My invention relates generally to the production of animated cartoons and more particularly to the production of an improved cell for use in making said cartoons.

As taught in the U.S. patent to Hurd, 1,143,542, and now rather generally known in the art, animated cartoons are produced by separately photographing on a continuous film strip a series of successive-action picture in such manner that the finished film when projected on a suitable screen produces an animated reproduction of the successive pictures photographed. While the motion pictures thus produced are generally termed and will be referred to herein as "animated cartoons," it will be realized of course that they are often portrayals of truly dramatic works with life-like characters drawn from living models.

In the production of animated cartoons by conventional methods, the action pictures are made on transparent sheets of Celluloid or other suitable material, each picture-bearing sheet being termed a cell. Usually a number of cells each bearing a part of the picture are assembled in front of a pictorial background and the composite picture thus formed is photographed in one operation.

Various methods of making cartoon cells are now in use, but the most common procedure is for the artist to make a pencil sketch of the outlines of the picture on paper, and then trace the outlines in ink on a sheet of clear Celluloid, after which the picture area is backed up with paint to give the right coloring, shadow effects, etc. Since the tracings are usually made by persons less skillful than the artist, much of the artistry of the original picture is often lost in the tracing and backing up operations, and as a consequence an inferior product is produced.

Another disadvantage of present systems is that the original drawings, especially when made with pencil or crayon may become smeared or soiled in handling, especially when kept for any length of time. Likewise, the ink or paint on the finished cell may be scratched or chipped off during use, and it is often necessary to maintain certain temperature and humidity conditions to prevent deterioration of the paint.

Still another practical disadvantage of the present system is the fact that the proper incentive is sometimes lacking for the artist to do his best work when he knows that the fine points of his artistic touch will be lost in the tracing operation.

The major object of my invention is to overcome all of the foregoing disadvantages of present systems, by producing a cartoon cell far superior to anything heretofore known, using a method which is simple and economical to perform.

In the accompanying drawing,

Fig. 1 is a plan view of a matte surface sheet upon which the drawing is made;

Fig. 2 is a greatly enlarged cross-sectional view of the sheet taken at 2—2 in Fig. 1 and showing the matte surface on the sheet;

Fig. 3 is a greatly enlarged cross-section view of a completed cell made according to a modified form of my invention;

Fig. 4 is a perspective view showing one method of protecting the drawing by laminating the cell; and

Fig. 5 is a plan view of a completed cell.

Referring now to the drawing, and particularly to Figs. 1 and 2 thereof, the numeral 10 indicates a sheet of transparent material such as cellulose acetate for example, which has a matte surface on its upper face, the matte having enough "tooth" to take pencil or crayon satisfactorily.

As the first step in producing a cartoon cell according to my invention, the desired picture is drawn on the matte surface of the sheet 10 in usual fashion, it being understood that I am using the term "draw" herein in its more generic form to include painting and other suitable methods of manually producing a satisfactory picture on the sheet. In making the picture the artist may of course, use any suitable material so long as it does not injuriously affect the matte surface on the sheet.

After the picture on sheet 10 has been completed, the matte surface is rendered inoperative by filling in the indentations thereof with a material having substantially the same index of refraction as the sheet 10. This may conveniently be done by flowing a suitable liquid such as an oil or a lacquer over the matte surface, by fusing a thermoplastic of low melting point over the sheet, or by any other suitable method which will produce a layer 11 of transparent material intimately bonded to the sheet 10.

One very simple and satisfactory method of providing the matte eliminator is to flow a suitable transparent lacquer such as ethyl cellulose lacquer over the matte surface to fill all of the indentations thereof, and then to spin the sheet to evenly distribute the lacquer and cause it to dry out, depositing a smooth clear surface film. It is, of course, necessary that the surface film have substantially the same index of refraction
as the material used for the sheet 10. For example, if the sheet 10 is made of plasticized cellulose acetate which has an optical index of 1.49, and it is desired to use a surface film of ethyl cellulose which only has an optical index of 1.47, it is necessary to add a suitable substance or extract of higher index in order to bring the surface film index up to that of the matte sheet 10.

