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(54) **RECONFIGURABLE MODULAR DISPLAY APPARATUSES AND SYSTEMS**

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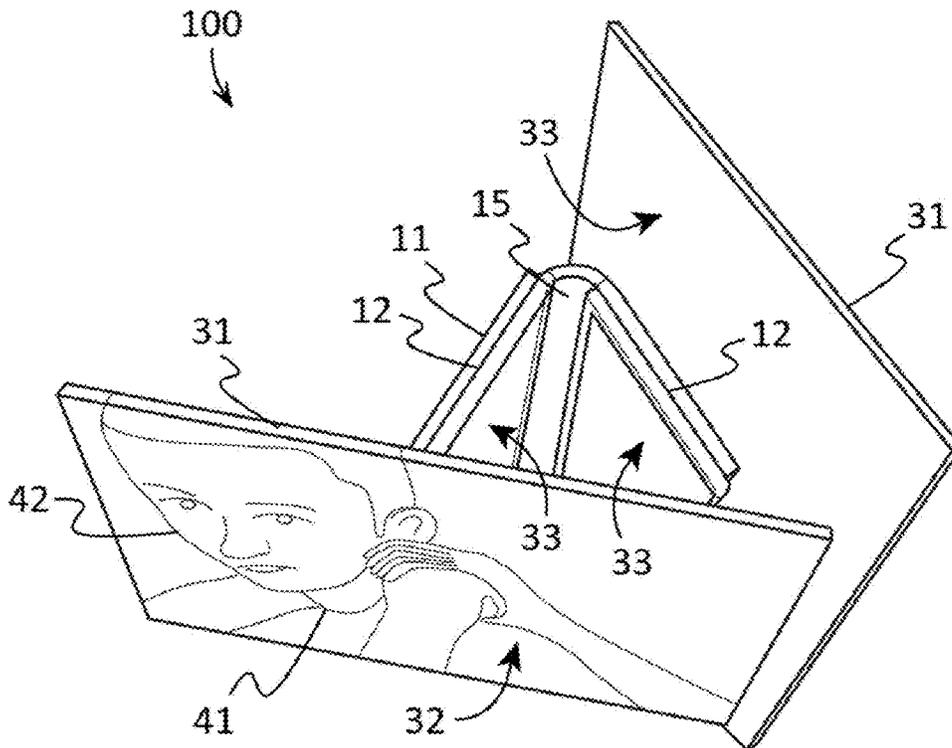
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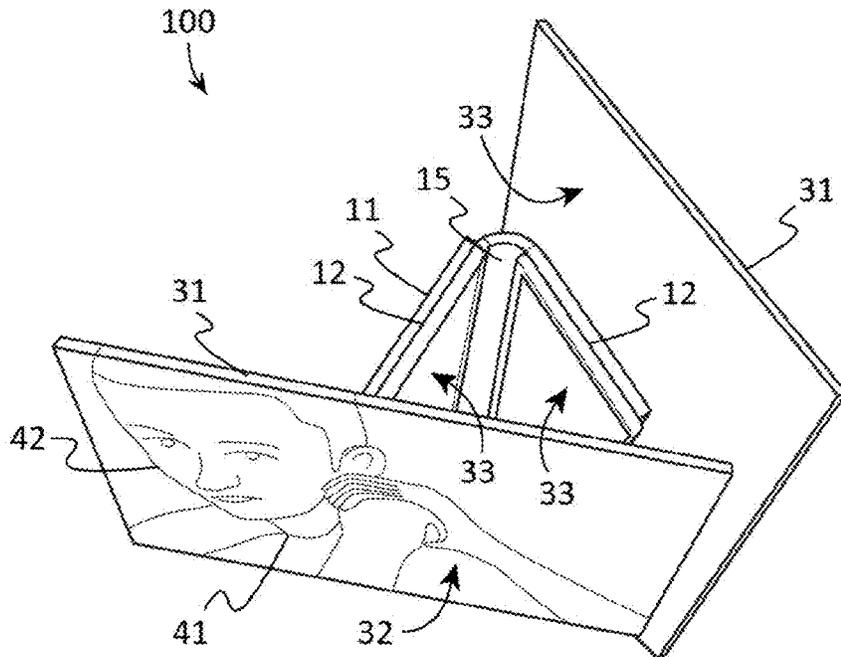
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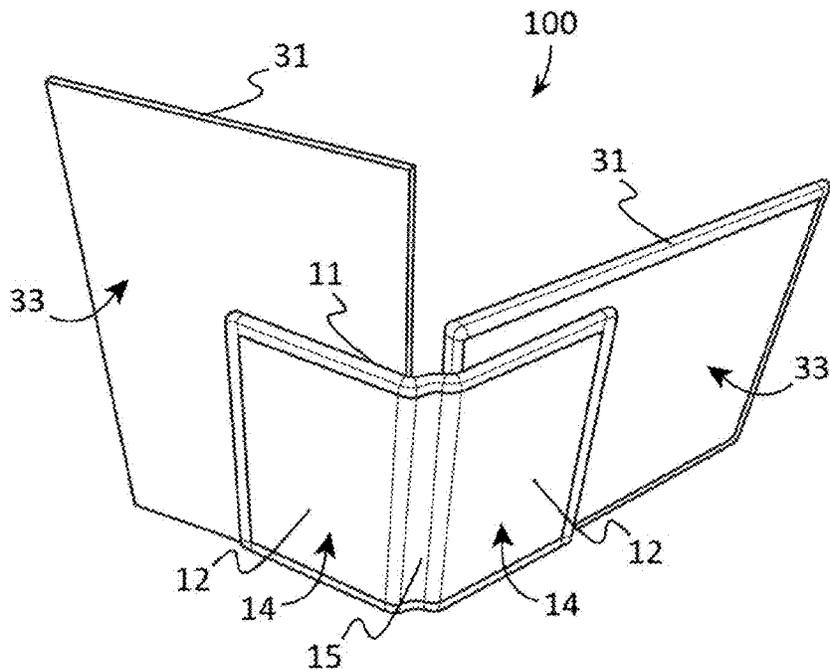
(57) **ABSTRACT**

A reconfigurable modular display system may include one or more display apparatuses and one or more reconfigurable modular apparatuses. A reconfigurable modular apparatus may comprise one or more joining panels, and each joining panel may have a positioning surface. A display apparatus may comprise a display surface, and the display surface may be configured to be placed in contact with printed media. Preferably, each joining panel and each display apparatus may comprise a magnetic material. The display apparatus and joining panel may each comprise a magnetic material. A display apparatus may be engaged to a positioning surface of a joining panel via magnetic attraction between the magnetic material of the joining panel and the magnetic material of the display apparatus.

