United States Patent

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[54] **METHOD AND APPARATUS OF DECOR SIMULATION**

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[51] **Int. Cl.** **G03b 15/00**

[58] **Field of Search** 353/30, 35; 355/40, 79; 95/85

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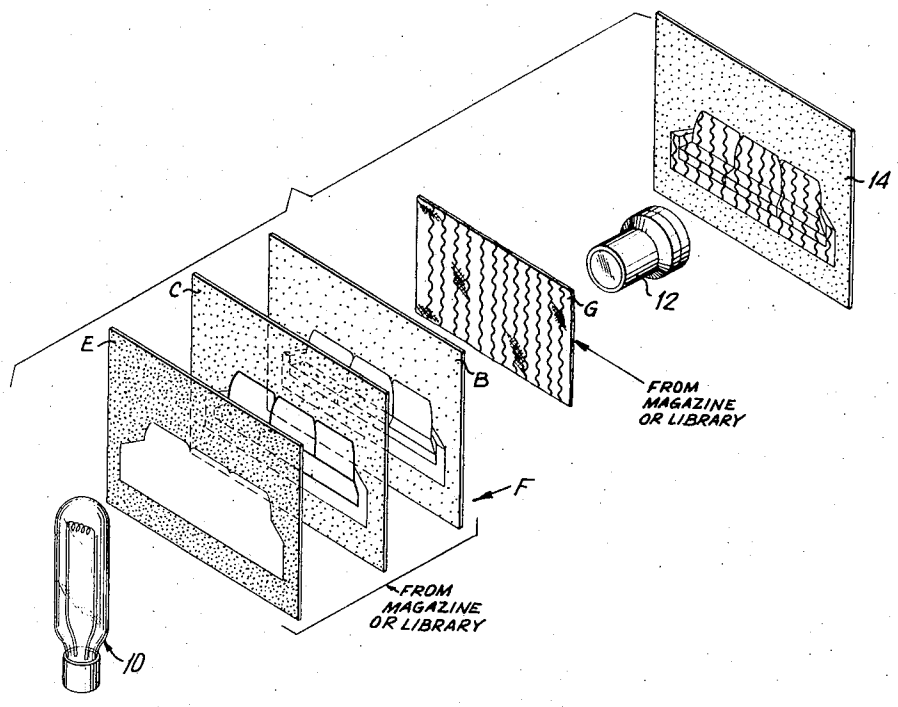
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[57] **ABSTRACT**

Methods and apparatus for decor simulation, such as simulating the appearance of custom upholstered furniture, custom window treatments, decorative furnishings, and the like, and methods and apparatus for producing projection transparencies having the detail spectrum thereof photographically modulated for enhanced usage in such decor simulation.