I have found that various resins of the classes known as "Santolite" (arylsulphonamide-formaldehyde resins) and "Arocol" (chlorinated diphenyls) manufactured by the Monsanto Co. Chemical when added in proper quantities to ethyl cellulose will produce a surface film of the proper index of refraction. The optical indices of resins of this type vary generally from 1.51 to 1.66. One suitable solvent for such a lacquer and one which does not attack or soften the cellulose acetate is toluene.

Another satisfactory method of eliminating the matte and protecting the drawing is to flow a suitable liquid over the matte surface to eliminate the same and then to superimpose a transparent sheet 12 of the same material as sheet 10, or other suitable material having a like index of refraction, over the layer of matte eliminator 11, and pressing the sheets into tight engagement to remove all air bubbles that may be present. By thus using two plastic sheets to encase the picture the ultimate in protection of the drawing is obtained.

Various materials may of course be used for laminating the cell, the chief requisite being that all materials used have substantially the same index of refraction, and that the matte eliminator be of such character as to remain between the sheets 10 and 12 without deterioration. In this form of my invention where the cell is laminated, I prefer to use a plastic such as cellulose acetate for the laminating sheets, and I have found that a highly refined natural mineral oil or a polymerized oil such as "Vistac," having an optical index of 1.49, makes an excellent binder, if the laminating is to be done cold. A suitable thermo-plastic bonding material such as ethyl cellulose mixed with suitable resins as above described may be used if the laminating is to be done by the heat and pressure method, it being essential of course that the material have the proper index of refraction when set. If the bonding material is relatively fluid at normal temperatures as is the case with most of the mineral oils, it is desirable to seal the edges of the sheets with some quick drying adhesive such as film cement, or to mechanically seal them with an overlapping strip of Scotch tape or other adhesive bound around the edges of the sheets. In the case of the thermo-plastic binders it may be advisable to employ them in the form of a sheet, which upon the application of heat and pressure will soften sufficiently to fill the matte indentations without injuring the sheets 10 and 12.

The result of these operations is a cell having the drawing in all of its original color and detail completely encased in a protective housing of transparent plastic of uniform index of refraction. It will be immediately evident that such a cell may be handled in any reasonable manner over a long period of time without damage, and that it is not subject to deterioration due to atmospheric variations. It will also be evident that my invention greatly reduces the time and labor of making cartoon cells, since it eliminates the tracing operation, and permits the original artist's drawing to be photographed. Furthermore, the use of pencil, crayon, etc., in place of ink lines is a distinct advantage.

As is well known in the art, it is usually advisable to back up the images with suitable paint applied in a substance or self-index of refraction. The drawn outline controls the definition. In many cases, it is desirable to protect this pigment image from the hazards of handling and other factors, and in such case I prefer to laminate the back of the cell with a layer of suitable protective material of the type of refraction. When this is done, the entire original sheet 10 is encased in a protective shell or casing which fully protects both sides of the sheet.

From the foregoing, it will be seen that I have provided a simple and economical method of producing an improved cell for use in the production of animated cartoons, it being understood, however, that the forms of my invention specifically disclosed herein are merely illustrative of the broad concept thereof as defined by the appended claims.

I claim:

1. A cartoon cell which includes: a transparent sheet of cellulose acetate having a matte surface and a drawing on said surface; and a layer of ethyl cellulose over said matte surface filling the indentations thereof, said ethyl cellulose having mixed therein a resin of a higher index of refraction in sufficient quantity to bring the index thereof substantially up to that of said acetate.

2. A cartoon cell, which includes: a transparent sheet of cellulose acetate having a matte surface and an original drawing on said surface; and a layer of ethyl cellulose over said matte surface filling the indentations thereof, said ethyl cellulose having mixed therein a substance of a higher index of refraction in sufficient quantity to bring its index of refraction substantially up to that of cellulose acetate.

