

- [54] **METHOD FOR CONVERTING BLACK-AND-WHITE FILMS TO COLOR FILMS**
- [72] Inventors: **Fred Ladd**, Great Neck, N.Y.; **Jung Hoon Song**, Seoul, South Korea
- [73] Assignee: **Color Systems, Inc.**, New York, N.Y.
- [22] Filed: **Sept. 20, 1971**
- [21] Appl. No.: **182,044**
- [52] U.S. Cl. ....**352/38, 352/50, 352/51, 352/87**
- [51] Int. Cl. ....**G03b 19/18, G03b 21/32**
- [58] Field of Search.....**352/38, 50, 51, 52, 87**

*Primary Examiner*—Samuel S. Matthews  
*Assistant Examiner*—Russell E. Adams, Jr.  
*Attorney*—George Gottlieb et al.

[57] **ABSTRACT**

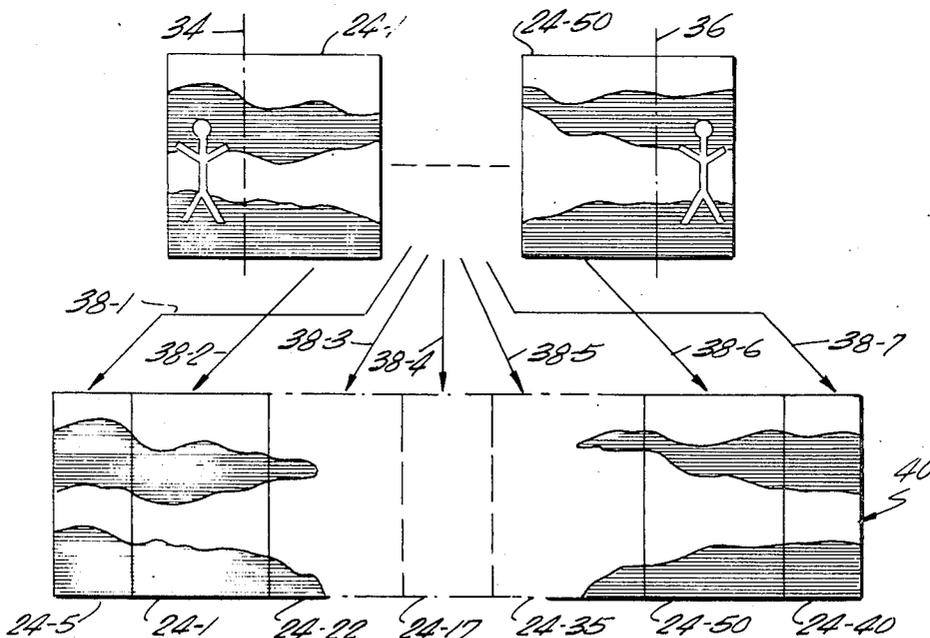
A method for converting black-and-white animated cartoons to color cartoons. An enlarged print is made for each frame of the cartoon, a celluloid sheet is placed over each print, the outlines of the characters in the frame are drawn on the sheet, and the characters are then hand colored. Several prints corresponding to each scene are then cut in order to derive unobstructed background views. The background views are pieced together to form a photo-montage of the background for the scene. The background is then hand colored. The final color film is made by placing successive celluloid sheets in successive positions on a common background and exposing the final film frame-by-frame. A similar technique is disclosed for converting live-action films.

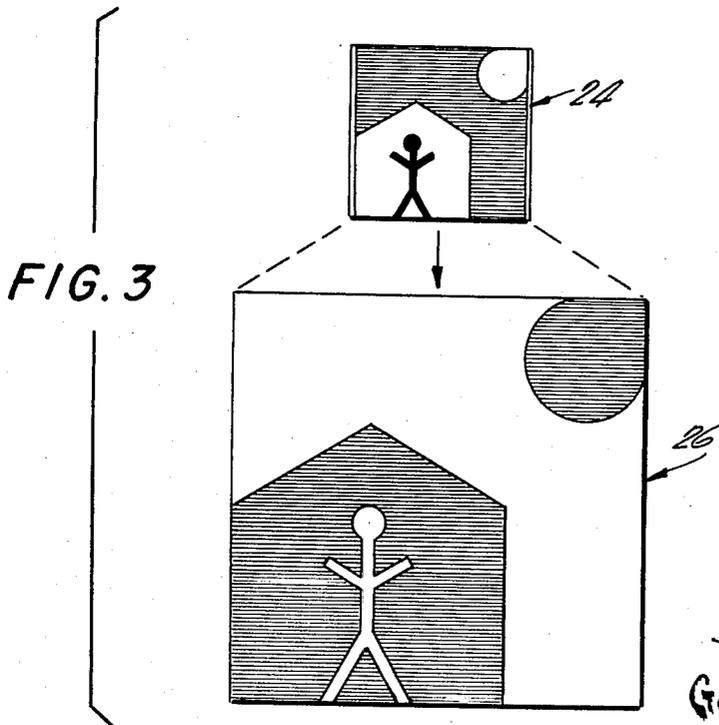
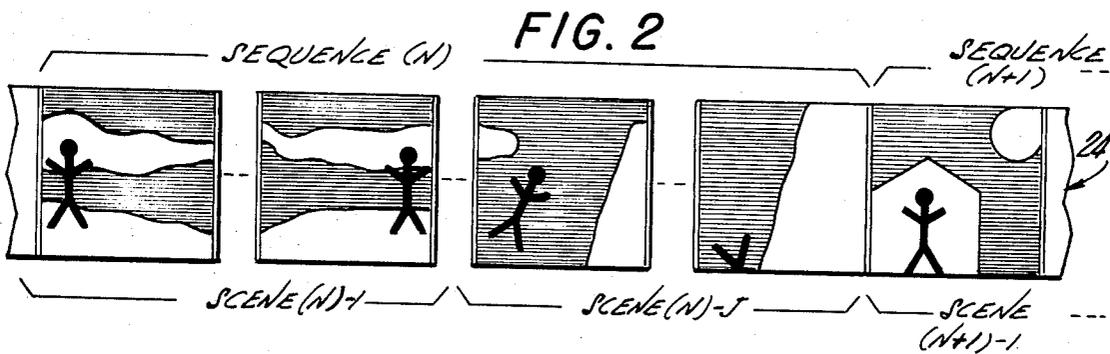
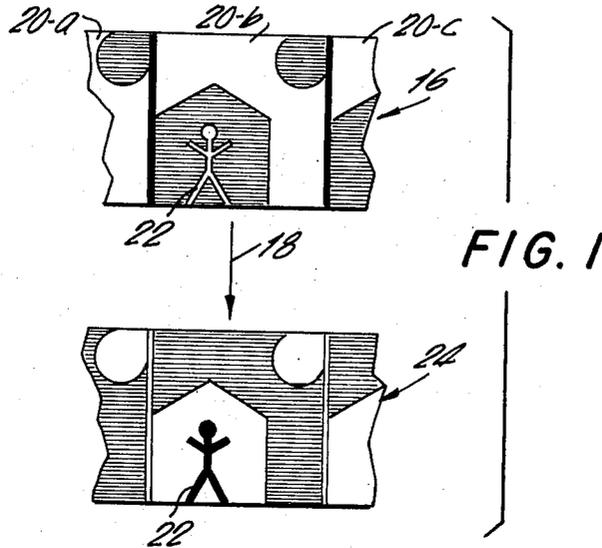
[56] **References Cited**