18 Claims, 5 Drawing Figures



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FIG. 1

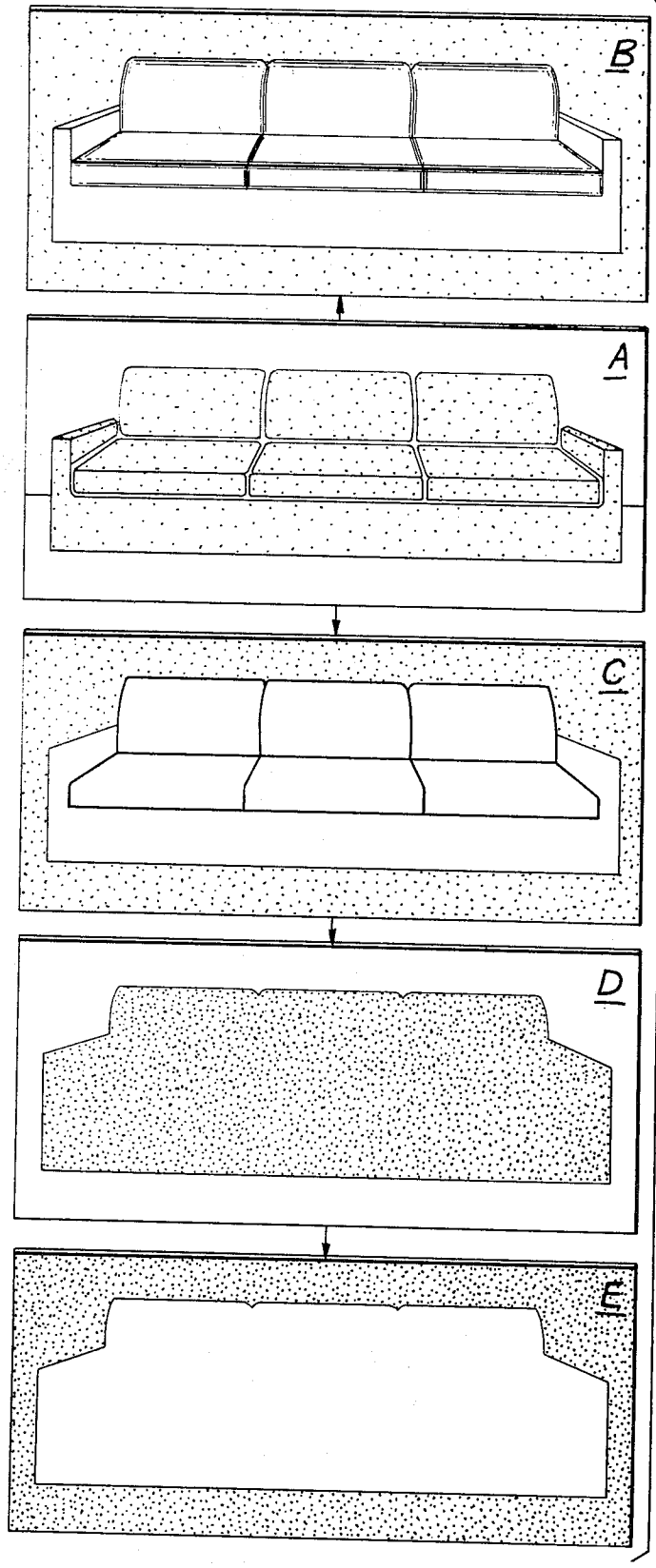


FIG. 3

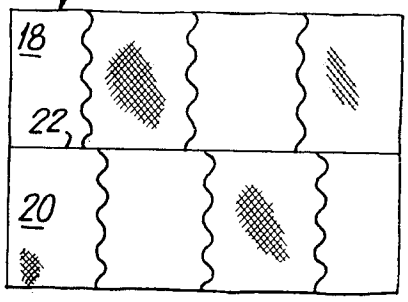
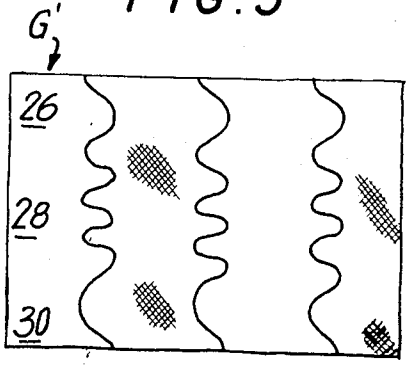


FIG. 5



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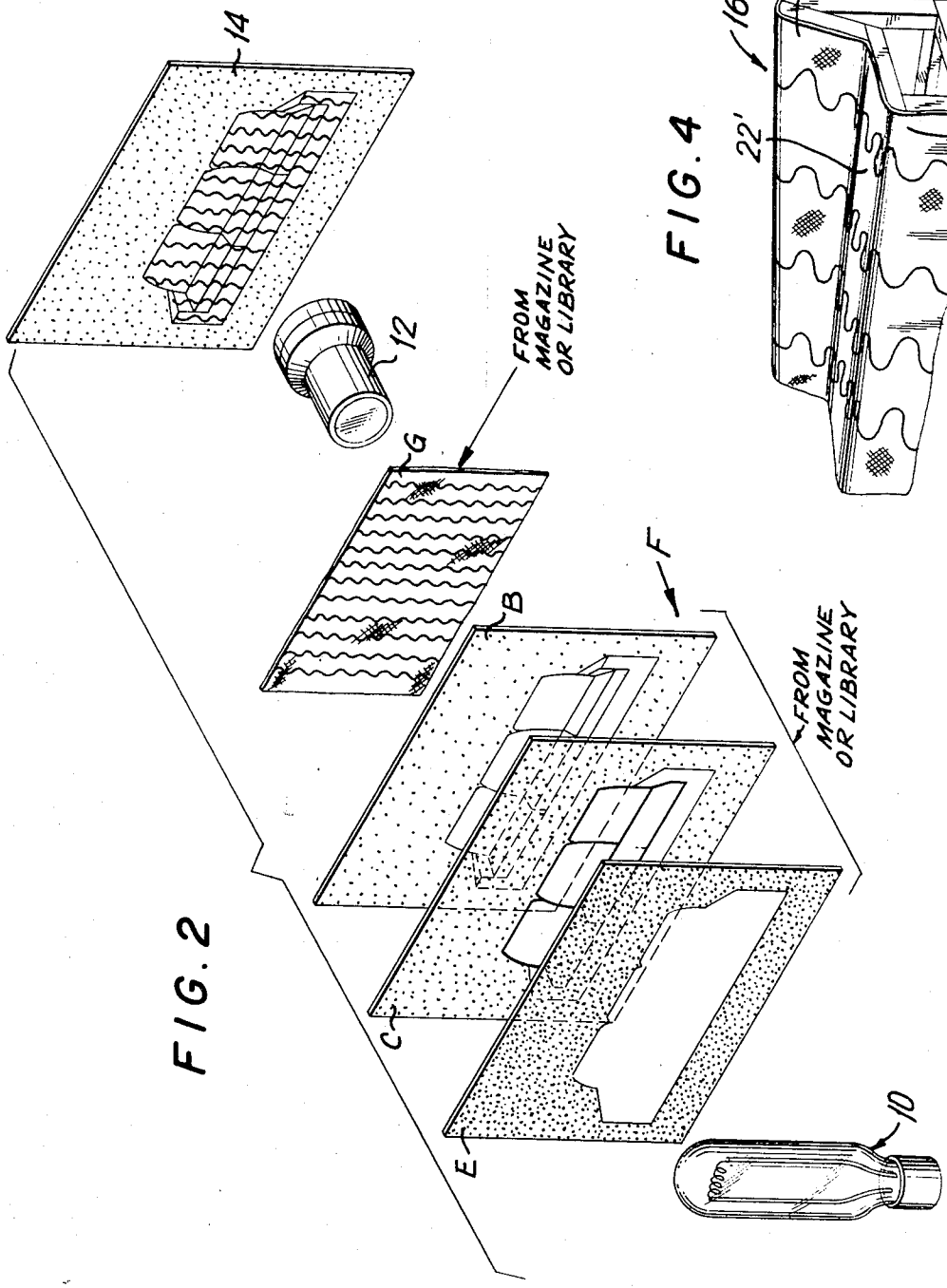


FIG. 2

FIG. 4

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METHOD AND APPARATUS OF DECOR SIMULATION

This invention relates to decor simulation and, more particularly, to methods, apparatus and systems for accurately simulating decorative furnishings, such as upholstered, veneered or inlaid furniture, window treatments, and the like. This invention further relates to methods, apparatus and systems for the production of transparencies with the detail spectrum thereof modulated for use in such decor simulation.

