the layout guide are opened in the photo manipulation program, making sure they both have the same bit depth and pixel density. The canvas size of the photograph is checked to make sure it is large enough to allow all of the layout guide to be seen when it is imported into the photograph, and increased if necessary.

As illustrated in FIG. **4***a*, the layout guide is superimposed onto the photograph and masked so that only the layout lines are visible. The positions of the two images are then adjusted so that the background area of the photograph is aligned with the background section of the layout. At this point, not much of the photographic image other then the background area aligns with the layout guide, and the resolution of this incongruity is an important part of the invention.

Using the editing tools of the photo manipulation program, the image is adjusted, one panel at a time, to match the layout guide. As illustrated in FIG. **4***b*, an area slightly larger than the panel to be worked on is selected, and a copy of that area is stored. Although it is possible to start with any of the panels, it is generally best to start with the panel that requires the greatest amount of adjustment, and in this particular example, the selected panel **25** is one of the two panels on which the roof structure is depicted.

The shape and size of the selected panel are adjusted until the area to be seen in the diorama corresponds closely to the panel in the layout guide, as illustrated in FIG. **4***c*. The image can be twisted, stretched, compressed, and/or otherwise adjusted as desired with the photo manipulation program, using the concentric arcs **33** and corner dividing lines **32** as a reference, to align objects that appear in two panels on opposite sides of a dividing line or corner to provide continuity between the two panels.

Since the selected area is larger than what is to be seen on the panel in the diorama, the excess must be removed, as illustrated in FIG. **4***d*. This is best done by masking the excess area with the program's masking tool since the image of the area removed can be unmasked later if needed to correct a discontinuity between portions of an object in adjacent panels. The excess areas can also be removed with the trimming or erasing tools of the program, but when those tools are used, the areas removed will no longer be available in the event they are needed later.

Each of the other panels of the photograph is adjusted and trimmed in a similar manner, as illustrated in FIG. **5**. These steps can then be repeated, as needed or desired, until all of the panels are precisely aligned with the lines on the layout

guide. In the event that the re-sizing and distortion needed to fit each panel to the guide results in misalignment of portions of objects that appear in adjoining panels, such misalignment is corrected in a later step.

When the conversion process is complete, the fit of the diorama in the box or frame is checked by printing a full size proof of the flattened diorama and cutting it to the outline, as illustrated in FIG. **5**. The proof sheet is then folded along the edges of the background panel to bring the adjacent edges of the other panels together along corner lines **25-29** and thereby give the diorama its three-dimensional shape. The abutting edges are secured together along the corner lines, and the folded proof sheet is placed in the shadow box or frame to check the overall size and fit. If necessary, the size and fit of the proof sheet are adjusted until the desired fit is achieved.

Each of the corners of the folded proof sheet is also checked for proper alignment of objects which appear in adjoining panels, and any misalignments are corrected with the editing tools of the image manipulation program, using the corner lines and arcs as a guide. This process is repeated until the alignment of the objects is as desired. In the event that proper alignment of one or more objects cannot be achieved, those objects can be relocated or removed.

Once all of the adjustments have been made, the final image of the flattened diorama is printed on photo paper, using printer settings that provide maximum clarity and impact. The flattened diorama is cut to the outline, as illustrated in FIG. **5**. The diorama is then folded to its three-dimensional shape, and the edge portions of adjacent panels are joined together along the corner lines. The completed diorama is placed in the shadow box or frame, as illustrated in FIG. **1**, and the mounting tabs are attached to the box or frame to hold the diorama in place.

In the embodiment of FIGS. **6-8**, the diorama has a horizontally curved back panel **38**, an upper panel **39** which extends forwardly and upwardly from the back panel, and a lower panel **41** which extends forwardly and downwardly from the rear panel, with the side edges of the back panel, the upper edge of the upper panel, and the lower edge of the lower panel extending along the front edges of the rectangular display frame or box (not shown) in which the diorama is mounted. Mounting tabs **42** extend along the outer edges of the panels for attachment to the display frame or box.

With the curved back panel, the lines **43**, **44** along which the adjacent edges **43***a*, **43***b* and **44***a*, **44***b* of the panels come together are also curved, as are the edges of the panels. As in the embodiment of FIG. **1**, corner dividing lines **46** and concentric alignment arcs **47** are included in the layout guide to aid in the alignment of objects which appear in adjoining panels so that there will be no discontinuities in them when the edges of the panels are brought together to give the diorama its three-dimensional configuration. The corner dividing lines extend along arcuate paths midway between the adjacent edges of the panels.