**UNITED STATES PATENTS**

3,619,051	11/1971	Wright .....	352/50
3,301,626	1/1967	Maurer.....	352/38
1,416,154	5/1922	Ahbe.....	352/51

**16 Claims, 9 Drawing Figures**





INVENTORS  
FRED LADD  
JUNG HOON SONG  
Gottlieb Rackman & Reisman  
ATTORNEYS

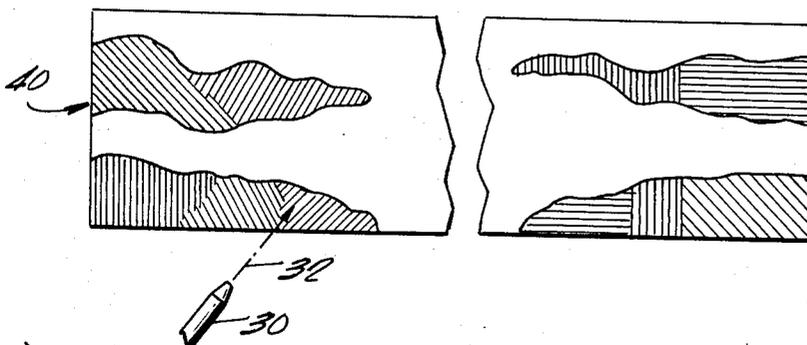
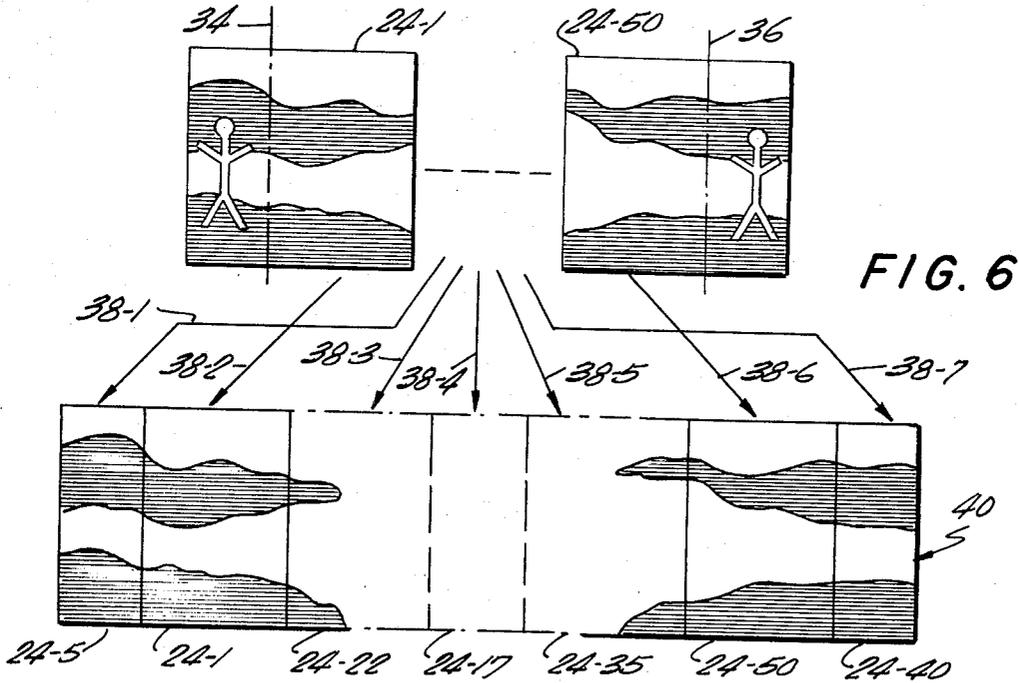
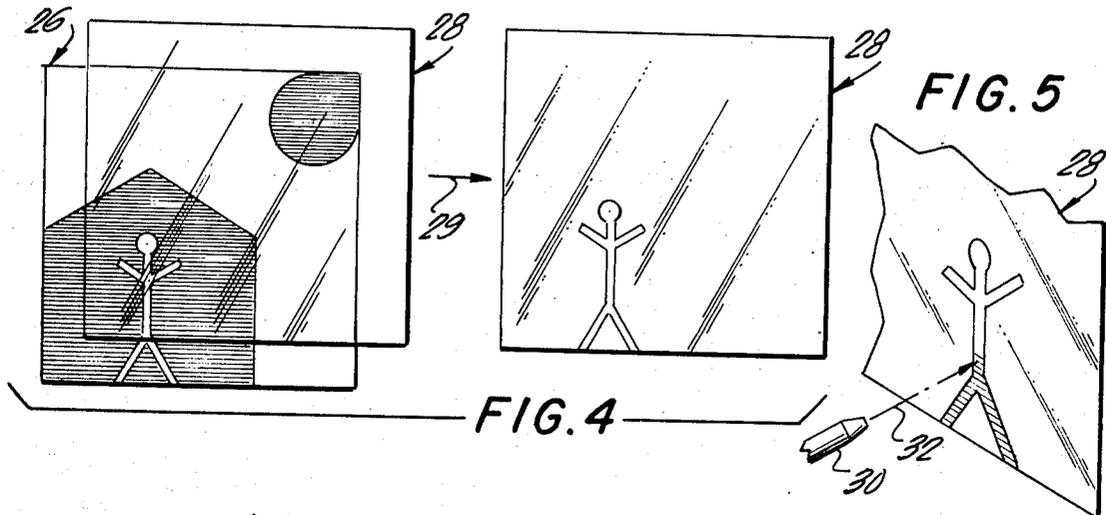
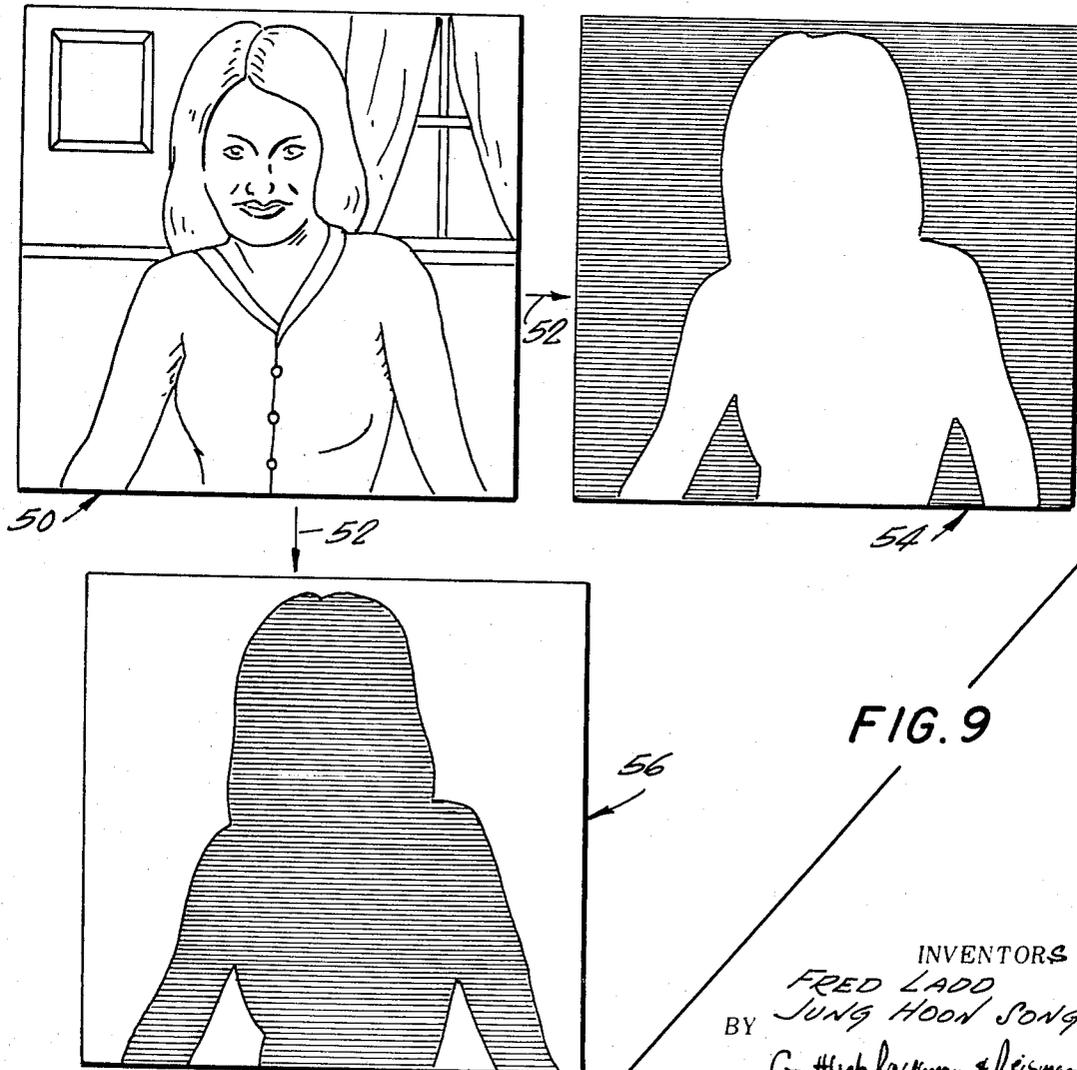
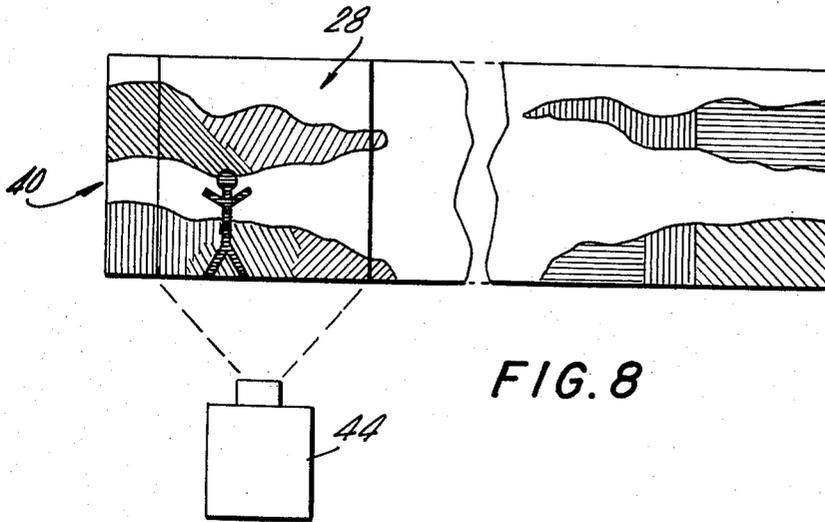