At the present time, when someone desires to purchase decorative furnishings, such as upholstered furniture he generally has only two options open to him. He may go to a furniture store and purchase a piece of furniture from the selection presently stocked by that furniture store, or, more commonly, he can order a piece of furniture to be made up in the fabric of his choice. At the present time the only way in which he can be certain as to what the appearance of the delivered furniture will be is to purchase the actual floor sample, or to order a piece of furniture covered with the identical material as the floor sample. Obviously the customer is severely limited, since furniture samples are expensive and very bulky so that even the largest of furniture stores can only stock and display a very small part of the upholstered pieces that they offer for sale. Moreover, due to the cost and size of upholstered furniture pieces, it is customer in the furniture industry for even the manufacturer not to carry a large inventory of completed furniture but, rather, to accept orders for furniture in advance of the actual construction and to ship the completed pieces only some 6 to 8 weeks after receiving an order therefor. Hence, except during special sales, it is not usual for a furniture store to sell furniture from stock, the vast majority of furniture sold being "custom ordered" for delivery some 6 or 8 weeks hence.

In addition, the customer is generally given an opportunity to view the fabric with which the furniture is to be upholstered in only a relatively small piece. If the customer purchases the furniture through a furniture store he is generally presented with a "swatch book" wherein a large number of fairly small samples of available fabrics are bound similar to the leaves of a book. The customer may go through the book examining the fabric samples and attempting to visualize how a particular fabric will appear when shaped to form the upholstery of a furniture piece and how that upholstered furniture piece will appear amidst the surroundings and colors that might be present in the customer's home. The ability to accurately visualize from a small piece of fabric what the finished appearance of an upholstered piece of furniture will be takes substantial time and effort to acquire. Except for professional decorators, few customers actually have the requisite ability since the completed appearance of a fabric pattern depends not only on the size of the pattern elements, but the visual perception of those pattern elements depends, at least to some extent, on other factors, such as the shape and extent of the fabric panels involved as well as the setting and background against which they are to be used.

Even when a customer purchases a "floor sample" or an upholstered piece from a dealer's stock he is not always certain how the finished piece will look in his home. The lightening, surroundings, and wall colors in a furniture store can be substantially different from the lighting, surrounding, and wall and floor colors in a customer's home, office or other setting.

In addition to the purchasing of furniture pieces from showrooms, much upholstered furniture is purchased through interior decorators who have no stock at all to display and who relay almost solely upon catalog or photographic pictures depicting the furniture pieces they are suggesting for a specific customer's application. In this type of sale, since the customer does not even have an opportunity to view a similar piece, he must rely to a very high degree upon the decorator's skill and judgement. In any event, the vast majority of upholstered furniture that is ordered does not even correspond to the sample or catalog picture of the piece which the customer viewed. Usually, only the general shape as defined by the frame and padding of furniture corresponds with that which the customer actually viewed, but the fabric with which the piece is upholstered is generally different from the fabric with which the sample or display piece was upholstered.

Where the customer uses such swatch books in a store he is presented with a large number of available fabrics to consider. Where he has employed the services of a decorator, the decorator will generally limit the number of swatches that he presents to the customer and the customer will generally have the opportunity to examine the swatches that the decorator gives him at his own leisure. The swatch books, however, are very bulky and do not readily lend themselves to customers taking them home for study at his leisure. Either way, the customer generally does not have an accurate idea of what the furniture is that he is ordering prior to the time that the furniture is actually delivered.

Having in mind all the foregoing, it is the primary object of the present invention to provide methods, means and apparatus for enabling a customer to preview the finished appearance of furnishings, such as custom-upholstered or veneered or inlaid furniture, window treatments, lamps, and the like.

It is another primary object of the present invention, in addition to the foregoing object, to provide methods, means and apparatus for producing and projecting transparencies depicting upholstered furniture and fabric panels for composite viewing to simulate the appearance of such furniture covered with such fabrics.

Yet still another primary object of the present invention, in addition to each of the foregoing objects, is the provision of methods of producing transparencies depicting custom furnishings, such as upholstered furniture having only the outlines and shadow detail thereof for composite viewing with transparencies depicting fabric patterns as aforesaid.

Yet still another primary object of the present invention, in addition to each of the foregoing objects, is the provision of novel methods and apparatus for preparing transparencies having the appearance of line drawings.

Another and yet still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of such methods, means and apparatus which are economic and effective, while being yet simple and easy to use.

Yet further, it is still another primary object of the present invention, in addition to each of the foregoing

objects, to provide novel methods, means, apparatus and systems for projecting a plurality of transparencies to provide a composite picture of a completed article.

Still further, it is yet another primary object of the present invention, in addition to each of the foregoing objects, to provide novel pictorial transparencies for use in simulation of upholstered furnishings, and the like.

The invention resides in the combination, construction, arrangement, disposition and processes of the various component parts, elements and methods incorporated in improved decor simulation in accordance with the principles of this invention. The present invention will be better understood and objects and important features, other than those specifically enumerated above, will become apparent when consideration is given to the following details and description, which when taken in conjunction with the annexed drawing, describes, discloses, illustrates and shows a preferred embodiment or modification of the present invention and what is presently considered and believed to be the best mode of practicing the principles thereof. Other embodiments or modifications may be suggested to those having the benefit of the teachings herein, and such other embodiments or modifications are intended to be reserved, especially if they fall within the scope and spirit of the subjoined claims.

