

METHODS AND APPARATUS FOR DECORATING INTERIOR ENVIRONMENTS

RELATED APPLICATIONS

5 This application is a continuation of U.S. Serial No. 60/210,938, filed June 11, 2000, which is a continuation-in-part of U.S. Serial No. 60/160,227, filed October 18, 1999, and a continuation-in-part of U.S. Serial No. 60/159,775, filed October 15, 1999, both of which are incorporated by reference in their entireties.

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BACKGROUND

 The present invention relates to the field of work environment structures and partitioning components or barrier members. In particular, it relates to decorated partitioning components and/or barrier members and methods of making such partitioning components and/or barrier members, and work environment management systems that implement such partitioning components and/or barrier members.

15 Prefabricated and modular work environment management systems are presently very popular with both employers and employees. Such systems utilize modular or semi-permanent walls to create private or semi-private work areas. The walls are prefabricated or fabricated on site from prefabricated partitioning components, and are relatively easy to construct and tear down.

20 Some systems, such as the furniture system manufactured and sold by the assignee of the present invention under the trademark Action Office®, are constructed with monolithic panels or partitions, each having a fabric cover stretched over each side of a panel to provide the desired aesthetics. In other systems, such as the furniture system manufactured and sold by the assignee of the present invention under the trademark Ethospace®, the walls are made from rigid frames upon which modular

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partitioning components, called tiles, are hung to create the desired aesthetics while providing easy access to the space within the wall for cabling and the like. Examples such work environment management systems are presented in United States Patents 4,685,255; 5,038,539; and
5 5,086,597, assigned to Herman Miller, Inc., of Zeeland, Michigan.

In still other systems, such as the interior environment space management system manufactured and sold by the assignee of the present invention under the trademark Resolve®, freestanding support columns and overhead beams support barrier members in the form of
10 fabric scrims, canopies, rolling screens, and blankets. This interior environment system is disclosed in commonly assigned U.S. Serial No. 60/104,101, entitled "Workspace Management and Furniture System", filed October 13, 1998.

The prefabricated work environment management system balances
15 the needs and desires of employers and employees. Modern employees desire an attractive, comfortable, personal work environment enclosed by walls. Employees that are satisfied with their work environments tend to be more productive. At the same time, employers are faced with constantly changing market conditions that demand flexibility in work
20 environment management. Offices and walls must be capable of quick and inexpensive erection and removal to allow optimum use of a work environment. In addition, constantly evolving communications technology tends to cause frequent equipment upgrades that may range from simple replacement of a computer or communications bus to complete rewiring
25 and rearrangement of an entire work area. While the former may be relatively benign, the latter can become a daunting task depending upon the extent of the changes to be made. The prefabricated office management systems can greatly simplify such a task.

Although convenient and desirable in many respects, the
30 prefabricated office management system presently offers limited

decorating options. Under present practice, each monolithic panel or modular tile is typically surfaced by fabric, although other surfaces, such as textured plastic or painted metal can be used. Thus, prior art panels are typically provided with a single surface texture and color. Although a variety of texture and color schemes may be implemented, the options available with the prior art are limited. There is only so much that can be done with square or rectangular blocks of color and texture.

Therefore, a work space management system having an improved appearance is desired. In particular, more decorating options and possibilities for the modern work space are desired while maintaining functionality and flexibility.

SUMMARY

In one aspect of the invention, a work environment includes a framework formed from a plurality of spaced apart columns extending upwardly from a base surface. The columns are interconnected by a plurality of crossbeams at a height substantially above a standing adult user. One or more of the barrier members are connected with the framework, and the barrier and framework define one or more work spaces within the work environment. At least one of the barrier members includes an integral display surface having at least a portion of a printed image thereon.

In another aspect of the invention, a work environment includes a partitioning framework defining a plurality of work spaces. A plurality of panels are supported by the partitioning framework. A substantial portion of one or more of the panels is translucent. The translucent portion includes a display surface having at least a portion of a printed image thereon.

In yet another aspect of the invention, an in-line digital printing system for printing on substantially rigid substrates includes a conveyor system adapted to transport substantially rigid substrates. A digital printer is positioned to print upon the substantially rigid substrates conveyed by the

conveyor system. A dryer is located downstream of the digital printer and positioned and configured to heat the substantially rigid substrates after printing by the digital printer.