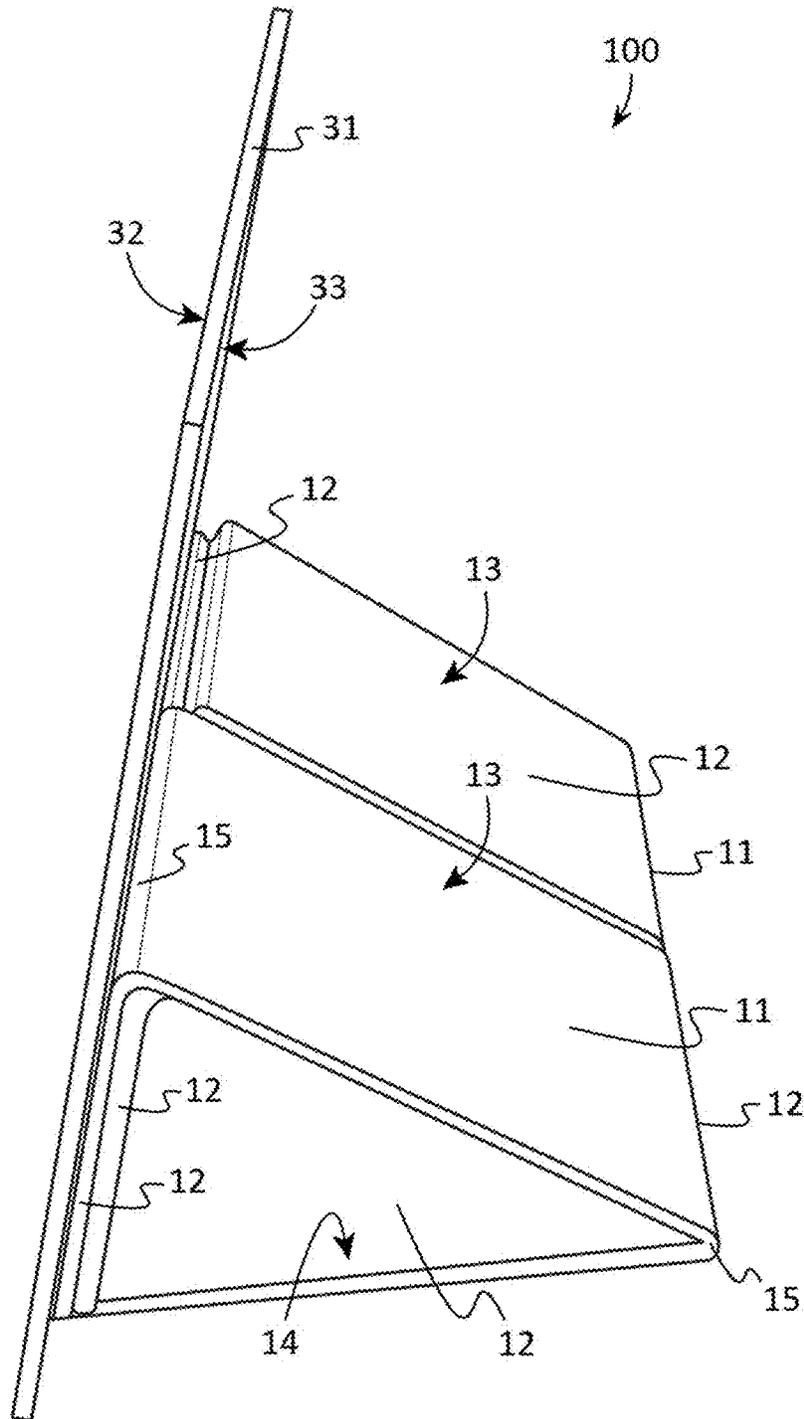




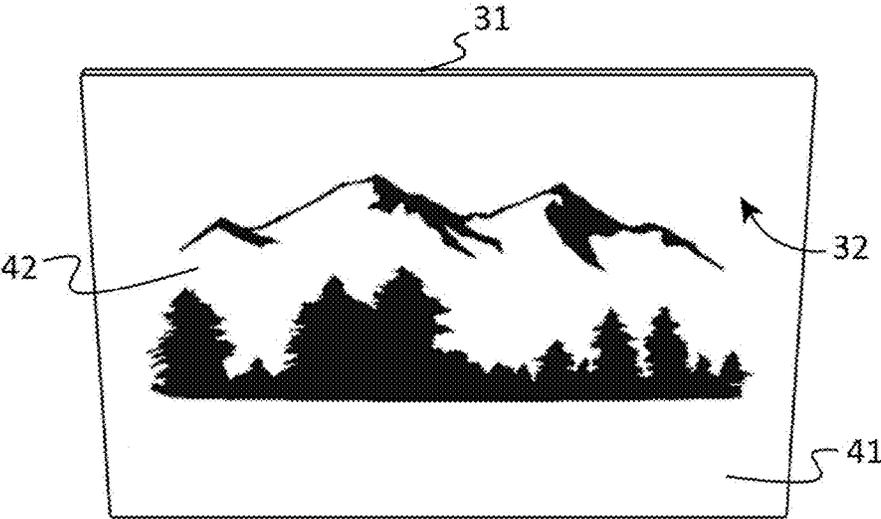
**FIG. 1**



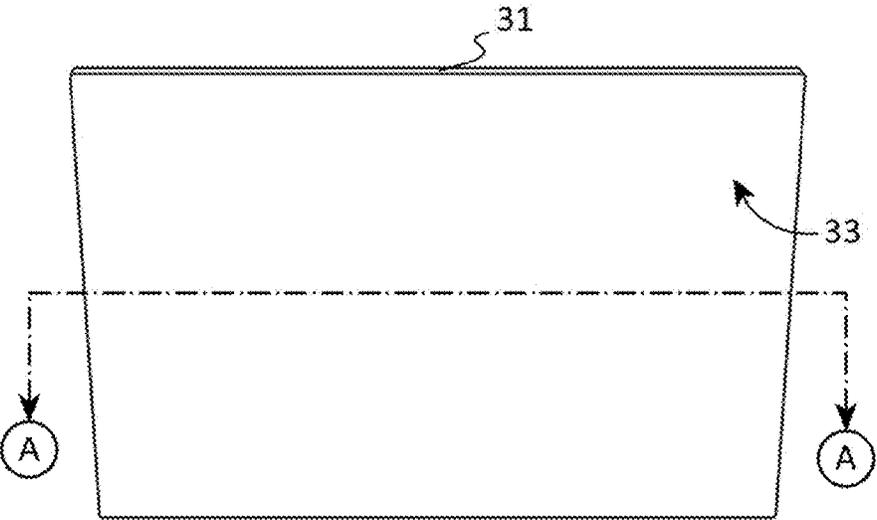
**FIG. 2**



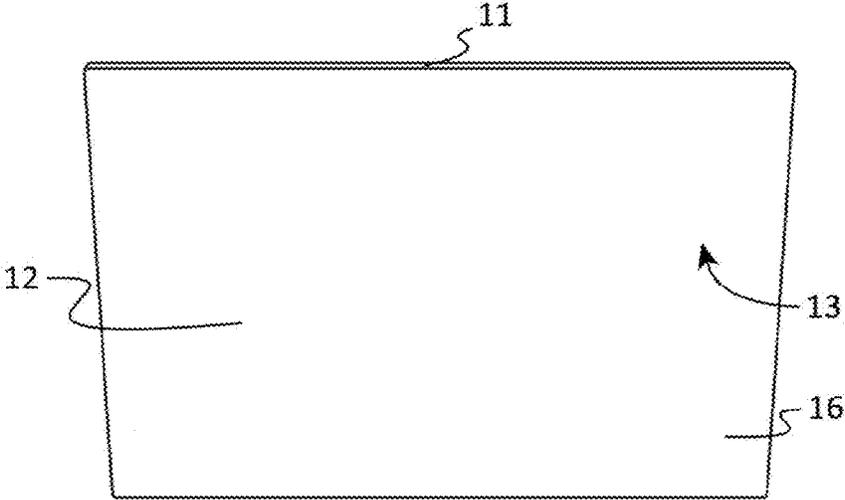
**FIG. 3**



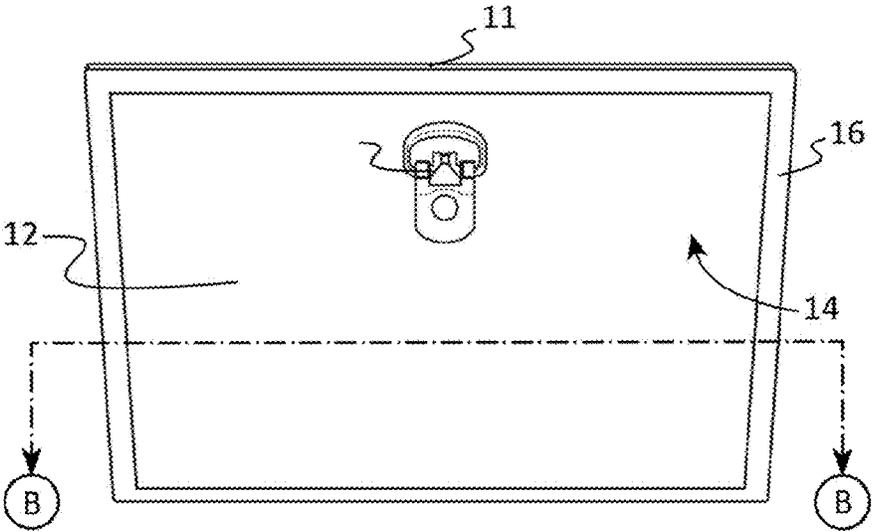
**FIG. 4**



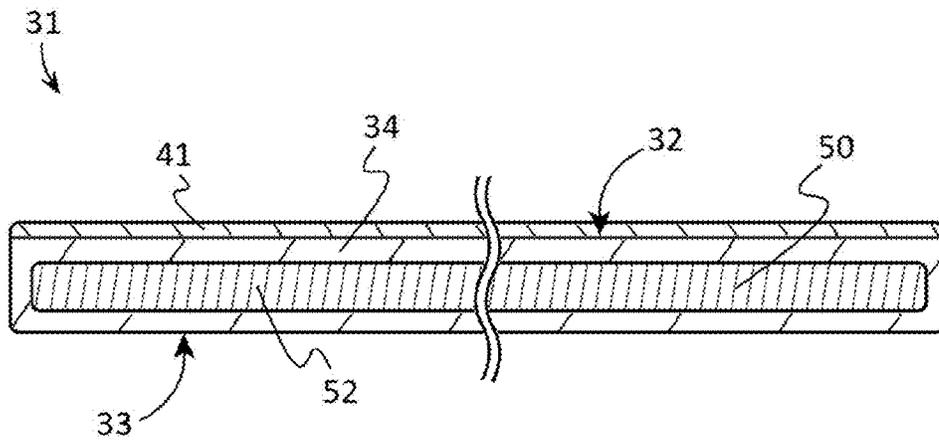
**FIG. 5**



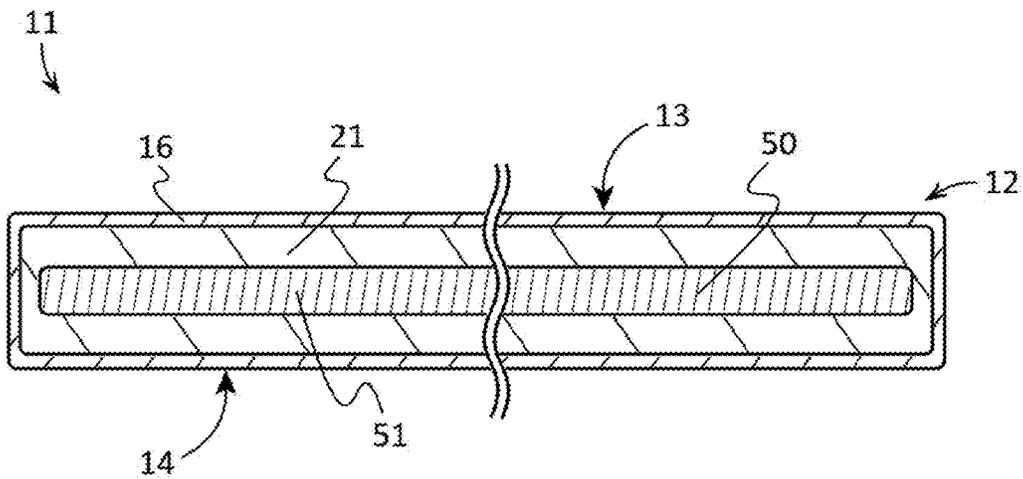
**FIG. 6**



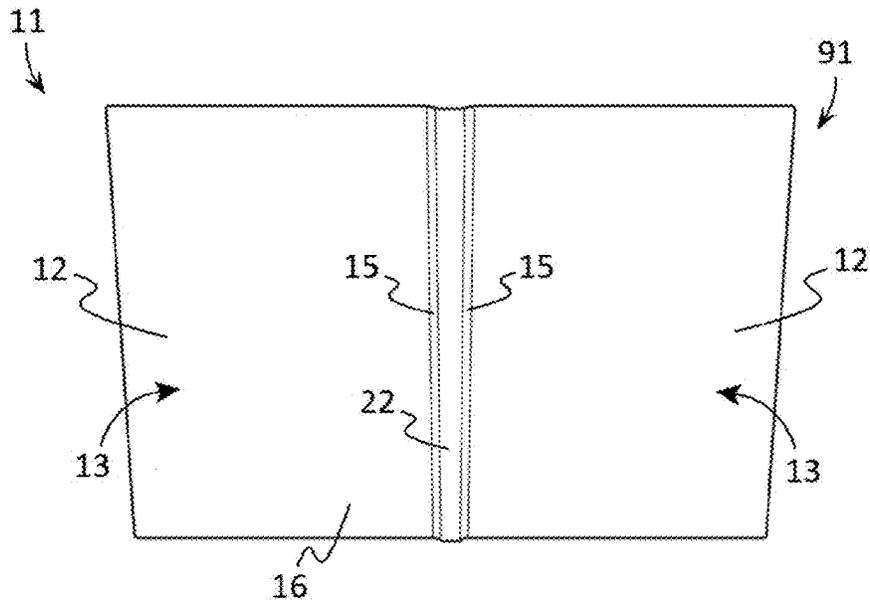
**FIG. 7**



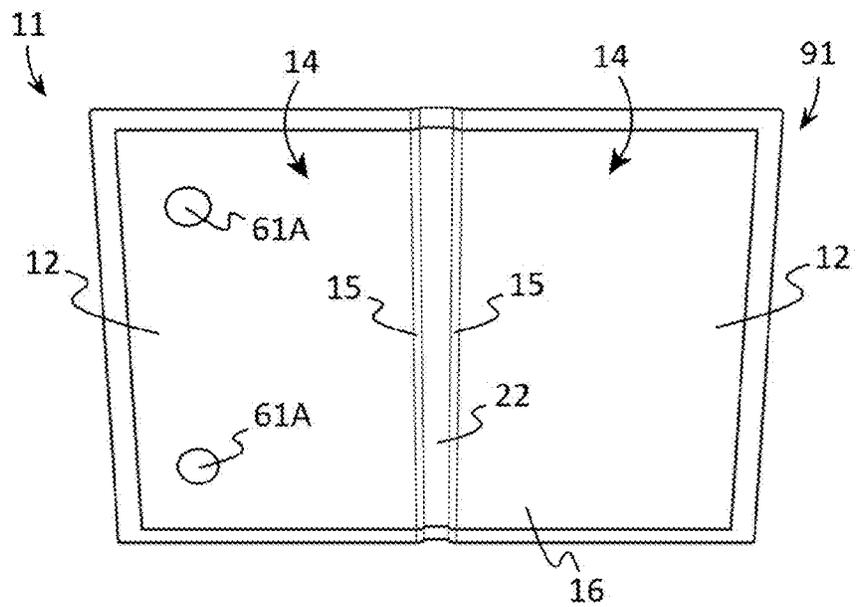
**FIG. 8**



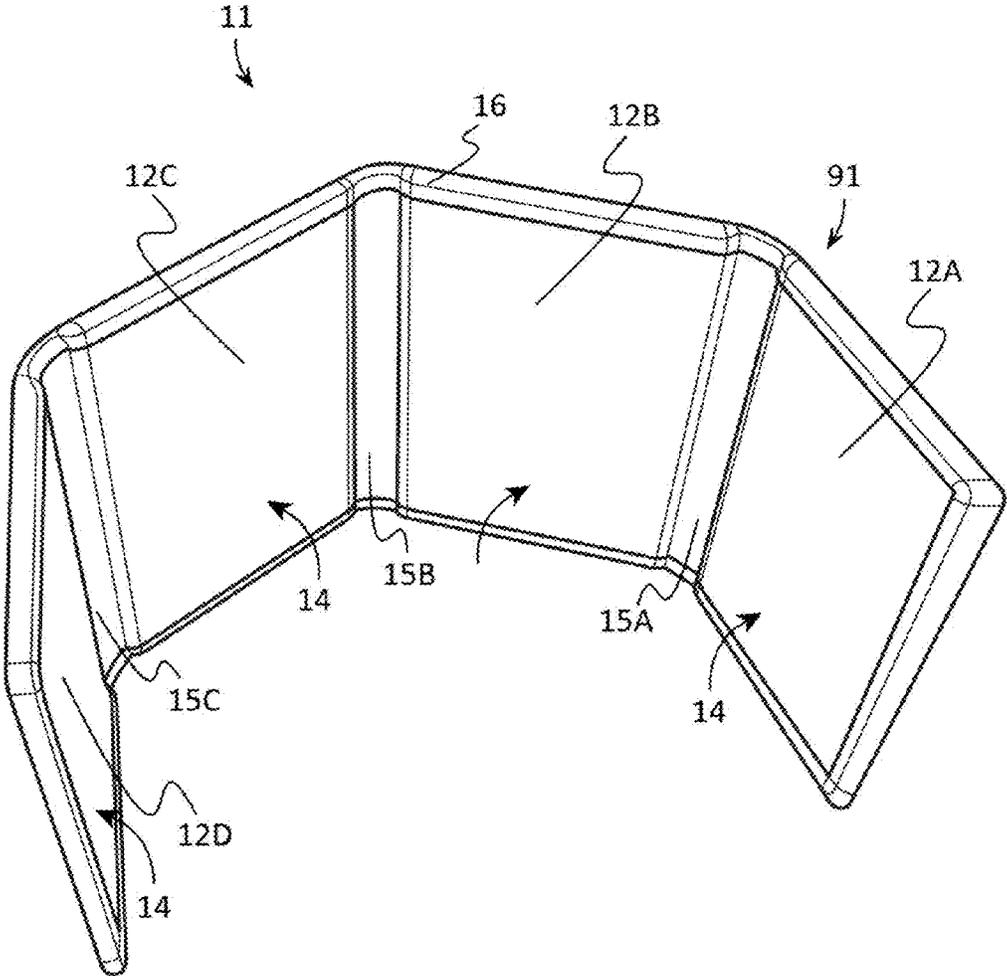
**FIG. 9**



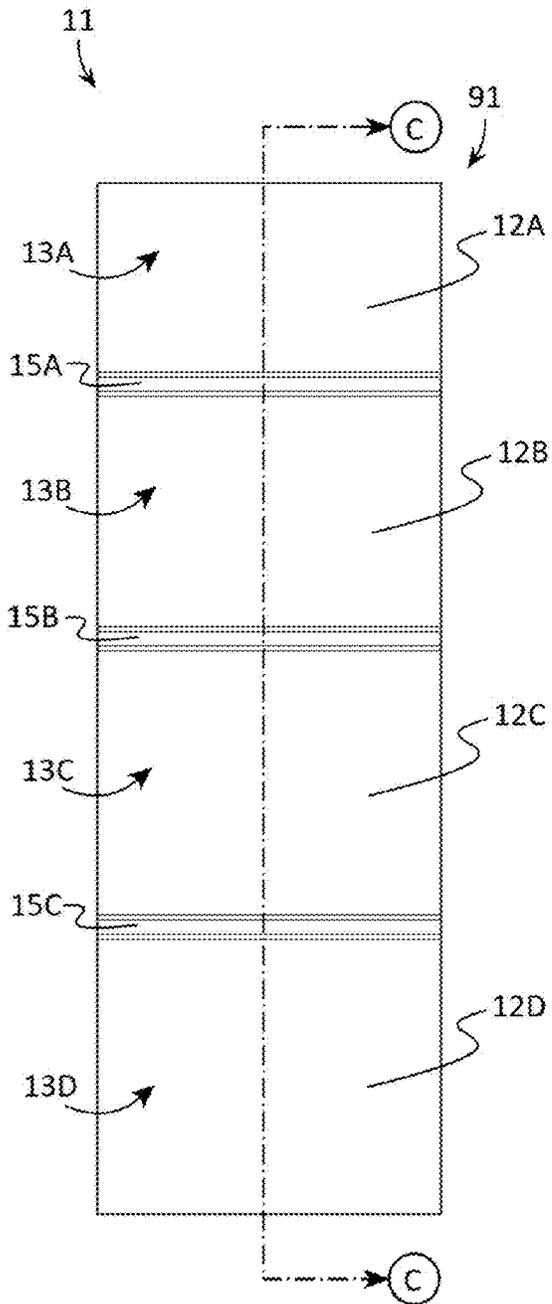
**FIG. 10**



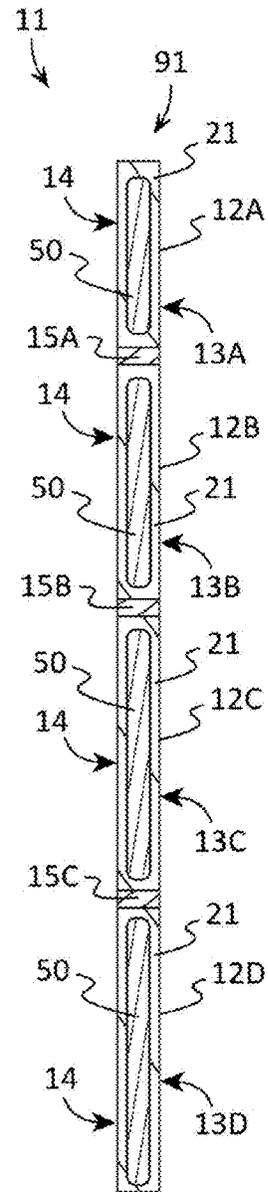
**FIG. 11**



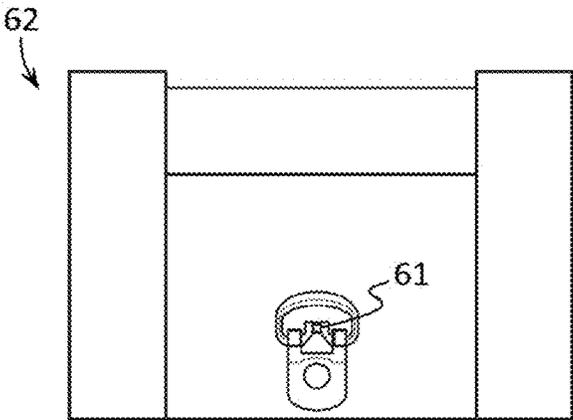
**FIG. 12**



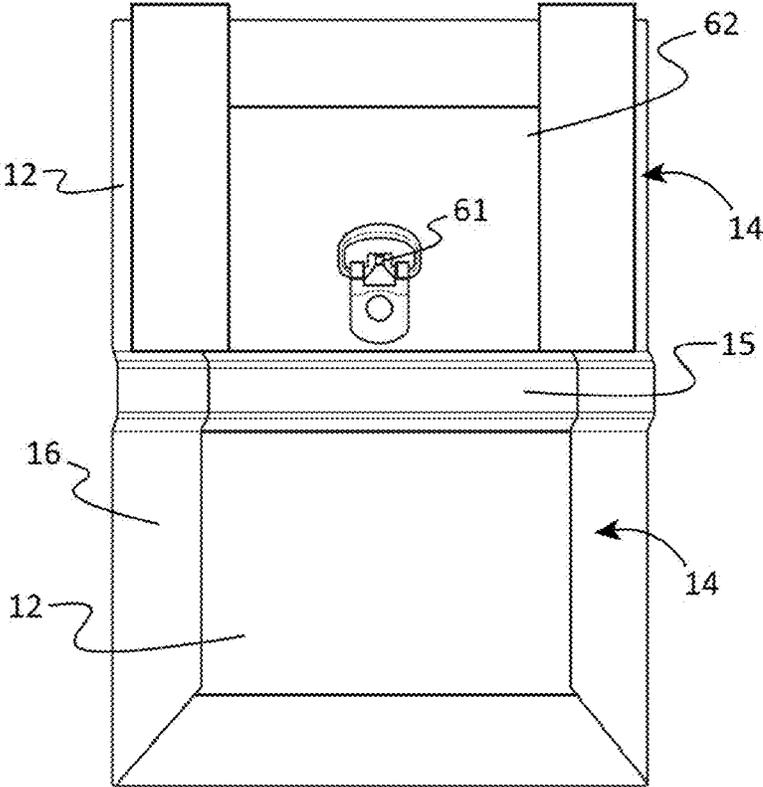
**FIG. 13**



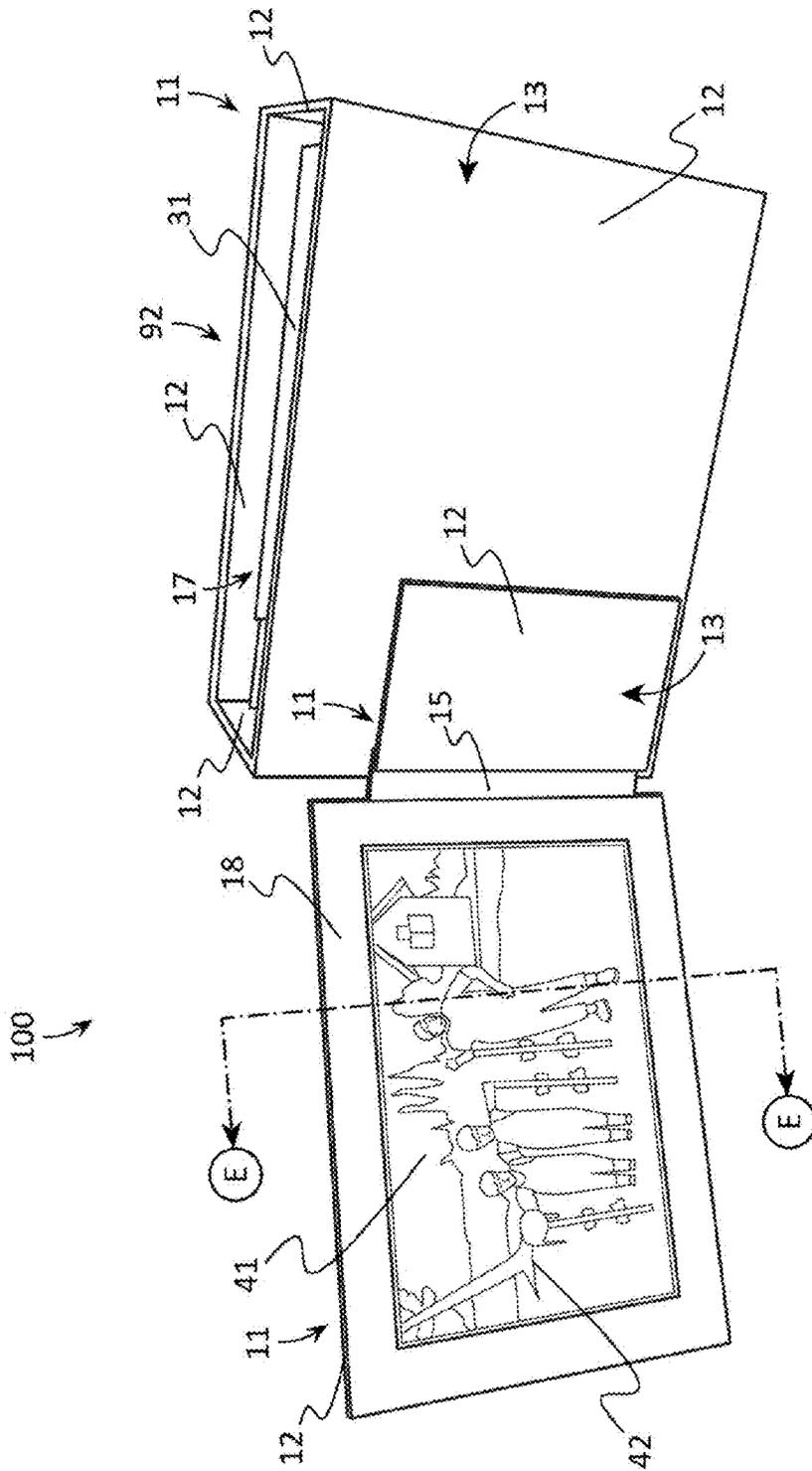
**FIG. 14**



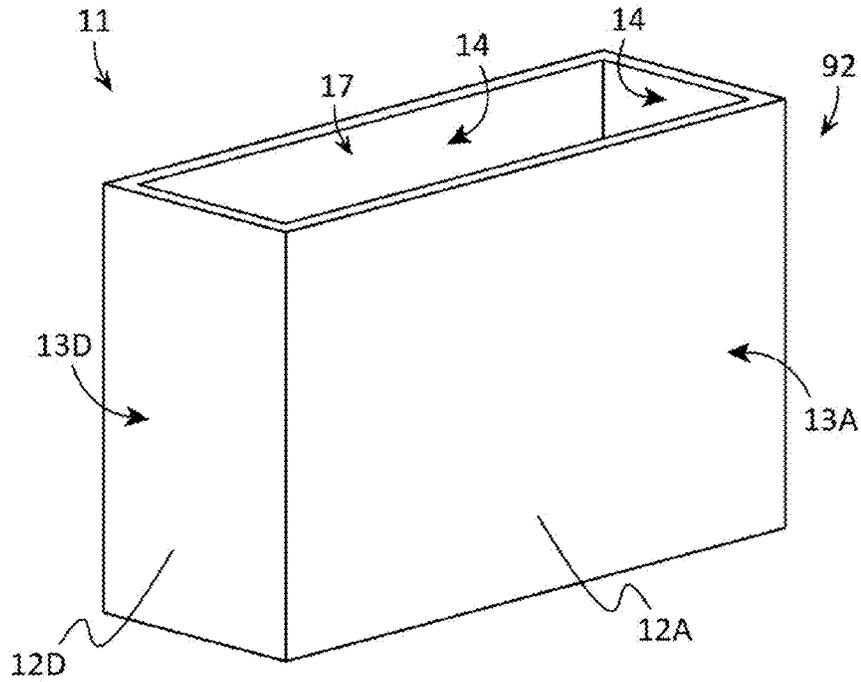
**FIG. 15**



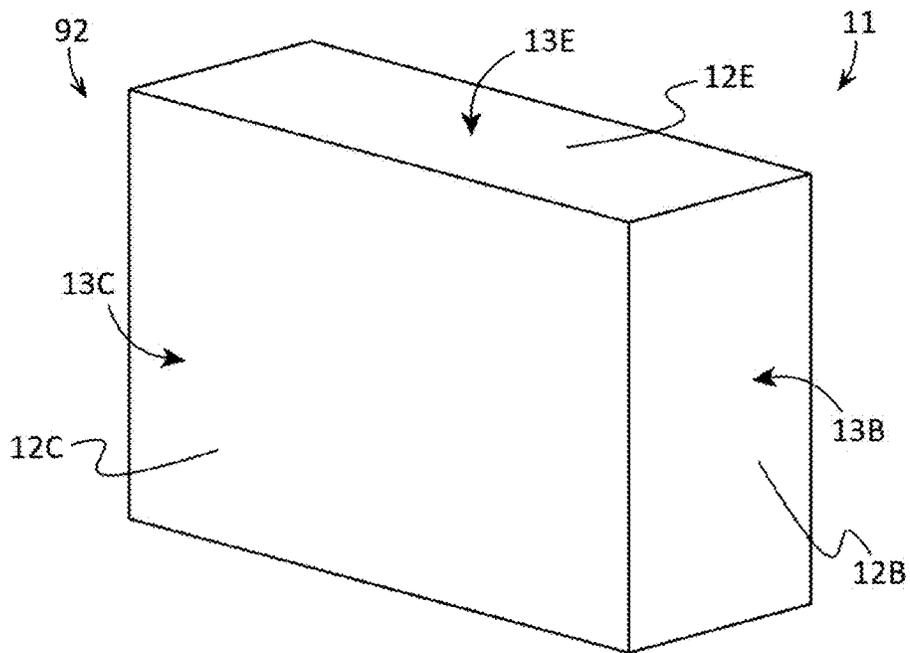
**FIG. 16**



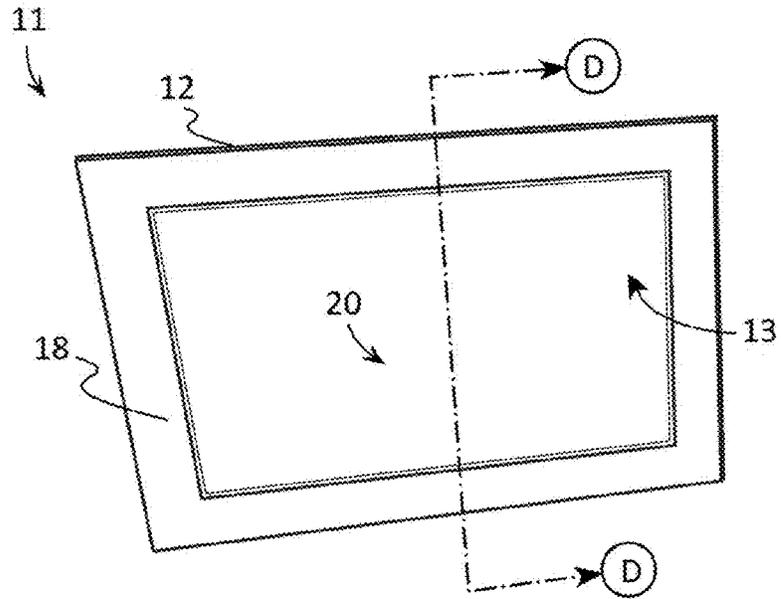
**FIG. 17**



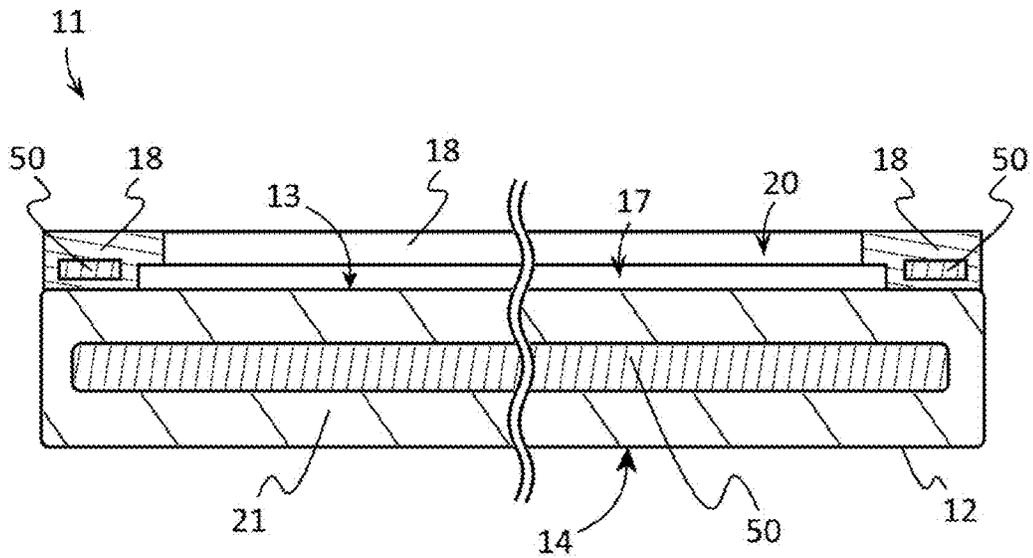
**FIG. 18**



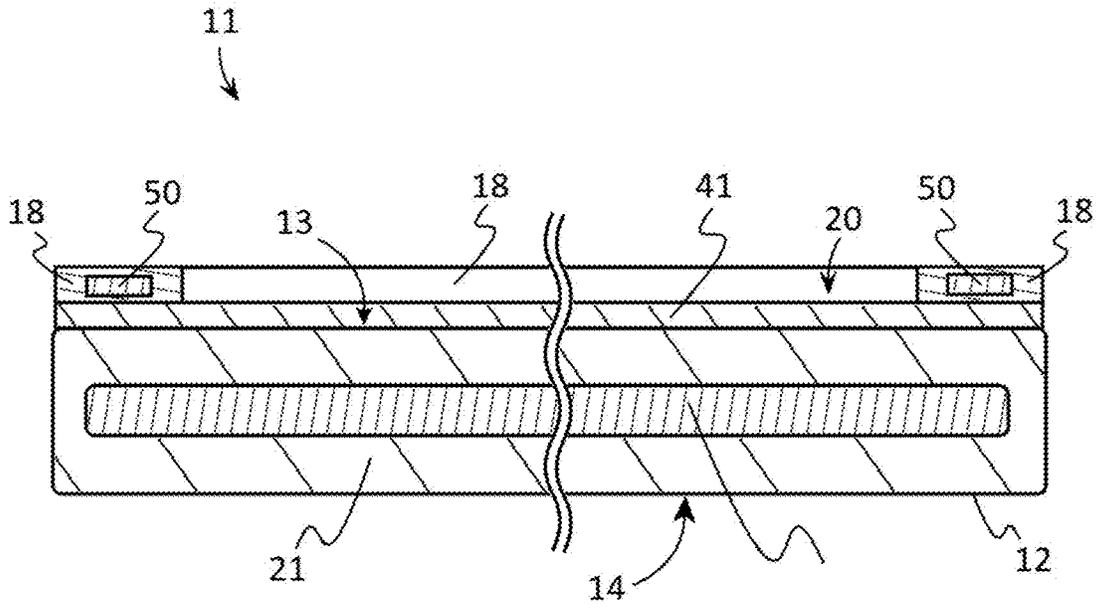
**FIG. 19**



**FIG. 20**



**FIG. 21**



**FIG. 22**

## RECONFIGURABLE MODULAR DISPLAY APPARATUSES AND SYSTEMS

### CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of the filing date of U.S. Provisional Application No. 62/406,528, filed on Oct. 11, 2016, entitled "RECONFIGURABLE MODULAR DISPLAY APPARATUSES AND SYSTEMS", which is hereby incorporated by reference in its entirety.

### FIELD OF THE INVENTION

[0002] The present invention relates to the field of picture and image display apparatuses and systems. More specifically, the invention relates to modular and reconfigurable apparatuses and systems for displaying pictures and other printed media.

### BACKGROUND

[0003] Devices for displaying images and documents are known in the art and are often referred to as picture frames and document displays. One type of image and document display device comprises a rectangular frame with an open center, often with a transparent plate of material positioned in the open center, with a back cover configured to secure a printed image within the device. However, these devices are only able to accommodate printed images that may fit between the frame and the back cover. Since printed images come in a variety of sizes, many different devices are required to display images of different sizes. Another drawback to these picture frame devices is that they require images contained within them to be displayed in a single plane, thereby severely limiting the display of images to a two dimensional organization and precluding different three dimensional image displays by a single device.

[0004] Another type of image and document display device comprises one or more planar panels that have a magnetic material disposed through portions of the panels. The panels may be hung on a wall or on a stand with each panel aligned in the same plane as the other panels. One or more printed images, documents, or other objects may be magnetically attached to the panels in different orientations relative to each other and the panels. However, due to the planar two dimensional arrangement of the panels, images magnetically attached to them are also required to be displayed in a single plane, thereby severely limiting the display of images to a two dimensional organization and precluding different three dimensional image displays by a single device even though it may comprise more than one panel.