IN THE DRAWING

FIG. 1 illustrates the sequence of steps utilized to produce transparencies in accordance with the present invention, having the outline and shadow detail;

FIG. 2 illustrates the way in which the transparencies produced as in FIG. 1 may be projected or viewed simultaneously with a color transparency depicting an upholstery fabric to simulate or preview the appearance of a completed upholstered furniture piece;

FIG. 3 illustrates one way in which the fabric transparency may be modified for increased realism;

FIG. 4 illustrates a way whereby a piece of upholstery fabric may be draped over a frame having the general contour of a sofa for producing a fabric transparency of greater realism; and

FIG. 5 is a schematic representation of such a fabric transparency.

At the outset, it is to be expressly understood that while the present invention is herein specifically described, disclosed, illustrated and shown as applied to upholstered furniture, this invention may with equal facility and effectiveness be applied to the pre-viewing or simulation of many other types and kinds of articles, arrangements and furnishings, especially those wherein a flexible, patterned, or decorative material is shaped to a configuration, either to be viewed alone in that configuration or combined with another material having a pre-set or specified shape of configuration. In the case of upholstered furniture, for example, a patterned or decorative material, such as an upholstery fabric may be shaped to a specific configuration, which configuration may be defined by cutting or sewing and securing the fabric onto a padded frame with only the fabric being visible in the final article or piece of furniture. On the other hand, parts of the frame may themselves remain visible, such as arms and/or legs, and may be appropriately finished and contoured for a decorative appearance which may complement the fabric. A particular furniture design, as defined by the frame, padding and cutting, sewing and securing of the fabric may be executed with many different fabrics, and it is the simulation of such designs, executed with diverse fabrics, that is intended to be simulated and previewed by the present invention, both as a selling aid and as a design aid, whether to a layman-purchaser or an experienced designer. In addition to upholstered furniture however, many other furnishings present similar problems and are susceptible to solution and simulation in accordance with the present invention, such as, and by way of example only and without limitation, fabric or other materials shaped to a specific configuration to define a lampshade as a part of a lamp; ceramics, tiles, marble, stone, glass, leather, veneers, screens, paintings, and the like, incorporated as decorative panels, inlays, projections, additions and the like on furniture, walls, and the like; window treatments comprising draperies, especially for specially shaped windows or areas, shades, blinds, glazing combinations, grillworks, and the like. All of the above, in addition to any other embodiments or modifications which may be suggested by benefit of the teachings herein are to be specifically included as being included herein and covered by the subjoined claims.

With reference now to the drawing, there is shown and illustrated in FIG. 1 a pictorial representation of a series of photographic transparent material prepared in accordance with the present invention and designated by the reference characters A through E respectively.

Photograph A represents an original negative such as might be produced utilizing a conventional panchromatic or orthochromatic film material having a fairly wide density range, or in other words, a relatively low contrast or gamma which is the slope of the straight line portion of the characteristic curve of the material.

The article of furniture preferably should be photographed in a neutral or plain and light colored fabric and evenly lighted so as to minimize shadows and any texture that may be present in the upholstery material. The article of furniture is preferably photographed from a head-on or front elevation position at an angle approximately the usual viewing angle thereof so as to reduce as much as possible the presence of oblique lines and distortion. Certain articles of furniture are, during the process of manufacture, constructed by covering the springs and padding with a layer of plain fabric which is subsequently covered by the upholstery fabric. Where down is used as cushioning, for example, a downproof cover must be used under most fabrics. In such cases, that underlayer may provide a sufficient fabric for photographing in accordance with this invention. Hereinafter, while the article of furniture which is illustrated and discussed will be referred to merely as a couch, it is to be expressly understood that this is for purposes of example only and that the present invention is equally suitable for use with chairs, draperies, lamp shades, etc., or substantially any desired article of furniture or furnishings.

The camera and film that are utilized to provide the original negative A may be of substantially any conventional type, but, preferably, the negative A should be sufficiently large so as to enable easy retouching and handling thereof, and it has been found that it is

preferably at least of a 4×5 inch size for ease in handling and processing. For increased contrast the couch may be placed against a contrasting dark, reflection free background.

Further, to enable a ready combination of any piece of furniture with any upholstery fabric within the system, all photographing should be done under similar conditions; that is, at similar distances, similar orientations and through similar lenses.

From the original negative A there are prepared a series of film transparencies, at least one of which is then utilized to provide the outline and shadow detail, which when viewed or projected in overlapping or superimposed relationship with a color transparency of an upholstery fabric provides the appearance of that couch upholstered in that particular upholstery fabric. A whole library of outline-and-shadow transparencies of furniture pieces, and a library of color film transparencies of upholstery fabrics may, therefore, be combined selecting any furniture piece and any upholstery fabric and combining them optically to provide the appearance of or to simulate that particular furniture piece covered with particular upholstery fabric. In this way, the customer need not try to visualize what a small swatch of upholstery fabric will look like when a furniture piece is upholstered therewith but, rather, may be easily and readily provided with an accurate picture thereof. Further, even the smallest store or individual decorator may show customers a very large selection of furniture pieces and upholstery fabrics together. Moreover, since the film transparencies are relatively small and easily duplicated, a furniture store may maintain an inventory of several sets of such film transparency libraries which might be lent to customers for viewing at home at their leisure. Yet further, such as to prevent pilferage of transparencies, such libraries may comprise film strips, rather than individual transparencies or slides.