5 In another aspect of the invention, an in-line digital printing system for printing on a continuous sheet includes a storage spool adapted to support a continuous sheet of material, a digital printer, a dryer, and a roller system adapted to feed a continuous sheet from the storage spool through the digital printer and then through the dryer.

10 Those skilled in the art will recognize other aspects of the invention in view of the detailed description that follows and with reference to the attached drawings. However, the invention is only limited by the claims following the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

15 FIG. 1 is a perspective view of a work environment having decorated partitioning components according to one embodiment of the present invention.

FIG. 2 is a plan view of one of the partitioning components illustrated in the work environment of FIG. 1.

20 FIG. 3 is a plan view of one of the partitioning components illustrated in the work environment of FIG. 1.

FIG. 4 is a side cross-sectional view of the partitioning component shown in FIG. 2 taken along the line 4-4.

FIG. 5 is a plan view of one of the partitioning components illustrated in the work environment of FIG. 1.

25 FIG. 6 is a plan view of one of the partitioning components illustrated in the work environment of FIG. 1.

FIG. 7 is a plan view of one of the partitioning components illustrated in the work environment of FIG. 1.

FIG. 8 is an exploded plan view of the image substrates corresponding to four of the partitioning components illustrated in the work environment of FIG. 1.

5 FIG. 9 is a perspective view of an alternative work environment having decorated partitioning components according to the present invention.

FIGS. 10-13 are perspective views of another alternate work environment having decorated barrier members according to the present invention.

10 FIG. 14 is a cross sectional view of an attachment member according to the present invention.

FIG. 15 is a side cross-sectional of a barrier member and support bars shown in FIG. 11 and taken along line 15-15.

15 FIG. 16A is a plan view of a decorated partitioning component or barrier member according to one embodiment of the present invention.

FIG. 16B is a perspective view of a partitioning component or barrier member of FIG. 16A.

20 FIG. 17A is a plan view of a decorated partitioning component or barrier member according to an alternate embodiment of the present invention.

FIG. 17B is a perspective view of a partitioning component according to an alternate embodiment of the present invention.

FIG. 18 is an exploded perspective view of a decorated partitioning component according to another embodiment of the present invention.

25 FIG. 19 is a perspective view of an alternate method of expressing images onto a decorated partitioning component according to another embodiment of the present invention.

30 FIG. 20A is a schematic view of a process for integrating images onto a partitioning component substrate or barrier member according to one embodiment of the invention.

FIG. 20B is a schematic view of an alternate embodiment of the process of FIG. 20A.

FIG. 21 is a side view of an apparatus for digital printing of an image onto a substrate or barrier member according to an embodiment of the present invention.

FIG. 22 is a schematic view of a process for printing an image onto substantially rigid substrates according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Various aspects of the invention are presented in FIGS. 1-22, which are not drawn to scale and wherein like elements in the various views are numbered alike. The invention is drawn to the decoration of any work environment or work environment partitioning components or barrier members. As used herein, the phrase "work environment" refers to any structure or portion of a structure adapted for and intended to be used at a workplace or home office, including, but not limited to, office systems, such as modular office or furniture systems, panel or partition systems, divider systems, including medical divider systems, modular interior architectural structures, and the like. As used herein, the word "partitioning components" and "barrier members" refers to any portion of a work environment, including, but not limited, a panel, tile, canopy, rolling screen, fabric scrim, floor mats, work surfaces, and ceiling tiles, and the like. The partitioning components and barrier members may be substantially rigid or generally non-rigid.

Referring now specifically to FIG. 1, an exemplary work environment 10 according to the present invention includes a plurality of partitioning frameworks 28 and 29. The work environment 10 is modeled on systems such as Office Action® System, the Ethospace® Office System, the Q® Office System, the Kiva® Office System, and the Phoenix® Office System, all manufactured and sold by Herman Miller, Inc. of Zeeland, Michigan. A

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suitable work environment is disclosed in U.S. Pat. Nos. 4,685,255, 5,038,539, 5,086,597, all of which are incorporated herein by reference. The partitioning frameworks 28, 29 generally include a frame structure 27 surfaced by or more partitioning components 12 that define potential display surfaces 14. The number of partitioning components 12 implemented within a work environment may vary from embodiment to embodiment depending upon the needs and desires at hand.

