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PRODUCTION OF ANIMATED PICTURES

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The present invention relates to the production of animated picture sequences in recorded form, for example animated films and "flicker books."

The principle of animation is the presentation to the eye in quick succession of a sequence of separately created static pictures representing the positions of the animated elements at successive instants of time. In animated films the pictures are projected on a screen one after another while in flicker books the pictures are carried on successive pages of a book and are presented to the eye in quick succession by riffling through the book, for example by allowing the edges of the sheets to run rapidly over the thumb. A difficulty with all such animation processes is that they do not lend themselves to large-scale production since each of the pictures in the sequence requires a new drawing by the animation artist.

In a typical known process of animated film production the successive pictures of a sequence are drawn by an animation artist, each picture showing the position reached by a slight movement from the position shown in the preceding picture. In order to reduce the amount of drawing required of the artist, individual picture elements to be animated are separated from one another and drawn on superimposed sheets of tracing paper. In this way a picture element, for example the leg of a character, can be drawn in a first position and the sheet carrying this drawing then removed and replaced by another sheet on which a second position of the element is drawn, the drawing on a separate sheet of a related picture element, for example the character's body, which is not required to move during the movement of the leg from the first to the second position, being retained and used as a reference against which to draw the leg in its two positions.

When the animation artist has completed the drawings for the animated sequence, which despite the use of the separation teachnique described involves the creation of a new drawing every time any picture element moves at any point in the sequence, the drawings are copied onto transparent acetate sheets by tracing and the traced outline is filled in with any required colour. For each frame of the film an assembly of superimposed transparent sheets is built up so that the individual picture elements on the separate sheets form the required picture, an opaque background sheet being usually placed behind the assembly. The assembly is then photographed as one frame of the film. Frequently the same assembly is used for two frames before one or more sheets are changed to produce a movement. It has been found that this produces a satisfactory visual impression when the film is projected and it is advantageous in reducing the amount of drawing required for a film of any given length.

It will be apparent that the production of animated films by the conventional methods, such as those described, involves a large amount of skilled artistic work by the animation artist in the production of the original drawings and the labour of tracing these drawings and painting-in the traced outlines. It is an object of the present invention to enable this work to be reduced and to provide a process suitable for producing long animated sequences, or a number of shorter animated sequences, employing the same picture-elements throughout, such as would be necessary for a series of cartoon films featuring the same character or characters.

It is a further object of the invention to provide a process for the production of flicker books which requires less drawing by the animation artist.

In accordance with the invention there is provided a process for producing animated picture sequences in recorded form, in which several identical sets of decalcomanias or transfers are made from a set of original drawings representing a unit movement of a picture element and comprising representations of a cycle of successive positions of the picture element in the unit movement, and the sets of decalcomanias are used to create the corresponding unit movements in the animated sequences by applying transfers of a set to individual supporting sheets to produce decal images at desired locations on the sheets.

In the production of animated films the visual content of the supporting sheets carrying the decal images is then recorded, in conjunction with that of the remaining parts of the required picture, in the order determined by the cycle of positions in the unit movement.

Preferably other unit movements of the same or a different picture element are created by the use of other sets of decalcomanias in the manner set forth, the visual contents of supporting sheets carrying decal images of different picture elements being combined during the recording when more than one picture element is to be simultaneously animated. All the required movements may be created by the use of appropriate sets of decalcomanias but for unit movements which occur infrequently it may prove cheaper and more convenient to produce the image-carrying sheets from original drawings directly by the known processes of tracing and painting.

For the production of an animated film for optical projection recording is effected by photography of a series of assemblies of superimposed transparent sheets carrying mutually complementary parts of the whole picture and background sheets showing the relatively fixed background against which the animated picture elements move. Instead of recording the assemblies on film their visual content may be recorded on magnetic tape by scanning and conversion of the light intensity variations over the area of the picture into electrical signals for recording on the tape. This method is applicable when the animated picture sequences are to be shown by means of television equipment and no optical projection is necessary.