[0005] Further types of image and document display devices attempt to allow for three dimensional displays by configuring the devices with a stand that protrudes from the rear of the back cover of each display device. The stand may be attached or folded out from the device to allow the device to be free standing on a horizontal surface and then the stand may be detached or folded back against the device to allow the device to be hung on a vertical surface. However, these stands are only able to support one device so that multiple stands are required to individually support multiple devices. Furthermore, these stands are unable to attach to other stands also resulting in limited three dimensional display options

[0006] One drawback common to all of these types of image and document display devices, is a universal inability to display multiple images and documents in different three dimensional configurations on or by a single device. Since these devices do not allow for different three dimensional displays of multiple images, many separate devices are required to provide different three dimensional display options. Since small spaces are unable to accommodate multiple devices, the image and display options for these spaces are severely limited.

[0007] Therefore, a need exists for novel apparatuses and systems for displaying images and documents. There also exists a need for novel apparatuses and systems for displaying images and documents of a plurality of sizes and shapes. There is a further need for novel apparatuses and systems for displaying images and documents that are able to display images and documents in different three dimensional arrangements. Finally, there exists a need for novel apparatuses and systems for displaying images and documents that are able to simultaneously display multiple images and documents of various sizes and shapes in different three dimensional configurations on or by a single device.

### BRIEF SUMMARY OF THE INVENTION

[0008] A reconfigurable modular display system is provided. In some embodiments, the system may include one or more display apparatuses and one or more reconfigurable modular apparatuses. A display apparatus may comprise a magnetic material and a display surface configured to be placed in contact with printed media. A reconfigurable modular apparatus may comprise a first joining panel having a first positioning surface and a magnetic material. The magnetic material of the joining panel may be configured to engage the display apparatus to the first positioning surface via magnetic attraction between the magnetic material of the first joining panel and the magnetic material of the display apparatus.

[0009] In further embodiments, the system may have a display apparatus and a reconfigurable modular apparatus. The display apparatus may include a magnetic material and a display surface configured to be placed in contact with printed media. The reconfigurable modular apparatus may include a first joining panel having both a first positioning surface and a magnetic material. The reconfigurable modular apparatus may also include a second joining panel having both a second positioning surface and a magnetic material, and the first joining panel may be pivotally coupled to the second joining panel with a first hinge. The reconfigurable modular apparatus may be configured to engage the display apparatus to at least one positioning surface via magnetic attraction between the magnetic material of at least one joining panel and the magnetic material of the display apparatus.