From the original negative A there may be prepared, as shown in FIG. 1, as by conventional contact printing techniques, a positive transparency B on a medium to high contrast film material. For example, the original negative A may be produced utilizing a fairly low contrast film, such as Plus-X and the positive transparency B, which will hereinafter be referred to as a shadow transparency, may be produced, for example, on a higher contrast material such as Tri-X or Super-XX. The shadow transparency B will, therefore, provide for fairly smooth shadow definition of the couch outline and any highlight or textures that might have been present in the original negative A resulting, for example, from the texture of the fabric material with which the sample couch was covered, lighting hot-spots, etc., could be substantially eliminated or reduced both by selection of an appropriately high contrast film material with its proportionately limited latitude and through control of the exposure and development process so that the positive shadow transparency B preferably is slightly underexposed and/or underdeveloped so as to be relatively thin, but with fairly wide shadow or shading areas blending smoothly into the main panels and cushions.

In order to achieve smooth transition in the shadow areas on the shading transparency B which, as heretofore pointed out, can be controlled by selecting the appropriate film type and appropriate processing, the shading transparency B will generally be thin or of only limited density. To emphasize the deep shadows between the cushions and the outlines of the couch, a second positive transparency, which will hereinafter be referred to as a line or shape transparency C, may also be prepared from the original negative A. Since the line or shape transparency C is utilized to deepen the shadows between the cushions and to clearly define the shape of the couch, it is desirable that the shadow lines of the line or shape transparency C by much more dense and narrow. Printing on a very high contrast film, such as a line type material as would be utilized in the photocopy industry for reproducing line drawings, may be used. Kodalith, which is utilized as a photocopy material and as an intermediate for producing offset plates, is well suited for producing the line or shape transparency C. By utilizing such a high contrast material, much of the gray shadows and shadings of the original negative A, as well as any lighting or texture information will be lost in printing from the original negative A on to a line material such as Kodalith to produce the line or shape transparency C. The density and width of the line image formed on the line or shape transparency C can, to some degree, be controlled by the length of exposure and development, as well as by the film selection.

If the line or shape transparency C and the shading transparency B are superimposed and viewed or projected together, then what will appear to be a line drawing of the couch will result, having very dense and narrow deep shadows and outlines with some shading and transitional shadowing being furnished by the shading transparency B. Of the utmost importance, however, is the realization that the shading density can, by the use of the separate transparencies B and C, be separately controlled. Therefore, the maximum density as well as the gradation of densities of the shadow and shading can be selected for maximum effect. Moreover, several medium density transparencies may be stacked or superposed for similar results without the use of very high density materials.

If the line or shape transparency C has been exposed and developed to full density, and if the background against which the couch was photographed was black and non-reflective, then the density of the region of the line or shape transparency C surrounding the image of the couch, particularly when added to the density of the region of the shading transparency B surrounding the couch, would generally be sufficient so as to block any light transmittal therethrough. For maximum realism to the composite image, this surrounding region should be of sufficient density so as to block all light transmission therethrough so that maximum sharpness and contrast will be given the simulated upholstered couch. In many cases, however, when the exposure and development of the shading transparency B and the line or shape transparency C are properly selected so as to provide the most realistically appearing couch composite, this surrounding region will not be sufficiently dense to block all light transmittance therethrough. In such instances, it is desirable to provide a mask corresponding to this region capable of blocking all light transmittance therethrough. Moreover, it is desirable to be able to produce this mask photographically so as

not to require the services of an artist, and to be able to control the density thereof completely independently of the density of the line or shape transparency C and the shading transparency B. In fact, in such instances, the outline mask may provide the shape of the couch and the line or shape transparency C need only define the shadow lines. Since, in reality, even the shadows of a real couch are not totally black, the most effective realism may be achieved if the combined shading transparency B and line or shape transparency C do not block all light from the shadow regions and a separate shadow mask may be utilized to block all light from the surrounding region.

Such a shadow mask E may be readily and easily produced photographically if a mask negative D is printed, as by contact printing, from the line or shape transparency C, as shown in FIG. 1. Such mask negative preferably may be produced on an exceedingly high contrast, high density film such as Kodalith so that the couch image will be as totally opaque as possible while the surrounding region is as totally transparent as the base material permits.

The mask negative D, as printed from the line or shape transparency C, will, of course, have transparent portions within the couch outline corresponding to the shadow lines on the line or shape transparency C. These shadow lines may be readily and easily opaqued using conventional retouching fluids by relatively unskilled personnel since all that is necessary is that the retouching fluid at least cover the shadow areas. Since fine control of the retouching fluid is not necessary, skilled artistry is not required. In fact, the degree of skill required is about the same as is required to fill in a child's coloring book since neither the area to be covered nor the color, tone, thickness of coating, or the like, is critical so long as at least the shadow lines are covered sufficiently so as to block the transmittal of light therethrough.

Finally, the mask negative D may be utilized to print, as by contact printing, the shadow mask E which, it will be recognized, if printed on a high contrast material such as Kodalith to maximum density will comprise a totally opaque region surrounding the couch and a transparent window corresponding to the outline of the couch. Then, if the shading transparency B, the line or shape transparency C, and the shadow mask E are superimposed one on top of the other, a composite transparency embodying all of the outline and shade detail of the couch will be produced, lacking only the color and design of the upholstery material to be applied. The composite transparency F may be utilized as a projection transparency, as indicated in FIG. 2, or the composite transparency F may be reprinted by conventional photographic techniques to provide a single transparency embodying all the detail of the composite transparency F. A greater or lesser number of individual transparencies may also be utilized to control and build up the desired shadow densities. Negatives may similarly be stacked or superposed and a single transparency produced therefrom.