The partitioning components 12 may be used with any type of wall that is constructed to cooperate with such partitioning components.

Existing walls may also be adapted to cooperate with the partitioning components 12. For example, traditional construction techniques are used to build the building that encloses the work environment 10. The building necessarily includes some walls constructed with traditional construction techniques, such as wood or metal studs surfaced by drywall or paneling. It may be desirable to cover these walls with partitioning components 12 in order to create a common decorative appearance. In such cases, frames that cooperate with the partitioning components 12 may be attached to the walls. Any such variations are considered to fall within the purview of the invention.

As presented in FIG. 1, one or more of the partitioning components 12 have a graphic or image 30, 31, 32, 34, 36, 38, or 39 integral with its respective display surface 14. As used herein, "integral" means that the image is affixed to the substrate of the partitioning component in a manner that is intended to be substantially permanent, such as by painting, embroidery, or printing, and as distinguished from easily separable methods, such as by mechanical fastening with a nail, thumbtack, or adhesive. The substrate may be the main body of the partitioning component itself, such as a metal, wood, plastic, glass, or fabric material, or may be sheet, such as a fabric, that is placed over or affixed to the main body of the partitioning component itself. The image may be integrated onto the substrate using any method known in the art, such as painting or

embroidering. A particularly preferred method of integrating the image(s) is through digital printing, as described more fully below.

The images may be merely decorative, or may be functional, or both. FIG. 2 illustrates an enlarged plan view of one of the partitioning components 13 having the image 30. In this embodiment, the image 30 is in the form of way-finding information. The image 30 includes the title "SALES" and an arrow that indicates a direction. As shown in FIG. 3, the sales work area is indicated by an image 32 on partitioning component 23, which includes the title "SALES". An individual seeking to find the sales work area would first encounter the way-finding printed image 30, follow the arrow, and then encounter the printed image 32 that indicates the sales area. Colors may be used to make the images more noticeable, more attractive, or to blend in better with the surroundings, as desired. Way-finding through a maze of wall partitioning frameworks 28, 29 may thus be greatly simplified in an attractive, functional way.

Referring now to FIG. 4, the partitioning component 13 is shown taken along line 4-4 of FIG. 2. The partitioning component 13, shown here as a tile, may be surfaced by a sheet 18 that is mounted to a rigid frame 16 such as a foamed plastic or wood board or a stamped metal sheet, a frame, or any other any other structure that is suitable for use in a partitioning component. The rigid frame 16, or the sheet 18, includes an attachment member 26 for mounting the fabric over the entire surface formed by the frame 16. The sheet may be permanently attached to the partitioning component, or preferably, may be removably attached to the partitioning component 13, for example, by a releasable clips. Suitable tiles and attachment members are disclosed in U.S. Pat. No. 5,129,202, and in U.S. Serial No. 60/184,891, entitled "Modular Wall Panel and Mounting Member," filed February 25, 2000, both of which are incorporated herein by reference in their entireties.

The image 30 is integral with the exposed surface of the sheet 18. As will be discussed in more detail, the image 30 is preferably integrated

with the sheet 18 before it is applied to the partitioning component 13. The sheet 18 may be selected from a group consisting of paper, fabric, metal, glass, opaque plastic, clear plastic, and translucent plastic. The fabric may be of any construction, including knit, woven or non-woven, without
5 limitation. Alternatively, the image 30 may be integrated directly onto the partitioning component 13. In either case, the image is integral with the partitioning component 13.

Referring now to FIG. 5, the partitioning component 33 is presented having the integral image 34 that is an alpine scene. The image 34 is
10 coterminous with the partitioning component 33, and may include a variety of colors as indicated by the various cross-hatchings. Images such as image 34 dramatically brighten a work space without interfering with the functionality of the work environment or the wall partitions that make up the work environment.