In the production of flicker books decalcomanias from several sets, the sets representing unit movements of different picture elements, are combined on each of a series of supporting sheets to form the required sequence of pictures and a book is made whose successive pages carry the successive picture of the sequence. The supporting sheets may form the pages of the book or the pictures may be reproduced from the supporting sheets and printed on the pages of the book.

The process of production of an animated film by means of the invention will now be described in more detail. The original drawings are first created by the animation artist in the conventional manner, using the separate technique. For every picture element to be animated, such as the head, body, legs and arms of a character, separate sets of drawings are made for all the frequently occurring movements of the element, such as nodding of the head, swinging of an arm, and walking of a leg. Each set of drawings comprises representations of the picture element in successive positions which are taken up by the picture element in the course of the movement and thus represents a unit movement of the picture element such as may occur at various positions, in various orientations, and in conjunction with various combinations of other unit movements. The drawings

are so made that one picture element, such as a leg, will in each of the positions of some or all of its unit movements combine with many or all of the positions of an associated element, such as a body, to form a satisfactory and convincing junction. The pictures drawn by the animation artist in this way are not necessarily pictures which are to be used as a whole in the finished film since his object is to produce a library of unit movements of picture elements which can be assembled in many combinations to produce different animated sequences. It is not necessary that all possible unit movements of every element should be drawn at this stage since it will be possible to draw a little-used movement as the need arises.

Before printing as transfers the original drawings can be tested by photographing them directly onto the film and projecting the film to enable the smoothness of the animation and dove-tailing of the individual picture elements to be judged. Assuming the drawings are adjudged satisfactory they are then traced onto individual transparent sheets of cellulose triacetate and coloured or shaded as required. From each of these sheets a number of decalcomanias are made and in this way every set of original drawings representing a unit movement is converted into several similar sets of transfers. Sets of transfers of the same unit movement may be made in different colours and different sizes, in left-hand and right-hand versions, and in solid black for use in the known technique of "matting."

It is not always necessary for the drawings to be traced onto transparent sheets before they are coloured and reproduced as decalcomanias. The drawings themselves may be coloured with water colours or oils or any other medium and the transfer made direct from these coloured drawings.

A library of decalcomanias has now been created relating to a particular group of animated characters each consisting of a plurality of picture elements movable relative to one another. From this library any number of different animated sequences involving this group of characters can be created. The decalcomanias are applied to individual supporting sheets of transparent material and the sheets are then assembled into a succession of complete pictures in accordance with the animation required and photographed onto cinematograph film in the known manner already referred to. In assembling the supporting sheets carrying the decal images of the set representing any one unit movement with supporting sheets of other unit movements and with a background sheet portraying the background scene, the order determined by the sequence of positions in the unit movement is maintained but it is not necessary that every decalcomania of the set should be used. By using every other decalcomania of a set, for example, it is possible to increase the apparent speed of the movement.

In order to make it easier to place the decal images carried on the supporting sheets in their correct relative positions registration marks may be incorporated in the decalcomanias. The use of photocells for matching up these registration marks is possible in accordance with the methods used in the printing industry.

The decalcomanias used may be wet or dry decalcomanias of any suitable type, though the latter are preferred as being more convenient in use.

The process of animation by the use of decalcomanias is also applicable to the production of "flicker books" in which the pictures representing successive stages of the animated movement are applied to successive sheets of a book and the sensation of movement its produced by riffling through the book, for example by allowing the edges of the sheets to run rapidly over the thumb, and thus presenting the pictures to the eye in rapid succession. A variety of other devices are known which employ the same principle to achieve a sensation of movement and this is indeed the principle of the animated film, but whereas in animated film production as described above separation techniques are employed and decal images representing individual picture elements are usually applied to separate transparent sheets which are then brought together and photographed to give one picture, in the production of flicker books and the like the decalcomanias of the various picture elements may be applied directly to a single sheet to form the desired picture.

In the production of flicker books in accordance with the invention sets of decalcomanias, preferably dry decalcomanias not requiring the use of water or other solvents in their application, are produced in the manner described above in connection with the production of animated films.