[0010] Another object of the present invention is to provide novel reconfigurable modular display apparatuses and systems that are able to display images and documents of a plurality of sizes and shapes.

[0011] An additional object of the present invention is to provide novel reconfigurable modular display apparatuses and systems that are able to display images and documents in different three dimensional arrangements.

[0012] It is a further object of the present invention to provide novel reconfigurable modular display apparatuses and systems that are able to simultaneously display multiple

images and documents of various sizes and shapes in different three dimensional configurations on or by a single device.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Some embodiments of the present invention are illustrated as an example and are not limited by the figures of the accompanying drawings, in which like references may indicate similar elements and in which:

[0014] FIG. 1 depicts a top perspective view of an example of a reconfigurable modular display system according to various embodiments described herein.

[0015] FIG. 2 illustrates a rear perspective view of a further example of a reconfigurable modular display system according to various embodiments described herein.

[0016] FIG. 3 shows a side perspective view of another example of a reconfigurable modular display system according to various embodiments described herein.

[0017] FIG. 4 depicts a front perspective view of an example of a display apparatus according to various embodiments described herein.

[0018] FIG. 5 illustrates a rear perspective view of an example of a display apparatus according to various embodiments described herein.

[0019] FIG. 6 shows a front perspective view of an example of a reconfigurable modular apparatus according to various embodiments described herein.

[0020] FIG. 7 depicts a rear perspective view of an example of a reconfigurable modular apparatus according to various embodiments described herein.

[0021] FIG. 8 illustrates a sectional, through line A-A shown in FIG. 5, elevation view of an example of a display apparatus according to various embodiments described herein.

[0022] FIG. 9 shows a sectional, through line B-B shown in FIG. 7, elevation view of an example of a reconfigurable modular apparatus according to various embodiments described herein.

[0023] FIG. 10 depicts a front perspective view of another example of a reconfigurable modular apparatus according to various embodiments described herein.

[0024] FIG. 11 illustrates a rear perspective view of another example of a reconfigurable modular apparatus according to various embodiments described herein.

[0025] FIG. 12 shows a rear perspective view of a further example of a reconfigurable modular apparatus according to various embodiments described herein.

[0026] FIG. 13 depicts a front elevation view of a further example of a reconfigurable modular apparatus according to various embodiments described herein.

[0027] FIG. 14 illustrates a sectional, through line C-C shown in FIG. 13, elevation view of a further example of a reconfigurable modular apparatus according to various embodiments described herein.