Referring now to FIG. 6, the partitioning component 43 is presented having the integral image 36. In this embodiment, a substantial portion of the surface of the partitioning component 43 is comprised of a translucent portion 40 supported by a partitioning component frame 42. One suitable
15 partitioning component having a translucent portion is disclosed in U.S. Pat. No. 4,685,255. The image 36 is printed on the translucent portion 40. The partitioning component 43 of FIG. 6 serves as a window and substantially opens the work environment by allowing light to enter and by providing a deeper field of view. In preferred embodiments, the translucent portion is substantially transparent. In especially preferred embodiments of
20 the invention, the translucent material is a sheet or pane of glass, or a pair of substantially co-planar and substantially coextensive sheets or panes of glass with a spacing therebetween. In alternate embodiments, the translucent portion 40 may be a thick sheet, such as polyacrylate. The sheet 40 may also be a perforated one-way view material applied to the
25 window for privacy needs, shading, or patterns.
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Referring now to FIG. 7, the partitioning component 53 is presented that has the integral image 38. Referring again to FIG. 1, the image 38 is a sub-image of a larger image 44, which in this example is a tree. A plurality of partitioning components 53 may be provided, each having a sub-image of a larger image that may be arranged to recreate the larger image 44. Thus, sub-image 38 is a continuation of the other sub-images making up image 44.

Referring now to FIG. 8, image 31 from FIG. 1 is shown resolved into four sub-images or graphics 71, 72, 73, 74, on respective contiguous sheets 61, 62, 63, 64. The contiguous sheets shown are preferably fabric materials. A computer is used to resolve the image into sub-images, and leaving rooms at edges 65, 66, 67, 68 for attaching the sheets to their respective partitioning components, such as rigid frames. The computer and software is programmed to divide the image 31 into the sub-images 71, 72, 73, 74 using image processing techniques and software known in the computer graphics art. When assembled, each of the sub-images 71, 72, 73, 74 is a continuation of the other, adjacent sub-images.

The variety of images that may be implemented in the practice of the invention is immediately apparent, and any such variation in image is considered to fall within the purview of the invention. By way of example, without limitation, such images may include way-finding information, corporate logos, trademarks, inspirational subject matter, quotations, and textual information. Innumerable graphic designs or photographic reproductions may be implemented. All of the images within a work environment may have a common theme. Of particular interest in the practice of the invention are images of nature. One preferred image is an image of a beach scene 39 (FIG. 1). Other images may include natural scenes, such as alpine scene 34 (FIG. 5), woodland, aquatic, rain forest, tropical and pastoral scenes, and are considered to provide a bright and attractive alternative that may improve worker productivity. Particularly preferred images for inspiring innovation and creativity, improving worker's

cognitive performance, and improving emotional well-being, are those images of the type disclosed in U.S. App. Ser. No. 09/590,966, entitled "Work Space Partitioning Components and Methods for Providing Same", filed June 9, 2000, the entire disclosure of which is incorporated by
5 reference.

The partitioning components 12 are preferably removable from the partitioning frameworks 28, 29. Suitable attachment techniques and devices are known in the art. The partitioning components 12 may be replaceable to allow a change of graphics or scenery, for example when a
10 new person inhabits a work space. Any variation in attachment is considered to fall within the purview of the invention.

Still referring to FIG. 1, a method of decorating a work environment 10 is provided according to a further aspect of the invention. The method includes attaching to the work environment 10 a plurality of partitioning
15 components 12, one or more of the partitioning components 12 having a display surface 14 with an integral image. The partitioning components 12 may be contiguous or interleaved with wall panels not having images. The partitioning components 12 may be contiguous and each image 38 may be a sub-image of a larger image 44. In such case, the method of the
20 invention may further comprise arranging the partitioning components 12 to recreate the larger image 44.

Referring now to FIG. 9, an alternate work space 80 is shown. The work space 80 includes an image 83 integrated onto a sheet 84. The sheet is suspended in the work environment 80 upon a frame 85 in a
25 position that divides two work stations 81 and 82. The sheet 84 is also referred to as a boundary blanket. The sheet 84 may be integrated and processed as described herein, and may be selected from a group consisting of fabric, metal, glass, opaque plastic, clear plastic, and translucent plastic. The fabric may be woven or non-woven. The frame 85
30 may be disposed vertically and rest upon the floor, be carried by adjacent wall partitions, or be suspended from a ceiling. The work space 80 may

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also comprise interconnected partitions and tiles as previously described in relation to FIG. 1.

FIG. 10A and FIG. 10B illustrate an alternate embodiment of a work environment 100 having decorative images on partitioning components or barrier members thereof. The work environment 100 is modeled on the
5 Resolve® office system sold by Herman Miller, Inc. of Zeeland, Michigan. The Resolve office system is disclosed in U.S. App. Serial No. 60/104,101, entitled "Work Space Management and Furniture System", filed October 13, 1998, the entire disclosure of which is incorporated herein by
10 reference.