The decalcomanias are applied to a corresponding part of one side of each of a plurality of sheets. The part of the sheet to which they are applied lies close to one edge of the sheet. On each sheet a picture is built up by the application of decalcomanias representing the individual elements of the picture required, such as the head, body, legs and arms of a character. The decalcomanias of each set are applied in order to successive sheets so that a series of complete pictures are produced representing successive stages of the animated sequence. The sheets are then bound together into a book by connecting them along the edge of the sheet opposite to that close to which the pictures have been placed. Alternatively the binding may be done first and the pictures applied subsequently.

The process of the invention may also be applied to the production of flicker books by a photographic printing technique. The decalcomanias are then applied to transparent sheets which are assembled in the same manner as for the production of animated films. The picture formed by the assembly of transparent sheets carrying various picture elements is then used to produce a printing plate by well-known photographic techniques and the flicker book is printed from a succession of such printing plates.

It will further be seen that the series of complete pictures representing successive stages of the animated sequence which are formed during the production of flicker books can be photographed to form the successive frames of an animated film. In this process for producing an animated film the individual frames, instead of being formed by assemblies of transparent sheets, are assembled as a whole on one sheet by the application of one decalcomania from each of a number of sets. Successive frames may be formed in this way on a continuous strip of opaque or transparent material. In the latter case the use of translucent transferred images will enable the strip itself to be used for projection purposes before it is photographically reproduced on a smaller scale as the final animated film.

I claim:

1. A process for producing animated picture sequences in recorded form the steps comprising:
   - making a set of original drawings representing a unit movement of a picture element, said set comprising representations of the picture element in successive positions in the unit movement;
   - making a plurality of identical sets of decalcomanias from said set of original drawings;
   - applying decalcomanias of at least one set to individual supporting sheets to produce images at desired locations on the sheets; and
   - assembling said sheets in the order determined by the sequence of successive positions in the unit movement so that the images on the sheets reproduce the unit movement.

2. A process as claimed in claim 1 the steps further comprising:
   - recording the visual content of said supporting sheets,

in conjunction with that of the remaining parts of the required picture, in the assembled order.

3. A process as claimed in claim 2 including:

reproducing other unit movements of the said picture element and other picture elements by the use of other sets of decalcomanias in the same manner; and

combining the visual contents of supporting sheets carrying images of different picture elements during said recording.

4. A process as claimed in claim 3 including:

applying said decalcomanias to transparent supporting sheets;

assembling the sheets to form a series of assemblies of superimposed sheets carrying mutually complementary picture elements and background sheets showing the relatively fixed background against which the animated elements move; and

effecting said recording by photography of the series of assemblies.

5. A process as claimed in claim 1 including the step of forming the required sequence of pictures by combining on each of a series of supporting sheets decalcomanias of several sets representing unit movements of different picture elements.

6. A process as claimed in claim 5 including binding the series of supporting sheets together to form a flicker book.

7. A process as claimed in claim 5 including reproducing the sequence of pictures from the supporting sheets and printing them on the pages of a flicker book by a photo-printing method.

8. A process as claimed in claim 5 including photographing the sequence of pictures to form successive frames of an animated film.

9. A process as claimed in claim 1 including:

forming a sequence of pictures on a continuous supporting strip by combining decalcomanias of several sets

representing unit movements of different picture elements, the decalcomanias of each set being used in the sequence of pictures in the order determined by the sequence of positions in the unit movement;

and photographing the strip to produce an animated film.

10. A process for the production of animated films the steps comprising:

making a number of sets of original drawings, each set representing a unit movement of a picture element and comprising representations of the picture element in successive positions in the unit movement;

making a plurality of identical sets of decalcomanias from each set of original drawings;

applying decalcomanias of a plurality of sets to individual transparent supporting sheets to produce images of the picture elements at desired locations on the sheets;

assembling said sheets to form a series of assemblies of transparent sheets each of which contains only one supporting sheet carrying an applied decalcomania from any set; and

photographing the assemblies in order to form an animated picture sequence.

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