This embodiment is particularly suitable for panoramas and other wide format images, with the width of the three-dimensional diorama being substantially greater than the height and the width and the height both being substantially greater than the depth. As an example, the diorama in this embodiment might have a width of 35 inches, a height of 11 inches, and a depth of 4 inches, although it can have any dimensions and/or aspect ratio desired.

FIGS. **9** and **10** illustrate an embodiment in which the diorama **49** is mounted behind a rectangular opening **51** in a mat board **52**. The mat board can be mounted in a suitable frame or box (not shown) or otherwise displayed, as desired. The diorama has a rectangular back panel **53**, with side panels **54**, **56**, an upper panel **57**, and a lower panel **58** extending between edges **53***a*-**53***d* of the back panel and edges **51***a*-**51***d* of the opening and coming together along lines **61-64** which extend between the corners of the back panel and the opening. With the back panel and the front edge of the diorama both being rectangular, panels **53-57** are trapezoidal in shape. Mounting tabs **66** extend outwardly from the front edges of the panels and are attached to the rear side of the mat around the opening.

In this embodiment, the back panel is relatively small and is positioned above the horizontal centerline of the diorama and asymmetrically of the opening in the mat board. Thus, lower panel **58** is longer or taller than upper panel **57** and extends from the plane of the back panel at a lesser angle than the upper panel. This gives an increased perception of depth to the portion of the image below the back panel, which in this particular example is the water downstream of a waterfall displayed on the back panel.

In the embodiment of FIGS. **11-22**, an image **67** is digitized and processed with a photo manipulation program to adjust features such as color and contrast as desired or required. The size of the image is recorded, and an area **68** is selected as the background or central section of the diorama. If necessary, the squareness or parallelism of the area can be adjusted with the photo manipulation program. The size and position of the area relative to the overall image are measured and recorded, and the image is saved as a discrete file.

The interior dimensions (length, width, and depth) of the frame or container in which the image will be displayed are measured and recorded, and a three-dimensional model of the image in the frame is constructed. As illustrated in FIG. **12**, a background panel **69** corresponding to background area **68** is drawn in the desired position on the back wall of a box-like frame **70**, and lines **71-74** are drawn from the four corners of the background area to the front corners of the frame to define the upper, lower, and side panels **76-79** of the diorama.

A two-dimensional layout guide **80** is then developed from the three-dimensional model of FIG. **12**. As in the other embodiments, the first step in this process is the creation of a two-dimensional projection of the model, as shown in FIG. **13**. That projection is then converted to an orthographic projection, or plan view, as seen in FIG. **14**, with mounting tabs **81-84** extending along the outer edges of the upper, lower, and side panels of the diorama. In the two-dimensional projection, the edges **71***a*, **71***b*; **72***a*, **72***b*; **73***a*, **73***b*; and **74***a*, **74***b* of the top, bottom, and side panels diverge from the corners of central panel **69** at angles corresponding to the relative sizes of the image and the frame and the depth of the frame. The layout guide is saved as a digital image, then masked so that only the layout lines and the mounting tabs are visible. That image is then saved as a discrete image file.

Using the layout guide, the two-dimensional image is converted to a diorama. The two files are opened and checked to verify that they have the same bit depth and pixel density. If the canvas size of the image is not large enough to allow all of the layout guide to be seen, the canvas size can be adjusted without changing the size of the image itself. The layout guide is then incorporated into the image, as illustrated in FIG. **15**, with the guide on top of the image and the background area **68** of the image aligned with the lines **69***a*-**69***d* which define background panel **69** of the diorama.

The layout guide is turned off, and the precise size and shape of the upper, lower, and side panels of the diorama are determined. As illustrated in FIG. **16**, this is done by drawing straight lines **86-89** from the corners of the background area to the corresponding outer corners of the original image **67** to define the upper, lower, and side areas **91-94** of the image that

will appear on the corresponding panels of the diorama. One by one, the areas of the image corresponding to the panels are selected and manipulated to correspond precisely to the layout guide. Thus, for example, as illustrated in FIG. **17**, the foreground or lower area **92** of the image is carefully and precisely selected with the image manipulation software and duplicated. The original image is turned off, the layout guide is turned on, and using the editing tools available in the photo manipulating software, the size and shape of the duplicated area **92'** are adjusted until the edges of that area are aligned precisely with the lines to the outline of the corresponding panel in the layout guide, as illustrated in FIG. **18**. These steps are repeated for each of the other panels until the top, bottom, and side areas of the image all correspond precisely to the corresponding panels in the layout guide, as shown in FIG. **19**.