Briefly, the work environment 100 includes an open space, freestanding partitioning framework 101. The framework 101 includes a plurality of spaced apart columns 102 extending upwardly from a base surface. The columns 102 are interconnected by a plurality of crossbeams
15 at a height substantially above a standing adult user. Preferably, the crossbeams have a height from about 6-10 feet, and more preferably, about 7-9 feet. The framework 101 may also include shorter columns 136 and pairs of substantially parallel and generally horizontal support members 132, 134 at a height substantially below a standing user.
20 Preferably, the support member 132 has a height of about 2-5 feet, and more preferably, from about 3-4 feet. The framework 101 is designed and adapted to be modular such that its various elements can be configured and reconfigured to form one or more work spaces 111, 112, 113, 114, 115, 116, and 117. The works spaces 111-117 may include floor mats 128
25 and work surfaces 130 as needed.

The workspaces 111-117 are further defined by one or more barrier members 120, 122, 124, 126. The barrier members 120 are attached with and extend between adjacent columns 102. Barrier members 122 are attached with and extend between support members 132, 134. Barrier
30 member 124 is formed as part of a rolling screen. Finally, barrier member 126 is formed as part of an overhead canopy.

Generally, the barrier members 120, 122, 124, and 126 are non-rigid, flexible sheets of material that are extended between one or more frame elements. In the preferred embodiment, the barrier members are formed from a fabric material.

5 One or more of the barrier members 120, 122, 124, and 126 have one or more images, or portions of an integral image 141, 142, 143, 144, 145, 146, 147, and 148 on a display surface thereof. The images may include any image of the user's choosing. The barrier members 120, 122, 124, and 126 are designed and adapted to allow their easy removal from
10 their supporting elements, thereby allowing workers to readily replace the images in their workspace as they move workspaces, or when they simply wish to have a new decoration in their work space.

FIG. 11 illustrates a portion of the work environment 100 having support bars 132, 134 for supporting barrier members 122, such as fabric
15 scrims. Barrier members 122 have images 150, 151, respectively. Here, images 150, 151 are identical, however, any combination of images may be used. The work environment also includes a rolling screen 124, which also has an image 149 on an other surface thereof. In alternate embodiments, the inner surface of the rolling screen 124 may also have
20 one or more images or a portion of an image thereon.

FIG. 12 shows another portion of work environment 100. The work environment 100 has support bars 132, 134 for supporting barrier
members 122. Barrier members 122 have images 153, 154, respectively. The work environment also includes a canopy 126, which also has an
25 image 152 thereon. Furthermore, images having been integrated into the horizontal surfaces. For example, image 155 has been integrated into worksurface 130, and an image 156 has been integrated into floor mat 128. In addition, an image 157 has been integrated into the ceiling tiles 160. The images shown in FIG. 12 have a common theme (e.g., a sunny
30 garden).

FIG. 13 illustrates another portion of the work environment 100 defining a work space 118. The workspace 118 is enclosed by a plurality of barrier members 120. The barrier members each have a portion of an image 161, 162, 163, respectively, that together form one continuous image.

FIGS. 14-15 illustrate an especially preferred mechanism for attaching the barrier members 122 to their respective support members 132, 134. The barrier members 122 preferably include an elongated resilient attachment member 170 extending a substantial portion of the length of one or both of the horizontal edges of the barrier member. The attachment member includes a hook shaped portion 171 ending in a reverse flange 172, and an extension 174. The extension 174 preferably attaches to a first end portion 178 of an elastic member 176, which in turn is attached to the barrier member 122 at a second end portion 180. The attachment member 170 is preferably formed from a resilient and/or elastic material, such as an elastomer, and most preferably from an expandable PVC. The elastic member 176 is preferably formed from an elastic material such as an elastomer. Preferably, the member 176 is more elastic than the member 170.

FIG. 15 illustrates the use of the attachment members 170 for attaching the barrier supports 122 to their respective support members 132, 134. The barrier supports 132, 134, shown in cross-section, have elongated channels 133 along their horizontal length. The reverse flange 172 of the attachment 170 is adapted to securely, but removeably engage the channels 133. The attachment member 170 is preferably at least slightly compressible so that the flange 172 can be compressed into the channel and then naturally expand outward to provide a snug fit.