FIG. 7

INVENTORS  
 FRED LADD  
 JUNG HOON SONG  
 Gottlieb Raessman & Reisman  
 ATTORNEYS



INVENTORS  
FRED LADD  
JUNG HOON SONG  
BY  
Cottlieb Lickman & Reisman  
ATTORNEYS

## METHOD FOR CONVERTING BLACK-AND-WHITE FILMS TO COLOR FILMS

This invention relates to methods for converting black-and-white films into color films, and more particularly to methods for converting both black-and-white animated cartoons and live-action films.

At the present time there are film libraries of many thousands of black-and-white animated cartoons and live-action films. (The term "live-action" films refers to ordinary movies.) Most of these films were made before color-film technology advanced to its present stage of development. Many of these films, especially animated cartoons, are almost worthless from a commercial standpoint because of the lack of color. Were it possible to convert these films to color films, at a cost less than that required to make a color film in the first instance, old black-and-white film libraries could become worth very large sums of money. As only a single example, thousands of "fresh" color cartoons would become available for television broadcast purposes.

It is a general object of the invention to provide a method for converting black-and-white films (both animated cartoons and live-action movies) to color films at a cost substantially less than that required to make color films in the first instance.

The invention will be described in detail below in connection with the conversion of animated cartoons. Thereafter, the conversion of live-action films will be described with reference to the cartoon method but with the changes necessary for the live-action situation. Before proceeding with a brief description of the method of the invention, it will be helpful to review the conventional method for making color cartoons in the first instance.

Each frame of a cartoon generally consists of both a background scene and characters in the foreground. For example, the background might be a landscape scene or some other stationary objects. Not only do the positions of the characters change from frame to frame (thus requiring the drawing and coloring of characters for every frame in the film), but as a general proposition the backgrounds also vary from frame to frame. But the backgrounds vary to a much lesser extent. For example, consider a cartoon character running in front of a house in the background. If the background is the same in all frames, the only difference from frame to frame would be in the character movement (arms, mouth, etc.) and the position of the character relative to the background. The simplest way to make a cartoon sequence of this type is to draw (in color) a single background scene, for example, a landscape in which a house is prominently featured. Suppose that the scene requires 50 different frames. For each frame, a piece of clear celluloid is taken and the outlines of the character or characters to be depicted in the frame are first drawn. Then color is applied within the outlines. The scene is "shot" by placing the celluloid sheets in succession on top of the background, and exposing a single frame of the film for each celluloid sheet placed on the background. The background shows through the clear celluloid, except in those portions containing the character. By placing the successive celluloid sheets on the same background, successive frames of the final film depict the character moving across a "fixed"

background. While characters must be drawn and colored for each frame, only a single background must be prepared.

Thus far, it has been assumed that the background for each of the frames in a scene is the same; the physical dimensions of the background correspond to the frame size. However, in most cases the background is not fixed for successive frames. Consider, for example, a character running in front of a house from left to right. If the background is fixed, the first frame in the sequence would have the character in front of the left side of the house on the left side of the frame, the last frame of the sequence would have the character in front of the right side of the house on the right side of the frame, and the intermediate frames would have the character at intermediate positions in front of the house. But suppose it is desired to position the character in the center region of each frame, thereby centering the character on the screen during projection. This can be accomplished by causing the house to "move" from frame-to-frame. In the first frame, the background would show the left side of the house and in the last frame the background would show the right side of the house, with the character being in the center of every frame. What is done in practice is to draw a background scene whose width is much greater than the width corresponding to a single frame. In other words, the background scene depicts much more than is required for any one frame. The celluloid sheets for the frames would be made with the cartoon character being placed in the central part of each sheet. The first sheet is then placed on top of the leftmost portion of the wide background and the first frame of the scene is shot. The first celluloid sheet is then removed, and the second is placed slightly to the right of the position of the first. The second frame is then shot. The third celluloid sheet is then placed on the same background but slightly to the right of the position of the second celluloid sheet. This process is continued and it is apparent that although the same background is used for each frame, a different portion of the background is overlaid by each celluloid sheet.

In practice, in the case of a cartoon character running across a field, only a single background might be drawn whose physical length might be several feet. Hundreds of frames might be shot utilizing an individual celluloid sheet drawn for each frame but with the same background. It is much less time consuming to draw a single large background and to use different parts of it for different frames than it is to completely draw a background for each frame.