The background area is then incorporated into the adjusted image by turning off the upper, lower, and side areas of that image, turning on the original image and the layout guide, selecting an area slightly larger (e.g., 0.02 inch) than the outline of the background panel on the layout guide, and then masking all of the original image except the selected area, as illustrated in FIG. **20**. The top, bottom and side panels **91'-94'** of the adjusted image are then turned on again, and all of the lines on the layout guide except the mounting tabs are masked to complete the adjusted image, as shown in FIG. **21**.

To complete the diorama, the adjusted image is printed, trimmed along the edges of the mounting tabs and panels, then folded along the edges **68***a*-**68***d* of the background panel to bring the corresponding edges of the upper, lower, and side panels together along corners **71-74**, as illustrated in FIG. **22**. The mating edges are connected together, and the three-dimensional image is mounted in its frame.

Determining the precise size and shape of each panel to be manipulated greatly simplifies the process of making the diorama. With this simplified method, it is not necessary to use corner arcs or other guidelines to ensure proper alignment and continuity between objects that appear in the two panels on opposite sides of a corner in the three-dimensional image. If executed precisely, resizing and other adjustments are very consistent across the mating corners, and proofing is generally not required. In the event that an alignment problem does arise, it can be corrected by printing, trimming, and folding a proof of the adjusted image, checking the fit of the folded proof in the frame, checking each corner of the folded proof, and manipulating the affected areas of the image as described above and illustrated in FIGS. **17-19**.

In the example of FIGS. **11-22**, the diorama has five panels, including the background panel, but it will be understood that the invention can be employed with images having any desired numbers of panels.

The invention has a number of important features and advantages which allow a two-dimensional photograph or other image to be readily converted to a three-dimensional diorama that creates a genuine perspective which greatly augments the illusion of depth.

The invention can be also applied to applications other than the display of stationary images by using video display panels arranged in the manner disclosed herein, with the video signals displayed on the different panels being processed to provide continuity between them.

It is apparent from the foregoing that a new and improved diorama and method of making the same have been provided. While only certain presently preferred embodiments have been described in detail, as will be apparent to those familiar with the art, certain changes and modifications can be made without departing from the scope of the invention as defined by the following claims.

The invention claimed is:

1. A method of enhancing the perspective effect of a two-dimensional image, comprising the steps of: constructing a three-dimensional model of a diorama having a background panel on which a focal area of the image will appear and a plurality of other panels diverging outwardly from the background panel on which other areas of the image will appear, with adjacent edges of the panels coming together along corner lines, converting the three-dimensional model to a two-dimensional layout guide with lines outlining two-dimensional orthographic projections of the panels, selecting a focal area of the image having the same shape and size as the background panel of the diorama, selecting other contiguous areas of the image to appear on the other panels of the diorama, adjusting the shape and size of each of the other selected areas of the two-dimensional image to match the size and shape of a corresponding one of the orthographic projections of the other panels on the layout guide, printing an adjusted image consisting of the focal area and the orthographically adjusted areas of the two-dimensional image arranged in accordance with the panels on the layout guide, trimming the printed image along facing edges of adjacent ones of the panels, and forming the printed image into the three-dimensional configuration of the diorama, with the facing edges coming together along the corner lines and the adjusted image flowing smoothly and continuously between the panels with an enhanced perspective effect and depth.

2. The method of claim **1** including the step of mounting the three-dimensional printed image in a frame, with the focal area on a background panel spaced behind the front of the frame and the other panels extending between the edges of the background panel and corresponding edges of the frame.

3. The method of claim **1** wherein the three-dimensional model of the diorama is constructed by making a three-dimensional drawing of a box in which the diorama is to be displayed, drawing the shape of the focal area on a rear wall of the box to define the background panel, and drawing lines from corners of the background panel to corners of the box to define the other panels.

4. The method of claim **1** wherein the shape and size of selected areas of the two-dimensional image are adjusted by marking a background area corresponding in size and shape to the focal area of the diorama on the two-dimensional image, drawing lines from the corners of the background area to corresponding corners of the two-dimensional image to establish outlines of panels surrounding the background area, selecting and making copies of selected areas of the two-dimensional image bounded by the outlines on the image, and individually adjusting the shape and size of the copies of the selected areas to correspond precisely to the outlines of the panels on the layout guide.

5. The method of claim **4** including the steps of turning off the adjusted copies of the selected areas, turning on the two-dimensional image and the layout guide, masking all of the two-dimensional image except the focal area defined by the lines on the layout guide, turning off the layout guide, and turning on the copies of the adjusted selected areas in combination with the unmasked focal area to form the adjusted image.

6. The method of claim **1** including the step of including reference lines in the layout guide which extend along arcuate paths between adjacent ones of the panels, and aligning portions of objects appearing in adjacent ones of the panels with the reference lines so that the portions of the objects in adja-

cent panels are aligned with each other and flow continuously between the panels when the edges of the panels are brought together.