3. A cartoon cell, which includes: a transparent sheet of cellulose acetate having a matte surface and an original drawing on said matte surface; and a layer of a different transparent material overlying said matte surface and filling the indentations thereof, said overlying material having mixed therein a substance of a different index of refraction in sufficient quantity to bring the index of refraction of said overlying layer substantially to that of said cellulose acetate.

4. A cartoon cell, which includes: a transparent sheet having a matte surface and an original drawing on said matte surface; and a layer of a different transparent material overlying said entire sheet and filling the indentations of its matte surface, said overlying material having mixed therein a substance of a different index of refraction in sufficient quantity to bring the index of refraction of said overlying layer substantially to that of said transparent sheet.

5. A cartoon cell, which includes: a transparent sheet of thermo-plastic material having a matte surface and an original drawing on said matte surface; a layer of transparent material over the entire area of said sheet said layer being of transparent material having the same index of refraction as said transparent sheet and filling the indentations thereof; and a second sheet of transparent material over said matte eliminating layer and bonded thereto.

6. A cartoon cell, which includes: a transparent sheet of cellulose acetate having a matte surface and an original drawing on said matte surface; a layer of transparent material over the en-
tire area of said sheet said layer being of transparent material having the same index of refraction as said transparent sheet and filling the indentations thereof; and a second sheet of transparent material over said matte eliminating layer and bonded thereto.

7. A cartoon cell, which includes: a transparent sheet having a matte surface and an original drawing on said matte surface; and a protective layer of transparent material overlying the entire area of said sheet and filling the indentations of said matte surface, said overlying layer having substantially the same index of refraction as said transparent sheet, whereby said matte surface is eliminated over the entire area of said drawing.

8. A cartoon cell, which includes: a transparent sheet having a matte surface and an original drawing on said matte surface; and a second transparent sheet overlying said first sheet and protecting said drawing and bonded to said first sheet with a material having substantially the same index of refraction as said first sheet, whereby said entire matte surface is eliminated.

9. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of a transparent sheet of cellulose acetate; mixing with a solution of ethyl cellulose sufficient resin of a different index of refraction to bring the index of said mixture to that of cellulose acetate; and applying a layer of said mixture over said matte surface to fill the indentations thereof and to protect said picture thereon.

10. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of a transparent sheet of cellulose acetate; mixing with a transparent substance whose index of refraction is different from that of cellulose acetate sufficient resin of a different index of refraction to bring the index of said mixture to that of cellulose acetate; and applying a layer of said mixture over said matte surface to fill the indentations thereof and to protect said picture thereon.

11. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of an otherwise transparent sheet; and covering said sheet with a protective layer of material which has substantially the same index of refraction as said transparent sheet and which flows into the indentations of said matte surface to eliminate the same.

12. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of an otherwise transparent sheet; covering said sheet with a protective layer of material which has substantially the same index of refraction as said transparent sheet and which flows into the indentations of said matte surface to eliminate the same; and intimately bonding an outer sheet of transparent material to said matte eliminating layer.

13. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of an otherwise transparent sheet; covering said sheet with a protective layer of material which has substantially the same index of refraction as said transparent sheet and which flows into the indentations of said matte surface to eliminate the same; and allowing said overlying layer to set to a relatively hard protective coating.

14. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of an otherwise transparent sheet; placing a transparent sheet over said drawing with a thermo-plastic binder therebetween, said sheets and said binder all having substantially the same index of refraction; and applying sufficient heat and pressure to said sheets to cause said binder to fill the indentations of said matte surface and thereby render the same transparent.

15. The method of making a cartoon cell, which includes: drawing a picture on the matte surface of an otherwise transparent sheet; covering said matte surface with a lacquer having substantially the same index of refraction as said sheet; and spinning said sheet to evenly distribute said lacquer thereon, whereby the same may set with a clear smooth surface.

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