Black-and-white cartoons have been made in the same way, except that the background scenes, as well as the individual celluloid sheets, have been colored only in black and white. But once a black-and-white cartoon film is in existence, it would appear that the only way to convert it to a color film would be to completely color each individual frame, the reason for this being that in almost all cases the backgrounds and the individual celluloid sheets are no longer available for the application of color to them.

In accordance with the principles of the invention, the black-and-white film to be converted is first "torn apart" in a sequence of steps which in some respects is the converse of the sequence employed for making a

cartoon film in the first place. Each frame is enlarged and a black-and-white print is made of it. A piece of celluloid is then placed over each print and the outline of the cartoon characters in the frame are drawn on the celluloid. Thereafter, each celluloid sheet is colored to produce a celluloid sheet containing color characters comparable to those hand drawn in the prior art. But it would still appear that the backgrounds for all frames would have to be colored on a frame-by-frame basis.

However, the prior art-type, extra-wide backgrounds can be constructed, thereby drastically reducing the overall cost of the conversion process, by what might be considered a "scissors-and paste" technique. The original black-and-white film is analyzed to identify frame sequences which comprise individual "scenes." Consider the case of a scene in which one or more characters run across a landscape background and for which the landscape background seen in each frame is different, the individual frames having originally been shot by placing successive celluloid sheets in successive positions on top of an extra-wide background. What is now done is to construct a montage from many different frames in the scene. Although part of the background in each frame is obscured by characters, almost every frame contains an unobstructed part of the overall background scene. Parts of unobstructed backgrounds from enough of the large prints comprising each scene are cut so that when they are pieced together (for example, by pasting them on a cardboard backing) what is obtained is a complete, unobscured, extra-wide background scene. In this cutting-and-pasting process, the frame prints which are used are generally those containing relatively large areas of unobscured background. This reduces the total number of cut pieces which must be used to form the composite picture. In almost all cases, a complete, composite background can be made from several of the frames comprising each scene. Once the black-and-white background montage is pieced together, it is colored and then used together with the individual color celluloid sheets to shoot the final film in a conventional manner.

This stripping apart of the original black-and-white film, followed by the making of the background montages, the coloring steps and the final photography, enable a color film to be made at a cost which is less than that of making a color film from "scratch" and which is also less than that of completely and individually hand coloring each frame of the black-and-white film. The celluloid sheets with color cartoon characters are relatively simple to derive; while in the making of an original cartoon the characters must be created for each frame, all that is required in the conversion process is to trace their outlines on a frame-by-frame basis and to then color them. And even with respect to the background required for each scene, it is not necessary to draw the background without benefit of any prior work. A black-and-white background can be constructed by making a montage, and then all that is required is to hand color the composite picture.

It is a feature of the invention to draw on transparent sheets color cartoon characters corresponding to the characters in respective frames of a black-and-white film.

It is another feature of the invention to construct a background montage from background sections taken from frames in a scene of a black-and-white film, and to color the background for subsequent use with the individual transparent sheets in shooting a color film.

Further objects, features and advantages of the invention, including the additional steps preferred for the conversion of black-and-white live-action films to color films, will become apparent upon consideration of the following detailed description in conjunction with the drawing, in which:

FIGS. 1-8 depict some of the successive steps employed to convert an animated cartoon; and

FIG. 9 depicts an additional step which is advantageous in the conversion of live-action films.

FIG. 1 depicts a single frame 20-b of a black-and-white cartoon film 16, together with partial views of the adjacent frames 20-a and 20-c. The drawing is symbolic only and is intended to show a cartoon character 22 in front of a background scene. The first step in the conversion method is the forming of a "negative" film strip 24, the step being shown symbolically by arrow 18. The negative is made in accordance with standard techniques.

FIG. 2 depicts several frames in the overall film (negative), and is designed to show the manner in which the film may be first analyzed before any further steps are taken in the conversion process. The analysis of the film reveals its exact length in footage and frames, the number of sequences it contains, and the number of scenes in each sequence. Each "sequence" is a set of successive frames involving the same characters. One full sequence (N) is shown in FIG. 2, together with part of the next sequence (N+1). Each sequence comprises one or more "scenes," each scene being a set of successive frames depicting the same background or different parts of the same overall background. In FIG. 2, the first and last frames of the first scene in sequence (N) are shown, together with the first and last frames of the last scene J of the same sequence. Analyzing the film in this manner simplifies subsequent processing in that it provides an indication of the number of different backgrounds required, the number of different characters, the total time that can be expected to be expended in the processing, etc.

Next, from the negative film a standard black-and-white, semi-gloss, photo-enlarged print is made of each frame. FIG. 3 shows a typical frame 24 of the negative and the resulting enlarged print. Since the print is a "positive" picture, each print corresponds exactly to a respective frame in the original film. For example, print 26 of FIG. 3 is a replica of frame 20-b of FIG. 1. Each print is numbered to correspond to its respective frame position in the negative film. Subsequent processing is performed by making use of the enlarged prints.

In the next step, the foreground motions of the characters are separated from or, in effect, "matted off" the backgrounds. This is accomplished by placing a transparent sheet of material, such as celluloid 28 in FIG. 4, over each print 26 and tracing in ink all key motions on the transparent sheet. The single character shown in print 26 of FIG. 4, after the tracing and removal of the celluloid sheet from on top of the print, as symbolized by arrow 29, results in a relatively simple tracing. It should be noted that in this step more than

just "characters" may be traced on the celluloid sheets. For example, consider a ball which is thrown by a cartoon character. The ball's position relative to the background changes from frame-to-frame. This type of motion is comparable to that of a character the ball cannot be made part of the background since its position is not fixed relative to the background. For this reason, the ball, along with the characters, would be traced on the successive celluloid sheets placed on top of all prints for the particular scene. (Hereinafter, the term "character" includes any object whose position relative to a background changes from frame to frame within a scene.)