7. A method of making a diorama from a two-dimensional image, comprising the steps of: graphically constructing a three-dimensional model of the diorama in the form of a background panel and a plurality of other panels on which different areas of the image will appear, converting the three-dimensional model to a two-dimensional layout guide with lines outlining the panels, superimposing the layout guide on the two-dimensional image and aligning a background area of the image with the background panel of the guide, drawing lines from corners of the background area to corresponding corners of the image to define other areas of the image corresponding to the other panels, making copies of the other areas, individually adjusting the shape and size of each of the copies to correspond precisely to the outlines of the panels on the layout guide, masking all of the two-dimensional image except the background area, combining the adjusted copies of the other areas with the unmasked background area to form an adjusted image, printing the adjusted image, trimming the printed image along facing edges of adjacent ones of the panels, and bringing the trimmed edges together to form a continuous three-dimensional image.

8. The method of claim **7** including the step of mounting the three-dimensional printed image in a frame, with a background panel spaced behind the front of the frame and the other panels extending between the edges of the background panel and corresponding edges of the frame.

9. The method of claim **7** wherein the three-dimensional model of the diorama is constructed by making a three-dimensional drawing of a box in which the diorama is to be displayed, drawing the shape of the background area on a rear wall of the box to define the background panel, and drawing lines from corners of the background area to corners of the box to define the other panels.

10. A method of making a diorama in the form of an enhanced perspective image, comprising the steps of: selecting a section of a two-dimensional image with perspective content as a focal area for the diorama, constructing a three-dimensional model of the diorama with a background panel corresponding in size and shape to the focal area and other panels on which other areas of the image will appear diverging outwardly from the background panel, with adjacent edges of the panels coming together along corner lines, constructing a layout guide in the form of a two-dimensional orthographic projection of the model with lines outlining the panels on the layout guide, superposing the two-dimensional image and the layout guide so that the section of the image selected as the focal area is aligned with the background panel of the layout guide, selecting contiguous areas of the two-dimensional image for display on adjacent ones of the other panels of the diorama, adjusting the shape and size of selected areas to fit precisely within the outline for a corresponding one of the panels on the layout guide, printing an image of the focal area and the adjusted areas arranged in accordance with the layout guide, trimming the printed image along facing edges of adjacent ones of the panels on which the adjusted areas appear, and bringing the facing edges together along the corner lines to form a three-dimensional image of enhanced perspective effect and depth that flows smoothly and continuously between the panels.

11. A method of making a diorama from a two-dimensional image, comprising the steps of: graphically constructing a three-dimensional model of the diorama in the form of a plurality of panels on which different sections of the image will appear, converting the three-dimensional model to a two-dimensional layout guide with guide lines outlining orthogonal projections of the panels, superposing the layout guide and the two-dimensional image, adjusting the shape and size of selected areas of the two-dimensional image to precisely match the orthogonal projections of the panels so that portions of objects in appearing on adjacent panels will be precisely aligned with each other when the panels are brought together, printing the adjusted image, trimming the printed image along facing edges of adjacent ones of the panels, and bringing the trimmed edges together to form a three-dimensional image of enhanced perspective effect that flows smoothly and continuously between the panels without discontinuities between portions of objects appearing in adjoining ones of the panels.

12. The method of claim **11** including the step of mounting the three-dimensional printed image in a frame, with a background panel spaced behind the front of the frame and the remaining panels extending between the edges of the background panel and corresponding edges of the frame.

13. The method of claim **11** wherein the three-dimensional model of the diorama is constructed by making a three-dimensional drawing of a box in which the diorama is to be displayed, selecting a central area of the two-dimensional image as a background area, drawing the shape of the background area on a rear wall of the box to define a background panel, and drawing lines from corners of the background area to corners of the box to define the remaining panels.

14. The method of claim **11** wherein the three-dimensional model is constructed and converted to a two-dimensional layout guide on a computer.

15. The method of claim **11** wherein the selected areas of the two-dimensional image differ in size from the panels, and excess portions of the selected areas are removed after the shape and size of selected areas have been adjusted to match the guide lines.

16. The method of claim **15** wherein the excess areas are removed by masking in a photo manipulation program on a computer.

17. The method of claim **11** including the step of including lines in the layout guide for use in aligning the portions of objects appearing in adjoining panels with each other.

18. The method of claim **17** wherein the lines for use in aligning the portions of the objects include corner lines disposed between the lines defining facing edges of adjacent panels and a plurality of spaced apart reference lines extending between the lines defining the facing edges.

* * * * *