Referring more particularly now to FIG. 2, if a color transparency G comprising a photograph of a fabric with which the couch might be upholstered is superimposed with the composite transparency F, and the superimposed stack of transparencies illuminated, as by means of a projector lamp **10**, and projected through a lens **12** on to a screen **14**, there will be presented on the screen **14** a composite picture of the couch as depicted by the composite transparency F upholstered with the fabric depicted by the color or fabric transparency G. The screen **14** may comprise a rear projection screen or a front projection screen or, in fact, the superimposed transparencies F and G may be viewed directly in a hand viewer or the like. Moreover, the projection lamp **10** and lens **12** may comprise a projector **16** having a plurality of magazines, one magazine being adapted to selectively feed one composite transparency F from a group of composite transparencies carried therein, into the optical line and a second magazine being adapted to selectively position one fabric transparency G of whole group thereof carried in that magazine into the optical line, as indicated by the dashed arrows, in FIG. 2, so that by proper manipulation of the two magazines any furniture composite transparency and any fabric transparency of the two magazine libraries may be viewed together. The screen **14**, particularly of the rear transmission type, may also comprise an integral part of such an apparatus, as indicated by the bracket. The magazines or libraries, as pointed out, may comprise film strips.

It is to be understood that preferably each of the composite transparencies F and fabric transparencies G are photographed to the same scale, that is, at the same distances so that the size relationship of the fabric patterns will be constant and will correspond to the size relationships of the articles of furniture. For example, each of the transparencies may be photographed on similar sized film, through similar lens systems, and from similar distances. Utilizing different lens systems and distances, proper correlations may permit the resulting transparencies to be similar.

The fabric transparency G may be produced by photographing a flat piece of the desired fabric. It will be understood that when such a flat fabric transparency is superimposed upon the composite transparency F, some misalignment and inaccuracies will result. Most furniture, for example, is not flat but, and utilizing the couch illustrated as an example, may comprise a back section, seat sections and a front section, all at differing angles and spacial positions. When the flat fabric transparency G is superimposed thereon, that portion of the transparency which overlies the seat cushions, for example, will obviously be misaligned. However, the overall effect and appearance of the color and pattern of a fabric on a sofa belies such inaccuracies to the eye. Moreover, on certain styles of couches the fabric pattern might not, in general, be exactly uniform throughout the width of the furniture due to the presence of cushions or false cushions on the back, padding on the arms, and so forth. However, again, the effect and appearance of color and pattern of fabric on the sofa will be readily discernible and much more real to the customer than merely looking at a small swatch of that fabric. In addition, for some increased realism without substantially increasing the cost or complexity, the fabric may be photographed in a position approximating a seating orientation but which would yet be usable for substantially any upholstered furniture, whether a chair, a sofa, or the like.

It will be appreciated that while the seat back and front of a sofa or chair are generally vertical, the seat cushions thereof extend in a generally horizontal plane. When a sofa or chair is viewed from a viewing position corresponding generally to that of a person standing, as illustrated in the drawing, and which is the preferred position for photographing in accordance with the present invention. When so positioned the generally horizontal surface of the seat cushions will appear substantially foreshortened. Hence, any break in the fabric pattern, generally along the line of the seat cushions, will increase the realism of the composite representation.

Accordingly, referring to FIG. **3**, if a fabric panel **16** is fabricated of an upper portion **18** and a lower portion **20** laterally shifted relative to one another along a shift or mismatch line **22**, and a color fabric transparency produced therefrom with the shift line **22** positioned so as to coincide with the generally horizontal seat portion of the couch, then when the superimposed transparencies are projected on a screen, the pattern across the seat backs and the couch front will differ sufficiently as to increase the realism of the composite picture. Of course, rather than the fabric being physically cut and translated laterally, the identical effect can be produced by physically cutting the transparency, by blocking half of the transparency and making one exposure, shifting the camera laterally, and then blocking or masking the other half of the film and re-exposing; or by the use of mirrors, prisms, or other optical devices so as to produce such a shift line.

For yet further realism, a frame **24** having the general contours of a sofa or couch, but without any arms or other ornamentation, may be provided as illustrated in FIG. **4** and a sheet of fabric **16'** draped thereover so as to have a portion **18'** corresponding to the seat back, **20'** corresponding to the seat front, and **22'** corresponding to the seat cushions themselves, in the general orientation of a conventional couch, sofa or chair, and then photographing the sheet of fabric from a position corresponding to the position that the couch was photographed to produce negative A so as to produce a color fabric transparency G' as shown in FIG. **5**, having an upper portion **26**, an intermediate portion **28** and a lower portion **30**, corresponding to the seat back, foreshortened seat cushion and couch front, respectively, which, upon superimposition with the composite transparency F, will provide a yet further more realistic picture. Since the shadow mask E will delete or mask all portions of the fabric transparency lying outside the couch region, so long as the fabric transparency is of sufficient width to cover a full couch or sofa, any shorter couch, sofa or chair will appear to be appropriately upholstered. The slight errors in patterning introduced by arms and other ornamental portions are generally not sufficient to detract from the overall realistic appearance. Moreover, wooden parts or the like will generally be sufficiently dark in the composite transparency so as to appear merely as shadows in the complete picture and be recognizable as wooden pieces or parts with the pattern of the fabric being toned down sufficiently as to not distract therefrom.