The attachment 170 may be used along one or both edges of the barrier member 122. Likewise, the elastic member 176 may be used along one or both horizontal edges of the barrier member 122. In the preferred embodiment shown, the elastic member 176 is used only at the lower edge

of the barrier member 122. The elongated attachment members 170 and elongated elastic members 176 evenly stretch the barrier member 122 so that the display surface of the barrier member is essentially flat, thereby presenting the best possible display surface for the image integrated thereon.

FIGS. 16-19 illustrate alternate embodiments and methods of expressing images onto partitioning components or barrier members. In particular, FIG. 16A and 16B illustrate a partitioning component or barrier member 182 having a lenticular image thereon. It should be understood that partitioning component shown in FIGS. 16A or 16B may be any of the partitioning components 12 or barrier members 120, 122, 124, and 126 shown in the previous FIGURES. The lenticular image appears to change shape as the observer changes his or her viewing position. In the example shown, the lenticular image is a pair of eyes 185, 186. In FIG. 16A, the eye 185 appears open when viewing the component 182 directly head-on. However, as shown in FIG. 16B, the eye appears to wink at the observer as the observer moves to a viewing position at an angle with the partitioning component 182.

FIG. 17A illustrate a barrier member 190 having a composite image thereon. The barrier member 190 may be formed as any of the barrier members shown in FIGS. 10A and 10B. The barrier member 190 includes a first display surface 192 and a second display surface 194. The surfaces 192 and 194 are separated by the thickness of the barrier member.

The first display surface 192 includes a first image 196. The second display surface 194 includes a second image 198. In preferred embodiments, the images complement each other in some manner. The thickness and material of the barrier member 190 is such that the images 196, 198 are at least partially recognizable from the opposing surface 194, 192, respectively. The use of two images provides a three-dimensional effect and the illusion of movement as a mobile observer views the barrier member 190.

FIG. 17B illustrates the same concept of FIG. 17A, but applied to a partitioning component 200 having a translucent portion. The partitioning component 200 is shown as two sheets 202, 204, however, in alternate embodiments, the partitioning component may have only one translucent sheet. The sheets 202, 204 have images 206, 208, respectively, on opposing display surfaces thereof. The use of two images provides a three-dimensional effect and the illusion of movement as a mobile observer views the barrier member 190.

FIG. 18 illustrates an alternate embodiment of a two surface partitioning component 210. The first display surface 212 is substantially translucent, and preferably transparent. The first display surface includes an image 214. The second display surface 216 includes a sheet 217, such as a vinyl sheet, that has a plurality of perforations 218. The sheet 217 and the perforations 218 provide single way viewing through the partitioning component 210.

FIG. 19 illustrates an alternate embodiment of a work environment 220 having dynamic images thereon rather than static images. The work environment includes projectors 222, 226 for projecting images 224, 228 respectively, onto partitioning components in the work environment. In should be understood that projectors may be used to create images in the work environments of any of the embodiments of the invention.

Various methods can be used to integrate the images unto their respective work environment partitioning components in FIGS. 1-19. The images may be painted, weaved, or embroidered onto their respective substrate. A particularly preferred method for integrating images onto work environment partitioning components is through digital printing.

In another aspect of the present invention, a method is provided for decorating a work environment. The method includes integrating one or more images, or a portion of an image, onto a partitioning component or a barrier member. The image may be chosen by the organization owning the work environment, or preferably is chosen by the user of the work

space. In an especially preferred embodiment, the image and/or partitioning component or barrier member is customized or personalized according to a method disclosed in U.S. App. Ser. No. 60/210,903, entitled "Methods and Apparatus for Customizing Interior Environments," filed June 11, 2000, the entire disclosure of which is incorporated by reference in its entirety. The partitioning component or barrier member, now having an integrated image, is releasably attached with a supporting framework of the work environment. The partitioning component or barrier member is then removed and replaced by a partitioning member or barrier member having another image, either when the user of the work space desires a new image in his or her work space, or when a new worker occupies the workspace and wishes to have a new image in the work space.