[0028] FIG. 15 shows a rear perspective view of an example of a positioning apparatus according to various embodiments described herein.

[0029] FIG. 16 depicts a rear perspective view of an example of a positioning apparatus and a reconfigurable modular apparatus according to various embodiments described herein.

[0030] FIG. 17 illustrates a front perspective view of yet a further example of a reconfigurable modular display system according to various embodiments described herein.

[0031] FIG. 18 shows a top front perspective view of an example of a reconfigurable modular apparatus in a five-sided rectangular prism arrangement according to various embodiments described herein.

[0032] FIG. 19 depicts a bottom rear perspective view of an example of a reconfigurable modular apparatus in a five-sided rectangular prism arrangement according to various embodiments described herein.

[0033] FIG. 20 illustrates a front perspective view of an example of a reconfigurable modular apparatus comprising a mat according to various embodiments described herein.

[0034] FIG. 21 shows a sectional, through line D-D shown in FIG. 20, elevation view of an example of a reconfigurable modular apparatus comprising a mat according to various embodiments described herein.

[0035] FIG. 22 depicts a sectional, through line E-E shown in FIG. 17, elevation view of an example of a reconfigurable modular apparatus comprising a mat according to various embodiments described herein.

#### DETAILED DESCRIPTION OF THE INVENTION

[0036] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items. As used herein, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well as the singular forms, unless the context clearly indicates otherwise. It will be further understood that the terms “comprises” and/or “comprising,” when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof.

[0037] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one having ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0038] In describing the invention, it will be understood that a number of techniques and steps are disclosed. Each of these has individual benefit and each can also be used in conjunction with one or more, or in some cases all, of the other disclosed techniques. Accordingly, for the sake of clarity, this description will refrain from repeating every possible combination of the individual steps in an unnecessary fashion. Nevertheless, the specification and claims should be read with the understanding that such combinations are entirely within the scope of the invention and the claims.

[0039] For purposes of description herein, the terms “upper”, “lower”, “left”, “right”, “rear”, “front”, “side”, “vertical”, “horizontal”, and derivatives thereof shall relate to the invention as oriented in FIG. 1. However, one will understand that the invention may assume various alternative orientations and step sequences, except where expressly specified to the contrary. Therefore, the specific devices and

processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

**[0040]** Although the terms “first”, “second”, etc. are used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another element. For example, the first element may be designated as the second element, and the second element may be likewise designated as the first element without departing from the scope of the invention.