The next step is to color the characters whose outlines appear on the clear overlays 28. As part of this process, a color scheme must be planned for the film on a scene-and-sequence basis. Artists select colors for the costumes of the characters and their skin tones to harmonize with the colors selected for the backgrounds. As aids, colored papers, and tinted transparent films may be used for checking various combinations. The colors selected for the characters and backgrounds in each scene are generally written down for reference purposes before the actual coloring begins.

The coloring of the characters is a hand process in which the specified colors are brushed on the reverse side of the overlay sheets within the character outlines. In FIG. 5, an air brush 30 is shown spraying paint 32 on the reverse side of overlay 28. Preferably, opaque vinyl colors are used. The reverse side of each clear sheet is painted so as not to obscure the black outline of each character; in a cartoon, black outlines are desirable. As a practical matter, skin tones are generally applied first, followed by jacket colors, trousers and shoes for most cartoon characters. At the end of this step, there is a celluloid sheet for each frame of the film which contains an exact replica of the cartoon characters in the frame in full, opaque color.

The enlarged prints (FIG. 3) are also used for constructing the backgrounds. As described above, key stills are selected from each scene, cut and pieced together to produce a background which is suitable for use with the overlays in shooting the final picture. On a long pan shot over a city or field, as many as eight or nine different stills may be selected and assembled into a composite photo-montage showing only the background. FIG. 6 shows the manner in which a composite background may be made from seven different stills (only two of which are shown in the drawing). It is assumed that the scene contains 50 frames, 24-1 through 24-50. It is further assumed that the character in the scene appears at the left of frame 24-1, at the right of frame 24-50, and at intermediate positions in the intermediate frames.

If print 24-1 is cut along the dashed line indicated at 34, it is apparent that a section of unobstructed background is made available. As shown by the arrow 38-2, this section is placed in the photo-montage in the position shown. Print 24-1 cannot be used to obtain the leftmost part of the overall background since that part of the background is obscured by the character in print 24-1. However, in the fifth frame 24-5 (not shown) the character is assumed to have moved to the right such that it has crossed over the imaginary line 34. If print 24-5 is cut along the same line 34, the leftmost section

cut from the print can be placed in the overall photo-montage 40 in a position indicated by arrow 38-1. In this manner, the right part of the print 24-1 and the left part of print 24-5, with the left part of print 24-5 being placed to the left of the right part of print 24-1, together provide an unobstructed view of the left-most part of the overall background.

In a similar manner, by cutting print 24-50 along the line 36 and using the leftmost part of the print as shown by arrow 38-6, another section of the photo-montage is obtained. As for the rightmost part of the overall photo-montage, it can be obtained by using the rightmost part of another print 24-40 (not shown) as indicated by arrow 38-7. The other arrows in FIG. 6 (38-3, 38-4 and 38-5) illustrate the manner in which cut sections from three other frames (not shown), 24-17, 24-22 and 24-35, can be used to complete the photo-montage. The individual cut sections are most conveniently pasted on a cardboard backing.

As shown in FIG. 7, the photo-montage for each scene is then painted in different colors (shown in the drawing by different cross-hatching), for example, by again using an air brush 30. It is the front of the photo-montage (which is not transparent) which is painted as shown in FIG. 7. Preferably, opaque poster colors are used. In some cases it has been found that it is not feasible to paint the mock-up of FIG. 6 directly because the cuts may be visible in the final film as a result of the light which is reflected from them in the final photographic sequence. For this reason, in some cases it may be necessary to photograph the photo-montage, make a print of it, and paint the print (which has no line cuts). Also, while the general rule is that sections which are cut from the prints should contain no characters on them so that an unobstructed background can be constructed, in actual practice it has been found that some characters or parts of characters can be tolerated in the photo-montage. They are eliminated simply by painting over them. Some parts of characters can be tolerated in the composite picture as long as it is possible to determine what the true background obscured by the characters should be by looking at the background immediately adjacent to the characters.

Following the painting of the backgrounds, there exists a full-color reproduction on celluloid of the animated cartoon characters which should appear in each frame of the film as well as the separate full-color backgrounds for all scenes. At this point a check can be made to confirm that all of the necessary component elements are present before the final photography is undertaken. Also, registration marks may be placed on each background scene for indicating where each celluloid sheet should be placed to correspond to a respective frame in the original film. This can be achieved by inspecting successive frames in the original film and making successive marks on each background corresponding to the leftmost or rightmost edges of successive frames.

The actual color cartoon is "shot" as depicted in FIG. 8. The drawing shows a multi-color background 40 on which is superimposed one of the celluloid sheets 28 which contains a color character on it. Camera 44 is used to expose a single frame in the final film (not shown) in the camera. Thereafter, the next celluloid sheet is placed on the same background, with its left-

most edge slightly to the right of the position of the left-most edge of sheet 28 in FIG. 8. At the same time, the camera may be moved to the right by the same distance prior to exposure of the next frame. (In actuality, the camera may be held stationary, and the background moved to the left in incremental steps, with successive celluloid sheets being placed in the same position relative to the camera.) Preferably, reversal film is used so that a positive is available immediately after the film processing, although other conventional photographic films and photographic processes may be employed.