Referring now to FIG. 20A, an apparatus 250 for integrating images on a sheet 252 suitable for attachment to a partitioning component, such as partitioning components 12, or for use as a barrier member, such as a fabric scrim, canopy, or rolling screens, and the like, is shown schematically according to a further aspect of the invention. The apparatus 250 comprises a computer 254, and an integrating device 256 in digital communication with the computer 254. The sheet 252 is provided as a roll 260, supported in known manner. The sheet is feed through the digital integrating device 256 and is then taken up on a roll 262. The digital integrating device 256 integrates an image onto the sheet 252 as the sheet 252 is fed through it. A controller 270 controls the advance of the rollers and thus the sheet through the system.

The integrating device 256 may be a computer controlled loom, a computer controlled knitting machine, a computer controlled embroidering machine, or a computer controlled digital printer. In a particularly preferred embodiment of the invention, the integrating device is a computer controlled digital fabric printer.

FIG. 20B illustrates the apparatus 250 in the case where the integrating device is a computer controlled digital printer. The apparatus

250 comprises a computer 254, a digital printer 257 in digital communication with the computer 254, and a dryer 258. The sheet 252 is provided as a roll 260, supported in known manner. The sheet is feed through the printer 257, through the dryer 258, and is then taken up on a roll 262. The digital printer 257 prints an image on the sheet 252 as the sheet 252 is fed through it. A controller 270 controls the advance of the rollers and thus the sheet through the system.

The printer 257 may be any printer suitable for printing on the type of material the sheet 252 is formed from. In certain embodiments, an inkjet printer has been found to be quite suitable, particularly a wide-format system adapted for textile printing, for example systems available from Digital Printing Systems of New York, NY, ENCAD of San Diego, CA, and Mimaki of Japan.

Heating the sheet 252 in the dryer 258 fixes the image to the sheet 252. According to a preferred embodiment, the sheet 252 is a material that does not shrink upon being heated to a temperature that fixes the image to it. A preshrunk fabric material is an example of a suitable material. After printing, the roll 262 may be transported to a panel fabrication station where the sheet 252 is cut into smaller pieces and used for construction of partitioning components in a known manner.

FIG. 21 illustrates an especially preferred embodiment of the system shown in FIG. 20. The system 300 can be carried upon a mobile cart or frame 390. The system 300 includes a digital printer 310, a dryer 350, and a system of rollers 380, 385, for advancing a sheet 304 through the system. The rollers are advanced by a controller (not shown). A wall 330 having through-holes 331, 332, 333, may be placed between the printer 310 and the dryer 350 to shield the printer 310 from the heat of the dryer 350. The dryer 350 includes a heating element 352 for drying a portion of the sheet 304 that is drawn substantially vertically across rollers 382, 383. The sheet 304 is heated for at least 60 seconds at a temperature of about 360° F-380 °F. The heat disperses the ink, blooms the color, and adheres

it to the fabric. The heating element 352 is preferably an infra-red heat source that is very linear in its output to ensure that the sheet width is dried evenly. A suitable heating element is sold by Sophis USA, Inc.

5 In a preferred embodiment, the fabric for digital imaging is 100% polyester, treated for stain resistance by dipping the fabric in a liquid stain resistance treatment such as MilliGuard®, Scotchguard®, or similar treatment material. Treating the fabric for stain resistance decreases the amount of ink the fabric absorbs and inhibits bleeding of the ink along the fibers of the fabric. The fabric is heated to about 400 °F to pre-shrink the material and pressed in rollers while heated. This process significantly stiffens the fabric and provides a printable, stable fabric for digital imaging. 10 Suitable inks for jet printing are the Terasil®-TI water-dispersed inks for direct printing on polyester fabrics for drop-on-demand ink jet printer heads, available from Ciba Specialty Chemicals Corp., in Charlotte, NC. 15 Weight of the fabric and type of weave appear to have little affect on the process. A paper backing may be used with a light-weight fabric to prevent ink that penetrates the fabric from smearing along the backside of the fabric.

20 Although described with reference to a particular image-forming process, it is not intended to limit the invention to the particular printing process described, as other processes may be implemented in the practice of the invention in light of the description provided herein, for example dye sublimation, electrostatic, dye transfer, and digital air brush.