**[0041]** As used in this application, the term “about” or “approximately” refers to a range of values within plus or minus 10% of the specified number. Additionally, as used in this application, the term “substantially” means that the actual value is within about 10% of the actual desired value, particularly within about 5% of the actual desired value and especially within about 1% of the actual desired value of any variable, element or limit set forth herein.

**[0042]** New picture and image display apparatuses and systems are discussed herein. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details.

**[0043]** The present disclosure is to be considered as an exemplification of the invention, and is not intended to limit the invention to the specific embodiments illustrated by the figures or description below.

**[0044]** The present invention will now be described by example and through referencing the appended figures representing preferred and alternative embodiments. FIGS. 1, 3, and 17 illustrate examples of a reconfigurable modular display system (“the system”) 100 according to various embodiments. In some embodiments, the system 100 may comprise one or more display apparatuses 31 and one or more reconfigurable modular apparatuses 11. A reconfigurable modular apparatus 11 may comprise one or more joining panels 12, and each joining panel 12 may have a positioning surface 13. A display apparatus 31 may comprise a display surface 32, and the display surface 32 may be configured to be placed in contact with printed media 41. Preferably, each joining panel 12 and each display apparatus 31 may comprise a magnetic material 50. A display apparatus 31 may be engaged to a positioning surface 13 of a joining panel 12 via magnetic attraction between the magnetic material 50 of the joining panel 12 and the magnetic material 50 of the display apparatus 31.

**[0045]** As perhaps best shown in FIGS. 1, 5, and 8, in some embodiments, each display apparatus 31 may comprise a display surface 32 which may be suitable for receiving an image 42. Preferably, a display surface 32 may be generally flat or planar in shape, although a display surface 32 may be configured with any other shape and/or texture. The exemplary display apparatuses 31 are illustrated as a three-dimensional rectangle or thin rectangular prism; although a display apparatus 31 may be configured in any shape, such as three-dimensional square, circle, oval, or any other shape apparent to one having ordinary skill in the art. Preferably,

the display apparatus 31 may comprise a mounting surface 33 which may be disposed on the display apparatus 31 opposite to the display surface 32. The surfaces 32, 33, may be separated or optionally formed by a display body 34. One or more magnetic materials 50 may be disposed in and/or coupled to the display body 34. A mounting surface 33 may form a portion of the display apparatus 31 which may contact portions of the positioning surface 13 of a joining panel 12 when the display apparatus 31 and joining panel 12 are engaged together. Preferably, a mounting surface 33 may be generally flat or planar in shape, although a mounting surface 33 may be configured with any other shape and/or texture.

**[0046]** In some embodiments, an image 42 may be disposed on printed media 41 and the printed media 41 may be placed in contact with the display surface 32 of a display apparatus 31 by the print media 41 being coupled to the display surface 32 of a display apparatus 31. An example of print media 41 may comprise an image 42 of a photograph printed on a substrate of photo paper. However, print media 41 may comprise an image 42 or indicia which may be applied to any substrate, such as paper, parchment, vinyl, and cardboard by a printer such as toner-based printers, liquid inkjet printers, solid ink printers, dye-sublimation printers, inkless printers, and the like. Preferably, the print media 41 may be coupled to the display surface 32 of a display apparatus 31 with adhesives, heat bonding or any other coupling method to form a single unit. In other embodiments, an image 42 may be applied directly to a display surface 32 such as by being painted, drawn, or otherwise applied by an animal, human, or machine.

**[0047]** In alternative embodiments, an image 42 may be painted, printed, drawn, burned, laid upon, or otherwise applied upon the display apparatus 31 in any way apparent to one having ordinary skill in the art. It should be noted that an image 42 may be any image, color, word, sentence, text, graphic, photograph, document, or any other graphic that may be disposed on the display surface 32 of the display apparatus 31. In an alternative embodiment, the display surface 32 may be blank, so that a user may dispose his or her own image thereon, such as by painting, drawing, printing or the like. In further embodiments, an image 42 may be disposed on the display surface 32 (front) and/or mounting surface 33 (back) of a display apparatus 31.

**[0048]** The display apparatus 31 or one or more elements of the display apparatus 31, such as the display surface 32, mounting surface 33, and/or display body 34 may be made from or comprise any durable, resilient material apparent to one having ordinary skill in the art, such as wood, plastic, cardboard, fiberglass, resin, metal, or any other material. In some embodiments, a display apparatus 31 or one or more elements of the display apparatus 31 may comprise Bank paper, Banana paper, Bond paper, Book paper, Coated glossy paper, Coated matte surface paper, Construction paper, Sugar paper, Cotton paper, Fish paper, Inkjet paper, Kraft paper, Laid paper, Leather paper, Mummy paper, Oak Tag Paper, Sandpaper, Tyvek paper, Wallpaper, Washi, Waterproof paper, Wax paper, Wove paper, Xuan paper, and the like that may optionally be used to form all or portions of the display surface 32, mounting surface 33, or other portion of the display apparatus 31. In other embodiments, a display apparatus 31 or one or more elements of the display apparatus 31 may comprise a material suitable for printing and engraving including, but not limited to, vinyl or

polyvinyl chloride (PVC) sheeting, such as gloss vinyl, matte vinyl, and scrim vinyl, polypropylene sheeting, magnetic sheeting, plastic sheeting, corrugated plastic, or any other type of material that may be printed on and engraved or cut with a cutting plotter that may optionally be used to form all or portions of the display surface 32, mounting surface 33, display body 34 or other portion of the display apparatus 31.

**[0049]** A display apparatus 31 may be any size, including any length, any width and any depth. For example, a display apparatus 31 may be relatively small, such as about 1 inch by 1 inch by 0.025 inches, or may be relatively large, such as many inches or even feet in dimensions. Moreover, a display apparatus 31 may have any depth, such as a shallow depth of around 0.025 inches or a very deep depth of around many inches or even feet.

**[0050]** As perhaps best shown in FIGS. 1 5, and 8, in some embodiments, each reconfigurable modular apparatus 11 may comprise one or more joining panels 12, and each joining panel 12 may comprise one or more positioning surfaces 13 and one or more bolster surfaces 14. The surfaces 13, 14, may be separated or optionally formed by a panel body 21. One or more magnetic materials 50 may be disposed in and/or coupled to the panel body 21. A positioning surface 13 may be suitable for contacting a portion of a display apparatus 31, such as a mounting surface 33 or display surface 32. Preferably, a positioning surface 13 may be generally flat or planar in shape, although a positioning surface 13 may be configured with any other shape and/or texture. The exemplary joining panels 12 are illustrated as a three-dimensional rectangle or thin rectangular prism; although a joining panel 12 may be configured in any shape, such as three-dimensional square, circle, oval, or any other shape apparent to one having ordinary skill in the art. Preferably, a joining panel 12 may comprise a positioning surface 13 which may be disposed on the joining panel 12 opposite to the bolster surface 14. A bolster surface 14 may form a portion of the joining panel 12 which may contact portions of other objects, such as walls and a surface of another joining panel 12 when two or more joining panels 12 are magnetically engaged together (FIGS. 1, 3, and 17). Preferably, a bolster surface 14 may be generally flat or planar in shape, although a bolster surface 14 may be configured with any other shape and/or texture.

**[0051]** In some embodiments, by placing one or more joining panels 12 from a reconfigurable modular apparatus 11 in contact with one or more joining panels 12 from the other reconfigurable modular apparatus 11, the two reconfigurable modular apparatus 11 may be secured together by the magnetic attraction between the contacting joining panels 12. In other embodiments, three, four, five, six, seven, or more reconfigurable modular apparatuses 11 may be magnetically adhered to each other. Additionally, one or more positioning apparatuses 62 may be magnetically adhered to one or more joining panels 12 allowing one or more reconfigurable modular apparatuses 11 to be secured to a vertical surface such as a wall, door, or other structure.

**[0052]** A joining panel 12 may be configured in any size, including any length, any width and any depth. For example, a joining panel 12 may be relatively small, such as about 1 inch by 1 inch by 0.025 inches, or may be relatively large, such as many inches or even feet in dimension. Moreover, a joining panel 12 may have any depth, such as a shallow depth of around 0.025 inches or a very deep depth of around

many inches or even feet. All or portions of a joining panel 12, such as a positioning surface 13 and bolster surface 14, may be made from or comprise any material that a display apparatus 31 may be made from or comprise. In preferred embodiments, the panel body 21 of a joining panel 12 may be substantially rigid and may be made from or comprise wood, cardboard, metal, plastic, or any other suitable substantially rigid material. In other embodiments, the panel body 21 of a joining panel 12 may be flexible and may be made from or comprise flexible plastic, cardboard, silicone, fabric, or any other suitable flexible material.

**[0053]** In some embodiments and as shown in FIGS. 1 3, 10-14, 16, and 17, a reconfigurable modular apparatus 11 may comprise two joining panels 12 which may be pivotally coupled together with at least one hinge 15 and preferably two hinges 15. In some embodiments, and as shown in FIGS. 10 and 11, two joining panels 12 may be coupled together with two hinges 15 which may be separated by a spine 22. In this manner, the spine 22, hinges 15, and joining panels 12 may be configured similar to a book binding. A spine 22 may be of any thickness or width and preferably comprise a substantially rigid material, although other materials may be used.

**[0054]** A hinge 15 may enable portions of the two joining panels 12 to be moved towards and away from each other to allow the joining panels 12 to be positioned within different 3D planes relative to each other and relative to surfaces upon which a reconfigurable modular display system 100 may be placed or attached to. In some embodiments, a hinge 15 may comprise a butt hinge, piano hinge, barrel hinge, butt/Mortise hinge, case hinge, flag hinge, strap hinge, H hinge, HL hinge, piano hinge, butterfly hinge, flush hinge, barrel hinge, concealed hinge, continuous hinge, T-hinge, strap hinge, double-acting hinge, Soss hinge, counterflap hinge, flush hinge, coach hinge, rising butt hinge, double action spring hinge, tee hinge, friction hinge, security hinge, cranked hinge or stormproof hinge, lift-off hinge, self closing or self positioning hinge, flexible material hinge, or any other type or style of hinge that may be configured to pivotally secure two joining panels 12 together.

**[0055]** In other embodiments, a hinge 15 may comprise a movable fastener such as rings or hoops, carabineer type fasteners, snap hook type fasteners, hook and loop type fasteners, rivets, or any other suitable fastener which may be configured to pivotally secure two joining panels 12 together. In alternative embodiments, two joining panels 12 may be generally non-movably or substantially rigidly coupled together. In further alternative embodiments, two joining panels 12 may be removably coupled together.