While not illustrated in the drawing, a plurality of separate upholstered furniture pieces may be projected on the same screen **14** to enable full groups of furniture to be viewed and simulated as in a room setting.

Yet further, a background, such as wallpaper, draperies, or just plain wall color, may be projected onto the screen **14** externally of the couch picture as by a separate projection system utilizing the same light source **1** or a separate light source, and either a lens separate from the lens **12** or may be superimposed through the same lens **12**, as by means of half silvered mirror means, prisms, and the like. To provide such background the negative mask D may be utilized in conjunction with a color transparency of the wallpaper or other desired surrounding decor, so that the color and pattern of the fabric transparency and the surrounding transparency, will not interfere with one another.

The method employed in the present invention, therefore, comprises a unique combination of photographic techniques which permit a viewer to look at a full size slide projection of a chosen couch, chair or other piece of furniture, or the like, upholstered in a chosen fabric. By combining essentially line transparencies of furniture with color transparencies of fabric, composite pictures of any desired piece of furniture, upholstered with any desired fabric in the film library, may be readily and easily produced. Accordingly, a person can view in a few minutes and at a very small cost and very conveniently and without requiring any imagination or interpretation on his part, what various pieces of furniture will look like upholstered in each of a series of chosen fabrics and thereby increasing the probability of a customer finding a piece of furniture that is appealing, since a customer is much more disposed to appreciate a piece of furniture in an appealing fabric than in just any fabric; increasing the probability of a customer finding a fabric that is appealing on a chosen piece of furniture, since he is no longer forced to chose from just a swatch of fabric separate from the furniture but now can choose from a swatch and a life-size image of the furniture upholstered in the chosen fabric; increasing the probability of a customer finding upholstered furniture that is appealing, since this is what the customer is ultimately interested in buying, all while yet reducing the amount of inventory required to be carried by a seller and while enabling a furniture store, individual decorator, or the like, to have several identical libraries of available furniture and fabrics at a very nominal cost. In fact, when several desired furniture-fabric combinations are selected provisionally by the customer, they may be easily printed using, for example, polaroid type color film, camera, or any other photographic process, to provide inexpensively a small group of photographs which the customer may take home and study at his leisure.

Yet further, the entire system may be made sufficiently compact as to be readily portable, and, therefore, readily brought to the customer's home where he could view the proposed furniture in the environment wherein he intends to place such furniture. Further, similar transparencies may be produced as artists' renderings, or such transparencies may be retouched as desired.

In preparing the various photographs of the present invention, in general a normal exposure and a normal length lens, together with flat lighting, is utilized. The

distance selected for producing the various photographs is preferably such that all furniture and fabrics to be incorporated into the system can be photographed at that distance, and, therefore, may be readily interchanged. In other words, the distance should be such that the largest possible piece of furniture to be photographed will fill the photograph while leaving a respectable border on all sides. This distance should not be changed for smaller couches. Thus, all couches and all other furniture will, when viewed one after the other, appear in their proper perspective. The furniture preferably should be centered in the photograph and preferably, for realism, should be photographed as set forth above, at an angle corresponding to the normal viewing angle thereof. While wood, as set forth above, will generally appear realistically utilizing the aforesaid methods and systems, occasionally light wood or cane may need to be retouched to a darker color. This may be done by making the wood or cane areas first appear clear in the positive transparency by, in turn, opaquing the wood dark in the second negative of the positive transparency. The wood area will thus appear clear in the succeeding positive and an artist can retouch to draw in the wood or cane in the positive transparency.

In the foregoing, it has been fully set forth how all of the pertinent and relative information relating to the form, shape and configuration of a furnishing item may be separated and divorced from the remainder of the composite or finished furnishing which is supplied by the fabric, tile, ceramic or other patterned or decorative material and presented in a single transparency which may, in fact, consist of a plurality of superposed transparencies adapted to be handled as a single unit, or a single transparency produced from such superimposed transparencies, such as the composite transparency F. For clarity, such transparency will be referred to in the subjoined claims as a form transparency, it being understood that such nomenclature is intended to incorporate and define a transparency as set forth above. In addition, the second transparency, which may be derived from the upholstery fabric, ceramic pattern, or the like, will be referred to in the subjoined claims as a design transparency and, similarly, it is to be understood that such nomenclature is intended to incorporate and define a transparency as set forth above. In both instances, it is not intended that the invention be limited to the precise definitions of these terminologies as they may be defined in one or another standard dictionary but, rather, that they be given the broad definitions as they are used in the foregoing description of the invention.

Furthermore, while the invention has been described, disclosed, illustrated and shown in terms of an embodiment or modification, which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiment modification herein described, disclosed, illustrated or shown, such other embodiments or modifications as may be suggested as having the benefit of the teachings herein being tentatively reserved, especially if they fall in the scope and breadth of the claims here appended.

What is claimed is:

1. Method of simulating the appearance of an article of upholstered furniture comprising, at least the steps of, preparing a form transparency of the outline and shadow aspects of such article of furniture having an opaque region completely surrounding the outline of such article, a substantially transparent portion defining such article and lines of varying density defining the shadows thereof, preparing a design representation to the same scale of a patterned material which could be incorporated in such article of furniture having a color image of such material extending in all directions at least a distance greater than the corresponding dimensions of such substantially transparent region of the form transparency, superimposing such form transparency and design representation one over the other so that the opaque portions of such form transparency masks a portion of such design representation and the design representation completely fills the substantially transparent portion of the form transparency, passing light therethrough to provide a composite image simulating the patterned material incorporated into the article of furniture.