The scenes are not necessarily shot in sequence, that is, the film shooting does not have to follow the original film on a scene-by-scene basis. For speed and efficiency, all scenes utilizing the same background are shot in tandem. Then another background is used for the shooting of all scenes which take place in that "set." In many cases, the same background may be used in different, separated scenes in the overall film and it is most convenient to shoot the scenes out of sequence and subsequently edit the film. A scene identifying number may be photographed in the frame immediately preceding each scene. In the final editing step, the scenes can be properly sequenced and spliced together in accordance with conventional practice, and the original sound track on the black-and-white film may be recorded on the color film using conventional synchronizing equipment.

Live-action films are those in which the players are not animated characters, but rather real "flesh-and-blood" characters or performers. To convert such black-and-white films into color films, a process similar to that described for animated cartoons is utilized, but with certain modifications.

The steps through that depicted in FIG. 3 are the same. For each frame of the original film, an enlarged print is made. As will be described below, for the live-action case a print is required for each frame for the purpose of coloring the performers directly on the print (rather than on a sheet of celluloid). Since in the basic process several of the prints for each scene are cut up and pieced together to construct a background, for some frames two enlarged prints must be made. The prints may be made on black-and-white stock as in the case of animated cartoons. However, it is also possible to make the prints on brown-and-white (sepia tone) stock. The reason for this will be explained below.

The next step in the process is depicted in FIG. 9. A typical frame (print) 50 is shown as consisting of a performer in front of a background scene. Two black "mattes" or masks are prepared from the print 50 as shown by arrows 52. The first matte 54 is completely black except in that area which would overlay the performer were the matte placed upon print 50. The matte can be prepared by utilizing a piece of clear celluloid, placing it over print 50, and painting the sheet with black ink over all of the background area. The second mask 56 is exactly the opposite; it is clear throughout except in that area which would overlay the performer were the mask placed on top of print 50. The two masks are complementary in that they block light and transmit light from the print in mutually exclusive regions.

The monochromatic prints are then examined and color schemes are planned. The colors which are

specified for the case of live-action must be realistic and authentic, as opposed to stylized or exaggerated colors which are often preferable for animated cartoons. It is then that the coloring of the characters or performers takes place. In the case of animated cartoons, as depicted in FIGS. 4 and 5, a sheet of transparent material is used for coloring the characters in each frame. This is not desirable for live-action films. Instead, the monochromatic print for each frame is itself hand colored, the coloring operation being confined to the live-action players. Skin tones are applied first followed by the coloring of clothing. The coloring is relatively simple because there is no need to confine the color to the outlines of the performers. As will be described below, before the colored print is used to expose a frame in the final film, it is covered by a mask such as mask 54 in FIG. 9 and consequently the final film frame is exposed only in an area corresponding to the actual performer in the print being used for the exposure. In the coloring step, the backgrounds are ignored (except insofar as they are accidentally colored which, as just described, presents no problem). The reason for using sepia-tone stock is that a Caucasian male star may already appear with life-like pink skin tones, brown eyes, sandy hair, and even be attired in a brown suit in the print, and there is thus much less coloring which must be done. Similarly, a Negro star's skin tone will already appear as a natural shade of sepia and little or no additional coloring will be required. In actual practice, all that is required for skin tones is to spread translucent color wash on the skin areas, followed by dabs of color (eyes, mouth, etc.) where necessary.

The color backgrounds are made exactly as they are for animated cartoons. Key stills are selected from each scene in the film, and they are cut and then pieced together to construct a background which can be used subsequently in the final photography. The specified colors are then applied to the photo-montage, principally by utilizing an air brush technique. As explained above, in some cases it may be necessary to make a print of the background and to color the print so that the cuts are not visible in the final film.

There are thus available all of the necessary color backgrounds or "sets," a print containing color performers for each frame, and two masks for each print. At this time, the original film may be examined and registration marks may be placed on the backgrounds for the purpose of subsequently correctly identifying that part of each background which should be shot for each frame.

A background is then taken and the first mask of the type shown by numeral 56 in FIG. 9 for the respective scene is placed in the correct position on the background. A frame in the film contained in the camera is exposed and what is "seen" is a colored background which is blacked out wherever performers should appear. The background is then advanced slightly and the next mask 56, corresponding to the next frame, is positioned on the background, the film in the camera is advanced by a single frame, and the frame is then exposed. This process is continued until the entire scene is photographed, that is, until the background for each of the frames in the scene has been photographed.

The film is then rewound in preparation for a second exposure of each frame. This time, however, the color background is not used. Instead, the first print 50 (FIG. 9) is placed under the camera underneath its respective mask 54. The mask prevents the already exposed background portion of the frame from being exposed once again, and what now happens is that the part of the frame corresponding to the performer is exposed in accordance with the color performer appearing on the print. The film is then advanced to the next frame, and the next print with its corresponding mask 54 is placed under the camera. This process continues until all frames in the scene are exposed once again. For any given scene the color film rolls past the camera lens twice once for recording the background alone and once for recording the performers alone. The result is that each frame, in color, matches a corresponding frame in the original black-and-white film. The film can then be edited and the sound track recorded as in the case of animated cartoons.

The reason for the different steps taken in the conversion of a live-action film is that the black outlines on the celluloid sheets (FIG. 4) which are made for each frame of an animated cartoon are not acceptable for a live-action film. Because it is exceedingly difficult to paint the performers on a celluloid sheet without benefit of black outlines, celluloid sheets are not used at all. Instead, the performers are colored directly on the prints themselves. The construction of the backgrounds is basically the same in both cases. But because the color performers are represented on prints which also include background, it is necessary to utilize the masks and to expose each frame in the final film two times.