**[0056]** In preferred embodiments, a hinge 15 may comprise a so-called "living" hinge, which typically comprises a linear, relatively flexible area between two relatively more rigid components, such as a line of thin plastic or flexible metal between thicker or more rigid portions, as is well known in the art. In further preferred embodiments, a hinge 15 configured as a living hinge may be formed by one or more flexible coverings 16 which may be placed over one or more portions of the joining panels 12, such as over, under, or forming the positioning surface 13 and/or bolster surface 14, and the one or more flexible coverings 16 may function as a living hinge or flex joint type of hinge 15, thereby allowing the two joining panels 12 to be flexibly and

pivotaly secured together. A flexible covering **16** may be made from any substantially flexible material(s) such as a fabric material.

**[0057]** A reconfigurable modular apparatus **11** may comprise one, two, three, four, five, six, seven, or more, such as a plurality of joining panels **12**. In some embodiments, a reconfigurable modular apparatus **11** may comprise two or more joining panels **12**, and each joining panel **12** may be pivotaly coupled to at least one other joining panel **12**. In further embodiments, a reconfigurable modular apparatus **11** may comprise two or more joining panels **12**, and each joining panel **12** may be rigidly coupled to at least one other joining panel **12**.

**[0058]** Referring to the examples of FIGS. **2**, **10**, **11**, **16**, and **17**, in some embodiments, a reconfigurable modular apparatus **11** may comprise a first joining panel **12A** having a first positioning surface **13A** and a second joining panel **12B** having a second positioning surface **13B**. The first joining panel **12A** may be pivotaly coupled to the second joining panel **12B** with a hinge **15**. Each joining panel **12A**, **12B**, may comprise a magnetic material **50**, such as a primary magnetic material **51**, which may enable each joining panel **12A**, **12B**, to magnetically engage a magnetic material **50**, such as a secondary magnetic material **52**, of one or more display apparatuses **31** and to magnetically engage a magnetic material **50** of another joining panel **12**.

**[0059]** Referring to the examples of FIGS. **12-14**, in some embodiments, a reconfigurable modular apparatus **11** may comprise a first joining panel **12A** having a first positioning surface **13A**, a second joining panel **12B** having a second positioning surface **13B**, a third joining panel **12C** having a third positioning surface **13C**, and a fourth joining panel **12D** having a fourth positioning surface **13D**. Each joining panel **12A**, **12B**, **12C**, **12D**, may comprise a magnetic material **50**, such as a primary magnetic material **51**, which may enable each joining panel **12A**, **12B**, **12C**, **12D**, to magnetically engage a magnetic material **50**, such as a secondary magnetic material **52**, of one or more display apparatuses **31** and to magnetically engage a magnetic material **50** of another joining panel **12**. In this and in further embodiments, the first joining panel **12A**, second joining panel **12B**, third joining panel **12C**, and fourth joining panel **12D** may be pivotaly coupled together in a linear arrangement **91**. In still further embodiments, the first joining panel **12A** may be coupled to the second joining panel **12B** with a first hinge **15A**, the third joining panel **12C** may be coupled to the second joining panel **12B** opposite to the first joining panel **12A** with a second hinge **15B**, and the fourth joining panel **12D** may be coupled to the third joining panel **12C** opposite to the second joining panel **12B** with a third hinge **15C**.

**[0060]** Turning now to FIGS. **8**, **9**, **21**, and **22**, each display apparatus **31** may comprise a magnetic material **50**, and at least one joining panel **12** of a reconfigurable modular apparatus **11** may comprise a magnetic material **50**. In some embodiments, the attraction of the magnetic material **50** of a display apparatus **31** and the magnetic material **50** of a joining panel **12** may secure or engage the display apparatus **31** and joining panel **12** together when they are placed in contact with each other. In further embodiments, the attraction of the magnetic material **50** of one joining panel **12** and the magnetic material **50** of another joining panel **12** may secure or engage the two joining panels **12** together when they are placed in contact with each other. The magnetic

material **50** of a joining panel **12** may be disposed across an area of the joining panel **12** corresponding to the area of the positioning surface **13**, or the magnetic material **50** may be disposed across or in one or more portions of the joining panel **12**. Similar, the magnetic material **50** of a display apparatus **31** may be disposed across an area of the display apparatus **31** corresponding to the area of the display surface **32**, or the magnetic material **50** may be disposed across or in one or more portions of the display surface **32**. Magnetic material **50** may be substantially rigid or flexible and may be positioned on an exterior surface, but is preferably disposed within an element of the system **100** or covered with a non-metallic material.

**[0061]** A magnetic material **50** may include or comprise ferrite, manganese-zinc ferrite, nickel-zinc ferrite, strontium ferrite, cobalt ferrite, barium ferrite, magnetic alloys such as alnico, comol, Hypernom® magnetic alloy, manganese-zinc ferrite, iron-silicon magnet alloys, nickel-zinc ferrite, ferritic stainless steel alloys, strontium ferrite, barium ferrite, alnico, iron-silicon magnet alloy, Chromindur® (Chromium-Cobalt-Iron) alloys, Silmanal (Silver-Manganese-Aluminium) alloys, Platinax II (platinum-cobalt) alloy, Bismanol (manganese bismuthide) alloy, cobalt-platinum alloys, chromium-manganese antimonide alloy, vectolite (cobalt ferrite), magnadur (sintered barium ferrite), lodex (oxide-coated iron-cobalt particles), awaruite (Ni<sub>2</sub>Fe to Ni<sub>3</sub>Fe nickel-iron alloy), wairauite, rare earth magnets such as samarium-cobalt, cesium-cobalt, neodymium-iron-boron, other neodymium magnet materials, metallic oxides such as magnetite, ulvospinel, hematite, ilmenite, maghemite, jacobsonite, iron sulfides such as pyrrhotite, greigite, troilite, metallic oxyhydroxides such as goethite, lepidocrocite, ferroxhyte, ferrimagnetic materials such as magnetite, pyrrhotite, cubic ferrites, hexagonal ferrites, ferromagnetic materials including metals such as iron, nickel, cobalt, metal alloys containing iron, nickel, and/or cobalt, soft magnetic materials, hard magnetic materials, or any other suitable magnetic material, that is capable of magnetically adhering to another magnetic material through the principle of magnetism.

**[0062]** In some embodiments, a magnetic material **50** may be a primary magnetic material **51** or a secondary magnetic material **52**. A primary magnetic material **51** may generally comprise a magnetic material capable of generating a magnetic field. Example primary magnetic materials **51** include ferrite, manganese-zinc ferrite, nickel-zinc ferrite, strontium ferrite, cobalt ferrite, barium ferrite, alnico, iron-silicon magnet alloy, Chromium-Cobalt-Iron alloy, iron-cobalt alloy, Silver-Manganese-Aluminium alloy, manganese bismuthide alloy, platinum-cobalt alloy, chromium-manganese antimonide alloy, sintered barium ferrite, oxide-coated iron-cobalt particles, nickel-iron alloy, samarium-cobalt alloy, cesium-cobalt alloy, and neodymium-iron-boron alloy. A secondary magnetic material **52** may generally comprise a magnetic material that is substantially unable to generate a magnetic field, but which is attracted to magnetic fields. Example, secondary magnetic materials include ferritic stainless steel, iron, other ferromagnetic metals such as nickel, cobalt, gadolinium, dysprosium, and alloys such as steel that contain ferromagnetic metals.

**[0063]** In preferred embodiments, each joining panel **12** of the system **100** may comprise a primary magnetic material **51** and each display apparatus **31** of the system **100** may comprise a secondary magnetic material **52**. In other

embodiments, a joining panel 12 may comprise a primary magnetic material 51 and/or a secondary magnetic material 52, and a display apparatus 31 may comprise a primary magnetic material 51 and/or a secondary magnetic material 52.

[0064] FIG. 3 depicts a top perspective view of the back of an example of a reconfigurable modular display system 100 according to various embodiments described herein. In this example, the system 100 comprises two display apparatuses 31 which are magnetically adhered to a joining panel 12 of a reconfigurable modular apparatus 11 allowing each display apparatus 31 to be positioned in a different 3D plane relative to each other by pivoting a hinge 15 to a desired orientation. Also, in this example, the mounting surface 33 of each display apparatus 31 is contacting and magnetically adhered to the positioning surface 13 of a joining panel 12. In other embodiments, the mounting surface 33 and/or display surface 32 of a display apparatus 31 may contact and be magnetically adhered to the positioning surface 13 and/or bolster surface 14 of a joining panel 12.

[0065] Optionally, the system 100 may comprise one or more panel supports 61 as shown in FIGS. 7, 15, and 16. A panel support 61 may be coupled to an element of the system 100 and used to suspend or support one or more other elements of the system 100 above another object or surface. In some embodiments, a panel support 61 may be coupled to a joining panel 12, such as to the bolster surface 14, of a reconfigurable modular apparatus 11 as shown in FIG. 7. In other embodiments, the system 100 may comprise a positioning apparatus 62 to which a panel support 61 may be coupled. A positioning apparatus 62 may comprise a substantially rigid material and a magnetic material 50, and the magnetic material 50 may enable a reconfigurable modular apparatus 11 and/or a display apparatus 31 to be coupled to the positioning apparatus 62.

[0066] A panel support 61 may be any type of hanging means which may be used to support the weight of the system 100 above an object or to a surface such as a wall. In some embodiments, a panel support 61 may comprise a hinged ring type hanger as shown in FIGS. 7, 15, and 16, that is configured to be secured to fasteners on vertical surfaces such as hook, nails, threaded fasteners, and the like. In other embodiments, a panel support 61 may include saw tooth fasteners, picture hanging wire, a depression, a cutout or aperture, hook and loop type fasteners, or any other hanging means that is suitable for securing an element of the system 100 to a generally vertical surface including walls, doors, cabinets, and other structures. In some embodiments, a panel support 61 may comprise a fastener aperture 61A as shown in FIG. 11 which may comprise a hole or depression which is configured to be secured to fasteners on vertical surfaces such as hooks, nails, threaded fasteners, and the like allowing a reconfigurable modular apparatus 11 to be secured directly to a wall or other vertical surface. In other embodiments, one or more fastener apertures 61A may be positioned anywhere on a positioning apparatus 11 such as on one or more joining panels 12, or on any other element or apparatus of a reconfigurable modular display system 100.

[0067] Similar to a display apparatus 31, a positioning apparatus 62 may comprise a magnetic material 50 that allows it to be magnetically adhered to reconfigurable modular apparatuses 11 and/or to display apparatuses 31. The magnetic material 50 may be disposed across the entire area of a positioning apparatus 62, or the magnetic material 50

may be disposed across one or more portions of the positioning apparatus 62. The magnetic material 50 may be substantially rigid or flexible and may be positioned on an exterior surface, but is preferably disposed within the positioning apparatus 62 or covered with a non-metallic material. In other embodiments, a positioning apparatus 62 may be permanently joined to a joining panel 12 of a reconfigurable modular apparatus 11 with heat bonding, chemical bonding, adhesives, clasp type fasteners, rivet type fasteners, threaded fasteners, other types of fasteners, by being integrally molded or formed together, or any other suitable substantially permanent joining method.