2. Method defined in claim 1 further comprising passing such light through an optical system to project the resulting composite image on a screen for viewing.

3. Method defined in claim 1 further comprising printing a photographic reproduction of such composite image for subsequent consideration.

4. Method defined in claim 1 further comprising, at least the additional steps of, preparing a multiplicity of additional form transparencies to define a library of different articles of furniture, preparing an additional multiplicity of design representations to define a library of different patterned materials corresponding to available different upholstery fabrics, and selecting one transparency from the form transparency library and one transparency from the library of design representations for superimposing one above the other to provide the desired simulation.

5. Method defined in claim 1 wherein said step of preparing a form transparency comprises, at least the steps of, photographically printing a plurality of transparencies of differing densities and contrasts and superimposing such plurality of transparencies one over the other to define a composite transparency so that the densities of different portions thereof may be separately controlled.

6. Method defined in claim 5 wherein said step of printing a plurality of transparencies comprises photographically printing a line or shape transparency on a higher contrast film material and a shading or shadow transparency on a lower contrast film material.

7. Method of decor simulation comprising at least the steps of photographically printing a line or shape transparency of the outline aspects of a furniture item on a high contrast film material, photographically printing a shading or shadow transparency of the shadow aspects of such furnishing item on a lower contrast film material, photographically printing a negative shadow mask on high contrast, line type photographic material from the line or shape transparency, retouching such negative shadow mask with an opaque retouching medium to eliminate all shadow detail therefrom, printing a positive shadow mask transparency from said negative shadow mask superimposing such line or shape transparency with said shading or shadow transparency and said positive shadow mask transparency to define a composite transparency hav-

ing separately controlled densities in different portions thereof, preparing a form transparency from said composite transparency, photographically preparing a design transparency to the same scale of a patterned material which could be incorporated into such furnishing item, superimposing such form and design transparencies one over the other and passing light through the superimposed form and design transparencies to provide a composite image simulating the patterned material incorporated into the furnishing item.

8. Method defined in claim 7 further comprising projecting the composite image formed by such form and design transparencies on a screen, and projecting a second image on the same screen in coincidence therewith defined by a background film transparency and such negative shadow mask so as to provide a patterned surround to the composite furnishing item simulation.

9. Method of decor simulation comprising, at least the steps of, preparing a form transparency of the outline and shadow aspects of an article of furniture, preparing a design representation to the same scale of a patterned upholstery material which could be incorporated in such furnishing item comprising, in turn, photographing a sheet of upholstery fabric with color film material and laterally shifting a portion of the fabric film image so as to provide a mismatch or shift in the patterns thereof and superimposing the form transparency and design representation one over the other with the patterned mismatch line positioned generally across the seating portion of the article of furniture depicted by the form transparency, and passing light through the superimposed transparencies to provide a high realism composite image simulating the patterned material incorporated into the article of furniture.

10. Method defined in claim 9 wherein said step of laterally shifting comprises, in turn, draping said flat piece of fabric material over a frame having the general contours of a bench-like piece of furniture and photographing such draped fabric so as to produce a color film transparency having a generally central portion wherein the fabric pattern appears foreshortened and positioning such foreshortened part of the fabric panel generally across the seating portion of the article of furniture to provide increased realism to the simulation.

11. Apparatus for producing a simulation of a furnishing item such as a piece of furniture upholstered in a desired fabric comprising, in combination, a form transparency providing only shape and shadow detail of such furnishing item and substantially opaque outside the shape of the item, and a design representation superimposed therewith and provided with the image of the desired patterned material to be associated therewith extending in all directions a distance greater than the corresponding dimension of the form transparency and means for passing light therethrough to provide a composite image simulating the depicted furnishing item incorporating the patterned material.

12. Apparatus defined in claim 11 wherein said form transparency comprises a plurality of superimposed photographs shading and line or shape transparencies having different optical densities and contrast ranges so the densities of the details thereof may be independently controlled.

13. Apparatus defined in claim 12 wherein the opaque portion of said form transparency is defined by a shadow mask of very high contrast film material superimposed with shading and line or shape transparencies.

14. Apparatus defined in claim 11 further comprising a magazine or library of form transparencies, a magazine or library of design representations and means for selectively positioning any desired one of the form transparencies in alignment with any desired one of the design representations.

15. Apparatus defined in claim 11 wherein said design transparency comprises a color film picture of a flat sheet of fabric.

16. Apparatus defined in claim 15 wherein said design representation comprises a portion shifted relative to the remaining portion to define a mismatch line adapted to be aligned with the seating portion of the furniture depicted by the form transparency as an aid in increasing the realism of the simulation.

17. Apparatus for producing a simulation of a furnishing item such as a piece of furniture upholstered in a desired fabric comprising, in combination, a form transparency providing only shape and shadow detail of such furnishing item, a design transparency superimposed therewith and provided with the image of the desired patterned material to be associated therewith such as an upholstery fabric and means for passing light therethrough to provide a composite image simulating the depicted furnishing item incorporating the patterned material wherein said design transparency comprises a color film picture of a sheet of fabric draped over a generally bench-like frame so as to define a generally medial portion whereat the fabric pattern is foreshortened, adapted to be disposed in general alignment with the seating portion of the furniture depicted by the form transparency to increase the realism of the resultant simulation.

18. Apparatus defined in claim 11 wherein said form transparency comprises a single photographic transparency printed from a plurality of superimposed photographic transparencies having differing optical densities and contrast ranges so that the densities of the details thereof, and particularly the shadows and shading, may be independently controlled.

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