Although the invention has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the application of the principles of the invention. For example, in many cartoons, each frame is repeated, that is, each frame is photographed twice so that in showing the cartoon there are only 720 "new" frames per minute rather than 1,440 as is normally the case in live-action films. The conversion process of the invention can be used in such a case simply by working on alternate, different frames of the black-and-white film and shooting the same frame in the color film twice in succession. Thus it is to be understood that numerous modifications may be made therein and other arrangements may be devised without departing from the spirit and scope of the invention.

What is claimed is:

1. A method for converting a black-and-white animated cartoon film to a color film comprising the steps of:

1. making a photographic print duplicate of sequential different frames of said black-and-white film,
2. placing a respective transparent sheet of material over each print, drawing on said sheet the outlines of the characters on the print, and coloring the characters within the outlines on said sheet,
3. selecting a group of prints corresponding to respective frames in each scene of said film, cutting substantially character-unobstructed background sections from the selected prints, piecing together the cut sections and constructing

a photo-montage of the entire background for the scene, and coloring the background photo-montage, and

4. for each scene, placing the transparent, colored, character-containing sheets corresponding to the frames in the scene on top of the colored background photo-montage for the scene in respective positions corresponding to the backgrounds of respective frames in said black-and-white film, and exposing each frame of a color film in accordance with the composite image of a respective transparent colored, character-containing sheet in its respective position on the colored background photo-montage.

2. A method in accordance with claim 1 wherein step (1) includes the sub-steps of making a negative of said black-and-white film and making enlarged photographic prints of frames of said negative.

3. A method in accordance with claim 1 wherein in step (2) the outlines of the characters on each transparent sheet are drawn on one side of the sheet and the coloring of the characters is done on the other side of the sheet, and in step (4) each transparent, colored, character-containing sheet is placed on top of the respective colored background photo-montage with said other side facing the background photo-montage.

4. A method in accordance with claim 3 wherein in step (2) the characters on a transparent sheet are colored by applying vinyl colors to the sheet.

5. A method in accordance with claim 1 wherein in step (3) the photo-montage for each scene is constructed by photographing the pieced together cut background sections for the scene.

6. A method in accordance with claim 1 wherein in step (3) a background photo-montage is colored by applying poster colors to the photo-montage.

7. A method for converting a black-and-white live-action film to a color film comprising the steps of:

(1) making a photographic print duplicate of sequential different frames of said black-and-white film,

(2) making a pair of masks for each of said prints, the first mask serving to block light from the performers in said print but allowing the transmission therethrough of light from the background in said print, and the second mask serving to block light from the background in said print but allowing the transmission therethrough of light from the performers in said print,

(3) coloring the performers on said prints,

(4) selecting a group of prints corresponding to respective frames in each scene of said film, cutting substantially performer-unobstructed background sections from the selected prints, piecing together the cut sections and constructing a photo-montage of the entire background for the scene, and coloring the background photo-montage,

(5) for each scene, placing the first masks corresponding to the frames in the scene on top of the colored background photo-montage for the scene in respective positions corresponding to the backgrounds of respective frames in said black-and-white film, and exposing each frame of a color film to light transmitted from the background photo-montage through the respective first mask, and

(6) for each scene, placing the second masks corresponding to the frames in the scene on top of the respective performer-colored prints for the scene, and exposing respective ones of the same frames of the color film exposed in step (5) to light transmitted from the performer-colored prints through the respective second masks.

8. A method in accordance with claim 7 wherein step (1) includes the sub-steps of making a negative of said black-and-white film and making enlarged photographic prints of frames of said negative.

9. A method in accordance with claim 7 wherein each print made in step (1) is made on brown-and-white stock.

10. A method in accordance with claim 7 wherein in step (4) the photo-montage for each scene is constructed by photographing the pieced together cut background sections for the scene.

11. A method in accordance with claim 7 wherein in step (4) a background photo-montage is colored by applying poster colors to the photo-montage.

12. A method for converting a black-and-white film to a color film comprising the steps of:

- (1) making a photographic print duplicate of sequential different frames of said black-and-white film,
- (2) for each print, making a colored record of the characters on the print,
- (3) selecting a group of prints corresponding to respective frames in each scene of said film, cutting substantially character-unobstructed background sections from the selected prints, piecing together the cut sections and constructing a photo-montage of the entire background for the scene, and coloring the background photo-montage, and
- (4) for each scene, exposing frames of a color film to

light transmitted from portions of the respective colored background photo-montage corresponding to the backgrounds of respective frames in said black-and-white film, and exposing respective ones of the same frames of the color film to light transmitted from respective ones of the character-colored records made in step (2).

13. A method in accordance with claim 12 wherein step (1) includes the sub-steps of making a negative of said black-and-white film and making enlarged photographic prints of frames of said negative.

14. A method in accordance with claim 12 wherein in step (3) the photo-montage for each scene is constructed by photographing the pieced together cut background sections for the scene.

15. A method in accordance with claim 12 wherein in step (3) a background photo-montage is colored by applying poster colors to the photo-montage.

16. A method for converting a black-and-white film to a color film comprising the steps of:

- (1) making a photographic print duplicate of sequential different frames of said black-and-white film,
- (2) for each print, making a colored record of the characters on the print,
- (3) selecting a group of frames in each scene of said film, constructing therefrom a record of the background for the entire scene, and coloring the background record, and
- (4) for each scene, exposing frames of a color film to light transmitted from portions of the respective colored background record corresponding to the backgrounds of respective frames in said black-and-white film, and exposing respective ones of the same frames of the color film to light transmitted from respective ones of the character-colored records made in step (2).

\* \* \* \* \*

40

45

50

55

60

65