[0068] The positioning apparatus 62 is illustrated as a three-dimensional rectangle, although a positioning apparatus 62 may be any shape, such as three-dimensional square, circle, oval, or any other shape apparent to one having ordinary skill in the art. The positioning apparatus 62 may be made from any durable, resilient material apparent to one having ordinary skill in the art, such as wood, plastic, cardboard, fiberglass, resin, metal, or any other material.

[0069] As also shown in FIG. 3, a perspective view of the side of an example of a reconfigurable modular display system 100 comprising a display apparatus 31 and two reconfigurable modular apparatuses 11 according to various embodiments described herein is shown. In this example, one large display apparatus 31 is magnetically adhered to and supported in a generally upright position by two reconfigurable modular apparatuses 11 each comprising four joining panels 12. Each reconfigurable modular apparatus 11 has two joining panels 12 that are magnetically adhered to and joined together allowing the reconfigurable modular apparatuses 11 to assume a generally triangular conformation. In other embodiments, one or more joining panels 12 from one reconfigurable modular apparatus 11 may be magnetically adhered to and joined to one or more joining panels 12 from one or more different reconfigurable modular apparatuses 11 allowing one or more display apparatuses 31 to be magnetically adhered to and joined to one or more joining panels 12 and thereby positioned in the same 3D plane or different 3D planes relative to each other.

[0070] Referencing FIGS. 17-19, in some embodiments, a reconfigurable modular apparatus 11 may be configured in a five-sided rectangular prism arrangement 92 suitable for acting as a container for one or more other elements of the system 100. In further embodiments, a reconfigurable modular apparatus 11 may comprise a first joining panel 12A having a first positioning surface 13A, a second joining panel 12B having a second positioning surface 13B, a third joining panel 12C having a third positioning surface 13C, a fourth joining panel 12D having a fourth positioning surface 13D, and a fifth joining panel 12E having a fifth positioning surface 13E, and the first joining panel 12A, second joining panel 12B, third joining panel 12C, fourth joining panel 12D, and fifth joining panel 12E. The joining panels 12A, 12B, 12C, 12D, 12E, may each be configured with four rectangular side walls and joined to each other at approximately right angles or generally perpendicular to each other in a five-sided rectangular prism arrangement 92. Preferably, at least one joining panel 12A, 12B, 12C, 12D, 12E, may comprise a magnetic material 50. In further embodiments, the reconfigurable modular apparatus 11 configured in a five-sided rectangular prism arrangement 92 may comprise a receiving cavity 17 formed by the joining panels 12A, 12B, 12C, 12D, 12E, which may be shaped to receive all or

portions of at least one display apparatus **31**, at least one positioning apparatus **62**, and/or at least one other reconfigurable modular apparatus **11**. A receiving cavity **17** may be configured in any size and shape.

[0071] In some embodiments and as shown in FIGS. **17**, and **20-22**, the system **100** may comprise a mat **18** which may be coupled, optionally removably coupled such as magnetically coupled, to an element of the system **100**. In further embodiments, a joining panel **12** may comprise a mat **18** which may be coupled to the positioning surface **13**. A mat **18** may be configured generally as a picture framing mat preferably made of a planar material having a central opening **20**. In preferred embodiments, the perimeter of the mat **18** may be coupled to the positioning surface **13** so that a mat cavity **19** may be formed between portions of the mat **18** not coupled to the positioning surface **13** and the first positioning surface **13**. In some embodiments, a mat cavity **19** may be shaped to receive and/or frictionally retain a unit of printed media **41**, such as a printed photograph, a document, or a painting so that portions of the image **42** on the printed media **41** may be viewed through the central opening **20**. In other embodiments, a mat cavity **19** may be shaped to receive and/or frictionally retain a display apparatus **31** so that portions of the image **42** on the display apparatus **31** may be viewed through the central opening **20**. In further embodiments, a mat **18** may comprise a magnetic material **50** which may enable the mat **18** to be magnetically coupled to a display apparatus **31** so that printed media **41** placed between the mat **18** and the display surface **32** may be maintained in contact with the display surface **32** by the magnetic engagement between the mat **18** and the display apparatus **31**. In further embodiments, a mat **18** may comprise a magnetic material **50** which may enable the mat **18** to be magnetically coupled to a joining panel **12** of a reconfigurable modular apparatus **11** so that printed media **41** placed between the mat **18** and the joining panel **12** may be maintained in contact with the joining panel **12** by the magnetic engagement between the mat **18** and the joining panel **12**. In still further embodiments, printed media may be placed in contact with a display surface **32** by placing the print media **41** between a mat **18** and the display surface **32** of a display apparatus **31**.

[0072] While some materials have been provided, in other embodiments, the elements that comprise the system **100** such as the reconfigurable modular apparatus **11**, display apparatus **31**, optional mat **18**, optional positioning apparatus **62**, and/or any other element discussed herein may be made from durable materials such as aluminum, steel, other metals and metal alloys, wood, hard rubbers, hard plastics, fiber reinforced plastics, carbon fiber, fiber glass, resins, polymers or any other suitable materials including combinations of materials. Additionally, one or more elements may be made from or comprise durable and slightly flexible materials such as soft plastics, silicone, soft rubbers, or any other suitable materials including combinations of materials. In some embodiments, one or more of the elements that comprise the system **100** may be coupled or connected together with heat bonding, chemical bonding, adhesives, clasp type fasteners, clip type fasteners, rivet type fasteners, threaded type fasteners, other types of fasteners, or any other suitable joining method. In other embodiments, one or more of the elements that comprise the system **100** may be coupled or removably connected by being press fit or snap fit together, by one or more fasteners such as hook and loop

type or Velcro® fasteners, magnetic type fasteners, threaded type fasteners, sealable tongue and groove fasteners, snap fasteners, clip type fasteners, clasp type fasteners, ratchet type fasteners, a push-to-lock type connection method, a turn-to-lock type connection method, a slide-to-lock type connection method or any other suitable temporary connection method as one reasonably skilled in the art could envision to serve the same function. In further embodiments, one or more of the elements that comprise the system **100** may be coupled by being one of connected to and integrally formed with another element of the system **100**.

[0073] Although the present invention has been illustrated and described herein with reference to preferred embodiments and specific examples thereof, it will be readily apparent to those of ordinary skill in the art that other embodiments and examples may perform similar functions and/or achieve like results. All such equivalent embodiments and examples are within the spirit and scope of the present invention, are contemplated thereby, and are intended to be covered by the following claims.

What is claimed is:

1. A reconfigurable modular display system, the system comprising:
  - a display apparatus, the display apparatus comprising a magnetic material and comprising a display surface configured to be placed in contact with printed media; and
  - a reconfigurable modular apparatus, the reconfigurable modular apparatus comprising a first joining panel having a first positioning surface, wherein the first joining panel comprises a magnetic material that is configured to engage the display apparatus to the first positioning surface via magnetic attraction between the magnetic material of the first joining panel and the magnetic material of the display apparatus.
2. The system of claim 1, wherein the reconfigurable modular apparatus comprises a second joining panel.
3. The system of claim 2, wherein second joining panel is pivotally coupled to the first panel with a first hinge.
4. The system of claim 3, wherein the first hinge is a living hinge.
5. The system of claim 1, wherein the reconfigurable modular apparatus further comprises a second joining panel having a second positioning surface, a third joining panel having a third positioning surface, and a fourth joining panel having a fourth positioning surface, wherein at least one joining panel comprises a magnetic material, and wherein the first joining panel, second joining panel, third joining panel, and fourth joining panel are pivotally coupled together in a linear arrangement.
6. The system of claim 5, wherein the first joining panel is coupled to the second joining panel with a first hinge, wherein the third joining panel is coupled to the second joining panel opposite to the first joining panel with a second hinge, and wherein the fourth joining panel is coupled to the third joining panel opposite to the second joining panel with a third hinge.
7. The system of claim 1, wherein the magnetic material of the reconfigurable modular apparatus comprises a magnetic material capable of generating a magnetic field, and wherein the magnetic material of the display apparatus comprises a magnetic material that is substantially unable to generate a magnetic field.

8. The system of claim 1, further comprising a mat.

9. The system of claim 1, further comprising a panel support.

10. The system of claim 1, wherein the reconfigurable modular apparatus further comprises a second joining panel having a second positioning surface, a third joining panel having a third positioning surface, a fourth joining panel having a fourth positioning surface, and a fifth joining panel having a fifth positioning surface, wherein at least one joining panel comprises a magnetic material, and wherein the first joining panel, second joining panel, third joining panel, fourth joining panel, and fifth joining panel are coupled together in a five-sided rectangular prism arrangement.

11. The system of claim 10, wherein the reconfigurable modular apparatus further comprises a receiving cavity shaped to receive at least one display apparatus.

12. A reconfigurable modular display system, the system comprising:

a display apparatus, the display apparatus comprising a magnetic material and comprising a display surface configured to be placed in contact with printed media; and

a reconfigurable modular apparatus, wherein the reconfigurable modular apparatus comprises a first joining panel having both a first positioning surface and a magnetic material, wherein the reconfigurable modular apparatus comprises a second joining panel having both a second positioning surface and a magnetic material, wherein the first joining panel is pivotally coupled to the second joining panel with a first hinge, and wherein the reconfigurable modular apparatus is configured to engage the display apparatus to at least one positioning surface via magnetic attraction between the magnetic material of at least one joining panel and the magnetic material of the display apparatus.

13. The system of claim 12, wherein the first hinge is a living hinge.

14. The system of claim 12, wherein the reconfigurable modular apparatus further comprises a third joining panel having a third positioning surface, and a fourth joining panel having a fourth positioning surface, wherein at least one joining panel comprises a magnetic material, and wherein the first joining panel, second joining panel, third joining panel, and fourth joining panel are pivotally coupled together in a linear arrangement.

15. The system of claim 14, wherein the third joining panel is coupled to the second joining panel opposite to the first joining panel with a second hinge, and wherein the fourth joining panel is coupled to the third joining panel opposite to the second joining panel with a third hinge.

16. The system of claim 12, wherein the primary magnetic material comprises a magnetic material capable of generating a magnetic field, and wherein the secondary magnetic material comprises a magnetic material that is substantially unable to generate a magnetic field.

17. The system of claim 12, further comprising a mat.

18. The system of claim 12, further comprising a panel support.

19. The system of claim 12, wherein the reconfigurable modular apparatus further comprises a second joining panel having a second positioning surface, a third joining panel having a third positioning surface, a fourth joining panel having a fourth positioning surface, and a fifth joining panel having a fifth positioning surface, wherein at least one joining panel comprises a magnetic material, and wherein the first joining panel, second joining panel, third joining panel, fourth joining panel, and fifth joining panel are coupled together in a five-sided rectangular prism arrangement.

20. The system of claim 19, wherein the reconfigurable modular apparatus further comprises a receiving cavity shaped to receive at least one display apparatus.

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