25 FIG. 22 is a schematic drawing of an alternate embodiment of a system 450 for printing on partitioning components. The system 450 is particularly adapted to printing upon substantially rigid partitions, rather than flexible sheets. The system 450 includes a conveyor belt 452 mounted upon rollers 460, 462 for moving rigid partitions 401 through the system. In line with the conveyor is a digital printer 456 in digital 30 communication with the computer 454, and an oven 458. A controller 470 controls the movement of the conveyor. The system 450 is designed to

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allow consecutive printing and heating of the rigid partitions without removing the partitions from the conveyor.

Although the invention has been described and illustrated with reference to specific illustrative embodiments thereof, it is not intended that the invention be limited to those illustrative embodiments. Those skilled in the art will recognize that variations and modifications can be made without departing from the true scope and spirit of the invention as defined by the claims that follow. It is therefore intended to include within the invention all such variations and modifications as fall within the scope of the appended claims and equivalents thereof.

**CLAIMS**

1. A work environment comprising:
a framework formed from a plurality of spaced apart columns extending
upwardly from a base surface, the columns interconnected by a plurality of
crossbeams at a height substantially above a standing user;
at least one barrier member connected with said framework; said at
least one barrier and said framework defining at least one work space;
wherein said at least one barrier member includes an integral display
surface having at least a portion of a printed image thereon.
2. The work environment of claim 1, wherein said at least one
barrier member comprises a fabric.
3. The work environment of claim 2, wherein said at least one
barrier comprises a generally non-rigid barrier.
4. The work environment of claim 1, wherein said at least one
image conveys information.
5. The work environment of claim 1, wherein said at least one
barrier comprises a lenticular image.
6. The work environment of claim 1, further comprising a second
image printed upon said at least one barrier member, said second image
printed on a second surface of said at least one barrier member opposite
said integral display surface.
7. The work environment of claim 1, further comprising at least
one pair of generally horizontal support members at a height substantially
below a standing user, said support members attached with at least one of

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said columns, said pair of support members supporting said at least one barrier member therebetween.

5 8. The work environment of claim 7, wherein at least one support member of said at least one pair of support members include a channel along at least a substantial portion of a longitudinal length thereof, and said at least one barrier member includes a resilient attachment member adapted to removably engage said channel.

10 9. The work environment of claim 1, wherein said at least one barrier member comprises a plurality of barrier members, each of at least two of said plurality of barrier members having a integral display surface having a printed image thereon.

15 10. The work environment of claim 9, wherein each of said images is related to a common theme.

20 11. A work environment, comprising:
a partitioning framework defining a plurality of work spaces, and
a plurality of panels supported by said partitioning framework;
wherein a substantial portion of at least one of said panels is translucent, said translucent portion including a display surface having at least a portion of a printed image thereon.

25 12. The work environment of claim 11, wherein said translucent portion comprises a transparent material.

30 13. The work environment of claim 12, wherein said translucent portion comprises glass.



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14. The work environment of claim 11, wherein said translucent portion comprises a plastic material.

5 15. The work environment of claim 11, wherein said translucent portion comprises at least two substantially coplanar and substantially coextensive translucent sheets.

10 16. The work environment of claim 15, wherein said at least two translucent sheets comprises two glass panes.

15 17. The work environment of claim 15, wherein each of said sheets has a display surface, a first of said display surfaces having at least a portion of a first image printed thereon, and a second of said display surfaces having at least a portion of a second image thereon.

18. The work environment of claim 15, wherein said at least two translucent sheets comprise a glass pane and a sheet attached to said glass pane by an adhesive.

20 19. The work environment of claim 18, wherein said sheet comprises a perforated plastic material allowing for substantially one-way viewing through said translucent portion.

25 20. An in-line digital printing system for printing on a continuous sheet, the system comprising:

a storage spool adapted to support a continuous sheet of material;
a digital printer;
a dryer; and

30 a roller system adapted to feed a continuous sheet from said storage spool through said digital printer and then through said dryer.



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21. The digital printing system of claim 20, further comprising:
a controller adapted to advance the roller system.

22. An in-line digital printing system for printing on substantially
rigid substrates, the system comprising:

a conveyor system adapted to transport substantially rigid
substrates;

a digital printer positioned to print upon the substantially rigid
substrates conveyed by said conveyor system; and

a dryer downstream of said digital printer and positioned and
configured to heat the substantially rigid substrates after printing by said
digital printer.

